higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# MARKING GUIDELINE

## NATIONAL CERTIFICATE

## ENGINEERING SCIENCE N1

**9 April 2020**

**This marking guideline consists of 10 pages.**

**✓ = 1 mark**
**☑ = ½ mark**

## SECTION A

### QUESTION 1

1.1 C
1.2 A
1.3 D
1.4 A
1.5 D

(5 × 1) **[5]**

### QUESTION 2

2.1 True
2.2 False
2.3 False
2.4 False
2.5 True

(5 × 1) **[5]**

### QUESTION 3

3.1 C
3.2 E
3.3 A
3.4 B
3.5 D

(5 × 1) **[5]**

### QUESTION 4

4.1 Resistance
4.2 Joule's law
4.3 Matter
4.4 Atom
4.5 Fleming's right-hand rule for conductors

(5 × 1) **[5]**

**TOTAL SECTION A: 20**

## SECTION B

## QUESTION 5

5.1 5.1.1 $s = 120 + 120$

$\underline{\underline{s = 240m}}$

OR

Distance covered 120 × 2 = 240 m✓ (1)

5.1.2 He walked 120 m one way and 120 m back again. He ended where he started, that is at home. So, his displacement is 0.✓ (1)

5.1.3 $Average\_speed = \frac{dis\tan ce}{time}$

$Average\_speed = \frac{240}{240}$ ✓

$\underline{\underline{Average\_speed = 1m \cdot s^{-1}}}$ ✓

(ONE mark for replacement, ONE mark for correct answer and unit)
(-½ mark for incorrect unit) (2)

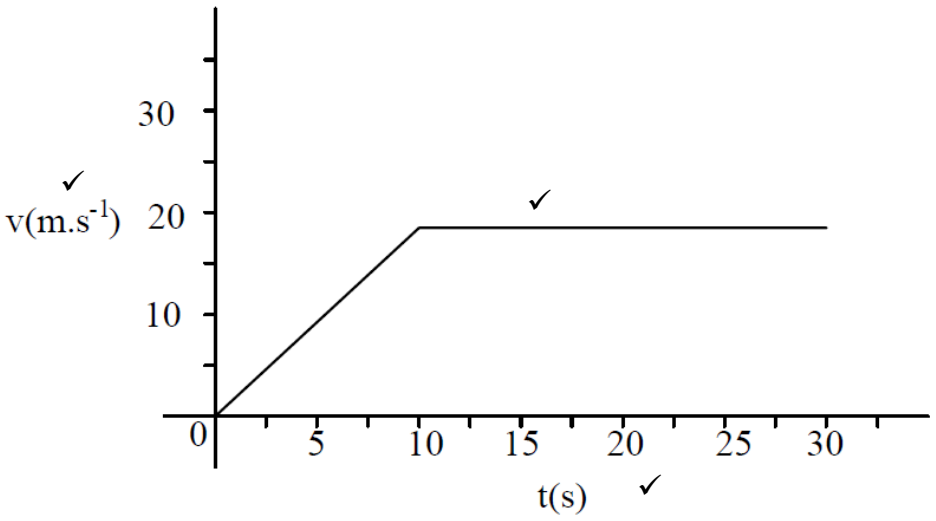
5.1.4 $Average\_velocity = \frac{displacement}{time}$

$Average\_velocity = \frac{0}{240}$ ✓

$\underline{\underline{Average\_velocity = 0m \cdot s^{-1}}}$ ✓

One mark for replacement one mark for correct answer and unit.
-½ mark for incorrect unit. (2)

5.2 5.2.1




(3)

5.2.2

$$a = \frac{v}{t}$$

$$a = \frac{20}{10} \checkmark$$

$$\underline{\underline{a = 2m.s^{-2}}} \checkmark$$

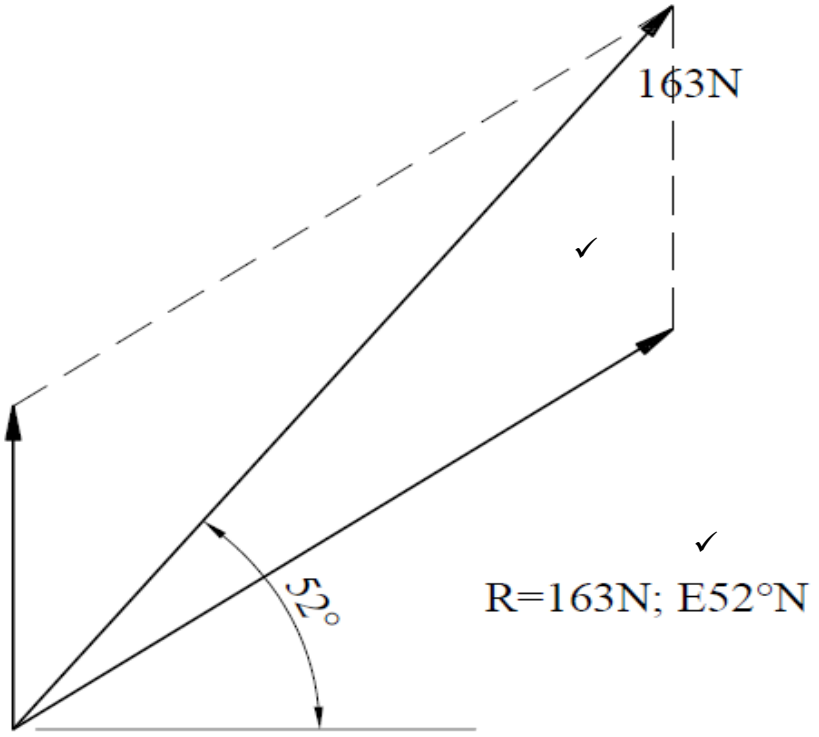
(ONE mark for replacement, ONE mark for correct answer and unit)
(-½ mark for incorrect unit) (2)
**[11]**

**QUESTION 6**

6.1 The force will:

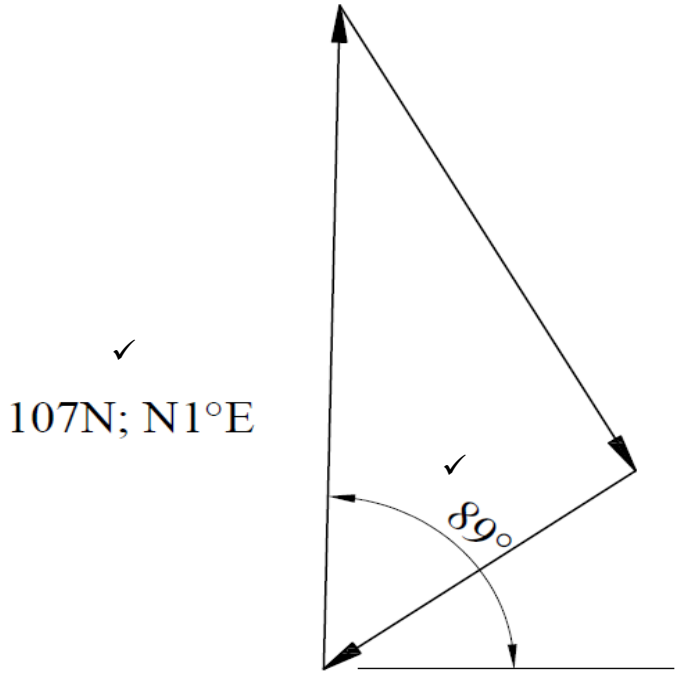
- Try to accelerate the body
- Accelerate the body
- Try to change the direction of the body
- Change the direction of the body (Any 2 correct answers) (2)

6.2



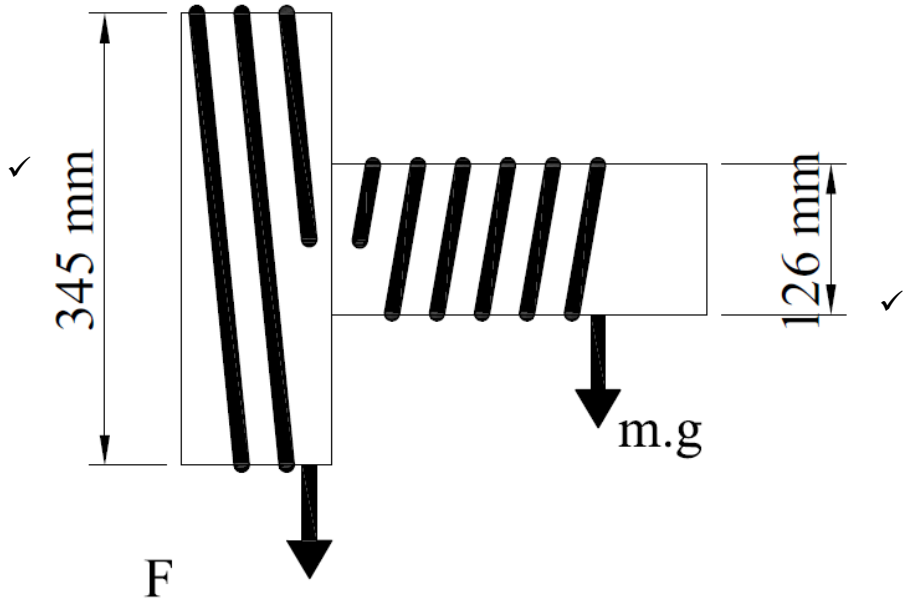

**(ONE mark for the drawing)**
**(ONE mark for the resultant written out)** (2)

6.3




(ONE mark for the drawing)
(ONE mark for the answer written out) (2)

6.4




(3)

6.5 $LM = RM$

$6m \times 15N = 5m \times B$

$B = \frac{90}{5}$ ✓

$\underline{\underline{B = 18N}}$ ✓

(2)

6.6 A force has direction✓ and magnitude.✓ (2)

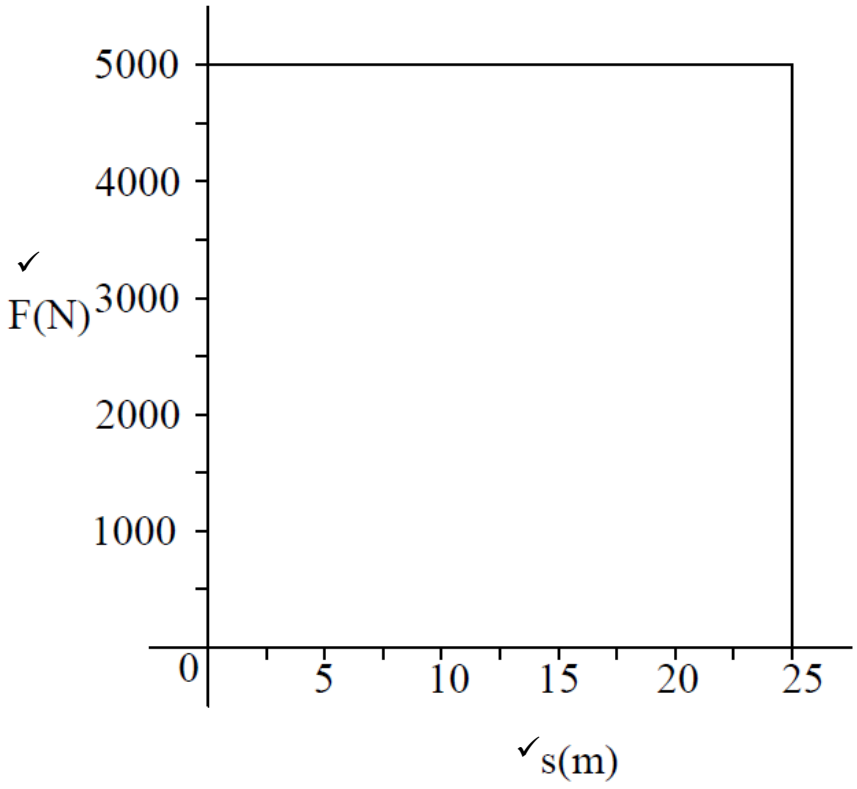
6.7
- Cantilever
- Spanner (Any applicable answer) (2)

**[15]**

**QUESTION 7**

7.1 7.1.1 Electric energy to kinetic energy
7.1.2 Potential energy to kinetic energy
(2 × 1) (2)

7.2 7.2.1




(2)

7.2.2 $P = \frac{F.s}{t}$

$= \frac{5\,000 \times 25✓}{6}$

$= 20{,}833$ kW✓ (2)

7.3 7.3.1

$$W = F \times s$$
$$W = 1000 \times 47$$
$$\underline{\underline{W = 47000J}}$$

(2)

7.3.2

$$P = \frac{W}{t}$$
$$P = \frac{47000}{2,5 \times 60} \checkmark$$
$$\underline{\underline{P = 313,333KW}} \checkmark$$

(2)
**[10]**

**QUESTION 8**

8.1
- Has a quick response to temperature changes.
- Does not stick to the sides of the glass tube.
- Has a high boiling point.
- Expands evenly.
- Good conductor of heat.

(Any applicable answer) (2 × 1) (2)

8.2 8.2.1 Conduction
8.2.2 Convection

(2 × 1) (2)

8.3 8.3.1 Change in colour
8.3.2 The origin of an electrical current.

(2 × 1) (2)

8.4

$$Q = m.c.\Delta t$$
$$Q = 4 \times 486 \times (36 - (-3)) \checkmark$$
$$Q = 75816J$$
$$Q = 75,816 \times 10^3 J$$
$$\underline{\underline{Q = 75,816kJ}} \checkmark$$

(2)

8.5 8.5.1

$$\Delta t = t_f - t_o$$
$$\Delta t = 89 - 2$$
$$\underline{\underline{\Delta t = 87°C}} \checkmark$$

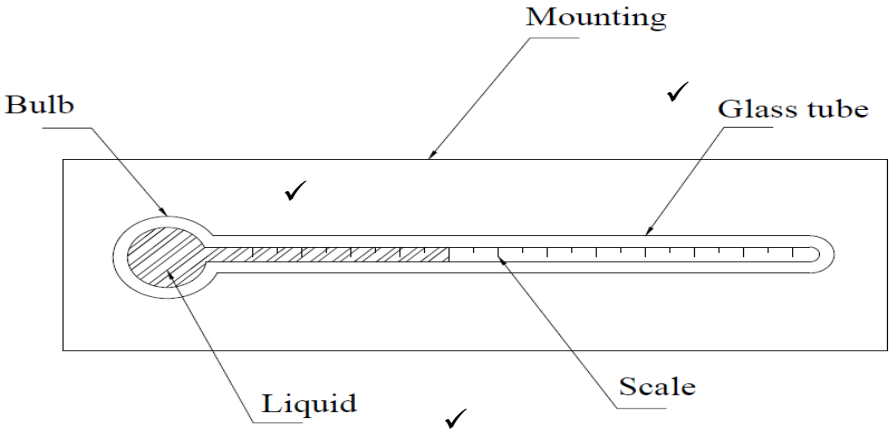
8.5.2

$$\ell_f = \ell_o + \Delta\ell$$
$$\ell_f = 21,056 + 0,025$$
$$\underline{\underline{\ell_f = 21,081m}} \checkmark$$

(2 × 1) (2)

8.6




(3)

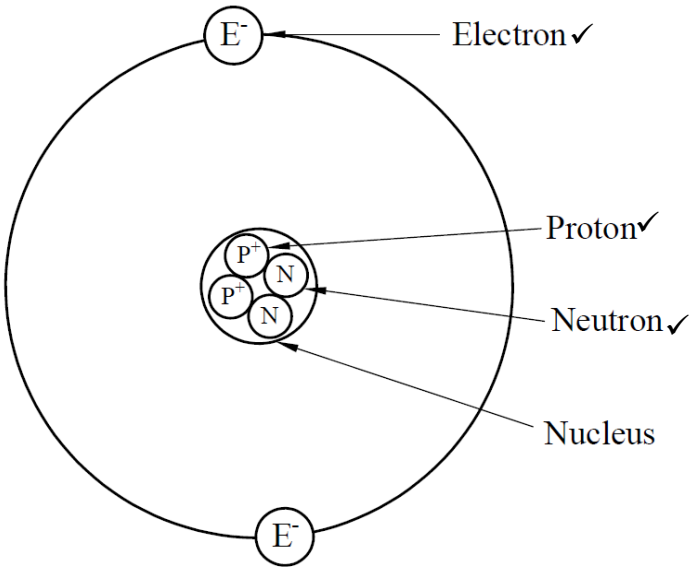
8.7 When different metals are connected at the one end and heated up✓ there will be a potential difference measured at the other end.✓ (2)

8.8 Heat is transferred from the cool drink to the ice cubes until they have the same temperature. (1)
**[16]**

**QUESTION 9**

9.1 9.1.1 Low energy
9.1.2 Weak attraction
9.1.3 More spaces than solid but less than gas
(3 × 1) (3)

9.2




(3)

9.3 Molecule (1)

9.4
- Ion
- Negative ion
- Cation

(Any ONE) (1)
**[8]**

## QUESTION 10

10.1 10.1.1 Battery
10.1.2 Ammeter
10.1.3 Resistor

(3 × 1) (3)

10.2
$$I = \frac{V}{R}$$
$$I = \frac{220}{17} \checkmark$$
$$\underline{\underline{I = 12,941A}} \checkmark$$

(2)

10.3
$$R_T = R_1 + R_2 + R_3$$
$$R_T = 15 + 28 + 36 \checkmark$$
$$\underline{\underline{R_T = 79\Omega}} \checkmark$$

(2)

10.4
- Type of material (resistivity)
- Length of the conductor
- Cross-sectional area
- Temperature of the conductor

(Any applicable answer) (3 × 1) (3)

10.5 10.5.1 Resistance will increase
10.5.2 Resistance will stay the same

(2 × 1) (2)

10.6
$$Q = V.I.t$$
$$Q = 220 \times 12 \times (5 \times 60) \checkmark$$
$$Q = 792000J$$
$$\underline{\underline{Q = 792kJ}} \checkmark$$

(2)

10.7 10.7.1
$$P = V.I$$
$$I = \frac{P}{V}$$
$$I = \frac{200}{220} \checkmark$$
$$\underline{\underline{I = 0,909A}} \checkmark$$

10.7.2

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

$$R = \frac{220}{0,909}$$

$$\underline{\underline{R = 242,024\Omega}}$$

OR

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

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

$$R = \frac{220^2}{200}$$ ✓

$$\underline{\underline{R = 242\Omega}}$$ ✓

(2 × 2) (4)

10.8
- Relays
- Electric bells
- Electrical motors
- Loudspeakers

(Any applicable answer 2 × 1) (2)

**[20]**

**TOTAL SECTION B: 80**
**GRAND TOTAL: 100**