



**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.**

✓ = 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

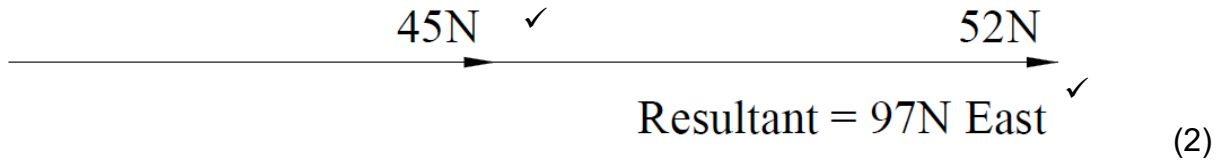
(5 × 1) [5]

**TOTAL SECTION A: 20**

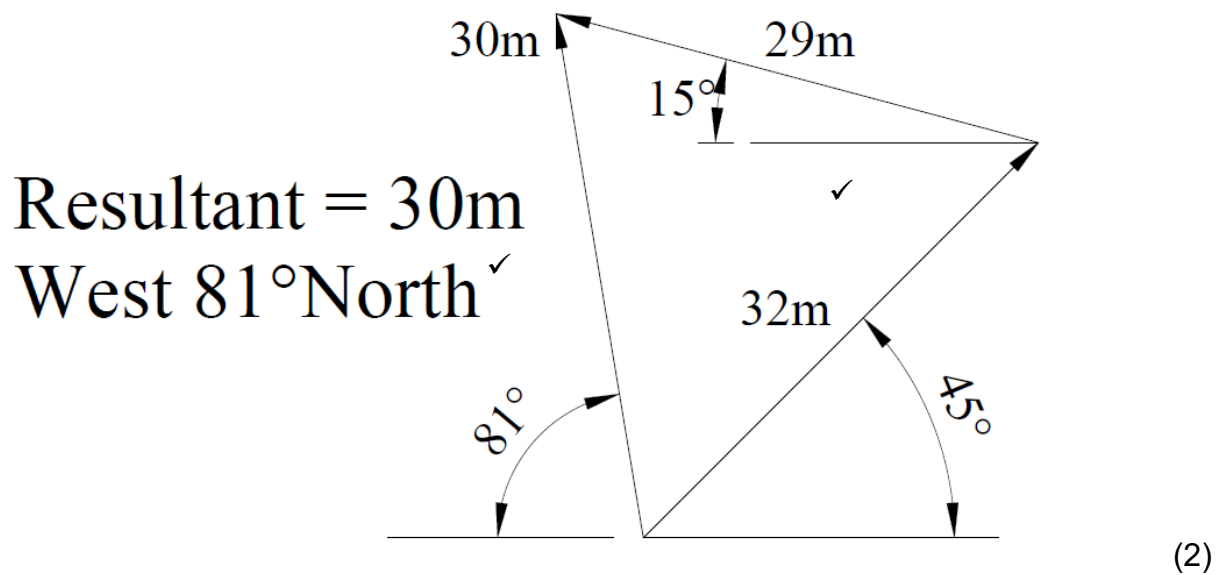
## SECTION B

## QUESTION 5

5.1

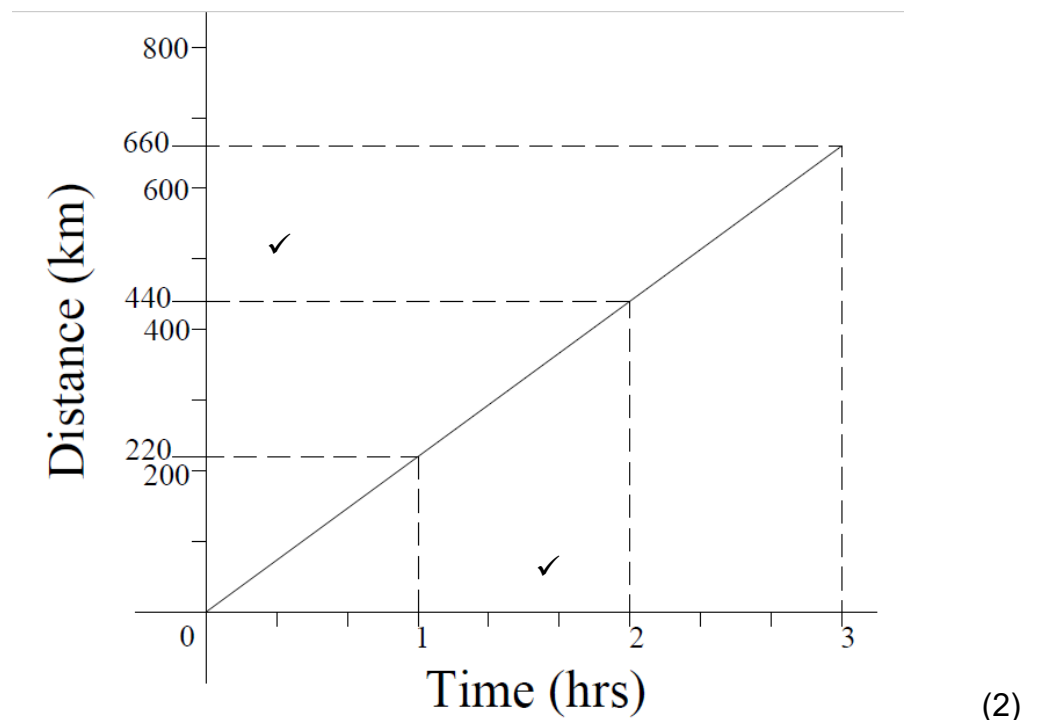


5.2

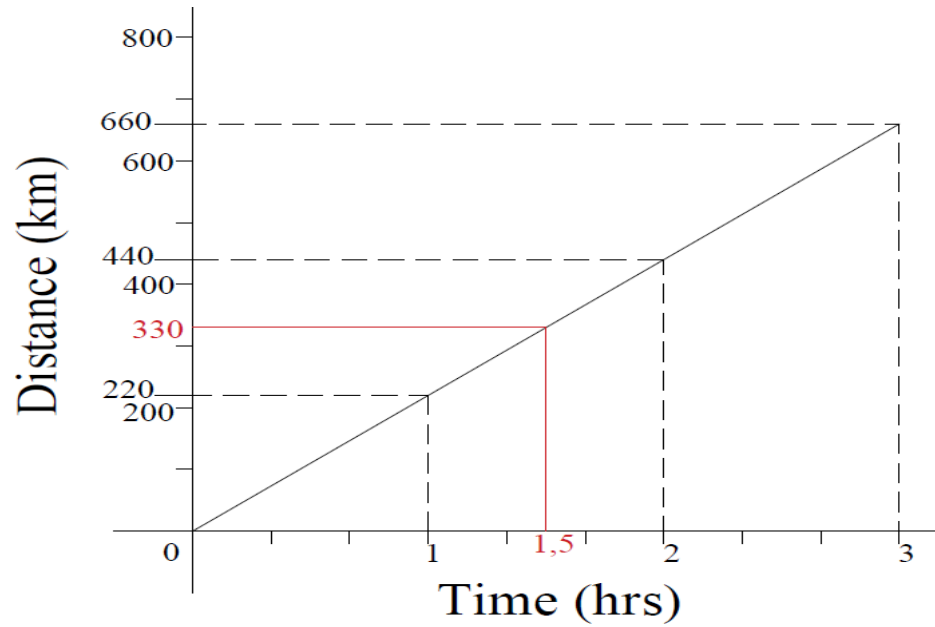


5.3

5.3.1



5.3.2



$$s = v \times t$$

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

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

(1)

5.4

5.4.1

$$w = m \cdot g$$

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

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

5.4.2

$$w = m \cdot g$$

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

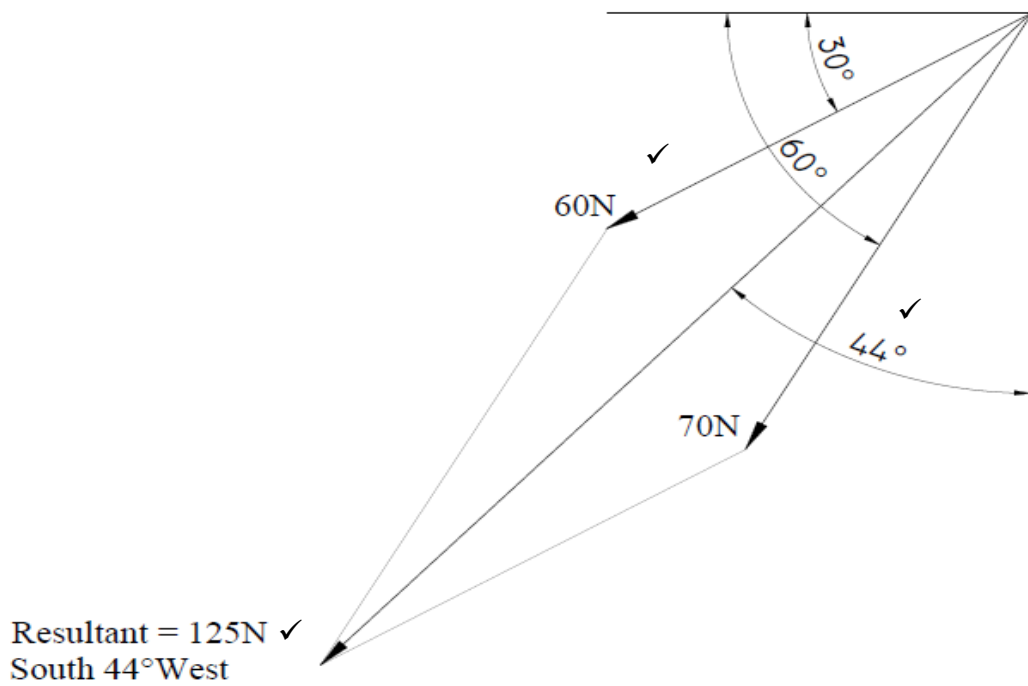
$$\underline{w = 833 \text{ N}} \checkmark$$

(2 × 1)

(2)  
[9]

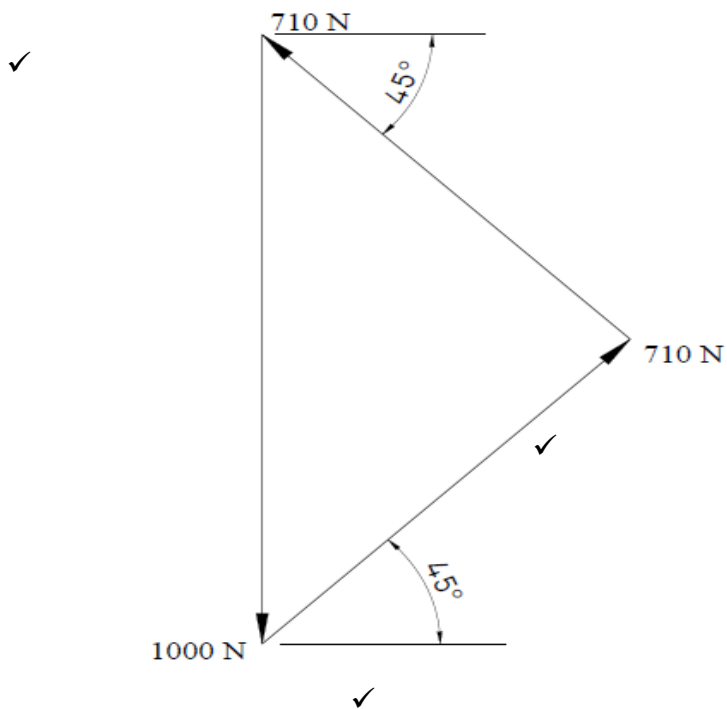
**QUESTION 6**

6.1



(3)

6.2



(3)

6.3.1  $VR = \text{number\_of\_pulleys}$   
 $VR = 5$  ✓

(1)

6.3.2

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

$$MA = \frac{300 \times 9,8}{650} \quad \checkmark$$

$$\underline{MA = 4,523} \quad \checkmark$$

(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  $2 \times 1$ )

(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

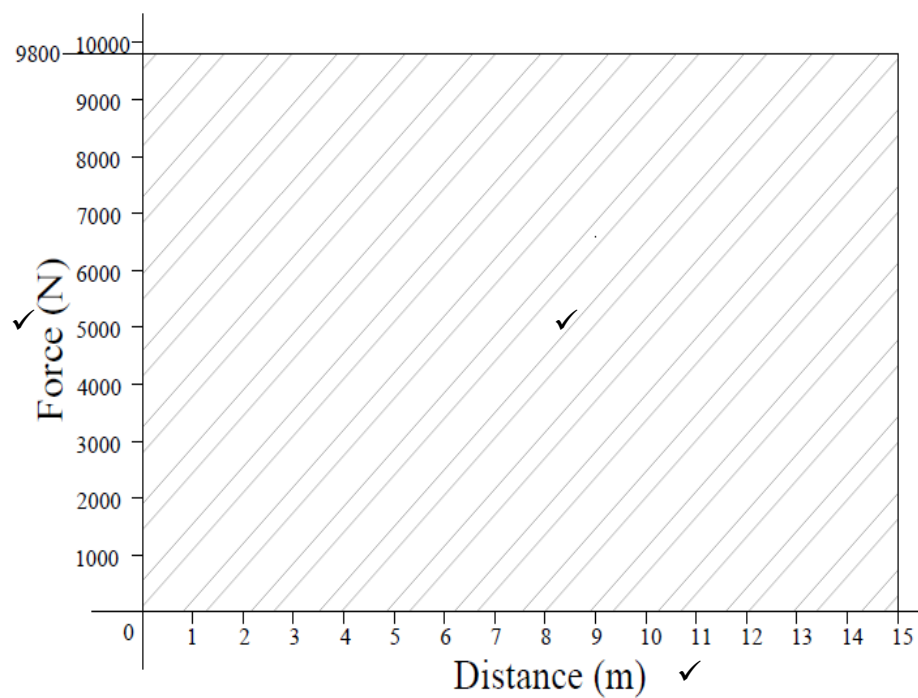
Potential energy to kinetic energy

(4 × 1)

(4)

7.2

7.2.1



(3)

7.2.2  $W = F.s$   
 $W = 9800 \times 15$   
 $W = 147000J$   
 $W = 147kJ$  ✓ (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  $2 \times 1$ ) (2)

8.2 8.2.1 Change of phase  
 8.2.2 Change of colour  
 (2 × 1) (2)

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

8.4	8.4.1	$\Delta t = t_f - t_o$ $\Delta t = 34 - 18$ <u><math>\Delta t = 16^\circ\text{C}</math></u> ✓	(2 × 1)	(2)
	8.4.2	$\Delta l = l_f - l_o$ $\Delta l = 150,005 - 149,925$ <u><math>\Delta l = 80\text{mm}</math></u> ✓		
8.5	8.5.1	Bi-metallic strip	(2 × 1)	(2)
	8.5.2	Difference in linear expansion of different materials		
8.6	8.6.1	<ul style="list-style-type: none"> <li>• High freezing point</li> <li>• Expensive</li> <li>• Poisonous</li> </ul>	(Any ONE correct answer)	(1)
	8.6.2	<ul style="list-style-type: none"> <li>• Low boiling point</li> <li>• Not easily visible</li> <li>• Adheres to the glass</li> <li>• Does not expand uniformly</li> </ul>		

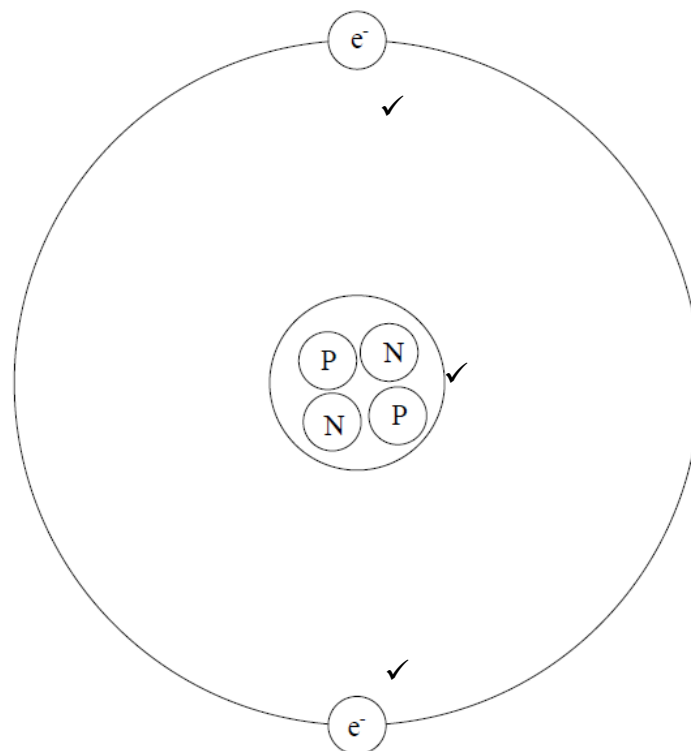
(1)  
[13]

**QUESTION 9**

9.1	9.1.1	More energy than a solid and less energy than a gas	(3 × 1)	(3)
	9.1.2	A lot of space between particles		
	9.1.3	Very strong forces between the particles		



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

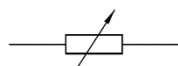
Conductor  
Insulator  
Conductor

(3 × 1)

(3)

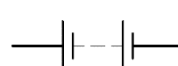
10.2

10.2.1



✓

10.2.2



✓

10.2.3



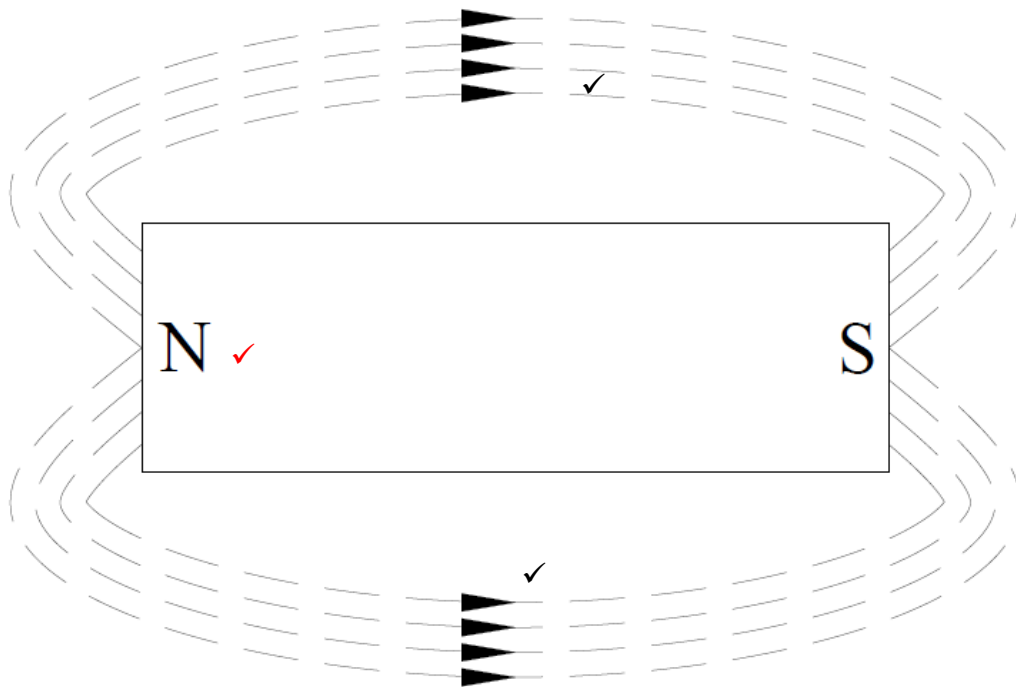
✓

(3 × 1)

(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       $Q = I^2 . R . t$   
 $Q = 11^2 \times 20 \times (15 \times 60) \checkmark$   
 $Q = 2,178MJ$   $\checkmark$  (2)

10.8



(3)

10.9

- More windings
- Iron core
- Increased current

(Any correct answers  $2 \times 1$ )

(2)

**[23]****TOTAL SECTION B:****80****GRAND TOTAL:****100**