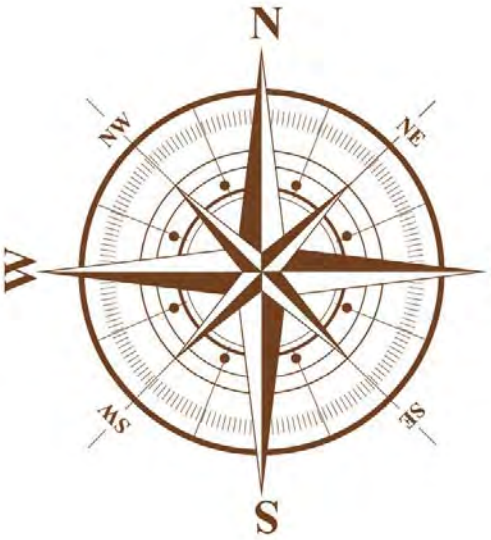

Officer of the Watch

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CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY – DECK OFFICER

EXAMINATIONS ADMINISTERED BY THE
SCOTTISH QUALIFICATIONS AUTHORITY
ON BEHALF OF THE
MARITIME AND COASTGUARD AGENCY

STCW 95 OFFICER IN CHARGE OF NAVIGATIONAL WATCH REG. II/1 (UNLIMITED)

034-83 – NAVIGATION

0915 – 1145 hrs

Examination paper inserts:

Worksheet Q2 – Tidal Curve for Pacific and Atlantic Oceans Ports Luminous Range Diagram/Geographical Range Table

Notes for the guidance of candidates:

1. Candidates should note that 100 marks are allocated to this paper. To pass candidates must achieve 60% of the total marks available. In addition, candidates must achieve a minimum of 70% from Section A.

2. Non-programmable calculators may be used.

3. All formulae used must be stated and the method of working and all intermediate steps must be made clear in the answer.

Materials to be supplied by examination centres:

Candidate's examination workbook	Nautical Almanac
Navigation Formulae Datasheet	UK and Ireland Tide Tables
Nautical Tables	Pacific and Atlantic Oceans Tide Tables
Chart 5048, Edition N°3 (07/04/2005)	

INSTRUCTIONS TO CANDIDATE

General Information

Before the examination begins you should ensure that you have been provided with any ancillary material required for the examination. "*Materials to be supplied by examination centre*" are listed on the front sheet of the examination paper.

All mobile phones **MUST** be surrendered to the Invigilator during the period of the examination.

Completion of Examination Workbook

CANDIDATES SHOULD READ THE MARITIME AND COASTGUARD AGENCY POLICY REGARDING CHEATING IN EXAMINATIONS, THEN SIGN AND COMPLETE THE DECLARATION ON THE INSIDE FRONT COVER.

YOUR EXAMINATION SCRIPT WILL NOT BE MARKED UNLESS YOU COMPLETE AND SIGN THIS FORM.

Please write in **BLOCK CAPITALS** on the cover of your workbook your name, date of birth, Candidate Number, subject number and title, course of study, centre attended, centre of examination, if different, and date of examination. You should be in possession of a candidate examination card giving your candidate number. If you are not in possession of this card the information can be provided by the Invigilator. **(Note: examination cards are not supplied to CEC and Yacht candidates)**

If an additional workbook/graph paper/worksheet is used these must be included inside the original workbook. An 'X' should be inserted in the appropriate box under Note 3 on the workbook cover in such circumstances.

In the space provided in the section 'Questions Attempted' on the workbook cover you must ***circle the numbers*** of the questions you have attempted. Do not make any entries in the boxes indicated 'For Markers Use Only'.

Use **BOTH** sides of each sheet. The answers to **EACH NEW QUESTION** must start at the top of a fresh page and the number of the question should be inserted at the top of each page. Use **ink** for all essential written matter, which should be contained within the feint ruled vertical lines. (While pencil may be used for diagrams and sketches, annotations to these should be in ink.). Please **DO NOT** use red ink.

YOUR EXAMINATION SCRIPT WILL NOT BE MARKED IF IT IS COMPLETED IN PENCIL AND/OR RED INK.

Show all necessary working in calculations, etc. (Rough work, not intended to be read by the marker, should be scored out.)

No part of this book is to be torn out. No writing is allowed on any other paper other than ancillary material/examination inserts. Please ensure you write your name and centre on all examination paper inserts.

Examination Room Conduct

All queries should be addressed to the Invigilator.

No candidate may enter the examination room later than **30 minutes** after the examination begins and no candidate may leave the examination room, except in the case of illness, during the first hour of an examination. Candidates may not leave an examination room during the last **fifteen minutes** of an examination.

Any candidate who leaves the examination room before the end of the examination must leave his or her examination paper with the Invigilator. Examination papers must not be removed from the examination room during the period of the examination.

All candidates must hand their workbook(s) to the Invigilator before leaving. Workbooks must not be removed from the examination room even if they have not been used.

Deviation Card No. 1	
Ship's Head by Compass	
000°	0.0°
010°	
020°	1.5°E
030°	
040°	2.0°E
050°	
060°	3.0°E
070°	
080°	3.0°E
090°	
100°	3.0°E
110°	
120°	2.5°E
130°	
140°	1.5°E
150°	
160°	1.0°E
170°	
180°	0.0°
190°	
200°	0.5°W
210°	
220°	1.0°W
230°	
240°	2.0°W
250°	
260°	2.5°W
270°	
280°	3.0°W
290°	
300°	3.0°W
310°	
320°	2.5°W
330°	
340°	1.5°W
350°	

Deviation Card No. 2	
Ship's Head by Compass	
000°	1.5°W
010°	
020°	0.5°W
030°	
040°	0.5°E
050°	
060°	2.0°E
070°	
080°	3.0°E
090°	
100°	4.0°E
110°	
120°	4.0°E
130°	
140°	3.5°E
150°	
160°	3.0°E
170°	
180°	2.5°E
190°	
200°	1.5°E
210°	
220°	0.0°
230°	
240°	1.5°W
250°	
260°	3.0°W
270°	
280°	4.0°W
290°	
300°	4.0°W
310°	
320°	3.5°W
330°	
340°	2.5°W
350°	

Deviation Card No. 3	
Ship's Head by Compass	
000°	2.5°W
010°	
020°	1.5°W
030°	
040°	0.5°W
050°	
060°	0.5°E
070°	
080°	2.0°E
090°	
100°	3.0°E
110°	
120°	4.0°E
130°	
140°	4.5°E
150°	
160°	5.0°E
170°	
180°	5.0°E
190°	
200°	4.0°E
210°	
220°	3.0°E
230°	
240°	1.5°E
250°	
260°	0.0°
270°	
280°	2.0°W
290°	
300°	4.0°W
310°	
320°	1.0°W
330°	
340°	4.0°W
350°	

Deviation Card No. 4	
Ship's Head by Compass	
000°	0.0°
010°	
020°	1.5°W
030°	
040°	2.0°W
050°	
060°	3.0°W
070°	
080°	3.0°W
090°	
100°	3.0°W
110°	
120°	2.5°W
130°	
140°	1.5°W
150°	
160°	1.0°W
170°	
180°	0.0°
190°	
200°	0.5°E
210°	
220°	1.0°E
230°	
240°	2.0°E
250°	
260°	2.5°E
270°	
280°	3.0°E
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320°	2.5°E
330°	
340°	1.5°E
350°	

Deviation Card No. 5	
Ship's Head by Compass	
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010°	
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030°	
040°	0.5°W
050°	
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070°	
080°	3.0°W
090°	
100°	4.0°W
110°	
120°	4.0°W
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150°	
160°	3.0°W
170°	
180°	2.5°W
190°	
200°	1.5°W
210°	
220°	0.0°
230°	
240°	1.5°E
250°	
260°	3.0°E
270°	
280°	4.0°E
290°	
300°	4.0°E
310°	
320°	3.5°E
330°	
340°	2.5°E
350°	

Deviation Card No. 6	
Ship's Head by Compass	
000°	2.5°E
010°	
020°	1.5°E
030°	
040°	0.5°E
050°	
060°	0.5°W
070°	
080°	2.0°W
090°	
100°	3.0°W
110°	
120°	4.0°W
130°	
140°	4.5°W
150°	
160°	5.0°W
170°	
180°	5.0°W
190°	
200°	4.0°W
210°	
220°	3.0°W
230°	
240°	1.5°W
250°	
260°	0.0°
270°	
280°	2.0°E
290°	
300°	4.0°E
310°	
320°	5.0°E
330°	
340°	4.0°E
350°	

Deviation Card No. 7	
Ship's Head by Compass	
000°	3.0°E
010°	
020°	1.5°W
030°	
040°	4.5°W
050°	
060°	3.5°W
070°	
080°	0.5°E
090°	
100°	5.5°E
110°	
120°	9.0°E
130°	
140°	8.5°E
150°	
160°	4.0°E
170°	
180°	1.0°W
190°	
200°	7.0°W
210°	
220°	9.5°W
230°	
240°	9.0°W
250°	
260°	4.0°W
270°	
280°	2.0°E
290°	
300°	7.5°E
310°	
320°	9.0°E
330°	
340°	7.5°E
350°	

Deviation Card No. 8	
Ship's Head by Compass	
000°	3.0°E
010°	
020°	9.0°E
030°	
040°	11.5°E
050°	
060°	11.0°E
070°	
080°	6.0°E
090°	
100°	0.0°
110°	
120°	5.5°W
130°	
140°	7.0°W
150°	
160°	5.5°W
170°	
180°	1.0°W
190°	
200°	2.5°E
210°	
220°	6.0°E
230°	
240°	5.5°E
250°	
260°	1.5°E
270°	
280°	3.5°W
290°	
300°	7.0°W
310°	
320°	6.5°W
330°	
340°	3.5°W
350°	

Deviation Card No. 9	
Ship's Head by Compass	
000°	0.5°E
010°	
020°	2.0°E
030°	
040°	3.0°E
050°	
060°	4.0°E
070°	
080°	4.5°E
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110°	
120°	5.0°E
130°	
140°	4.0°E
150°	
160°	3.0°E
170°	
180°	1.5°E
190°	
200°	0.0°
210°	
220°	2.0°W
230°	
240°	4.0°W
250°	
260°	5.0°W
270°	
280°	4.0°W
290°	
300°	2.5°W
310°	
320°	1.5°W
330°	
340°	0.5°W
350°	

Deviation Card No. 10	
Ship's Head by Compass	
000°	9.0°E
010°	
020°	9.5°E
030°	
040°	8.5°E
050°	
060°	7.0°E
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150°	
160°	6.0°W
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210°	
220°	6.5°W
230°	
240°	5.0°W
250°	
260°	2.5°W
270°	
280°	0.5°E
290°	
300°	3.5°E
310°	
320°	6.0°E
330°	
340°	8.0°E
350°	

Deviation Card No. 11	
Ship's Head by Compass	
000°	2.0°W
010°	
020°	3.0°W
030°	
040°	4.0°W
050°	
060°	4.0°W
070°	
080°	3.5°W
090°	
100°	3.0°W
110°	
120°	2.5°W
130°	
140°	1.5°W
150°	
160°	0.0°
170°	
180°	1.5°E
190°	
200°	3.0°E
210°	
220°	4.0°E
230°	
240°	4.0°E
250°	
260°	3.5°E
270°	
280°	2.5°E
290°	
300°	1.5°E
310°	
320°	0.5°E
330°	
340°	0.5°W
350°	

Deviation Card No. 12	
Ship's Head by Compass	
000°	7.0°W
010°	
020°	6.0°W
030°	
040°	4.0°W
050°	
060°	1.5°W
070°	
080°	1.5°E
090°	
100°	4.0°E
110°	
120°	6.5°E
130°	
140°	8.5°E
150°	
160°	9.5°E
170°	
180°	9.0°E
190°	
200°	7.5°E
210°	
220°	6.0°E
230°	
240°	3.5°E
250°	
260°	0.5°E
270°	
280°	2.5°W
290°	
300°	5.0°W
310°	
320°	6.5°W
330°	
340°	7.5°W
350°	

Deviation Card No. 13	
Ship's Head by Compass	
000°	3.0°E
010°	
020°	6.0°E
030°	
040°	8.0°E
050°	
060°	9.0°E
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150°	
160°	1.5°E
170°	
180°	1.0°W
190°	
200°	4.0°W
210°	
220°	6.0°W
230°	
240°	7.0°W
250°	
260°	7.5°W
270°	
280°	7.0°W
290°	
300°	5.0°W
310°	
320°	3.0°W
330°	
340°	0.5°E
350°	

Deviation Card No. 14	
Ship's Head by Compass	
000°	4.0°E
010°	
020°	3.5°E
030°	
040°	3.0°E
050°	
060°	2.5°E
070°	
080°	1.5°E
090°	
100°	0.0°
110°	
120°	1.5°W
130°	
140°	3.0°W
150°	
160°	4.0°W
170°	
180°	4.0°W
190°	
200°	3.5°W
210°	
220°	2.5°W
230°	
240°	1.5°W
250°	
260°	0.5°W
270°	
280°	0.5°E
290°	
300°	2.0°E
310°	
320°	3.0°E
330°	
340°	4.0°E
350°	

Deviation Card No. 15	
Ship's Head by Compass	
000°	4.0°E
010°	
020°	4.5°E
030°	
040°	5.0°E
050°	
060°	5.0°E
070°	
080°	4.0°E
090°	
100°	3.0°E
110°	
120°	1.5°E
130°	
140°	0.0°
150°	
160°	2.0°W
170°	
180°	4.0°W
190°	
200°	5.0°W
210°	
220°	4.0°W
230°	
240°	2.5°W
250°	
260°	1.5°W
270°	
280°	0.5°W
290°	
300°	0.5°E
310°	
320°	2.0°E
330°	
340°	3.0°E
350°	

Deviation Card No. 16	
Ship's Head by Compass	
000°	3.0°E
010°	
020°	0.0°
030°	
040°	2.5°W
050°	
060°	5.0°W
070°	
080°	6.5°W
090°	
100°	7.0°W
110°	
120°	7.0°W
130°	
140°	5.0°W
150°	
160°	3.5°W
170°	
180°	1.0°W
190°	
200°	2.0°E
210°	
220°	4.5°E
230°	
240°	7.0°E
250°	
260°	8.5°E
270°	
280°	9.0°E
290°	
300°	9.0°E
310°	
320°	7.5°E
330°	
340°	5.5°E
350°	

Deviation Card No. 17	
Ship's Head by Compass	
000°	5.0°W
010°	
020°	2.5°W
030°	
040°	0.5°W
050°	
060°	4.0°E
070°	
080°	7.5°E
090°	
100°	10.5°E
110°	
120°	12.0°E
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140°	11.5°E
150°	
160°	10.0°E
170°	
180°	7.0°E
190°	
200°	3.0°E
210°	
220°	0.5°W
230°	
240°	4.0°W
250°	
260°	6.5°W
270°	
280°	7.5°W
290°	
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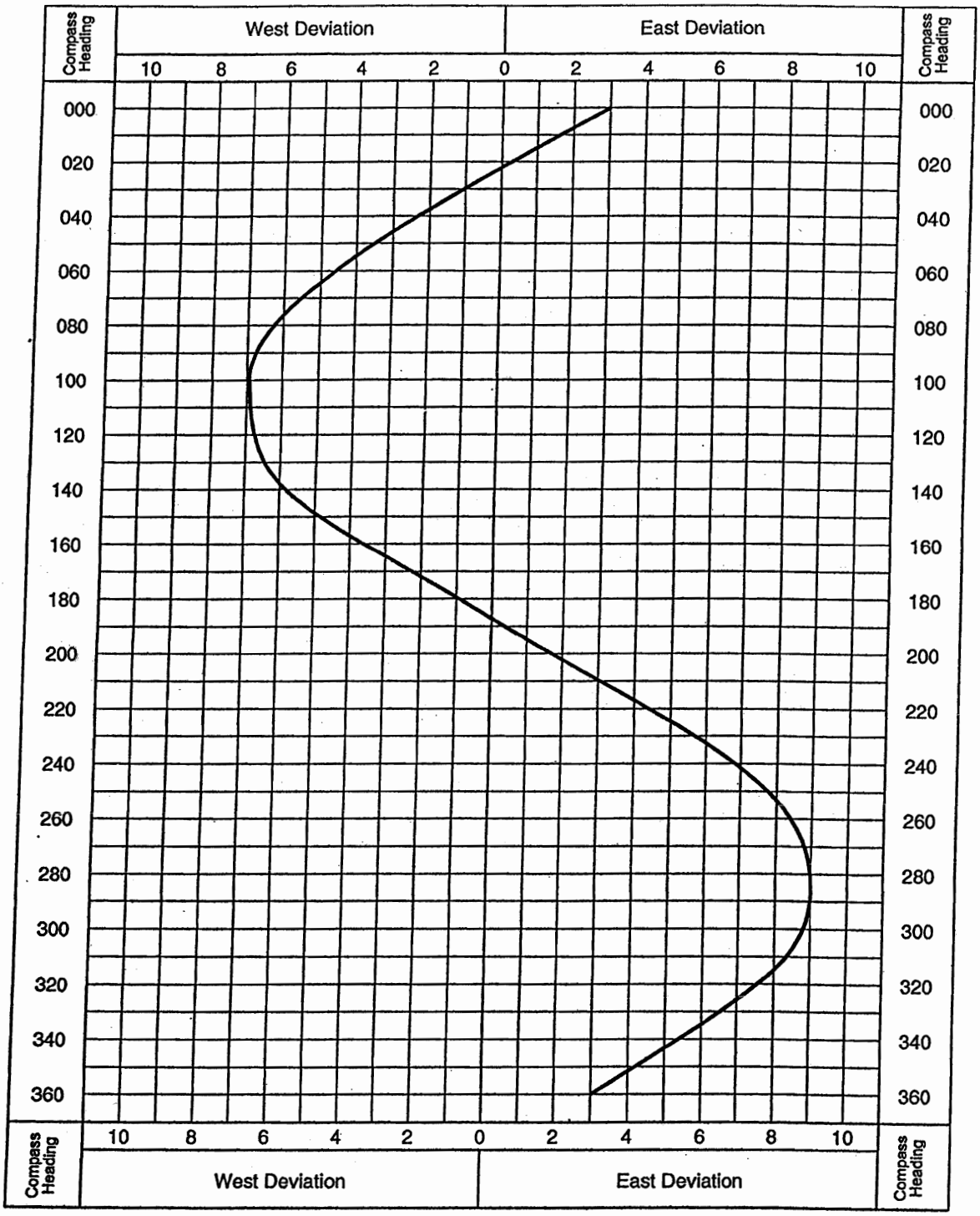
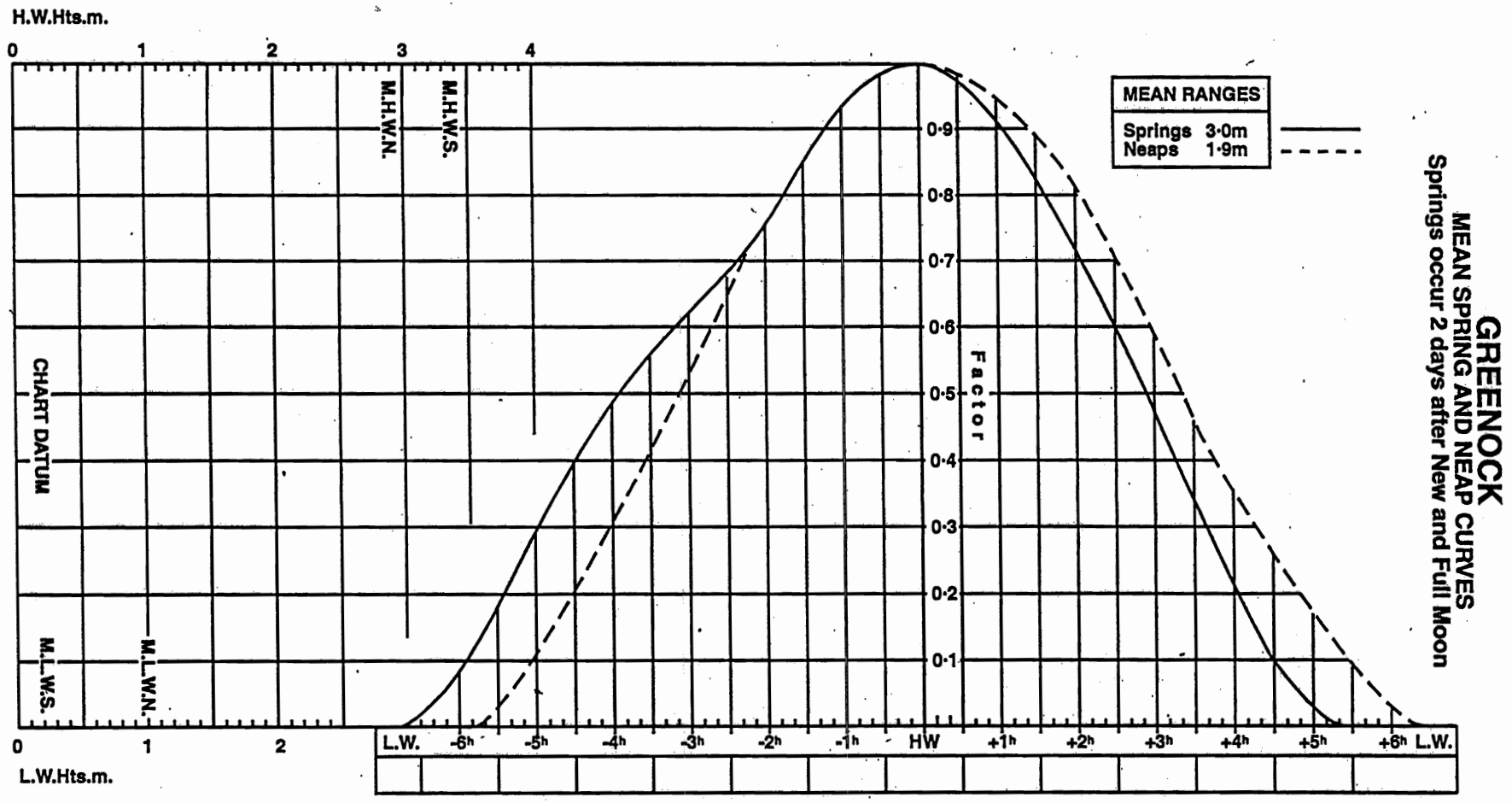
330°	
340°	5.5°W
350°	

DEVIATION CURVE No 16A



WORKSHEET Q2

(This Worksheet must be returned with your answer book)

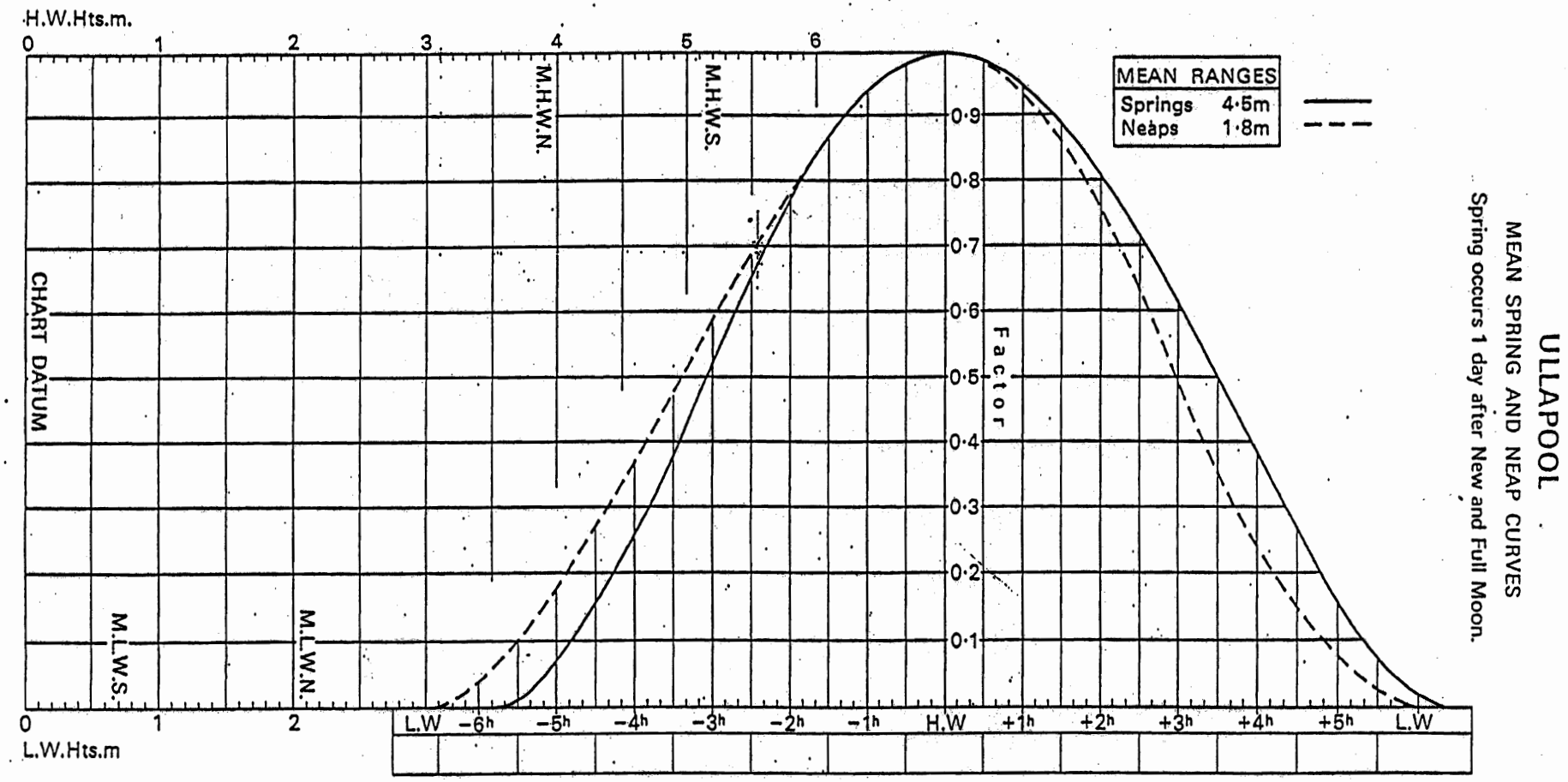


Candidate's Name .....

Examination Centre .....

WORKSHEET Q2

(This Worksheet must be returned with your answer book)



ULLAPOOL

MEAN SPRING AND NEAP CURVES

Spring occurs 1 day after New and Full Moon.

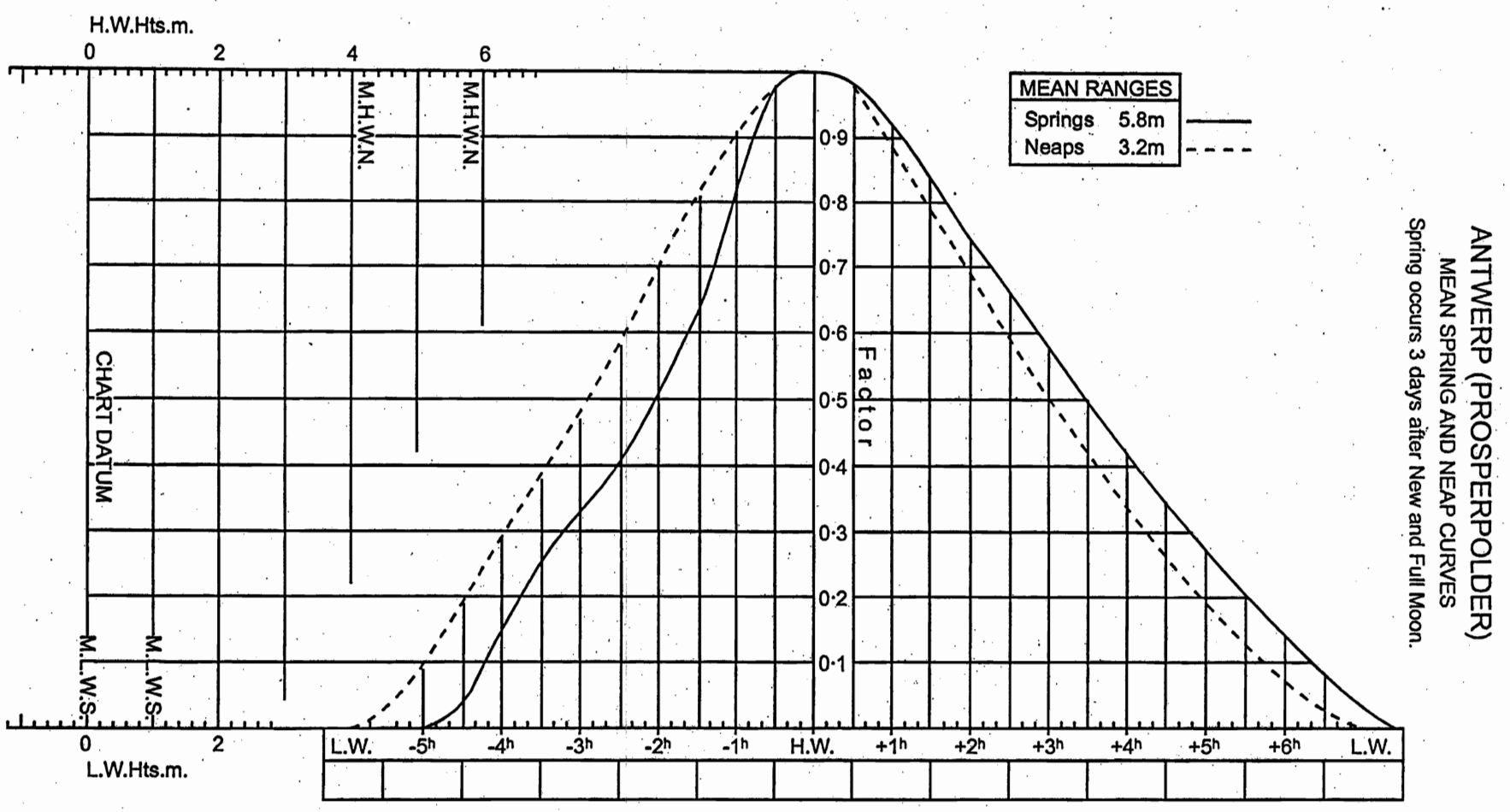
Candidate's Name .....

Examination Centre .....

WORKSHEET Q2

(This Worksheet must be returned with your answer book)

~~9 OCTOBER 2007~~

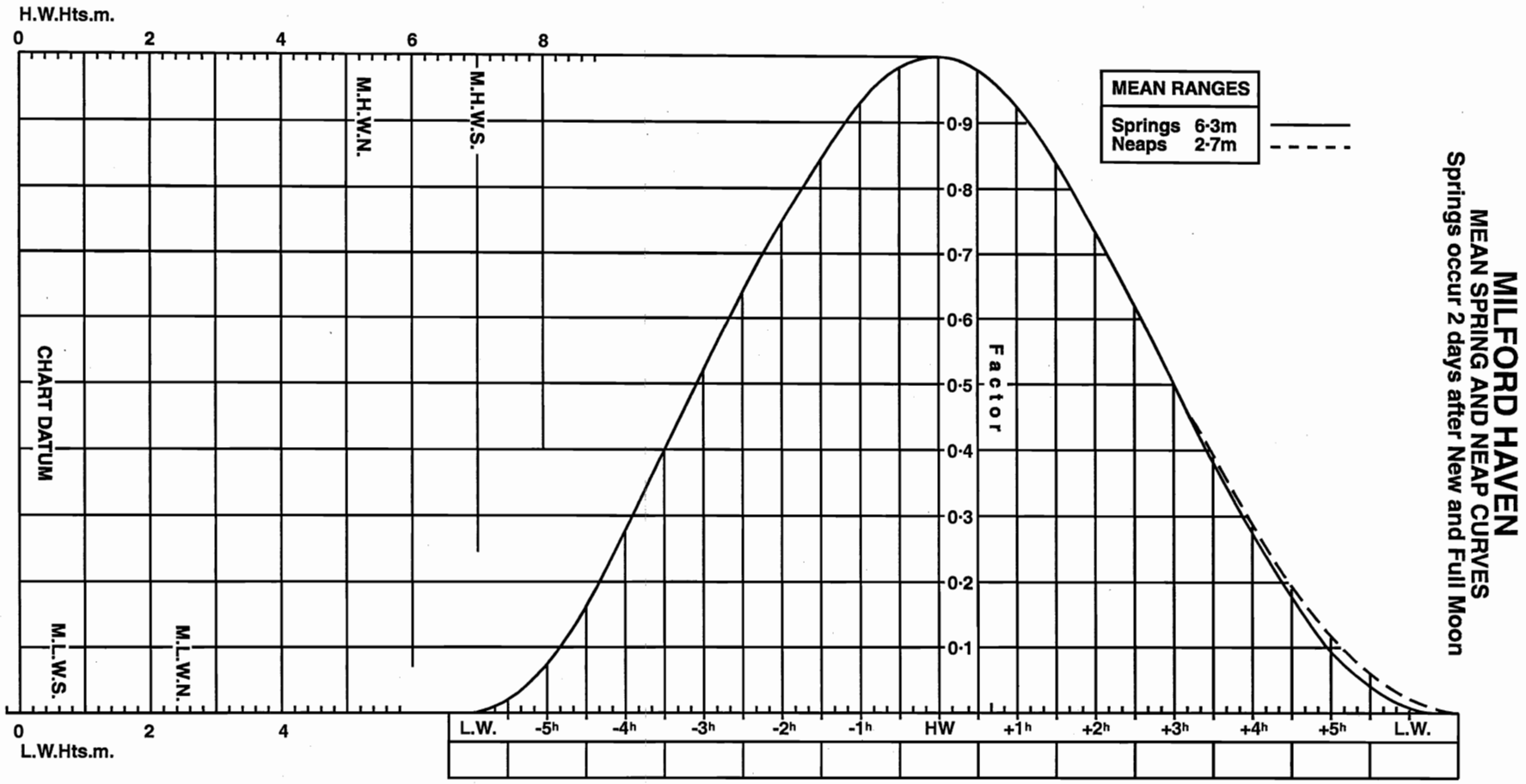


Candidate's Name .....

Examination Centre .....

WORKSHEET Q2

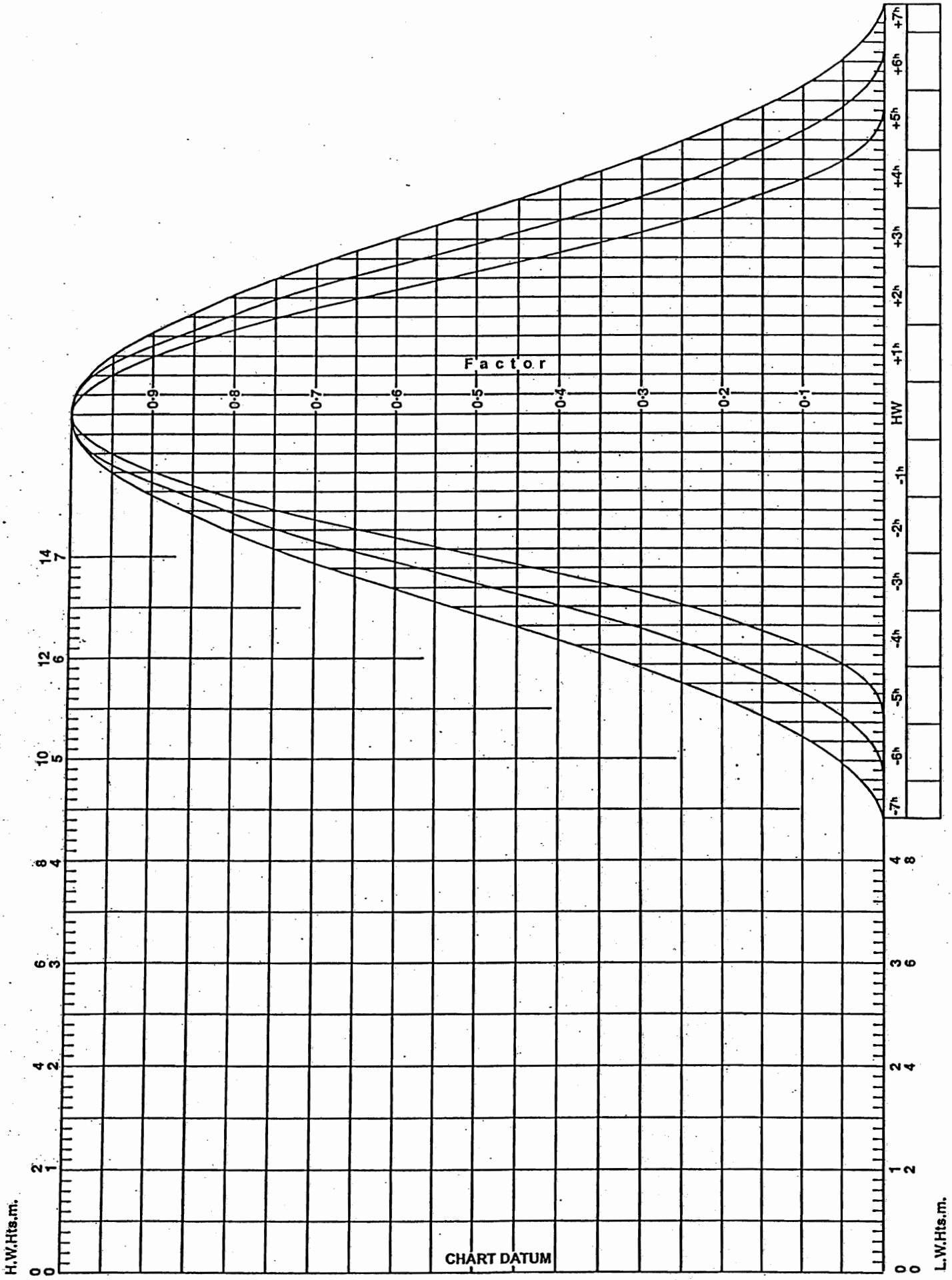
(This Worksheet must be returned with your answer book)



Candidate's Name .....

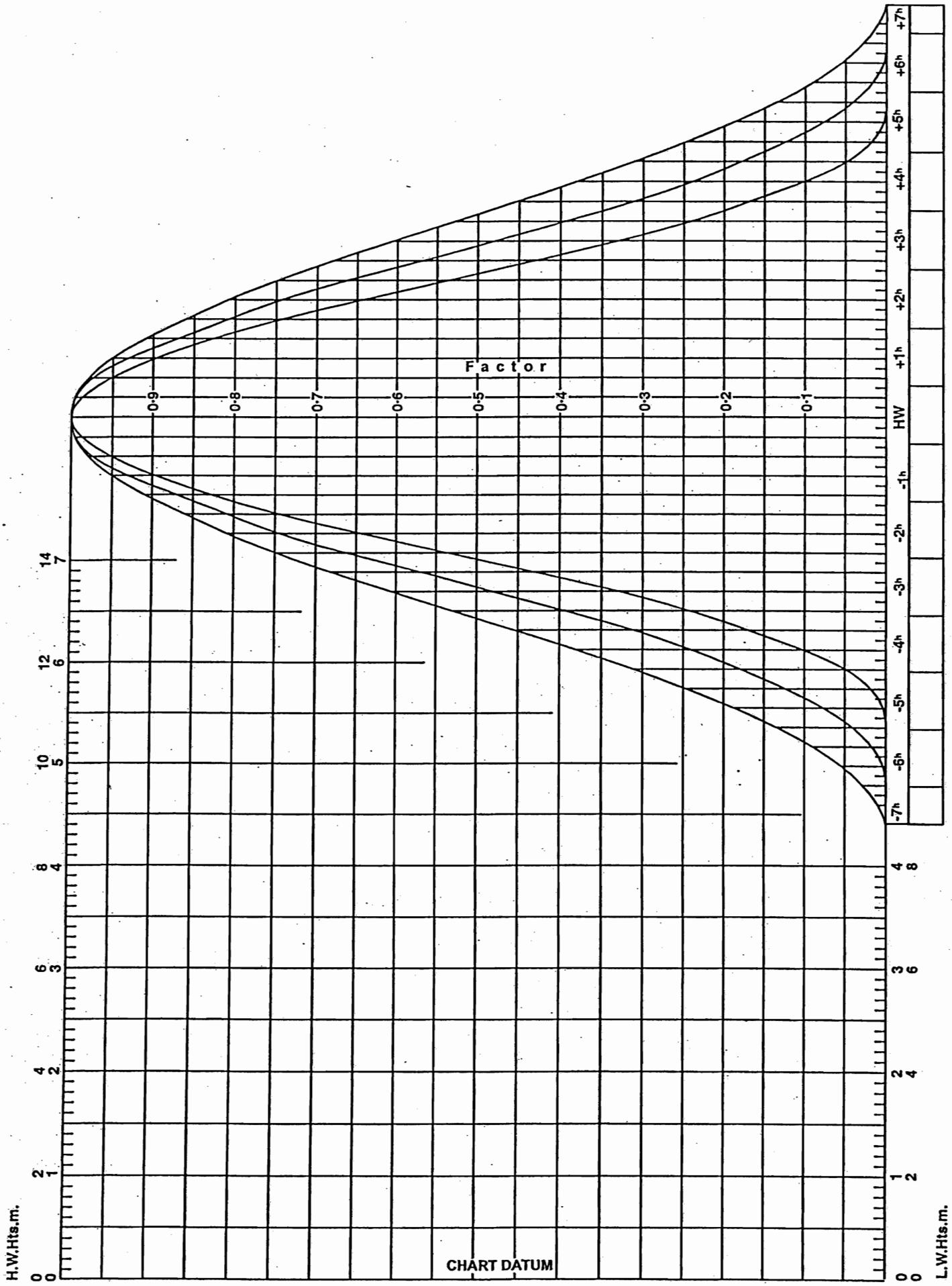
Examination Centre .....

(This Worksheet must be returned with your answer book)



Candidate's Name ..... Examination Centre .....

(This Worksheet must be returned with your answer book)



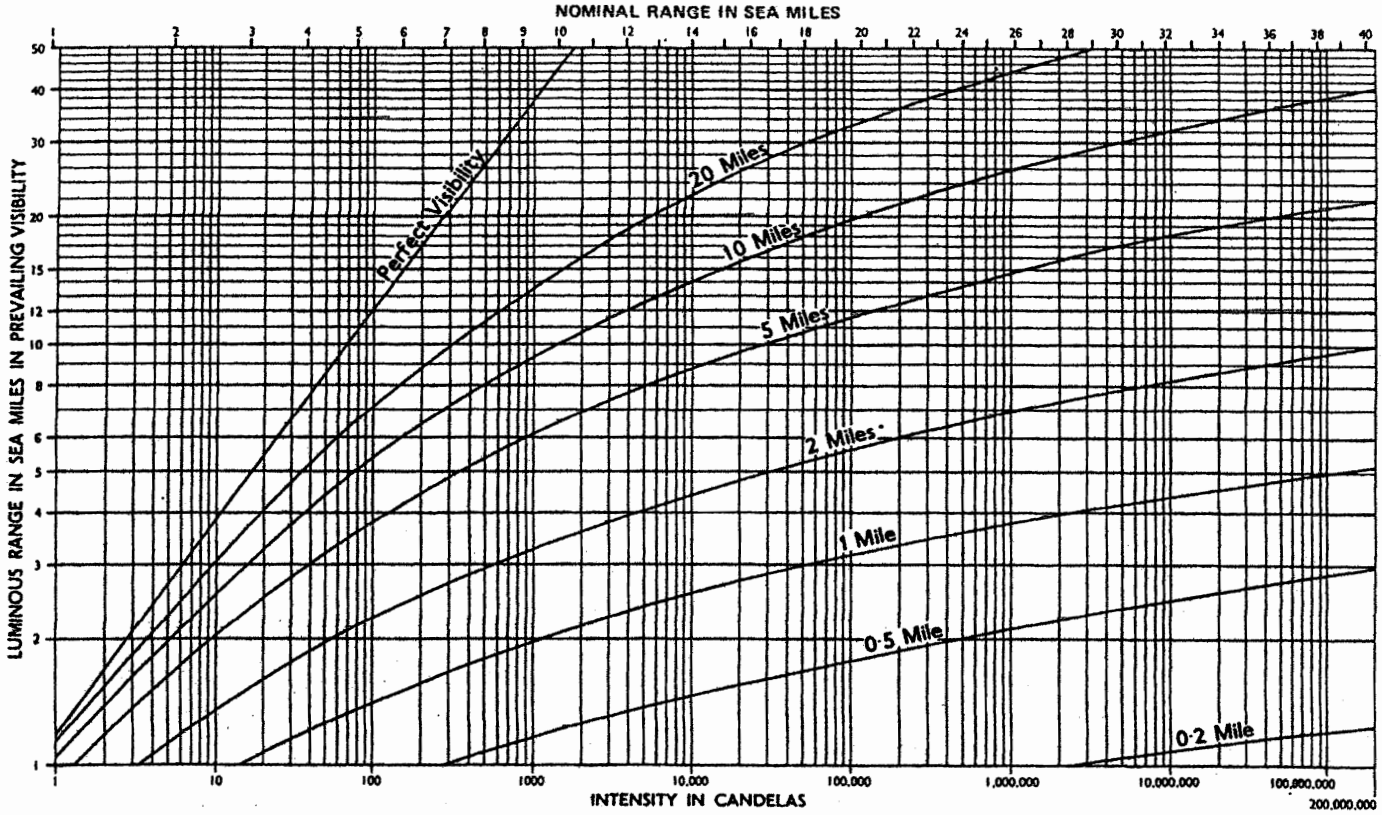
Candidate's Name ..... Examination Centre .....

GEOGRAPHICAL RANGE TABLE

Elevation in		Height of Eye of Observer in feet/metres																							
ft		3	7	10	13	16	20	23	26	30	33	39	46	52	59	66	72	79	85	92	98	115	131	148
	m	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28	30	35	40	45
		Range in Sea Miles																						
0	0	2·0	2·9	3·5	4·1	4·5	5·0	5·4	5·7	6·1	6·4	7·0	7·6	8·1	8·6	9·1	9·5	10·0	10·4	10·7	11·1	12·0	12·8	13·6
3	1	4·1	4·9	5·5	6·1	6·6	7·0	7·4	7·8	8·1	8·5	9·1	9·6	10·2	10·6	11·1	11·6	12·0	12·4	12·8	13·2	14·0	14·9	15·7
7	2	4·9	5·7	6·4	6·9	7·4	7·8	8·2	8·6	9·0	9·3	9·9	10·5	11·0	11·5	12·0	12·4	12·8	13·2	13·6	14·0	14·9	15·7	16·5
10	3	5·5	6·4	7·0	7·6	8·1	8·5	8·9	9·3	9·6	9·9	10·6	11·1	11·6	12·1	12·6	13·0	13·5	13·9	14·3	14·6	15·5	16·4	17·1
13	4	6·1	6·9	7·6	8·1	8·6	9·0	9·4	9·8	10·2	10·5	11·1	11·7	12·2	12·7	13·1	13·6	14·0	14·4	14·8	15·2	16·1	16·9	17·7
16	5	6·6	7·4	8·1	8·6	9·1	9·5	9·9	10·3	10·6	11·0	11·6	12·1	12·7	13·2	13·6	14·1	14·5	14·9	15·3	15·7	16·6	17·4	18·2
20	6	7·0	7·8	8·5	9·0	9·5	9·9	10·3	10·7	11·1	11·4	12·0	12·6	13·1	13·6	14·1	14·5	14·9	15·3	15·7	16·1	17·0	17·8	18·6
23	7	7·4	8·2	8·9	9·4	9·9	10·3	10·7	11·1	11·5	11·8	12·4	13·0	13·5	14·0	14·5	14·9	15·3	15·7	16·1	16·5	17·4	18·2	19·0
26	8	7·8	8·6	9·3	9·8	10·3	10·7	11·1	11·5	11·8	12·2	12·8	13·3	13·9	14·4	14·8	15·3	15·7	16·1	16·5	16·9	17·8	18·6	19·4
30	9	8·1	9·0	9·6	10·2	10·6	11·1	11·5	11·8	12·2	12·5	13·1	13·7	14·2	14·7	15·2	15·6	16·0	16·4	16·8	17·2	18·1	18·9	19·7
33	10	8·5	9·3	9·9	10·5	11·0	11·4	11·8	12·2	12·5	12·8	13·5	14·0	14·5	15·0	15·5	15·9	16·4	16·8	17·2	17·5	18·4	19·3	20·0
36	11	8·8	9·6	10·3	10·8	11·3	11·7	12·1	12·5	12·8	13·2	13·8	14·3	14·9	15·4	15·8	16·3	16·7	17·1	17·5	17·9	18·8	19·6	20·4
39	12	9·1	9·9	10·6	11·1	11·6	12·0	12·4	12·8	13·1	13·5	14·1	14·6	15·2	15·7	16·1	16·6	17·0	17·4	17·8	18·2	19·1	19·9	20·7
43	13	9·4	10·2	10·8	11·4	11·9	12·3	12·7	13·1	13·4	13·7	14·4	14·9	15·4	15·9	16·4	16·8	17·3	17·7	18·1	18·4	19·3	20·2	20·9
46	14	9·6	10·5	11·1	11·7	12·1	12·6	13·0	13·3	13·7	14·0	14·6	15·2	15·7	16·2	16·7	17·1	17·6	18·0	18·3	18·7	19·6	20·4	21·2
49	15	9·9	10·7	11·4	11·9	12·4	12·8	13·2	13·6	14·0	14·3	14·9	15·5	16·0	16·5	17·0	17·4	17·8	18·2	18·6	19·0	19·9	20·7	21·5
52	16	10·2	11·0	11·6	12·2	12·7	13·1	13·5	13·9	14·2	14·5	15·2	15·7	16·2	16·7	17·2	17·7	18·1	18·5	18·9	19·2	20·1	21·0	21·7
56	17	10·4	11·2	11·9	12·4	12·9	13·3	13·7	14·1	14·5	14·8	15·4	16·0	16·5	17·0	17·4	17·9	18·3	18·7	19·1	19·5	20·4	21·2	22·0
59	18	10·6	11·5	12·1	12·7	13·2	13·6	14·0	14·4	14·7	15·0	15·7	16·2	16·7	17·2	17·7	18·1	18·6	19·0	19·4	19·7	20·6	21·5	22·2
62	19	10·9	11·7	12·4	12·9	13·4	13·8	14·2	14·6	14·9	15·3	15·9	16·5	17·0	17·5	17·9	18·4	18·8	19·2	19·6	20·0	20·9	21·7	22·5
66	20	11·1	12·0	12·6	13·1	13·6	14·1	14·5	14·8	15·2	15·5	16·1	16·7	17·2	17·7	18·2	18·6	19·0	19·4	19·8	20·2	21·1	21·9	22·7
72	22	11·6	12·4	13·0	13·6	14·1	14·5	14·9	15·3	15·6	15·9	16·6	17·1	17·7	18·1	18·6	19·1	19·5	19·9	20·3	20·7	21·5	22·4	23·2
79	24	12·0	12·8	13·5	14·0	14·5	14·9	15·3	15·7	16·0	16·4	17·0	17·6	18·1	18·6	19·0	19·5	19·9	20·3	20·7	21·1	22·0	22·8	23·6
85	26	12·4	13·2	13·9	14·4	14·9	15·3	15·7	16·1	16·4	16·8	17·4	18·0	18·5	19·0	19·4	19·9	20·3	20·7	21·1	21·5	22·4	23·2	24·0
92	28	12·8	13·6	14·3	14·8	15·3	15·7	16·1	16·5	16·8	17·2	17·8	18·3	18·9	19·4	19·8	20·3	20·7	21·1	21·5	21·9	22·8	23·6	24·4
98	30	13·2	14·0	14·6	15·2	15·7	16·1	16·5	16·9	17·2	17·5	18·2	18·7	19·2	19·7	20·2	20·7	21·1	21·5	21·9	22·2	23·1	24·0	24·7
115	35	14·0	14·9	15·5	16·1	16·6	17·0	17·4	17·8	18·1	18·4	19·1	19·6	20·1	20·6	21·1	21·5	22·0	22·4	22·8	23·1	24·0	24·9	25·6
131	40	14·9	15·7	16·4	16·9	17·4	17·8	18·2	18·6	18·9	19·3	19·9	20·4	21·0	21·5	21·9	22·4	22·8	23·2	23·6	24·0	24·9	25·7	26·5
148	45	15·7	16·5	17·1	17·7	18·2	18·6	19·0	19·4	19·7	20·0	20·7	21·2	21·7	22·2	22·7	23·2	23·6	24·0	24·4	24·7	25·6	26·5	27·2
164	50	16·4	17·2	17·9	18·4	18·9	19·3	19·7	20·1	20·5	20·8	21·4	22·0	22·5	23·0	23·4	23·9	24·3	24·7	25·1	25·5	26·4	27·2	28·0
180	55	17·1	17·9	18·6	19·1	19·6	20·0	20·4	20·8	21·2	21·5	22·1	22·7	23·2	23·7	24·1	24·6	25·0	25·4	25·8	26·2	27·1	27·9	28·7
197	60	17·8	18·6	19·3	19·8	20·3	20·7	21·1	21·5	21·8	22·2	22·8	23·3	23·9	24·3	24·8	25·3	25·7	26·1	26·5	26·9	27·7	28·6	29·4
213	65	18·4	19·2	19·9	20·4	20·9	21·4	21·7	22·1	22·5	22·8	23·4	24·0	24·5	25·0	25·5	25·9	26·3	26·7	27·1	27·5	28·4	29·2	30·0
230	70	19·0	19·9	20·5	21·1	21·5	22·0	22·4	22·7	23·1	23·4	24·0	24·6	25·1	25·6	26·1	26·5	26·9	27·4	27·7	28·1	29·0	29·8	30·6
246	75	19·6	20·5	21·1	21·7	22·1	22·6	23·0	23·3	23·7	24·0	24·6	25·2	25·7	26·2	26·7	27·1	27·5	27·9	28·3	28·7	29·6	30·4	31·2
262	80	20·2	21·0	21·7	22·2	22·7	23·1	23·5	23·9	24·3	24·6	25·2	25·8	26·3	26·8	27·3	27·7	28·1	28·5	28·9	29·3	30·2	31·0	31·8
279	85	20·8	21·6	22·2	22·8	23·3	23·7	24·1	24·5	24·8	25·1	25·8	26·3	26·9	27·3	27·8	28·3	28·7	29·1	29·5	29·9	30·7	31·6	32·4
295	90	21·3	22·1	22·8	23·3	23·8	24·2	24·6	25·0	25·4	25·7	26·3	26·9	27·4	27·9	28·4	28·8	29·2	29·6	30·0	30·4	31·3	32·1	32·9
312	95	21·8	22·7	23·3	23·9	24·3	24·8	25·2	25·5	25·9	26·2	26·8	27·4	27·9	28·4	28·9	29·3	29·7	30·1	30·5	30·9	31·8	32·6	33·4
328	100	22·3	23·2	23·8	24·4	24·9	25·3	25·7	26·1	26·4	26·7	27·3	27·9	28·4	28·9	29·4	29·8	30·3	30·7	31·1	31·4	32·3	33·2	33·9
361	110	23·3	24·2	24·8	25·4	25·8	26·3	26·7	27·0	27·4	27·7	28·3	28·9	29·4	29·9	30·4	30·8	31·3	31·7	32·1	32·4	33·3	34·1	34·9
394	120	24·3	25·1	25·8	26·3	26·8	27·2	27·6	28·0	28·3	28·7	29·3	29·8	30·4	30·9	31·3	31·8	32·2	32·6	33·0	33·4	34·3	35·1	35·9
427	130	25·2	26·0	26·7	27·2	27·7	28·1	28·5	28·9	29·2	29·6	30·2	30·8	31·3	31·8	32·2	32·7	33·1	33·5	33·9	34·3	35·2	36·0	36·8
459	140	26·1	26·9	27·6	28·1	28·6	29·0	29·4	29·8	30·1	30·5	31·1	31·6	32·2	32·6	33·1	33·6	34·0	34·4	34·8	35·2	36·0	36·9	37·7
492	150	26·9	27·7	28·4	28·9	29·4	29·9	30·2	30·6	31·0	31·3	31·9	32·5	33·0	33·5	34·0	34·4	34·8	35·2	35·6	36·0	36·9	37·7	38·5
525	160	27·7	28·6	29·2	29·8	30·2	30·7	31·1	31·4	31·8	32·1	32·7	33·3	33·8	34·3	34·8	35·2	35·6	36·0	36·4	36·8	37·7	38·5	39·3
558	170	28·5	29·4	30·0	30·5	31·0	31·5	31·9	32·2	32·6	32·9	33·5	34·1	34·6	35·1	35·6	36·0	36·4	36·8	37·2	37·6	38·5	39·3	40·1
591	180	29·3	30·1	30·8	31·3	31·8	32·2	32·6	33·0	33·3	33·7	34·3	34·9	35·4	35·9	36·3	36·8	37·2	37·6	38·0	38·4	39·3	40·1	40·9
623	190	30·0	30·9	31·5	32·1	32·5	33·0	33·4	33·7	34·1	34·4	35·0	35·6	36·1	36·6	37·1	37·5	37·9	38·4	38·7	39·1	40·0	40·8	41·6
656	200	30·8	31·6	32·2	32·8	33·3	33·7	34·1	34·5	34·8	35·1	35·8	36·3	36·8	37·3	37·8	38·3	38·7	39·1	39·5	39·8	40·7	41·6	42·3
722	220	32·2	33·0	33·6	34·2	34·7	35·1	35·5	35·9	36·2	36·5	37·2	37·7	38·3	38·7	39·2	39·7	40·1	40·5	40·9	41·4	42·1	43·0	43·8
787	240	33·5	34·3	35·0	35·5	36·0	36·4	36·8	37·2	37·6	37·9	38·5	39·1	39·6	40·1	40·4	41·0	41·4	41·8	42·2	42·6	43·5	44·3	45·1
853	260	34·8	35·6	36·3	36·8	37·3	37·7	38·1	38·5	38·8	39·2	39·8	40·4	40·9	41·4	41·8	42·3	42·7	43·1	43·5	43·9	44·8	45·6	46·4
919	280	36·0	36·9	37·5	38·0	38·5	39·0	39·4	39·7	40·1	40·4	41·0	41·6	42·1	42·6	43·1	43·5	43·9	44·3	44·7	45·1	46·0	46·8	47·6
984	300	37·2	38·1	38·7	39·2	39·7	40·2	40·6	40·9	41·3	41·6	42·2	42·8	43·3	43·8	44·3	44·7	45·1	45·5	45·9	46·3	47·2	48·0	48·8
1050	320	38·4	39·2	39·9	40·4	40·9	41·3	41·7	42·1	42·4	42·8	43·4	43·9	44·5	45·0	45·4	45·9	46·3	46·7	47·1	47·5	48·3	49·2	50·0
1115	340	39·5	40·3	41·0	41·5	42·0	42·4	42·8	43·2	43·5	43·9	44·5	45·1	45·6	46·1	46·5	47·0	47·4	47·8	48·2	48·6	49·5	50·3	51·1
1181	360	40·6	41·4	42·1	42·6	43·1	43·5	43·9	44·3	44·6	45·0	45·6	46·1	46·7	47·2	47·6	48·1	48·5	48·9	49·3	49·7	50·6	51·4	52·2
1247	380	41·6	42·5	43·1	43·7	44·1	44·6	45·0	45·3	45·7	46·0	46·6	47·2	47·7	48·2	48·7	49·1	49·5	50·0	50·3	50·7	51·6	52·4	53·2
1312	400	42·7	43·5	44·1	44·7	45·2	45·6	46·0	46·4	46·7	47·0	47·7	48·2	48·7	49·2	49·7	50·1	50·6	51·0	51·4	51·7	52·6	53·5	54·2

LUMINOUS RANGE DIAGRAM

HD574



Luminous Range Diagram.—This diagram enables the mariner to determine the approximate range at which a light may be sighted, at night, in the meteorological visibility prevailing at the time of observation.

The diagram is entered from the top border, using the nominal range listed in the body of the book, in column 6, or from the bottom border using the intensity from column 4 where listed. A list of those countries where nominal range is used will be found on page xxii. All other countries use luminous range for which the most commonly adopted meteorological visibility is 20 miles, equivalent to a transmission factor of 0·85.

The figures along the curves represent the estimated meteorological visibility at the time of observation, and those along the left-hand border the luminous range under those conditions.

Example: A light of an intensity of 100 000 candelas has a nominal range of about 20 miles. When the meteorological visibility is 20 miles the light would be sighted at about 33 miles, given a sufficient elevation and height of eye; and when 2 miles, at about $5\frac{1}{2}$ miles.

As the scale along the top border is based on a meteorological visibility of 10 sea miles, the luminous ranges in the prevailing conditions obtained from the 10-mile curve will be identical to those with which the diagram is entered from the top border. If a line is drawn joining points where values from the left-hand border intersect equal values on the curves, it will be seen to be parallel with and to the right of the curve for perfect visibility. Luminous ranges in the conditions prevailing at the time of observation obtained from intersections to the left of this line will be less than the estimated meteorological visibility, whilst those to the right will be greater. Due to their intensity, many lights will therefore be sighted at a greater distance than that of the estimated meteorological visibility.

The diagram can also be used to obtain an approximate meteorological visibility; when, for example, a light of an intensity of 100 000 candelas is sighted at 12 miles, the meteorological visibility will be about 5 miles.

CAUTION.—When using this diagram it must be remembered that:

1. *The ranges obtained are approximate.*
2. *The transparency of the atmosphere is not necessarily consistent between the observer and the light.*
3. *Glare from background lighting will reduce considerably the range at which lights are sighted. A light of 100 000 candelas has a nominal range of about 20 miles; with minor background lighting as from a populated coastline this range will be reduced to about 14 miles, and with major background lighting as from a city or from harbour installations to about 9 miles.*

   Approximate sighting ranges may be obtained by entering the diagram with the listed intensity divided by 10 for minor background lighting, and by 100 for major background lighting.

Navigation Formulae Sheet

NB. These formulae and symbols are for guidance only and other formulae which give equally valid results are acceptable

Departure = D'Long x Cos Mean Lat

Tan Course = $\frac{\text{Dep}}{\text{D'Lat}}$

Distance = $\frac{\text{D'Lat}}{\text{Cos Course}}$

Tan course = $\frac{\text{D'Long}}{\text{DMP}}$

Cos AB = (Cos P x Sin PA x Sin PB) + (Cos PA x Cos PB)

A = $\frac{\text{Tan Lat}}{\text{Tan LHA}}$

B = $\frac{\text{Tan Dec}}{\text{Sin LHA}}$

C = A +/- B

Tan Azimuth = $\frac{1}{\text{C x Cos Lat}}$

Sin Amplitude = $\frac{\text{Sin Dec}}{\text{Cos Lat}}$

Sin mid part = Tan adjacent x Tan adjacent

Sin mid part = Cos opposite x Cos opposite

CHARTS: 5046/5047/5048/5056/5138/5140

DATE:	CHART:	DEV. CARD.
MARCH 05	5048	10
JUNE 05	5072 (N/A)	4
OCT 05	5047	—
NOV 05	5047	13
MARCH 06	5048	7
JULY 06	5072 (N/A)	17
OCT 06	5056	7
NOV 06	5056	10
MARCH 07	5047	8
JULY 07	5138	16
OCT 07	5048	12
NOV 07	5138	—
MARCH 08	5140	1
JULY 08	5138	17
OCT 08	5046	7
NOV 08	5048	10
MARCH 09	5056	10
JULY 09	5048	—
OCT 09	5046	17
DEC 09	5140	13

5048
MAR 2005
DEV No 10

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1′ and are to be used for identification purposes only.

Section A

1. At 1900hrs Kinsale A-East platform (51° 22'N 7° 57'W) is observed bearing 232°C at distance 7.3 miles from a vessel steering 320°C at 12.0 knots.
Variation 7°W.

   (a) Find the position of the vessel at 1900hrs. (7)

   (b) The vessel is inward bound to Cork harbour and is programmed to embark the pilot at 2140hrs.

   The Master instructs the Officer of the Watch to make good a track direct to Cork pilot station, (51° 45'N 8° 15'W) and be 4.0 miles off the station 30 minutes before pilot embarkation.

   Using the charted tidal stream prediction (51° 39'N 7° 57'W) and an allowance of 3° leeway for a South-Westerly wind, find the compass course to steer and the ship speed required to comply with the Master's instruction. (18)

2. A vessel, draught 5.2m, is to pass over a shoal, charted depth 4.5m, at Village Bay, St Kilda.
ETA at the shoal is 1330hrs GMT 13th January.

   Village Bay, St Kilda (No. 322): ATT United Kingdom and Ireland.

   Find the predicted under keel clearance at the ETA. (15)

Section B

3. Chart 5048

A passage plan is being prepared, incorporating a passage through the St Georges Channel Traffic Separation Scheme (52° 10'N 6° 10'W) and on to Dungarvan Harbour (52° 04'N 7° 34'W). Draught of vessel 5.8m.

The meteorological forecast is:
S'ly wind; force 5;
Visibility moderate to good;
Showers.

(a) Outline the elements contained in Rule 10 of the I.R.P.C.S. which must be taken into consideration when appraising and planning a passage through or in the proximity of a Traffic Separation Scheme. (10)

(b) State, giving reasons, whether the planned passage should pass to the north or south of Coningbeg lightvessel (52° 02'N 6° 40'W). (5)

(c) The passage from St Georges Channel Traffic Separation Scheme to Dungarvan is to be undertaken during daylight.
List EACH of the following:

(i) the charted features that could be used for visual position monitoring; (5)

(ii) the charted features that could be used for radar position monitoring. (5)

4. A vessel on a coastal passage is to sail from position 36° 15.0'S 19° 40.0'E to position 34° 25.0'S 15° 20.0'E and then to 34° 25.0'S 9° 50.0'E.

Calculate EACH of the following:

(a) the total distance of the passage; (9)

(b) the courses required to complete the passage. (6)

5. (a) State the signs indicating the proximity of drift ice. (7)

(b) Describe the methods of avoiding or reducing ice accumulation and accretion. (5)

(c) State the publication that obliges a Shipmaster to report ice and severe ice accretion. (1)

(d) Outline the reporting requirements of EACH of the following:

(i) ice; (3)

(ii) severe ice accretion. (4)

NAVIGATION

JUNE 2005
5072
DEV N° 4

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1′ and are to be used for identification purposes only.

Section A

1. At 0200hrs a vessel, steering 060°C at 12.0 knots, observed Sandhammaren light (55° 23'N 14° 12'E) bearing 320°C and Hammerodde light (55° 23'N 14° 12'E) bearing 085°C.
At 0300hrs the vessel altered course to 013°C.
A current was estimated to be setting 220°T at 2.0 knots throughout.
An Easterly wind was estimated to be causing 3° leeway throughout.
Variation 1°W.

   (a) Find the 0400hrs E.P. (20)

   (b) At 0400hrs Simrishamn light (55° 34'N 14° 22'E) was observed bearing 270°C at distance 10.2 miles.

   Find the actual set and rate of the current experienced. (5)

2. (a) Explain, with the aid of diagrams, the cause of Spring tides and Neap tides. (5)

   (b) Explain EACH of the following terms:

   (i) Height of tide; (2)

   (ii) Spring range; (2)

   (iii) Drying height. (2)

   (c) State EACH of the following:

   (i) the range of tide for Avonmouth on the midday flood tide 24th January; (2)

   (ii) the mean Neap range of tide for Avonmouth. (2)

Section B

3. (a) State the factors to be considered AND the publications to be consulted when appraising and planning a landfall for an ocean passage. (15)

(b) Chart 5072

Metrological visibility 5 miles.
Height of observer's eye 12.0m.
Find the distance from Utklippan light (55° 57'N 15° 42'E) when it is predicted to be first sighted. (3)

(c) (i) State the effects of the charted *Local Magnetic Anomaly* (55° 20'N 14° 45'E); (3)

(ii) State the meaning of the blue shaded area around Utklippan light; (2)

(iii) State and explain the abbreviation *Iso* contained in the charted characteristics of Utklippan light. (2)

4. (a) (i) Calculate, by Plane Sailing, the course and distance

from: Lat 36° 50.0'N Long 5° 42.0'W
to: Lat 35° 55.0'N Long 9° 15.0'W. (10)

(ii) Find the steaming time of the passage at a Ship's speed of 13.0 knots. (2)

(b) State the properties of a Mercator Chart. (8)

5. At approximately 2100hrs 13th September, D.R. position 18° 30.0'N 171° 10.0'W, an observer noted star Antares bearing 232°G.
Chronometer showed 7h 52m 43s.
Chronometer error 2m 28s slow.

Find the error of the gyro compass. (15)

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NAVIGATION

OCT 05

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1′ and are to be used for identification purposes only.

Section A

1. At 2130hrs the following bearings were obtained:

Bull Point light	(51° 12′N 4° 12′W)	066°G
Hartland Point light	(51° 01′N 4° 31′W)	183°G
Lundy Island south light	(51° 10′N 4° 39′W)	293°G

(a) Find the position of the vessel and the gyro error at 2130hrs. (12)

(b) Using tidal diamond P, HW Avonmouth at 1830hrs, Neap tides, an allowance of 3° for an Easterly wind and ship speed 12.5 knots, find EACH of the following:

(i) the gyro course to steer to make good Port Talbot pilot station (51° 29′N 4° 00′W); (10)

(ii) the ETA at the pilot station; (5)

(iii) the bearing of Bull Point light when abeam. (3)

2. (a) A vessel's ETA at a shoal, charted depth 2.6m, at Prince Rupert, (Pacific and Atlantic Oceans Tide Tables) is 2020hrs, Standard Time, 20th July.
Vessel's draught 5.8m.
Minimum required under keel clearance 1.0m.

Find if it is safe to cross the shoal. (5)

(b) Discuss the reliability of the tidal predictions contained in the Admiralty Tide Tables, giving reasons for discrepancies between predicted tidal heights and actual tidal heights. (5)

Section B

3. (a) Explain how the Mariners' Routeing Guide, English Channel and Southern North Sea, Chart 5500, may be used in the preparation of a passage plan. (10)

(b) Explain the objective and rationale of ship's routeing, as outlined in the IMO publication *Ship's Routeing Guide* and SOLAS Chapter V. (5)

(c) Explain EACH of the following terms:

(i) Traffic lane; (2)

(ii) Separation zone; (2)

(iii) Separation line; (2)

(iv) Inshore traffic zone; (2)

(v) Precautionary area. (2)

4. (a) A vessel is to sail a rhumb line track for the ocean passage from Luanda, Angola, to Montevideo, Uruguay.

Rhumb line departure waypoint 8° 10.0'N 13° 15.0'E
Rhumb line destination waypoint 35° 00.0'S 54° 10.0'W

Calculate the course and distance of the ocean passage. (10)

(b) On completion of the ocean passage a further 105 miles of coastal passage is required to the pilot station. The ETD Luanda is 0900hrs 8th March, Standard Time.
Ship speed 18.5 knots.

Calculate the ETA, to the nearest whole hour, at Montevideo pilot station, Standard Time. (5)

5. (a) The Officer of the Watch, D.R. position 15° 40.0'S 32° 24.0'W, observed the sun set bearing 268°C on the 25th March.
Variation 5°E.

Find the deviation of the compass for the ship's head. (12)

(b) (i) List the MAIN topics of Part A of the *Bridge Procedure Guide.* (5)

(ii) State SIX checklists contained in Part C of the *Bridge Procedure Guide.* (3)

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DEV No 13

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

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Section A

1. At 2300hrs, 24th February, a vessel bound for the port of Avonmouth is advised that the berth will not be available until the evening of the 25th February.
The vessel is presently steering 105°C at speed 12.0 knots and is in position Helwick lightvessel (51° 30'N 4° 26'W) bearing 005°C, distance 4.2 miles.
Variation 7°W.

   (a) Find the position of the vessel at 2300hrs. (7)

   (b) The Master decides to anchor in Porlock Bay (51° 13'N 3° 37'W) to seek shelter from a southerly wind whilst awaiting the berth.
   Find the compass course to steer to make good a track to waypoint 51° 15'.0N 3° 37'.0W allowing 5° leeway and a tidal stream estimated to be setting 070°T, rate 2.5 knots. (15)

   Note: Assume alteration of course at 2300hrs is instantaneous.

   (c) The Master instructs the Officer of the Watch to commence reducing speed when the vessel is 6.0 miles from the waypoint. The Engine Room is to be notified 1 hour prior to a planned speed reduction.

   Find the estimated time that 1 hours notice will be given to the Engine Room. (3)

2. Chart 5047
The vessel referred to in Q1 anchors in position 51° 13'.8N 3° 36'.7W with a maximum draught 9.6m at 0200hrs 25th February. The vessel is to commence weighing anchor at 1400hrs 25th February.

   Find EACH of the following pieces of tidal information for the vessel at anchor in Porlock Bay (No. 533) ATT United Kingdom and Ireland:

   (a) the predicted maximum tidal range whilst the vessel is at anchor; (10)

   (b) the predicted minimum under keel clearance whilst the vessel is at anchor; (2)

   (c) the predicted time that the minimum under keel clearance occurs. (3)

Section B

3. (a) As Officer of the Watch, on a dry cargo vessel of length 100m, outline the elements contained in Rule 10 of the I.R.P.C.S. which must be taken into consideration when appraising and planning a passage through or in the proximity of a Traffic Separation Scheme. (10)

(b) Chart 5047

(i) State in full the charted abbreviations for Bull Point light (51° 12'N 4° 12'W). (4)

(ii) State the meaning of the symbol in position 51° 31'.2N 4° 33'.7W. (2)

(iii) State the meaning of the green shaded areas on the chart. (2)

(iv) State the type of buoy in position 51° 24'.6N 3° 38'.4W. (2)

(v) State which direction a vessel should alter course to, if Horseshoe Rocks buoy (51° 15'N 4° 13'W) is observed dead ahead. (2)

4. Find the course and distance for EACH leg of the following voyage:

Departure waypoint	43° 18'.0S	100° 30'.0W
Waypoint 1	43° 18'.0S	103° 48'.0W
Waypoint 2	41° 30'.0S	108° 50'.0W
Arrival waypoint	39° 50'.0S	108° 50'.0W.

(18)

5. The *Bridge Procedure Guide* states 'The need to maintain a proper lookout should determine the basic composition of the navigational watch. There are, however, a number of circumstances and conditions that could influence at any time the actual watchkeeping arrangements and bridge manning levels.'

(a) Outline the rationale and objective of forming a bridge team when a vessel is navigating in restricted waters. (5)

(b) State TEN factors that should be considered when determining the composition of a navigational watch. (10)

(c) (i) State the specific condition when the Officer of the Watch may act as the sole lookout. (2)

(ii) Outline the additional factors to be considered when determining if the Officer of the Watch may act as sole lookout. (3)

MAR 2006
5048
DEV N° 7

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0800hrs a vessel on passage through the Celtic Sea, bound for St George's Channel Traffic Separation Scheme (52° 07'N 6° 07'W), during restricted visibility, last observes Kinsale A-East platform (51° 22'N 7° 57'W) by radar bearing 224° Relative, range 12.0 miles. Vessel steering 050°C at 8.0 knots.
At 1025hrs the vessel alters course to 090°C due to traffic avoidance.
At 1115hrs the vessel is able to return to 050°C and due to an improvement in visibility increases speed to 10.0 knots.
The tidal atlas predicts that a tidal stream will be setting 050°T, rate 2.0 knots between 0800hrs and 1000hrs. Between 1000hrs and 1200hrs the tidal stream prediction is 070°T, rate 1.5 knots.

   Variation 5°W.

   (a) Find EACH of the following:

      (i) the D.R. position of the vessel at 1200hrs; (15)

      (ii) the E.P. of the vessel at 1200hrs. (8)

   (b) At 1230hrs Coningbeg lightvessel (52° 02'N 6° 39'W) is detected by radar bearing 324° Relative, range 12.0 miles.

      Find the actual set and rate of the tidal stream experienced since 0800hrs. (7)

2. (a) Explain, with the aid of a diagram, how the relative positions of the earth, sun and moon influence the tidal ranges experienced. (5)

   (b) (i) Explain the reliability of the tidal information contained in the *Admiralty Tide Tables*. (2)

      (ii) State reasons for possible discrepancies between published tidal heights / times and actual tidal heights / times experienced. (3)

Section B

3. SOLAS Chapter V requires a Master to have in place a Voyage Plan prior to the commencement of a passage.

   (a) State TEN factors to be considered under the *appraisal* stage when determining the choice of route. (10)

   (b) State FIVE factors that would influence the *margin of safety* when undertaking the *planning* stage of a Voyage Plan. (5)

   (c) State, with reasons, FIVE factors to be considered under the *execution* stage of a Voyage Plan. (5)

   (d) State, with reasons, FIVE factors to be considered when considering the *monitoring* stage of a Voyage Plan. (5)

4. A vessel is to undertake a voyage from Southampton to Plymouth, England. The voyage consists of three sections:

   - From the berth, 28.5 miles of restricted water navigation
   - A rhumb line passage, from 50° 30'.0N 1° 55'.0W to 50° 04'.0N 3° 48'.0W
   - A further 20 miles of coastal navigation to the pilot station at Plymouth

   (a) Calculate the total distance from the berth at Southampton to Plymouth pilot station. (10)

   (b) The tidal stream atlas predicts that the tidal flow will be favourable at 1.0 knot for the first 3 hours of the passage, slack water for 1 hour and adverse, 1.5 knots, for the remaining time on voyage.
   Ship speed 15.0 knots.
   ETD 0600hrs 11th July.

   Calculate the ETA at Plymouth pilot station. (5)

5. At approximately 0200hrs, ship time, 28th March, the star Kaus Australis was observed bearing 125°G.
   D.R. position 10° 20'.0S 89° 30'.0E.
   Chronometer showed 8h 03m 51s.
   Chronometer error 1m 13s fast.

   (a) Find the error of the gyro compass. (15)

   (b) As Officer of the Watch, state the actions that should be taken if a celestial observation indicated that the gyro compass was in error by 15°High. (5)

OCT 06

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DEI N° 7

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 2300hrs a vessel steering 068°C, speed 10.5 knots, observed Bill of Portland light (50° 31'N 2° 27'W) bearing 350°C.
   At 0000hrs Anvil Point light (50° 36'N 1° 58'W) was observed bearing 041°C.
   Variation 6°W.
   High water at Devonport 2230hrs, Spring tides.
   A NW'ly wind was causing 3° leeway.

   Find EACH of the following:

   (a) using tidal diamond G, the position of the vessel at 0000hrs; (18)

   (b) using tidal diamond H, the 0100hrs E.P; (6)

   (c) the relative bearing of the Needles Channel buoy (50° 38'N 1° 39'W) when abeam. (2)

2. (a) With reference to the *Pacific and Atlantic Oceans Admiralty Tide Tables,* state the circumstances when intermediate tidal heights may not be found by use of the *Standard Curve* and *Part II* correction tables. (4)

   (b) A vessel is to sail from Vancouver Harbour, British Colombia, on the 20th March. The Master instructs the OOW to determine the available time window on the morning high water tide, 20th March, that the vessel may cross a shoal.
   Charted depth of shoal 9.5m.
   Sailing draught for'd 11.1m.
   Sailing draught aft 11.9m.
   It is the Company requirement that a minimum under keel clearance of 10% of the draught is required.

   Find EACH of the following:

   (i) the earliest time that the vessel may cross the shoal; (5)

   (ii) the latest time that the vessel may cross the shoal. (5)

Section B

3. Chart 5056
A coastal passage from Portland Harbour (50° 35'N 2° 27'W) to Exmouth pilot station (50° 36'N 3° 22'W) is being appraised.

(a) Outline the type of information that could be extracted from the *Sailing Directions* to assist the mariner in appraising this passage. (8)

(b) State SIX other publications that should be consulted as part of the appraisal process. (6)

(c) The Portland Harbour meteorological office has issued the following forecast:
Wind South-East, force 5, showers, visibility poor.
Draught of vessel 3.0m.

Appraise EACH of the following options, explaining the factors that are relevant to EACH option:

(i) passing to the West of the Shambles Bank (50° 31'N 2° 22'W); (3)

(ii) crossing over the Shambles Bank; (3)

(iii) passing to the East of the Shambles Bank. (3)

(d) From the options appraised in Q3(c), state the preferred option to be recommended to the Master for the given conditions. (1)

4. A vessel is to sail a rhumb line from departure waypoint 4° 20'N 30° 50'W to arrival waypoint 3° 40'S 36° 25'W.

(a) Find, by Plane Sailing, the course and distance from the departure waypoint to the arrival waypoint. (12)

(b) Find the ETA if the time of departure is 1730hrs, 18th January, and the ship speed is 15.5 knots. (3)

OCT 06

5. A vessel on passage from the Baltic to Aberdeen, Scotland, observes the sun set bearing 270°G on the 20th March.
D.R. position 57° 36'.0N 6° 12'.0E.

(a) Find the error of the gyro compass. (10)

(b) Whilst on passage heavy weather is forecast.
State SIX items contained in the *Bridge Procedure Guide, Bridge Checklists* for a vessel navigating in heavy weather. (6)

(c) Whilst on passage the vessel is to transit an area of offshore installations.
Explain FIVE bridge operational factors that should be considered by the OOW prior to a vessel entering an area of offshore installations. (5)

Nov 06
Dec
5056
DEV N° 10

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. A vessel steering 255°C, ship speed 14.0 knots, on passage to Ireland is to transit the Traffic Separation Scheme using the WSW bound traffic lane.
At 2100hrs, 18th May 2007, the East Channel buoy light (49°59'N 02°29'W) is observed bearing 240°C at range 15.7 miles.
Variation as per chart 5056

   (a) Find the position of the vessel at 2100hrs. (10)

   (b) The vessel is to make good a course of 255°T through the T.S.S.
   A tidal stream is estimated to be setting 220°T, rate 2.0 knots.
   A N'ly wind is estimated to be causing 3° leeway.

   Find the compass course required. (12)

   (c) Find the estimated time the vessel will clear the T.S.S. (4)

2. (a) Assuming the sea level shown represents Mean High Water Neaps, on Worksheet Q2 mark and clearly label the relative levels for EACH of the following sea levels:

   - Mean High Water Springs;
   - Mean Low Water Springs;
   - Mean Low Water Neaps. (6)

   (b) On Worksheet Q2 mark and clearly label EACH of the following:

   (i) Charted Sounding; (2)

   (ii) Drying Height; (2)

   (iii) Charted Height of light; (2)

   (iv) Under Keel Clearance; (1)

   (v) Air Draught. (1)

Section B

3. As part of a voyage, a vessel is to undertake a passage through the English Channel and Dover Straits.

   (a) Explain how the Mariners' Routeing Guide, English Channel and Southern North Sea, Chart 5500, may be used in the preparation of this passage. (10)

   (b) Explain how EACH of the following publications would be used in the *Appraisal* stage of the Passage Plan:

      (i) Tidal Stream Atlas; (4)

      (ii) Admiralty Sailing Directions; (4)

      (iii) Admiralty List of Light and Fog Signals. (4)

   (c) Contained on Chart 5500 is a *Co Tidal and Co Range* diagram.
   Explain why this diagram may be of use in the *Execution* stage of a passage plan. (3)

4. A vessel is to sail a rhumb line track for the ocean passage from Freetown, Sierra Leone, to Braganca, North coast of Brazil.

   Rhumb line departure waypoint: 8°30'N 13°20'W.
   Rhumb line destination waypoint: 1°05'S 47°00'W.

   (a) Calculate the course and distance of the ocean passage. (10)

   (b) In addition to the ocean passage, a further 70 nautical miles of coastal passage is required.
   The ETD Freetown is 2000 hrs, Standard Time, 28th March.
   Ship speed 16.5kts.

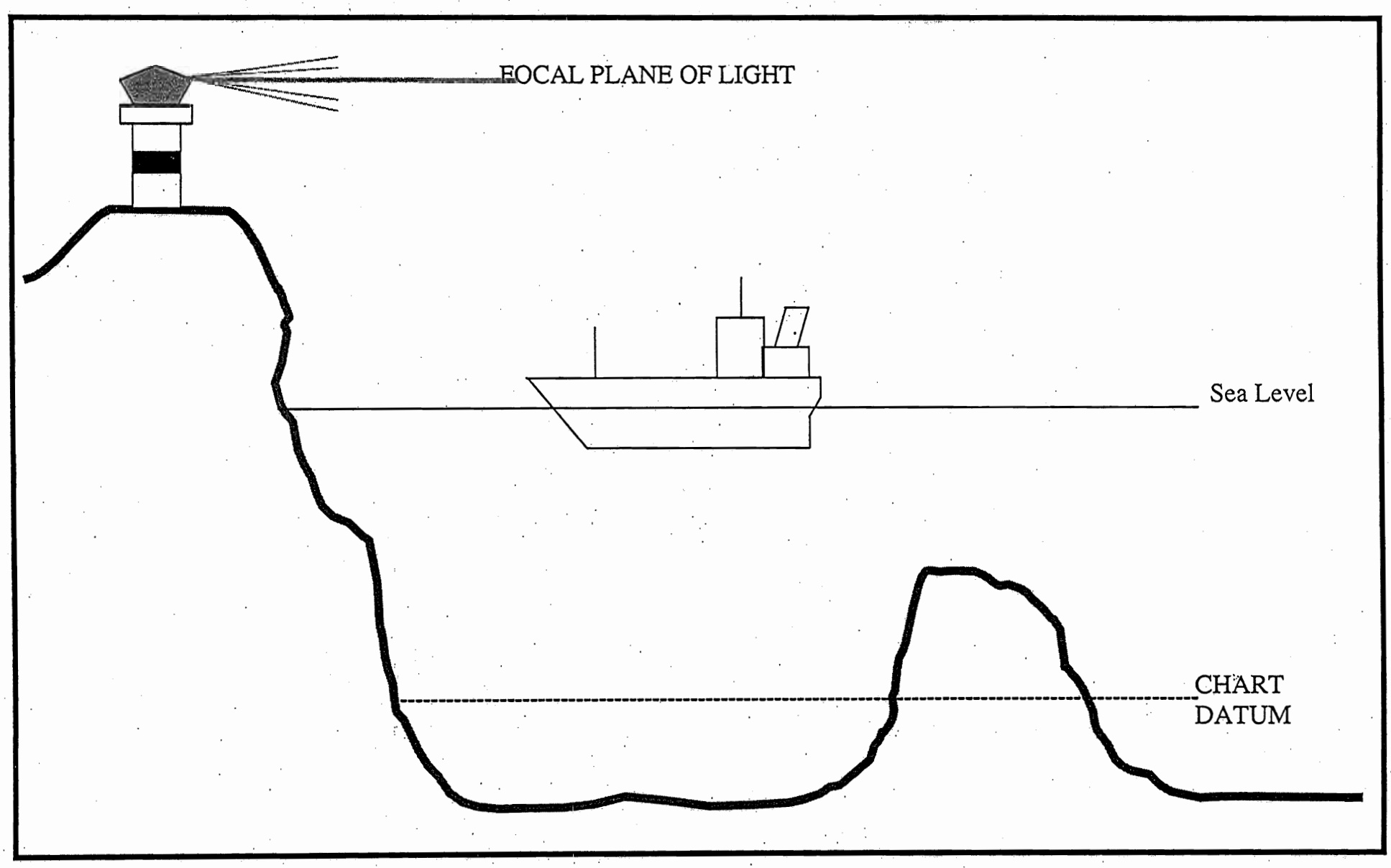
   Calculate the ETA, to the nearest hour, Standard Time, at Braganca. (5)

5. The planet Venus was observed bearing 115°G by an observer in D.R. 45°30'S 58°35'W at approximately 0445hrs, 29th December.
   Chronometer showed 8h 47m 20s and had an error of 1m 28s slow.

   (a) Find the gyro error at the time of the observation. (15)

   (b) As Officer of the Watch state the actions that should be taken if a celestial observation using the magnetic compass indicated that the deviation was 10°W greater than the deviation card showed for that ship's head. (5)

(This Worksheet must be returned with your answer book)



Candidate's Name .....

Examination Centre .....

DDV CARD (8) ~~DEC 06~~ MAR 07

5047

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1300hrs a vessel bound for Appledore ship repair yard (51°03'N 04°12'W) observed St Gowans light vessel (51°30'N 05°00'W) bearing 299°C at range 10.8 miles whilst steering 107°C at ship speed 14.5 knots.
Variation 8°W

   (a) Find the position of the vessel at 1300hrs. (7)

   (b) The vessel is to alter course and adjust her speed to make good a position 2.0 miles due West of Bideford Fairway buoy (51°05'N 04°16'W) at 1600hrs.
   Tidal stream predictions to be obtained by means of tidal diamond A, for 5hrs before HW Avonmouth, Spring tides. Assume the tidal stream is constant throughout.
   A SW'ly wind is estimated to be causing 2° leeway.

   Find the compass course to steer and the ship speed required. (18)

   Note: Assume that the alteration of course and speed is instantaneous.

2. The vessel referred to in Q1 is to proceed to the repair berth at Appledore (Index No.536 United Kingdom and Ireland Tide Tables). The vessel is to berth at high water on the afternoon of 26th February.

   (a) Calculate the time and height of high water at Appledore for this tide. (6)

   (b) The vessel is expected to be alongside the repair berth until the morning of 4th March.
   Charted depth of water at the berth 4.8m.
   Vessel's draught 3.5m even keel.
   The Master requires to know the predicted minimum under keel clearance of the vessel and the time that this will occur during the vessel's anticipated repair period.

   Calculate the required tidal information. (9)

Section B

3. SOLAS Chapter V requires a Master to have in place a Voyage Plan prior to the commencement of a passage.

   (a) State TEN factors to be considered when undertaking the *appraisal* stage when determining the choice of route. (10)

   (b) State FOUR factors to be considered when undertaking the *planning* stage to determine an appropriate distance to pass off a headland. (4)

   (c) Outline FOUR factors to be considered when undertaking the *monitoring* stage when determining the primary and secondary means of position monitoring for a coastal passage. (4)

   (d) Outline FOUR factors to be considered when undertaking the *monitoring* stage when determining the frequency of position fixing. (4)

4. A vessel is to sail a rhumb line from Corinto, Nicaragua, to Phoenix Island, Kiribati. The ocean passage will be from waypoint 12°30'N 87°20'W to waypoint 3°50'S 170°30'W.

   (a) Calculate the course and distance for the ocean passage. (10)

   (b) The Ocean Routeing Chart indicates that two thirds of the ocean distance will have the advantage of a 1 knot favourable current. The remaining third of the ocean distance will be subject to an equatorial counter current of ½ knot.
   Ship service speed 17.0 knots.

   Calculate, to the nearest whole hour, the total steaming time of the ocean passage. (3)

   (c) If the ETD Corinto is 1000hrs, Standard Time, 8th December calculate the ETA, Standard Time, Phoenix Island. (5)

5. (a) List the signs indicating the proximity of drift ice. (7)

   (b) Describe the methods of avoiding or reducing ice accumulation and accretion. (5)

   (c) State the publication that obliges a Shipmaster to report ice and severe ice accretion. (1)

   (d) Outline the reporting requirements for EACH of the following:

   (i) ice; (3)

   (ii) severe ice accretion. (4)

JUL 07

S138

DEC 16

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0600hrs, during restricted visibility, a vessel on passage to Auckland observed Flat Rock (36°27'S 174°55'E) by radar at range 5.2 miles.
At 0715hrs, during an improvement in visibility, Tiritiri Matangi Island light (36°36'S 174°53'E) was observed bearing 242°C.
Vessel steering 175°C at 6.4 knots throughout.
A tidal stream was setting 350°T, rate 1.0 knot, throughout.
An Easterly wind was causing 3° leeway throughout.
Variation 19½°E

   (a) Find the position of the vessel at 0715hrs. (16)

   (b) Find the time and bearing that Tiritiri Matangi Island light was abeam. (6)

   (c) State the compass bearing of Tiritiri Matangi light when abeam. (3)

2. A vessel is to enter the port of Monggum P'o (Index No. 7468, Pacific and Atlantic Oceans Tide Tables) on the evening flood tide 5th August. The Master instructs the Officer of the Watch to obtain the necessary tidal information.

   (a) Find the earliest predicted time that the vessel can enter the port if a minimum height of tide of 1.7m is required. (12)

   (b) State any additional specific information that should be brought to the attention of the Master. (3)

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Section B

3. (a) Explain the objective and rationale of ship's routeing, as outlined in the IMO publication *Ship's Routeing Guide* and SOLAS Chapter V. (5)

(b) State a publication other than the *Ship's Routeing Guide* that can be used to determine if a particular Traffic Separation Scheme has been adopted by the IMO. (2)

(c) Explain EACH of the following terms:

(i) Traffic lane; (2)

(ii) Separation zone; (2)

(iii) Separation line; (2)

(iv) Inshore traffic zone; (2)

(v) Precautionary area. (2)

4. A vessel is bound from Salcombe, England, to Abbeville, France.

(a) Calculate the course and distance from Salcombe pilot disembarkation point, 50°10'N 3°45'W, to Abbeville pilot embarkation point, 50°10'N 1°23'E. (5)

(b) The tidal stream atlas indicates that after disembarking the pilot the tidal stream will be slack water for 1 hour. Subsequently the tidal stream will be favourable, 1½ knots, for 5 hours and slack water again for 1 hour. The remainder of the passage will be with the tidal stream adverse by 1 knot.
Ship speed 18.0 knots.
Time of pilot disembarkation 0800hrs 13th July.

Calculate the ETA Abbeville pilot station. (5)

Note: Assume that there is no time difference between the two pilot stations.

(c) State EIGHT properties of a Mercator chart. (8)

JULY 07

5. (a) (i) During an ocean passage an observer, D.R. position 30°45'S 31°40'E, noted the sun to rise bearing 088°G on the 23rd September.

Calculate the error of the gyro compass. (10)

(ii) State SIX other items of bridge equipment that the OOW should check every watch during an ocean passage. (6)

(b) The Merchant Shipping (Distress Signals and Prevention of Collision) Regulations 1996, contains factors to be considered when determining a safe speed for a vessel.

Explain why EACH of the following factors are to be considered:

(i) at night the presence of background light such as from shore lights or from back scatter of her own lights; (3)

(ii) the characteristics, efficiency and limitations of the radar equipment; (3)

(iii) the more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity. (3)

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5

OCT 07

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DEV N° 12

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0700hrs a vessel on passage to St George's Channel Traffic Separation Scheme (52°07'N 06°07'W) observes Ballycotton Island light (51°50'N 07°59'W) bearing 328°C x 12.8'.
Vessel steering 077°C, ship speed 12.0 knots.
At 0810hrs, due to overheating of the main engine, the ship speed is reduced to 9.0 knots.
At 0830hrs the ship speed is further reduced to 6.0 knots and the Master orders that the vessel steers 150°C, to clear the shipping route, so that engines may be stopped at 0930hrs to effect engine repairs.
Variation 8°W.
The tidal atlas gives the following information:

0700hrs to 0800hrs - predicted tidal stream 100°T x 1.5 knots;
0800hrs to 0900hrs - predicted tidal stream 100°T x 0.5 knot;
0900hrs to 1000hrs - predicted tidal stream 220°T x 1.0 knot;
1000hrs to 1100hrs - predicted tidal stream 220°T x 2.0 knots.

Note: Assume all alterations of course and speed are instantaneous.

(a) Find EACH of the following:

(i) the D.R. position of the vessel at 0930hrs; (15)

(ii) the E.P. of the vessel at 0930hrs. (8)

(b) The repairs to the engine cooling system are expected to require 90 minutes to complete.

Find the E.P. of the vessel at the predicted time of completion of engine repairs. (4)

2. Using Worksheet Q2, calculate the height of tide at Boom (Index No. 1539c United Kingdom and Ireland Tide Tables) at 1400hrs, Standard Time, 13th April. (13)

Section B

3. (a) State the factors to be considered when appraising and planning a landfall as part of a voyage plan. (10)

(b) From the following information, estimate when the Old Head of Kinsale light (51°36'N 08°32'W) will first be observed:
Prevailing visibility 7.0 miles;
Observer's height of eye above sea level 12.0m. (3)

(c) (i) State the THREE types of seabed indicated in Ballycotton Bay (51°52'N 07°59'W). (3)

(ii) State the meaning of the symbol in position 51°39'.4N 07°57'.4W. (2)

(iii) State the meaning of the symbol in position 52°06'.0N 06°30'.3W. (2)

(iv) State the meaning of the symbol in position 52°05'.8N 06°34'.8W. (2)

(v) Explain the purpose of the symbol indicating the *General Direction of Buoyage* (51°59'N 08°00'W). (2)

(vi) State the chart required to appraise a passage into Cork harbour (51°50'N 08°16'W). (1)

4. At 1815hrs GMT, 21st October, a distress message is received from a vessel in position 36°28'S 142°37'W requiring immediate assistance. The vessel is not making way. Your position at 1815hrs GMT is 39°42'S 137°56'W and maximum speed 18.5 knots.

(a) Calculate, by Plane Sailing, the required course and distance to rendezvous with the vessel in distress. (10)

(b) The ocean routeing chart indicates a current of 1 knot setting NW throughout the area.

Calculate the ETA, GMT, at the rendezvous. (4)

(c) Explain why the d'long between two points on a parallel of latitude cannot be used as a linear measure. (2)

5. (a) With reference to the *Bridge Procedure Guide*, list the TEN circumstances when the Master must be called. (10)

(b) State TEN other checklists contained in Section B of the *Bridge Procedure Guide*. (5)

(c) The *Bridge Procedure Guide* contains advice regarding the recording of bridge activities. Explain the requirements and purpose of recording bridge activities. (2)

(d) State a reason why the Engine Room should be given one hours notice prior to any planned reductions in speed. (2)

NOV 07

NAVIGATION

Attempt ALL questions

5.38

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1400hrs, 9th January, a vessel obtains the following observations:

Chamberlins Island peak,	172m,	(36°52'S 175°11'E)	bearing 224°G;
Hauturu peak,	536m,	(36°54'S 175°29'E)	bearing 131°G;
Motutapere Island peak,	174m,	(36°47'S 175°26'E)	bearing 092°G.

(a) Find the position of the vessel and the gyro error at 1400hrs. (12)

(b) State the charted predicted tidal stream set and rate at the vessel's 1400hrs position, (Auckland, Index No. 6400, Pacific and Atlantic Oceans Tide Tables). (6)

(c) The vessel is to make good a course to waypoint 36°25'S 175°00'E.
Ship speed 8.0 knots.
A SW'ly wind causing 3° leeway.

Find the gyro course required and the ETA at the waypoint, using the tidal stream stated in Q1(b). (12)

Note: Assume tidal stream and leeway remain constant throughout.

2. A vessel is to berth on the evening flood tide, 29th January, at Halifax, Canada. (Index No. 2935, Pacific and Atlantic Oceans Tide Tables).
Draught on arrival 11.5m for'd, 11.8m aft.
The Company policy is that a minimum under keel clearance of 15% of the maximum draught is maintained.
The vessel is required to cross a shoal, charted depth 12.3m.

(a) Calculate the height of tide required to cross the shoal. (2)

(b) Calculate the earliest time, GMT, that it is safe to cross the shoal using the information available. (4)

(c) State the instances when intermediate tidal heights may not be calculated for Pacific ports. (4)

[OVER

Section B

3. A vessel anchored in position 36°42'.0S 175°40'.0E is to proceed to Auckland harbour, berthing at the general cargo wharf 36°50'.4S 174°46'.1E.
The passage will be undertaken during daylight, good visibility, wind S'ly force 5.

(a) (i) The *Admiralty Sailing Directions* will be used in the appraisal. State EIGHT topics of information contained in this publication. (4)

(ii) State the TWO charts that should be used to appraise the passage through Auckland approach channel (36°40'S 174°55'E) and to the berth. (2)

(iii) State FOUR other publications used to appraise the passage. (2)

(b) State, with reasons, whether the planned track should pass to the North or to the South of Channel Island (36°25'S 175°20'E). (4)

(c) State the charted features AND the methods that would be used for position monitoring from the anchorage to the Auckland pilot station (36°45'S 174°49'E). (8)

4. A vessel is to undertake a passage from waypoint 2°12'S 175°15'W to waypoint 5°20'N 178°35'E.

(a) Calculate, by Plane Sailing, the required course and distance. (12)

(b) The *Execution* stage of the passage plan has identified the requirement to arrive at the destination waypoint at 0900hrs 8th April. The passage will commence at 1900hrs on the 6th April. An adverse current of 1 knot is predicted.

Calculate the required ship speed. (3)

5. (a) An OOW in D.R. position 56°00'N 145°30'W observed the sun rise bearing 088°C on the 24th September. Variation 4°E.

Find the deviation of the compass for the ship's head. (12)

(b) (i) Outline the purpose of forming a bridge team when a vessel is navigating in restricted waters. (5)

(ii) State EIGHT factors that should be considered when determining the composition of a bridge watch team. (8)

MAR 08

5140

DEV N° 1

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

All times are Standard Time unless otherwise stated.

Section A

1. At 1200hrs, a ship bound for Wellington was in position 42°02'S 175°03'E. The ship was steering 310°C at 12.0 knots. At 1230hrs the ship altered course to 010°C to increase the C.P.A. of another ship. The ship was able to resume steering 310°C at 1250hrs. At 1330hrs a reduction of speed to 8.0 knots was ordered due to restricted visibility.

   Variation 22°E.

   (a) Find the 1400hrs D.R. position of the ship. (12)

   (b) The tidal stream atlas of the area showed the following tidal stream predictions:

1130hrs - 1230hrs,	Set 280°T,	Rate 1.0 knot.
1230hrs - 1330hrs,	Set 280°T,	Rate 1.5 knots.
1330hrs - 1430hrs,	Set 320°T,	Rate 2.0 knots.

   Find the 1400hrs E.P. of the ship. (8)

   (c) At 1430hrs Turakirae Head (41°26'S 174°55'E) was detected by radar bearing 056° Relative at range 12.0 miles.

   Find the actual tidal stream set, drift and rate experienced between 1200hrs and 1430hrs. (7)

   Note: Assume all alterations of course and speed are instantaneous.

2. A ship is to enter Cape Cod Canal by the west entrance (No. 2787) ATT Pacific and Atlantic Oceans. ETA at the canal entrance is 1200hrs 5th January.

   (a) Calculate the low water and high water details for the midday flood tide. (10)

   (b) The west entrance has a charted depth of 5.8m.
   Vessel's draughts on arrival: for'd 4.9m, aft 5.3m.
   Required under keel clearance 1.0m.

   Find the earliest time that the ship can safely enter the canal. (3)

Section B

3. The OOW of a ship, outward bound from Wellington harbour (41°17'S 174°48'E), is planning a passage from the pilot station (41°24'S 174°50'E), through the Cook Strait (41°10'S 174°30'E) to a waypoint at 40°20'S 174°50'E. The passage is to be executed during daylight.

   (a) State FIVE publications that would be consulted to appraise this passage. (5)

   (b) Identify the charted dangers of this passage. (7)

   (c) Identify the methods and charted features that would be used to monitor this passage. (10)

4. In order to undertake a replenishment at sea, a fleet auxiliary ship and a warship have agreed to rendezvous in position 41°30'S 177°45'E.
   At 0900hrs UT, 20th March the two vessels are in positions:

   Fleet auxiliary ship; 41°30'S 178°55'W.
   Warship; 37°55'S 177°45'E.

   (a) Calculate EACH of the following:

      (i) the course and distance for the fleet auxiliary ship; (5)

      (ii) the course and distance for the warship. (3)

   (b) The rendezvous is to commence at sunrise on the 21st March. Calculate the speeds required for both ships to make good the rendezvous position. (10)

5. (a) With reference to MGN 315, *Keeping A Safe Navigational Watch On Merchant Ships*, and MSN 1767, *Hours of Work, Safe Manning And Watchkeeping revised Provisions From September 2002*, state EACH of the following:

(i) the THREE specified items that the OOW should ensure before handing over the watch; (3)

(ii) the TWO specified instances when the OOW should not hand over the watch to the relieving officer; (2)

(iii) the minimum rest time, unless an exceptional circumstance, during a 24 hour period; (2)

(iv) the minimum length of at least one of the daily rest periods. (2)

(b) An OOW obtains a ship position derived by celestial observations which is 20 nautical miles to the south of the D.R. position. After having checked the calculations and plotting of the sights the OOW can find no error.

State the actions required by the OOW. (2)

(c) State TWO reasons why 1 hours notice should be given to the engine room prior to arrival at the *stand by engines* position. (2)

(d) State FIVE instances when the error of the ship's compass should be obtained. (5)

(e) State the means of communication with the emergency steering position in the steering flat in the event of a total power failure of the ship's telephone system. (2)

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5138
DEV N° 17

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

All times are Standard Time unless otherwise stated.

Section A

1. At 1020hrs, 1st May 2008, a ship westbound at ship speed 13.8 knots through the Colville Channel (36°24'S 175°27'E) observed the Channel Island lighthouse (36°25'S 175°20'E) in transit with the western edge of the Moehau Range peninsula (36°32'S 175°23'E) bearing 170°C. Variation as per charted information.

   (a) Find the deviation of the ship's compass. (6)

   (b) At 1030hrs the Channel Island lighthouse was observed bearing 130°C, at range 1.6 miles.

   Find the position of the ship at 1030hrs. (4)

   (c) The master instructed the OOW to alter course and speed at 1030hrs so as to arrive at a position 4.0 miles due east from the Tiritiri Matangi Island lighthouse (36°36'S 174°54'E) at 1200hrs. Predicted tidal stream 250°T, rate 2.0 knots. NW'ly wind causing 2° leeway.

   Find the required compass course and speed. (15)

   (d) The master instructed that End Of Passage/Stand By Engines was to be 5.0 miles before the 1200hrs position.

   Find the time of EOP/SBE. (3)

2. (a) On Worksheet Q2 mark and clearly label EACH of the following sea levels, assuming the sea level shown represents Mean High Water Neaps:

   - MHWS;
   - MLWS;
   - MLWN. (6)

   (b) On Worksheet Q2 mark and clearly label EACH of the following:

   - Air draught;
   - Under bridge clearance. (2)

   (c) With reference to the Menai Bridge, (No. 473) ATT UK and Ireland, charted height 30.0m, find the height of the bridge above sea level when the height of tide is 2.6m. (4)

[OVER

Section B

3. A passage through severely restricted waters is being planned.

   (a) With reference to a vessel's manoeuvring characteristics, explain EACH of the following terms:

      (i) Advance; (2)

      (ii) Transfer; (2)

      (iii) Wheel Over position. (2)

   (b) Show, using a labelled diagram, how the information explained in Q3(a) may be presented on the bridge of a ship. (6)

   (c) State FOUR additional items of information that should be presented with the manoeuvring data. (4)

   (d) With reference to execution and position monitoring for an intended passage, explain EACH of the following terms:

      (i) Clearing bearing; (2)

      (ii) Leading lights; (2)

      (iii) Cross Track limit; (2)

      (iv) Abort position. (2)

4. The following table is an extract from a ship's log book:

Date	Ship Time	Log Book Entry
4th March	1200hrs	D.R. position 15°42'.0S 125°44'.0E Observed position 15°48'.0S 125°50'.0E
5th March	1200hrs	D.R. position 19°38'.0S 131°08'.0E Observed position 19°38'.0S 130°40'.0E

Find EACH of the following:

   (a) by Plane Sailing, the course and distance made good between 1200hrs 4th March and 1200hrs 5th March; (10)

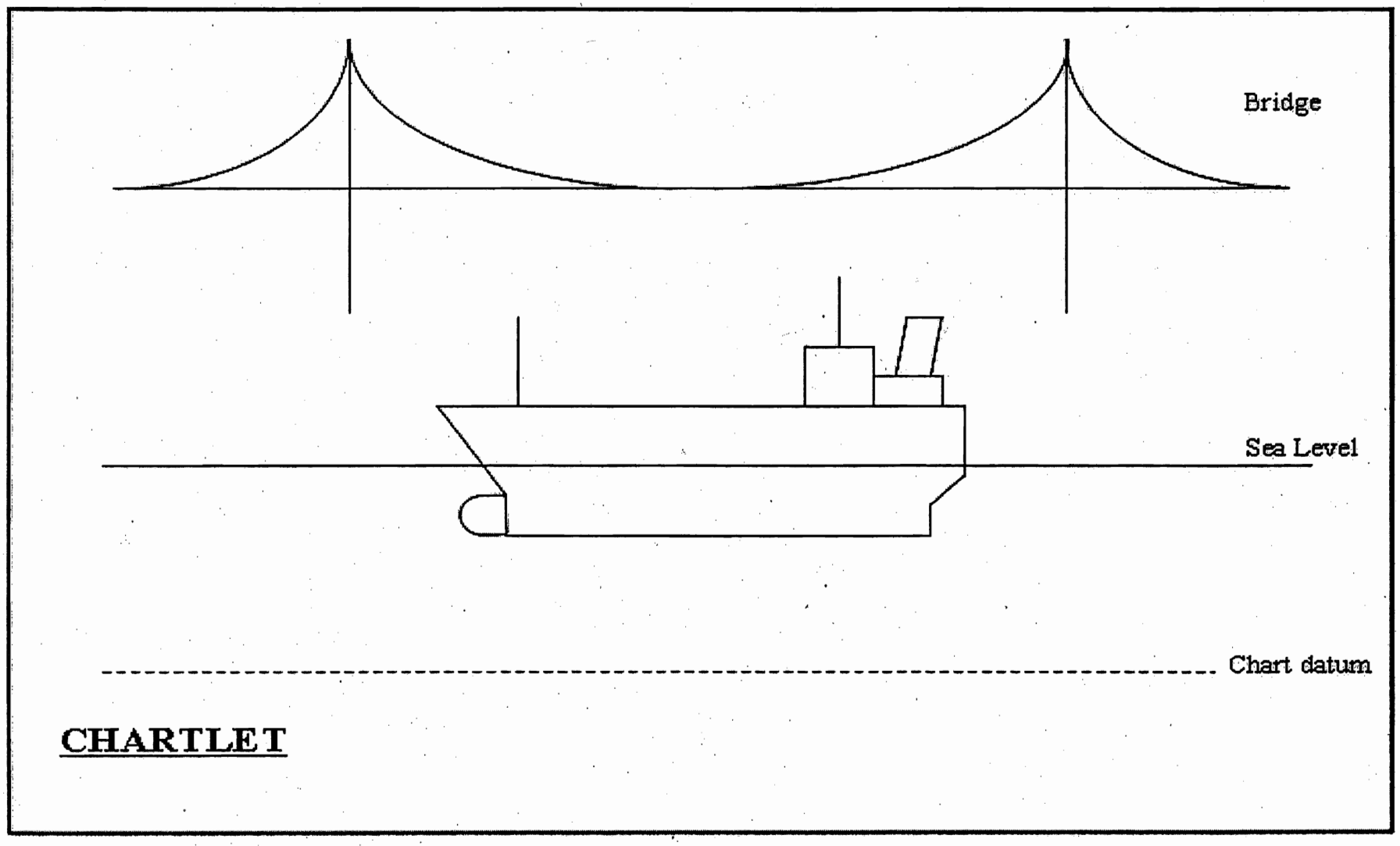
   (b) the set, drift and rate of the current experienced between 1200hrs 4th March and 1200hrs 5th March. (6)

5. The planet Venus was observed bearing 070°G by an observer at approximately 0600hrs, ship's time, 13th September.
Chronometer showed 5h 50m 03s.
Chronometer error 1m 03s slow.
D.R. position 03°15'S 178°40'E.

(a) Find the error of the gyro compass. (15)

(b) State FIVE instances when the Officer of the Watch should check the gyro and magnetic compass error. (5)

(This Worksheet must be returned with your answer book)



CHARTLET

Candidate's Name .....

Examination Centre .....

OCT 08

5046

DEV CARD

(7)

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

All times are Standard Time unless otherwise stated.

Section A

1. At 2000hrs, a ship on passage through the Dover Straits, observed Dungeness light (50°55'N 00°59'E) abeam at range 6.2 miles. Ship steering 244°C at 13.0 knots.

   At 2100hrs the Royal Sovereign light (50°43'N 00°26'E) was observed bearing 289°C at range 12.1 miles.

   Variation 2°W

   (a) Find the tidal stream experienced between 2000hrs and 2100hrs. (10)

   (b) After appraising the traffic situation the Master of the ship instructs the Officer of the Watch to maintain the present Ground Track until the Royal Sovereign light is abeam and then alter course to make good a course of 255°T. The predicted tidal stream at the time of alteration of course is 230°T at rate 2.0 knots.

   Find EACH of the following to comply with the Master's instructions:

   (i) the time of the alteration of course; (5)

   (ii) the compass course required. (10)

2. A ship proceeding to Avonmouth (No. 523) ATT UK and Ireland, must pass beneath power cables spanning the harbour entrance. Charted height of power cables 18.7m.
   Air draught of ship 23.2m.
   The Avonmouth Port Authority advises the ship that they consider that the maximum height of tide for the ship to safely pass beneath the power cables is 6.2m.

   (a) Calculate the clearance under the power cables at the recommended maximum height of tide. 1.7 (5)

   (b) The ETA of the ship at the power cables is 1230hrs, 23rd January.

   Find EACH of the following, using the recommended maximum height of tide:

   (i) the earliest time that the ship can pass under the power cables; (5)

   (ii) the latest time that the ship can pass under the power cables on that tide. (5)

Section B

3. With reference to Chart 5046.
A ship outward bound from Boulogne (50°44'N 01°36'E) is to cross the NNE bound traffic lane so as to enter the SW bound traffic lane. It is intended that the ship will pass 0.4 mile to the North of ZC1 buoy (50°45'N 01°27'E) at 0825hrs UT, 10th November.

(a) Calculate the predicted tidal stream, using the nearest tidal diamond. (6)

(b) A Northerly wind is causing 3° leeway.
State the true course to steer to comply with rule 10c of the International Regulations for Preventing Collision at Sea as regards crossing the NNE bound traffic lane. (3)

(c) The ship will need to cross the separation zone prior to entering the SW bound traffic lane. State the TWO other circumstances when a vessel may enter the separation zone. (2)

(d) State TWO methods to determine if the charted traffic separation scheme has been adopted by the International Maritime Organisation. (2)

(e) State which vessels may use the Inshore Traffic Zones. (5)

(f) State the TWO prescribed circumstances when a ship is exempt from complying with the International Regulations for Preventing Collision at Sea with regards to traffic separation schemes. (2)

4. At 1600hrs, ship's time, 30th August, a ship bound from Panama to NW Europe is in position 26°10'N 56°35'W. The ship is keeping ship's time consistent with Zone Time. Due to a serious injury sustained by a crew member the Master diverts the ship to San Miguel Island, Azores, and increases to the maximum ship speed of 17.0kts.
Landfall position San Miguel Island 37°50'N 25°50'W.

Find EACH of the following:

(a) the course and distance to the landfall position; (10)

(b) the ETA, Standard Time, at the landfall position. (5)

Note: ETA to be calculated to the nearest hour

OCT 08

5. On completion of an ocean passage a ship is to enter restricted navigational waters.

(a) State TEN factors to be considered when determining the bridge composition when navigating in restricted waters. (10)

(b) State TEN items of bridge equipment that should be checked prior to entering restricted waters. (10)

(c) State FIVE factors to be considered when determining the frequency of position fixing in restricted waters. (5)

NOV 08

5048

DEV N° 10

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

All times are Standard Time unless otherwise stated.

Section A

1. A ship bound for Waterford harbour (52°10'N 06°56'W) had been unable to fix the position for 12 hours due to navigational equipment failure and overcast conditions. At 1840hrs, in D.R. position 51°25'N 06°55'W, a sight of planet Venus gave an Intercept of 2.6' Away, bearing 213°T. At 2210hrs the bridge lookout reported a white light, flashing three times in close succession, bearing 35° on the starboard bow.

   Ship was steering 330°C at 8.5 knots throughout.
   A tidal stream was setting 050°T at rate 1.5 knots throughout.
   A W'ly wind was causing 4° leeway throughout.
   Variation 5°W.

   (a) Find the position of the ship at 2210hrs. (15)

   (b) Find the Compass course to steer to leave Hook Head (52°07'N 06°55'W), 2.0 miles to starboard, assuming that the tidal stream and leeway remain constant. (10)

   (c) State the compass bearing of Hook Head light when abeam. (3)

2. (a) Explain, with the aid of a diagram, how the relative positions of the earth, sun and moon influence tidal ranges. (5)

   (b) Explain the reliability of the tidal information contained in the *Admiralty Tide Tables.* (2)

   (c) State the reasons for possible discrepancies between the published heights/times and actual heights/times experienced. (3)

   (d) State the criteria used to determine which Standard Port a Secondary Port is linked to when the Part II correction tables were compiled. (2)

Section B

3. A ship outward bound from Dungarvan Harbour (52°04'N 07°34'W) is to enter St George's Traffic Separation Scheme at 52°03'.0N 06°10'.0W.
The meteorological forecast is: Southerly winds, force 5 to 6. Showers. Visibility 3 miles.
In order to minimise the distance a rhumb line track due East from 52°03'.0N 07°30'.0W to the T.S.S. waypoint is being considered.

(a) State, with reasons, the feasibility of this route. (5)

(b) Refer to Datasheet Q3(b) - an extract of the *Admiralty List of Lights and Fog Signals.*

During the appraisal stage of the proposed passage the Admiralty List of Light and Fog Signals is to be used to obtain full details of Ballinacourty Point light (No. 5782) and Hook Head light (No. 5798).

With reference to Ballinacourty Point light, explain EACH of the following abbreviations:

(i) fl 0.5, ec 1, fl 0.5, ec 8 (2)
(ii) G245° - 274° (29°) (2)
(iii) White tower (2)

With reference to Hook Head light, explain EACH of the following abbreviations:

(iv) bl 1.5, si 3, bl 1.5, si 39 (2)
(v) Racon (2)
(vi) State why **Hook Head** is shown in bold letters. (2)

(c) With reference to Datasheet Q3(c), state the predicted distance that Hook Head light would first be observed in the forecast conditions, assuming a height of eye of 6.0m. (3)

(d) Outline the details contained in the Admiralty Sailing Directions to assist in the appraisal of this passage. (5)

4. A ship is on passage from Puetto Montt, Chile, to Monrovia, Liberia.
At 1530hrs, Zone Time, 9th June, the ship clears the Magellan Straits at position 52°45'S 68°10'W and a rhumb line is set for landfall position 06°10'N 10°40'W.

(a) Find the course and distance of the rhumb line. (10)

(b) The Ocean Routeing charts for June indicate that the Falklands current will be favourable at 1.5 knots for the initial 3 days of the ocean passage. The Brazil current will then be adverse at 1.0 knot for 4 days. The Equatorial currents will then be adverse at 0.5 knot for the remainder of the passage.
Ship speed 18.2 knots.

(i) Calculate the total steaming time of the passage, to the nearest hour. (3)

(ii) Find the ETA, Standard Time Monrovia, at the landfall position. (5)

5. An observer obtains simultaneous bearings, 256°C and 269°G, of the sun at sunset on the 21st September whilst in D.R. position 58°10'N 25°35'W.
Variation 16°E.

(a) Find EACH of the following:

(i) the error of the gyro compass; (10)

(ii) the error of the magnetic compass; (2)

(iii) the deviation of the ship's head. (3)

(b) State the position of the apparent sun, in relation to the visible horizon, when an amplitude bearing should be obtained. (2)

MARCH 09

5056

DEV. CARD 10

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1030hrs, 12th February, whilst anchored in Tor Bay (50°26'N 3°22'W) the following bearings are obtained:

Berry Head (50°24'N 3°29'W)	185°C
Hope's Nose (50°28'N 3°29'W)	005°C
Roundham Head (50°26'N 3°33'W)	275°C

Variation 5°W.

(a) Find the position of the ship and the deviation of the ship's head at 1030hrs. (12)

(b) The ship is to depart the anchorage at 1330hrs and the passage plan is to pass 5'.0 to the southward of Bill of Portland (50°31'N 2°27'W).

Ship speed 13.5 knots.

(i) State the predicted tidal stream at 1330hrs, using

. (6)

(ii) Find the compass course to steer at 1330hrs to make good the required course, allowing 3° for a northerly wind, in addition to the predicted tidal stream. (7)

(c) Outline, by inspection of the tidal stream prediction table, the anticipated allowances for tidal set that will be required until the ship is 5.0 miles south of Bill of Portland. (5)

2. A ship is to discharge cargo at Manli Po (Index No. 7497, Pacific and Atlantic Oceans Tide Tables). The master is concerned about the shallow depth of water and the clearance beneath the gantry cranes alongside the berth.

To ensure safe cargo operations the critical low water and high water details are to be appraised.

The ship is to berth on the midday flood tide 11th July and is scheduled to depart on the morning high water 19th July.

Find the heights and times of the predicted lowest low waters and highest high waters whilst the ship will be on the berth. (10)

Section B

3. (a) With reference to the passage outlined in Q1, state FIVE factors to be considered when determining the safe distance to pass off Bill of Portland. (5)

(b) Using Datasheet Q3 and relating to Bill of Portland:

(i) explain the meaning of the notation (T) beneath the name; (2)

(ii) describe the visual appearance of the lighthouse structure as seen from a ship during daylight hours; (2)

(iii) state the purpose of the fixed red light. (2)

(c) State, giving reasons, whether Bill of Portland and surrounding land would be radar conspicuous and suitable for use as a means of radar position monitoring. (4)

4. A ship is to undertake a voyage from San Francisco, California, USA, to Auckland, New Zealand.

(a) Calculate, by rumb line, the total distance between the two pilot stations:

San Francisco pilot station 37°48'N 122°35'W.
Landfall position New Zealand 36°10'S 175°40'E.
Additional coastal passage to Auckland pilot station 38 miles.

(10)

(b) Appraisal of the ocean current charts indicates the following:

1,000 miles of the ocean passage will have the benefit of a 1 knot current;
1,000 miles of the ocean passage will have the benefit of a ½ knot current;
The 500 miles required to cross the equatorial counter current will reduce the ship speed by ½ knot;
The remainder of the voyage will have no significant ocean current influence.
The San Francisco pilot will be disembarked at 1500hrs, Standard Time, 30th March.
Ship speed 21.0 knots.

Find EACH of the following:

(i) the steaming time on passage; (5)

(ii) the ETA, Standard Time, Auckland pilot station. (5)

5. (a) The Merchant Shipping (Distress Signals and Prevention of Collision) Regulations 1996, contains factors to be considered when determining a safe speed for a vessel.

State the factors that are to be taken into account by vessels with operational radar when determining a safe speed. (12)

(b) The *Bridge Procedures Guide*, Annex A7, contains guidance on steering gear test routines. Outline the equipment that should be verified and the tests that should be conducted when conducting steering gear tests prior to departure from a port. (12)

(c) State the required frequency, as outlined by SOLAS, that emergency steering gear drills must be conducted. (1)

England — South Coast

		N/W		metres	miles		
	TEIGNMOUTH HARBOUR—(contd)						
0262·7	- Pier. Head	50 32·6 3 29·4	2 F G(vert)				
0263	- Training Wall. Middle. Philip Lucette Beacon	50 32·3 3 29·8	Oc R 5·5s	4	2	White stone column, black base	*ec 0·5*
0263·5	- Den Point. SW end	50 32·4 3 30·0	Oc G 5·5s F G(vert)	..	..	△ on green beacon	*ec 0·5*
0264	- New Quay. Lts in line. Front	50 32·6 3 29·8	F Bu	..	..	..	Leading line reported as unreliable and should not be used without recent local knowledge
0264·1	--- Rear. 67 m from front	50 32·6 3 29·8	F Bu				
0265	- Fish Quay	50 32·6 3 29·8	2 F G(vert)				
0266	- Eastern Quay	50 32·7 3 29·9	2 F G(vert)				
0267	-- Western Quay. W end	50 32·8 3 30·2	2 F G(vert)				
	EXMOUTH HARBOUR						
0270	- Straight Point	50 36·5 3 21·7	Fl R 10s	34	7 7	Metal mast	*fl 1.* Vis 246°-071°(185°) F R lights on radio mast 15·4M NE
0274	- Ldg Lts 305°. Front	50 36·9 3 25·3	Iso W 2s	6	7 2	White metal column	Difficult to distinguish by day
0274·1	-- Custom House. Rear. 57 m from front	50 36·9 3 25·3	Q W	12	7 10	Black mast	
0275	- Exmouth Pier. S corner	50 36·9 3 25·4	2 F G(vert)	7	3 5	Aluminium column	2 m apart
	RIVER EXE						
0277	- Turf Lock. Entrance. E side	50 39·6 3 27·7	2 F R(vert)	7	3 5	Aluminium column	2 m apart
0278	Sidmouth	50 40·3 3 14·4	Fl R 5s	5	2	..	Vis 230°-100°(230°)
0280	Beer. Near church	50 42·0 3 05·0	F W	26	.. 5	Metal column	Difficult to distinguish
0282	Axmouth. Pier. Head	50 42·1 3 03·2	Fl W 5s	7	2	△ on metal column	TE 1996
	LYME REGIS						
0284	- Lts in line 296°. Victoria Pier. Head. Front	50 43·2 2 56·1	Oc WR 8s	6	W 9 R 7 5	Blue metal column	*ec* 2. R296°-116°(180°), W116°-296°(180°)
0284·1	-- Rear. 240 m from front	50 43·2 2 56·2	F G	8	9	On Building	
	BRIDPORT HARBOUR						
0288	- E Pier. Head	50 42·5 2 45·7	F G	3	2	On pier capping	Occas
0290	- W Pier. Head	50 42·5 2 45·8	F R	3	2	On pier capping	Occas
0290·2	-- Root	50 42·6 2 45·8	Iso R 2s	9	5	Harbour master's office	
0294	Bill of Portland. Portland (T)	50 30·5 2 27·3	Fl(4)W 20s	43	25 41	White round tower, red band	*fl 0·1, ec 1·4, fl 0·1, ec 1·4, fl 0·1, ec 1·4, fl 0·1, ec 15·4.* Gradually changes from 1 *fl* to 4 *fl* 221°-244°(23°), 4 *fl* 244°-117°(233°), gradually changes from 4 *fl* to 1 *fl* 117°-141°(24°). RC
		..	F R	19	13	Same structure	Vis 271°-291°(20°) over The Shambles
		..	Dia 30s	..	..	..	*bl 3·5*

July 09 5048

No DEVCARD

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. A ship bound for Waterford Harbour (52°11'N 6°57'W) is steering 021°G at speed 12.5 knots.
At 1600hrs the G.P.S. position is given as 51°22'.6N 7°25'.5W.
At 1700hrs the G.P.S. position is given as 51°35'.4N 7°15'.6W.
Gyro error 2° low.

   (a) Find EACH of the following:

      (i) the course and speed that the ship is making good at 1700hrs; (4)

      (ii) the set and rate of the tidal stream at 1700hrs. (6)

   (b) An inspection of the tidal stream atlas indicates that the tidal stream will remain constant until 2000hrs. The Master requires that the ship be at the position 3.0 mile to the south-west of Hook Head (52° 07´N 6° 56´W) at 1930hrs.

      Find the gyro course and the ship's speed required. (10)

   (c) The Master has left orders to be called 5.0 miles prior to the required 1930hrs position.

      Find the estimated time that the Master will be called. (5)

2. (a) The *Admiralty Tide Tables* state that chart datum is "at or near the level of Lowest Astronomical Tide".

Explain the term *Lowest Astronomical Tide*. (2)

(b) State SIX possible reasons for differences between the published tidal heights / times and the actual tidal heights / times experienced. (3)

(c) With reference to the tidal predictions for Plymouth (Devonport) (Index No. 14 , UK and Ireland Tide Tables), explain EACH of the following:

(i) the black circle symbol beneath the date and day 29th March, Thursday; (2)

(ii) the significance of this symbol relative to the tidal characteristics. (2)

(d) Explain EACH of the following terms, stating the units used:

(i) tidal set; (2)

(ii) tidal drift; (2)

(iii) tidal rate. (2)

Section B

3. With reference to the ship on passage to Waterford Harbour, Q1, and using Chart 5048.

(a) Outline any relevant information regarding the accuracy of the G.P.S positions obtained at 1600hrs and 1700hrs. (2)

(b) Ship's height of eye 12.2m.
Prevailing visibility 3.0 miles.

State the predicted distance Hook Head light would first be seen. (3)

(c) Hook Head light shows the symbol Racon (K). Draw the echo that would appear on the ship's radar in relation to this charted symbol. (2)

(d) Outline the suitability of making a landfall off Hook Head, in view of the restricted visibility. (5)

(e) Outline any help that the echo sounder could give in respect of making this landfall. (2)

(f) With reference to the symbol in position 52°07'.2N 6°59'.0W, explain the possible effects on the ship whilst entering Waterford harbour. (2)

(g) In the event of it not being possible to proceed to the berth due to the restricted visibility the Master intends to anchor between Keeragh Islands (52°12'N 6°44'W) and Great Saltee Island (52°07'N 6°37'W).

State EACH of the following:

(i) the approximate height of the islands above chart datum; (3)

(ii) the nature of the seabed to the east of Keeragh Islands. (2)

4. At 1620hrs UT 8th March, a Pan Pan message is received from a ship requiring medical attention for an injured seaman.
Your ship, in position 22°20'N 25°30'W, makes contact with the ship and agrees to rendezvous in position 18°00'N 28°00'W.

(a) Calculate, by Plane Sailing, the required course and distance to the rendezvous position. (10)

(b) So as to ensure the safety of personnel whilst transferring between ships it is decided that the rendezvous will be at the time of sunrise next morning.

Find own ship's speed required. (7)

5. (a) At approximately 1430hrs, ship's time, 23rd September, a bearing of the sun, 291°C, was obtained.

The satellite derived position at the time of the observation was 13°48'S 159°35'E.

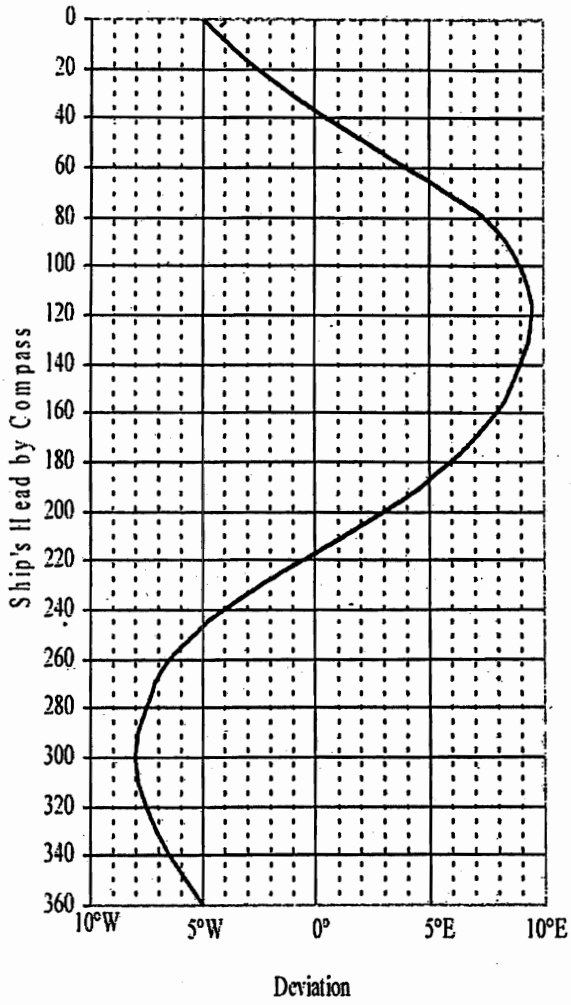
Chronometer showed 3h 40m 15s.
Chronometer error 13 seconds slow.
Variation 1°W.

Calculate the deviation of the compass for the ship's head. (17)

(b) At the time of the observation the ship's head by compass showed 083°C.

Using Datasheet Q5 - Deviation Curve, state the deviation that the OOW should have expected and any subsequent action, in light of the celestial observation, that should be taken by the OOW. (5)

Deviation Curve



OCT 09
5046
DEN CARD 17

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0700hrs, 10th September, a ship steering 073°T is in position Greenwich buoy (50° 25'N 00°00') bearing 323°T, range 4.5 miles. Log reading 207.5 miles.

   At 0745hrs an engine and mains power failure is experienced. Log reading 219.6 miles. The master immediately orders the helmsman to steer 030°C to take the ship out of the traffic lane whilst checks of the navigational equipment status are made.

   At 0810hrs, log reading 223.1, the ship is no longer making way.

   Variation 4°W

   (a) Find the D.R. position of the ship at 0810hrs. (10)

   (b) At 0830hrs checks of the navigational equipment are completed and Greenwich buoy observed by radar bearing 257°T, range 16.8 miles. The Chief Engineer advises the Master that the estimated time for restoration of power is 1300hrs.

   Find the E.P. at the estimated time of the ship being able to resume passage, using

. (10)

   (c) On completion of the engine repairs the master orders the helmsman to steer 080°T for the ship to rejoin the traffic lane and resume passage.

   Calculate the required compass course to steer. (5)

2. A ship is to proceed outward bound from the port of Antwerp (No. 1539 ATT UK and Ireland) and must pass beneath a bridge.

Charted height of bridge 15.7m. (Assume charted height measured from MHWS)

Air draught of ship 16.5m.

The Port Authority advises the Master that they consider the maximum height of tide for the ship to safely pass beneath the bridge is 3.2m.

(a) Calculate the clearance under the bridge at the recommended maximum height of tide. (5)

(b) The ship will be ready to sail at 0300hrs (local time) 26th February, but may be required to delay sailing due to unfavourable meteorological conditions. Find EACH of the following, using the recommended height of tide:

(i) the earliest time that the ship can pass under the bridge; (5)

(ii) the latest time that the ship can pass under the bridge on that tide. (5)

Section B

3. With reference to the Master's actions in Q1:

   (a) Outline the justification of entering the traffic separation zone when the Master does not intend to cross the zone. (3)

   (b) The ship, when engine repairs are completed, is to proceed to Dover (51°07'N 1°20°E) for a full inspection and testing of the engine. The passage plan, rejoining the traffic scheme and proceeding to Dover, is being appraised.

   Outline the elements contained within Rule 10 of the *I.R.P.C.S.* which must be taken into account when planning this passage. (7)

   (c) Explain the justification within the *International Regulations for the Prevention of Collision at Sea* that permitted the master to leave the traffic lane at an angle that was not as small an angle to the general direction of traffic flow as practicable. (3)

   (d) State the precise objectives of a routeing scheme, as outlined in the IMO *Ships' Routeing Guide.* (4)

4. The following table is an extract from a ship's log book:

Date	Ship Time	Log Book Entry	
14th June	1200hrs	D.R. position Observed position	31°15'N 175°22'W 31°26'N 175°20'W
15th June	1200hrs	D.R. position Observed position	38°52'N 178°41'E 39°14'N 178°41'E

   (a) Find the course and distance made good between 1200hrs 14th June and 1200hrs 15th June. (10)

   (b) At 1800hrs 14th June, ship's time, the clocks were retarded by 1 hour to allow for the change in time zones.

   Find EACH of the following:

   (i) the speed made good between 1200hrs 14th June and 1200hrs 15th June. (3)

   (ii) the set and rate of the current experienced between 1200hrs 14th June and 1200hrs 15th June. (5)

5. (a) MGN 315 *Keeping a Safe Navigational Watch on Merchant Vessels* issues clear guidance on the requirements of maintaining a lookout.

(i) State the specific condition when the OOW may act as sole lookout. (2)

(ii) State the factors that must be taken into account prior to the OOW becoming the sole lookout. (5)

(iii) Outline the guidance on how the OOW may fully engage the lookout's attention. (3)

(c) The *Bridge Procedures Guide* issues guidance on the composition of a navigational watch.

(i) Outline the rationale and objective of forming a bridge team when the ship is navigating in restricting waters. (5)

(ii) State TEN factors that should be considered when determining the composition of a navigational watch. (10)

DEC 2009

S140

DEV CARD 13

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0300hrs Stephens Island light (40°40'S 174°00'E) is observed bearing 250°C.
At 0430hrs Cape Jackson light, Fl (3) 20s, (41°00'S 174°19'E) is observed bearing 182°C.
Ship steering 110°C, speed 10.0knots.
Tidal stream setting 170°T, rate 1.0knot.
NE'ly wind causing 3° leeway.
Variation 22°E

   (a) Find the ship's position at 0430hrs. (15)

   (b) State the CPA off Cook Rock (41°03'S 174°25'E). (2)

   (c) The ship is to alter course to pass through the Cook Strait when The Brothers light (41° 06´S 174° 26´E) is abeam.

   Find the compass bearing of The Brothers light when abeam. (3)

   (d) The passage plan requires a track of 180°T to be made good through the Cook Strait. The tidal stream is predicted to be setting due south at rate 2.0 knots and the effect of the leeway will be reduced to 2°.

   Find the compass course to steer. (7)

2. At 2230hrs, 28th February, whilst at anchor at Southend, Kintyre (Index No. 391, UK and Ireland Tide Tables), the accuracy of the ship's echo sounder is being evaluated. The actual height of tide, using the charted information and echo sounder reading, is found to be 1.6m.

   Using Worksheet Q2, compare the actual height of tide with the predicted height of tide. (13)

Section B

3. With reference to the ship in Q1 transiting the Cook Strait:

   (a) Outline the information in the relevant Sailing Directions that could be used to appraise the proposed transit. (6)

   (b) The passage plan stipulates that parallel indexing will be one of the methods used to monitor the passage through the Cook Strait and then towards a waypoint 8.0 miles south of Cape Palliser (41°37'S 175°18'E).

   Identify conspicuous points that could be considered suitable for the required parallel indexing. (6)

   (c) Explain why parallel indexing cannot be used as a primary means of position fixing. (2)

   (d) State the primary method of position fixing that should be used whilst undertaking this night time transit of the Cook Strait. (2)

   (e) State TWO means, other than parallel indexing, that would be used to cross check the primary means of position fixing. (2)

   (f) Explain the meaning of the statement "WGS 84 positions can be plotted directly on this chart" contained in the top margin of the chart. (2)

4. (a) A ship is charted to carry a full cargo from Cape Town, South Africa, to Buenos Aries, Argentina. The ship will sail loaded to her summer marks and so cannot enter the winter zone until sufficient fuel, water and stores have been consumed.

   Calculate, by rhumb line, the total distance of the passage.

   Cape Town departure 34°00'S 18°18'E.
   Waypoint at which ship's freeboard will be at the winter marks 34°00'S 20°30'W.
   Landfall position South American coast 34°50'S 54°40'W.
   Coastal passage distance, landfall to Buenos Aries 190 miles. (15)

   (b) The charter agreement requires the ship to present itself ready to discharge the cargo at 0800hrs 12th March, Standard Time.

   The ship will commence passage at 0800hrs, Standard Time, 3rd March.

   Calculate the speed required to be made good to comply with the charter agreement. (5)

5. (a) List the signs indicating the proximity of drift ice. (7)

(b) Describe the methods of avoiding or reducing ice accumulation and accretion. (5)

(c) State the publication that requires a Shipmaster to report ice and severe ice accretion. (1)

(d) Outline the reporting requirements for EACH of the following:

(i) ice; (3)

(ii) severe ice accretion. (4)

CHARTWORK SQA ANSWERS.

March 2005

Q1 1900hrs 51-26.7N 007-47.6W Co to steer 310 speed reqd 10.0kts

Q2 HT of Tide 2230hrs 1.6m, UKC at 1330hrs is 0.8m

Q4. 511' 270 and 297

June 2005

0400EP 55-31.8N 014-39.2W Tidal Stream 243 x 1.3kts

Q2. 7.20, 7.10 ii) 6.5 mean neap range

Q4. 252 T x 180' 13h50m

Q5. G/E 1 high

October 2005

Q1 2130 51-07.2N 004-30.6W Gyro error 2 low, Co to steer 044G, ETA 0006hrs, beam 136t

Q2 Ht of Tide 4.2m on a falling tide

Q4. 236(T) x 4644', eta 18th march-2142

Q5. Compass error 0.1 west, deviation 0.9 degrees west

Nov 05

Q1 2300 51-26.3N 004-26.2W Comp Co 124, 1hrs notice given at 2357hrs

Q2 minimum UKC is 3.9m time of min UKC is at LW time of 1001 on 25th Feb. Predicted Max tidal range is 5.9m

Q4. 270 x 144' 296 x 248' 000 x 100'

March 2006

Q1 1200DR 51-43.6N 006-58.8W EP 51-47.2N 006-49.4W Tide 068t x 1.8kts

Q4. 125.2' eta 11th July 1436

Q5. Gyro error 1 high

July 06

Q1 0800 51-19.2N 015-04.4E Comp Co 013, steaming speed 10.7kts

Q2 earliest time is 1614hrs on 8th March

Q4. 087 x 4937' 10th November 17h 54m

October 06

Q1 0000 50-28.1N 002-05.1W, 0100EP 50-33.9N 001-46.4W rel brg 270

Q2 vessel can cross shoal between 0418-0914 ST on 20th March

Q4. 215 x 586' 20th 07h 18m

November 06

Q1 2100 50-08.6N 002-09.8W Compass co 269 ETA at end of TSS 2301hrs

Q4. 254 x 2107' 3rd, 04h 57m

Q5. Az 114 gyro error 1 high

March 07

Q1 1300 51-27.0N 004-43.5W Compass co 168 steaming speed 8.5kts

Q2 HW 26th Feb 1658hrs, height 6.9m min UKC of 1,1m occurs at 1340hrs 1st March

Q4. 259 x 5090' 291.3 hrs, 21st 08h 20m

July 07

Q1 0715 36-35.7S 174-58.1E time of beam brg 0730 beam brg 265

Q2 earliest time v/l can enter is 2100hrs on 5th August

Q4. 090 x 197.3' eta 13th July 18h 40m

Q5. Gyro error 2 low

October 07

Q1 0930dr 51-40.2N 007-15.9W 0930EP 51-39.8N 007-13.2W 1100EP 51-37.6N 007-15.8W

Q2 Height of Tide 1400ST on 13th April is 3.2m

Q4. 311 x 294' 22nd 10h 09m

November 07

Q1 1400 36-46.4N 175-18.8E Gyro error 2low, gyro co 318, ETA waypoint 1706 9th Jan

Q2 Earliest time vessel can cross shoal is 0330hrs GMT on 30th Jan

Q4. 321 x 584' 16.4 kts

Q5. Deviation 1 west

March 08

Q1 1400DR 41-43.3S 174-53.4E 1400 EP 41-42.1S 174-49.9E set 327 x 1.3kts (3.2dr) charted predicted tidal stream 353t x 0.5kts

Q2 Time and Hts of Sec port LW 1159 0.1m HW 1654 1.0m earliest time HW (1654) Height of tide required is 1.3m (cannot calculate time, outside 5/7hr)

Q4. 270 x 15 fl 180 x 215 w 16.26k f 23.32 w

Q5. Azimuth 070.8 gyro error 1 low

July 08

Q1 1030 36-24.0S 175-18.7E deviation 5.5W Gr speed 13.53kts, Reqd |Comp Co 210, Req'd spd 11.6kts

Time of SBE/EOP is 11.38kts

Q2 Height of bridge above the land is 34.8m

Q4. 130 x 359.3' 270 x 26.4' (1.1kts) Q5- 1 degree Low

October 08

Q1 Compass Co 263, time to a/c 2135hrs, tidal stream 252T x 2kts

Q2 Anticipated clearance 2.5m, earliest time 1554hrs, latest time 2059hrs ETA at power cables 1600hrs

Q4. 066 x 1721' 4th 01h 14m

November 08

Q1 2110 51-48.2N 006-42.2W Compass Co 315.5, beam brg 045.5C predicted tidal stream 1330hrs

Q4. 040 x 4628' 10d 16h o3m 20th June 11h 33m (daylight saving?)

Q5. Amplitude 271 gyro error 2 low, mag err 15 east deviation 1 west

March 09

Q1 1030 50-25.6N 006-28.8W, Deviation 2 East, Compass Co to steer 085

Q2 14th July LW 2240zt ht 1.0 Hw 0440zt 6.5

15th july LW 2318zt ht 1.0 HW 0518zt 6.5

16th july LW 2354 ht 1.0 HW 0553 6.5

Q4. 5662' 11d 02h 55m 11th April 13h 55m

July 09

Q1 CMG 026t, SMG 14.2kts, set 045t x 1.8kts, Gyro co 013, speed reqd 11.1kts, call time 1906

Q4. 208 x 295.6 18.8kts

October 09

Q1 0810DR 50-27.6N 000-24.6E, 1300EP 50-30.0N 000-37.2E, Compass Co 077

Q2 Clearance under bridge 1.8m, earliest time 0425hrs, latest time 1218hrs

Q4. 328 x 552' 22.1kts 000 x 22 (0.88kts)

December 09

Q1 0430 40-54.8S 174-23.0E CPA 2.8 to stbd, Beam Brg 200c, Comp co 154

Q2 Actual Ht of Tide 0.2m higher than predicted

Q4. 3846' 17.4 kts

CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY – DECK OFFICER

EXAMINATIONS ADMINISTERED BY THE
SCOTTISH QUALIFICATIONS AUTHORITY
ON BEHALF OF THE
MARITIME AND COASTGUARD AGENCY

STCW 95 OFFICER IN CHARGE OF NAVIGATIONAL WATCH REG. II/1 (UNLIMITED)

034-83 – NAVIGATION

0915 – 1145 hrs

Examination paper inserts:

Worksheet Q2 – Tidal Curve for Pacific and Atlantic Oceans Ports Luminous Range Diagram/Geographical Range Table

Notes for the guidance of candidates:

1. Candidates should note that 100 marks are allocated to this paper. To pass candidates must achieve 60% of the total marks available. In addition, candidates must achieve a minimum of 70% from Section A.

2. Non-programmable calculators may be used.

3. All formulae used must be stated and the method of working and all intermediate steps must be made clear in the answer.

Materials to be supplied by examination centres:

Candidate's examination workbook	Nautical Almanac
Navigation Formulae Datasheet	UK and Ireland Tide Tables
Nautical Tables	Pacific and Atlantic Oceans Tide Tables
Chart 5048, Edition N°3 (07/04/2005)	

INSTRUCTIONS TO CANDIDATE

General Information

Before the examination begins you should ensure that you have been provided with any ancillary material required for the examination. "*Materials to be supplied by examination centre*" are listed on the front sheet of the examination paper.

All mobile phones **MUST** be surrendered to the Invigilator during the period of the examination.

Completion of Examination Workbook

CANDIDATES SHOULD READ THE MARITIME AND COASTGUARD AGENCY POLICY REGARDING CHEATING IN EXAMINATIONS, THEN SIGN AND COMPLETE THE DECLARATION ON THE INSIDE FRONT COVER.

YOUR EXAMINATION SCRIPT WILL NOT BE MARKED UNLESS YOU COMPLETE AND SIGN THIS FORM.

Please write in **BLOCK CAPITALS** on the cover of your workbook your name, date of birth, Candidate Number, subject number and title, course of study, centre attended, centre of examination, if different, and date of examination. You should be in possession of a candidate examination card giving your candidate number. If you are not in possession of this card the information can be provided by the Invigilator. **(Note: examination cards are not supplied to CEC and Yacht candidates)**

If an additional workbook/graph paper/worksheet is used these must be included inside the original workbook. An 'X' should be inserted in the appropriate box under Note 3 on the workbook cover in such circumstances.

In the space provided in the section 'Questions Attempted' on the workbook cover you must ***circle the numbers*** of the questions you have attempted. Do not make any entries in the boxes indicated 'For Markers Use Only'.

Use **BOTH** sides of each sheet. The answers to **EACH NEW QUESTION** must start at the top of a fresh page and the number of the question should be inserted at the top of each page. Use **ink** for all essential written matter, which should be contained within the feint ruled vertical lines. (While pencil may be used for diagrams and sketches, annotations to these should be in ink.). Please **DO NOT** use red ink.

YOUR EXAMINATION SCRIPT WILL NOT BE MARKED IF IT IS COMPLETED IN PENCIL AND/OR RED INK.

Show all necessary working in calculations, etc. (Rough work, not intended to be read by the marker, should be scored out.)

No part of this book is to be torn out. No writing is allowed on any other paper other than ancillary material/examination inserts. Please ensure you write your name and centre on all examination paper inserts.

Examination Room Conduct

All queries should be addressed to the Invigilator.

No candidate may enter the examination room later than **30 minutes** after the examination begins and no candidate may leave the examination room, except in the case of illness, during the first hour of an examination. Candidates may not leave an examination room during the last **fifteen minutes** of an examination.

Any candidate who leaves the examination room before the end of the examination must leave his or her examination paper with the Invigilator. Examination papers must not be removed from the examination room during the period of the examination.

All candidates must hand their workbook(s) to the Invigilator before leaving. Workbooks must not be removed from the examination room even if they have not been used.

Deviation Card No. 1	
Ship's Head by Compass	
000°	0.0°
010°	
020°	1.5°E
030°	
040°	2.0°E
050°	
060°	3.0°E
070°	
080°	3.0°E
090°	
100°	3.0°E
110°	
120°	2.5°E
130°	
140°	1.5°E
150°	
160°	1.0°E
170°	
180°	0.0°
190°	
200°	0.5°W
210°	
220°	1.0°W
230°	
240°	2.0°W
250°	
260°	2.5°W
270°	
280°	3.0°W
290°	
300°	3.0°W
310°	
320°	2.5°W
330°	
340°	1.5°W
350°	

Deviation Card No. 2	
Ship's Head by Compass	
000°	1.5°W
010°	
020°	0.5°W
030°	
040°	0.5°E
050°	
060°	2.0°E
070°	
080°	3.0°E
090°	
100°	4.0°E
110°	
120°	4.0°E
130°	
140°	3.5°E
150°	
160°	3.0°E
170°	
180°	2.5°E
190°	
200°	1.5°E
210°	
220°	0.0°
230°	
240°	1.5°W
250°	
260°	3.0°W
270°	
280°	4.0°W
290°	
300°	4.0°W
310°	
320°	3.5°W
330°	
340°	2.5°W
350°	

Deviation Card No. 3	
Ship's Head by Compass	
000°	2.5°W
010°	
020°	1.5°W
030°	
040°	0.5°W
050°	
060°	0.5°E
070°	
080°	2.0°E
090°	
100°	3.0°E
110°	
120°	4.0°E
130°	
140°	4.5°E
150°	
160°	5.0°E
170°	
180°	5.0°E
190°	
200°	4.0°E
210°	
220°	3.0°E
230°	
240°	1.5°E
250°	
260°	0.0°
270°	
280°	2.0°W
290°	
300°	4.0°W
310°	
320°	4.0°W
330°	
340°	4.0°W
350°	

Deviation Card No. 4	
Ship's Head by Compass	
000°	0.0°
010°	
020°	1.5°W
030°	
040°	2.0°W
050°	
060°	3.0°W
070°	
080°	3.0°W
090°	
100°	3.0°W
110°	
120°	2.5°W
130°	
140°	1.5°W
150°	
160°	1.0°W
170°	
180°	0.0°
190°	
200°	0.5°E
210°	
220°	1.0°E
230°	
240°	2.0°E
250°	
260°	2.5°E
270°	
280°	3.0°E
290°	
300°	3.0°E
310°	
320°	2.5°E
330°	
340°	1.5°E
350°	

Deviation Card No. 5	
Ship's Head by Compass	
000°	1.5°E
010°	
020°	0.5°E
030°	
040°	0.5°W
050°	
060°	2.0°W
070°	
080°	3.0°W
090°	
100°	4.0°W
110°	
120°	4.0°W
130°	
140°	3.5°W
150°	
160°	3.0°W
170°	
180°	2.5°W
190°	
200°	1.5°W
210°	
220°	0.0°
230°	
240°	1.5°E
250°	
260°	3.0°E
270°	
280°	4.0°E
290°	
300°	4.0°E
310°	
320°	3.5°E
330°	
340°	2.5°E
350°	

Deviation Card No. 6	
Ship's Head by Compass	
000°	2.5°E
010°	
020°	1.5°E
030°	
040°	0.5°E
050°	
060°	0.5°W
070°	
080°	2.0°W
090°	
100°	3.0°W
110°	
120°	4.0°W
130°	
140°	4.5°W
150°	
160°	5.0°W
170°	
180°	5.0°W
190°	
200°	4.0°W
210°	
220°	3.0°W
230°	
240°	1.5°W
250°	
260°	0.0°
270°	
280°	2.0°E
290°	
300°	4.0°E
310°	
320°	5.0°E
330°	
340°	4.0°E
350°	

Deviation Card No. 7	
Ship's Head by Compass	
000°	3.0°E
010°	
020°	1.5°W
030°	
040°	4.5°W
050°	
060°	3.5°W
070°	
080°	0.5°E
090°	
100°	5.5°E
110°	
120°	9.0°E
130°	
140°	8.5°E
150°	
160°	4.0°E
170°	
180°	1.0°W
190°	
200°	7.0°W
210°	
220°	9.5°W
230°	
240°	9.0°W
250°	
260°	4.0°W
270°	
280°	2.0°E
290°	
300°	7.5°E
310°	
320°	9.0°E
330°	
340°	7.5°E
350°	

Deviation Card No. 8	
Ship's Head by Compass	
000°	3.0°E
010°	
020°	9.0°E
030°	
040°	11.5°E
050°	
060°	11.0°E
070°	
080°	6.0°E
090°	
100°	0.0°
110°	
120°	5.5°W
130°	
140°	7.0°W
150°	
160°	5.5°W
170°	
180°	1.0°W
190°	
200°	2.5°E
210°	
220°	6.0°E
230°	
240°	5.5°E
250°	
260°	1.5°E
270°	
280°	3.5°W
290°	
300°	7.0°W
310°	
320°	6.5°W
330°	
340°	3.5°W
350°	

Deviation Card No. 9	
Ship's Head by Compass	
000°	0.5°E
010°	
020°	2.0°E
030°	
040°	3.0°E
050°	
060°	4.0°E
070°	
080°	4.5°E
090°	
100°	5.0°E
110°	
120°	5.0°E
130°	
140°	4.0°E
150°	
160°	3.0°E
170°	
180°	1.5°E
190°	
200°	0.0°
210°	
220°	2.0°W
230°	
240°	4.0°W
250°	
260°	5.0°W
270°	
280°	4.0°W
290°	
300°	2.5°W
310°	
320°	1.5°W
330°	
340°	0.5°W
350°	

Deviation Card No. 10	
Ship's Head by Compass	
000°	9.0°E
010°	
020°	9.5°E
030°	
040°	8.5°E
050°	
060°	7.0°E
070°	
080°	4.5°E
090°	
100°	2.0°E
110°	
120°	1.5°W
130°	
140°	4.0°W
150°	
160°	6.0°W
170°	
180°	7.0°W
190°	
200°	7.5°W
210°	
220°	6.5°W
230°	
240°	5.0°W
250°	
260°	2.5°W
270°	
280°	0.5°E
290°	
300°	3.5°E
310°	
320°	6.0°E
330°	
340°	8.0°E
350°	

Deviation Card No. 11	
Ship's Head by Compass	
000°	2.0°W
010°	
020°	3.0°W
030°	
040°	4.0°W
050°	
060°	4.0°W
070°	
080°	3.5°W
090°	
100°	3.0°W
110°	
120°	2.5°W
130°	
140°	1.5°W
150°	
160°	0.0°
170°	
180°	1.5°E
190°	
200°	3.0°E
210°	
220°	4.0°E
230°	
240°	4.0°E
250°	
260°	3.5°E
270°	
280°	2.5°E
290°	
300°	1.5°E
310°	
320°	0.5°E
330°	
340°	0.5°W
350°	

Deviation Card No. 12	
Ship's Head by Compass	
000°	7.0°W
010°	
020°	6.0°W
030°	
040°	4.0°W
050°	
060°	1.5°W
070°	
080°	1.5°E
090°	
100°	4.0°E
110°	
120°	6.5°E
130°	
140°	8.5°E
150°	
160°	9.5°E
170°	
180°	9.0°E
190°	
200°	7.5°E
210°	
220°	6.0°E
230°	
240°	3.5°E
250°	
260°	0.5°E
270°	
280°	2.5°W
290°	
300°	5.0°W
310°	
320°	6.5°W
330°	
340°	7.5°W
350°	

Deviation Card No. 13	
Ship's Head by Compass	
000°	3.0°E
010°	
020°	6.0°E
030°	
040°	8.0°E
050°	
060°	9.0°E
070°	
080°	9.5°E
090°	
100°	9.0°E
110°	
120°	7.0°E
130°	
140°	4.5°E
150°	
160°	1.5°E
170°	
180°	1.0°W
190°	
200°	4.0°W
210°	
220°	6.0°W
230°	
240°	7.0°W
250°	
260°	7.5°W
270°	
280°	7.0°W
290°	
300°	5.0°W
310°	
320°	3.0°W
330°	
340°	0.5°E
350°	

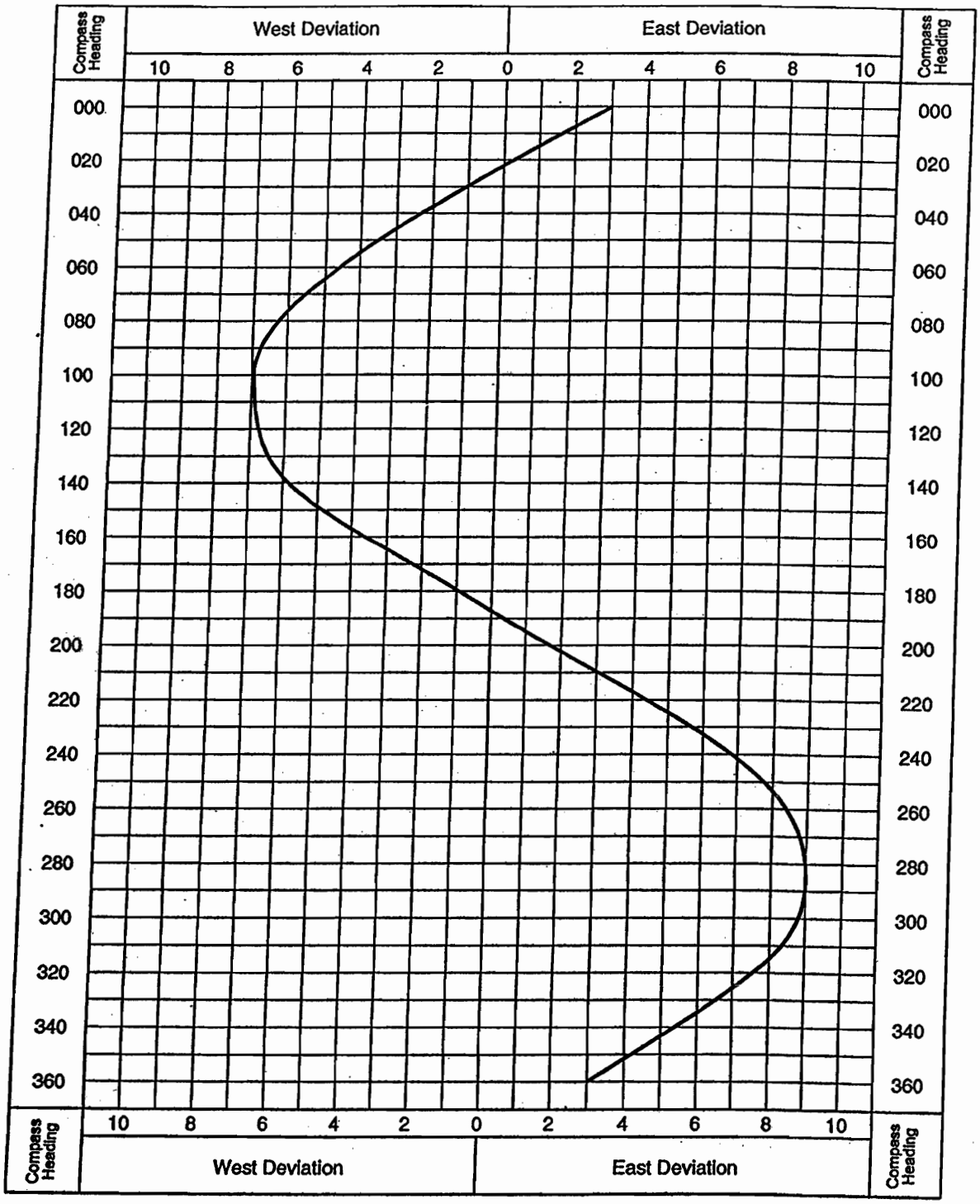
Deviation Card No. 14	
Ship's Head by Compass	
000°	4.0°E
010°	
020°	3.5°E
030°	
040°	3.0°E
050°	
060°	2.5°E
070°	
080°	1.5°E
090°	
100°	0.0°
110°	
120°	1.5°W
130°	
140°	3.0°W
150°	
160°	4.0°W
170°	
180°	4.0°W
190°	
200°	3.5°W
210°	
220°	2.5°W
230°	
240°	1.5°W
250°	
260°	0.5°W
270°	
280°	0.5°E
290°	
300°	2.0°E
310°	
320°	3.0°E
330°	
340°	4.0°E
350°	

Deviation Card No. 15	
Ship's Head by Compass	
000°	4.0°E
010°	
020°	4.5°E
030°	
040°	5.0°E
050°	
060°	5.0°E
070°	
080°	4.0°E
090°	
100°	3.0°E
110°	
120°	1.5°E
130°	
140°	0.0°
150°	
160°	2.0°W
170°	
180°	4.0°W
190°	
200°	5.0°W
210°	
220°	4.0°W
230°	
240°	2.5°W
250°	
260°	1.5°W
270°	
280°	0.5°W
290°	
300°	0.5°E
310°	
320°	2.0°E
330°	
340°	3.0°E
350°	

Deviation Card No. 16	
Ship's Head by Compass	
000°	3.0°E
010°	
020°	0.0°
030°	
040°	2.5°W
050°	
060°	5.0°W
070°	
080°	6.5°W
090°	
100°	7.0°W
110°	
120°	7.0°W
130°	
140°	5.0°W
150°	
160°	3.5°W
170°	
180°	1.0°W
190°	
200°	2.0°E
210°	
220°	4.5°E
230°	
240°	7.0°E
250°	
260°	8.5°E
270°	
280°	9.0°E
290°	
300°	9.0°E
310°	
320°	7.5°E
330°	
340°	5.5°E
350°	

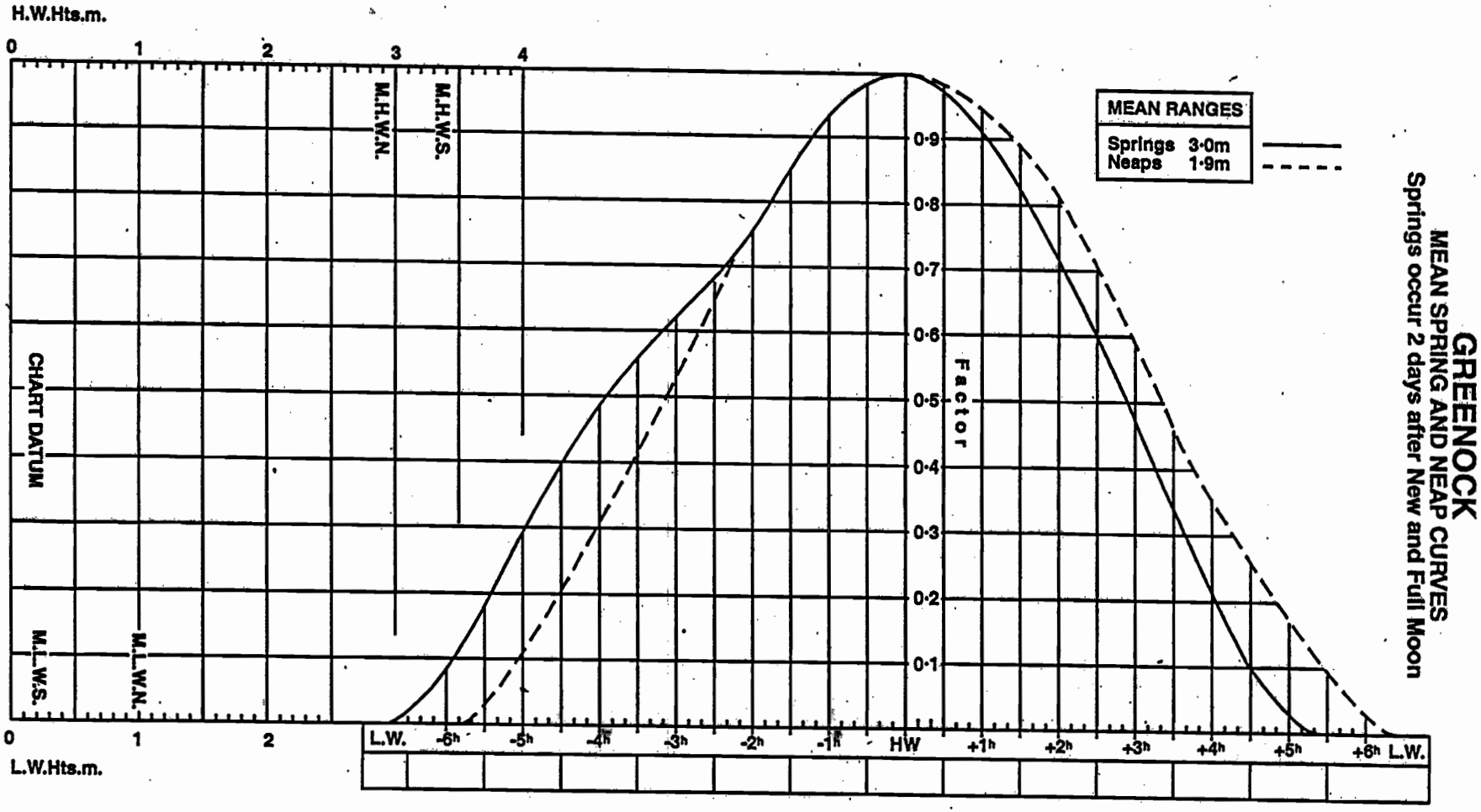
Deviation Card No. 17	
Ship's Head by Compass	
000°	5.0°W
010°	
020°	2.5°W
030°	
040°	0.5°W
050°	
060°	4.0°E
070°	
080°	7.5°E
090°	
100°	10.5°E
110°	
120°	12.0°E
130°	
140°	11.5°E
150°	
160°	10.0°E
170°	
180°	7.0°E
190°	
200°	3.0°E
210°	
220°	0.5°W
230°	
240°	4.0°W
250°	
260°	6.5°W
270°	
280°	7.5°W
290°	
300°	8.0°W
310°	
320°	7.5°W
330°	
340°	5.5°W
350°	

DEVIATION CURVE No 16A



WORKSHEET Q2

(This Worksheet must be returned with your answer book)

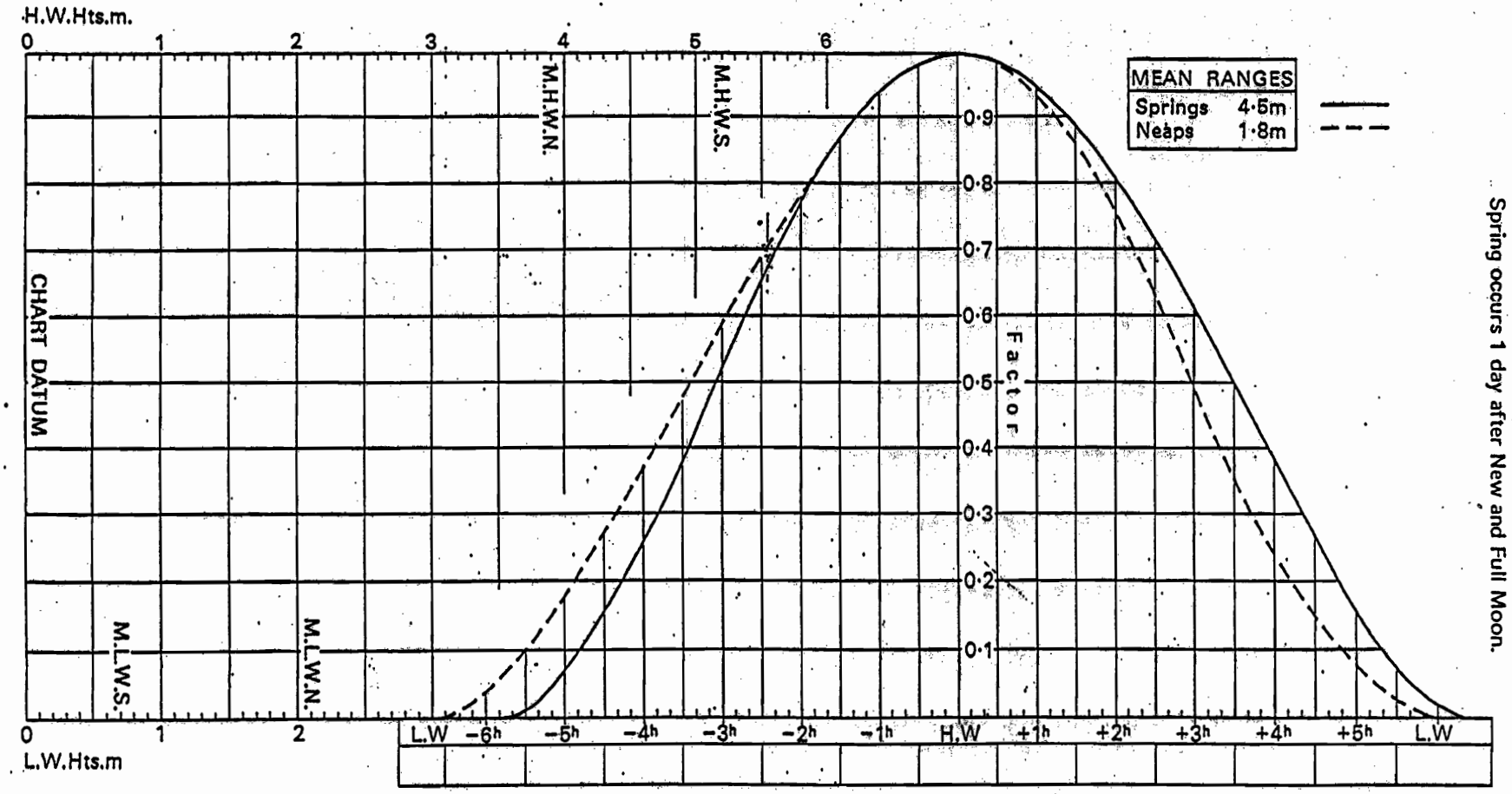


Candidate's Name .....

Examination Centre .....

WORKSHEET Q2

(This Worksheet must be returned with your answer book)



ULLAPOOL

MEAN SPRING AND NEAP CURVES

Spring occurs 1 day after New and Full Moon.

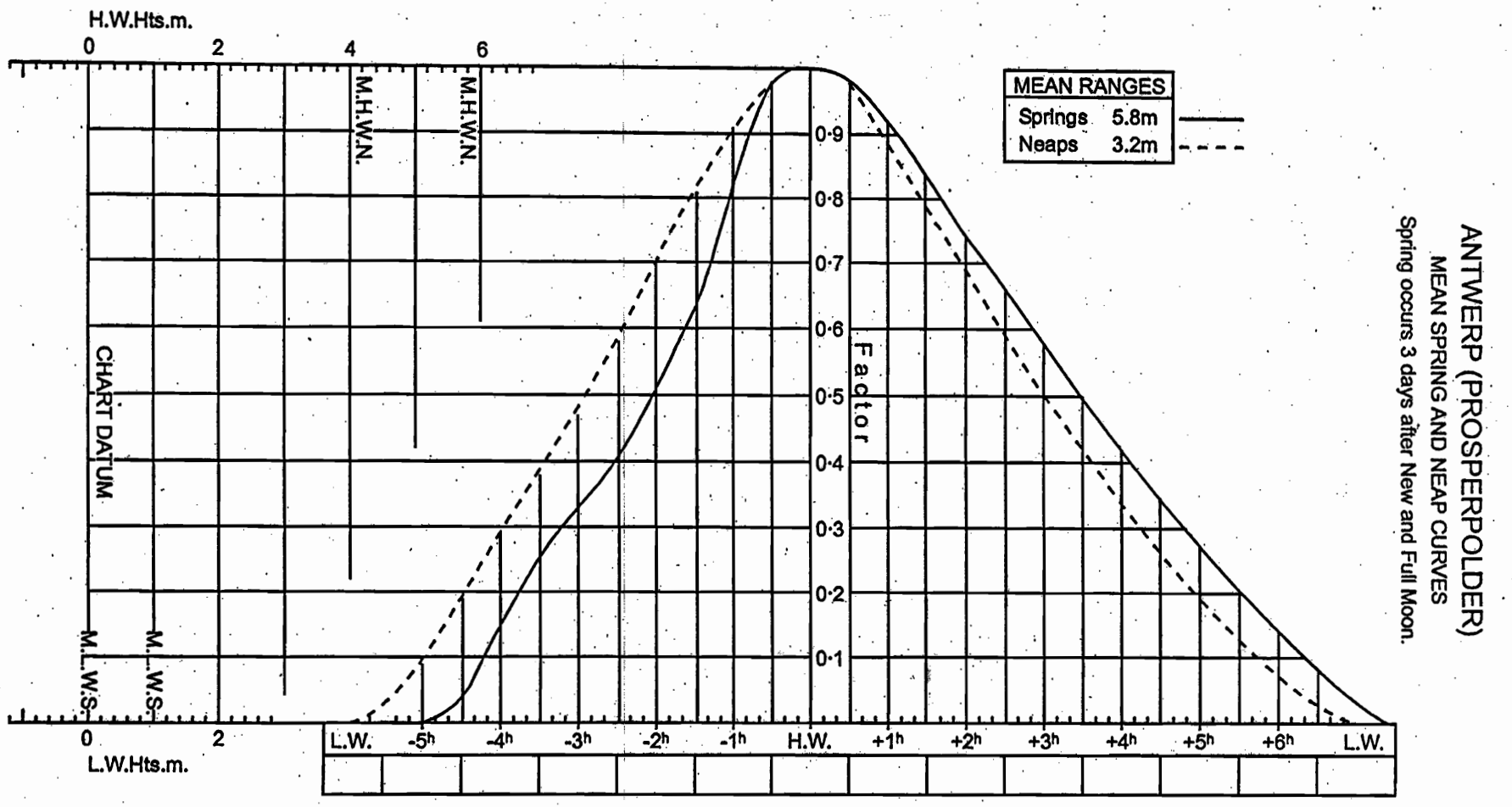
Candidate's Name .....

Examination Centre .....

WORKSHEET Q2

(This Worksheet must be returned with your answer book)

~~9 OCTOBER 2007~~

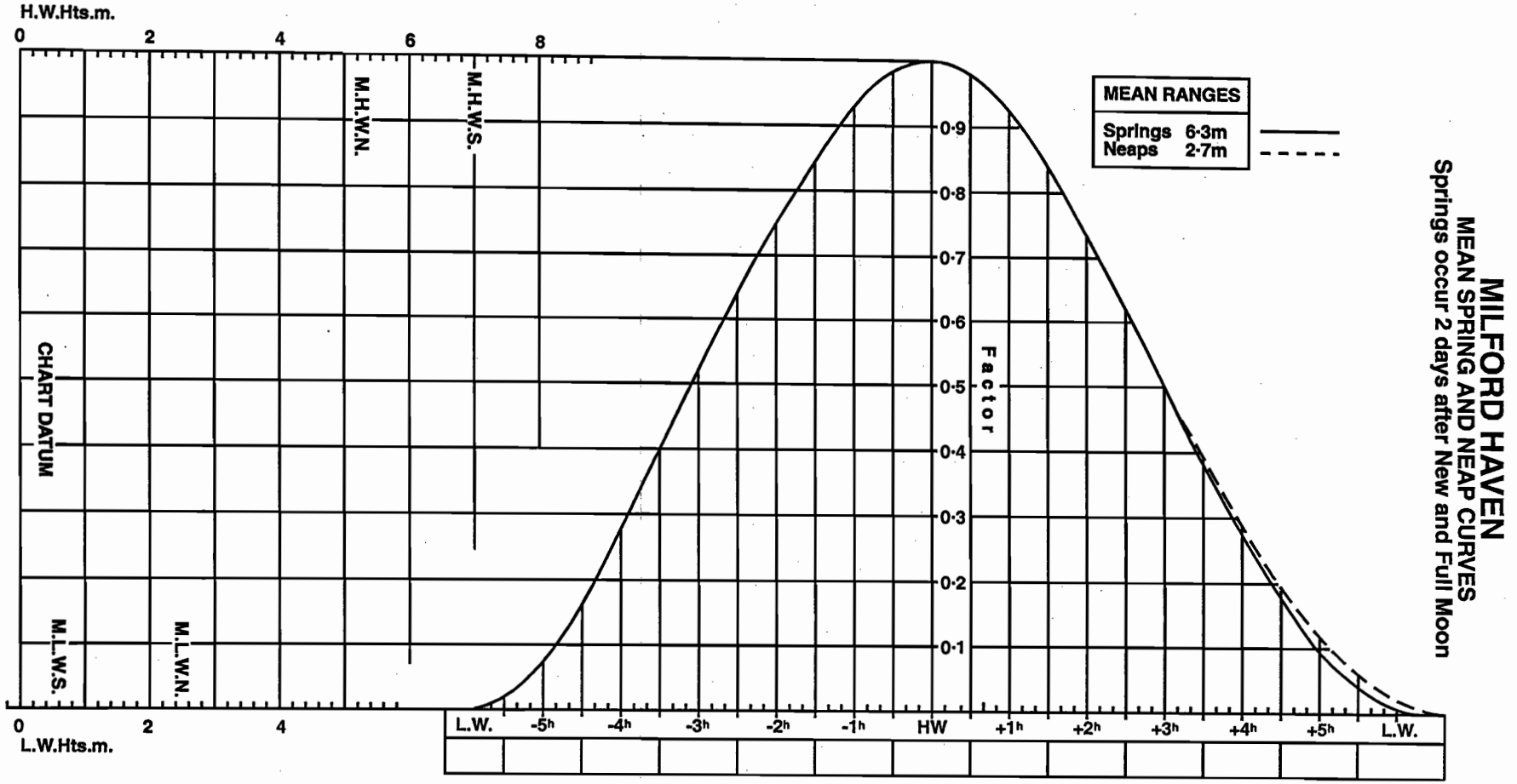


Candidate's Name .....

Examination Centre .....

WORKSHEET Q2

(This Worksheet must be returned with your answer book)



MILFORD HAVEN

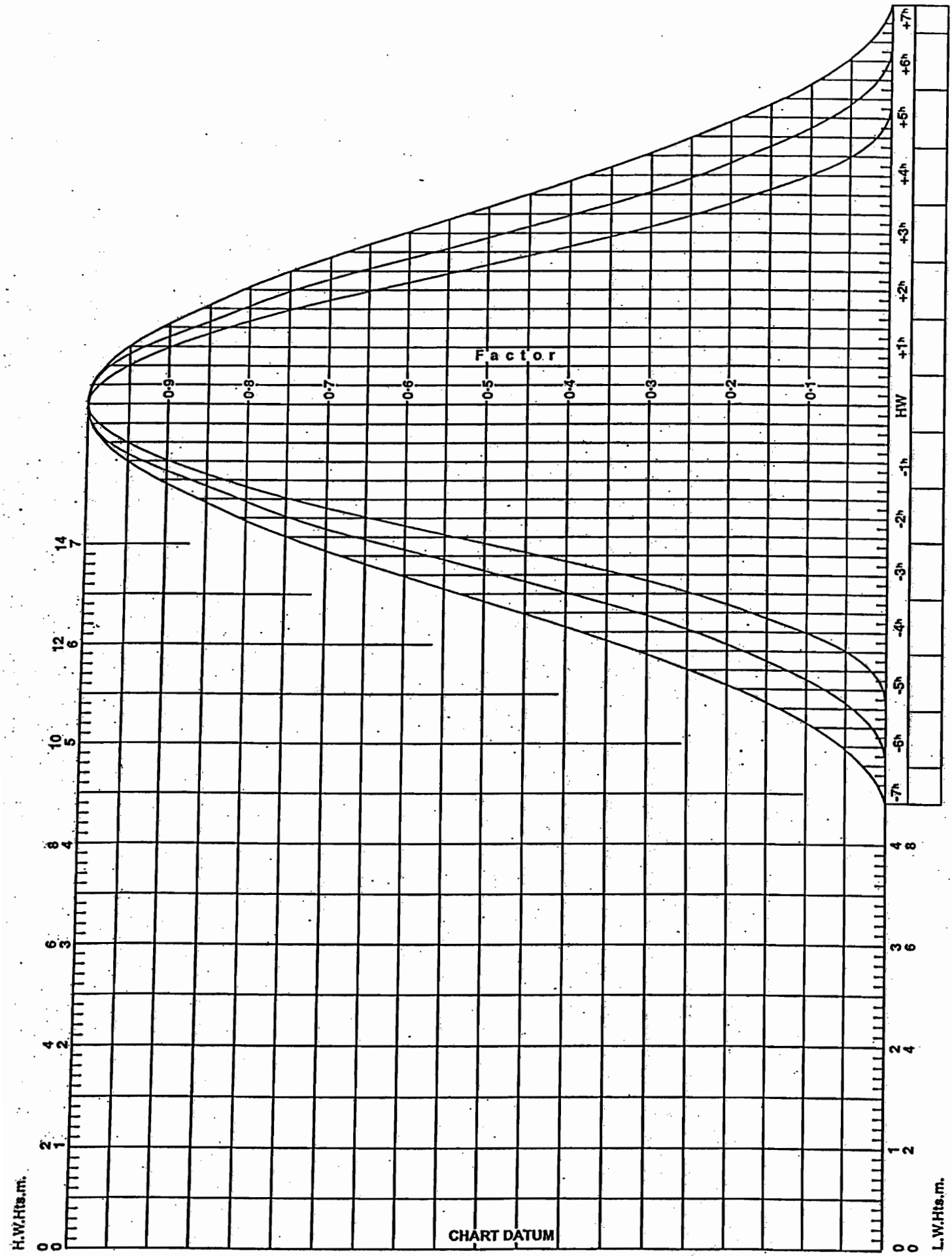
MEAN SPRING AND NEAP CURVES

Springs occur 2 days after New and Full Moon

Candidate's Name .....

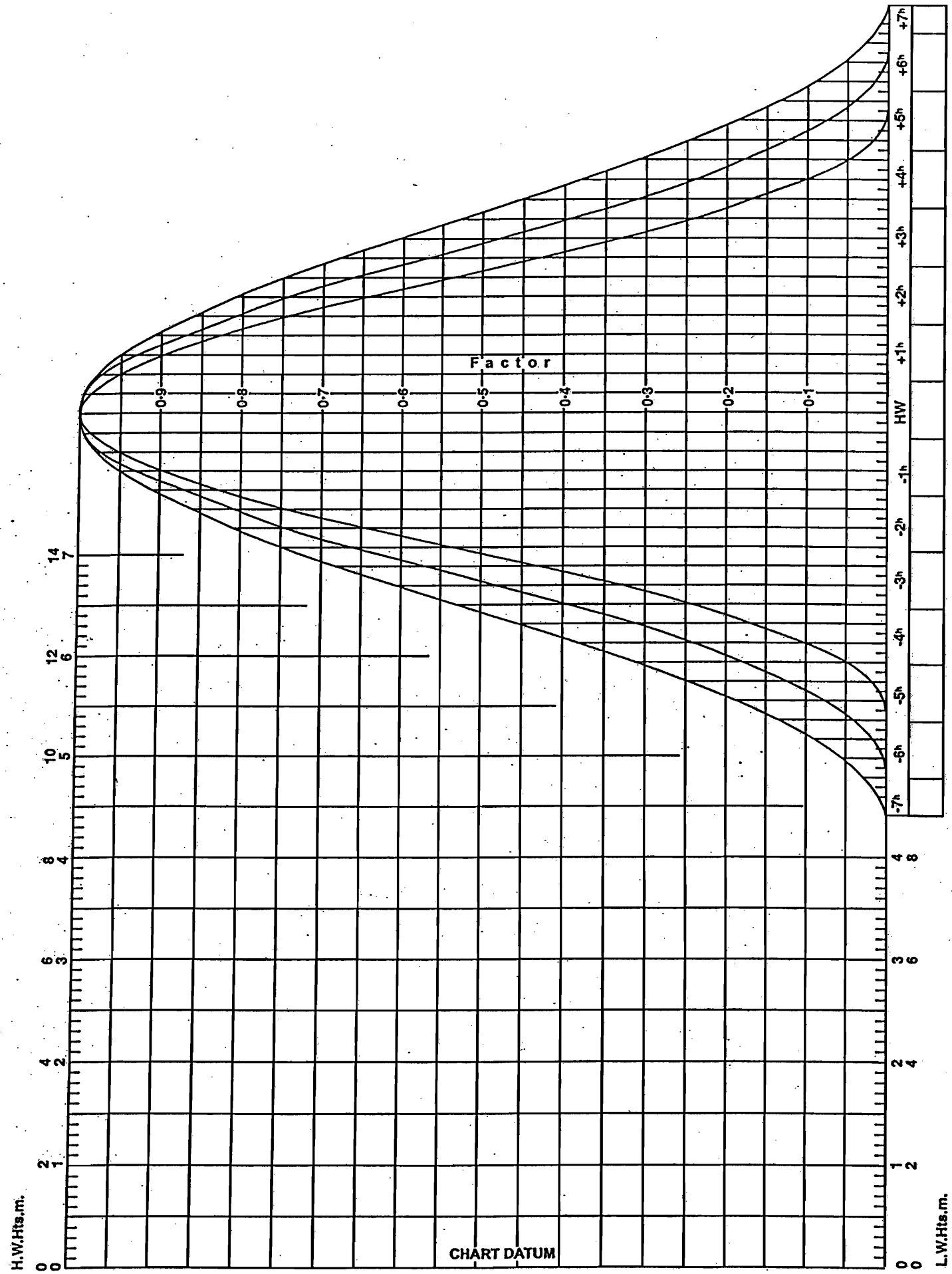
Examination Centre .....

(This Worksheet must be returned with your answer book)



ndidate's Name ..... Examination Centre .....

(This Worksheet must be returned with your answer book)



Candidate's Name ..... Examination Centre .....

Navigation Formulae Sheet

NB. These formulae and symbols are for guidance only and other formulae which give equally valid results are acceptable

Departure = D'Long x Cos Mean Lat

Tan Course = $\frac{\text{Dep}}{\text{D'Lat}}$

Distance = $\frac{\text{D'Lat}}{\text{Cos Course}}$

Tan course = $\frac{\text{D'Long}}{\text{DMP}}$

Cos AB = (Cos P x Sin PA x Sin PB) + (Cos PA x Cos PB)

A = $\frac{\text{Tan Lat}}{\text{Tan LHA}}$

B = $\frac{\text{Tan Dec}}{\text{Sin LHA}}$

C = A +/- B

Tan Azimuth = $\frac{1}{\text{C x Cos Lat}}$

Sin Amplitude = $\frac{\text{Sin Dec}}{\text{Cos Lat}}$

Sin mid part = Tan adjacent x Tan adjacent

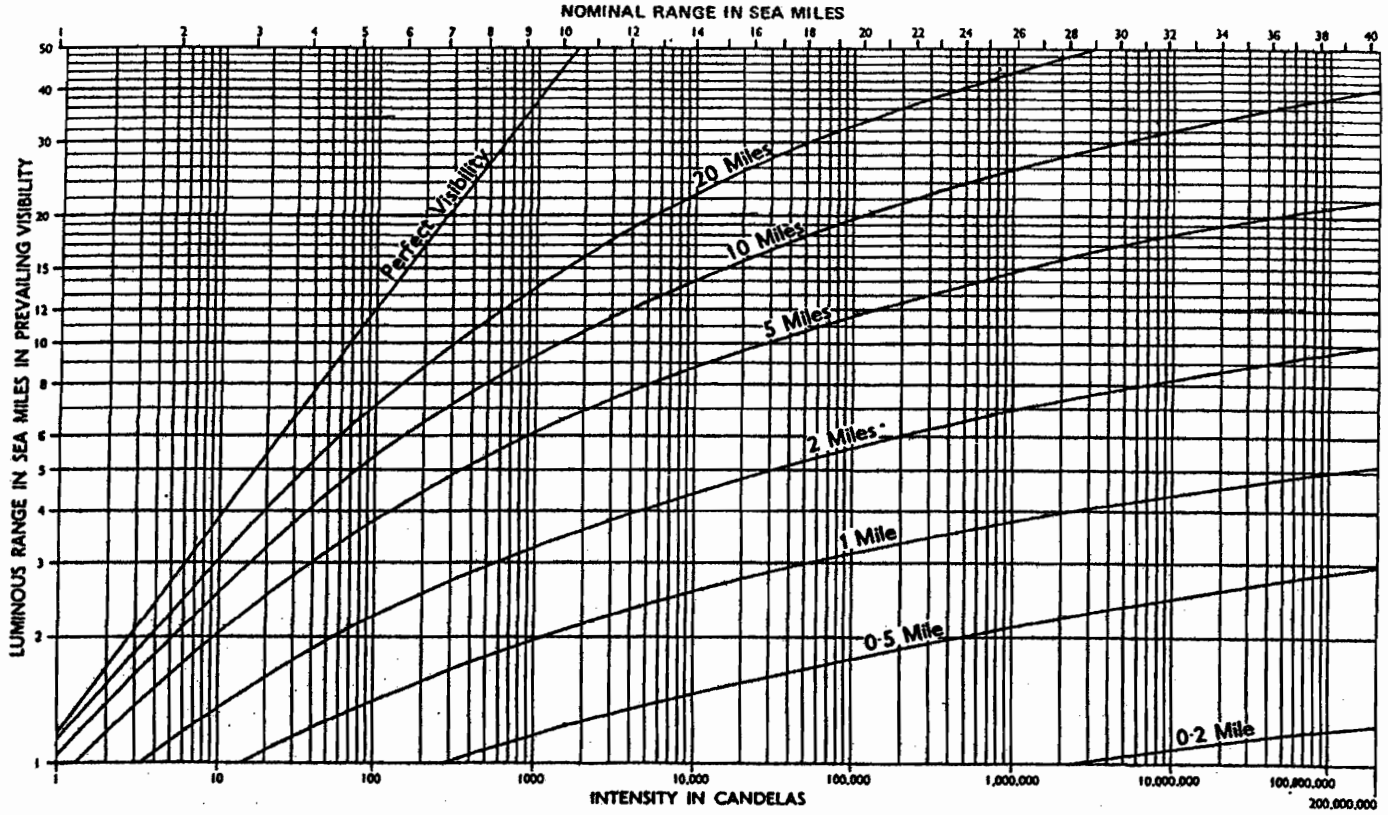
Sin mid part = Cos opposite x Cos opposite

GEOGRAPHICAL RANGE TABLE

Elevation in		Height of Eye of Observer in feet/metres																							
ft		3	7	10	13	16	20	23	26	30	33	39	46	52	59	66	72	79	85	92	98	115	131	148
	m	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28	30	35	40	45
		Range in Sea Miles																							
0	0	2·0	2·9	3·5	4·1	4·5	5·0	5·4	5·7	6·1	6·4	7·0	7·6	8·1	8·6	9·1	9·5	10·0	10·4	10·7	11·1	12·0	12·8	13·6
3	1	4·1	4·9	5·5	6·1	6·6	7·0	7·4	7·8	8·1	8·5	9·1	9·6	10·2	10·6	11·1	11·6	12·0	12·4	12·8	13·2	14·0	14·9	15·7
7	2	4·9	5·7	6·4	6·9	7·4	7·8	8·2	8·6	9·0	9·3	9·9	10·5	11·0	11·5	12·0	12·4	12·8	13·2	13·6	14·0	14·9	15·7	16·5
10	3	5·5	6·4	7·0	7·6	8·1	8·5	8·9	9·3	9·6	9·9	10·6	11·1	11·6	12·1	12·6	13·0	13·5	13·9	14·3	14·6	15·5	16·4	17·1
13	4	6·1	6·9	7·6	8·1	8·6	9·0	9·4	9·8	10·2	10·5	11·1	11·7	12·2	12·7	13·1	13·6	14·0	14·4	14·8	15·2	16·1	16·9	17·7
16	5	6·6	7·4	8·1	8·6	9·1	9·5	9·9	10·3	10·6	11·0	11·6	12·1	12·7	13·2	13·6	14·1	14·5	14·9	15·3	15·7	16·6	17·4	18·2
20	6	7·0	7·8	8·5	9·0	9·5	9·9	10·3	10·7	11·1	11·4	12·0	12·6	13·1	13·6	14·1	14·5	14·9	15·3	15·7	16·1	17·0	17·8	18·6
23	7	7·4	8·2	8·9	9·4	9·9	10·3	10·7	11·1	11·5	11·8	12·4	13·0	13·5	14·0	14·5	14·9	15·3	15·7	16·1	16·5	17·4	18·2	19·0
26	8	7·8	8·6	9·3	9·8	10·3	10·7	11·1	11·5	11·8	12·2	12·8	13·3	13·9	14·4	14·8	15·3	15·7	16·1	16·5	16·9	17·8	18·6	19·4
30	9	8·1	9·0	9·6	10·2	10·6	11·1	11·5	11·8	12·2	12·5	13·1	13·7	14·2	14·7	15·2	15·6	16·0	16·4	16·8	17·2	18·1	18·9	19·7
33	10	8·5	9·3	9·9	10·5	11·0	11·4	11·8	12·2	12·5	12·8	13·5	14·0	14·5	15·0	15·5	15·9	16·4	16·8	17·2	17·5	18·4	19·3	20·0
36	11	8·8	9·6	10·3	10·8	11·3	11·7	12·1	12·5	12·8	13·2	13·8	14·3	14·9	15·4	15·8	16·3	16·7	17·1	17·5	17·9	18·8	19·6	20·4
39	12	9·1	9·9	10·6	11·1	11·6	12·0	12·4	12·8	13·1	13·5	14·1	14·6	15·2	15·7	16·1	16·6	17·0	17·4	17·8	18·2	19·1	19·9	20·7
43	13	9·4	10·2	10·8	11·4	11·9	12·3	12·7	13·1	13·4	13·7	14·4	14·9	15·4	15·9	16·4	16·8	17·3	17·7	18·1	18·4	19·3	20·2	20·9
46	14	9·6	10·5	11·1	11·7	12·1	12·6	13·0	13·3	13·7	14·0	14·6	15·2	15·7	16·2	16·7	17·1	17·6	18·0	18·3	18·7	19·6	20·4	21·2
49	15	9·9	10·7	11·4	11·9	12·4	12·8	13·2	13·6	14·0	14·3	14·9	15·5	16·0	16·5	17·0	17·4	17·8	18·2	18·6	19·0	19·9	20·7	21·5
52	16	10·2	11·0	11·6	12·2	12·7	13·1	13·5	13·9	14·2	14·5	15·2	15·7	16·2	16·7	17·2	17·7	18·1	18·5	18·9	19·2	20·1	21·0	21·7
56	17	10·4	11·2	11·9	12·4	12·9	13·3	13·7	14·1	14·5	14·8	15·4	16·0	16·5	17·0	17·4	17·9	18·3	18·7	19·1	19·5	20·4	21·2	22·0
59	18	10·6	11·5	12·1	12·7	13·2	13·6	14·0	14·4	14·7	15·0	15·7	16·2	16·7	17·2	17·7	18·1	18·6	19·0	19·4	19·7	20·6	21·5	22·2
62	19	10·9	11·7	12·4	12·9	13·4	13·8	14·2	14·6	14·9	15·3	15·9	16·5	17·0	17·5	17·9	18·4	18·8	19·2	19·6	20·0	20·9	21·7	22·5
66	20	11·1	12·0	12·6	13·1	13·6	14·1	14·5	14·8	15·2	15·5	16·1	16·7	17·2	17·7	18·2	18·6	19·0	19·4	19·8	20·2	21·1	21·9	22·7
72	22	11·6	12·4	13·0	13·6	14·1	14·5	14·9	15·3	15·6	15·9	16·6	17·1	17·7	18·1	18·6	19·1	19·5	19·9	20·3	20·7	21·5	22·4	23·2
79	24	12·0	12·8	13·5	14·0	14·5	14·9	15·3	15·7	16·0	16·4	17·0	17·6	18·1	18·6	19·0	19·5	19·9	20·3	20·7	21·1	22·0	22·8	23·6
85	26	12·4	13·2	13·9	14·4	14·9	15·3	15·7	16·1	16·4	16·8	17·4	18·0	18·5	19·0	19·4	19·9	20·3	20·7	21·1	21·5	22·4	23·2	24·0
92	28	12·8	13·6	14·3	14·8	15·3	15·7	16·1	16·5	16·8	17·2	17·8	18·3	18·9	19·4	19·8	20·3	20·7	21·1	21·5	21·9	22·8	23·6	24·4
98	30	13·2	14·0	14·6	15·2	15·7	16·1	16·5	16·9	17·2	17·5	18·2	18·7	19·2	19·7	20·2	20·7	21·1	21·5	21·9	22·2	23·1	24·0	24·7
115	35	14·0	14·9	15·5	16·1	16·6	17·0	17·4	17·8	18·1	18·4	19·1	19·6	20·1	20·6	21·1	21·5	22·0	22·4	22·8	23·1	24·0	24·9	25·6
131	40	14·9	15·7	16·4	16·9	17·4	17·8	18·2	18·6	18·9	19·3	19·9	20·4	21·0	21·5	21·9	22·4	22·8	23·2	23·6	24·0	24·9	25·7	26·5
148	45	15·7	16·5	17·1	17·7	18·2	18·6	19·0	19·4	19·7	20·0	20·7	21·2	21·7	22·2	22·7	23·2	23·6	24·0	24·4	24·7	25·6	26·5	27·2
164	50	16·4	17·2	17·9	18·4	18·9	19·3	19·7	20·1	20·5	20·8	21·4	22·0	22·5	23·0	23·4	23·9	24·3	24·7	25·1	25·5	26·4	27·2	28·0
180	55	17·1	17·9	18·6	19·1	19·6	20·0	20·4	20·8	21·2	21·5	22·1	22·7	23·2	23·7	24·1	24·6	25·0	25·4	25·8	26·2	27·1	27·9	28·7
197	60	17·8	18·6	19·3	19·8	20·3	20·7	21·1	21·5	21·8	22·2	22·8	23·3	23·9	24·3	24·8	25·3	25·7	26·1	26·5	26·9	27·7	28·6	29·4
213	65	18·4	19·2	19·9	20·4	20·9	21·4	21·7	22·1	22·5	22·8	23·4	24·0	24·5	25·0	25·5	25·9	26·3	26·7	27·1	27·5	28·4	29·2	30·0
230	70	19·0	19·9	20·5	21·1	21·5	22·0	22·4	22·7	23·1	23·4	24·0	24·6	25·1	25·6	26·1	26·5	26·9	27·4	27·7	28·1	29·0	29·8	30·6
246	75	19·6	20·5	21·1	21·7	22·1	22·6	23·0	23·3	23·7	24·0	24·6	25·2	25·7	26·2	26·7	27·1	27·5	27·9	28·3	28·7	29·6	30·4	31·2
262	80	20·2	21·0	21·7	22·2	22·7	23·1	23·5	23·9	24·3	24·6	25·2	25·8	26·3	26·8	27·3	27·7	28·1	28·5	28·9	29·3	30·2	31·0	31·8
279	85	20·8	21·6	22·2	22·8	23·3	23·7	24·1	24·5	24·8	25·1	25·8	26·3	26·9	27·3	27·8	28·3	28·7	29·1	29·5	29·9	30·7	31·6	32·4
295	90	21·3	22·1	22·8	23·3	23·8	24·2	24·6	25·0	25·4	25·7	26·3	26·9	27·4	27·9	28·4	28·8	29·2	29·6	30·0	30·4	31·3	32·1	32·9
312	95	21·8	22·7	23·3	23·9	24·3	24·8	25·2	25·5	25·9	26·2	26·8	27·4	27·9	28·4	28·9	29·3	29·7	30·1	30·5	30·9	31·8	32·6	33·4
328	100	22·3	23·2	23·8	24·4	24·9	25·3	25·7	26·1	26·4	26·7	27·3	27·9	28·4	28·9	29·4	29·8	30·3	30·7	31·1	31·4	32·3	33·2	33·9
361	110	23·3	24·2	24·8	25·4	25·8	26·3	26·7	27·0	27·4	27·7	28·3	28·9	29·4	29·9	30·4	30·8	31·3	31·7	32·1	32·4	33·3	34·1	34·9
394	120	24·3	25·1	25·8	26·3	26·8	27·2	27·6	28·0	28·3	28·7	29·3	29·8	30·4	30·9	31·3	31·8	32·2	32·6	33·0	33·4	34·3	35·1	35·9
427	130	25·2	26·0	26·7	27·2	27·7	28·1	28·5	28·9	29·2	29·6	30·2	30·8	31·3	31·8	32·2	32·7	33·1	33·5	33·9	34·3	35·2	36·0	36·8
459	140	26·1	26·9	27·6	28·1	28·6	29·0	29·4	29·8	30·1	30·5	31·1	31·6	32·2	32·6	33·1	33·6	34·0	34·4	34·8	35·2	36·0	36·9	37·7
492	150	26·9	27·7	28·4	28·9	29·4	29·9	30·2	30·6	31·0	31·3	31·9	32·5	33·0	33·5	34·0	34·4	34·8	35·2	35·6	36·0	36·9	37·7	38·5
525	160	27·7	28·6	29·2	29·8	30·2	30·7	31·1	31·4	31·8	32·1	32·7	33·3	33·8	34·3	34·8	35·2	35·6	36·0	36·4	36·8	37·7	38·5	39·3
558	170	28·5	29·4	30·0	30·5	31·0	31·5	31·9	32·2	32·6	32·9	33·5	34·1	34·6	35·1	35·6	36·0	36·4	36·8	37·2	37·6	38·5	39·3	40·1
591	180	29·3	30·1	30·8	31·3	31·8	32·2	32·6	33·0	33·3	33·7	34·3	34·9	35·4	35·9	36·3	36·8	37·2	37·6	38·0	38·4	39·3	40·1	40·9
623	190	30·0	30·9	31·5	32·1	32·5	33·0	33·4	33·7	34·1	34·4	35·0	35·6	36·1	36·6	37·1	37·5	37·9	38·4	38·7	39·1	40·0	40·8	41·6
656	200	30·8	31·6	32·2	32·8	33·3	33·7	34·1	34·5	34·8	35·1	35·8	36·3	36·8	37·3	37·8	38·3	38·7	39·1	39·5	39·8	40·7	41·6	42·3
722	220	32·2	33·0	33·6	34·2	34·7	35·1	35·5	35·9	36·2	36·5	37·2	37·7	38·3	38·7	39·2	39·7	40·1	40·5	40·9	41·4	42·1	43·0	43·8
787	240	33·5	34·3	35·0	35·5	36·0	36·4	36·8	37·2	37·6	37·9	38·5	39·1	39·6	40·1	40·4	41·0	41·4	41·8	42·2	42·6	43·5	44·3	45·1
853	260	34·8	35·6	36·3	36·8	37·3	37·7	38·1	38·5	38·8	39·2	39·8	40·4	40·9	41·4	41·8	42·3	42·7	43·1	43·5	43·9	44·8	45·6	46·4
919	280	36·0	36·9	37·5	38·0	38·5	39·0	39·4	39·7	40·1	40·4	41·0	41·6	42·1	42·6	43·1	43·5	43·9	44·3	44·7	45·1	46·0	46·8	47·6
984	300	37·2	38·1	38·7	39·2	39·7	40·2	40·6	40·9	41·3	41·6	42·2	42·8	43·3	43·8	44·3	44·7	45·1	45·5	45·9	46·3	47·2	48·0	48·8
1050	320	38·4	39·2	39·9	40·4	40·9	41·3	41·7	42·1	42·4	42·8	43·4	43·9	44·5	45·0	45·4	45·9	46·3	46·7	47·1	47·5	48·3	49·2	50·0
1115	340	39·5	40·3	41·0	41·5	42·0	42·4	42·8	43·2	43·5	43·9	44·5	45·1	45·6	46·1	46·5	47·0	47·4	47·8	48·2	48·6	49·5	50·3	51·1
1181	360	40·6	41·4	42·1	42·6	43·1	43·5	43·9	44·3	44·6	45·0	45·6	46·1	46·7	47·2	47·6	48·1	48·5	48·9	49·3	49·7	50·6	51·4	52·2
1247	380	41·6	42·5	43·1	43·7	44·1	44·6	45·0	45·3	45·7	46·0	46·6	47·2	47·7	48·2	48·7	49·1	49·5	50·0	50·3	50·7	51·6	52·4	53·2
1312	400	42·7	43·5	44·1	44·7	45·2	45·6	46·0	46·4	46·7	47·0	47·7	48·2	48·7	49·2	49·7	50·1	50·6	51·0	51·4	51·7	52·6	53·5	54·2

LUMINOUS RANGE DIAGRAM

HD574



Luminous Range Diagram.—This diagram enables the mariner to determine the approximate range at which a light may be sighted, at night, in the meteorological visibility prevailing at the time of observation.

The diagram is entered from the top border, using the nominal range listed in the body of the book, in column 6, or from the bottom border using the intensity from column 4 where listed. A list of those countries where nominal range is used will be found on page xxii. All other countries use luminous range for which the most commonly adopted meteorological visibility is 20 miles, equivalent to a transmission factor of 0·85.

The figures along the curves represent the estimated meteorological visibility at the time of observation, and those along the left-hand border the luminous range under those conditions.

Example: A light of an intensity of 100 000 candelas has a nominal range of about 20 miles. When the meteorological visibility is 20 miles the light would be sighted at about 33 miles, given a sufficient elevation and height of eye; and when 2 miles, at about $5\frac{1}{2}$ miles.

As the scale along the top border is based on a meteorological visibility of 10 sea miles, the luminous ranges in the prevailing conditions obtained from the 10-mile curve will be identical to those with which the diagram is entered from the top border. If a line is drawn joining points where values from the left-hand border intersect equal values on the curves, it will be seen to be parallel with and to the right of the curve for perfect visibility. Luminous ranges in the conditions prevailing at the time of observation obtained from intersections to the left of this line will be less than the estimated meteorological visibility, whilst those to the right will be greater. Due to their intensity, many lights will therefore be sighted at a greater distance than that of the estimated meteorological visibility.

The diagram can also be used to obtain an approximate meteorological visibility; when, for example, a light of an intensity of 100 000 candelas is sighted at 12 miles, the meteorological visibility will be about 5 miles.

CAUTION.—When using this diagram it must be remembered that:

1. *The ranges obtained are approximate.*
2. *The transparency of the atmosphere is not necessarily consistent between the observer and the light.*
3. *Glare from background lighting will reduce considerably the range at which lights are sighted. A light of 100 000 candelas has a nominal range of about 20 miles; with minor background lighting as from a populated coastline this range will be reduced to about 14 miles, and with major background lighting as from a city or from harbour installations to about 9 miles.*

   Approximate sighting ranges may be obtained by entering the diagram with the listed intensity divided by 10 for minor background lighting, and by 100 for major background lighting.

CHARTS: 5046/5047/5048/5056/5138/5140

DATE:	CHART:	DEV. CARD
MARCH 10	5046	12
JULY 10	5140	—
OCT 10	5047	10
DEC 10	5048	CURVE
FEB 11	5048	—
MARCH 11	5138	—
JUNE 11	5056	4
JULY 11	5140	3
OCT 11	5056	—
DEC 11	5048	10
FEB 12	5046	—
MARCH 12	5047	12
MAY 12	5046	11
JULY 12	5048	12
OCT 12	5140	CURVE
NOV 12	5138	

MARCH 2010
5046
DEV CARD 12

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 2230hrs, during poor visibility, a vessel proceeding along the SW lane of the TSS observed Dungeness Headland (50°55'N 00°58'E) abaft the starboard beam by radar range 6.6 miles.
At 2330hrs, in increasing visibility, Royal Sovereign light (50°43'N 00°26'E) was observed bearing 268°C.
Vessel steering 233°C at 11.0 knots.

Tidal stream prediction to be obtained by means of

, 2 hrs before HW Dover, Springs.
Variation 2.5°W.

Find EACH of the following:

(a) the position of the vessel at 2330hrs; (14)

(b) the position of the vessel at 2230hrs; (7)

(c) the time and compass bearing when Royal Sovereign light is in transit with CS2 buoy (50°39'N 00°33'W). (5)

2. (a) On Worksheet Q2, assuming the sea level shown represents Mean Sea Level, mark and clearly label the relative levels for EACH of the following sea levels:

- MHWS
- MLWS
- MLWN (6)

(b) On Worksheet Q2 mark and clearly label EACH of the following:

(i) Drying Height; (2)

(ii) Charted Elevation of Light. (2)

(c) Define EACH of the following terms:

(i) Mean Sea level; (2)

(ii) Charted Depth. (2)

Section B

3. A vessel is expected to embark on a passage through the English Channel and Dover Straits.

   (a) Explain how the use of Admiralty Chart 5500, Mariners Routeing Guide, English Channel and Southern North Sea can aid an OOW to plan this passage through busy and congested waters. (10)

   (b) Outline the details contained in the Tidal Stream Atlas to assist in the appraisal of this passage. (5)

   (c) With reference to Chart 5046:

   (i) using

, find the direction and rate of the tidal stream between 0320hrs and 0420hrs UT on Wednesday 16th December; (5)

   (ii) state in full the charted abbreviations for Cap Gris-Nez light (50°52'N 01°35'E). (6)

4. At 1530hrs UT on 9th December, whilst on passage from Monrovia, Liberia (06°21'N 10°48'W) to Walvis Bay, Namibia (22°57'S 14°30'E), a ship is in position 12°00'S 02°05'E when a crew member suffers a serious injury which requires immediate attention.

   The nearest superior medical services is in Jamestown, St Helena, landfall position 15°55'S 05°43'W.

   The ship immediately sets a rhumb line course at a maximum speed of 18 knots.

   Calculate EACH of the following:

   (a) the course and distance, by Plane Sailing, to Jamestown; (12)

   (b) the ETA, Standard Time, Jamestown. (5)

5. On 29th September, a ship in D.R. position 19°15'S 146°50'E, the OOW obtains simultaneous bearings, 266°G and 276°C, of the sun at sunset.

   Calculate EACH of the following:

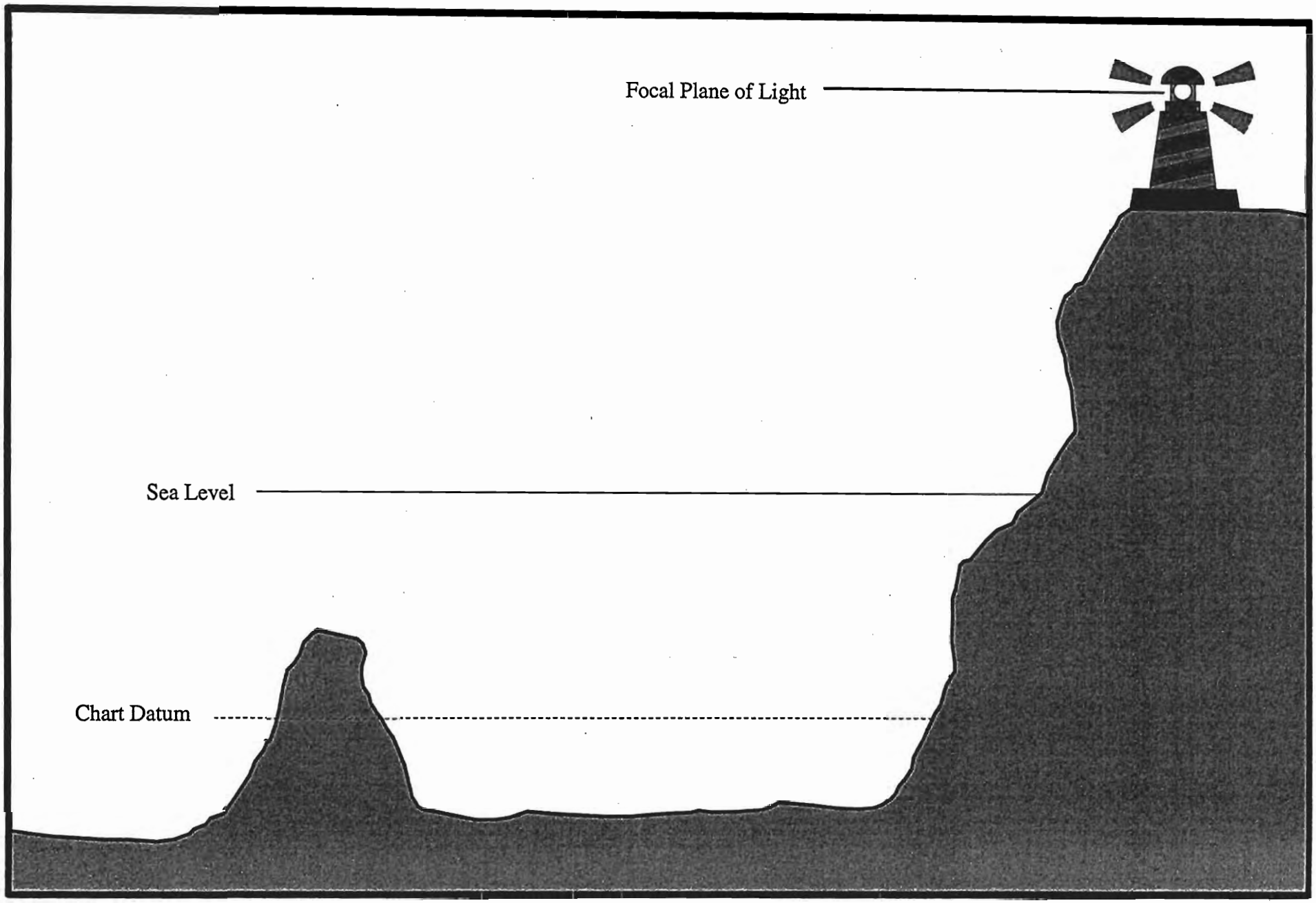
   (a) the true amplitude; (10)

   (b) the error of the gyro; (2)

   (c) the deviation for the direction of the ship's head if the variation was 18°W. (5)

WORKSHEET Q2

(This Worksheet must be returned with your answer book)



Candidate's Name .....

Examination Centre .....

July 2010

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0630hrs, a vessel bound for Wellington (41°20'S 174°50'E), observes the following celestial observations using DR position 40°19'S 174°21'E:

Star Sirius	bearing 335°T	intercept 2.0 miles Towards
Star Antares	bearing 090°T	intercept 2.0 miles Away

(a) Find the vessel's position at 0630hrs. (8)

(b) A course was set to the entrance of the Cook Strait passing 4.0 miles off The Brothers Lt.Ho. (41°06'S 174°26'E).

Ship speed 18.5 knots.
Gyro Error 2°H
A SE'ly wind was causing 2° leeway throughout.

Find the gyro course to steer at 0630hrs to make good the required track. (6)

(c) At 0845hrs Cape Jackson Lt.Ho. (41°00'S 174°19'E) was observed bearing 246°G, distant 7.5 miles.

Find the set and rate of the tidal stream experienced. (8)

(d) Find the time and distance off The Brothers Lt.Ho. when it is at its CPA. (5)

2. A vessel is expected to sail early morning 3rd February from Auckland (No.6400) ATT Pacific and Atlantic Oceans and has to pass under the harbour bridge.

Bridge Charted Height:	7.9m
Draught:	3.5m
Mast Top Above Keel:	11.5m
Clearance Required:	1.0m

Calculate the latest time the vessel will be able to pass under the bridge on the morning flood tide.

Note: Assume Charted Height from MHWS (13)

[OVER

Section B

3. (a) State the factors to be considered when planning a landfall. (10)

   (b) List FOUR publications that should be consulted when planning a landfall. (4)

   (c) With reference to Chart 5140:

      (i) estimate when Stephens Island light (40°40'S 174°00'E) will be first observed:

      Prevailing visibility 9.0 miles
      Observer's height of eye above sea level 7.0m. (5)

      (ii) identify the chart symbol in position 40° 20'.5S 175° 00'.4E. (2)

4. The following table is an extract from a ship's log book:

Date	Ship Time	Log Book Entry	
17th March	0600hrs	DR Position	37°33'S 154°56'E
		Observed Celestial Position	37°30'S 154°50'E
18th March	0600hrs	DR Position	38°49'S 163°28'E
		Observed Celestial Position	39°19'S 163°28'E

   Find EACH of following:

   (a) by Plane Sailing, the course, distance and speed made good between 0600hrs 17th March and 0600hrs 18th March; (16)

   (b) the set, drift and rate of the current experienced between 0600hrs 17th March and 0600hrs 18th March. (4)

5. With reference to the *Bridge Procedures Guide*:

   (a) list TEN circumstances when the master must be called; (10)

   (b) list SIX items of equipment to be checked to ensure that they are fully operational, when entering restricted visibility; (6)

   (c) explain the obligations the OOW will have when in the presence of a pilot. (3)

OCT 2010
5047
DEV N°7

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. Whilst anchored off St Govan's Head the following bearings are obtained:

Southerly edge of Caldey Island (51°38'N 04°41'W)	081°C
St Govan's Head (51°36'N 04°55'W)	261°C
St Gowan light float (51°31'N 05°00'W)	227°C

Variation 6°W

Find EACH of the following:

(a) the position of the ship and the deviation of the ship's head; (12)

(b) the compass course to steer at 13.5 knots to a position Bideford Fairway buoy (51°05'N 04°16'W) bearing 090°T, distant 1.0 mile assuming a tidal stream was setting 072°T x 1.5 knots throughout and allowing for a strong SW'ly wind causing 7° leeway; (8)

(c) the steaming time to Bideford Fairway buoy; (3)

(d) the distance from Lundy North light (51°12'N 04°41'W) when it is predicted to be first sighted assuming meteorological visibility of 5.0 miles and height of observer's eye 12.0m. (4)

2. On 28th February at 2130hrs UT, the ship referred to in Q1 anchors off Bideford Fairway buoy (No. 540) ATT United Kingdom and Ireland, in position 51°04'.4N 04°17'.7W with a maximum draft of 5.4m.

Find EACH of the following:

(a) the predicted UKC on anchoring; (10)

(b) the predicted UKC at the subsequent LW. (3)

Section B

3. The ship referred to in Q1 is to undertake the coastal passage from the anchored position off St Govan's Head (51°36'N 04°55'W) to Bideford Fairway buoy (51°05'N 04°16'W). The passage is to be executed in the hours of darkness.

   (a) List EIGHT publications that should be consulted to appraise this coastal passage. (8)

   (b) List the charted features that could be used to monitor the position of the ship whilst on passage. (8)

   (c) State how the charts will be checked to ensure that they are corrected up to date. (3)

   (d) State the true bearing when Bull Point light (51°12'N 04°12'W) becomes red in colour. (3)

4. At 1030hrs, Standard Time, 23rd September, a ship departs Suva, Fiji and sets a rhumb line course to Balboa, Republic of Panama.

   Departure Position: 18°08'S 178°26'E
   Landfall Position: 07°00'N 80°30'W

   (a) Find the course and distance of the rhumb line track. (10)

   (b) The Equatorial Ocean Currents will affect the ship as follows:

   - 2500 miles – Favourable at 1.0 knot
   - 2000 miles – No current
   - Remainder – Adverse at 0.5 knot

   Ship's speed 13.2 knots.

   Find the ETA, Standard Time, Balboa at landfall position. (8)

5. With reference to the Bridge Procedures Guide and MGN 315, Keeping A Safe Navigational Watch On Merchant Ships:

   (a) list the information that the OOW should inform the relieving OOW during the handover of a navigation watch; (15)

   (b) state the instances when the handover of a navigation watch should be deferred. (5)

UKL 2010
5048
DEVIATION CURVE

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

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Section A

10
5

1. At 1600hrs, a supply vessel on a voyage from Kinsale A-East oil rig (51°22'N 07°56'W) to Waterford Harbour (52°11'N 06°56'W) is in position by GPS 51°47'.5N 07°25'.0W (Adjusted to Datum).

   (a) Plot the position of the vessel. (3)

   (b) Find the compass course to steer and speed required at 1600hrs so as to arrive at Waterford Harbour Pilot Station (52°09'N 06°58'W) at 1830hrs.
   A tidal stream was estimated to be setting 071°T x 1.2 knots throughout.
   A SE'ly wind was estimated to be causing 3° leeway.
   Variation 5°W. (16)

   (c) At 1745hrs Hook Head Lt.Ho. (52°07'N 06°56'W) was observed bearing 048°T, distant 7.4 miles.

   Find the set and rate of the tide experienced between 1600hrs and 1745hrs. (7)

2. A bulk carrier is to enter the port of Nauru (No.6764) ATT Pacific and Atlantic Oceans on 23rd February and the master instructs the OOW to determine tidal predictions.

   Determine the HW and LW predictions for the port of Nauru on 23rd February. (14)

[OVER

Section B

3. (a) State the use of transit bearings. (10)

(b) State the considerations to be taken into account when selecting objects to be used as transits. (6)

(c) With reference to navigating in restricted waters, explain the use of EACH of the following:

(i) clearing bearings; (3)

(ii) parallel indexing. (3)

4. A ship is to sail a rhumb line track for an ocean passage from Cape Leeuwin, Western Australia to Durban, South Africa avoiding the adverse currents. The following way-points are used:

- Departure WP1: 34°18'S 115°00'E
- WP2: 30°00'S 100°00'E
- Destination WP3: 30°00'S 31°10'E

(a) Calculate the total distance of the ocean passage. (12)

(b) The ETD Cape Leeuwin is 24th April at 2130hrs, Standard Time and ship's speed is 15.6 knots.

Calculate the ETA, Standard Time, at Durban. (5)

5. (a) State the factors that should be considered prior to the OOW acting as sole-lookout in daylight conditions. (7)

(b) State the purpose of maintaining a lookout. (6)

(c) Outline the mandatory rest periods. (8)

FEB 2011 5048

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

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Section A

1. At 0745 hrs an anchor handler departs Kinsale Head Gas Field (51°22'N 07°59'W) bound for Dungarvan Harbour (52°04'N 07°35'W). Speed 10.6 knots. Gyro Error 2°H.

   Departure Position: 51°22'.6N 07°57'.4W

   (a) Plot the anchor handler's position at 0745 hrs. (1)

   (b) Find the gyro course to steer to pass 1.5 miles off Mine Head lighthouse (52°00'N 07°35'W) counteracting the effects of a tidal stream estimated to be setting 266°T at 2.6 knots and a NW'ly wind causing 7° leeway. (8)

   (c) At 0915 hrs the anchor handler is in position by GPS 51°33'.8N 07°50'.9W (Adjusted to Datum).

   Plot EACH of the following:

   (i) the anchor handler's position at 0915 hrs; (1)

   (ii) the DR position at 0915 hrs. (3)

   (d) Find EACH of the following:

   (i) the actual set, drift and rate of tidal stream experienced; (7)

   (ii) the course and speed made good since 0745 hrs. (5)

2. A vessel in Puerto Montt (No.9700) ATT Pacific and Atlantic Oceans expects to complete loading on Saturday 13th February.
   The Master instructs the OOW to determine the available time window on the evening HW, 13th February, that the vessel may cross a shoal with a charted depth of 7.2 metres. The vessel's sailing draft is 9.7 metres and an UKC of 1.0 metre must be maintained at all times.

   Find EACH of the following:

   (a) the earliest time that the vessel may cross the shoal; (9)

   (b) the latest time that the vessel may cross the shoal. (6)

[OVER

Section B

3. The ship referred to in Q1 is undertaking the passage from Kinsale Head Gas Field to Dungarvan Harbour during the hours of daylight.

   (a) State; with reasons, FIVE bridge procedures to be undertaken prior to navigating in or near an Oil Installation Area. (10)

   (b) With reference to Chart 5048:

      (i) state THREE prominent charted features that may be used for visual monitoring the passage; (3)

      (ii) state THREE prominent charted features that may be used for radar position monitoring the passage; (3)

      (iii) determine the approximate range at which Mine Head light (52°00'N 07°35'W) may be sighted at night if the prevailing visibility is 5.0 miles and observer's height of eye above sea level is 9.0 m. (4)

   (c) Chart Interpretation 5048.

      (i) state the bearing that Ballynacourty Point light (52°05'N 07°33'W) will be first sighted showing red; (2)

      (ii) Cork buoy (51°43'N 08°15'W) shows a Racon. Sketch the echo that would be painted on the ship's radar screen in relation to this symbol. (3)

4. At 1040 hrs UT on 16th May, a cruise ship on passage from Tampa, Florida to Barcelona, Spain in position 36°30'N 12°30'W receives a message that a crew member on a tanker in position 34°00'N 09°00'W requires urgent medical attention.

   The cruise ship agrees to rendezvous in position 35°50'N 10°22'W.

   (a) Find the course and distance for the cruise ship to make the rendezvous. (10)

   (b) Find the ETA, UT, at the rendezvous position if the cruise ship's speed is 17.5 knots and there is an adverse current of 1.5 knots throughout. (4)

   (c) The cruise ship is keeping the appropriate Zone Time. State the required ship time that the engine room will need to be given one hours notice of manoeuvring. (4)

5. With reference to the Bridge Procedures Guide and MGN 315, Keeping A Safe Navigational Watch on Merchant Ships:

   (a) outline the primary duties of the OOW in order to maintain a safe navigational watch; (9)

   (b) list EIGHT duties that the OOW should perform whilst the vessel is at anchor. (8)

MARCH 2011
5140

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1830 hrs a vessel observes Motukokopu Island (36°30'S 175°28'E) bearing 260°G and the eastern side of Motakauri Point (36°33'S 175°32'E) bearing 183°G.

   The vessel is bound for Auckland (36°51'S 174°47'E) and must be in position Tiritiri Matangi Island light (36°36'S 174°54'E) bearing 268°G, distance 4.5 miles at 2130 hrs the same day.

   The passage will consist of two legs. The first leg is to be conducted at full speed of 12.0 knots and the 2nd leg speed adjusted accordingly to arrive at 2130 hrs. The vessel must a/c 1.5 miles due north of Channel Island light (36°25'S 175°20'E).

   1st leg tidal stream setting 090° x 1.5 knots.
   2nd leg tidal stream setting 195° x 1.5 knots.

   Gyro Error 2°L.

   Find EACH of the following:

   (a) the position of the vessel at 1830 hrs; (3)

   (b) the gyro course to steer on the 1st leg; (7)

   (c) the ETA at the assigned position 1.5 miles due north of Channel Island light; (3)

   (d) the required latitude and longitude of the vessel at 2130 hrs; (3)

   (e) the gyro course and ship speed required on the 2nd leg so as to arrive at 2130 hrs. (10)

2. (a) State the instances when intermediate tidal heights may not be calculated for Pacific ports. (4)

   (b) A vessel with a draught of 11.0 metres is due to arrive at the port of Vancouver Harbour on the afternoon of Friday 15th April.
   There is a shoal in the port approaches with a charted depth of 9.2 metres.
   The company policy is that a minimum under keel clearance of 10% of the maximum draught is maintained.

   Find the latest time the vessel can cross the shoal on the PM ebb tide. (10)

[OVER

Section B

3. With reference to Traffic Separation Schemes:

   (a) outline the requirements of Rule 10 applicable to a power driven vessel of 20 m or more in length; (12)

   (b) Datasheet Q3 shows FOUR tracks, state, with reasons, the tracks that comply and the tracks that do not comply with Rule 10. (12)

4. A cargo vessel is to make an ocean passage from Los Angeles, California, USA to Singapore.

   Departure Position: 33°40'N 118°20'W
   Landfall Position: 05°30'N 121°10'E

   (a) Find the course and distance of the rhumb line track. (10)

   (b) In addition, on completion of the ocean passage, a further 1260 nautical miles of coastal passage is required.
   The ETD Los Angeles is 1355 hrs ST on 26th July.
   Ship's speed 16.5 knots.

   Find the ETA, Standard Time, to the nearest hour, at Singapore. (5)

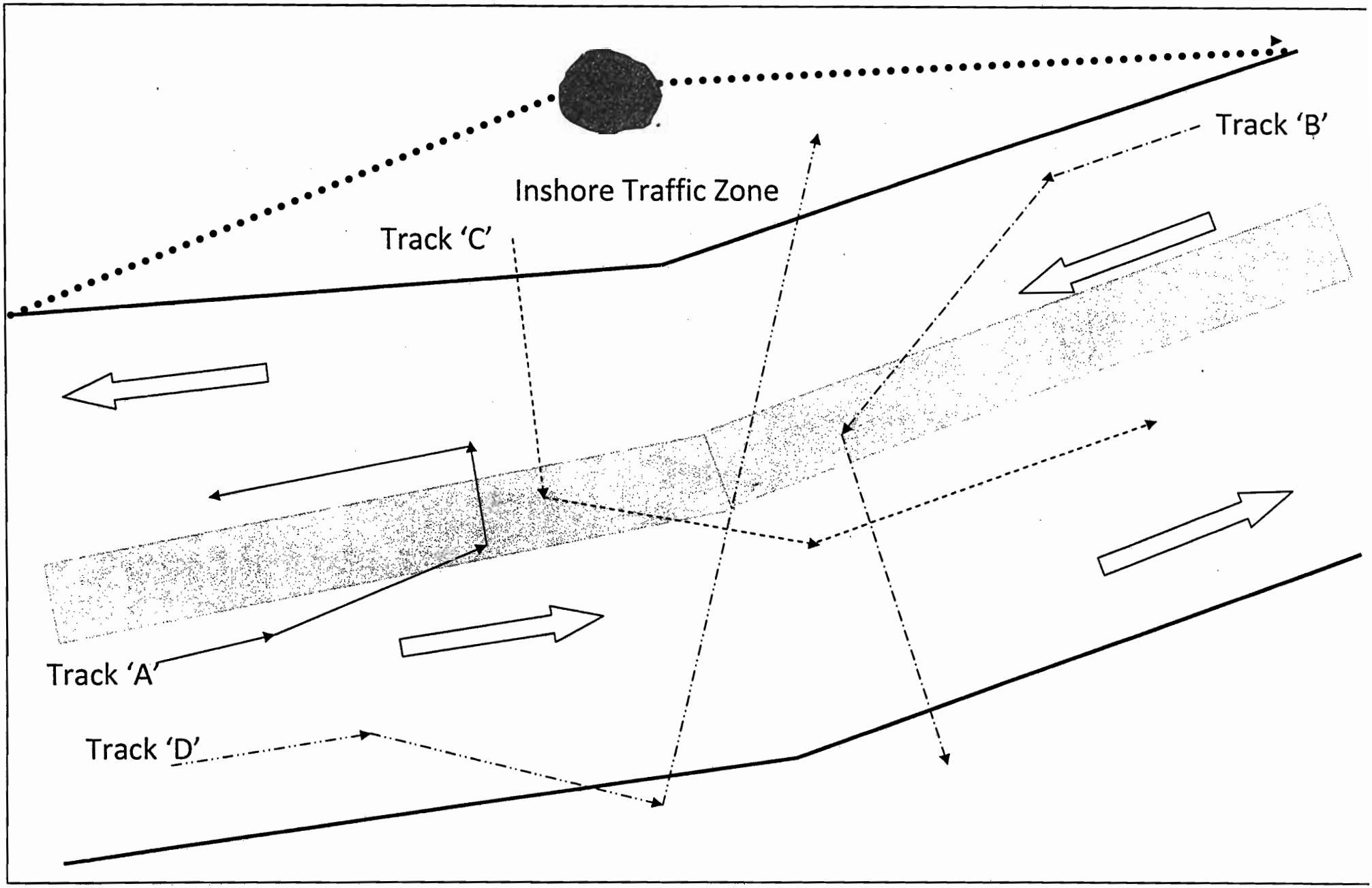
   (c) State SIX properties of a Mercator Chart. (6)

5. (a) The planet Venus was observed bearing 072°C by the OOW in DR position 12°15'S 83°39'E at approximately 0400 hrs, 11th June.
   Chronometer showed 10h 32m 42s and had an error of 2m 03s fast.

   Calculate the deviation for the direction of the ship's head, if the variation was 1.5°W. (12)

   (b) At the time of observation the ship's head by compass showed 300°C.

   Using Deviation Card No.8, state the deviation that the OOW should have expected and any subsequent action, in light of the celestial observation, that should be taken by the OOW. (3)


Track 'B'
Inshore Traffic Zone
Track 'C'
Track 'A'
Track 'D'

JUNE 2011

5056

DEV CARD N° 4

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0120 hrs, a ship steering 260°C, speed 14.4 knots, proceeding along the SW lane of the Channel Traffic Separation Scheme observed Channel light float (49°55'N 02°55'W) bearing 222°C, distant 6.8 miles.
Variation 8°W.

At 0140 hrs the course was altered to 294°C.
At 0230 hrs the ship stopped for engine repairs.
At 0320 hrs the ship resumed passage steering 294°C at 14.4 knots.
At 0340 hrs the ship a/c to 260°C for collision avoidance.
At 0400 hrs the ship resumed passage steering 294°C.

A Tidal Stream Atlas showed that the tidal stream was estimated to setting as follows:

between 0100 hrs and 0300 hrs 062°T x 1.6 knots;
between 0300 hrs and 0500 hrs 105°T x 2.8 knots.

Find EACH of the following:

(a) the position of the ship at 0120 hrs; (7)

(b) the DR position at 0430 hrs; (12)

(c) the EP at 0430 hrs. (8)

Note: Assume all alterations of course and speed are instantaneous.

2. (a) Explain, with the aid of a sketch, the cause of Neap Tides. (3)

(b) A vessel is requested to shift berth whilst in the port of Antwerp (No.1539 ATT UK and Ireland) and must pass under a bridge with a charted height of 9.6 metres. (Assume charted height measured from MHWS)
The vessel expects to pass under the bridge with an air draft of 10.4 metres at 1550 hrs on Wednesday 4th March.

Find the clearance when the vessel passes under the bridge. (10)

Section B

3. SOLAS Chapter V requires a Master to have in place a Voyage Plan prior to the commencement of a passage.

   (a) Outline the information contained in EACH of the following publications which would be used in the *appraisal* stage:

      (i) Ship Routeing Guide; (2)

      (ii) Merchant Shipping Notices; (4)

      (iii) Annual Summary of Admiralty Notices to Mariners. (2)

   (b) State FOUR factors to be considered when undertaking the *planning* stage to determine an appropriate distance to pass off a headland. (4)

   (c) State FOUR factors to be considered when undertaking the *monitoring* stage when determining the frequency of position fixing. (4)

   (d) With reference to execution and position monitoring for an intended passage, explain, with the aid of sketches, the principle of EACH of the following:

      (i) leading lights; (4)

      (ii) sector lights. (4)

4. A vessel is to sail a coastal passage from Huelva, Spain to Almeria, Spain

Departure Position Huelva (WP1):	37°16'N 06°55'W
Entrance to Gibraltar Strait (WP2):	36°00'N 06°55'W
Exit Gibraltar Strait (WP3):	36°00'N 05°20'W
Arrival Position Almeria (WP4):	36°51'N 02°30'W

   (a) Find the total distance from Huelva to Almeria. (12)

   (b) Current Atlas indicates the following currents whilst on passage:

      - 1st leg of passage – adverse x 0.5 knot
      - 2nd leg of passage – favourable x 1.0 knot
      - 3rd leg of passage – favourable x 1.0 knot

      Ship's speed 12.2 knots.

      Find the total steaming time between the two ports. (5)

June 2011

5. (a) Whilst at anchor on the 18th June in DR position 43°45'N 175°50'W an OOW observes the sun setting bearing 292°C.

Find the deviation of the compass for the ship's head, if the variation is 11.5°E. (9)

(b) With reference to the Bridge Procedures Guide, state TEN relevant factors to ensure the composition of the Navigation Watch is adequate. (10)

July 2011

5140

DEV'N N° 3.

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 2130 hrs a vessel made the following observations:

Kauka (R Lts)	(41°14'S 174°47'E)	bearing 331°C
Baring Head light	(41°24'S 174°52'E)	bearing 088°C

At the same time Wellington harbour entrance Leading Lights (41°19'S 174°52'E) were observed in transit.

Variation 22°E.

Find EACH of the following:

(a) the position of the vessel as a bearing and distance in relation to Turakirae Head (41°26'S 174°55'E); (10)

(b) the deviation of the compass for the direction of the vessel's head; (3)

(c) the compass course to steer at 13.0 knots to pass 10.0 miles to starboard of Cape Campbell light (41°44'S 174°17'E) assuming the tidal stream was slack and allowing for a strong NW'ly wind causing 7° leeway; (10)

(d) the estimated time when Cape Campbell light will be abeam. (2)

2. A survey vessel with a draught of 4.5 metres anchors off Bon Accord Harbour, Kawau Island, New Zealand (No.6397 ATT Pacific and Atlantic Oceans) at 1121 hrs ST on Saturday 19th March.
The charted depth of the anchorage position is 7.6 metres.

Find the predicted reading on the echo sounder at the time of anchoring. (15)

Section B

3. (a) State TEN factors to be considered when choosing an area for anchorage, as part of a Voyage Plan. (10)

(b) With reference to Chart 5140:

(i) identify the chart symbol in position 41°21'.2S 174°18'.0E; (2)

(ii) identify the type of buoy and the colour of its light in position 41°24'.5S 174°50'.4E; (2)

(iii) identify the chart symbol in position 41°19'.8S 174°49'.5E; (2)

(iv) determine the approximate range at which Cape Campbell light (41°44'S 174°17'E) may be sighted at night if the prevailing visibility is 3.0 miles and observer's height of eye above sea level is 7.0 m; (3)

(v) using Datasheet Q3, find the direction and spring rate of the tidal stream in position 41°24'.9S 174°28'.0E at 0830 hrs on 1st December. (5)

4. A vessel is to sail a rhumb line track for the ocean passage from Yokohama, Japan to Mazatlan, Mexico.

Departure Position off Yokohama: 34°50'N 139°55'E
Landfall Position off Mazatlan: 22°45'N 110°00'W

(a) Find the course and distance of the rhumb line track. (12)

(b) The Ocean Routeing chart for March indicates that the current will be adverse at 1.0 knot for the 1st 2500 miles of the passage and favourable at 0.5 knot for the remainder of the passage.

Ship's speed 15.0 knots.

Find the ETA, Standard Time, Mazatlan if the time of departure Yokohama is 1000 hrs, ST, on 10th March. (5)

5. With reference to the Bridge Procedures Guide and MGN 315, Keeping A Safe Navigational Watch on Merchant Ships:

(a) state the THREE conditions that the OOW shall ensure before handing over the navigational watch; (6)

(b) state the TWO circumstances that the OOW shall not hand over the watch; (4)

(c) state NINE factors that the relieving OOW should personally satisfy themselves when taking over the navigational watch. (9)

OCT 2011
5056

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1815 hrs, a ship proceeding eastbound in the Channel TSS observes E Channel buoy (49°59'N 02°29'W) bearing 035°G.
30 minutes later the same light bore 318°G.
Ship steering 073°G, speed 14.4 knots.
Tidal stream setting 352°T, rate 2.2 knots.
Gyro error 2° low.

   (a) State EACH of the following:

      (i) the position of the ship at 1845 hrs; (8)

      (ii) the EP at 1900 hrs. (5)

   (b) The master instructed the OOW to alter course and speed at 1900 hrs so as to arrive at a position 5.0 miles due south of the Needles Pilot Station (50°38'N 01°39'W), 30 minutes before pilot boarding at 2300 hrs.

   Find the required gyro course and speed assuming a tidal stream was setting 081°T x 1.8 knots and now allowing for an E'ly wind causing 3° leeway. (12)

2. (a) On Worksheet Q2 mark and clearly label the levels between which EACH of the following are measured:

(i) Air draught; (2)

(ii) Charted Height; (2)

(iii) Height of Tide; (2)

(iv) UKC; (2)

(v) MHWS. (2)

(b) A container vessel departing Avonmouth (No.523 ATT United Kingdom and Ireland) with a draught of 10.2 m and an air draft of 31.2 m must pass under a bridge with a clearance of at least 2.5 m. The bridge has a charted height of 31.9 m.

Calculate the highest height of tide that the vessel will be able to pass under the bridge with the required clearance. (5)

Note: Assume Charted Height from MHWS

OCT 2011

Section B

3. A coastal passage from Tor Bay Deep-Sea Pilots (50°25'N 03°27'W) to Weymouth (50°37'N 02°27'W) is being appraised.

   (a) Outline the type of information that could be extracted from the *Sailing Directions* to assist the OOW in appraising this passage. (6)

   (b) State SIX other publications that should be consulted as part of this appraisal process. (3)

   (c) The local radio has issued the following weather forecast for the area around Bill of Portland (50°31'N 02°27'W): Wind S'ly F 5/6, intermittent drizzle, visibility moderate to poor.
   Draught of vessel: 4.5 metres.

   Appraise EACH of the following passage plan options, explaining THREE factors that are relevant to EACH option:

   (i) passing to the West of The Shambles Bank (50°31'N 02°22'W); (3)

   (ii) crossing over The Shambles Bank; (3)

   (iii) passing to the East of The Shambles Bank. (3)

   (d) State the preferred option to be recommended to the Master for the given conditions, from the options appraised in Q3(c). (1)

   (e) With reference to Bill of Portland light (50°31'N 02°27'W), state the purpose of the fixed red light. (2)

4. At 2150 hrs UT 22nd January, a container vessel in the South Atlantic receives a call for assistance from an oil tanker that has a fire onboard.

   Your container vessel, in position 50°49'S 60°59'W, makes contact with the oil tanker and agrees to rendezvous in position 53°30'S 62°30'W.

   (a) Calculate, by Plane Sailing, the required course and distance to the rendezvous position. (10)

   (b) To ensure there is sufficient light on arrival, it is decided to rendezvous one hour after sunrise the following morning.

   Find own vessel's speed required. (8)

5. (a) With reference to The Merchant Shipping (Distress Signals and Prevention of Collision) Regulations:

(i) state the reason that every vessel shall at all times proceed at a safe speed; (3)

(ii) explain why EACH of the following factors are to be considered in determining a safe speed:

(1) the draught in relation to the available depth of water; (3)

(2) at night the presence of background light such as from shore lights or from back scatter of her own lights; (3)

(3) the more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity. (3)

(b) The Bridge Procedures Guide, Annex A5, contains the required boarding arrangements for pilots.

(i) State the maximum freeboard for using a pilot ladder by itself. (1)

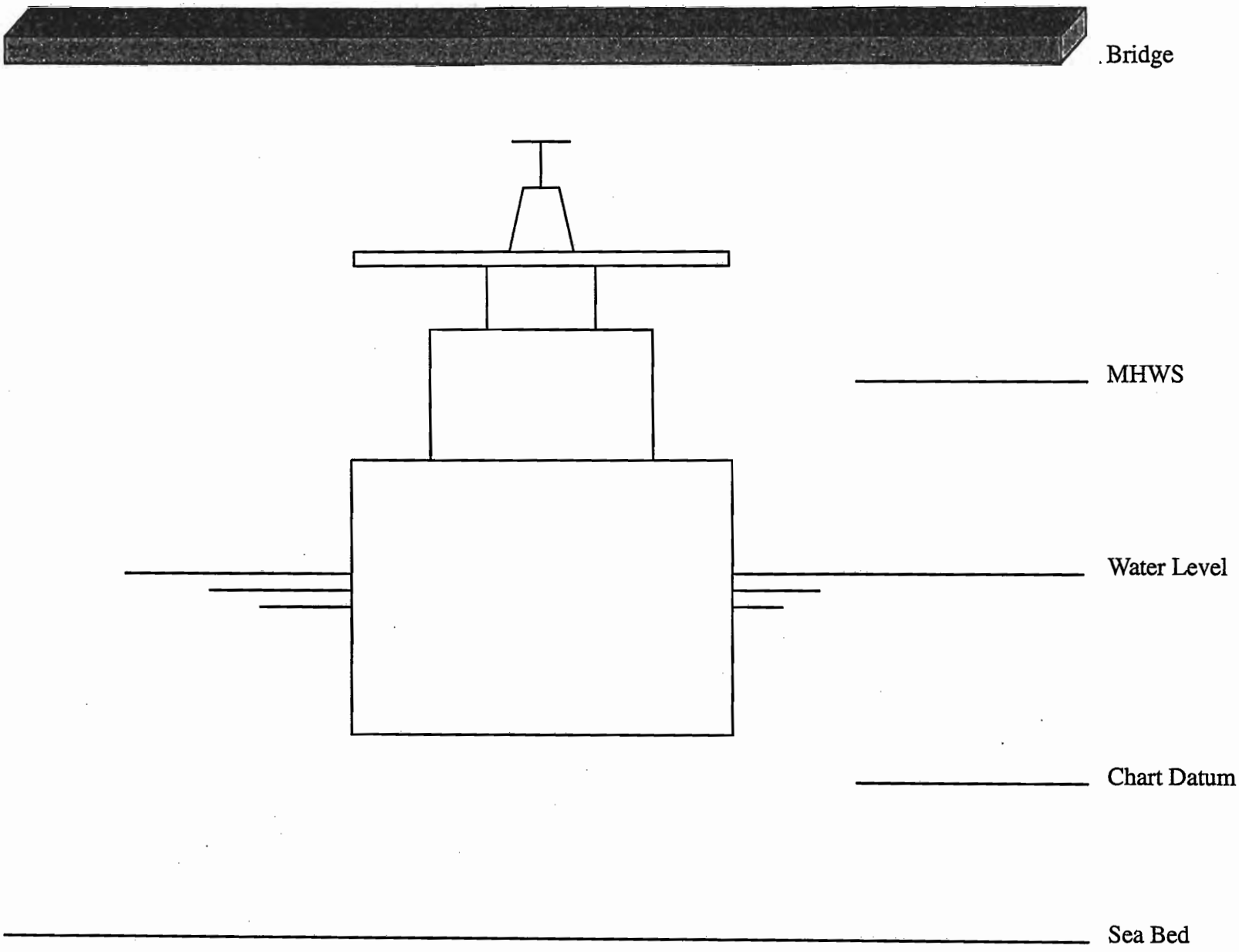
(ii) State the required arrangements when the freeboard is greater than the maximum freeboard for using a pilot ladder and no side door or hoist is available. (4)

(c) The Bridge Procedures Guide, Annex A7, - Guidance on Steering Gear Test Routines - contains guidance on the rudder movement and the procedures to be implemented in the steering flat during the test.

Outline the guidance on these aspects of the steering gear tests. (4)

WORKSHEET Q2

(This Worksheet must be returned with your answer book)



Candidate's Name .....

Examination Centre .....

DEC 2011

DEVIATION CARD 10

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0400 hrs, during restricted visibility, a vessel bound for Waterford Harbour observed the eastern extremity of Robert's Hd (51°44'N 08°19'W) by radar, abaft the port beam, range 6.1 miles.
At 0515 hrs during an improvement in visibility, Ballycotton Island light (51°50'N 07°59'W) bore 342°C.

Vessel steering 060°C at 7.0 knots.
A tidal stream was setting 133°T, rate 1.2 knots, throughout.
An ESE'ly wind was causing 3° leeway throughout.
Variation 7°W.

Find EACH of following:

(a) the position of the vessel at 0515 hrs; (14)

(b) the course and speed made good; (3)

(c) the time and bearing of Ballycotton Island light when abeam; (6)

(d) the compass bearing of Ballycotton Island light when abeam. (3)

2. (a) A vessel with a draught of 5.5 metres is due to arrive late afternoon at Port Talbot (No.510 ATT United Kingdom and Ireland) on the 24th March. There is a shoal patch in the port approaches with a charted depth of 2.3 metres.

Calculate the latest time that the vessel can cross the shoal on the PM ebb tide whilst maintaining an UKC of 1.0 metre. (11)

(b) State SIX possible reasons for differences between the published heights/times and actual heights/times experienced. (3)

D2L

Section B

3. During the appraisal stage of the proposed passage in Q1, the Admiralty List of Lights and Fog Signals is to be used to obtain full details of Ballycotton Island light (No.5774).

   (a) With reference to Datasheet Q3(a) (Ballycotton Island light) and Chart 5048, explain EACH of the following:

   (i) bl 1.5, si 2, bl 1.5, si 2, bl 1.5, si 2, bl 1.5, si 78; (2)
   (ii) W238°-048°(170°), R048°-238°(190°); (2)
   (iii) the reason **Ballycotton** is shown in bold letters; Range 7 15 nm (2)
   (iv) the height of the structure; 15 METRES (2)
   (v) the visual appearance of the lighthouse structure as seen from a ship during daylight hours; BLACK TOWER / WITH WHITE WALK / BL LANTERN (3)
   (vi) the purpose of the flashing red light. DANGER (2)

   (b) With reference to Datasheet Q3(b), determine the approximate range at which Ballycotton Island white light may be sighted at night if prevailing visibility is 8.0 miles and observer's height of eye is 10.0 metres. (4)

   (c) Chart Interpretation 5048:

   (i) identify the chart symbol in position 51°49'.8N 08°01'.6W; Rescue station Lifeboat Station (2)

   (ii) state the nature of the seabed surrounding Ballycotton Island (51°50'N 07°59'W). ROCK - covers + uncovers (2)

4. A vessel is to sail an ocean passage from Funafuti, Tuvalu, South Pacific to Brisbane, Queensland, Australia, via Labasa, Fiji, South Pacific and thence Port Sandwich, Vanuatu, South Pacific.

Funafuti, Tuvalu (WP1):	08°31'S 179°22'E
Labasa, Fuji (WP2):	16°26'S 179°22'E
Port Sandwich, Vanuatu (WP3):	16°26'S 167°47'E
Brisbane, Australia (WP4):	27°27'S 153°04'E

   (a) Find the total distance of the ocean passage. (16)

   (b) Calculate the total steaming time of the ocean passage, to the nearest hour, if vessel's passage speed is 11.4 knots. (2)

DEC 2011

5. (a) At approximately 1545 hrs, ship's time, on the 10th March in DR position 52°45'S 59°27'W, the compass bearing of the SUN was observed to be 288°C.

Chronometer showed 7h 42m 15s.
Chronometer error 45 seconds slow.

Calculate the deviation for the direction of the ship's head, if the variation was 1°E. (16)

(b) Using the time stated in your answer for Q2(a), state how much daylight is remaining after crossing the shoal. (5)

FEB 2012
(5046)

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. (a) At 1430 hrs, a ship steering 073°G, speed 16.0 knots, using the appropriate lane in the Traffic Separation Scheme, was in position Greenwich buoy (50°25'N 00°00') abeam to port, distance 5.2 miles.
The Chief Engineer advises the Master that the ship will need to be stopped so as to carry out necessary repairs to the main engine.

At 1515 hrs, the ship a/c to 060°G to leave the traffic lane.

At 1600 hrs the ship is stopped.

Gyro Error 2°H.

HW Dover, springs, 1230 hrs.
Tidal stream predictions to be obtained by means of ⟨B⟩

Find EACH of the following:

(i) the observed position at 1430 hrs; (4)

(ii) the DR position at 1600 hrs; (7)

(iii) the EP at 1600 hrs. (10)

(b) At 1700 hrs, the main engine repairs are complete and the ship is to rejoin the traffic lane and continue her passage at a reduced speed of 12 knots.

Find EACH of the following:

(i) the EP at 1700 hrs; (4)

(ii) the ground track required to a position Bassurelle buoy (50°33'N 00°58'E) bearing 000°T x 1.5 miles. (3)

Note: Assume all alterations of course and speed are instantaneous.

2. An oil tanker is to enter the port of Dalian Gang (No.7421 ATT Pacific and Atlantic Oceans) on 1st August and the Master instructs the OOW to determine tidal predictions.

Determine the HW and LW predictions for the port of Dalian Gang on 1st August. (12)

FEB

Section B

3. With reference to Traffic Separation Schemes:

   (a) as Officer of the Watch on a dry cargo vessel of length 100 m, outline the elements contained in Rule 10 of the International Regulations for Preventing Collisions at Sea which must be taken into consideration when appraising and planning a passage through or in the proximity of a Traffic Separation Scheme; (9)

   (b) Datasheet Q3(b) shows FIVE tracks, state, with reasons, the tracks that comply and tracks that do not comply with Rule 10. (15)

4. At 1600 hrs, ship's time, 30th April, a ship bound from Fremantle, Western Australia (32°03'S 115°44'E) to the Suez Canal, Egypt (29°58'N 32°33'E) is in position 11°39'S 78°16'E. The ship is keeping ship's time consistent with Zone Time.

   Due to a serious eye injury sustained by a crew member the Master diverts the ship to Diego Garcia, Chagos Archipelago 07°19'S 72°28'E and increases to the maximum ship speed of 16.5 knots.

   Find EACH of the following:.

   (a) by Plane sailing, the course and distance to Diego Garcia; (10)

   (b) the ETA, Standard Time, at Diego Garcia. (5)

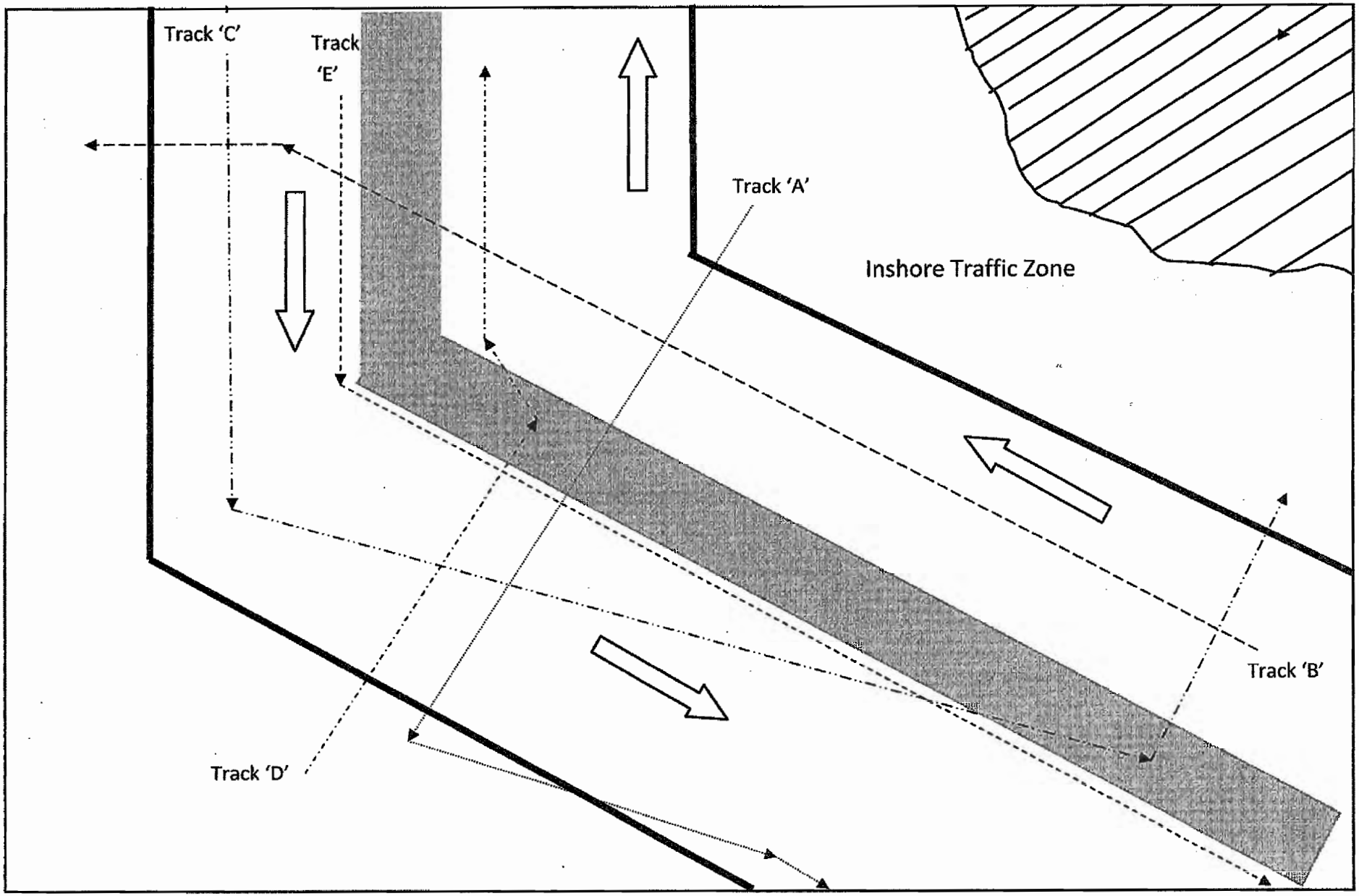
5. (a) The Bridge Procedures Guide issues guidance on the composition of a navigational watch.

      (i) Outline the rationale and objective of forming a bridge team when the ship is navigating in restricted waters. (5)

      (ii) State TEN factors to be considered in determining the bridge composition when navigating in restricted waters. (10)

   (b) The Merchant Shipping (Distress Signals and Prevention of Collision) Regulations 1996, contains factors to be considered when determining a safe speed for a vessel.

      State the factors that are to be taken into account by all vessels when determining a safe speed. (6)


Track 'C'
Track 'E'
Track 'A'
Inshore Traffic Zone
Track 'B'
Track 'D'

MARCH 2012
DEVCAND 12
CHART 5047

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1500 hrs from a vessel at anchor near Port Talbot Pilot Station (51°29′N 04°00′W), the following bearings were obtained:

Porteyon Pt (51°32′N 04°13′W)	300°C
Mumbles Head lighthouse (51°34′N 03°58′W)	030°C
Scarweather light float (51°27′N 03°56′W)	120°C

Variation 6°W.

(a) Find the position of the vessel and the deviation of the ship's head at 1500 hrs. (13)

(b) The vessel is to depart the anchorage at 1700 hrs and the passage plan is to pass northwards of Lundy north light (51°12′N 04°41′W) with a CPA of 3.5 miles.

Ship speed 13.0 knots.
Tidal stream was setting 265°T x 1.8 knots.
Height of observer 10.0 metres.
Prevailing meteorological visibility 4.0 miles.

Find EACH of the following:

(i) the compass course to steer at 1700 hrs to make good the required course; (6)

(ii) the range that Lundy north light will be first observed; (4)

(iii) the ETA when this light will be first observed; (3)

(iv) the relative bearing of the light when first observed. (2)

2. A vessel, leaving the port of Milford Haven with a maximum draught of 7.8 metres, grounds on a mud bank.
Find the earliest time that the vessel can be refloated, allowing 0.3 metre to break the vessel out of the mud, if the vessel grounded at 2145 hrs on the 15th March. (12)

Section B

3. As part of a voyage, a vessel is to undertake a passage through the English Channel and Dover Straits.

   (a) Explain how the use of Admiralty Chart 5500, Mariner's Routeing Guide, English Channel and Southern North Sea can aid an OOW to plan this passage through busy and congested waters. (12)

   (b) State FIVE precise objectives of a routeing scheme, as outlined in the IMO Ship's Routeing Guide. (5)

   (c) With reference to Chart 5047:

   Find the direction and rate of the tidal stream, using ◈H between 0050 hrs and 0130 hrs UT on Tuesday 24th February. (5)

4. The following table is an extract from a ship's log:

Date	Ship Time	Log Book Entry	
25th April	1200 hrs	DR Pos'n: Obs Celestial Pos'n:	22°45′N 178°31′W 22°49′N 178°40′W
27th April	1200 hrs	DR Pos'n: Obs Celestial Pos'n:	27°30′N 174°12′E 27°30′N 173°39′E

During the evening of the 25th April, the clocks were advanced by 24 hours to allow for the change in time zones.

Find EACH of the following:

(a) by Mercator sailing, the course and distance made good between 1200 hrs 25th April and 1200 hrs 27th April; (9)

(b) the speed made good between 1200 hrs 25th April and 1200 hrs 27th April; (3)

(c) the set and rate of the current experienced between 1200 hrs 25th April and 1200 hrs 27th April. (5)

5. With reference to the Bridge Procedures Guide and MGN 315, Keeping a Safe Navigational Watch on Merchant Vessels:

   (a) state the specific condition when consideration may be given to the OOW acting as sole look-out; (2)

   (b) state the factors that should be considered prior to the OOW acting as sole look-out; (8)

   (c) state the purpose of maintaining a look-out; (8)

   (d) outline the guidance on how the OOW may fully engage the look-out's attention. (3)

ARPNA 2012
MAY

DEV CARD N°11
CHART 5046

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1600 hrs, during poor visibility, a vessel proceeding along the SW lane of the TSS, last observes eastern headland of Dungeness (50°55'N 00°59'E), by radar, bearing 141° Relative, range off headland beside lighthouse 12.2 miles.
Vessel steering 233°C at 7.5 knots.
Variation 2°W.

(a) State the position of the vessel at 1600 hrs. (4)

(b) At 1650 hrs the vessel alters course to 266°C due to collision avoidance.

At 1740 hrs the vessel resumes course of 233°C and due to improvement in visibility increases speed to 10.0 knots.

A Tidal Stream Atlas predicts that the tidal stream was estimated to be setting as follows:

between 1530 hrs and 1630 hrs 044°T x 1.2 knots;
between 1630 hrs and 1730 hrs 055°T x 1.3 knots;
between 1730 hrs and 1830 hrs 044°T x 1.3 knots.

Find EACH of the following:

(i) the DR position at 1810 hrs; (9)

(ii) the EP at 1810 hrs. (6)

(c) At 1830 hrs Royal Sovereign light (50°43'N 00°26'E) is detected by radar bearing 116° Relative, range 7.0 miles.

Find the actual set and rate of the tidal stream experienced since 1600 hrs. (9)

Note: Assume all alterations of course and speed are instantaneous.

2. At 1135 hrs on Monday 1st August a ship with a draught of 5.8 metres grounded on a mudbank with a charted depth of 4.5 metres whilst approaching Liao He Bar, China (No.7392 ATT Pacific and Atlantic Oceans).

Calculate the earliest time that the ship will be refloated allowing 0.5 metre to break the ship out of the mud. (12)

[OVER

Section B

3. (a) On Chart 5046, a vessel bound for Dover Pilot Station (51°07'N 01°22'E) is in position with Cap Gri-Nez lighthouse (50°52'N 01°35'E) bearing 064°T x 7.4 miles, steering 015°T at a speed of 14 knots. It is intended that the vessel will cross the TSS approximately 6.0 miles SW of the MPC Buoy (51°06'N 01°38'E).

(i) On Chart 5046 plot TWO alternative safe tracks for crossing the TSS. (6)

(ii) Explain why the tracks indicated are considered acceptable for crossing this TSS. (6)

(iii) A SW'ly wind is causing 3° leeway and the tide is as per tidal diamond 'M' HW Springs. State the true course to steer to comply with rule 10c of IRPCS as regards crossing the TSS. (3)

(b) The vessel in Q3(a) will pass through the separation zone when crossing the TSS. State TWO other circumstances when a vessel may enter the separation zone. (2)

(c) State the difference between adopted and non-adopted routeing schemes. (4)

(d) State the TWO prescribed circumstances when a ship is exempt from complying with International Regulations for Preventing Collision at Sea with regard to Traffic Separation Schemes. (2)

4. The following table is an extract from a ship's log book:

Date	Ship Time	Log Book Entry	
25th May	1200 hrs (UT +5)	DR Position Observed Position	01°21'N 97°21'W 01°25'N 97°15'W
26th May	1200 hrs (UT +7)	DR Position Observed Position	00°55'S 107°21'W 00°55'S 106°45'W

Find EACH of the following:

(a) by Plane Sailing, the course, distance and speed made good between 1200 hrs 25th May and 1200 hrs 26th May; (13)

(b) the set, drift and rate of the current experienced between 1200 hrs 25th May and 1200 hrs 26th May. (5)

5. (a) With reference to the Bridge Procedures Guide:

(i) list EIGHT items of equipment that should have been prepared and checked prior to the vessel's arrival in port; (8)

(ii) state FOUR checks that have to be made by the OOW when navigating in ice. (4)

(b) With reference to SOLAS Chapter V, outline the reporting requirements for EACH of the following:

(i) ice; (3)

(ii) severe ice accretion. (4)

JULY 2012
(5048)
DEV 12

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 2120 hrs, 23rd April, a vessel bound for Cork Harbour (51°51′N 08°15′W) observes Kinsale A-East Platform (51°22′N 07°56′W) bearing 302°C.

   At 2140 hrs Kinsale A-East Platform and Kinsale B-West Platform (51°22′N 08°01′W) were in transit.

   Ship steering 330°C, speed 10.8 knots.

   Tidal stream slack.

   Leeway 7° for a W'ly gale.

   Variation 6°W.

   (a) Find the position of the vessel at 2140 hrs. (10)

   (b) At 2200 hrs, the vessel is advised that the berth will not be available until the evening of 24th April.

   The Master decides to anchor in Ballycotton Bay (51°51′N 07°57′W) to seek shelter from the westerly gale until the following evening.

   Find EACH of the following:

   (i) the EP at 2200 hrs; (5)

   (ii) the compass course to steer at 10.8 knots to waypoint 51°50′.0N 07°57′.0W assuming a tidal stream was now setting 057°T x 1.0 knot and allowing 7° leeway for a W'ly gale. (10)

   Note: Assume alteration of course at 2200 hrs is instantaneous.

2. The vessel referred to in Q1 (Chart 5048) anchors in position 51°51′.0N 07°56′.6W, Ballycotton Bay (No.754 ATT United Kingdom and Ireland), with a maximum draught of 9.8 metres at 0100 hrs, 24th April.

The vessel is to commence weighing anchor at 1500 hrs, 24th April.

Find EACH of the following:

(a) the predicted UKC when the vessel anchors; (10)

(b) the predicted minimum UKC whilst the vessel is at anchor; (3)

(c) the predicted time that the minimum UKC occurs. (2)

Section B

3. (a) State the use of transit bearings. (10)

(b) State FIVE considerations to be taken into account when selecting objects to be used as transits. (5)

(c) Explain the use of clearing bearings. (3)

(d) Explain, with the aid of sketches, how EACH of the following could be used when forming a Passage Plan into a harbour:

(i) sector lights; (4)

(ii) leading lights. (4)

4. The following table is an extract from a ship's log book:

Date	Ship Time	Log Book Entry	
31st August	1200 hrs	DR Position Observed position	02°13′S 12°54′W 02°20′S 13°13′W
1st September	1200 hrs	DR Position Observed position	01°47′N 07°59′W 01°47′N 07°34′W

(a) Find, by Plane sailing, the course and distance made good between 1200 hrs 31st August and 1200 hrs 1st September. (10)

(b) At 0200 hrs 1st September, ship's time, the clocks were advanced by 1 hour to allow for the change in time zones.

Find EACH of the following:

(i) the speed made good between 1200 hrs 31st August and 1200 hrs 1st September; (4)

(ii) the set and rate of the current experienced between 1200 hrs 31st August and 1200 hrs 1st September. (4)

5. (a) On 16th December, a ship in DR position 14°23′S 93°15′W, the OOW obtains a bearing 235°C of the SUN at sunset.

Calculate EACH of the following:

(i) the true bearing; (7)

(ii) the deviation for the direction of the ship's head if variation was 18°E. (3)

(b) At the time of observation the ship's head by compass showed 150°C.

State, using Deviation Card No.12, the deviation that the OOW should have expected and any subsequent action, in light of the celestial observation, that should be taken by the OOW. (4)

(c) State the position of the apparent sun, in relation to the visible horizon, when an amplitude bearing should be obtained. (2)

OCT 2012
5140 Dev curve
16A

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 2220 hrs, 16th April, from a vessel steering 030°C Cape Cambell light (41°44'S 174°17'E) bore 334°C, distant 7.9 miles from light.

   Variation 23°E.

   (a) Find the position of the vessel at 2220 hrs. (7)

   (b) The vessel is inward bound to Wellington Harbour (41°17'S 174°48'E) and is programmed to embark the pilot at 0200 hrs, 17th April.

   The Master instructs the OOW to make good a track to be in a position with Wellington Harbour leading lights (41°18'S 174°51'E) in line and Turakirae Head (41°26'S 174°55'E) bearing due east at 0120 hrs, 17th April.

   Find EACH of the following:

   (i) the compass course to steer and the ship's speed required to comply with the Master's instruction assuming a tidal stream was setting 338°T x 1.4 knots throughout and allowing 3° leeway for a s'ly wind; (13)

   (ii) the compass bearing when Cape Campbell light is abeam; (2)

   (iii) the speed to make good. (3)

2. (a) A vessel has to cross a shoal, charted depth 6.9 metres, at St. John's Harbour, Newfoundland. The vessel's draught is 6.8 metres and an UKC of 1.0 metre must be maintained.
   ETA at the shoal is 0500 hrs, Standard Time, 16th February.

   State whether it is safe to cross the shoal on arrival and, if it is not safe, find the earliest predicted time that the ship can safely cross the shoal. (8)

   (b) Explain EACH of the following with reference to the tidal predictions for Newfoundland, St. John's Harbour:

   (i) the circle symbol beneath the date and day 9th March, Friday; (2)
   (ii) the significance of this symbol relative to the tidal characteristics. (2)

   (c) With reference to Worksheet Q2, explain why there are THREE distinct tidal curves shown. (3)

[OVER

OCT. 2012

Section B

3. Chart 5140

The OOW of a ship, outward bound from Wellington Harbour (41°17′S 174°48′E) is planning a passage from the pilot station (41°24′S 174°50′E), through the Cook Strait (41°10′S 174°30′E) to a waypoint 40°20′S 174°20′E. The passage is to be executed during daylight.

(a) Identify the charted dangers of this passage. (7)

(b) Identify the charted features that would be used to monitor this passage. (8)

(c) State the possible effects of the *Area of Magnetic Disturbances* in charted position 41°18′.6S 174°24′.1E. (3)

(d) State and explain the abbreviation *Oc* contained in the charted characteristics of Baring Head light (41°24′S 174°52′E). (3)

(e) Determine the approximate range at which The Brothers light (41°06′S 174°27′E) may be sighted on this passage if prevailing visibility is 10 miles and observer's height of eye is 7.0 metres. (5)

4. (a) A vessel is charted to carry a full cargo from Almeria, Spain to Halifax, Nova Scotia, Canada. The vessel will sail loaded to her summer marks and so cannot enter the North Atlantic Winter Zone until sufficient fuel, water and stores have been consumed.

Coastal passage distance Almeria to Strait of Gibraltar departure waypoint 180 miles.
Strait of Gibraltar waypoint 36°00′N 05°55′W.
Waypoint at which ship's freeboard will be at the winter marks 36°00′N 31°45′W.
Landfall position Nova Scotia coast 44°28′N 63°32′W.
Coastal passage distance, landfall to Halifax 11 miles.

Calculate the total distance of the rhumb line passages. (12)

(b) The charter agreement requires the ship to present itself ready to discharge the cargo at 0600 hrs, Standard Time, 26th February.

The ship will commence passage at 2300 hrs, Standard Time, 16th February.

Calculate the speed to be made good to comply with the charter agreement. (7)

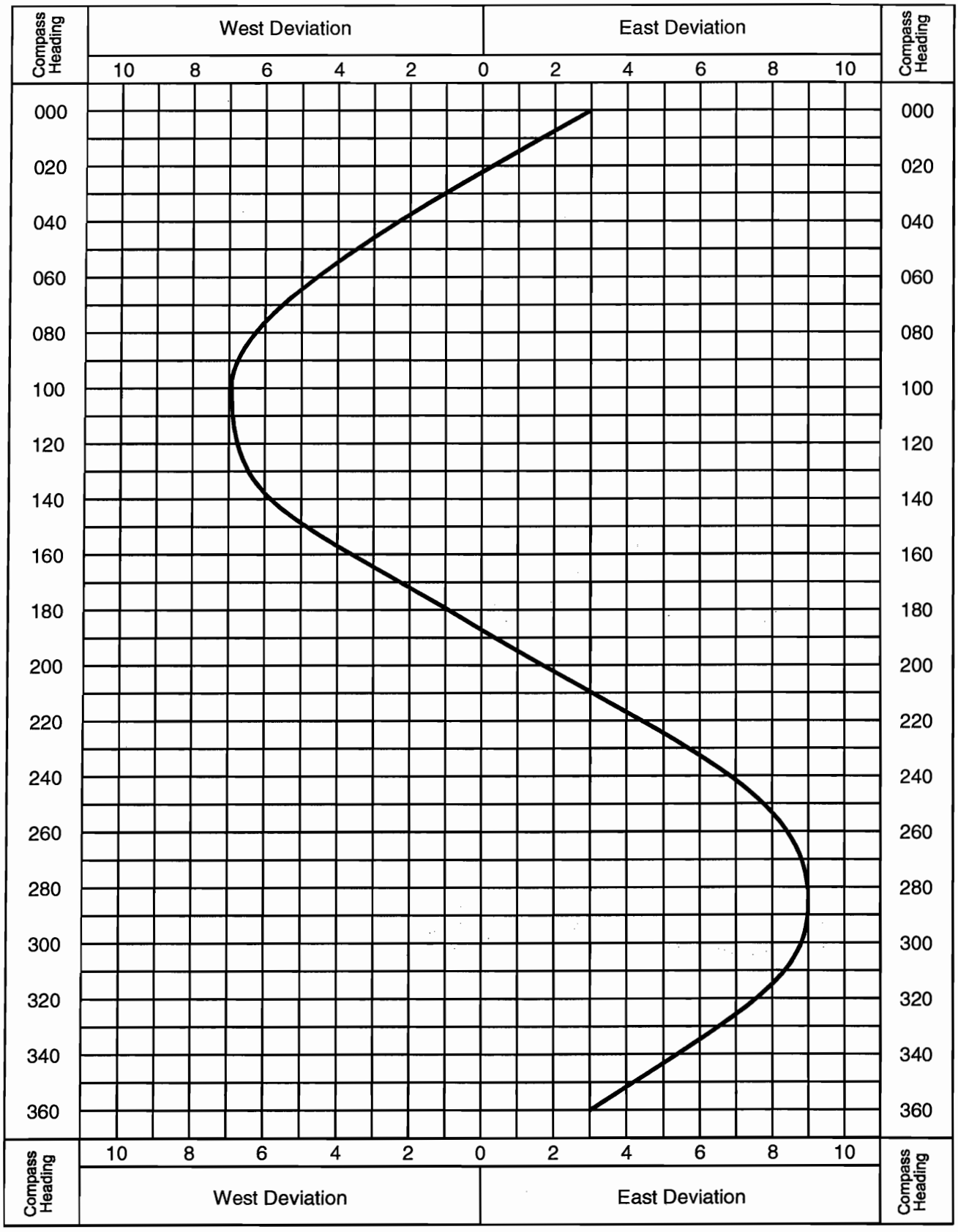
5. (a) In the early part of the 0400 hrs – 0800 hrs watch on 10th June, an OOW obtained a bearing of VENUS 077°G.

DR 10°30′S 82°30′E

Chronometer showed 10h 53m 22s.
Chronometer error 1m 11s slow.

Find the error of the gyro. (10)

(b) State FIVE instances when the OOW should check the gyro and magnetic compass error. (5)


Compass Heading
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East Deviation
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360

NOV 2012
DEV CURVE 16A
CITATION 5/38

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 2145 hrs Fl (4) 20s light (36°31′S 175°29′E) is observed bearing 197°C.

   At 2215 hrs Channel Island light (36°25′S 175°20′E) is observed bearing 242°C.

   Vessel steering 253°C, speed 14.0 knots.

   Tidal stream setting 086°T x 1.2 knots throughout.

   SE'ly wind causing 5° leeway throughout.

   Variation 19°E.

   (a) Find EACH of the following:

   (i) the position of the vessel at 2215 hrs; (10)

   (ii) the ETA when Channel Island light is abeam; (5)

   (iii) the distance off Channel Island light when abeam. (2)

   (b) When the vessel is in the position abeam of Channel Island light, the course will be altered to proceed to a position 36°29′.8S 174°51′.0E (WP1).

   Find EACH of the following:

   (i) the compass course to steer to WP1; (7)

   (ii) the ETA at WP1. (4)

2. A vessel is to enter the harbour of Darwin, Australia and pass under a railway bridge with a charted height of 9.4 metres. (Assume charted height measured from MHWS)
   The vessel's masthead is 9.9 metres above the waterline.

   The vessel arrives off the port at HW on the afternoon of the 30th March.

   State the earliest time that the vessel can pass under the bridge assuming a clearance of 1.0 metre being maintained. (12)

Section B

3. (a) State the factors to be considered when planning a landfall. (12)

(b) With reference to Chart 5138, determine the approximate range at which Channel Island light (36°25′S 175°20′E) may be sighted at night if prevailing visibility is 5.0 miles and observer's height of eye is 8.0 metres. (4)

(c) Chart Interpretation 5138

(i) Explain the meaning of the term WGS 84 POSITIONS indicated outside the top left margin. (2)

(ii) Identify the chart symbol in position 36°26′.5S 175°19′.9E. (2)

(iii) Identify the chart symbol in position 36°32′.9S 175°07′.0E. (2)

4. A vessel is to sail a rhumb line track for an ocean passage from Nauru Island to Honolulu, Hawaii, USA.

Departure Waypoint	00°32′S 166°56′E
Destination Waypoint	21°19′N 157°52′W

(a) Calculate the course and distance of the rhumb line track. (9)

(b) The Ocean Routeing charts for May indicate that the current will be favourable at 1.5 knots for the initial 3 days of the ocean passage. Thereafter the current will be adverse at 0.5 knots for the remainder of the ocean passage.

The ETD Nauru Island is 25th May at 0945 hrs, Standard Time and ship's speed is 13.5 knots.

(i) Calculate the total steaming time of the passage, to the nearest hour. (4)

(ii) Find the ETA, Standard Time, Honolulu. (4)

5. (a) An OOW observes the SUN bearing 248°G at sunset on the 23rd January whilst in DR position 18°58′S 116°15′E.

Find the error of the gyro compass. (9)

(b) The OOW on the bridge of a ship observes a crew member fall overboard from the port side of the focsle.

State TWELVE actions to the situation. (12)

HQS 2013
5140 DEV 18

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1700 hrs, a vessel steering 140°C, speed 11.5 knots, observed Stephens Island light (40°40'S 174°00'E) bearing 266°C.

   At 1800 hrs Cape Jackson light (41°00'S 174°19'E) was observed bearing 191°C.

   High Water Port Taranaki 1930 hrs, Springs.

   An Easterly wind was causing 4° leeway throughout.

   Variation 22°E.

   Find EACH of the following:

   (a) using ◇A◇, the position of the vessel at 1800 hrs; (15)

   (b) using ◇D◇, the EP at 1900 hrs; (8)

   (c) the relative bearing of the Brothers light (41°06'S 174°26'E) when abeam. (2)

2. (a) A chemical tanker is to enter the port of Yingkou, China (No.7394 ATT Pacific and Atlantic Oceans) on 30th June and the Master instructs the OOW to determine tidal predictions.

   Determine the HW and LW predictions for the port of Yingkou on 30th June. (12)

   (b) State the criteria used to determine which Standard Port a Secondary Port is linked to when the Part II correction tables were compiled. (1)

   (c) When the Standard Port and Secondary are not in the same country, state how the time difference between the two countries is accounted for within the ATT. (2)

Section B

3. Chart 5140

A vessel is undertaking the passage through Cook Strait (41°13'S 174°30'E) during the hours of darkness and is expected to be abeam of Ohau Point (41°14'S 174°39'E), distant 6.0 miles at 2020 hrs.

(a) State the primary method of position fixing that should be used whilst undertaking this night-time transit of the Cook Strait. (2)

(b) Explain why parallel indexing cannot be used as a primary means of position fixing. (2)

(c) State TWO means that would be used to cross check the primary means of position fixing. (2)

(d) (i) Determine the approximate range at which Ohau Point light may be sighted on this passage if prevailing visibility is 8.0 miles and observer's height of eye is 6.0 metres. (4)

(ii) Identify the chart symbol in position 41°28'.9S 174°39'.0E. (3)

(iii) State the purpose of the sectored red light of The Brothers light (41°06' 174°26'E). (3)

(iv) Sketch the symbol to indicate a drying height of 2.3 metres. (2)

4. At 1430 hrs, Standard Time, 26th July, a bulk carrier departs Timaru, New Zealand and sets a rhumb line course to Iquique, Chile.

Departure Position	44°24'S 171°19'E
Landfall Position	20°12'S 70°09'W

(a) Find the course and distance of the rhumb line track. (10)

(b) The ocean currents will affect the bulk carrier as follows:

- 1st 1500 miles – Favourable at 0.5 knot
- Subsequent 3000 miles – Adverse at 1.0 knot
- Remainder – No current

Bulk Carrier's speed 12.8 knots.

Find the ETA, Standard Time, Iquique at landfall position. (10)

5. With reference to the Bridge Procedures Guide:

(a) list TEN bridge checklists; (10)

(b) list SIX emergency checklists; (6)

(c) explain why teamwork is considered good management of bridge procedures. (6)

MARCH 2013
5047

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0630 hrs, 17th December, a vessel obtains the following observations:

Bull Point light	(51°12′N 04°12′W)	bearing 224°G
Foreland Point light	(51°15′N 03°47′W)	bearing 126°G
Scarweather light float	(51°27′N 03°56′W)	bearing 011°G

Find EACH of the following:

(a) (i) the position of the vessel at 0630 hrs; (8)

(ii) the error of the gyro. (2)

(b) Find the gyro course to steer at a speed of 14.5 knots to a position Lundy North light (51°12′N 04°41′W) bearing 172°G x 4.4 miles counteracting the effects of a tidal stream estimated to be setting as per ◇E◇ 5 hours before HW Avonmouth, springs. (7)

(c) At 0745 hrs Lundy North light is observed bearing 238°G x 12.0 miles.

Plot EACH of the following:

(i) the vessel's position at 0745 hrs; (3)

(ii) the DR position at 0745 hrs. (3)

(d) Find the actual set, drift and rate of the tidal stream experienced. (5)

2. (a) The *Admiralty Tide Tables* state that chart datum is "at or near the level of Lowest Astronomical Tide".

Explain the term *Lowest Astronomical Tide.* (3)

(b) A vessel, draught 7.8 metres, outward bound from Southampton is to pass over a shoal, charted depth 7.4 metres. An UKC of 1.0 m must be maintained at all times.

ETA at the shoal is 0245 hrs, 24th March.

Calculate whether it is safe to cross the shoal at this time. (9)

[OVER

Section B

3. (a) A passage plan should aim to establish the most favourable route while maintaining appropriate margins of safety and safe passing distances offshore.

State SEVEN factors that should be taken into account when deciding on an appropriate ocean passage route. (14)

(b) With reference to Chart 5047:

(i) state the meaning of the given light characteristic (vert) of Minehead harbour lights (51°13′N 03°28′W); (2)

(ii) using ◇P , find the direction and rate of the tidal stream between 1610 hrs and 1640 hrs on Saturday 7th February. (4)

4. In order to undertake a replenishment at sea, a fleet auxiliary vessel and a warship have agreed to rendezvous in position 00°00′ 00°30′E.

At 1730 hrs UT, 9th December the two vessels are in positions:

Warship	01°16′S 02°35′W
Fleet auxiliary vessel	00°00′ 03°05′E

(a) Calculate EACH of the following to make good the rendezvous:

(i) the course and distance for the warship; (7)

(ii) the course and distance for the fleet auxiliary vessel. (5)

(b) Calculate the speeds required for both vessels to make good the rendezvous position if the replenishment is to commence at sunrise on the 10th December. (8)

5. With reference to the Bridge Procedures Guide and MGN 315, Keeping A Safe Navigational Watch on Merchant Ships:

(a) state TEN of the identified requirements of a navigating officer performing a navigational watch; (10)

(b) state TEN circumstances when the Master must be called. (10)

MAY 2013
5046
O/C 7

NAVIGATION

Attempt ALL questions
Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0600 hrs, a vessel using the appropriate lane in the Traffic Separation Scheme, observed the Greenwich Buoy (50°25'N 00°00') bearing 298°C, distant 5.8 miles.

   Ship steering 075°C, speed 14.5 knots.

   At 0700 hrs the vessel is in position by GPS 50°25'.4N 00°27'.7E (Adjusted to Datum).

   Variation 1.5°W.

   (a) Find the tidal stream experienced between 0600 hrs and 0700 hrs. (12)

   (b) After appraising the traffic situation the Master of the ship instructs the Officer of the Watch to maintain the present ground track until the Bassurelle buoy (50°33'N 00'°58'E) is abeam to port and then alter course to make good a course of 053°T. The predicted tidal stream at the time of alteration of course is 022°T x 1.4 knots. Ship's speed 14.5 knots.

   Find EACH of the following to comply with the Master's instructions:

   (i) the time of the alteration of course; (6)

   (ii) the compass course required after the alteration of course. (8)

2. (a) On Worksheet Q2, assuming the sea level shown represents Mean Sea Level, mark and clearly label the relative levels for EACH of the following sea levels:

   - MLWS
   - MLWN
   - HAT

   (6)

   (b) On Worksheet, mark and clearly label the levels between which EACH of the following are measured:

   (i) Charted depth; (2)
   (ii) Air draught. (2)

   (c) Define EACH of the following terms:

   (i) MSL; (2)
   (ii) HAT. (2)

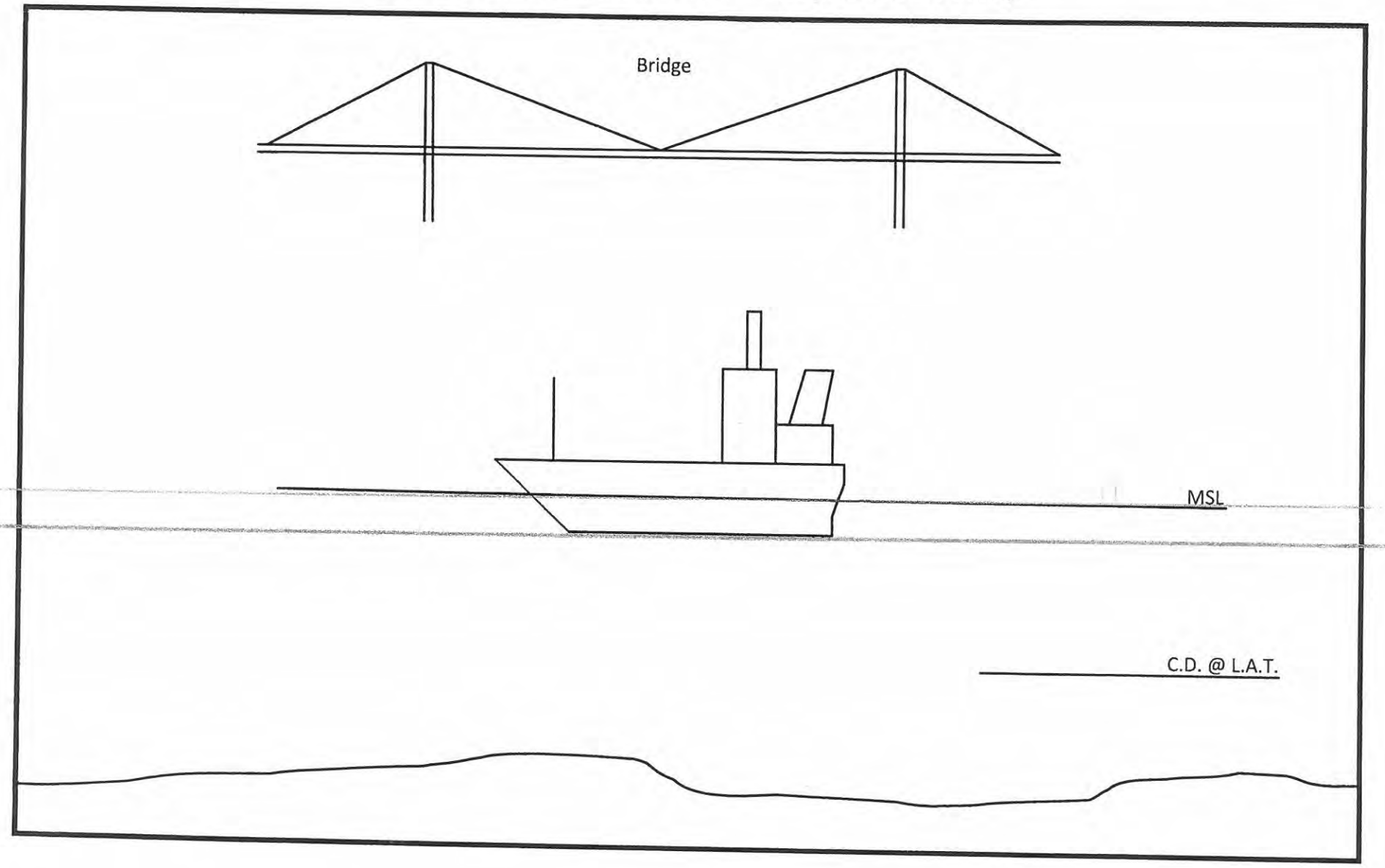
[OVER

034-83 NAVIGATION

Worksheet Q2

(This Worksheet must be returned with your answer book)

21 MAY 2013



Candidates Name.....

Examination Centre.....

Section B

3. (a) Explain the objective and rationale of ships' routeing, as outlined in the IMO publication *Ships' Routeing Guide* and *SOLAS Chapter V.* (6)

(b) State which vessels may use the Inshore Traffic Zone. (5)

(c) Explain EACH of the following terms:

(i) Traffic Lane; (2)

(ii) Precautionary Area; (2)

(iii) Inshore Traffic Zone; (2)

(iv) Separation Zone or Line. (2)

4. A ship is to sail a coastal passage from Lisbon, Portugal to a position off Gibraltar.

Departure Position Lisbon (WP1)	38°41'N 09°26'W
Off Cabo St.Vincent (WP2)	37°02'N 09°26'W
Entrance to Strait of Gibraltar TSS (WP3)	35°56'N 06°20'W
Off Gibraltar (WP4)	35°56'N 05°22'W

(a) Find the total distance from Lisbon to Gibraltar *by plane sailing.* (12)

(b) Current Atlas indicates the current will be favourable by 1.0 knot throughout the passage.

Ship's speed 11.7 knots.

Find the total steaming time for the passage. (4)

5. On the 31st December whilst on passage from Melbourne to Brisbane, Australia, the OOW observes the SUN setting on a bearing of 242°G, 225°C.

DR 31°55'S 152°55'E.

Variation 22°E.

(a) Find EACH of the following:

(i) the approximate UT of the SUN setting; (4)

(ii) the true bearing of the SUN; (6)

(iii) the gyro compass error; (2)

(iv) the deviation of the compass for the direction of the ship's head. (4)

(b) At the time of observation the ship's head by compass showed 040°C.

State EACH of the following:

(i) the deviation that the OOW should have expected using Deviation Card No.7; (1)

(ii) any action that may be required in light of the deviation obtained in Q5(a)(iv); (3)

(iii) FIVE instances when the OOW should check the gyro and magnetic compass error. (5)

JULY 2013
5048 Dev CURVE 16a

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1345 hrs, a vessel on passage from St George's Channel (52°10'N 06°08'W) to Cork (51°50'N 08°15'W) last observes Coningbeg light float (52°02'N 06°39'W) in diminishing visibility by radar bearing 152° Relative, range 8.8 miles.

   Vessel steering 253°C at 10.0 knots.

   At 1515 hrs, the vessel alters course to 325°C and reduces speed to 6.0 knots due to very poor visibility and traffic avoidance.

   At 1600 hrs, in order to regain the planned track after the traffic avoidance manoeuvre, the vessel alters course to 233°C.

   At 1700 hrs, the vessel adjusts course to 253°C and due to an improvement in visibility increases speed to 12.0 knots.

   The tidal atlas predicts the following tidal streams:

   Between 1300 hrs and 1500 hrs 244°T x 1.4 knots;
   Between 1500 hrs and 1700 hrs 222°T x 1.8 knots;
   Between 1700 hrs and 1900 hrs 233°T x 1.0 knot.

   Variation 5°W.

   State EACH of the following:

   (a) the latitude and longitude of the DR position at 1800 hrs; (17)

   (b) the latitude and longitude of the EP at 1800 hrs. (8)

2. (a) The vessel referred to in Q1, anchors in Ballycotton Bay (51°51'N 07°58'W) (No.754 ATT United Kingdom & Ireland) at 2000 hrs on 23rd March to seek shelter from a W'ly gale and to await orders from the Cork Harbour Pilots.

The vessel has a maximum draught of 8.7 metres and an UKC of 1.0 metre must be maintained at all times. The charted depth of the anchor position is 8.4 metres.

Find EACH of the following:

(i) the predicted UKC when the vessel anchors; (11)

(ii) the predicted UKC at the subsequent LW. (2)

(b) State the initial action, in light of the UKC found in Q2(a)(ii), that should be taken by the OOW. (2)

Section B

3. (a) State the factors to be considered when planning a landfall. (10)

(b) List FOUR publications that are relevant when planning a landfall. (2)

(c) With reference to Chart 5048:

(i) determine the approximate range at which Hook Head light (52°07'N 06°56'W) may be sighted at night if prevailing visibility is 10 miles and observer's height of eye is 8.0 metres; (5)

(ii) state the nature of the seabed in position 51°22'.2N 07°31'.2W; (3)

(iii) state the main constituent found on the seabed identified in Q3(c)(ii). (1)

4. At 2215 hrs, ship's time, 22nd November, whilst on passage from Manila, Philippine Islands (14°35'N 120°58'E) to Honolulu, Hawaii, USA (21°19'N 157°52'W), a ship is in position 14°11'N 137°18'E when a crew member suffers a serious eye injury which requires immediate medical attention.

The ship is keeping ship's time consistent with Zone Time.

The nearest superior medical services is in Apra, Guam Island, landfall position 13°26'N 144°39'E.

The ship immediately sets a rhumb line course at a maximum speed of 14.0 knots.

Calculate EACH of the following:

(a) by plane sailing, the course and distance to Apra; (10)

(b) the ETA, Standard Time, Apra. (6)

5. (a) For the purpose of familiarisation, list FIFTEEN items of bridge operational equipment which have to be studied and fully understood before keeping a navigational watch. (15)

(b) Outline the rationale and objective in determining the bridge composition in restricted waters. (5)

(c) State the required action by the OOW if he considers that a pilot has issued an incorrect rudder order. (3)

5138 OCT '13
DEV CARD (4)

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. (a) At 1800 hrs from a vessel at anchor north of Waiheke Island (36°48'S 175°06'E), the northern limit of the red sector of Maria Island light (36°43'S 175°00'E) bore 278°G and Horuhoru Rock (36°43'S 175°10'E) and Te Whau Pt (36°46'S 175°06'E) subtended an HSA of 112°.

State EACH of the following:

(i) the latitude and longitude of the vessel at 1800 hrs; (10)

(ii) the gyro error. (2)

(b) The vessel is to depart the anchorage at 2000 hrs and the passage plan is to pass 3.2 miles westwards of the Channel Island light (36°25'S 175°20'E).

Vessel's speed 12.5 knots.

Tidal stream was setting 000°T x 1.0 knot.

Height of observer 8.0 metres.

Prevailing meteorological visibility 20 miles.

State EACH of the following:

(i) the gyro course to steer at 2000 hrs to make good the required course; (5)

(ii) the estimated range that the Channel Island light will be first observed. (4)

(c) At 2100 hrs, Channel Island light bore 038°G, distant 8.5 miles.

State the actual set and rate of the tidal stream experienced since leaving the anchorage. (7)

2. (a) Explain, with the aid of a sketch, how the relative positions of the earth, sun and moon influence tidal ranges. (5)

(b) Explain the reliability of the tidal information contained in the Admiralty Tide Tables. (2)

(c) State the reasons for possible discrepancies between the published heights/times and actual heights/times experienced. (3)

(d) State the reason why the time of Low Water, instead of High Water, is used for the time base for the Southampton tidal curve. (2)

Section B

3. With reference to Traffic Separation Schemes:

   (a) state TWO methods to determine if the charted traffic separation schemes shown on charts have been adopted by the International Maritime Organisation; (2)

   (b) outline the justification of entering a traffic separation zone which the intended passage does not require the vessel to cross; (3)

   (c) explain the justification within the *International Regulations for the Prevention of Collision at Sea* that permits the master of a vessel to leave a traffic lane at an angle that was not as small an angle to the general direction of traffic flow as practicable; (3)

   (d) Datasheet Q3 shows FIVE proposed tracks.

   State, with reasons, the tracks that comply and tracks that do not comply with Rule 10. (15)

4. A ship is to undertake a voyage from Port San Luis, California, USA to Valdez, Alaska, USA.

   (a) Calculate, by rhumb line, the total distance between the two pilot stations.

   - Port San Luis pilot station 35°10'N 120°45'W
   - Landfall position Alaska 60°05'N 145°10'W
   - Additional coastal passage to Valdez pilot station 35 miles. (10)

   (b) Appraisal of the ocean current charts indicates that the current will be adverse at 1.0 knot for the first 1200 miles of the passage and favourable at 0.5 knot for the remainder of the passage.

   Ship's speed 9.5 knots.

   Find the ETA, Valdez pilot station, to the nearest hour, Standard Time, Alaska if the Port San Luis pilot will be disembarked at 0630 hrs, Standard Time, 31st December. (8)

5. (a) During evening twilight on 23rd January, the OOW observed the planet Venus bearing 275°G, 282°C.

DR 46°12'S 162°39'W.

Chronometer showed 7h 11m 42s.
Chronometer error 1m 5s slow.

Variation 5°E.

Find EACH of the following:

(i) the error of the gyro; (10)

(ii) the deviation for the direction of the ship's head. (5)

(b) At the time of observation the ship's head by compass showed 040°C.

Using Deviation Card No. 4, state the deviation that the OOW should have expected and any subsequent actions, in light of the celestial observation, that should be taken by the OOW. (4)

5047 - DEC 10
NOVEMBER 2013

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 2100 hrs, a vessel west of Lundy Island (51°11'N 04°40'W), steering 030°C, speed 15.0 knots, observes Lundy south light (51°10'N 04°39'W) becoming obscured bearing 070°C.

   At 2140 hrs the same light becomes visible bearing 167°C.

   Tidal stream 072°T x 1.8 knots.

   Leeway 3° for a NW'ly breeze.

   Variation 6°W.

   (a) State EACH of the following:

   (i) the latitude and longitude of the vessel at 2140 hrs; (10)

   (ii) the latitude and longitude of the EP at 2200 hrs. (6)

   (b) The master instructs the OOW to alter course and speed at 2200 hrs so as to arrive at a position 3.0 miles due west of the Swansea and Neath Pilot Station (51°32'N 03°58'W) 30 minutes before pilot boarding at 0100 hrs.

   State EACH of the following:

   (i) the compass course to steer and the vessel's speed required to comply with the master's instruction assuming a tidal stream was setting 085°T x 1.8 knots throughout and allowing 3° leeway for a NW'ly breeze; (10)

   (ii) the compass bearing of Helwick light float (51°31'N 04°26'W) when abeam. (2)

2. A vessel with draughts of F:5.3m, A:6.0m is due to arrive at the Cape Cod Canal West Entrance (No. 2787 ATT Pacific and Atlantic Oceans), charted depth 6.0 metres, on the morning of the 7th January.

   The company policy is that a minimum UKC of 10% of the maximum draught is maintained.

   Find the earliest time on the PM flood tide that the ship can safely enter the canal. (12)

[OVER

Section B

3. (a) Explain how the use of Admiralty Chart 5500, Mariner's Routeing Guide, English Channel and Southern North Sea can aid an OOW to plan a passage through the English Channel. (10)

(b) Outline the details contained in the Tidal Stream Atlas that would be used in the appraisal stage of a passage plan. (4)

(c) With reference to Chart 5047:

(i) state in full the charted abbreviation for Bull Point light (51°12'N 04°12'W); (4)

(ii) using find the direction and rate of the tidal stream between 2310 hrs and 2340 hrs on 22nd February. (5)

4. A ship is to sail, using rhumb line tracks, a passage from Pensacola, Florida, USA to Cristobal, Republic of Panama. The following way points are used:

- Departure Pensacola WP1: 30°20'N 87°13'W
- WP2: 22°48'N 87°13'W
- WP3: 16°50'N 79°55'W
- Landfall Cristobal WP4: 09°25'N 79°55'W

(a) Calculate the total distance of the passage. (12)

(b) The Ocean Routeing chart for July indicates that the current will be adverse at 0.75 knots throughout the passage.

Ship's speed 13.2 knots.

Find the ETA, to the nearest hour, Standard Time, Cristobal if time of departure WP1 is 2200 hrs, ST, 4th July. (6)

5. (a) The Bridge Procedures Guide gives guidance on ice and contains a Bridge Checklist 'Navigation in Ice'.

State FOUR checks, particularly pertaining to ice navigation, which should be undertaken by an OOW when navigating in ice. (4)

(b) List TWELVE other Bridge Checklists as contained in the Bridge Procedures Guide. (12)

(c) With reference to SOLAS Chapter V, outline the reporting requirements for severe ice accretion. (3)

March 10

Q1 2330 50-43.4N 000-50.2E 2230 50-48.8N 001-02.8E time of transit 0039, brg 313.5C

Q4. 510.6' 10th Dec 19h 51m

Q5 amplitude 267.5 gyro error 1.5 low deviation 9.5 east

July 2010

Q1 0630 40-17.7S 174-18.4E Gyro Co 168 Set 325 x 1.2kts (2.6) CPA 0917, 2.7'

Q2 Maximum Ht of Tide req'd 2.0 or 2.1, latest time 0522hrs

Q5. Deviation 2 West

October 10

Q1 51-36.5N 004-50.5W Deviation 3° East Compass Co 162.5, est st time 2hr 43m, light will be first seen at luminous range 13.7'

Q2 2130 UKC is 12.2m, UKC at LW is 9.2m

Q4. 6233' 12th October 01-15

December 10

Q1 Compass Co 044.5 req'd speed 9.8kts, set 080t x 1.8kts 50-43.4N, 000-50.2E

Q2 23rd Feb, LW 0153 0.6m HW 0815 1.4m, LW 1435 0.7m, HW 2039 1.2m

Q4. 4386' 6th May 08h 38m

Febuary 2011

Q1 Gyro 030, actual set 250t x 3.7kts. CMG 020 x 7.9 kts

Q2 earliest time 1902hrs 13th feb, latest time 0159hrs 14th feb

Q4. 111 x 110.6 16th May 17h 37m 16th May 15h 47m

March 2011

Q1 35-29.4S 175-32.5E 293G 1937hrs 36-36.4S 174-59.4E 236G 9.7 kts

Q2 2040hrs

Q4. 256 x 6971' 17th Aug 00h 46m Q5. 0.1 West

Q5. Deviation 5.1E, card 7W

June 2011

Q1 50-00N 002-49.2W, 50-05.4N 003-39.0W, 50-05.5N 003-29.4W

Q2 3.1m clearance

Q4. 299.2' 35h 00m Q5 9.3 East

Q5. Deviation 0.1 west

July 2011

Q1 119 x 4.8' 6 west 194 compass 2355hrs

Q2 echo sounder 4.6m

Q4. 097 x 5866 26th March 06h 44m

October 2011.

Q1. 49-56.0N 002-25.0W 49-57.5N 002-19.6W 032G x 11.4kts

Q2. 11.4m

Q4. 199 x 170.4 15.04kts

December 2011.

Q1. 51-44.6N 007-56.5W 066 x 9.2 (7.4kts) 0525hrs 330C 330T-330C

Q2. 1743

Q4. 8 days 01hr 2196.5'

Q5. 9.1 east, 2 hours

February 2012

Q1. 1430- 50 19.6N 000 02.6E 1600DR 50 29.7N 000 36.5E EP 50 29.4N 000 33.7E

1700 EP 50 29.4N 000 33.7E 083 true

Q2 0008-0605-1235-1841 3.1, 0.4, 3.4, 0.55

Q4. 307 true x 430.5 ETA 1st may 1749

March 2012

Q1. 51-28.8N 004-02.2W, Deviation 3 East, 238.4 (C) , ETA 1816, 346 relative

Q2. 0336, 16th March

Q4. 303.8(T) x 503.3, 20.97kts, set 270(T) x 1.22kts

May 2012

Q1. 50-43.1N 000-53.6E, DR 50-36.5N 000-29.4E, EP 50-38.2N 000-32.6E, 040 x 2.7(1.1kts)

Q2. 1529hrs. Q4. 256.2deg x 586.9, 23.5 kts, set 090 x 38' 1.52kts

July 2012

Q1. 51-23.0N 007-50.4W, 51-26.0N 007-53.8W, 357 Co

Q2. 4.8m, 2.34m at 0903hrs

Q4. 053.9 x 419.2' 18.23kts, set 090 x 1.08kts

Q5. Dev 7.1deg West

October 2012

Q1. 41-51.5 S 174-17.2 E 031.4 Co 301.4deg Beam, 11.4kts

Q2. Not safe, 1405hrs

Q4. 2990' 13.11kts Q5. 1.9deg High

November 2012

Q1. 36-25.2 S 175-26.2E 2239hrs, 1.6', 227.7 Co, 0035hrs

Q2. 1927hrs, Q4. 057.7deg, x 2453', 178hrs, 31st 2100hrs

Q5. 1.4 deg Low

February 2013

Q1. a) 40-15.5S, 174-23.2E, b) 41-01.1S, 174-28.6E, c) 090 Rel

Q2. 0440, 1032, 1721, 2.6m, 0.2m, 4.85m Q4. 076T x 6132.9', 15th August, 1305hrs

[FEB 2015]
5048
DEV. CARD 10

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. (a) At 1900 hrs, during restricted visibility, a vessel on passage to Waterford Harbour (52°11'N 06°57'W) observed Capel Island (51°53'N 07°51'W) by radar range 4.6 miles.

At 1930 hrs, during an improvement in visibility, Mine Head light (52°00'N 07°35'W) was observed bearing 349°C.

Vessel steering 060°C at 13.8 knots.

A tidal stream was setting 050°T, rate 1.2 knots.

A southeasterly wind was causing 3° leeway.

Variation 5°W.

State EACH of the following:

(i) the position of the vessel at 1930 hrs; (10)

(ii) the course and speed made good between 1900 hrs and 1930 hrs. (3)

(b) At 1950 hrs, the Master instructs the OOW to make good a track to be in position with Hook Head lighthouse (52°07'N 06°56'W) bearing due East and Pilot Lookout lighthouse (52°09'N 06°59'W) bearing due North at 2130 hrs.

Find EACH of the following:

(i) the compass course to steer and the vessel's speed required to comply with the Master's instruction assuming a tidal stream was setting 055°T x 1.0 knot throughout and due to an increase of wind strength, the leeway allowance is to be increased to 5°; (9)

(ii) the speed to make good. (3)

19½

2. A vessel is to depart on the flood tide that commences evening 10th May at Monggum P'o (No.7468 ATT Pacific & Atlantic Oceans) and is required to cross a shoal, charted depth 8.2 m.

Draught on departure 8.2 m for'd, 8.9 m aft.

(a) Calculate the earliest time that it is safe to cross the shoal allowing 10% of maximum draught for UKC plus additional 0.5 m allowance for squat. (13)

(b) State any additional specific information that should be brought to the attention of the Master. (2)

Section B

3. (a) Outline the objective of the third stage (Execution) of a passage plan, listing factors that should be considered. (10)

   (b) Explain EACH of the following:

      (i) why the presence of non-navigational shore lights should be considered when determining the planned passage; (3)

      (ii) why the proximity of fishing grounds should be considered when determining the planned passage. (2)

   (c) Explain EACH of the following terms:

      (i) wheel over position; (3)

      (ii) cross track limit; (2)

      (iii) abort position. (2)

4. The following table is an extract from a ship's log book:

Date	Ship Time	Log Book Entry
31st May	1200 hrs	DR Position 01°47'S 07°59'W Observed position 01°47'S 07°34'W
1st June	1200 hrs	DR Position 02°20'N 12°54'W Observed position 02°20'N 13°13'W

   (a) Find, by Plane sailing, the course and distance made good between 1200 hrs 31st May and 1200 hrs 1st June. (9)

   (b) At 0200 hrs 1st June, ship's time, the clocks were retarded by 1 hour to allow for the change in time zones.

   Find EACH of the following:

      (i) the speed made good between 1200 hrs 31st May and 1200 hrs 1st June; (3)

      (ii) the set and rate of the current experienced between 1200 hrs 31st May and 1200 hrs 1st June. (5)

5. (a) On the 23rd January, a vessel on passage from Narvik, Norway to Dundee, Scotland, the OOW observes the sun rising bearing 131°G.

DR position 58°57'N 00°56'E.

Calculate the error of the gyro. (9)

(b) With reference to Bridge Procedures Guide:

(i) state TWELVE actions required to be carried out by the OOW when he observes a crew member fall overboard from the starboard side of the focsle; (9)

(ii) list SIX actions required by the OOW when heavy weather is forecasted. (3)

MARCH 2015
5056
DEV CAND 8

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. A vessel bound for the Needles pilot station (50°38'N 01°39'W) had been unable to fix the position for 4 hours due to navigational equipment failure and overcast conditions.

   At 1910 hrs, in DR position 50°02'.0N 01°58'.0W, celestial observation of planet Jupiter gave an intercept of 1.8 miles Away, bearing 203°T.

   At 2140 hrs, a white light flashing every 10 seconds was observed bearing 4 points on the port bow.

   Vessel steering 010°C at 9.0 knots throughout.

   A tidal stream was estimated to be setting 265°T x 2.0 knots throughout.

   A westerly wind was causing 3° leeway throughout.

   Variation 4°W.

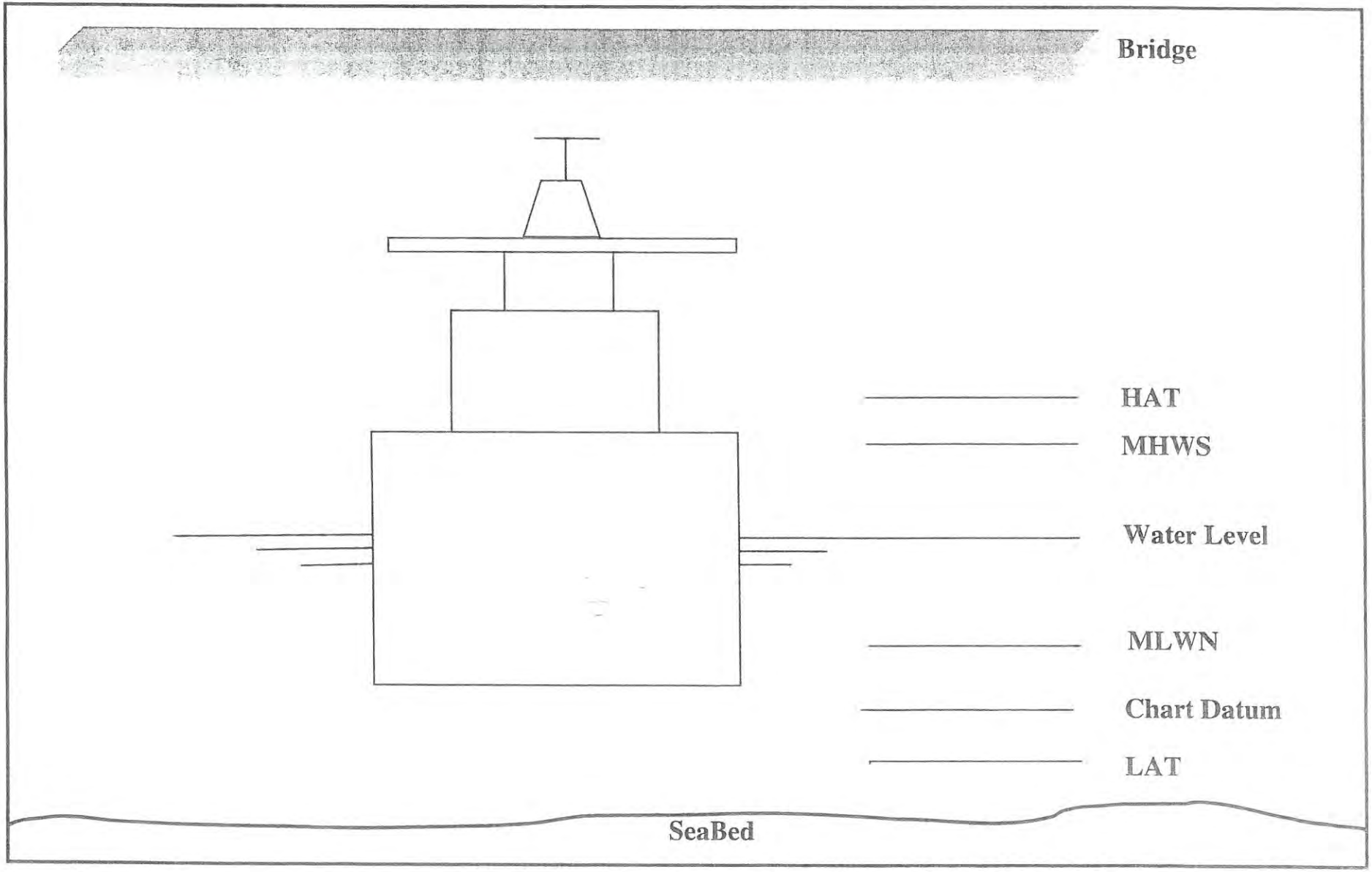
   State EACH of the following at 2140 hrs:

   (a) the position of the vessel; (16)

   (b) the compass course to steer at a speed of 9.0 knots to the Needles pilot station, assuming that the tidal stream and leeway remain constant; (7)

   (c) the ETA at the Needles pilot station. (4)

(This Worksheet must be returned with your answer book)



Candidate's Name.....

Examination Centre.....

2. (a) On Worksheet Q2(a) mark and clearly label the levels between which EACH of the following are measured:

(i) Height of Tide; (2)

(ii) Charted Sounding; (2)

(iii) Charted Height of Bridge. (2)

(b) A vessel with a draught of 8.7 metres is bound for Milford Haven. Due to adverse meteorological conditions the ship is delayed and may not be able to make the planned arrival time of HW on the morning of 27th April.

Calculate the latest time on the subsequent ebb tide that the vessel can cross a shoal with a charted depth of 6.6 metres whilst maintaining an UKC of 2.0 metres. (7)

Section B

3. SOLAS Chapter V requires a Master to have in place a Voyage Plan prior to the commencement of a coastal passage from Tor Bay Deep-Sea Pilots (50°25'N 03°27'W) to Weymouth (50°37'N 02°27'W).

   (a) Outline the type of information that could be extracted from the *Sailing Directions* to assist the OOW in appraising this passage. (6)

   (b) State FOUR factors to be considered when undertaking the *planning* stage to determine an appropriate distance to pass off a headland. (4)

   (c) State FOUR factors to be considered when undertaking the *monitoring* stage when determining the frequency of position fixing. (4)

   (d) The local radio has issued the following weather forecast for the area around Bill of Portland (50°31'N 02°27'W): Wind S'ly F 5/6, intermittent drizzle, visibility moderate to poor.

   Draught of vessel: 4.5 metres.

   Vessel is categorised a *low powered vessel*.

   Appraise EACH of the following passage plan options, explaining THREE factors that are relevant to EACH option:

   (i) passing to the West of The Shambles Bank (50°31'N 02°22'W); (3)

   (ii) crossing over The Shambles Bank; (3)

   (iii) passing to the East of The Shambles Bank. (3)

   (e) State the preferred option to be recommended to the Master for the given conditions, from the options appraised in Q3(d). (1)

4. The following table is an extract from a ship's log book:

Date	Ship Time	Log Book Entry
14th January	1200hrs	DR position 31°05'N 175°43'W Observed position 31°28'N 175°41'W
16th January	1200hrs	DR position 38°52'N 178°22'E Observed position 39°14'N 178°22'E

During the evening of the 14th January, the clocks were advanced by 24 hours to allow for the change in time zones.

Find EACH of the following:

(a) the course and distance made good between 1200 hrs 14th January and 1200hrs 16th January; (9)

(b) the speed made good between 1200 hrs 14th January and 1200 hrs 16th January; (3)

(c) the set and rate of the current experienced between 1200 hrs 14th January and 1200 hrs 16th January. (5)

5. (a) At approximately 1535 hrs, ship's time, 17th September, a bearing of the SUN, 256°C was obtained.

DR position 52°36'N 14°15'W.

Chronometer showed 4h 34m 17s.
Chronometer error 13 seconds slow.

Variation 11°W.

Calculate the deviation of the compass for the ship's head. (15)

(b) At the time of observation the ship's head by compass showed 010°C.

Using Deviation Card No. 8, state the deviation that the OOW should have expected and any subsequent actions, in light of the celestial observation, that should be taken by the OOW. (4)

June 2015
5047
Curve

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 0345 hrs, a ship outward bound from Port Talbot disembarked the pilot at the pilot station (51°29'N 04°00'W).

   The ship was to make WP1 51°03'.2N 04°42'.4W.

   Variation 6°W.

   (a) State the compass course to steer at 15.8 knots to make WP1 assuming the tidal stream was setting 100°T x 2.4 knots throughout and allowing for a strong northwesterly wind causing 4° leeway. (9)

   At 0455 hrs, Bull Point light (51°12'N 04°12'W) was observed on the beam, range 6.6 miles.

   (b) State the actual set and rate of tidal stream experienced. (8)

   Due to a concentration of vessels engaged in fishing, the ship is unable to immediately return to the planned track.

   (c) State the time and distance off Hartland Point light (51°01'N 04°31'W) when the ship is at its CPA. (5)

   (d) State the probable reason(s), for *this* passage, that the predicted and actual tidal streams are different. (4)

2. (a) The *Admiralty Tide Tables* state that chart datum is "at or near the level of Lowest Astronomical Tide".

Explain the term *Lowest Astronomical Tide.* (2)

(b) Explain the reliability of the tidal information contained in the Admiralty Tide Tables. (2)

(c) With reference to the tidal predictions for Southampton, explain EACH of the following:

(i) the small circle symbol beneath the date and day 14th April; (1)

(ii) the significance of this symbol relative to the tidal characteristics. (2)

(d) A vessel with a draught of 5.4 metres is to pass over a shoal, charted depth 2.9 metres, at Prince Rupert (No.8850 ATT Pacific and Atlantic Oceans).

The vessel's ETA at the shoal is 0740 hrs, Standard Time, 19th August.

Calculate if it is safe to cross the shoal whilst maintaining an UKC of 1.0 metre. (7)

Section B

3. (a) With reference to Admiralty Chart 5500, Mariner's Routeing Guide, English Channel and Southern North Sea:

(i) explain the purpose of the co-tidal and co-range chartlet; (2)

(ii) state the information that the Maritime Radio Services broadcast for vessels in English and French coastal waters; (2)

(iii) state the publication that should be consulted for details and frequencies relating to Maritime Radio Services broadcasts; (2)

(iv) outline the rationale and objectives of the guidance given regarding Passage Planning for Deep Draught Vessels. (7)

(b) Outline the contents in the Tidal Stream Atlas that would be used in the appraisal stage of a passage plan. (4)

(c) With reference to Chart 5047:

(i) using Datasheets Q3(c)(i)(1) and Q3(c)(i)(2), determine the approximate range at which Hartland Point light (51°01'N 04°31'W) may be sighted at night if prevailing visibility is 5 miles and observer's height of eye is 7.5 metres; (5)

(ii) state the nature of the seabed in position 51°17'.3N 04°52'.4W. (3)

4. At 1600hrs, ship's time, 30th July, a ship bound from Tampa, Florida, USA to NW Europe is in position 36°58'N 47°36'W. The ship is keeping ship's time consistent with Zone Time.

Due to a serious injury sustained by a crew member, the Master diverts the ship to San Miguel Island, Azores, and increases to the maximum speed of 15.5 knots.

Landfall position San Miguel Island 37°50'N 25°50'W.

Calculate EACH of the following:

(a) the course and distance to the landfall position; (10)

(b) the ETA, to the nearest hour, Standard Time, at the landfall position. (5)

5. (a) On the 10th December whilst on passage from Visakhapatnam, India to Penang, Malaysia, the OOW observes the SUN rising on a bearing of 112°G. The vessel is keeping UT +6.

DR 13°24'N 89°45'E.

Calculate EACH of the following:

(i) the predicted ship's time of sunrise; (4)

(ii) the error of the gyro compass. (6)

(b) With reference to The Merchant Shipping (Distress Signals and Prevention of Collision) Regulations:

(i) state the reason that every vessel shall at all times proceed at a safe speed; (2)

(ii) explain why EACH of the following factors are to be considered in determining a safe speed:

(1) at night the presence of background light such as from shore lights or from back scatter of her own lights; (5)

(2) the more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity. (3)

JULY 2015
5048
Gyro

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 2200 hrs, 23rd March, a vessel steering 060°G, speed 10.0 knots, observes Old Head of Kinsale light (51°36'N 08°32'W) bearing 257°G and Roche's Point light (51°48'N 08°15'W) changing from red to white bearing 014°G.

   At 2330 hrs, 23rd March, the vessel observes Roche's Point light changing from white to red and at the same time Ballycotton Island light (51°50'N 07°59'W) bore 002°G.

   Find EACH of the following:

   (a) (i) the gyro error; (2)

   (ii) the position of the vessel at 2200 hrs; (3)

   (iii) the position of the vessel at 2330 hrs; (3)

   (iv) the set, drift and rate of the tidal stream experienced between 2200 hrs and 2330 hrs. (8)

   (b) The vessel is inward bound for Dungarvan Harbour (52°04'N 07°34'W) and is programmed to embark the pilot at 0230 hrs, 24th March.

   The Master instructs the OOW to make good a track to be in a position due east of Helvick Head (52°03'N 07°32'W), distant 4.0 miles, 30 minutes before the agreed pilot boarding time.

   Find the gyro course to steer and the required steaming speed to comply with the Master's instruction assuming a tidal stream setting 220°T x 1.0 knot throughout and, due to a freshening southeasterly wind, a 2° allowance for leeway. (12)

2. A vessel has to cross a shoal, charted depth 6.8 metres, at the harbour of Puerto Bolivar, Ecuador (No.9545 ATT Pacific & Atlantic Oceans).

   The vessel's draught is 7.7 metres and an UKC of 1.0 metre must be maintained.

   ETA at the shoal is 1830 hrs, Standard Time, 23rd April.

   Calculate the earliest predicted time that the ship can cross the shoal. (12)

[OVER

Section B

3. With reference to Traffic Separation Schemes:

(a) state the THREE reasons for the introduction of ship routeing measures as outlined in the Bridge Procedures Guide; (6)

(b) state the publication other than the *Ship's Routeing Guide* that can be used to determine if a particular Traffic Separation Scheme has been adopted by the IMO; (2)

(c) explain the justification within the *International Regulations for the Prevention of Collision at Sea* that permits the vessel to deviate from the provisions of Rule 10; (3)

(d) state which vessels may use the Inshore Traffic Zone; (5)

(e) explain EACH of the following terms:

(i) Precautionary area; (2)

(ii) Separation line; (2)

(iii) Inshore Traffic Zone. (2)

4. At 0800 hrs, ST, 17th March, a ship departs St. Valery-sur-Somme, France bound for Salcombe, England.

Pilot disembarkation position	50°14'N 01°37'E
Pilot station Salcombe	50°14'N 03°46'W

(a) Calculate the course and distance of the rhumb line track. (4)

(b) For the passage, the tidal stream atlas indicates the following:

• 1st hour of passage	slack water
• Subsequent 5 hrs	adverse 1½ knots
• Next hour	slack water
• Remainder of passage	favourable 1 knot

Ship's speed 18.0 knots.

Calculate the ETA, Standard Time, Salcombe pilot station. (8)

(c) State SIX properties of a Mercator chart. (6)

5. (a) On the 10th December whilst on passage from Burnie, Tasmania to Newcastle, New South Wales, the OOW observes the SUN setting on a bearing of 240°G. The vessel is keeping UT +10.

DR 39°45'S 147°20'E.

Calculate EACH of the following:

(i) the predicted ship's time of sunset; (4)

(ii) the error of the gyro compass. (6)

(b) With reference to Bridge Procedures Guide:

(i) state the TWO types of official electronic charts in use; (2)

(ii) outline the differences between the TWO types of chart formats. (8)

OCT 2013
CHART 5046
DEV CARD N°15

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1340 hrs, 10th October, a vessel steering 235°T is in position Dungeness lighthouse (50°55'N 00°59'E) bearing 000°T, distant, 8.4 miles. Log reading 89.9.

   Log Reading Instrument set to read 'water track' distance throughout.

   At 1420 hrs an engine and mains power failure is experienced. Log reading 100.3.

   The Master immediately orders the OOW to steer 200°C to take the vessel out of the traffic lane whilst checks of the navigational equipment status are made.

   At 1446 hrs, log reading 105.5, the ship is no longer making way.

   At 1500 hrs mains power is fully restored.

   Deviation Card No. 15.

   Variation 1°W.

   (a) State the DR position of the vessel at 1446 hrs. (10)

   (b) At 1510 hrs checks of the navigational equipment are completed and Royal Sovereign Tower (50°43'N 00°26'E) observed by radar bearing 309°T, distant 13.7 miles. The Chief Engineer advises the Master that the estimated time for restoration of main engine power is 1840 hrs.

   Using ◇B◇, state the EP at the estimated time of the ship being able to resume passage. (10)

   (c) On completion of the engine repairs the Master orders the OOW to steer 255°T for the vessel to continue the passage in the traffic lane.

   State the compass bearing of Royal Sovereign Tower when abeam. (7)

2. A vessel is to proceed to the repair berth at Glasgow, UK (No.407 ATT United Kingdom & Ireland). The vessel is to berth at high water on the morning of 26th February.

(a) Calculate the time and height of high water at Glasgow for this tide. (5)

(b) The vessel is expected to be alongside the repair berth until 1500 hrs on 1st March.

Charted depth of water at the repair berth is 6.5 metres.

Vessel's draught F 4.7m A 6.3m.

The Master requires the predicted minimum UKC of the vessel and the time that this will occur during the vessel's anticipated repair period.

Calculate the required tidal information that the Master requires. (8)

Section B

3. With reference to Traffic Separation Schemes:

   (a) state FOUR vessels which may use the Inshore Traffic Zone; (4)

   (b) outline the justification of entering a traffic separation zone which the intended passage does not require the vessel to cross; (3)

   (c) Datasheet Q3(c) shows FOUR proposed tracks. State, with reasons, the tracks that comply and tracks that do not comply with Rule 10. (16)

4. At 0700hrs, Standard Time, 27th January, a vessel departs Mount Maunganui, North Island, New Zealand and sets a rhumb line course to Mazatlan, Mexico.

   Departure position: 37°39'S 176°11'E
   Landfall position: 23°11'N 106°26'W

   (a) Calculate the course and distance of the rhumb line track. (10)

   (b) Appraisal of the ocean current charts indicates the following:

   1000 miles of the ocean passage will have the benefit of a ½ knot current;

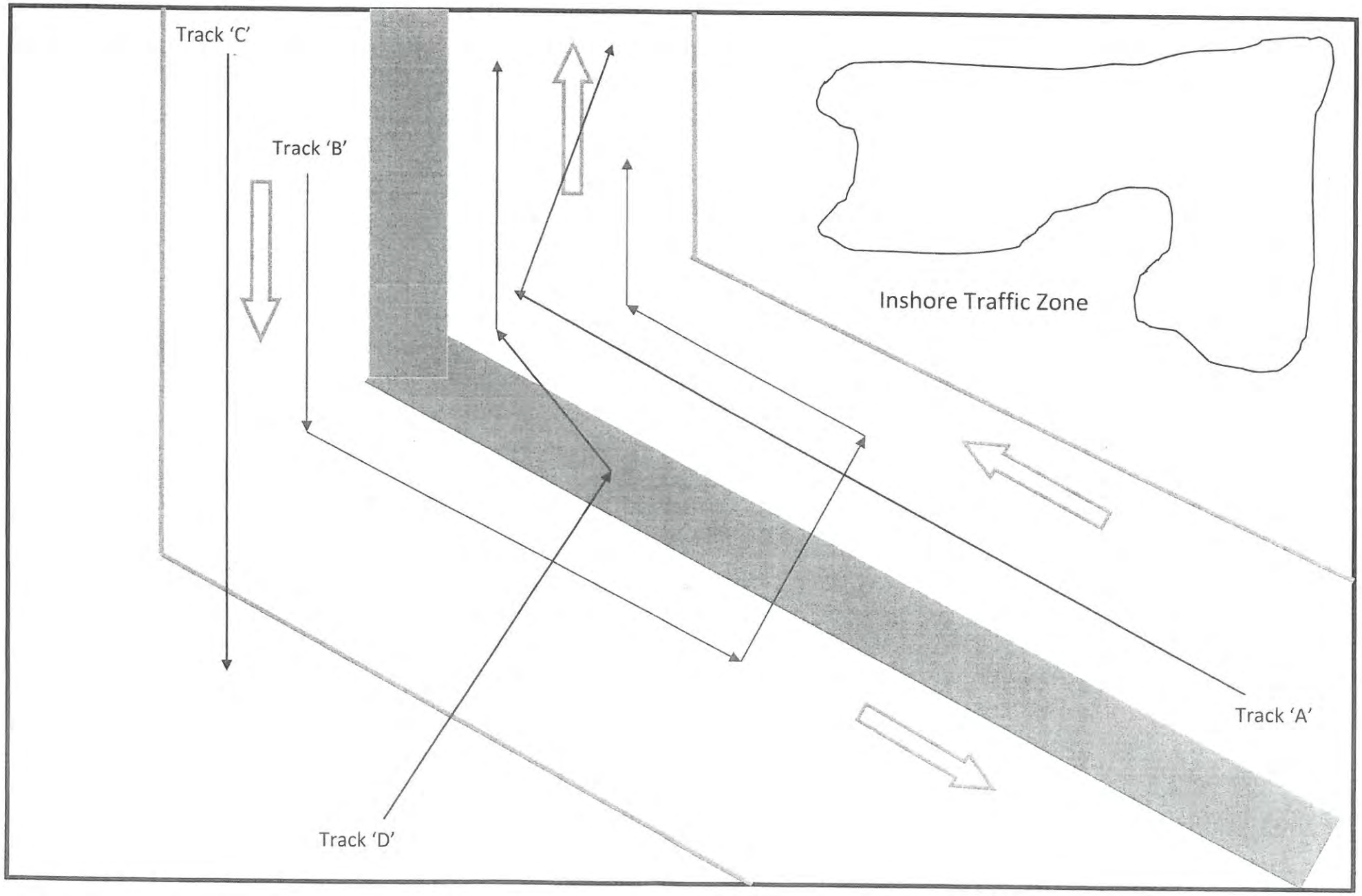
   1000 miles of the ocean passage will have the benefit of a 1 knot current;

   The 500 miles required to cross the equatorial counter current will have a ½ knot adverse effect;

   The remainder of the voyage will have no significant ocean current influence.

   Vessel speed 19.0 knots.

   Calculate the ETA, to the nearest hour, Standard Time, at Mazatlan landfall position. (7)


Track 'C'
Track 'B'
Inshore Traffic Zone
Track 'A'
Track 'D'

5. (a) With reference to the vessel in Q1 and the Bridge Procedures Guide:

In the event of an engine and main power failure, state EACH of the following:

(i) the immediate action to the situation by the OOW; (7)

(ii) EIGHT items of navigational equipment that the OOW should personally check after resumption of power. (8)

(b) With reference to boarding arrangements for pilots:

(i) state the maximum freeboard for using a pilot ladder by itself; (1)

(ii) state the required arrangements when the freeboard is greater than the maximum freeboard for using a pilot ladder and no side door or hoist is available. (4)

DECEMBER 2015
5047
DEV. CARD N° 7

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets

The positions given in brackets after the names of prominent points are approximate to 1' and are to be used for identification purposes only.

Section A

1. At 1020 hrs from a vessel heading into Swansea Bay (51°32'N 03°54'W), Helwick light float(51°31'N 04°26'W) was observed at a range of 4.2 miles.

   The vessel was steering 075°C at speed 9.0 knots.

   At 1140 hrs Scarweather light float (51°27'N 03°56'W) was observed at a range of 8.7 miles.

   The tidal stream was setting

   4 hours before HW Avonmouth, neaps.

   A northerly wind was causing 5° leeway.

   Variation 5.5°W.

   Find EACH of the following:

   (a) the position of the vessel at 1140 hrs; (10)

   (b) the position of the vessel at 1020 hrs; (5)

   (c) the time and distance off when the next South Cardinal buoy is abeam to starboard; (8)

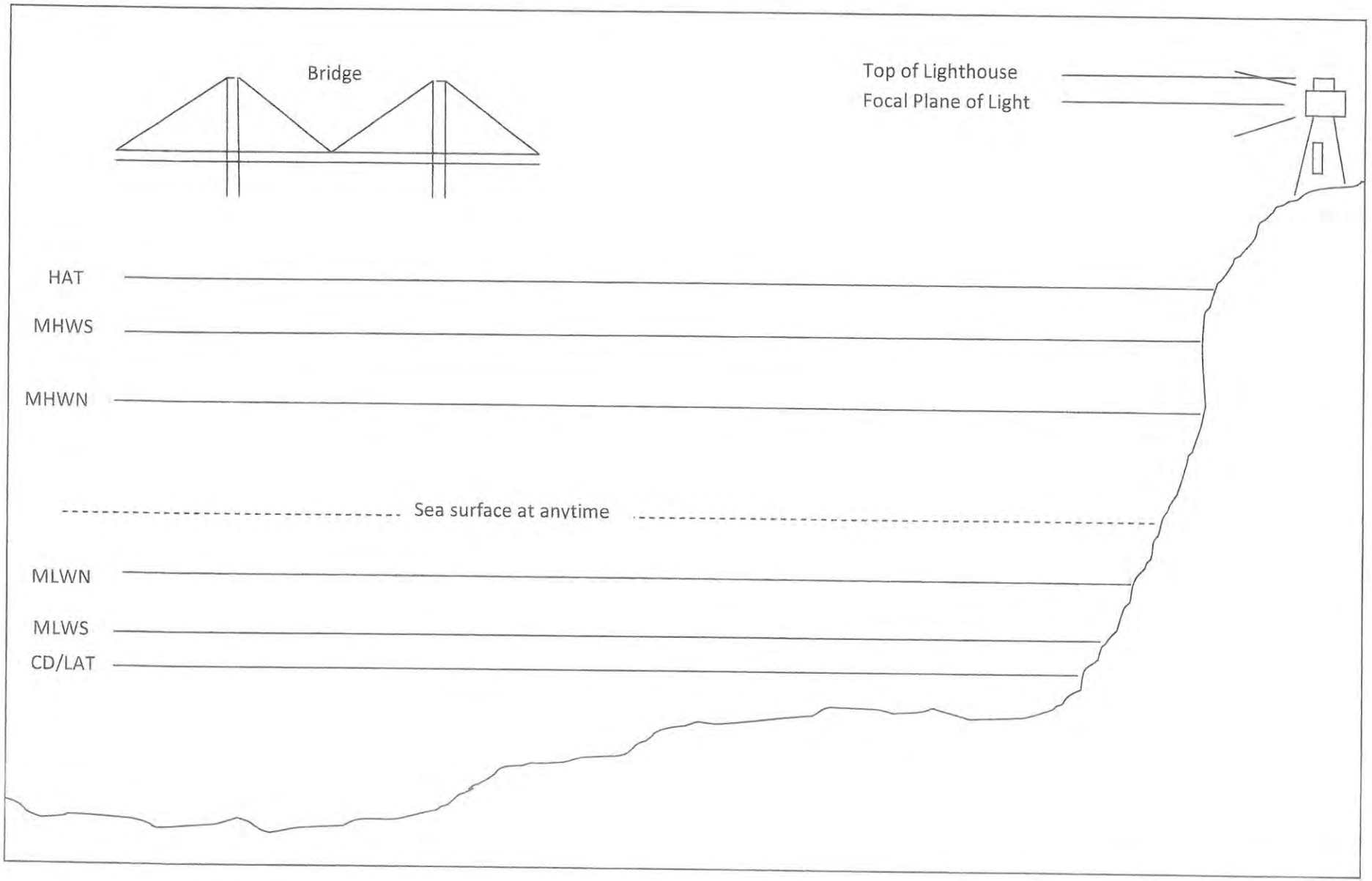
   (d) the compass bearing when the buoy is abeam. (2)

2. (a) On Worksheet Q2, mark and clearly label the levels between which EACH of the following are measured:

   - Height of lighthouse structure
   - Charted vertical clearance of the bridge
   - Observed depth of water
   - Spring range of tide (6)

   (b) Calculate the range and duration of ebb tide on the morning of 30th March for the port of Nauru (No.6764 ATT Pacific & Atlantic Oceans). (9)

Worksheet Q2
(This Worksheet must be returned with your answer book)



Candidate's Name.....

Examination Centre.....

Section B

3. (a) State TWELVE factors to be considered when planning a landfall at the end of an ocean passage. (12)

(b) With reference to Chart 5047:

(i) using Datasheets Q3(b)(i)(1) and Q3(b)(i)(2), determine the approximate range at which Lundy North light (51°12'N 04°40'W) may be sighted at night if prevailing visibility is 8 miles and observer's height of eye is 8.5 metres; (5)

(ii) state the meaning of the chart symbol in position 51°13'.3N 04°40'.9W; (2)

(iii) state the meaning of the given light characteristic 2 F.G.(vert) with reference to Ilfracombe light in position 51°12'.6N 04°06'.8W. (2)

4. A ship is to sail a coastal passage from Spencer Gulf, South Australia to an anchor position off Adelaide, South Australia.

Departure Position Spencer Gulf (WP1)	33°56'S 136°43'E
Off Cape Spencer (WP2)	35°22'S 136°43'E
Investigator Strait (WP3)	35°22'S 137°31'E
Anchor Position off Adelaide (WP4)	34°51'S 138°30'E

(a) Find the total distance from Spencer Gulf to Adelaide. (12)

(b) For this passage, the Current Atlas indicates the following currents:

- WP1 to WP2 adverse ½ knot
- WP2 to WP3 favourable ½ knot
- WP3 to WP4 favourable 1.0 knot

Calculate the total steaming time for the passage if ships's speed is 13.3 knots. (6)

5. With reference to the Bridge Procedures Guide and MGN 315, Keeping a Safe Navigational Watch on Merchant Vessels:

(a) state the specific condition when consideration may be given to the OOW acting as sole look-out; (2)

(b) state EIGHT factors that should be considered prior to the OOW acting as the sole look-out; (8)

(c) state the purpose of maintaining a look-out; (8)

(d) outline the guidance on how the OOW may fully engage the look-out's attention. (3)