



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

ENGINEERING SCIENCE N1

22 November 2024

This marking guideline consists of 11 pages.

✓ = 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

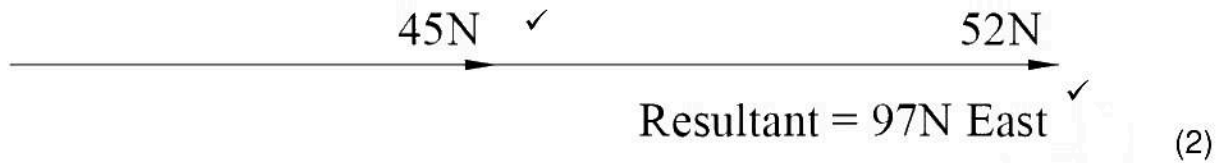
(5 × 1) [5]

TOTAL SECTION A: 20

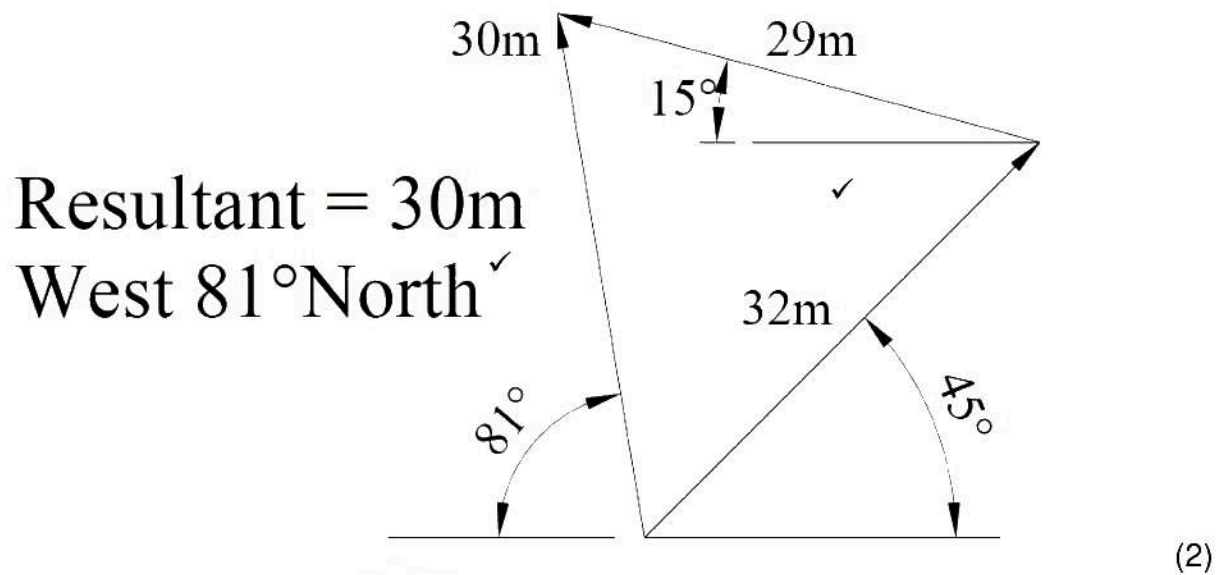
SECTION B

QUESTION 5

5.1

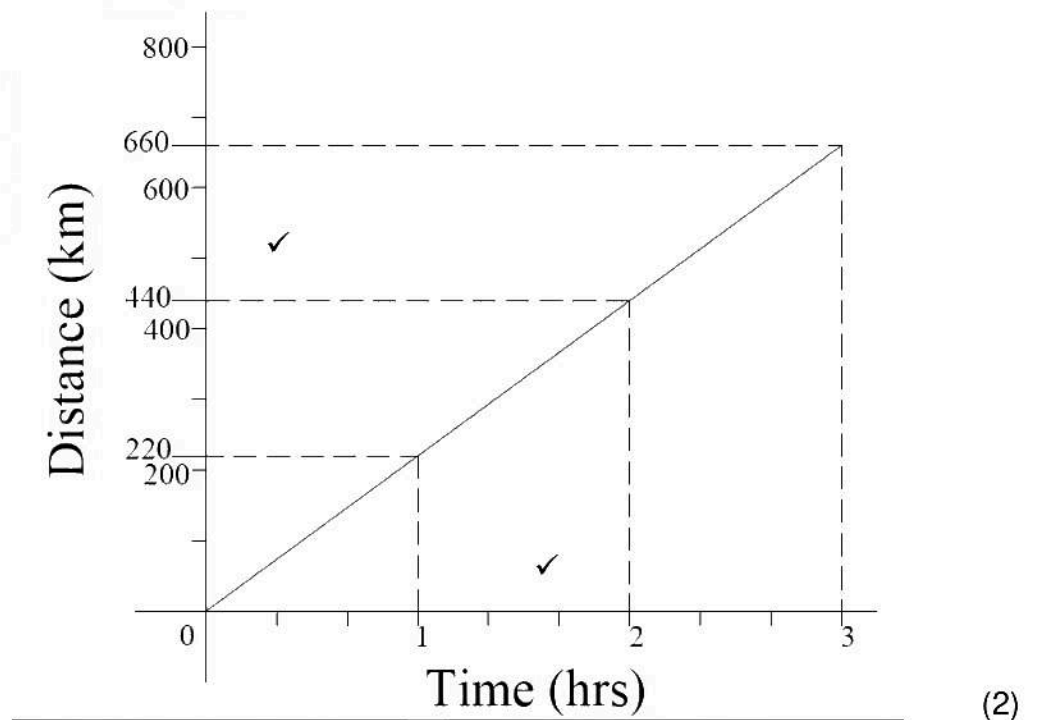


5.2

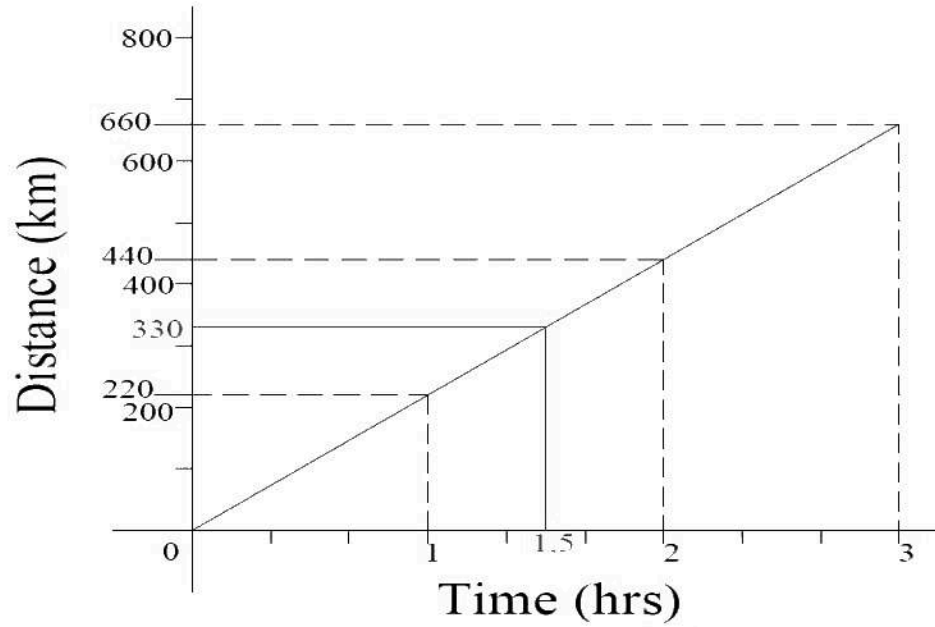


5.3

5.3.1



5.3.2



$$s = v \times t$$

$$s = 220 \times 1,5$$

$$s = 330 \text{ km} \checkmark$$

(1)

5.4

5.4.1

$$w = m \cdot g$$

$$w = 85 \times 1,6$$

$$w = 136 \text{ N} \checkmark$$

5.4.2

$$w = m \cdot g$$

$$w = 85 \times 9,8$$

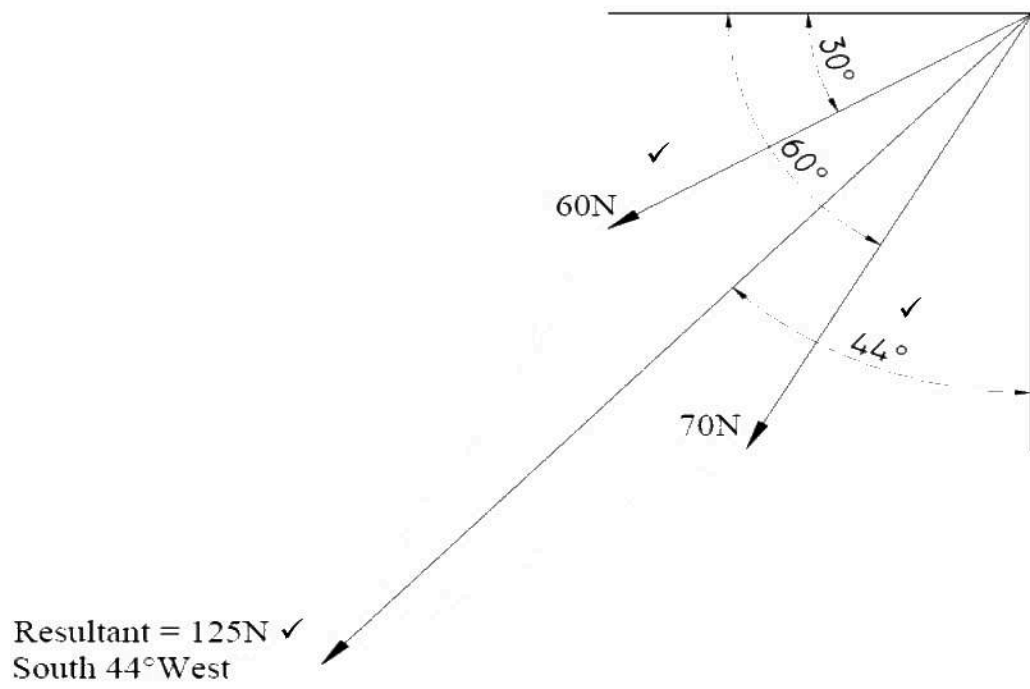
$$w = 833 \text{ N} \checkmark$$

(2 × 1)

(2)
[9]

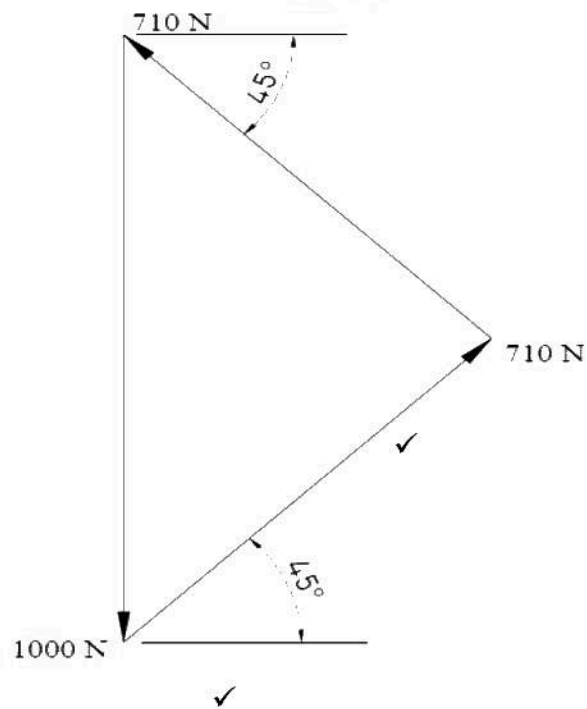
QUESTION 6

6.1



(3)

6.2



(3)

6.3 6.3.1 $VR = \text{number_of_pulleys}$
 $VR = 5 \checkmark$ (1)

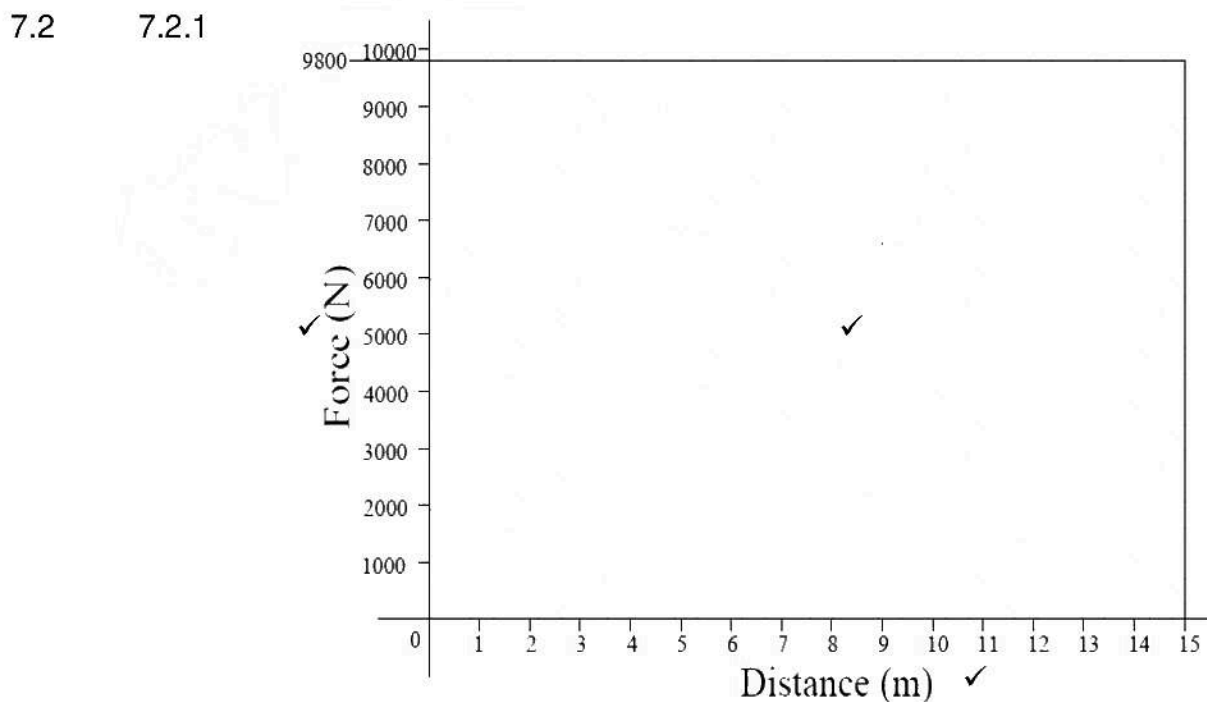
6.3.2 $MA = \frac{\text{load}}{\text{effort}}$
 $MA = \frac{300 \times 9,8}{650} \checkmark$
 $MA = 4,523 \checkmark$ (2)

6.4 $ACWM = CWM$
 $3,5 \times F = (6 \times 20)(11,5 \times 15)$
 $F = \frac{292,5}{3,5}$
 $F = 83,57N$ (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)



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

7.3 7.3.1 $km/h \rightarrow m/s$
 $75 \div \frac{3600}{1000} = 20,833m/s$
 $P = F \times v$
 $F = \frac{P}{v}$
 $F = \frac{1100}{20,833}$
 $F = 52,8N$ ✓✓ (3)

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

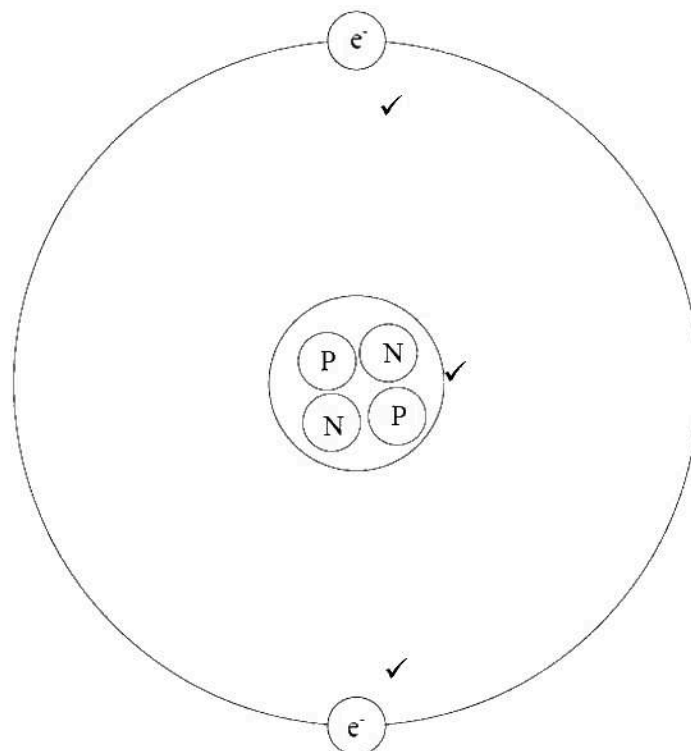
8.3 $Q = m.c.\Delta t$
 $Q = 150 \times 380 \times (650 - 25)$ ✓
 $Q = 35,625MJ$ ✓

8.4	8.4.1	$\Delta t = t_f - t_o$ $\Delta t = 34 - 18$ $\Delta t = 16^\circ\text{C}$ ✓		
	8.4.2	$\Delta l = l_f - l_o$ $\Delta l = 150,005 - 149,925$ $\Delta l = 80\text{mm}$ ✓	(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
9.3.2

It liquifies
It melts

(2 × 1)

(2)
[8]

QUESTION 10

10.1

10.1.1
10.1.2
10.1.3

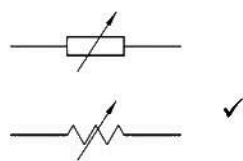
Conductor
Insulator
Conductor

(3 × 1)

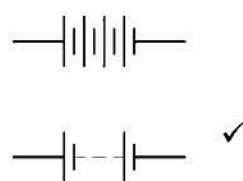
(3)

10.2

10.2.1



10.2.2

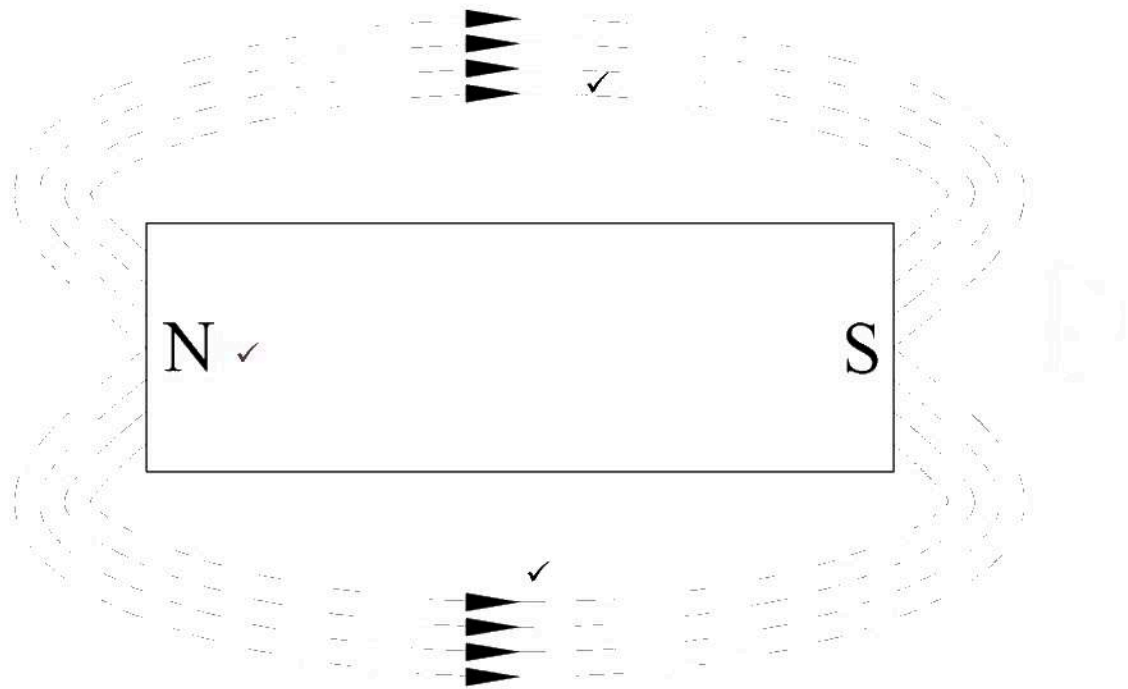


10.2.3



- 10.3 10.3.1 $V = I \times R$
 $V = 15 \times 14 \checkmark$
 $V = 210V$ $\checkmark$
- 10.3.2 $P = V \times I$
 $P = 210 \times 15 \checkmark$
 $P = 3150W$ $\checkmark$
- $P = I^2 R$
 $P = 15^2 \times 14$
 $P = 3150W$
- $P = \frac{V^2}{R}$
 $P = \frac{210^2}{14}$
 $P = 3150W$
- (2 × 2) (4)
- 10.4 $R_T = R_1 + R_2 + R_3$
 $R_T = 16 + 35 + 29 \checkmark$
 $R_T = 80\Omega$ $\checkmark$
- (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 $Q = I^2 \cdot R \cdot t$
 $Q = 11^2 \times 20 \times (15 \times 60) \checkmark$
 $Q = 2,178MJ$ $\checkmark$
- (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