higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T230**(E)**(J30)T

NATIONAL CERTIFICATE

BUILDING SCIENCE N1

(15070001)

30 JULY 2019 (X-Paper)
09:00–12:00

Calculators and drawing instruments may be used.

This question paper consists of 5 pages, 1 diagram sheet and 1 formula sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
BUILDING SCIENCE N1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Sketches must be large, neat and fully labelled.
5. Assume that 1 kg mass exerts a force of 10 N.
6. Write the formula before starting with a calculation.
7. Round off numerical answers to TWO decimal places.
8. Write neatly and legibly.

QUESTION 1

Give the name of the SI unit, together with the symbol, in which each of the following is measured:

1.1 Moment of force

1.2 Thermodynamic temperature

1.3 Pressure

1.4 Area of a site

1.5 Mass of a block

(10 × ½) **[5]**

QUESTION 2

2.1 Define *Archimedes' principle*. (3)

2.2 A concrete beam has a mass of 850 kg.

Calculate:

2.2.1 The volume of the concrete beam if the density of the concrete is 2 550 kg/m^3.

2.2.2 The length of the concrete beam if the cross-sectional area of the column is 0,2025 m^2.

(2 × 3) (6)

2.3 Give the formula to calculate the relative density of a material. (1)
[10]

QUESTION 3

3.1 Give THREE ingredients used in concrete. (3)

3.2 List the properties of a good concrete mix. (6)

3.3 Define each of the following construction terms:

3.3.1 Fine aggregate

3.3.2 Coarse aggregate

(2 × 3) (6)

3.4 Calculate the water-cement ratio of a concrete mixture that contains 50 kg cement and 35 litres of water. (4)
[19]

QUESTION 4

4.1 Define *Charles's law*. (3)

4.2 A quantity of gas has a volume of 6 m^3 at a pressure of 350 kilopascals.

Calculate the pressure when the gas occupies a volume of 3 m^3 while the temperature remains constant. (3)

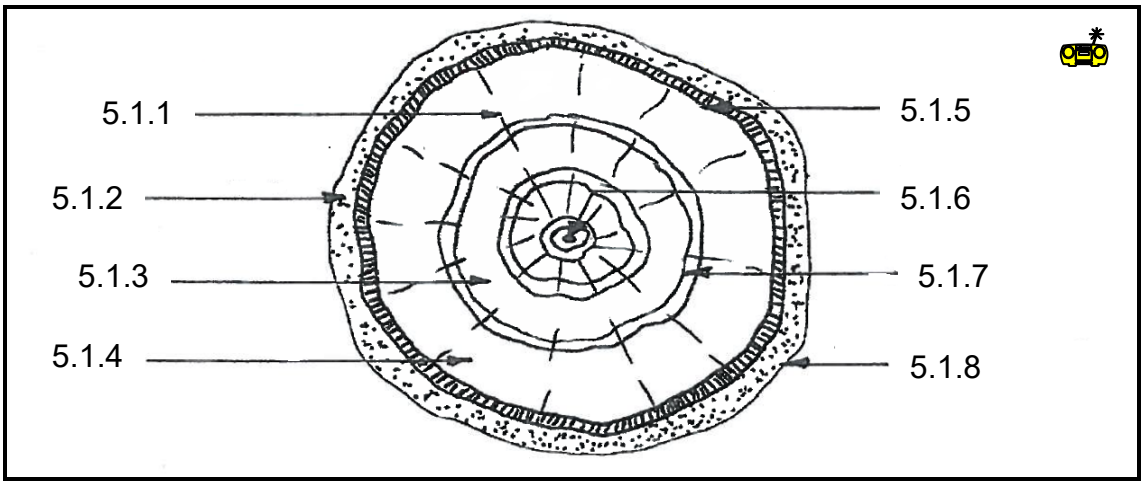
4.3 Calculate the pressure at a point 70 m below the surface of seawater. The relative density of seawater is 1,02 and the density of pure water is 1 000 kg/m^3. (5)

4.4 Draw a neat, labelled sectional sketch of a water closet with a U-shape bend in the pipe and clearly show the water seal. (5)

[16]

QUESTION 5

5.1 The sketch below shows a cross-section of a tree trunk.



Label the cross-section of the tree trunk by writing only the answer next to the question number (5.1.1–5.1.8) in the ANSWER BOOK. (8 × 1) (8)

5.2 Name FOUR factors that should be removed to prevent fungus from attacking timber. (4 × 2) (8)

[16]

QUESTION 6

6.1 Define the term *equilibrant*. (4)

6.2 A 550 N force is acting upwards and an 800 N force is acting downwards along the same line of action.

Determine the magnitude and direction of each of the following:

6.2.1 The resultant force

6.2.2 The equilibrant force

(2 × 3) (6)

6.3 Calculate the horizontal and vertical components of 65 N acting upwards at an angle of 30° for the horizontal. (6)

[16]

QUESTION 7

FIGURE 1 on the DIAGRAM SHEET (attached) shows three concurrent coplanar forces.

Determine graphically the magnitude and direction of forces P and Q. Clearly indicate the direction on the space diagram. **[8]**

QUESTION 8

FIGURE 2 on the DIAGRAM SHEET (attached) shows three forces acting on a beam.

Determine, by means of a link-polygon diagram, the position and magnitude of the THREE forces. Clearly show the distance from the resultant to the left end A of the beam. **[10]**

TOTAL: 100

DIAGRAM SHEET

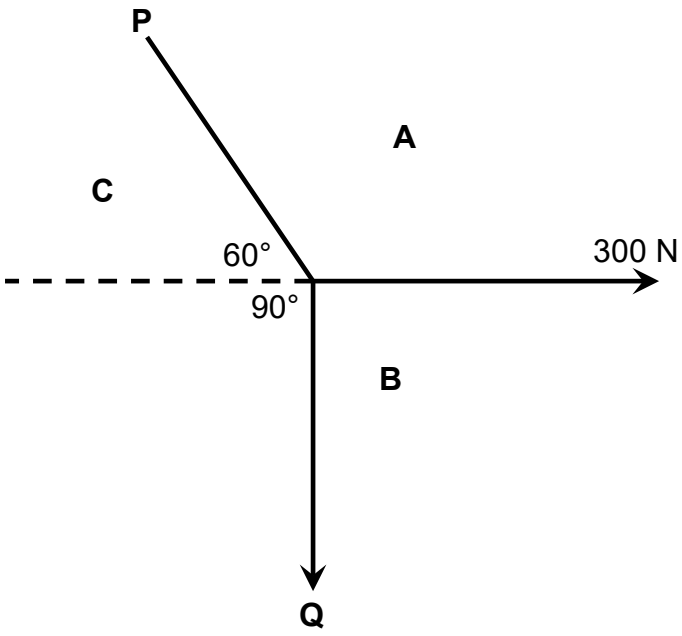


FIGURE 1

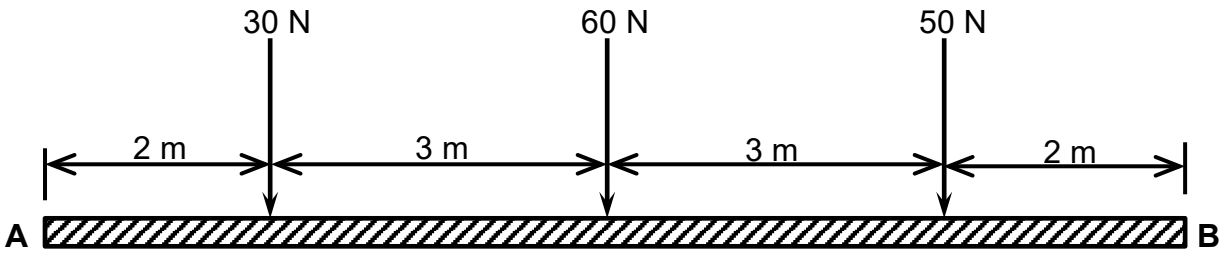


FIGURE 2

FORMULA SHEET

Any applicable formula may also be used.

1. $F = m \times g$
2. $\sin\theta = \frac{O}{H}$
3. $\cos\theta = \frac{A}{H}$
4. $\tan\theta = \frac{O}{A}$
5. $A = \frac{\pi D^2}{4} = \pi r^2$
6. $A = ½ (B \times h)$
7. $V = \frac{\pi D^2}{4} \times h$
8. $V = \frac{4}{3} \pi r^3$
9. $V = \frac{1}{3} \pi r^2 h$
10. $D = \frac{M}{V}$
11. $R.D. = \frac{M.S}{M.W}$
12. $K = C + 273$
13. $P_1V_1 = P_2V_2$
14. $VC = FSin2$
15. $HC = FCos2$
16. $V = L \times \exists \times H$
17. $\%MC = \frac{IW - DW}{DW} \times 100$
18. $P = h \times d \times g$
19. Water-cement ratio:

    $W.C.R. = \frac{M.W.}{M.C.}$
20. $R^2 = VC^2 + HC^2$
21. $W = P \times V \times g$
22. $W = m \times g$