



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING SCIENCE N2

24 November 2023

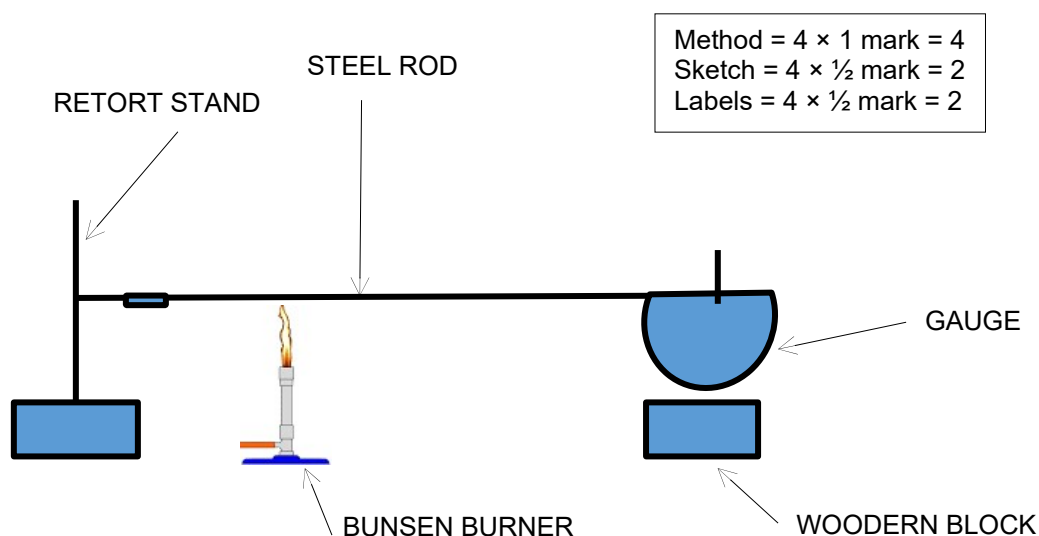
This marking guideline consists of 7 pages

QUESTION 1

- 1.1
- The sun
 - Electricity
 - Friction
 - Chemical reaction
 - Burning fuel
 - Internal heat of the earth
- (Any 5 × 1) (5)

- 1.2
- The clinical thermometer
 - The alcohol thermometer
 - The mercury thermometer
 - Special thermometer
 - The pyrometer thermometer
- (Any 4 × 1) (4)

- 1.3 Apparatus:
- Retort stand
 - Metal/steel rod
 - Bunsen burner
 - Needle & gauge
 - Wooden block
- Method:
- Clamp the rod in the stand and fix the rod and gauge on the wooden block as shown in the sketch.
 - Heat the rod
- Observation:
- The movement in the rod's edge will cause the gauge to show a reading.
- Conclusion:
- The rod increased in length due to the increase in temperature.

(8)
[17]

QUESTION 2

2.1 Take moments about RR to calculate the magnitude of RL.

$$\sum \text{CW Moments} = \sum \text{ACW Moments} \checkmark$$

$$(\text{RL} \times 16) = (25 \times 18) + (35 \times 12) + (30 \times 4) \checkmark$$

$$(\text{RL} \times 16) = 450 + 420 + 120 \checkmark$$

$$\text{RL} = \frac{990 \checkmark}{16}$$

$$\text{RL} = 61,875 \text{ kN} \checkmark \quad (5)$$

2.2 Take moments about RL to calculate the magnitude of RR.

$$\sum \text{ACW Moments} = \sum \text{CW Moments} \checkmark$$

$$(\text{RR} \times 16) + (25 \times 2) = (35 \times 4) + (30 \times 12) \checkmark$$

$$(\text{RR} \times 16) = 140 + 360 - 50 \checkmark$$

$$\text{RR} = \frac{450 \checkmark}{16}$$

$$\text{RR} = 28,125 \text{ KN} \checkmark \quad (5)$$

2.3 Test the answer to prove equilibrium:

$$\sum \text{Upwards Forces} = \sum \text{Downwards Forces}$$

$$(61,875 \text{ kN} + 28,125 \text{ kN}) \checkmark = (25 \text{ kN} + 35 \text{ kN} + 30 \text{ kN}) \checkmark$$

$$90 \text{ kN} = 90 \text{ kN} \checkmark$$

(3)
[13]

QUESTION 3

3.1 Relative density (Specific gravity) of a material is the density of that material ✓
compared with the density of water or mass of any volume of a material ✓
compared with the mass of an equal volume of water. ✓ (3 × 1) (3)

3.2 Absorbent materials

- Bricks
- Wood
- Concrete
- Limestone
- Plaster

(Any 3 × 1)

Non-absorbent materials

- Polythene
- Slate
- Dense bricks
- Glass
- Rubber

(Any 3 × 1)
(3 × 2)

(6)

- 3.3 A burnt-clay brick has many pores or voids✓ which are interconnected.✓
The rising of water into these pores or voids is called capillarity.✓ (3)
- 3.4 When clay bricks are burnt,✓ the water in the mixture evaporates✓ and leaves pores or voids in the bricks.✓ (3)
- 3.5 3.5.1
- High resistance to puncture
 - It is easy to apply.
 - It is self-healing.
 - Not too expensive
 - It is waterproof.
 - The material will not expand in high temperatures and will not crack at low temperatures. (Any 2 × 1)
- 3.5.2
- Mixture of well-graded sand and Portland cement
 - Manufactured in various profiles
 - Tough
 - Durable
 - Inflammable (Any 2 × 1)
(2 × 2) (4)
- [19]

QUESTION 4

MEMBER	4.1 AREA	4.2 METAL PLATE DISTANCE	4.3 AREA × DISTANCE
A	20×50 $= 1\,000\text{ mm}^2$ ✓	10 mm✓	$1\,000\text{ mm}^2 \times 10\text{ mm}$ $= 10\,000\text{ mm}^3$ ✓
B	$\frac{1}{2} \cdot 20 \times 30$ $= -300\text{ mm}^2$ ✓	20 mm✓	$-300\text{ mm}^2 \times 20\text{ mm}$ $= -6\,000\text{ mm}^3$ ✓
C	70×40 $= 2\,800\text{ mm}^2$ ✓	55 mm✓	$2\,800\text{ mm}^2 \times 55\text{ mm}$ $= 154\,000\text{ mm}^3$ ✓
D	$\pi \times (15)^2$ $= -706,858\text{ mm}^2$ ✓	70 mm✓	$-706,858\text{ mm}^2 \times 70\text{ mm}$ $= -49\,480,06\text{ mm}^3$ ✓
TOTALS	$= 2\,793,142\text{ mm}^2$✓✓		$= 108\,519,94\text{ mm}^3$✓✓
Marks	(6)	(4)	(6)

(16)

4.4 Centroid = $\frac{(\text{Total area} \times \text{Distance})}{\text{Total area}}$ ✓

Centroid = $\frac{108\,519,94\text{ mm}^3}{2\,793,142\text{ mm}^2}$ ✓

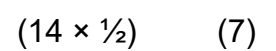
Centroid = **38,854 mm 'X-X'**✓✓

(4)
[20]

5.1



5.2



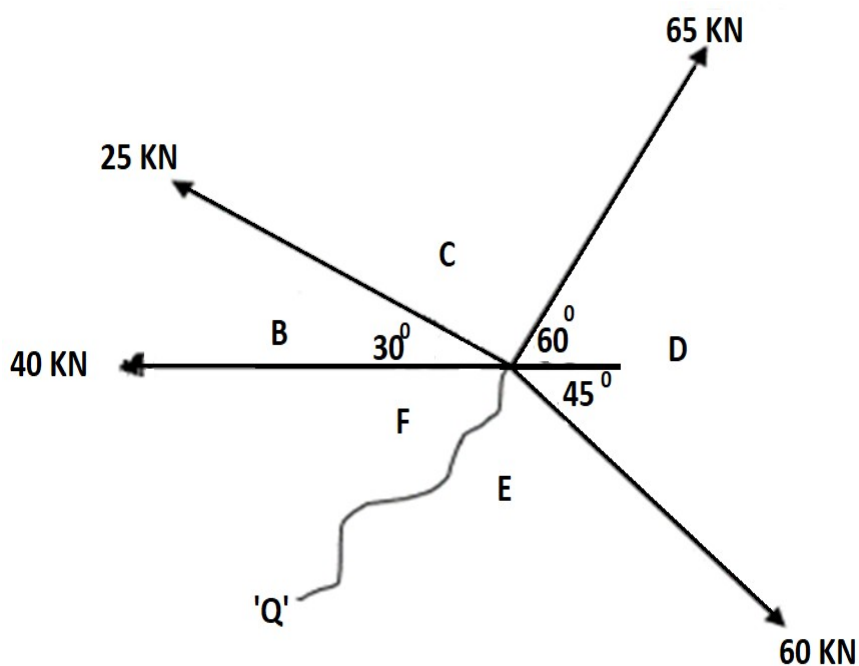
5.3

Member	Magnitude	Nature
AF	120 kN✓	Strut✓
BG	76 kN✓	Strut✓
CH	76 kN✓	Strut✓
DI	120 kN✓	Strut✓
EF	104 kN✓	Tie✓
FG	44 kN✓	Strut✓
GH	45 kN✓	Tie✓
HI	44 kN✓	Strut✓
EI	104 kN✓	Tie✓

(18 × ½)

(9)
[20]**QUESTION 6**

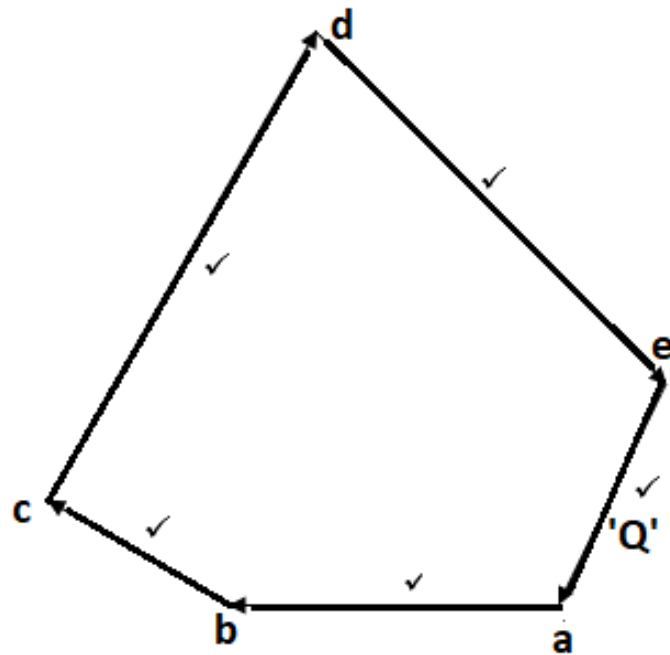
6.1



Space diagram = 1 mark✓
Bow's notation = 2 marks✓✓

(3)

6.2



'Q' = 29 kN ✓ @ 64 ✓ South of West ✓

(8)
[11]

TOTAL: 100