



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

BUILDING SCIENCE N1

APRIL 2016

This marking guideline consists of 8 pages.

QUESTION 1

1.1 The volume of a given mass of gas is inversely proportional to the pressure exerted on it, providing the temperature remains the same. (3)

1.2
$$\begin{aligned} ^\circ\text{C} &= \text{K} - 273 \\ &= 200 - 273 \\ &= -73^\circ\text{C} \end{aligned}$$
 (2)

1.3
$$\begin{aligned} P_1 V_1 &= P_2 V_2 \\ V_2 &= \frac{P_1 V_1}{P_2} \\ &= \frac{250 \text{ kPa} \times 4 \text{ m}^3}{400 \text{ kPa}} = 2,5 \text{ m}^3 \end{aligned}$$
 (5)
[10]

QUESTION 2

2.1
$$\begin{aligned} \text{Area} &= \text{length} \times \text{breadth} \\ &= 50 \text{ cm} \times 15 \text{ cm} \\ &= 750 \text{ cm}^2 \end{aligned}$$
 (3)

2.2
$$\begin{aligned} \text{Volume} &= \text{length} \times \text{breadth} \times \text{height} \\ &= 9 \text{ m} \times 0,15 \text{ m} \times 0,25 \text{ m} \\ &= 0,338 \text{ m}^3 \end{aligned}$$
 or

$$\begin{aligned} &= 9\,000 \text{ mm} \times 150 \text{ mm} \times 250 \text{ mm} \\ &= 337\,500\,000 \text{ mm}^3 \end{aligned}$$
 (3)

2.3

QUANTITY	UNIT	SYMBOL
Volumes (liquids)	Litre ✓	✓ ℓ or litre
Pressure ✓	pascal	✓ Pa
Force	newton ✓	✓ N

(8 × ½)

(4)

[10]**QUESTION 3**

3.1

- Malthoid
- PVC
- Bitumen-impregnated felt
- Thin layers of slate
- Dense pressed bricks

(Any 3 × 1)

(3)

3.2

15 litres of water = 15 kg of water (1 litre = 1 kg)

$$\text{Water:cement ratio} = \frac{\text{mass of water} \checkmark}{\text{mass of cement} \checkmark}$$

$$= \frac{15 \text{ kg} \checkmark}{30 \text{ kg} \checkmark}$$

$$= 0,5 \checkmark \quad (4)$$

3.3

$$\text{Moisture content} = \frac{\text{OM} - \text{DM}}{\text{DM}} \times 100 \checkmark$$

$$= \frac{\checkmark 75 - \checkmark 50}{50 \checkmark} \times 100$$

$$= 50\% \checkmark \checkmark \quad (3)$$

[10]

QUESTION 4

4.1 The mass per unit volume of a substance is called its density, and is expressed in g/cm³ or kg/m³. (3)

4.2 Relative density = $\frac{\text{density of substance}}{\text{density of water}}$
or
= $\frac{\text{mass of substance}}{\text{mass of water}}$ (1)

4.3 Volume = length x breadth x width
= 5 x 0,07 x 0,12 m (correct conversion to m)
= 0,042 m³

Density = $\frac{\text{mass}}{\text{volume}}$
= $\frac{40 \text{ kg}}{0,042 \text{ m}^3}$ = 952,381 kg/m³ (6)
[10]

QUESTION 5

5.1 A material is said to be porous when its mass is not solid throughout, but contains a certain amount of air space. This air space is usually divided up into a great number of very small spaces known as voids or pores which are distributed throughout the mass of the material. (3)

5.2

- Furniture beetle
- Powder-post beetle
- Longhorn beetle
- Termites

(Any 3 × 1) (3)

5.3

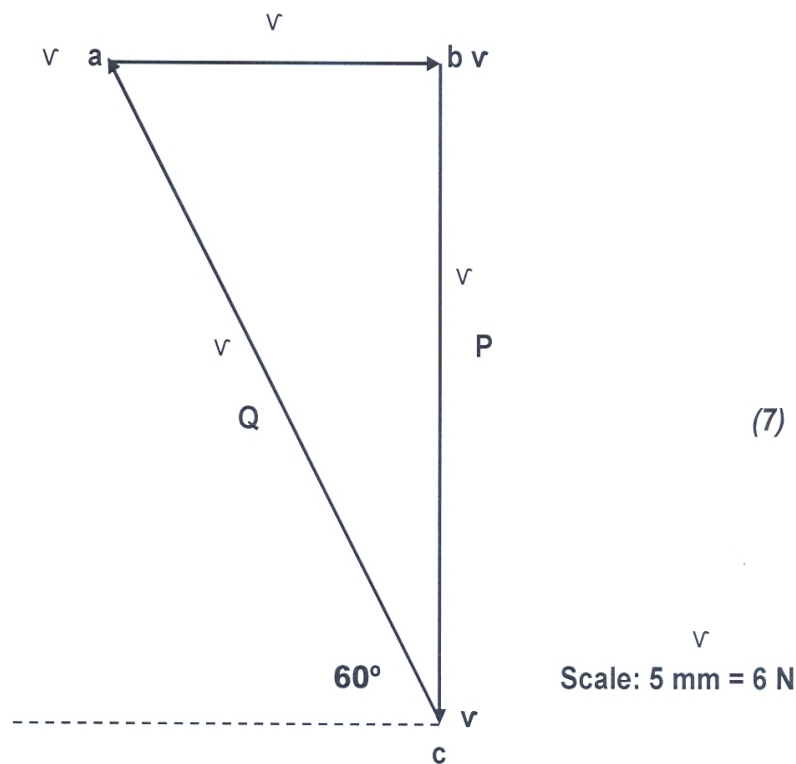
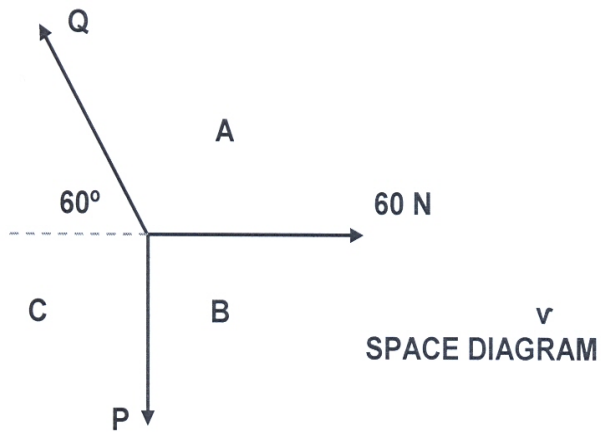
- It must be composed of the correct proportions of fine to coarse aggregates.
- It must have the correct cement/aggregate ratio.
- It must have the correct water/cement ratio.
- It must be well mixed.
- It must be fully compacted.
- It must be well cured.

(Any 4 × 1) (4)
[10]

QUESTION 6

6.1 If three forces acting at a point are in equilibrium, they can be represented in size or magnitude and direction by the sides of a triangle, taken in order. (3)

6.2



FORCE DIAGRAM ✓

$Q = \pm 120 \text{ N}$ and 60° to the horizontal

$P = \pm 105 \text{ N}$ and 90° to the horizontal

(7)
[10]

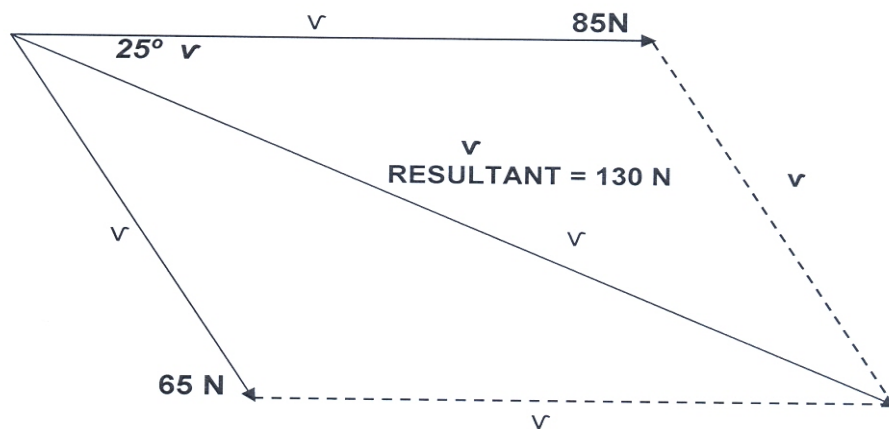
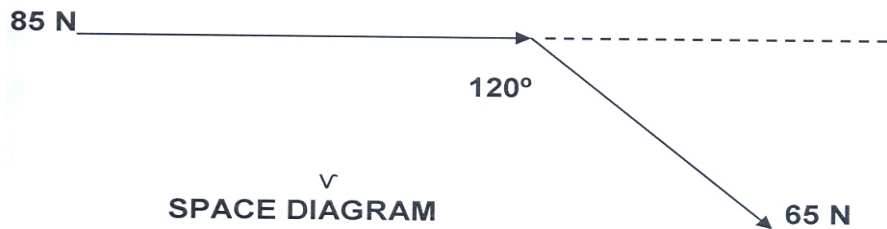
QUESTION 7

7.1 7.1.1 A force is that which changes or tends to change the state of rest or uniform motion of a body in a straight line.

7.1.2 The unit in which a force is measured, is called the newton and the symbol used for newton is N.

(2 × 2) (4)

7.2



FORCE DIAGRAM

SCALE: 1cm = 10N

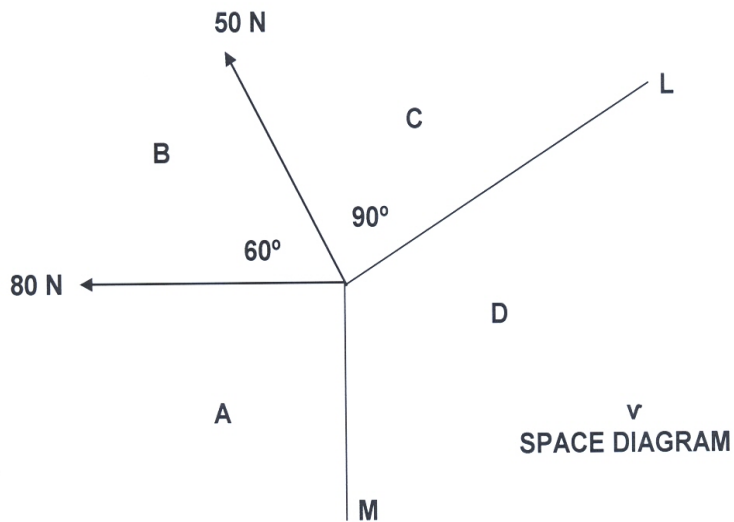
RESULTANT = $\pm 130 \text{ N}$ / $\pm 25^\circ$ to the horizontal

(6)
[10]

QUESTION 8

- 8.1 If more than three coplanar forces acting on a point are in equilibrium, they can be represented in magnitude and direction by the sides of a closed polygon, taken in order. (3)

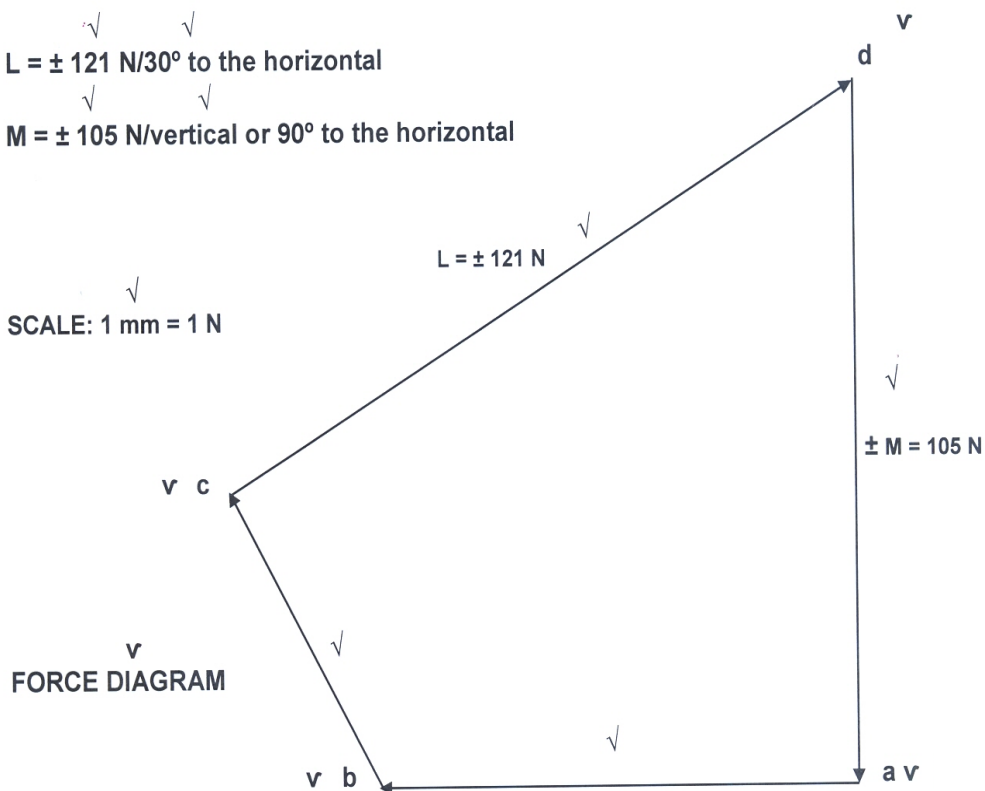
8.2



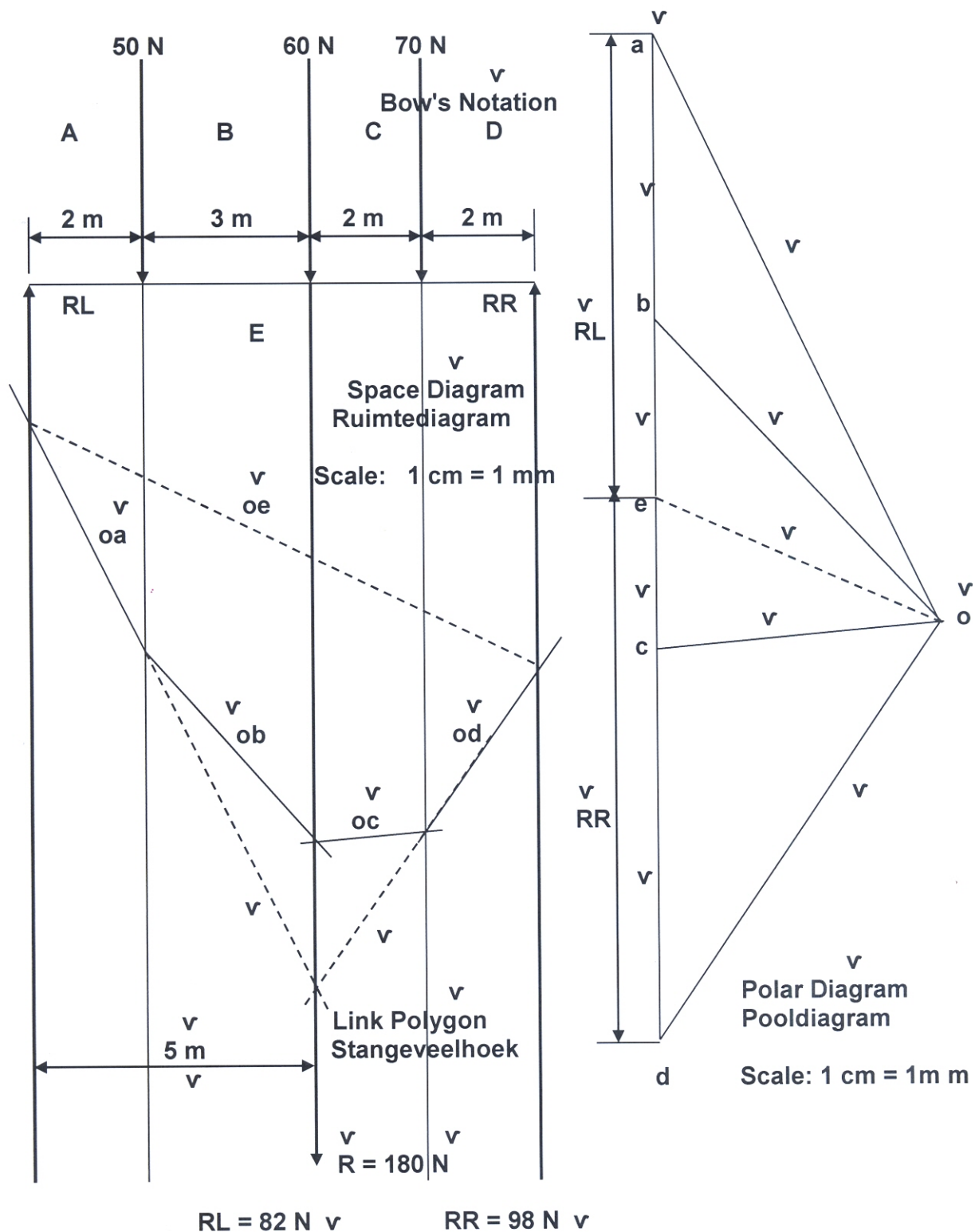
$$L = \pm 121 \text{ N} / 30^\circ \text{ to the horizontal}$$

$$M = \pm 105 \text{ N} / \text{vertical or } 90^\circ \text{ to the horizontal}$$

SCALE: 1 mm = 1 N

(12)
[15]

QUESTION 9



[15]

TOTAL: 100