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**

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## 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)

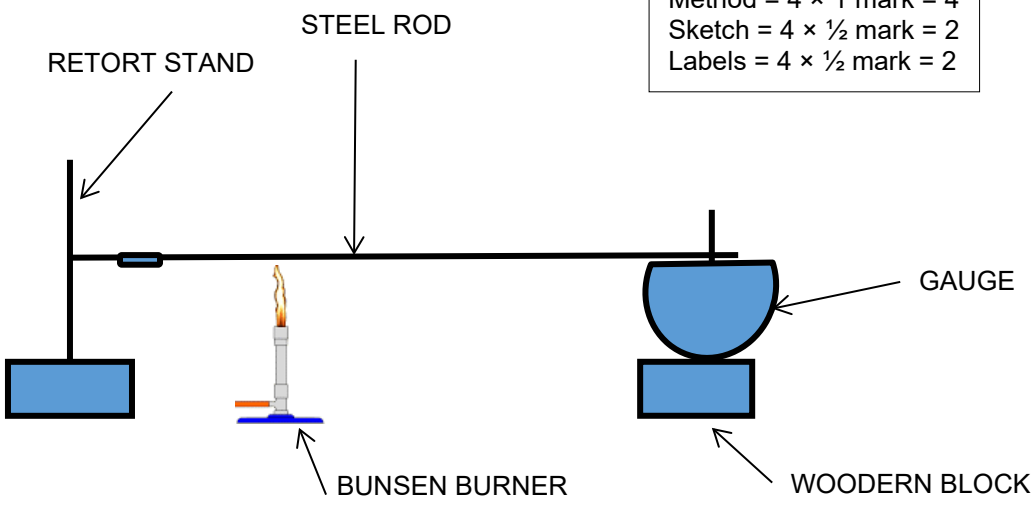
1.3 Apparatus:
- Retort stand
- Metal/steel rod
- Bunsen burner
- Needle & gauge
- Wooden block

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.

Method = 4 × 1 mark = 4
Sketch = 4 × ½ mark = 2
Labels = 4 × ½ mark = 2




(8)
**[17]**

**QUESTION 2**

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

∑ CW Moments = ∑ ACW Moments✓

(RL × 16) = (25 × 18) + (35 × 12) + (30 × 4)✓

(RL × 16) = 450 + 420 + 120 ✓

$$RL = \frac{990✓}{16}$$

RL = 61,875 kN✓ (5)

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

∑ ACW Moments = ∑ CW Moments✓

(RR × 16) + (25 × 2) = (35 × 4) + (30 × 12)✓

(RR × 16) = 140 + 360 – 50✓

$$RR = \frac{450✓}{16}$$

RR = 28,125 KN✓ (5)

2.3 Test the answer to prove equilibrium:

∑ Upwards Forces = ∑ Downwards Forces

(61,875 kN + 28,125 kN)✓ = (25 kN + 35 kN + 30 kN)✓

90 kN = 90 kN✓ (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<br>= 1 000 $mm^2$✓ | 10 mm✓ | 1 000 $mm^2$ × 10 mm<br>= 10 000 $mm^3$✓ |
| B | ½.20 x 30<br>= -300 $mm^2$✓ | 20 mm✓ | -300 $mm^2$ × 20 mm<br>= - 6 000 $mm^3$✓ |
| C | 70 × 40<br>= 2 800 $mm^2$✓ | 55 mm✓ | 2 800 $mm^2$ × 55 mm<br>= 154 000 $mm^3$✓ |
| D | Π × $(15)^2$<br>= -706,858 $mm^2$✓ | 70 mm✓ | -706.858 $mm^2$ × 70 mm<br>= - 49480,06 $mm^3$✓ |
| **TOTALS** | **= 2793.142 $mm^2$✓✓** | | **= 108 519,94 $mm^3$✓✓** |
| **Marks** | (6) | (4) | (6) |

(16)

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

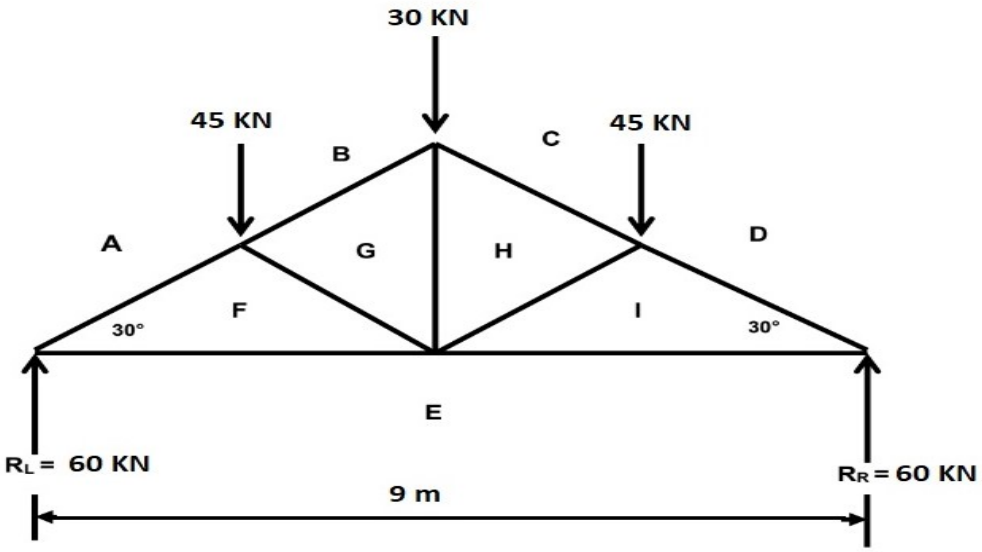
Centroid = $\frac{108\ 519,94 mm^3}{2\ 793,142\ mm^2}$✓

**Centroid = 38,854 mm 'X–X'✓✓** (4)

**[20]**

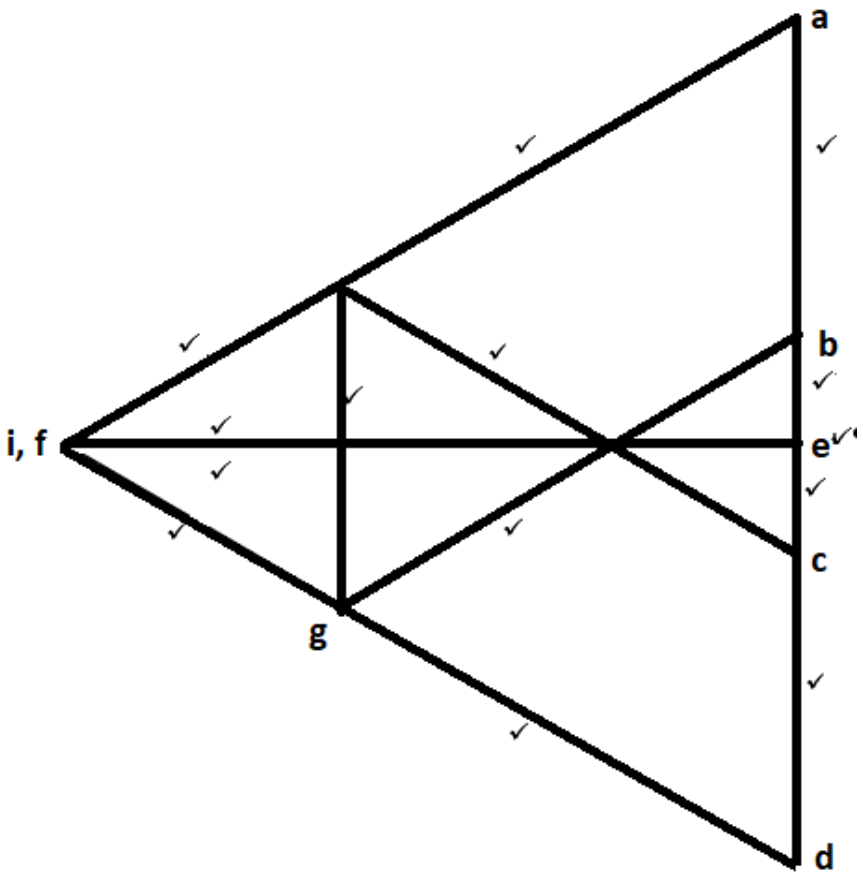
## QUESTION 5

5.1




(4)

5.2




(14 × ½) (7)

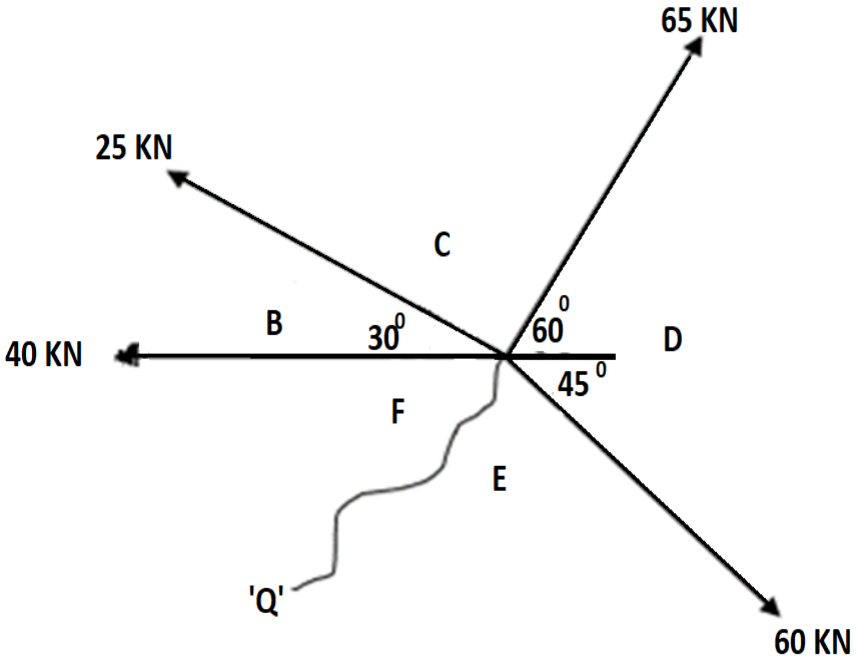
5.3

| 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]**

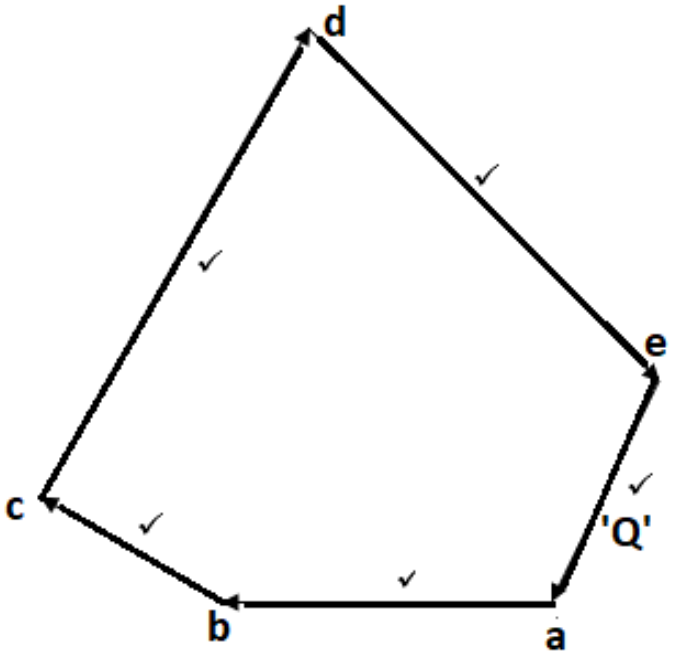
## QUESTION 6

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**

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