higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

ENGINEERING SCIENCE N1

5 August 2021

This marking guideline consists of 11 pages.

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✓ = 1 mark
☑ = ½ mark

SECTION A

QUESTION 1

1.1 C
1.2 C
1.3 A
1.4 A
1.5 A

(5 × 1) **[5]**

QUESTION 2

2.1 False
2.2 True
2.3 True
2.4 False
2.5 False

(5 × 1) **[5]**

QUESTION 3

3.1 C
3.2 F
3.3 E
3.4 A
3.5 D

(5 × 1) **[5]**

QUESTION 4

4.1 Work
4.2 Direction
4.3 Matter
4.4 Neutrons
4.5 Matter

(5 × 1) **[5]**

TOTAL SECTION A: 20

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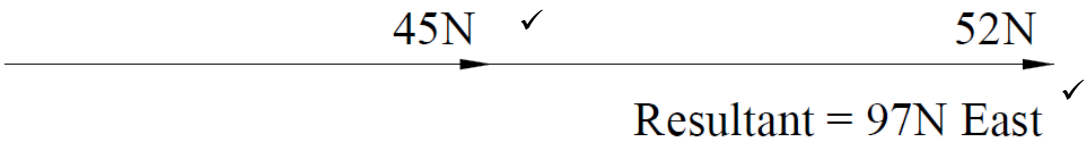
SECTION B

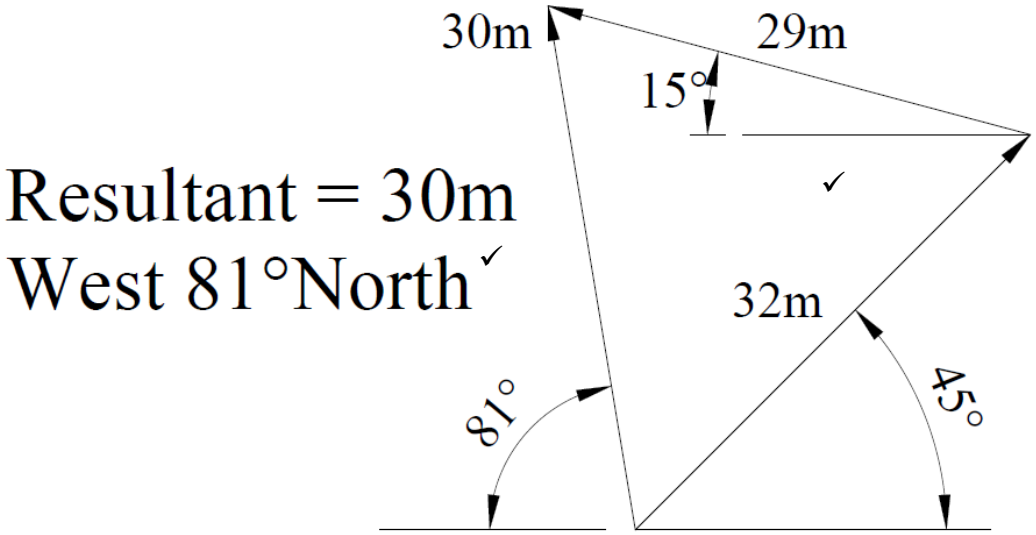
QUESTION 5

5.1



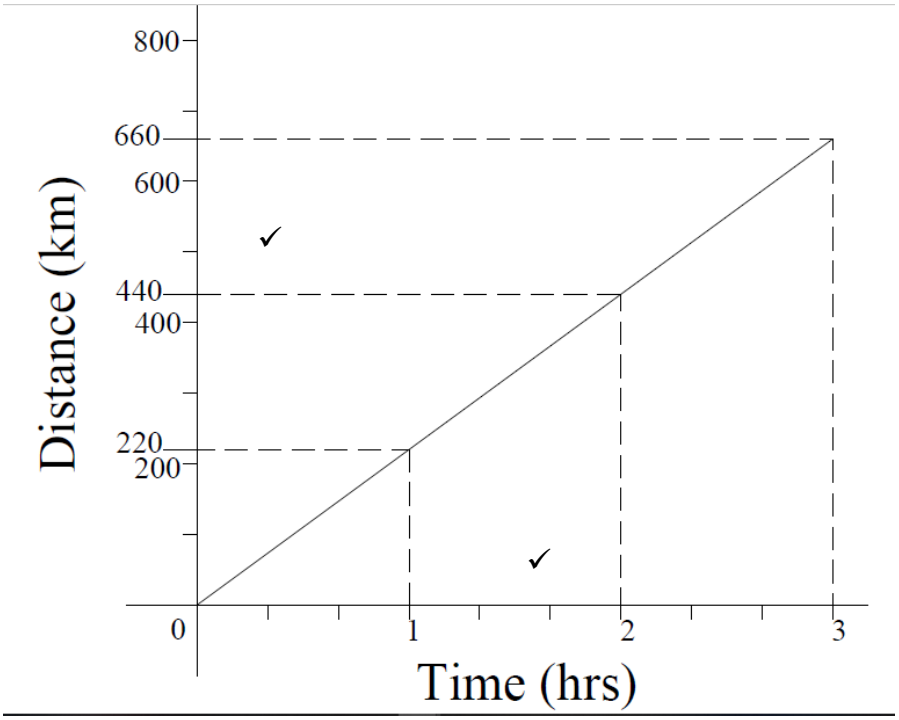
(2)

5.2



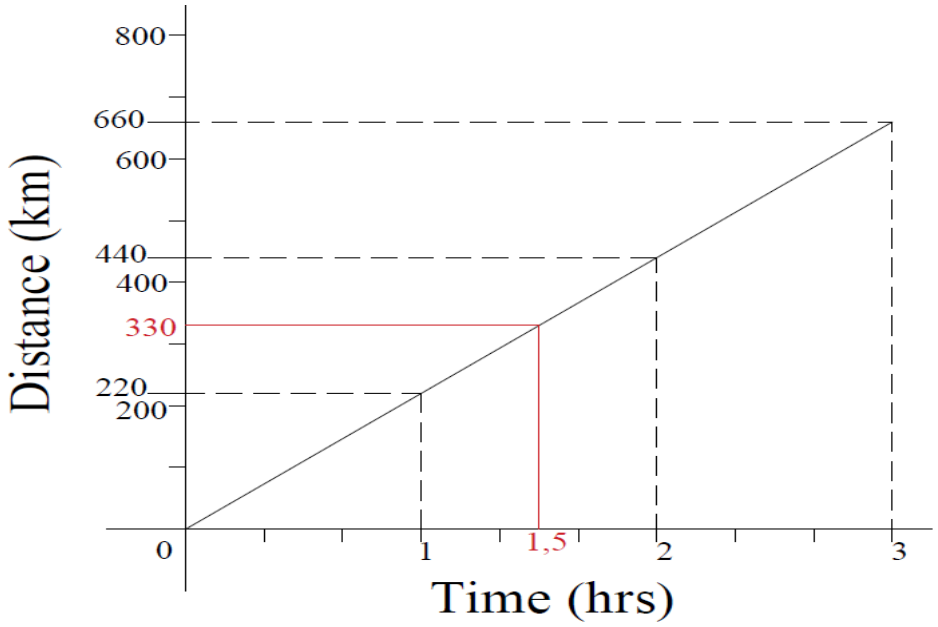
(2)

5.3 5.3.1



(2)

5.3.2



$s = v \times t$

$s = 220 \times 1,5$

$\underline{s = 330km}$ ✓ (1)

5.4 5.4.1 $w = m.g$

$w = 85 \times 1,6$

$\underline{w = 136N}$ ✓

5.4.2 $w = m.g$

$w = 85 \times 9,8$

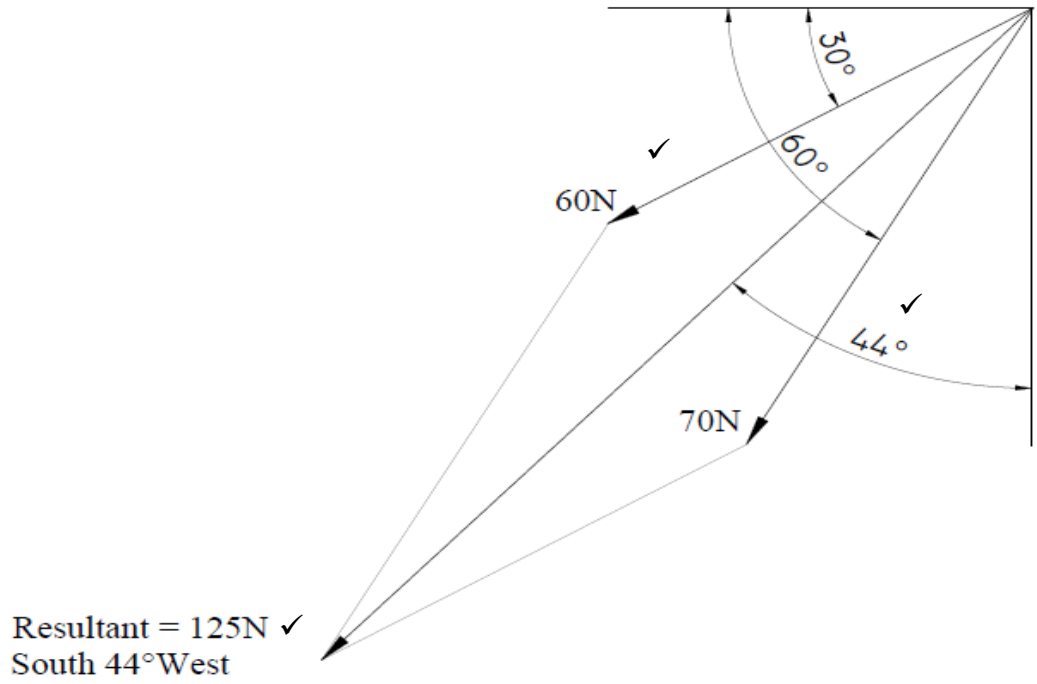
$\underline{w = 833N}$ ✓

(2 × 1) (2)

[9]

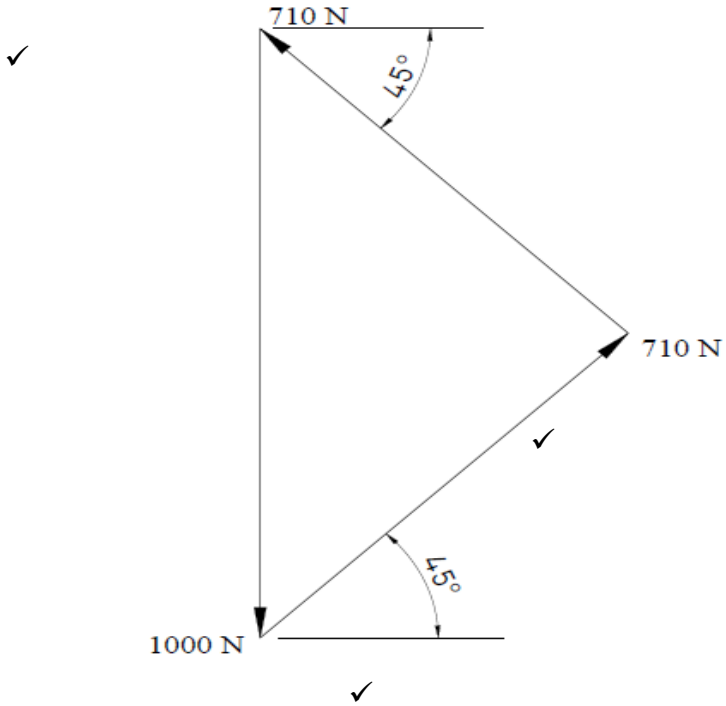
QUESTION 6

6.1



(3)

6.2



(3)

6.3.1 $VR = number_of_pulleys$

$VR = 5$ ✓ (1)

6.3.2 $$MA = \frac{load}{effort}$$

$$MA = \frac{300 \times 9,8}{650}$$ ✓

$$\underline{MA = 4,523}$$ ✓ (2)

6.4 $$ACWM = CWM$$

$$3,5 \times F = (6 \times 20)(11,5 \times 15)$$

$$F = \frac{292,5}{3,5}$$

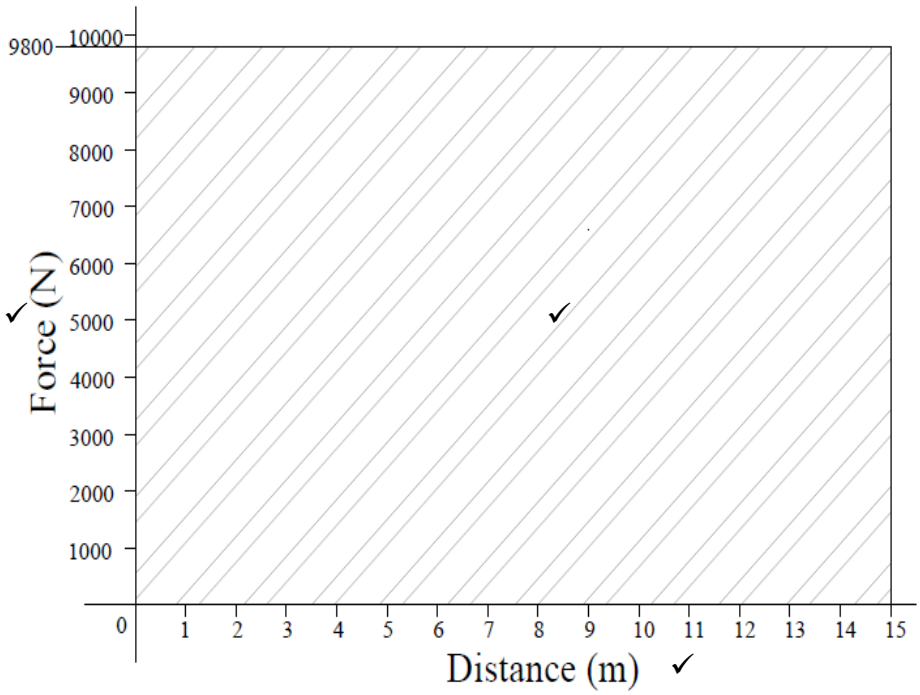
$$\underline{F = 83,57N}$$ (3)

6.5 Move a body
Stop a body
Change the direction of a body (Any applicable answers 2 × 1) (2)
[14]

QUESTION 7

7.1 7.1.1 Chemical energy to kinetic/mechanical energy
7.1.2 Electrical energy to heat energy
7.1.3 Heat energy to chemical energy
7.1.4 Potential energy to kinetic energy
(4 × 1) (4)

7.2 7.2.1



(3)

7.2.2 $W = F.s$
$W = 9800 \times 15$
$W = 147000J$
$\underline{W = 147kJ}$ ✓ (1)

7.3 7.3.1 $km/h \rightarrow m/s$

$75 \div \frac{3600}{1000} = 20{,}833m/s$ ✓

$P = F \times v$
$F = \frac{P}{v}$
$F = \frac{1100}{20{,}833}$

$\underline{F = 52{,}8N}$ ✓✓ (3)

7.3.2 $P = \frac{W}{t}$
$W = P \times t$
$W = 1100 \times (6 \times 60)$ ✓
$W = 396000J$
$\underline{W = 396kJ}$ ✓ (2)

[13]

QUESTION 8

8.1 8.1.1 Thermocouple

OR

Thermocouple pyrometer (1)

8.1.2
- Measuring temperatures in furnaces
- Measuring temperatures in hard-to-reach places of machines
- Used as hospital thermometers
- In diagnostics testing of vehicle engines
- In some gas appliances such as boilers, water heaters, and ovens they are used as safety features

(Any correct answers 2 × 1) (2)

8.2 8.2.1 Change of phase
8.2.2 Change of colour

(2 × 1) (2)

8.3 $Q = m.c.\Delta t$
$Q = 150 \times 380 \times (650 - 25)$ ✓
$\underline{Q = 35{,}625MJ}$ ✓ (2)

8.4 8.4.1 $\Delta t = t_f - t_o$

$\Delta t = 34 - 18$

$\underline{\Delta t = 16°C}$ ✓

8.4.2 $\Delta l = l_f - l_o$

$\Delta l = 150,005 - 149,925$

$\underline{\Delta l = 80mm}$ ✓

(2 × 1) (2)

8.5 8.5.1 Bi-metallic strip

8.5.2 Difference in linear expansion of different materials

(2 × 1) (2)

8.6 8.6.1
- High freezing point
- Expensive
- Poisonous (Any ONE correct answer) (1)

8.6.2
- Low boiling point
- Not easily visible
- Adheres to the glass
- Does not expand uniformly (Any ONE correct answer) (1)

[13]

QUESTION 9

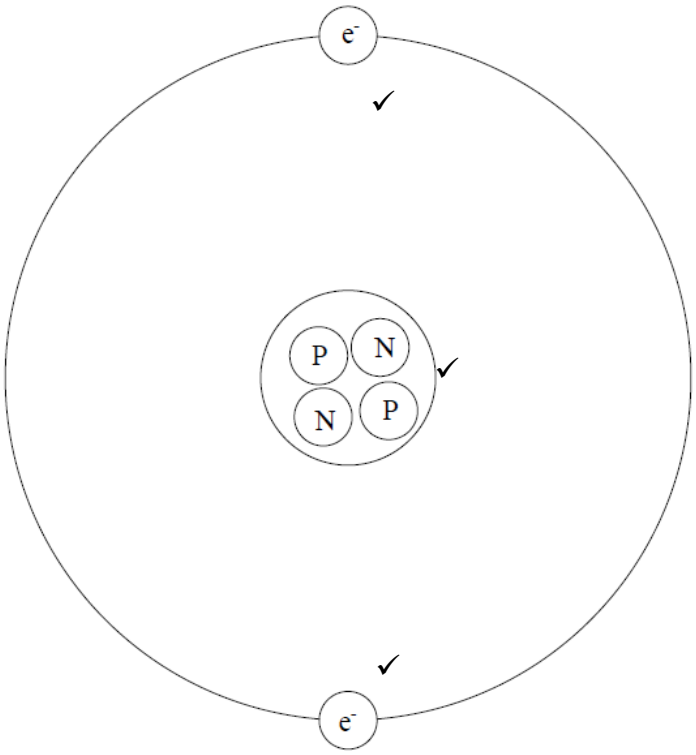
9.1 9.1.1 More energy than a solid and less energy than a gas

9.1.2 A lot of space between particles

9.1.3 Very strong forces between the particles

(3 × 1) (3)

9.2



(3)

9.3 9.3.1 It liquifies
9.3.2 It melts

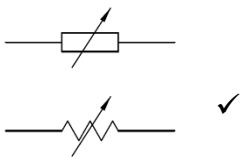
(2 × 1) (2)
[8]

QUESTION 10

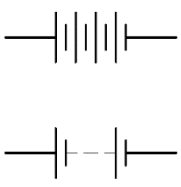
10.1 10.1.1 Conductor
10.1.2 Insulator
10.1.3 Conductor

(3 × 1) (3)

10.2 10.2.1



10.2.2



10.2.3



(3 × 1) (3)

10.3 10.3.1 $V = I \times R$

$V = 15 \times 14$ ✓

$\underline{V = 210V}$ ✓

10.3.2 $P = V \times I$

$P = 210 \times 15$ ✓

$\underline{P = 3150W}$ ✓

$P = I^2 R$

$P = 15^2 \times 14$

$\underline{P = 3150W}$

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

$P = \frac{210^2}{14}$

$\underline{P = 3150W}$

(2 × 2) (4)

10.4 $R_T = R_1 + R_2 + R_3$

$R_T = 16 + 35 + 29$ ✓

$\underline{R_T = 80\Omega}$ ✓ (2)

10.5
- Length
- Cross-sectional area
- Type of material
- Temperature (Any correct answers 3 × 1) (3)

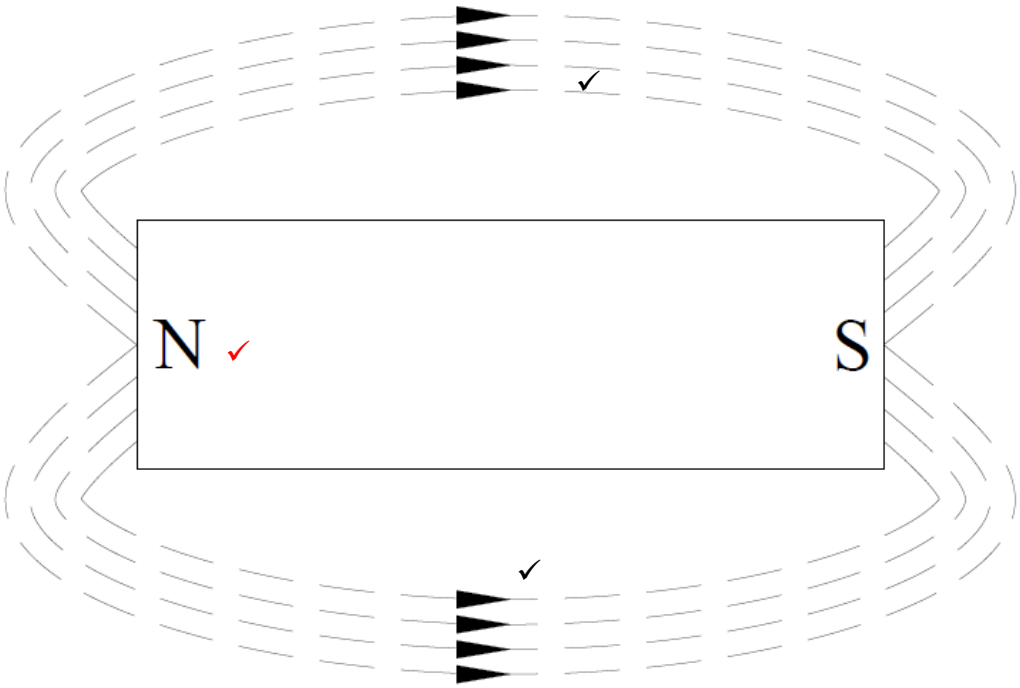
10.6 The current will decrease because the resistance will increase. (1)

10.7 $Q = I^2.R.t$

$Q = 11^2 \times 20 \times (15 \times 60)$ ✓

$\underline{Q = 2,178MJ}$ ✓ (2)

10.8



(3)

10.9
- More windings
- Iron core
- Increased current

(Any correct answers 2 × 1) (2)
[23]

TOTAL SECTION B: 80
GRAND TOTAL: 100

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