

# higher education & training

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Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

## **MARKING GUIDELINE**

**NATIONAL CERTIFICATE**

**NOVEMBER EXAMINATION**

**ENGINEERING SCIENCE N1**

**18 NOVEMBER 2014**

**This marking guideline consists of 8 pages.**

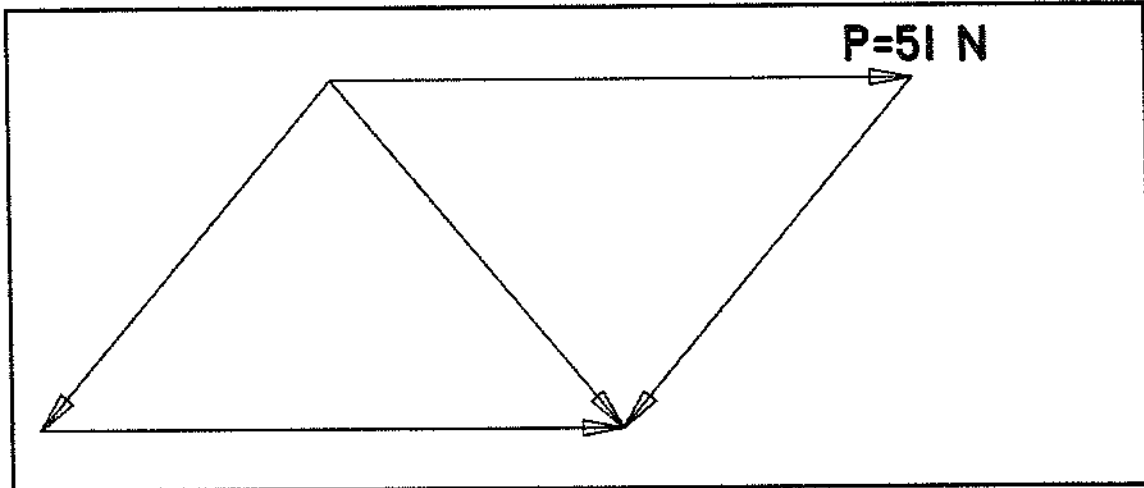


**QUESTION 2**

2.1 A system is *two or more forces acting on a body* (1)

2.2 When a system of force *acts on a point and it remains at rest,* the forces are in equilibrium. (1)

2.3



(2)

2.4 2.4.1 Amount of pulleys: 4 (1)

2.4.2

$$MA = \frac{L}{E}$$

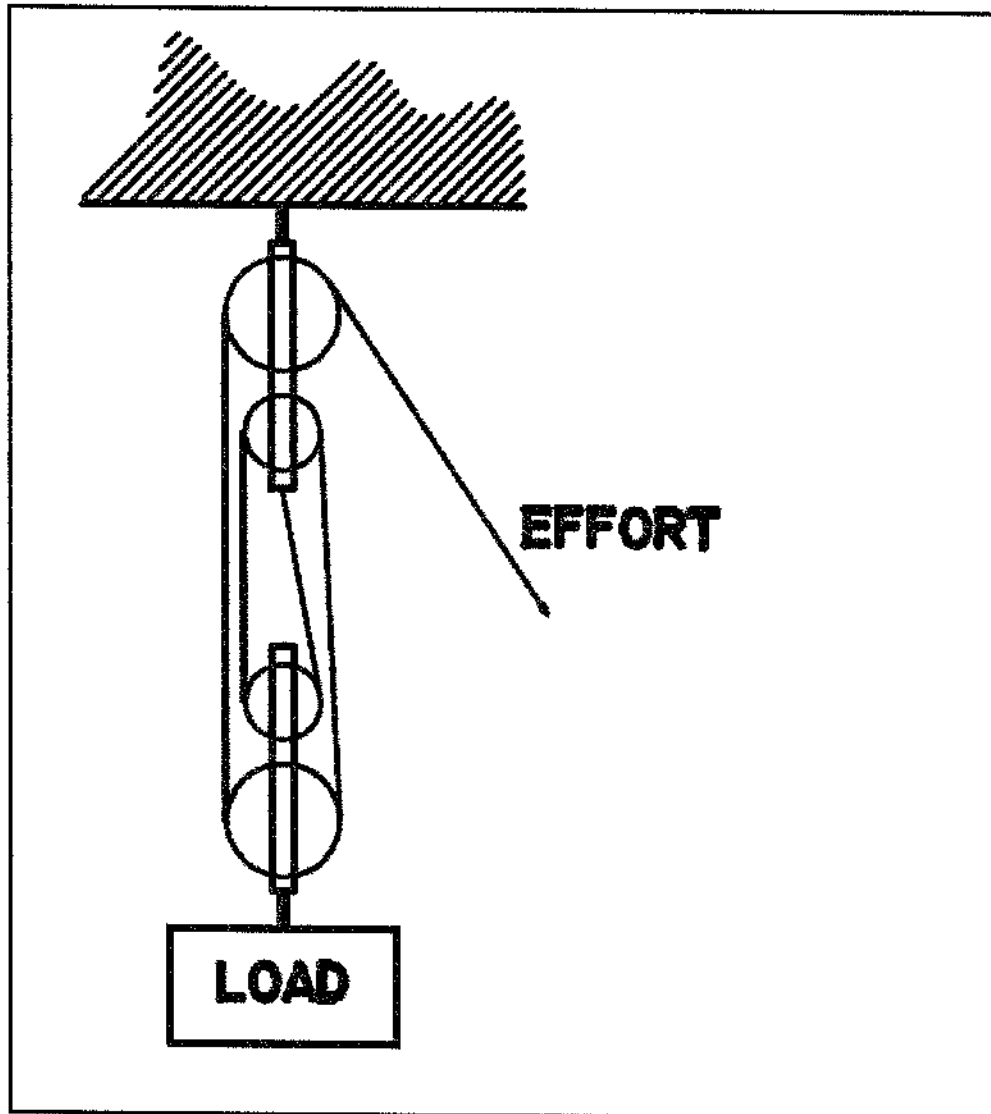
$$E = \frac{L}{MA}$$

$$E = \frac{1300}{3,2}$$

$$E = 406,25N$$

(3)

2.4.3



(2)

2.5 Moment about R:

$$4L = 0,5(150) + 3(250)$$

$$L = \frac{825}{4}$$

$$\underline{L = 206,5 \text{ N}}$$

(3)  
[13]

**QUESTION 3**

- 3.1 3.1.1 Potential Energy is the energy that a body possesses by virtue of its position or state ✓.
- 3.1.2 Conservation of Energy means energy cannot be created ✓ or destroyed, ✓ ; it can only be transferred from one form to another. ✓  
(2 x 2) (4)
- 3.2 3.2.1  $W = F \times s$   
 $W = 230 \times 30$   
 $W = 6,9kJ$
- 3.2.2  $v = \frac{s}{t}$   
 $v = \frac{30}{40}$   
 $v = 0,75m/s$
- 3.2.3  $P = \frac{W}{t}$   
 $P = \frac{6900}{40}$   
 $P = 172,5W$   
(3 x 2) (6)
- 3.3 A force of 1N ✓ that moves over a distance of 1 m. ✓ (½ mark each) (1)
- 3.4 NO work done; NO displacement. (1)
- [12]

**QUESTION 4**

- 4.1 Temperature can be defined as: how hot ✓ or cold ✓ a body is. (2)
- 4.2 Temperature changes: In the Heating of water or metals.
- Colour changes:*  
Heated iron changes colour.
- Volume changes:*  
Expansion of metals.
- Change of phase:*  
Ice to liquid to gas.
- Change of resistance:*  
Resistance of most conductors increases with an increase of temperature.  
(Any 2 x 2) (4)

4.3

COMPARE	MERCURY	COLOURED ALCOHOL
Boiling point	4.3.1 360 °C✓	4.3.2 80 °C✓
Colour	4.3.3 Silver✓	4.3.4 Transparent✓
Sticks to class	4.3.5 No✓	4.3.6 Yes✓

(6)

4.4

Shrinking of ring gears onto the flywheel,✓  
Steel tyres onto the steel railway wheels.✓

(2)

4.5

4.5.1  $Q = mc\Delta t$   
 $\Delta t = \frac{Q}{mc}$   
 $\Delta t = \frac{58500}{2 \times 390}$   
 $\Delta t = 75^\circ C$

4.5.2  $\Delta t = t_2 - t_1$   
 $t_2 = \Delta t + t_1$   
 $= 75 + 20$   
 $= 95^\circ C$

(2 × 2)

(4)  
[18]

**QUESTION 5**

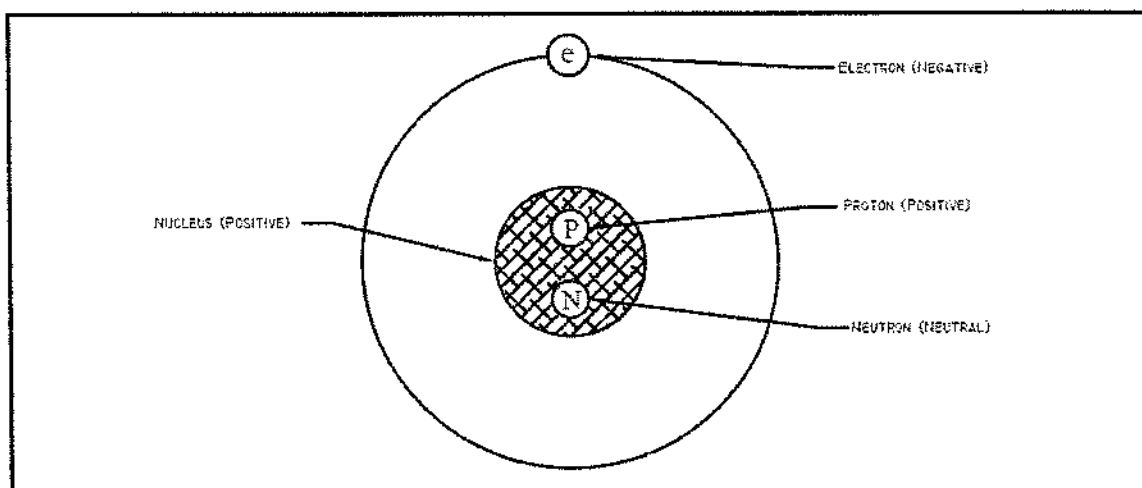
5.1

Matter is that which has weight/mass✓ and occupies✓ space.

(½ mark each)

(1)

5.2



(3)

5.3

Electrons✓

(1)

	<b>SOLID</b>	<b>LIQUID</b>	<b>GASEOUS</b>
<b>Rigidity</b>	Rigid✓	No lasting rigidity✓	No rigidity✓
<b>Compressibility</b>	Virtually incompressible✓	Virtually incompressible✓	Compresses easily✓

(6)

5.5 An element is a substance that contains one kind of atom.✓

(1)  
[12]

**QUESTION 6**

6.1 A conductor is a substance through which electrical current can flow easily.✓  
An insulator is a substance which prevents the flow of a current.✓

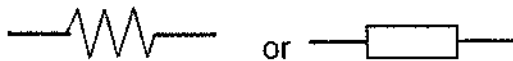
(2)

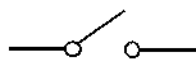
6.2 A Gold conductor.✓

(1)

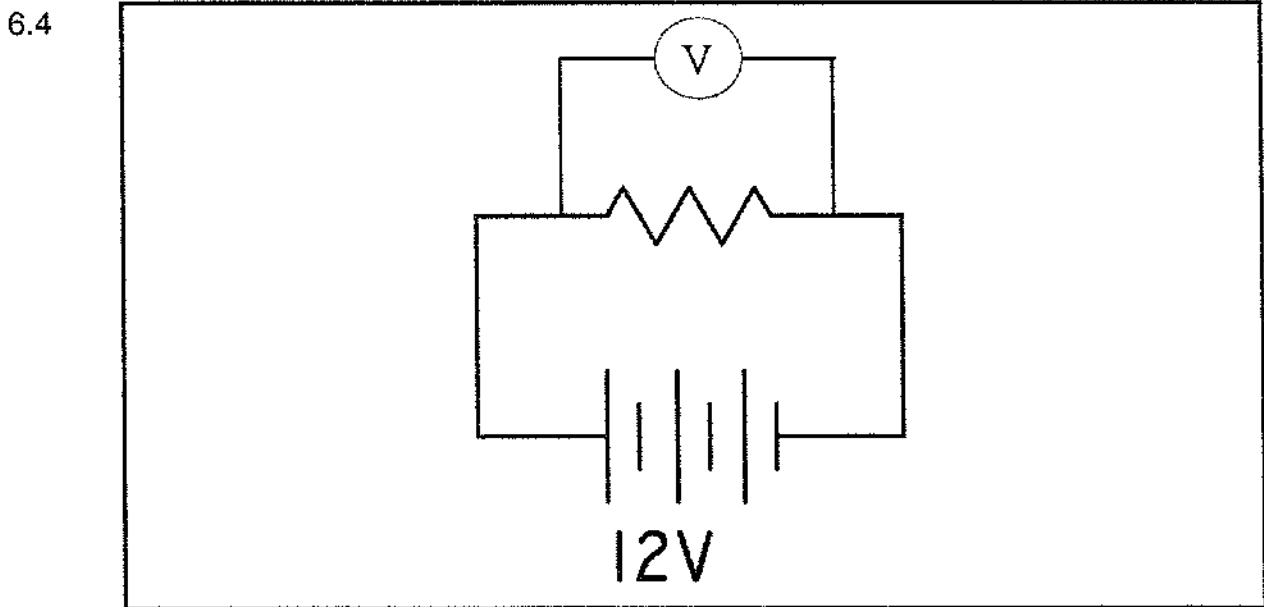
6.3 6.3.1 

6.3.2 

6.3.3 

6.3.4 

(4 × 1) (4)



(2)

- 6.5 It is that which causes the current to flow√. (1)
- 6.6 The current flowing in a circuit is proportional to the applied voltage√ and inversely proportional√ to the resistance of the circuit.√ (3)
- 6.7 Heating up of motors, generators and transformers. (Any 2 × 1) (2)
- 6.8 The resistance increases.. (1)
- 6.9 6.9.1 Copper: resistance *increases*√
- 6.9.2 An insulator: resistance *decreases*√
- 6.9.3 A conductor: resistance *increases*√ (3 × 1) (3)
- 6.10  $Q = I^2 R t$   
 $R = \frac{Q}{I^2 t}$   
 $R = \frac{500000}{7,5 \times 7,5 \times 300}$   
 $R = 29,63 \text{ ohms}$  (4)
- 6.11 6.11.1  $P = VI$   
 $I = \frac{P}{V}$   
 $I = \frac{500}{220}$   
 $I = 2,27 \text{ A}$  (4)
- 6.11.2  $R = \frac{V}{I}$   
 $R = \frac{220}{2,27}$   
 $R = 96,92 \text{ ohm}$  (3)
- [30]**
- TOTAL: 100**