



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE ENGINEERING SCIENCE N1

30 JULY 2019

This marking guideline consists of 12 pages.

✓ = 1 mark

√ = ½ mark

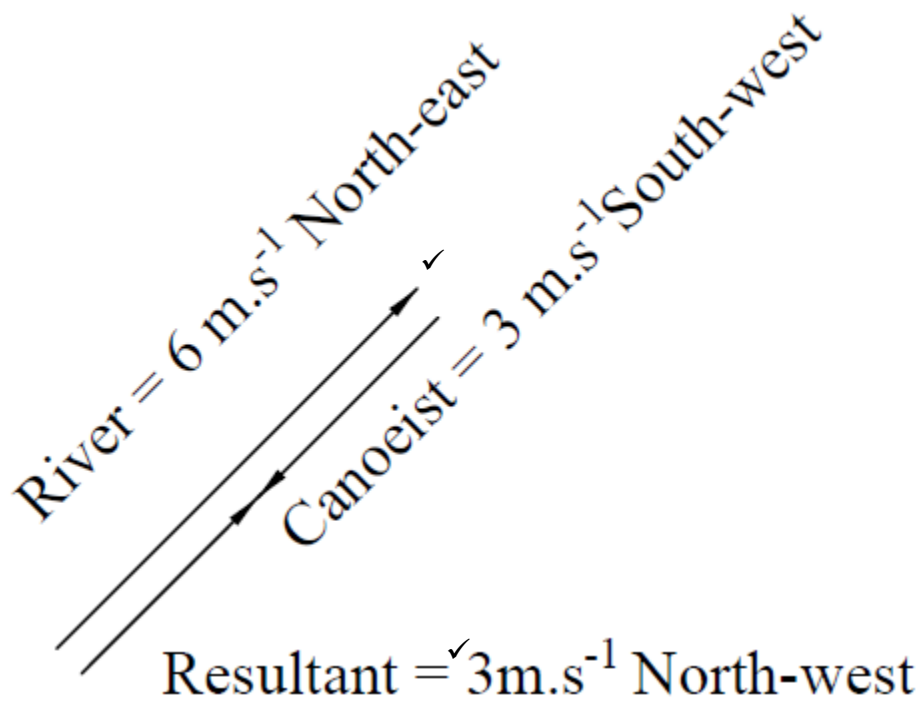
SECTION A**QUESTION 1**

| | | | | |
|-----|-------|----------------|---------|-------------|
| 1.1 | 1.1.1 | Scalar | | |
| | 1.1.2 | Equilibrant | | |
| | 1.1.3 | Kinetic energy | | |
| | 1.1.4 | Temperature | | |
| | 1.1.5 | Conductor | (5 × 1) | (5) |
| 1.2 | 1.2.1 | C | | |
| | 1.2.2 | A | | |
| | 1.2.3 | F | | |
| | 1.2.4 | E | | |
| | 1.2.5 | D | (5 × 1) | (5) |
| 1.3 | 1.3.1 | C | | |
| | 1.3.2 | B | | |
| | 1.3.3 | B | | |
| | 1.3.4 | C | | |
| | 1.3.5 | D | (5 × 1) | (5) |
| 1.4 | 1.4.1 | False | | |
| | 1.4.2 | True | | |
| | 1.4.3 | False | | |
| | 1.4.4 | False | | |
| | 1.4.5 | False | (5 × 1) | (5) |
| | | | | [20] |

TOTAL SECTION A: 20

QUESTION 2: DYNAMICS

2.1



(2)

2.2 2.2.1 A

(1)

2.2.2

$$speed = \frac{\Delta s}{\Delta t}$$

$$speed = \frac{(30 - 0)}{(5 - 1)}$$

$$speed = 7,5 \text{ m/s} \checkmark$$

(1)

2.3

$$speed = \frac{s}{t}$$

$$speed = \frac{80}{1,167}$$

$$speed = 68,552 \text{ km/h} \checkmark$$

(1)

2.4

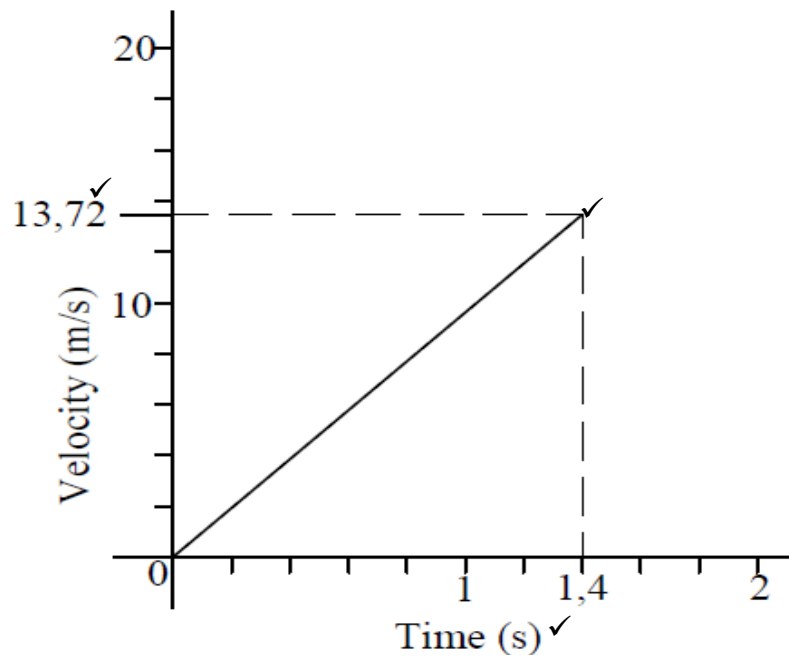
$$F = m \cdot g$$

$$F = 2,4 \times 9,8$$

$$F = 23,52 \text{ N} \checkmark$$

(1)

2.5 2.5.1



(2)

2.5.2 Gravitational acceleration.

(1)

- 2.6
- Mass of a body is the amount of matter of which a body consists. ✓
 - Weight is the attraction force between a body and the earth. ✓

(1)

2.7

$$w = m \cdot g$$

$$m = \frac{w}{g}$$

$$m = \frac{282}{3,711}$$

$$m = 75,99 \text{ kg} \checkmark$$

$$\underline{\underline{m = 76 \text{ kg}}}$$

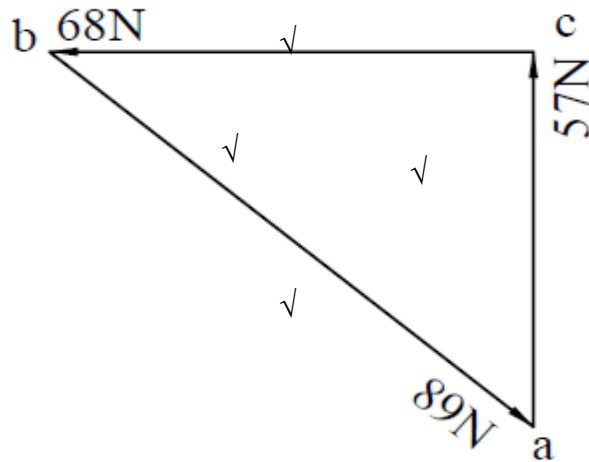
(1)

[11]

QUESTION 3: STATICS

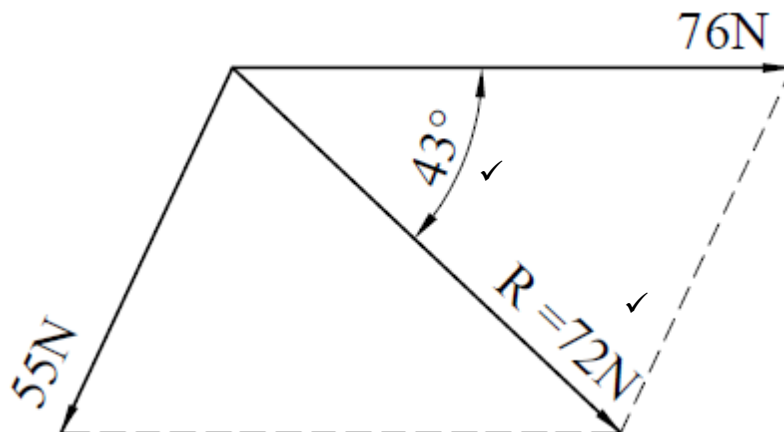
- 3.1 When three forces are in equilibrium they can be represented by the sides of a triangle in size and direction. (1)

3.2



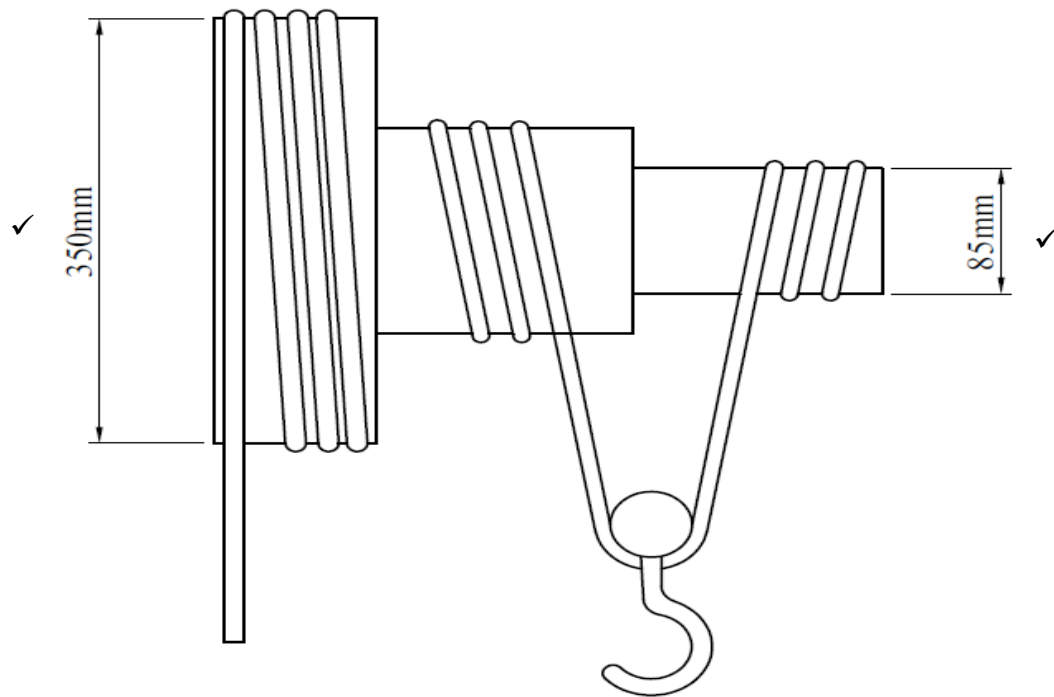
(2)

3.3



(2)

3.4



(2)

3.5 3.5.1

$$MA = \frac{W}{F}$$

$$MA = \frac{210 \times 9,8}{425} \checkmark$$

$$\underline{MA = 4,842} \checkmark$$

(2)

3.5.2

$$VR = \frac{\text{effort_distance}}{\text{load_distance}}$$

$$VR = \frac{2}{0,3} \checkmark$$

$$\underline{VR = 6,667} \checkmark$$

(2)

3.6 $T = F.r$

$$T = 45 \times 0,38 \checkmark$$

$$\underline{T = 17,1 N.m} \checkmark$$

(2)

3.7 The tendency of a force to cause or change the rotational motion of a body.

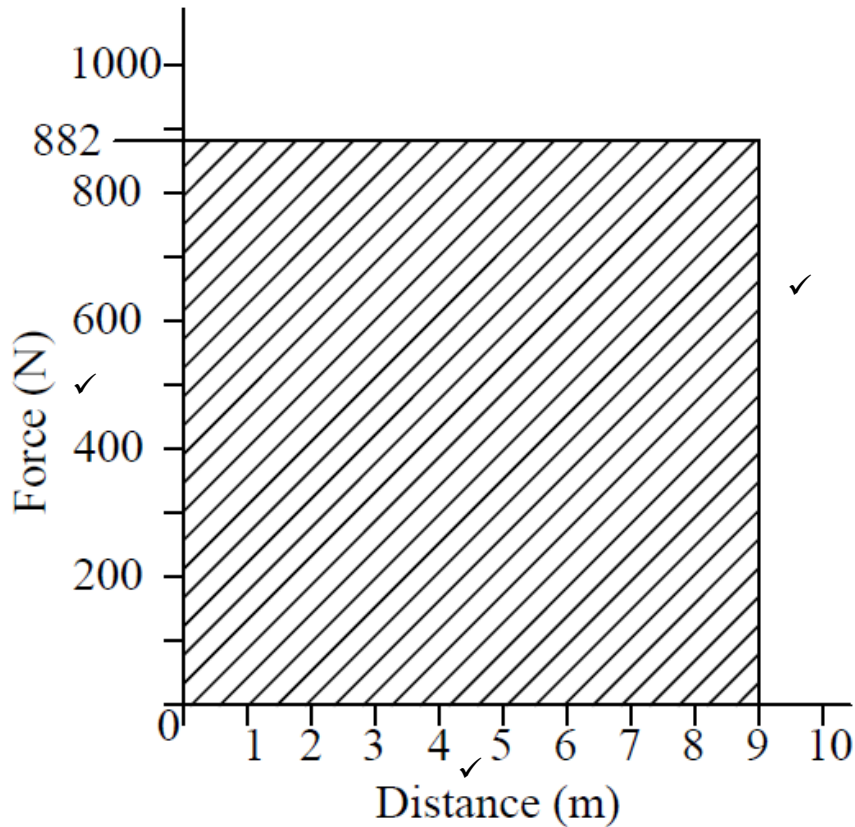
(1)

[14]

QUESTION 4: ENERGY WORK AND POWER

- 4.1 • Potential to kinetic
 • Electrical to mechanical (Any 1 × 1) (1)

4.2 4.2.1



(3)

4.2.2 $WD = F.s$
 $WD = (90 \times 9,8).(30 \times 0,3)$
 $WD = 7938J$ ✓
 $WD = 7,938kJ$ (1)

4.2.3 $P = \frac{W}{t}$
 $P = \frac{7938}{2,5 \times 60}$
 $P = 52W$ ✓ (1)

4.3 4.3.1 $WD = F.s$
 $WD = (500 \times 9,8) \times 1\,400$ ✓
 $WD = 68\,600\,00J$
 $WD = 6,86MJ$ ✓ (2)

4.3.2

$$P = \frac{W}{t}$$

$$P = \frac{6860000}{1,5 \times 60} \checkmark$$

$$P = 76222,222W$$

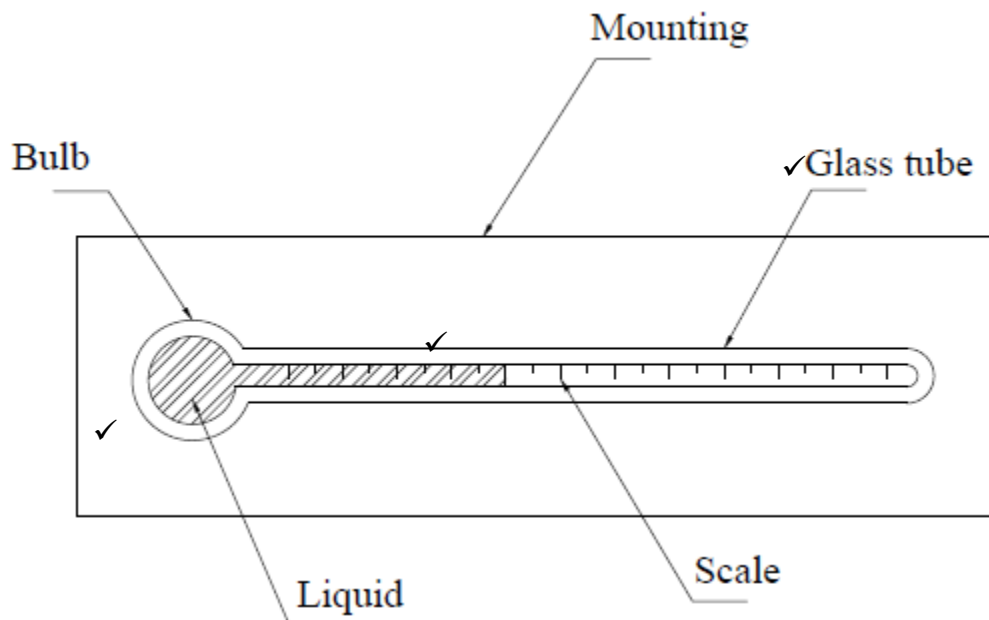
$$\underline{\underline{P = 76,222kW \checkmark}}$$

(2)
[10]**QUESTION 5: HEAT**

- 5.1
- Heat is a form of energy.
 - Temperature is an indication of the hotness or coldness of a body.

(2)

5.2



(3)

5.3

| ADVANTAGE | DISADVANTAGE |
|---|---------------------------------------|
| • Quick response to temperature changes | • Can't measure very low temperatures |
| • Does not adhere to the glass | • Poisonous |
| • Visible | • Expensive |
| • High boiling point | |
| • Expands evenly | |
| • Good conductor of heat (Any ONE) | (Any ONE) |

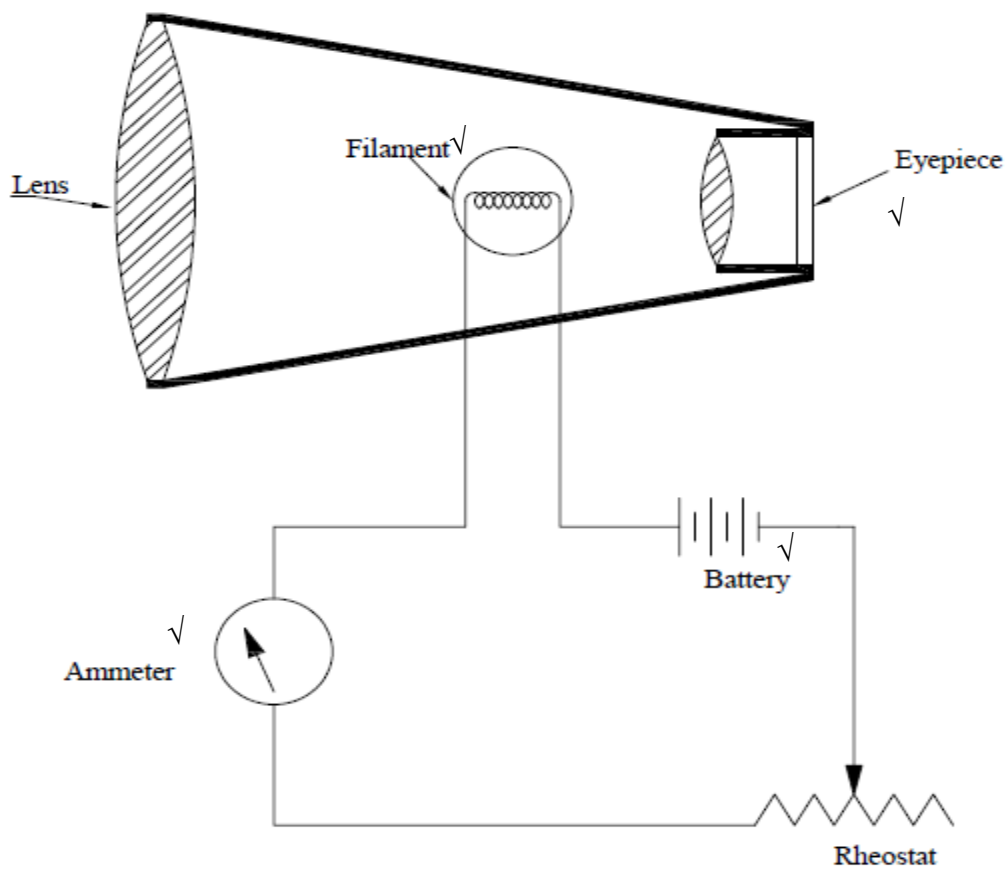
(2 × 1)

(2)

- 5.4
- Liquids – convection
Vacuum - radiation

(2)

5.5



(2)

5.6

$$Q = m.c.\Delta t$$

$$Q = 60 \times 4\,200 \times (-25 - 25) \checkmark$$

$$Q = 126\,000\,000\text{ J}$$

$$\underline{\underline{Q = 12,6\text{ MJ} \checkmark}}$$

(2)

5.7

$$\Delta L = L_f - L_o$$

$$\Delta L = 4,31 - 4,29$$

$$\underline{\underline{\Delta L = 0,02\text{ m}}}$$

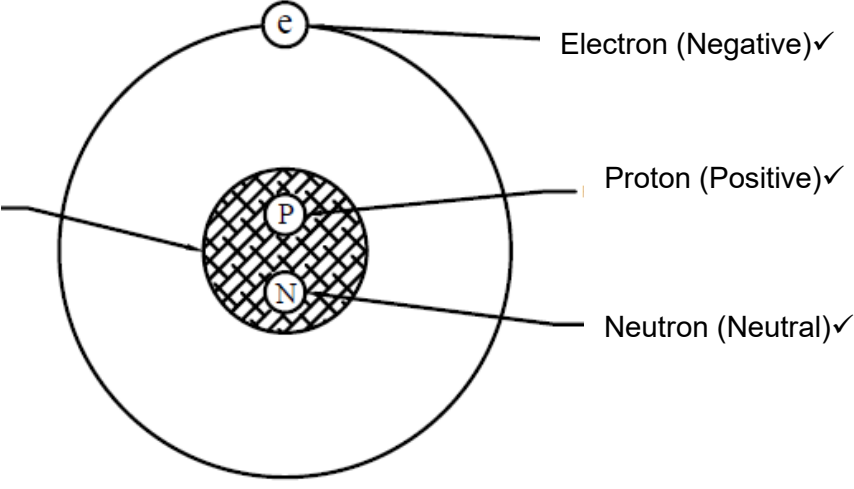
(2)

[15]

QUESTION 6: PARTICLE STRUCTURE OF MATTER

- 6.1
- Gas – Steam
 - Liquid – Water
 - Solid – Ice
- (Any correct THREE examples) (3)

6.2



Nucleus (Positive)✓

Electron (Negative)✓

Proton (Positive)✓

Neutron (Neutral)✓

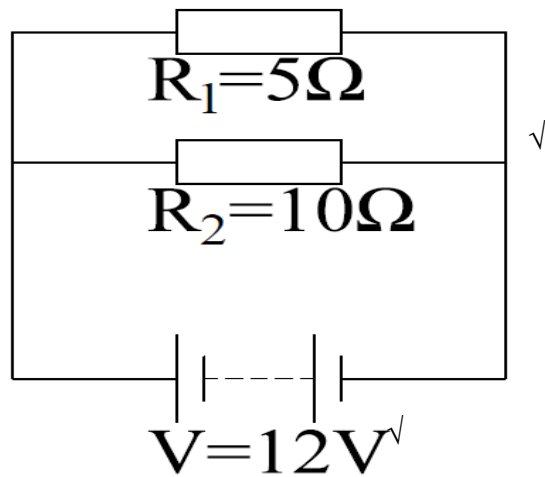
(4)

- 6.3 When heat is added to water the particles begin to move faster and further apart,✓ until the water changes phase✓ to gas where the particles moves very fast and are far apart.✓ (3)
- 6.4 The volume increases. (1)
- [11]**

QUESTION 7: ELECTRICITY

- 7.1
- Copper
 - Silver
 - Gold
 - Iron
- (Any relevant 2 × 1) (2)
- 7.2
- In direct current the polarity stays the same.
 - In alternating current the polarity changes at a certain rate.
- (2)
- 7.3 The cross-sectional area which is the dimension of the conductor (1)
- 7.4
- German silver
 - Bronze
- (2)

7.5 7.5.1



(1)

$$7.5.2 \quad \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_T} = \frac{1}{5} + \frac{1}{10} \quad \checkmark$$

$$\underline{\underline{R_T = 3,333\Omega \quad \checkmark}}$$

(2)

$$7.5.3 \quad I = \frac{V}{R}$$

$$I = \frac{12}{3,333} \quad \checkmark$$

$$\underline{\underline{I = 3,6A \quad \checkmark}}$$

(2)

$$7.5.4 \quad P = I^2 R$$

$$P = 3,6^2 \times 3,333$$

$$\underline{\underline{P = 43,195W}}$$

$$\text{OR } P = \frac{V^2}{R}$$

$$P = \frac{12^2}{3,333}$$

$$\underline{\underline{P = 43,204W}}$$

$$P = V.I$$

$$\text{OR } P = 12 \times 3,6 \quad \checkmark$$

$$\checkmark \quad \underline{\underline{P = 43,2W}}$$

(2)

7.6 The resistivity of a good conductor is low and that of a bad conductor is high. (1)

$$7.7 \quad Q = I^2 . R . t$$

$$t = \frac{Q}{I^2 . R}$$

$$t = \frac{225\,000}{5^2 \times 44} \quad \checkmark$$

$$\underline{\underline{t = 204,545s \quad \checkmark}}$$

(2)

| | | | |
|-----|---|-------------|-------------|
| 7.8 | <ul style="list-style-type: none">• More turns• Insert core• Increase current | (Any 2 × 1) | (2) |
| | | | [19] |

| | |
|-------------------------|------------|
| TOTAL SECTION B: | 80 |
| GRAND TOTAL: | 100 |