higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

ENGINEERING SCIENCE N1

24 November 2022

This marking guideline consists of 11 pages.

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SECTION A

QUESTION 1

1.1 A
1.2 B
1.3 D
1.4 C
1.5 A

(5 × 1) **[5]**

QUESTION 2

2.1 False
2.2 False
2.3 True
2.4 False
2.5 True

(5 × 1) **[5]**

QUESTION 3

3.1 F
3.2 E
3.3 A
3.4 B
3.5 C

(5 × 1) **[5]**

QUESTION 4

4.1 force
4.2 velocity
4.3 Joule's law
4.4 specific heat capacity
4.5 kinetic energy

(5 × 1) **[5]**

TOTAL SECTION A: 20

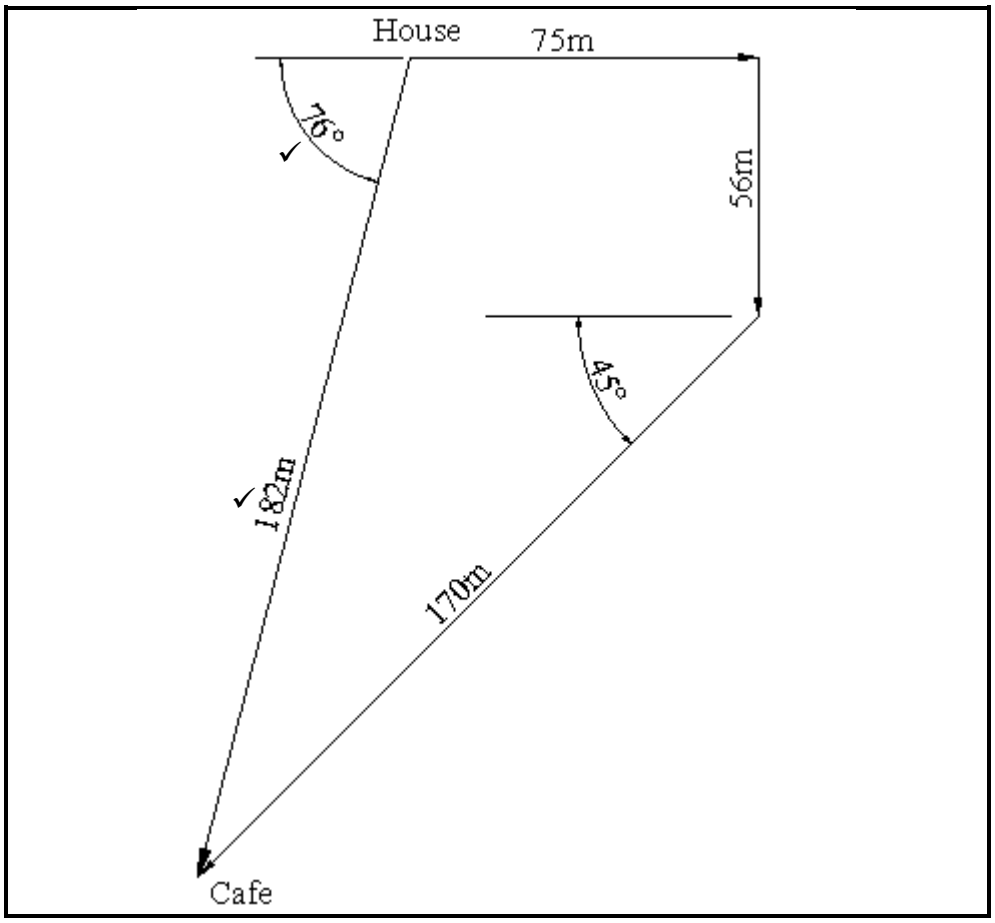
SECTION B

QUESTION 5

5.1 5.1.1 $\text{Distance} = 75 + 56 + 170$

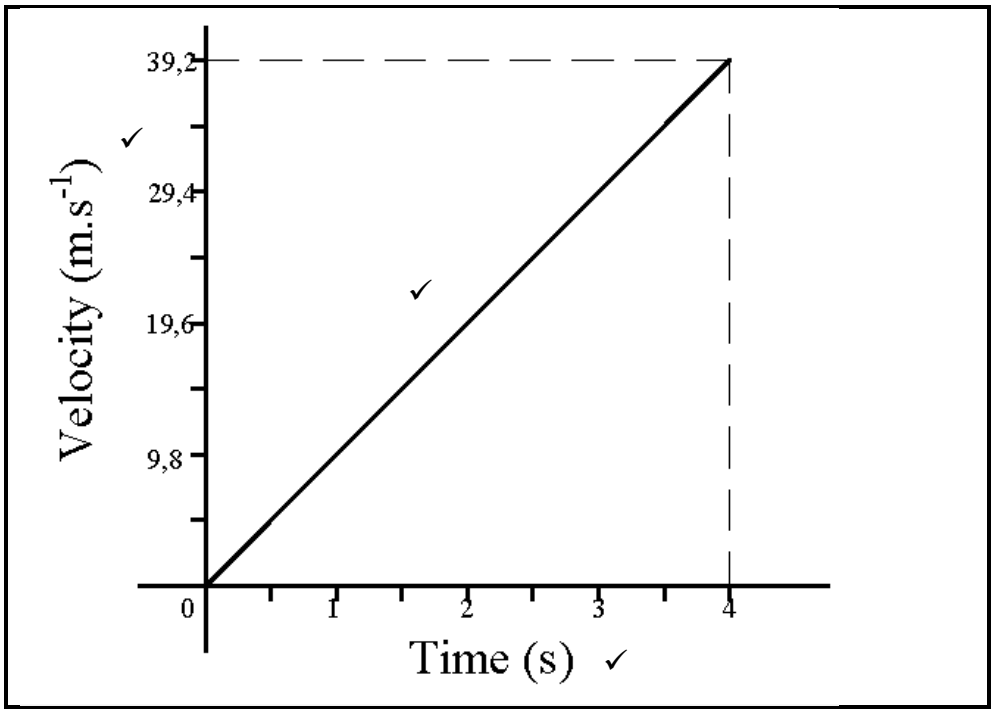
$\underline{\text{Distance} = 301 \text{ m}}$ (2)

5.1.2



(3)

5.2 5.2.1



(3)

5.2.2 $\text{Slope} = \frac{\Delta v}{\Delta t}$

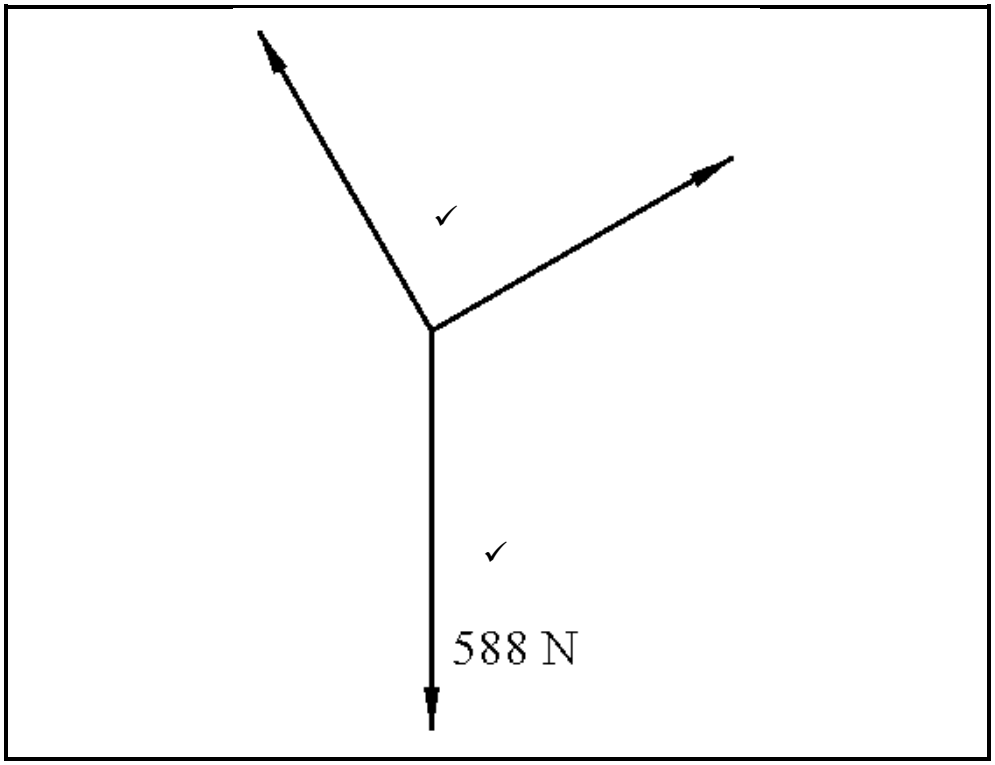
$\text{Slope} = \frac{39{,}2 - 0}{4 - 0}$

$\underline{\text{Slope} = 9{,}8\ \text{m.s}^{-2}}$ ✓

(1)
[9]

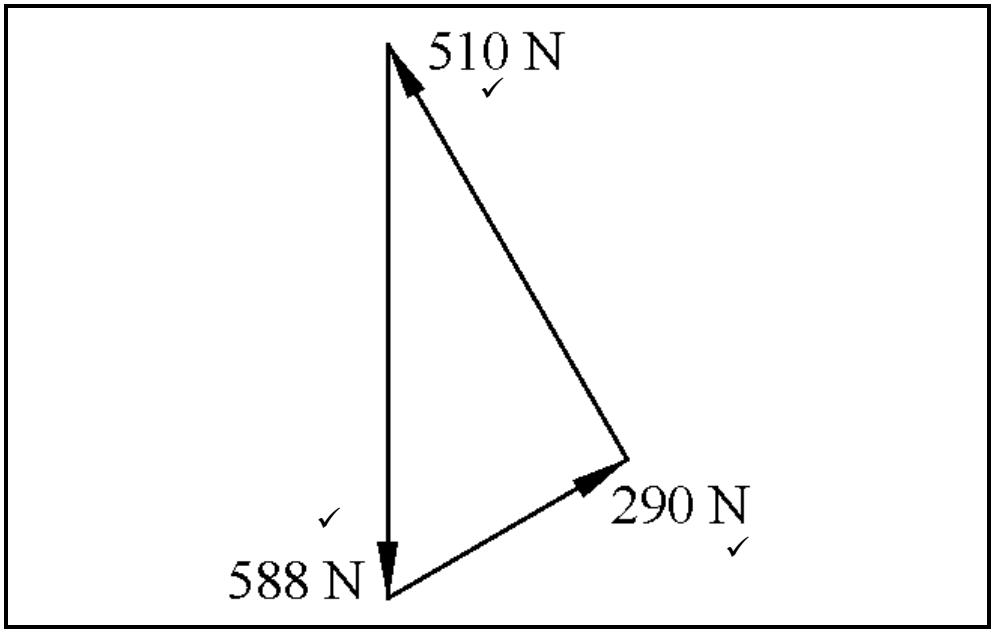
QUESTION 6

6.1 6.1.1



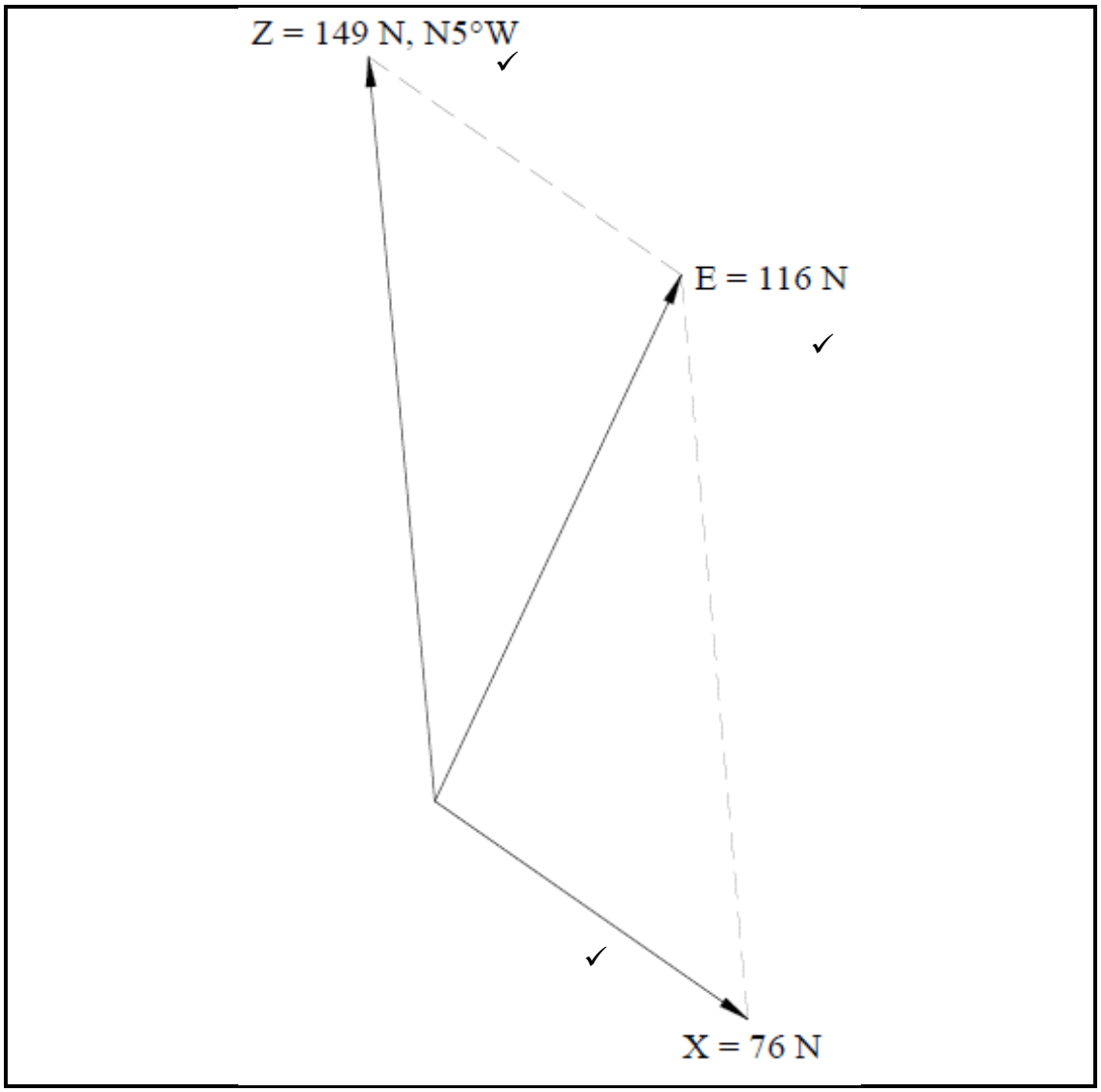
(2)

6.1.2



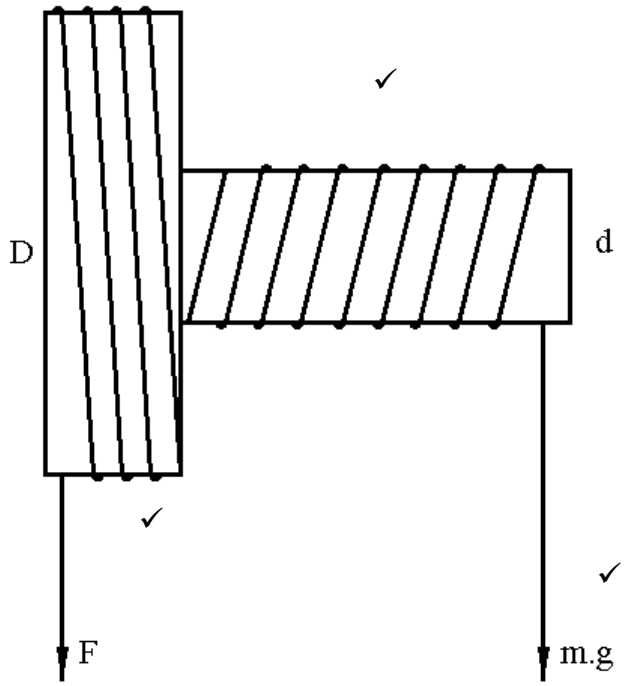
(3)

6.2



(3)

6.3 6.3.1



(3)

6.3.2 $$MA = \frac{m.g}{F}$$

$$MA = \frac{1\,560}{390}\checkmark$$

$$\underline{MA = 4}\checkmark$$ (2)

6.3.3 $$VR = \frac{D}{d}$$

$$VR = \frac{320}{64}\checkmark$$

$$\underline{VR = 5}\checkmark$$ (2)

6.4 $$T = F.r$$

$$F = \frac{T}{r}$$

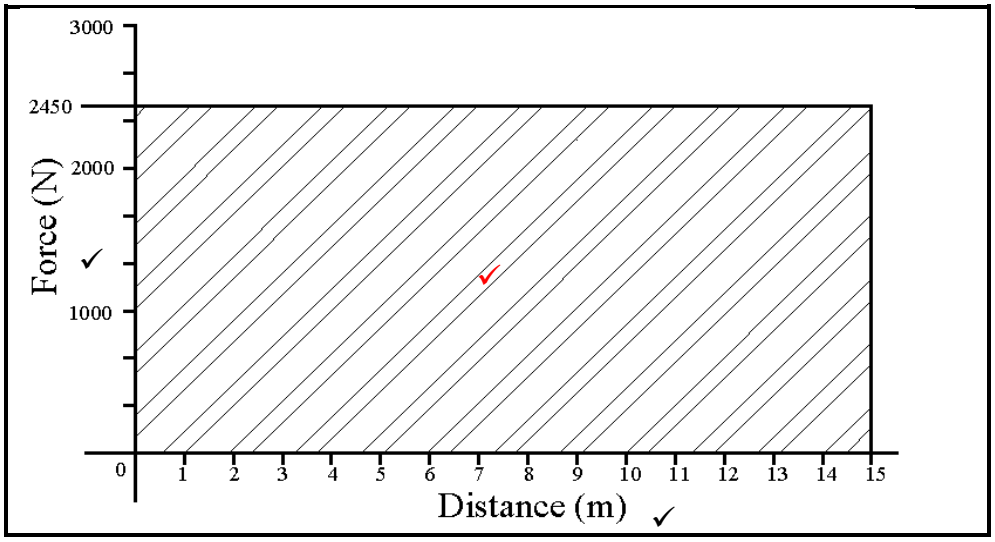
$$F = \frac{494}{0{,}65}\checkmark$$

$$\underline{F = 760\ N}\checkmark$$ (2)

[17]

QUESTION 7

7.1 7.1.1



(3)

7.1.2
$A = l \times b$
$W = F \times s$
$W = 2\,450 \times 15$✓
$W = 36{,}75\ kJ$✓ (2)

7.2 7.2.1
$v = 100 \times \frac{1\,000}{3\,600}$
$v = 27{,}778\ m/s$✓ (1)

7.2.2
$P = F.v$
$P = 2\,850 \times 27{,}778$
$P = 79167{,}3\ W$✓
$P = 79{,}167\ kW$✓ (2)
[8]

QUESTION 8

8.1
- Responds quickly to temperature changes
- Does not adhere to the glass
- Clearly visible
- High boiling point
- Expands evenly
- Good conductor of heat

(Any 2 × 1) (2)

8.2 8.2.1
$\Delta t = t_f - t_o$
$\Delta t = 91 - 22$
$\Delta t = 69\ C$ ✓ (1)

8.2.2 $Q = m.c.\Delta t$
$Q = 2{,}75 \times 4\,187 \times 69$
$Q = 794\,483{,}25$✓
$\underline{Q = 794{,}483\ kJ}$✓ (2)

8.3 The linear expansion rate of materials are nor the same. In a bi-metallic strip, two metals with a different rate of expansion are joined together✓ if the strip is heated, the metal with the fastest expansion rate will bend the strip to the side of the metal with a lower expansion rate.✓ (2)

8.4 8.4.1 $\Delta t = t_f - t_o$
$\Delta t = 36 - 18$
$\underline{\Delta t = 18\ °C}$✓ (1)

8.4.2 $L_f = L_o - \Delta l$
$L_f = 135 + 0{,}0126$✓
$\underline{L_f = 135{,}0126\ m}$✓ (2)

8.5 A thermocouple consists of two different metals joined electrically on the one side. If heat is applied to the one side, a difference in potential will form because of the difference in conductivity.✓ This potential difference can be measured by a galvanometer.✓ (2)

8.6 8.6.1 Conduction
8.6.2 Convection
(2 × 1) (2)

8.7 8.7.1 Heating of steel (Any relevant answer) (1)

8.7.2 Ice changes to water changes to vapour
(Any relevant answer) (1)
[16]

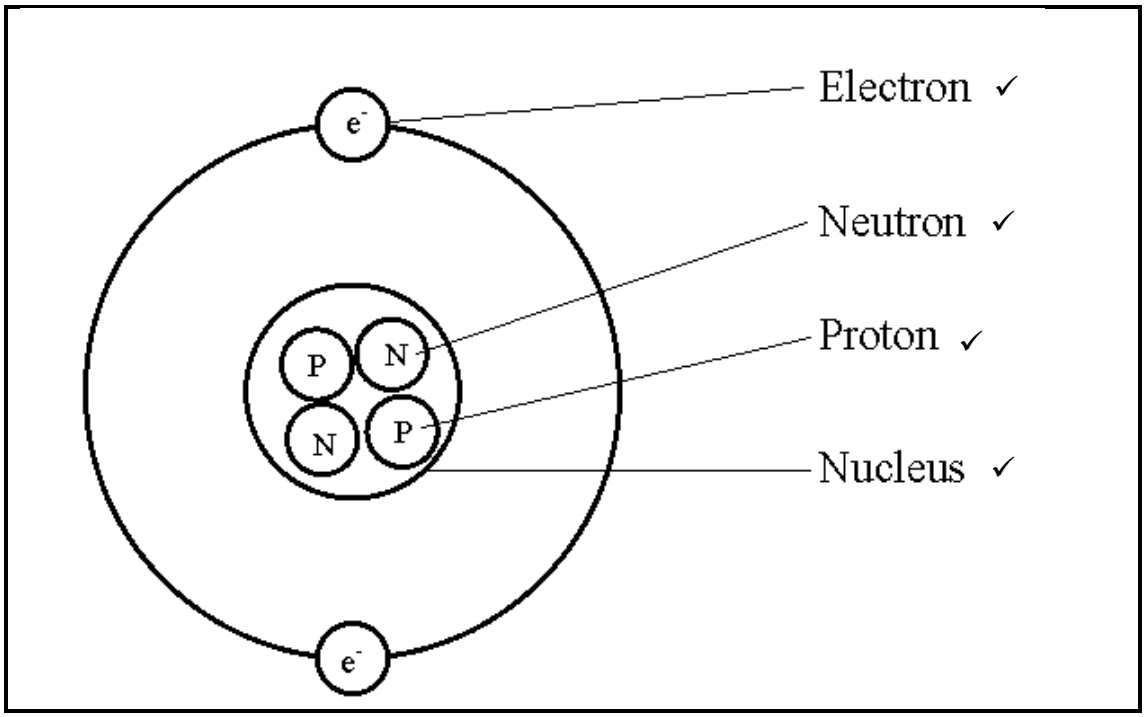
QUESTION 9

9.1 9.1.1 Particles have high energy and move constantly and fast.
(Any relevant answer)

9.1.2 Low energy particles vibrate around a fixed point.
(Any relevant answer)
(2 × 1) (2)

9.2 9.2.1 Atom
9.2.2 Molecule
(2 × 1) (2)

9.3



(4)

9.4 9.4.1 Negative
9.4.2 Positive

(2 × 1) (2)
[10]

QUESTION 10

10.1 10.1.1 Cell
10.1.2 Resistor
10.1.3 Voltmeter

(3 × 1) (3)

10.2 10.2.1 $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$\frac{1}{R_T} = \frac{1}{16} + \frac{1}{24} + \frac{1}{36}$ ✓

$\underline{R_T = 7{,}579\ \Omega}$ ✓ (2)

10.2.2 $I = \frac{V}{R}$

$I = \frac{12}{7{,}579}$ ✓

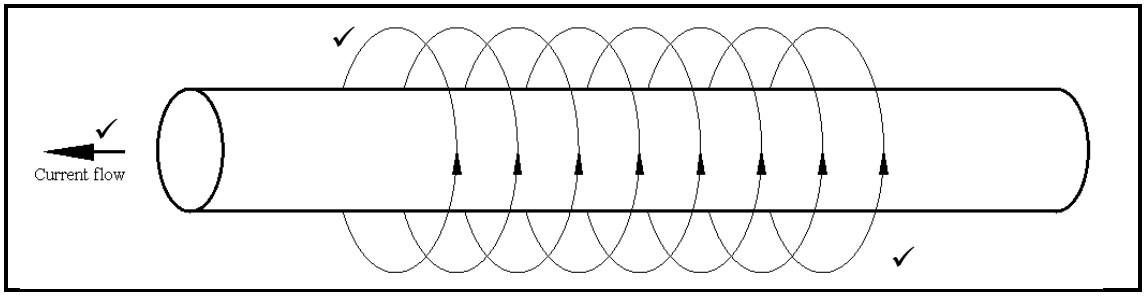
$\underline{I = 1{,}583\ A}$ ✓ (2)

10.3 10.3.1 Resistance will increase
10.3.2 No change
(2 × 1) (2)

10.4
- Length of the conductor
- Type of material
- Temperature
- Cross-sectional area (Any 3 × 1) (3)

10.5 NO ANSWER PROVIDED (2)

10.6



(3)

10.7
$$P = V.I$$
$$I = \frac{P}{V}$$
$$I = \frac{1\,200}{230} \checkmark$$
$$I = 5{,}217\ A \checkmark$$
(2)

10.8
- Electrical motor
- Electrical bell
- Relay (Any relevant 1 × 1) (1)

[20]

TOTAL SECTION B: 80
GRAND TOTAL: 100

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