



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2023

## **NAUTICAL SCIENCE: PAPER I**

### **MARKING GUIDELINES**

Time: 3 hours

150 marks

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**These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.**

**The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.**

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**SECTION A PRACTICAL CHARTWORK****QUESTION 1**1.1 Course WP1 – WP2 =  $139^{\circ}$  (T)

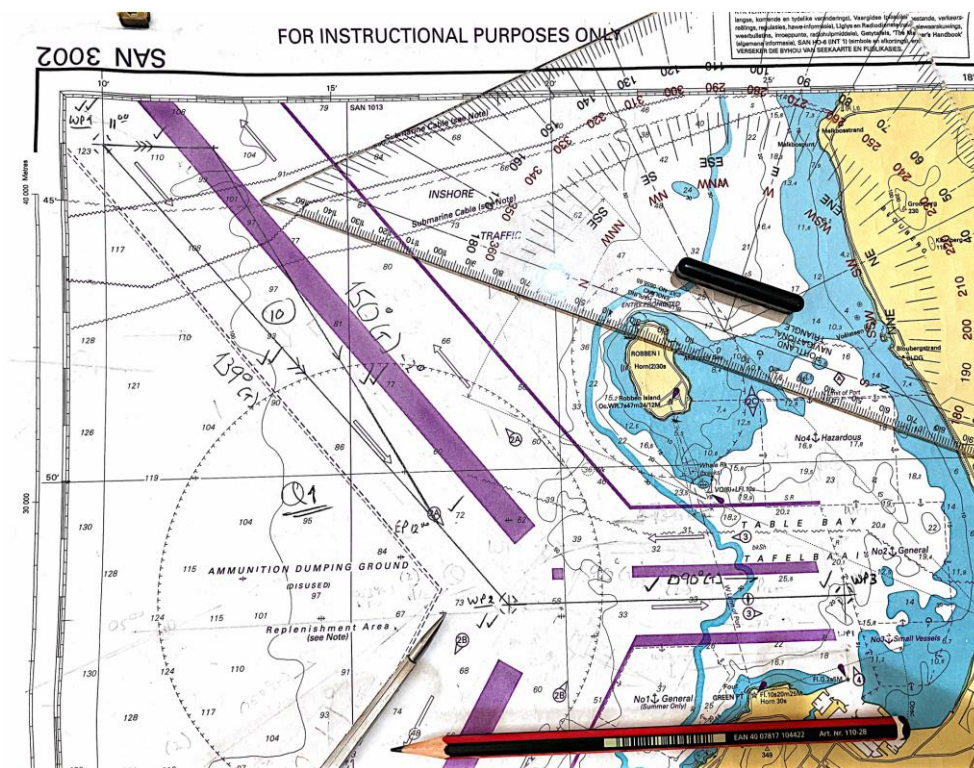
Chart

1.2 Course to steer for current (set)	$150^{\circ}$ (T)
Leeway W'l'y	$2^{\circ}$
Steer	$152^{\circ}$ (T)

Chart

1.3 Chart Course  $090^{\circ}$  (T)

1.4 WP1 – WP2	11,2 M
WP2 – WP3	<u>6,2 M</u>
Total dist.	17,4 M
at 6,0 kts	
Time	2,9 hrs
ETA	<b>13:54</b>



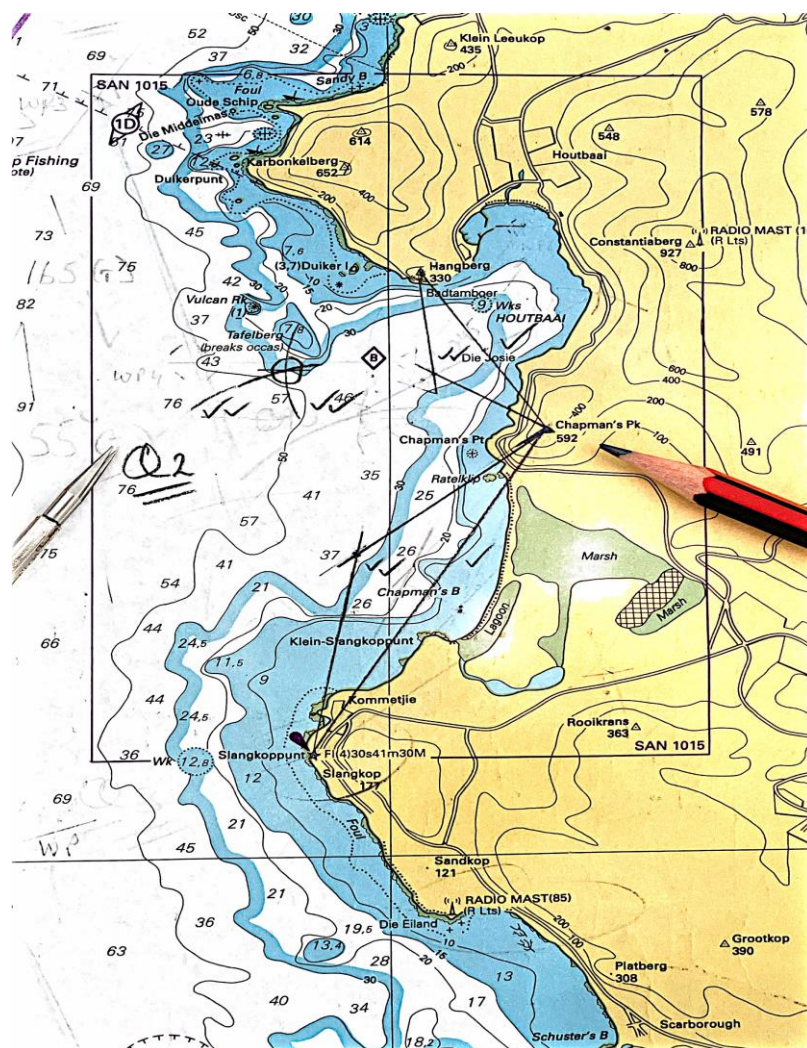
**QUESTION 2**

Karbonkelberg & Chapman's Peak	=	148°/328°	
Sextant angle	=	64°	
- 90°	=	26°	
Bearing from Karbonkelberg	=	148° + 26° =	174° (T)
Bearing from Chapman's Peak	=	328° - 26° =	302° (T)

Chapman's Peak & Slangkop Lt.	=	030°/210°	
Sextant angle	=	70°	
- 90°	=	20°	
Bearing from Chapman's Peak	=	210° + 20° =	230° (T)
Bearing from Slangkop Lt.	=	030° - 20° =	010° (T)

Position

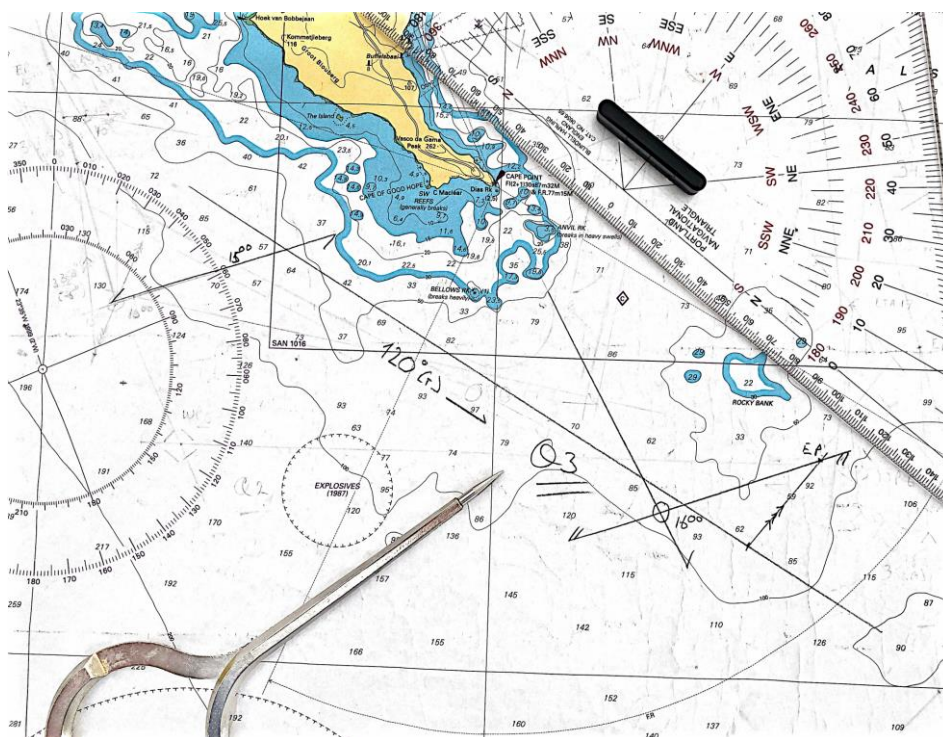
34° 04,6' S 018° 19,0' E





**QUESTION 3**

	<b>Heading</b>		<b>Bearing at 15:00</b>		<b>Bearing at 16:00</b>	
Compass	138°	(C)	089°	(C)	349°	(C)
Deviation	1°	W	1°	W	1°	W
Magnetic	137°	M	088°	M	348°	M
Variation	17°	W	17°	W	17°	W
True	120°	(T)	071°	(T)	331°	(T)

**CHART**

Position at 16:00

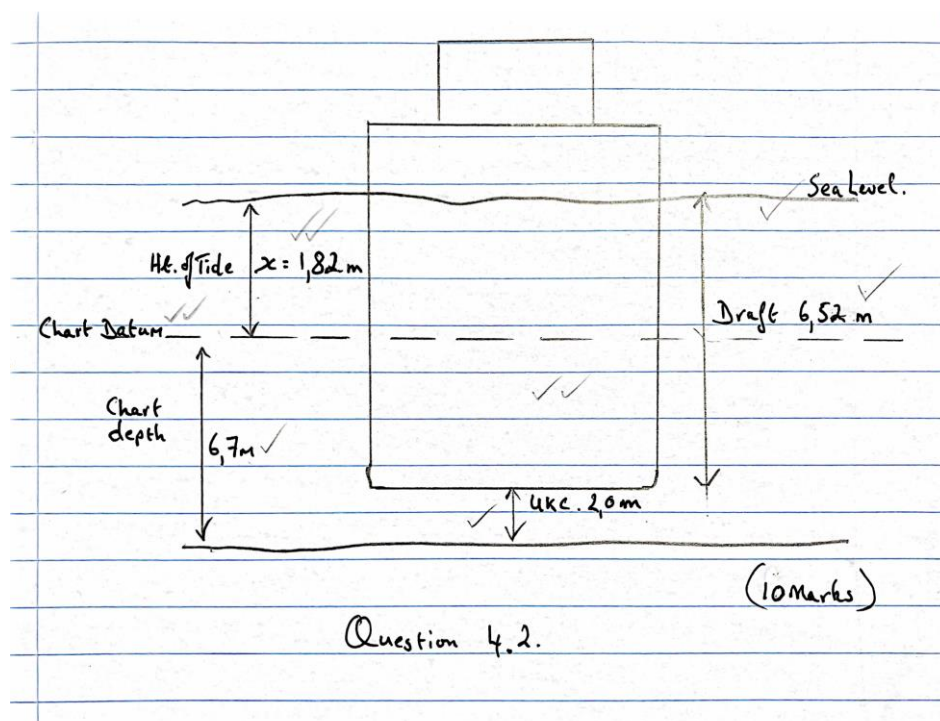
Cape Point Lt. bearing 330° (T) x 6,6 M  
34° 27,2' S 018° 33,7' E

**QUESTION 4**

4.1	Draught	=	6,52
	Under keel clearance	=	2,00
	Total depth required	=	8,52
	Chart depth	=	6,70
	Required height of tide	=	1,82 m

The earliest to cross the bank will be 15:00 on 25 November

4.2



4.3 TRUE

4.4 About  $7\frac{1}{2}$  days after the Full and New Moon, **NEAP** Tides occur.

**QUESTION 5**

- 5.1 Direction 171° @ 0,8 knots.
- 5.2
  - 5.2.1 Slangkop Lt. – White light, group flashing 4 times every 30 seconds; height of light is 41 m above MSL; nominal visibility 30 miles.
  - 5.2.2 Green Point Lt. – White light flashing every 10 seconds; height of the light 20 m above MSL; nominal visibility 25 miles; foghorn blasts every 30 seconds.
  - 5.2.3 Kalkbaai Breakwater Light – Long-flashing red light with a nominal distance of 6 miles.
- 5.3 Two blasts every 30 seconds.
- 5.4 'Ships replenishing stores off Table Bay should remain to the westward of the lines running in the north-north-westerly and south-westerly directions from a position bearing 290° and 6 nautical miles west of Green Point Light.'
- 5.5 VESSEL TRAFFIC SERVICES – 'For procedures and working details of VTS see South African List of Lights and Radio Signals (SAN HO-1).'

**SECTION B            ASTRO-NAVIGATION****QUESTION 6**

$$\begin{aligned}
 \text{LMT } 26^{\circ} 30' \text{ S} &= \{ \text{LMT for } 20^{\circ} - \text{LMT for } 30^{\circ} \} \times \{ (26,5^{\circ} - 20^{\circ}) / (30^{\circ} - 20^{\circ}) \} \\
 &= \{ 06:31 - 06:17 \} \times \{ 6,5/10 \} \\
 &= 14 \text{ min} \times 0,65 \\
 &= 9 \text{ mins.}
 \end{aligned}$$

$$\begin{aligned}
 \text{LMT Sunrise 5 May} &= 06:17 + 9 \text{ mins.} \\
 &= 06:26 \\
 \text{Long } 140^{\circ} 08' \text{ W (+)} &= \underline{09:20} \\
 \text{GMT Sunrise} &= 15:46 \\
 \text{Zone 'V' (-)} &= \underline{09:00} \\
 \text{Zone time sunrise} &= \underline{06:46} \quad 5 \text{ May}
 \end{aligned}$$

**QUESTION 7**

$$\begin{array}{rcl}
 \text{Zone time (E) 6 May} & & 06^{\text{d}} 16:45 \\
 \text{Zone (E)} & (-) & \underline{05:00} \\
 \text{GMT} & & 11:45
 \end{array}$$

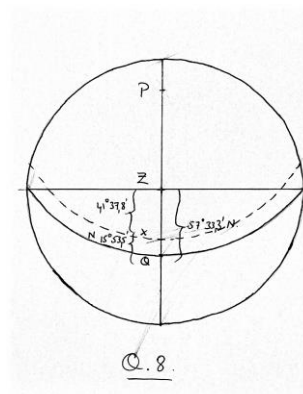
$$\begin{array}{rcl}
 \text{GHA } 6^{\text{th}} 11:00 & & 345^{\circ} 50,3' \\
 \text{Inc 45 mins} & & \underline{11^{\circ} 15,0'} \\
 \text{GHA } 6^{\text{th}} 11:45 & & 357^{\circ} 05,3' \\
 \text{Long. } 079^{\circ} 20' \text{ E (+)} & & \underline{79^{\circ} 20,0'} \\
 \text{LHA of Sun on 6}^{\text{th}} \text{ at 11:45} & & \mathbf{76^{\circ} 25,3'}
 \end{array}$$

$$\begin{array}{rcl}
 \text{Dec. 11:00} & & \text{N } 16^{\circ} 27,3' \\
 \text{D' } 0,7 & & 0,5' \\
 \text{Dec. 11:45} & & \text{N } 16^{\circ} 27,8'
 \end{array}$$

**QUESTION 8**

LMT Mer. Pass 4 May	=	11:57:00
Long 002° 12' E (–)	=	<u>08:48</u>
GMT Mer. Pass 4 May	=	11:48:12
Zone time (Z)	=	<u>00:00:00</u>
Mer. Pass. Ship's zone	=	11:48:12
Dec. 11:00 4 May	=	15° 52,9' N
'd' 48:12 (0,7)	=	<u>0,6' +</u>
Dec. 11:48:12	=	15° 53,5' N

Sextant altitude	=	48° 12,0'
i.e. ON (–)	=	<u>2,1'</u>
Obs. Alt.	=	48° 09,9'
Dip (–)	=	<u>4,8'</u>
App. Alt.	=	48° 05,1'
Total correction (+)	=	<u>15,1'</u>
True altitude	=	48° 20,2'
		<u>90° 00,0'</u>
ZX	=	41° 39,8'
Dec. (+)	=	<u>15° 53,5'</u> N
<b>Observer's latitude (QZ)</b>	=	<b>57° 33,3' N</b>

**QUESTION 9**

- 9.1 9.1.1 The shortest day occurs in December;
- 9.1.2 The shortest night occurs in June.
- 9.2 The three correctable errors of the sextant are:
1. Perpendicularity;
  2. Side error;
  3. Index error.
- 9.3 FALSE – the Hour Angle is always measured westward from the observer's meridian.

**Total: 150 marks**