



**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.

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

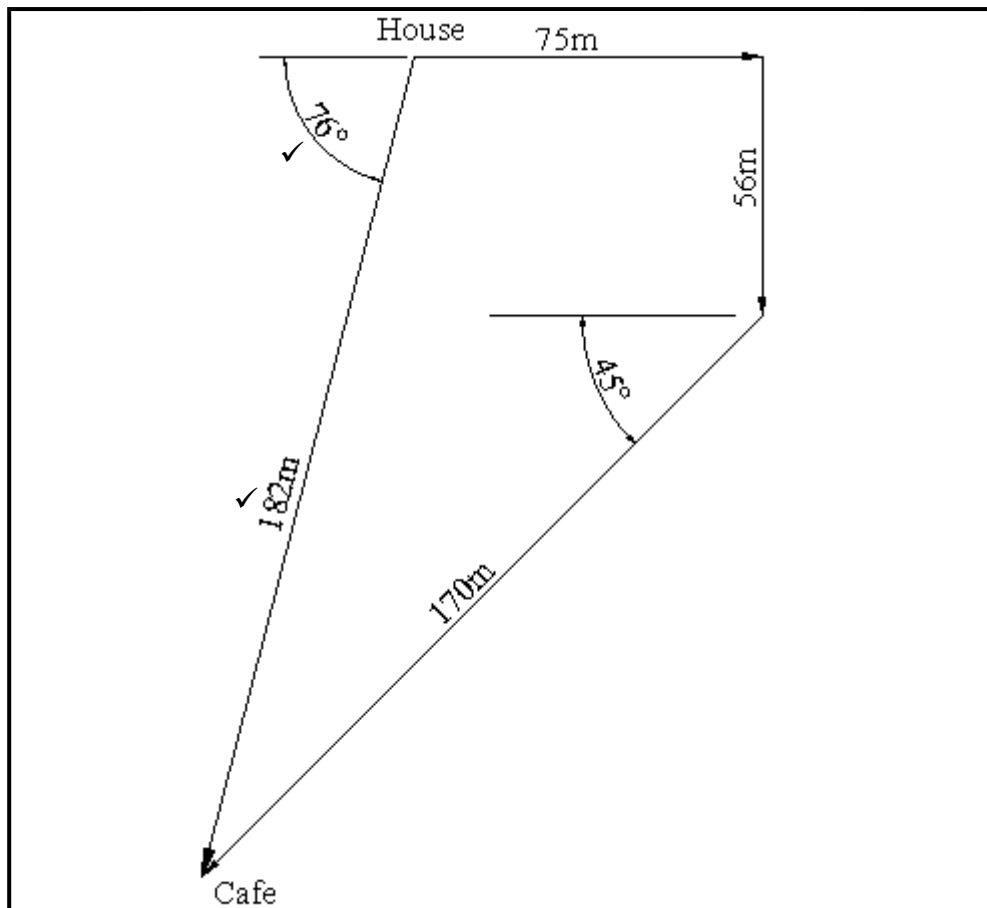
(5 × 1) [5]

TOTAL SECTION A: 20

SECTION B**QUESTION 5**

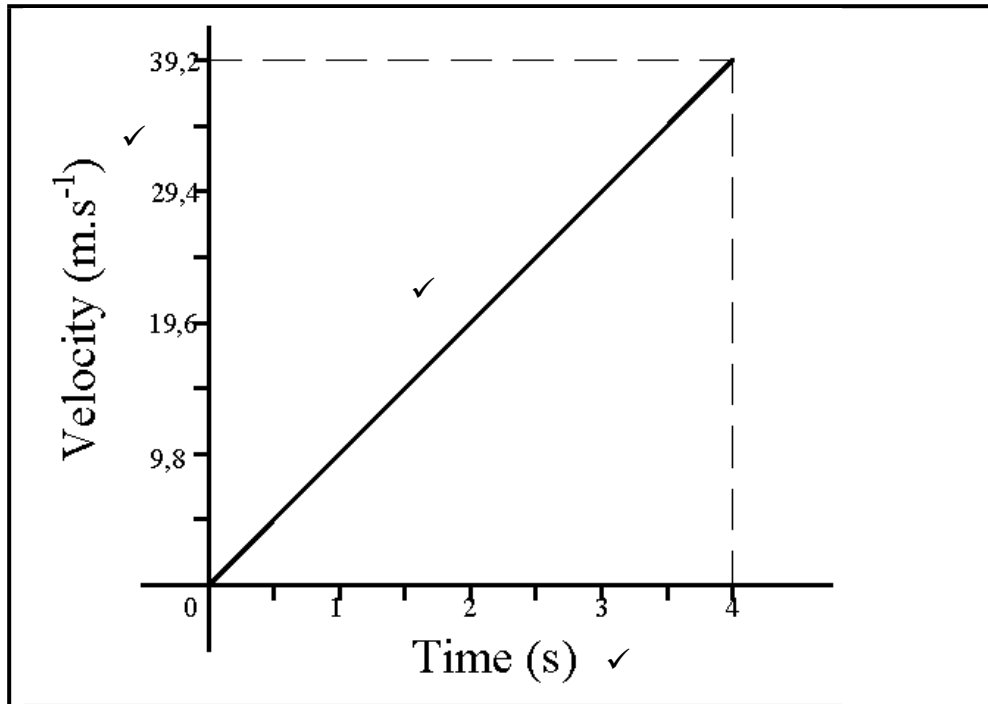
5.1 5.1.1 $Distance = 75 + 56 + 170$ $Distance = 301m$ (2)

5.1.2



(3)

5.2 5.2.1



(3)

5.2.2

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

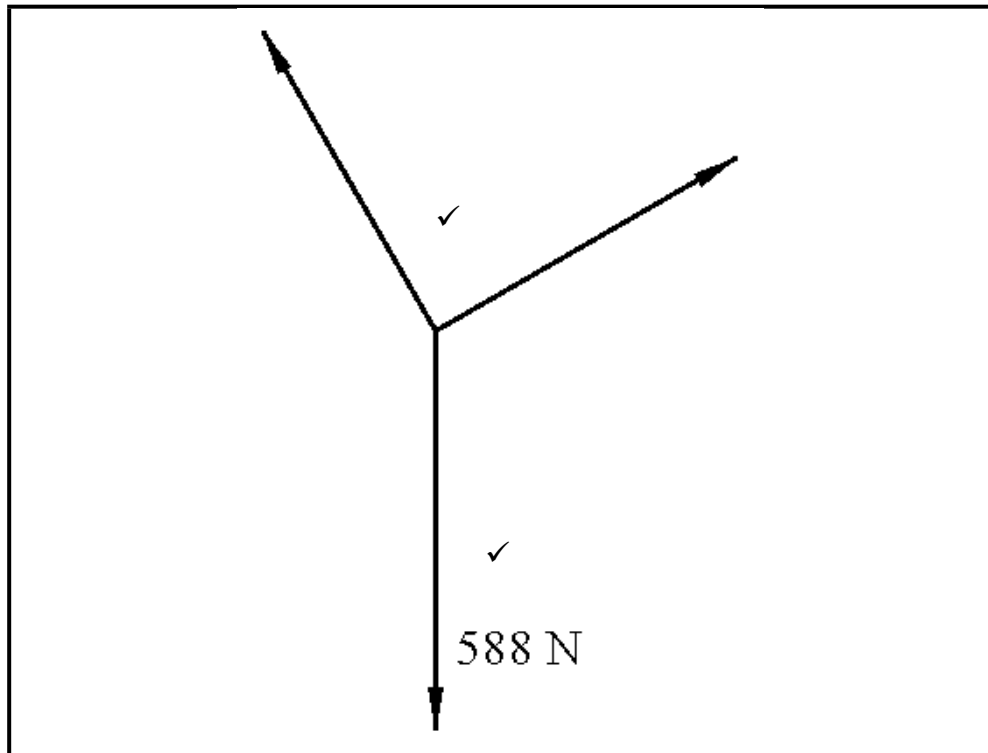
$$\text{Slope} = \frac{39,2 - 0}{4 - 0}$$

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

(1)
[9]

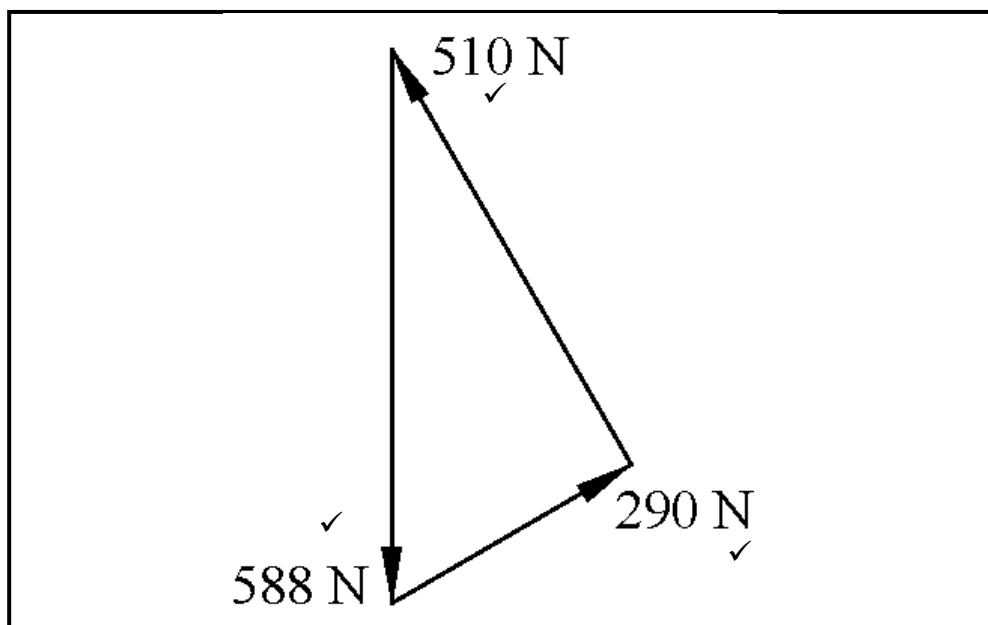
QUESTION 6

6.1 6.1.1



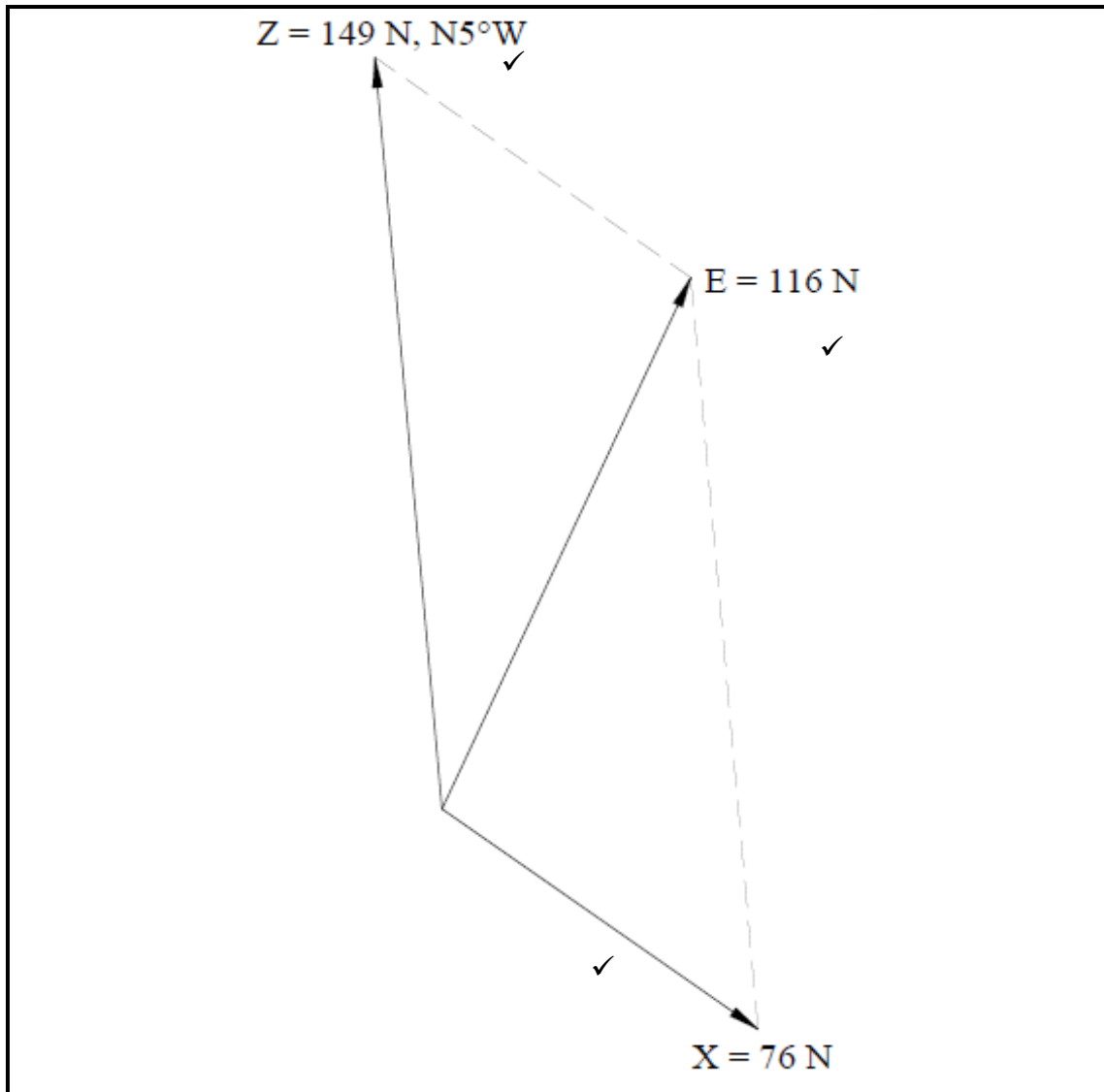
(2)

6.1.2



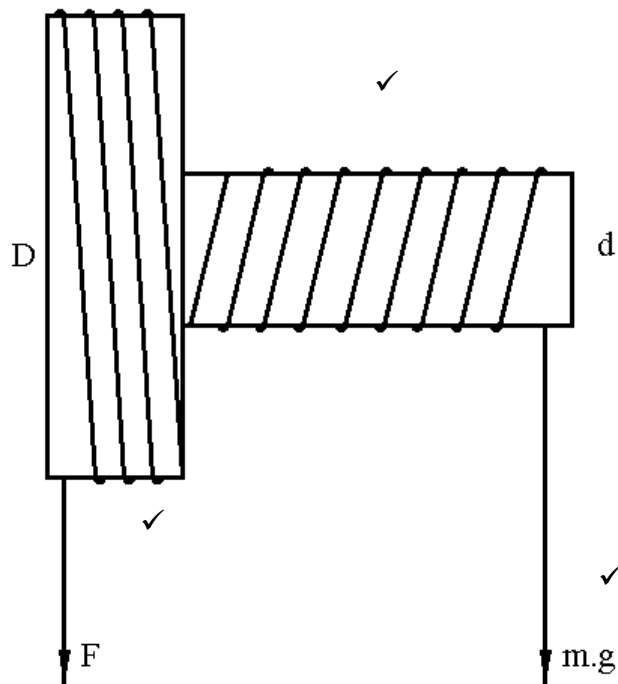
(3)

6.2



(3)

6.3 6.3.1



(3)

$$6.3.2 \quad MA = \frac{m \cdot g}{F} \quad MA = \frac{1560}{390} \quad \underline{MA = 4} \quad \checkmark$$

(2)

$$6.3.3 \quad VR = \frac{D}{d} \quad VR = \frac{320}{64} \quad \underline{VR = 5} \quad \checkmark$$

(2)

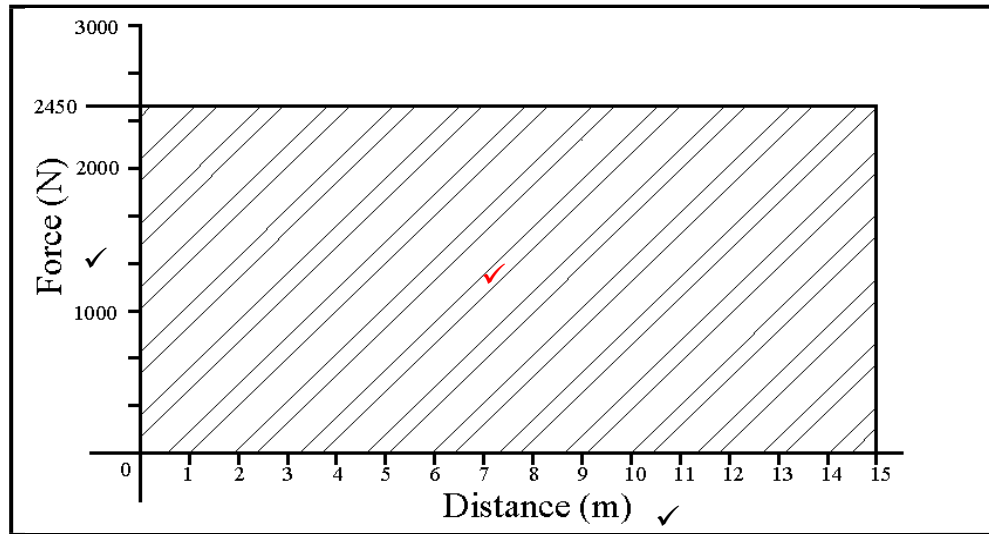
$$6.4 \quad T = F \cdot r \quad F = \frac{T}{r} \quad F = \frac{494}{0,65} \quad \underline{F = 760 \text{ N}} \quad \checkmark$$

(2)

[17]

QUESTION 7

7.1 7.1.1



(3)

$$7.1.2 \quad A = l \times b \quad W = F \times s \quad W = 2450 \times 15 \quad \underline{W = 36,75 \text{ kJ}}$$

(2)

$$7.2 \quad 7.2.1 \quad v = 100 \times \frac{1000}{3600} \quad \underline{v = 27,778 \text{ m/s}}$$

(1)

$$7.2.2 \quad P = F \cdot v \quad P = 2450 \times 27,778 \quad P = 79167,3 \text{ W} \quad \underline{P = 79,167 \text{ kW}}$$

(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)

$$8.2 \quad 8.2.1 \quad \Delta t = t_f - t_o \quad \Delta t = 91 - 22 \quad \underline{\Delta t = 69^\circ\text{C}}$$

(1)

$$8.2.2 \quad Q = m \cdot c \cdot \Delta t \quad Q = 2,75 \times 4187 \times 69 \quad Q = 794\,483,25 \quad \underline{Q = 794,483 \text{ kJ}}$$

(2)

- 8.3 The linear expansion rate of materials are not 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.

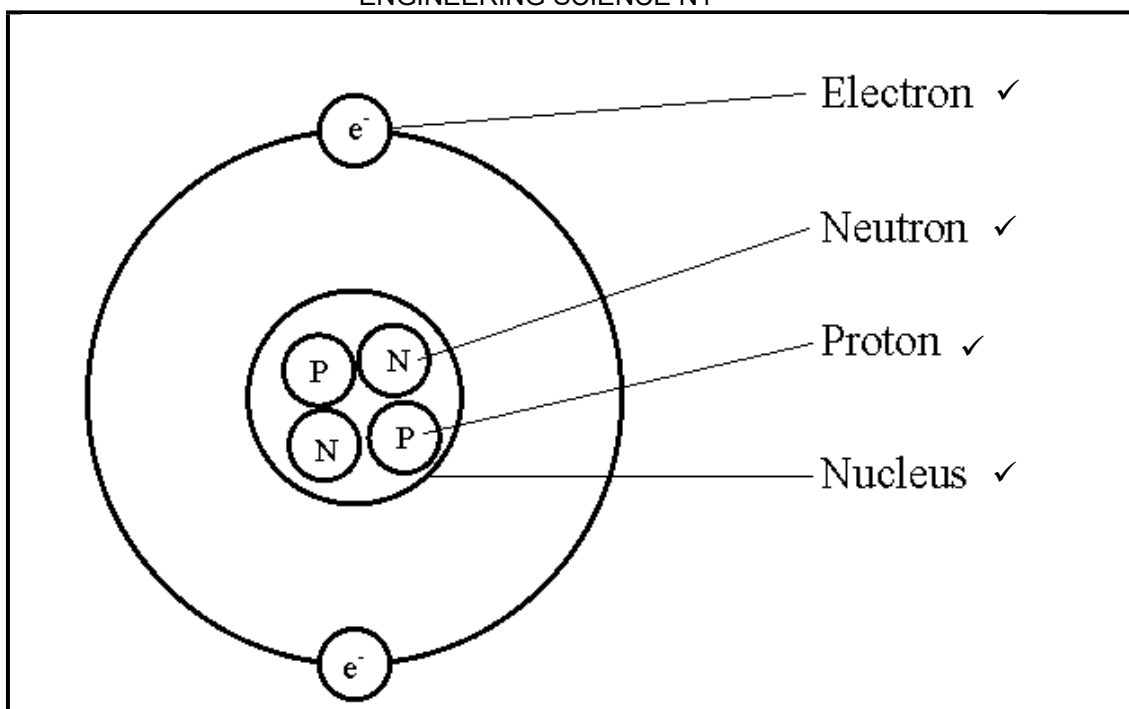
(2)

8.4	8.4.1	$\Delta t = t_f - t_o \Delta t = 36 - 18 \underline{\Delta t = 18^\circ C}$ ✓	(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	(2 × 1) (2)
	8.6.2	Convection	
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)	(2 × 1) (2)
	9.1.2	Low energy particles vibrate around a fixed point. (Any relevant answer)	
9.2	9.2.1	Atom	(2 × 1) (2)
	9.2.2	Molecule	

9.3



(4)

9.4

9.4.1
9.4.2Negative
Positive

(2 × 1)

(2)
[10]**QUESTION 10**

10.1

10.1.1
10.1.2
10.1.3Cell
Resistor
Voltmeter

(3 × 1)

(3)

10.2

10.2.1

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \quad \frac{1}{R_T} = \frac{1}{16} + \frac{1}{24} + \frac{1}{36} \quad R_T = 7,579 \Omega \checkmark$$

(2)

10.2.2

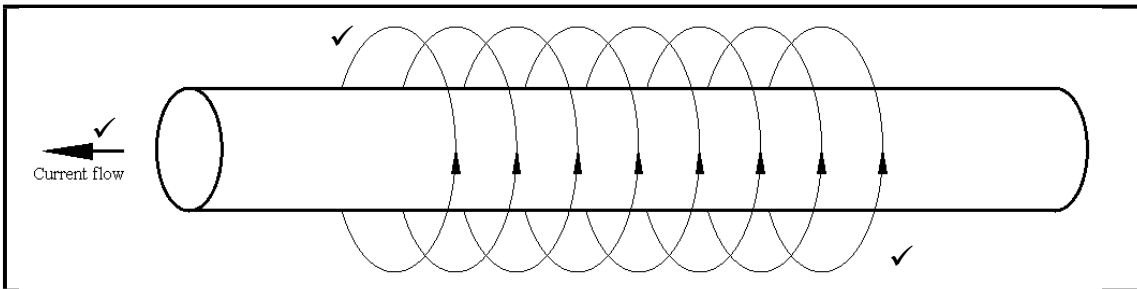
$$I = \frac{V}{R} \quad I = \frac{12}{7,579} \quad I = 1,583 A \checkmark$$

(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 $P = V \cdot I$ $I = \frac{P}{V} = \frac{1200}{230} I = 5,217 A$ ✓ (2)

10.8 • Electrical motor
 • Electrical bell
 • Relay
 1)
(Any relevant 1 × (1)
[20])

TOTAL SECTION B: 80
GRAND TOTAL: 100