



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

ENGINEERING SCIENCE N1

28 March 2025

This marking guideline consists of 9 pages.

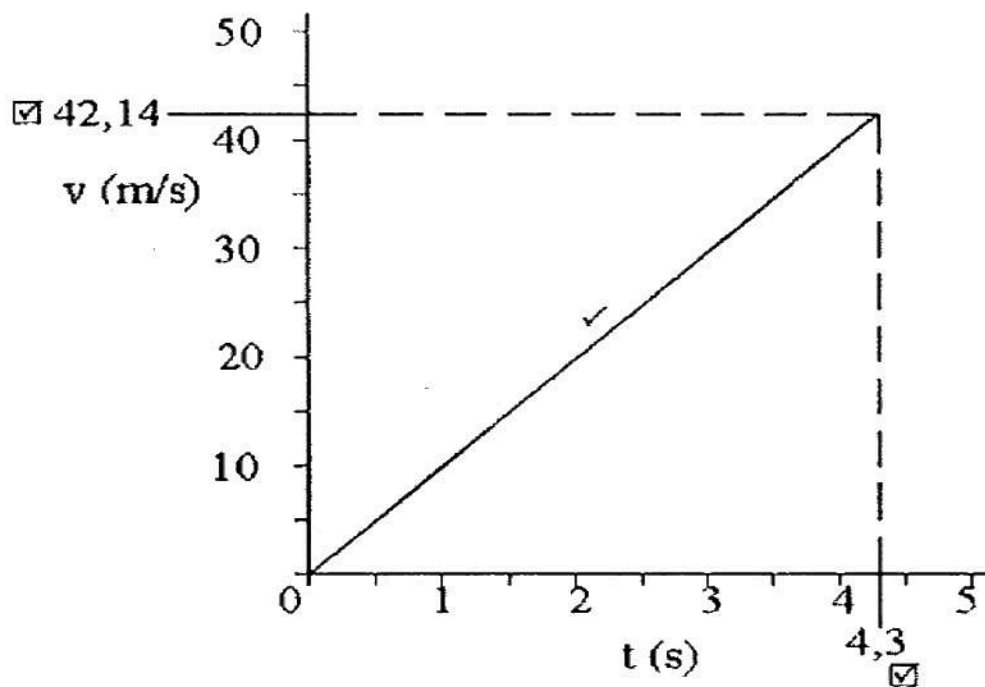
SECTION A

QUESTION 1

1.1	1.1.1	J	(10 × 1)	(10)
	1.1.2	F		
	1.1.3	I		
	1.1.4	E		
	1.1.5	B		
	1.1.6	G		
	1.1.7	H		
	1.1.8	C		
	1.1.9	A		
	1.1.10	D		
1.2	1.2.1	Potential energy	(10 × 1)	(10)
	1.2.2	Resistivity		
	1.2.3	Vector		
	1.2.4	Element		
	1.2.5	Heat capacity		
	1.2.6	Heat		
	1.2.7	Atom		
	1.2.8	Matter		
	1.2.9	Mechanical advantage		
	1.2.10	Ohm's law		
				[20]

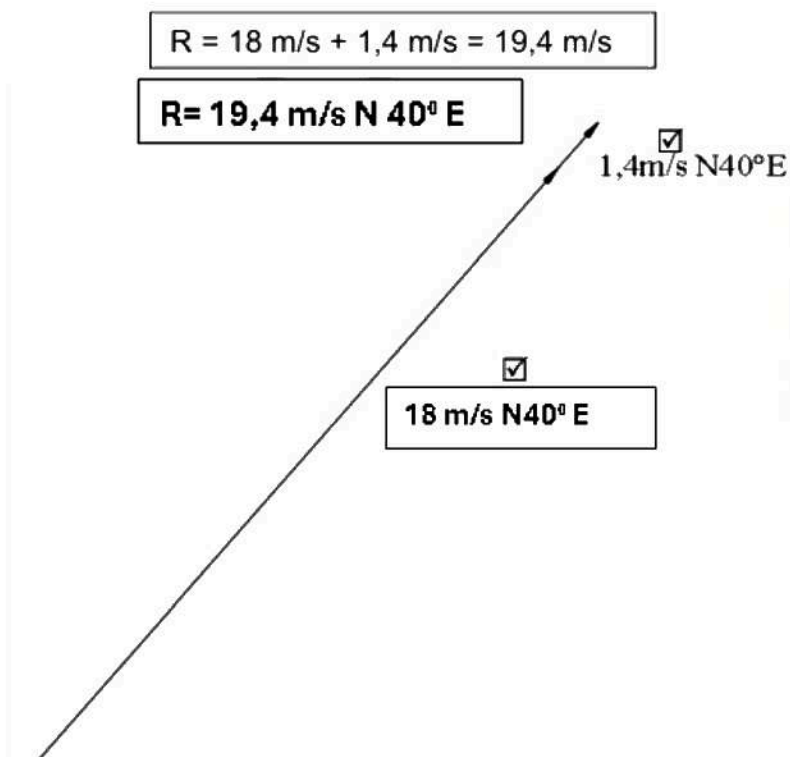
QUESTION 2: DYNAMICS

2.1



(3)

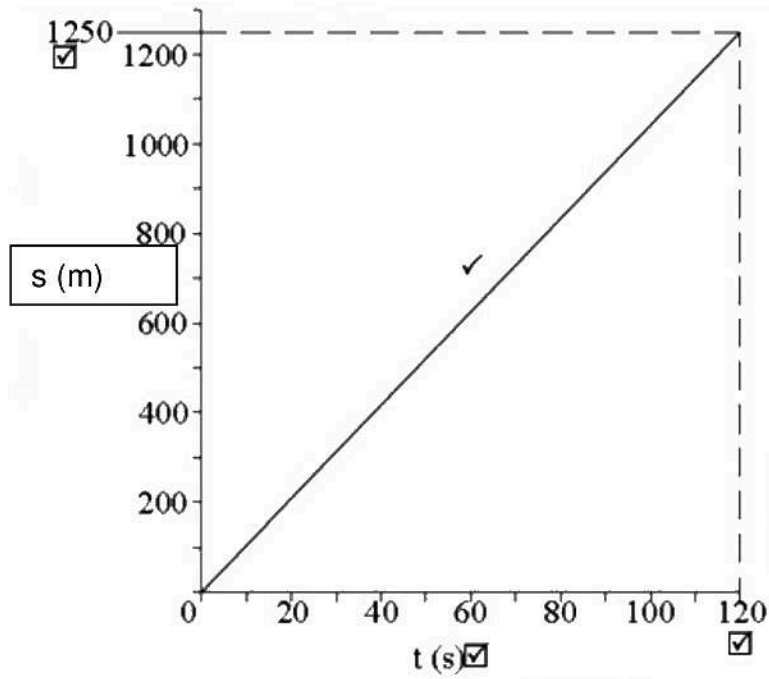
2.2



(2)

2.3

2.3.1



(3)

2.3.2

$$v = s/t$$

$$v = 1\,250 / 120 \checkmark$$

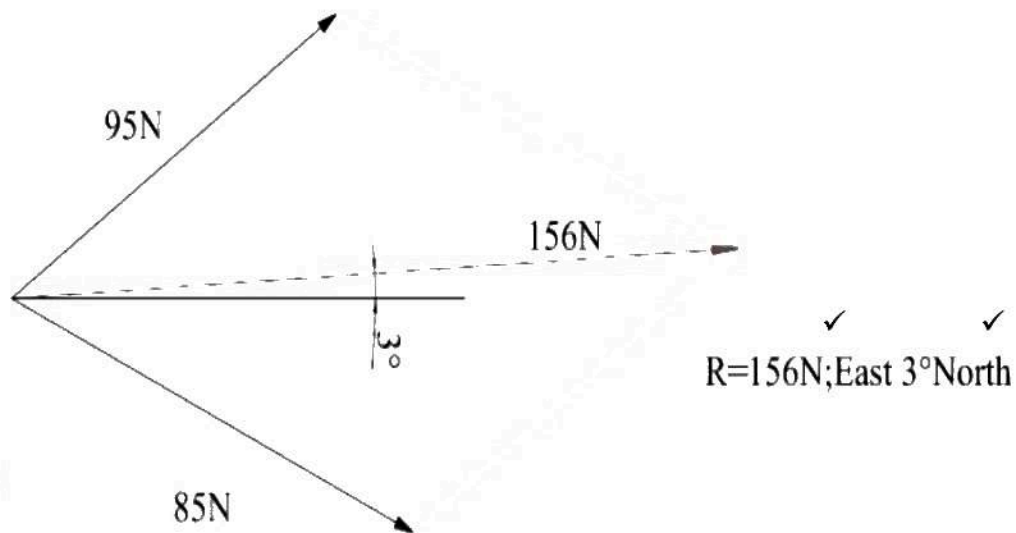
$$v = 10,417 \text{ m/s} \checkmark$$

(2)

[10]

QUESTION 3: STATICS

3.1



(2)

3.2

3.2.1

$$V_R = S_E / S_L$$

$$S_L = S_E / V_R$$

$$S_L = 5 / 20 \checkmark$$

$$S_L = 0,25 \text{ m} \checkmark$$

3.2.2

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

$$MA = MA \times \text{effort}$$

$$MA = 10 \times 10 \checkmark$$

$$MA = 100 \text{ N} \checkmark$$

(2 × 2)

(4)

3.3

Clockwise moment = anti-clockwise moment

$$F.S = F.S$$

$$260 \times 5 = K \times 2 \checkmark$$

$$1300 = 2 K$$

$$K = 650 \text{ N} \checkmark$$

(2)

3.4

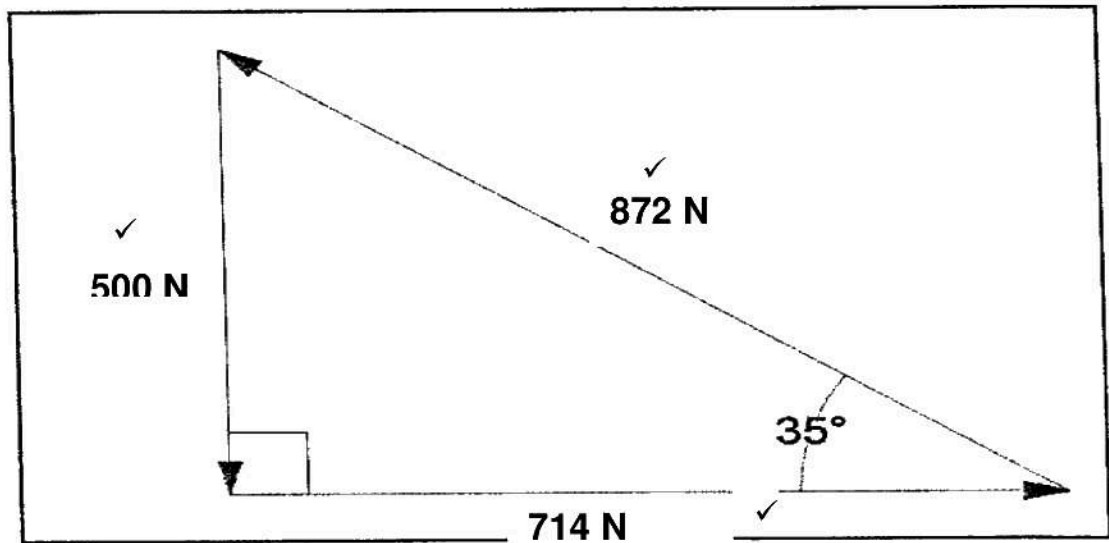
$$T = F.r$$

$$T = 62 \times 0,25 \checkmark$$

$$T = 15,5 \text{ N.m} \checkmark$$

(2)

3.5



(3)

3.6

- 3.6.1 Force
- 3.6.2 Law of moments
- 3.6.3 Velocity ratio
- 3.6.4 Resultant
- 3.6.5 Mechanical advantage

(5 × 1)

(5)

[18]

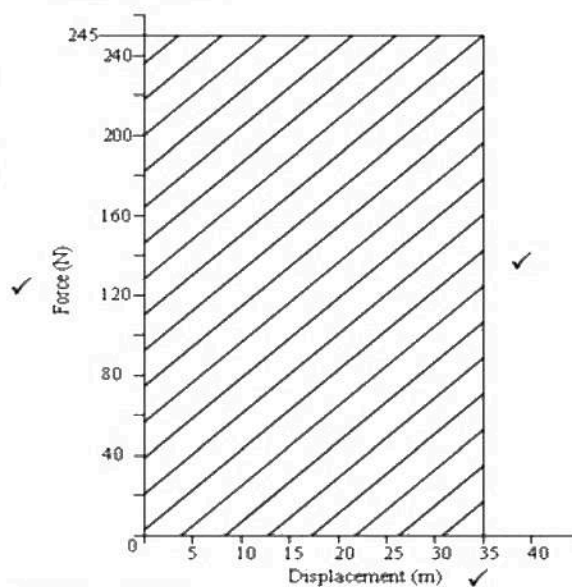
QUESTION 4: ENERGY, WORK AND POWER

4.1

4.1.1 $F = m \times 9,8$
 $F = 25 \times 9,8$ ✓
 $F = 245 \text{ N}$ ✓

(2)

4.1.2



(3)

4.1.3 $A = l.b$
 $W = F.s$
 $W = 245 \times 35$
 $W = 8\,575\text{ J}$ ✓ (1)

4.2 4.2.1 $V = 115/3,6$ ✓
 $V = 31,944\text{ m/s}$ ✓

4.2.2 $P = F.v$
 $P = 1\,200 \times 31,944$ ✓
 $P = 38\,332,8\text{ W}$ ✓

(2 × 2) (4)

4.3 4.3.1 $P = F.v$
 $F = P/v$
 $F = \frac{62 \times 10^3}{(110/3,6)}$ ✓
 $F = 2\,029\text{ N}$ ✓

4.3.2 $v = s/t$
 $s = v.t$
 $s = 30,556 \times 18$ ✓
 $s = 550\text{ m}$ ✓

(2 × 2) (4)
[14]

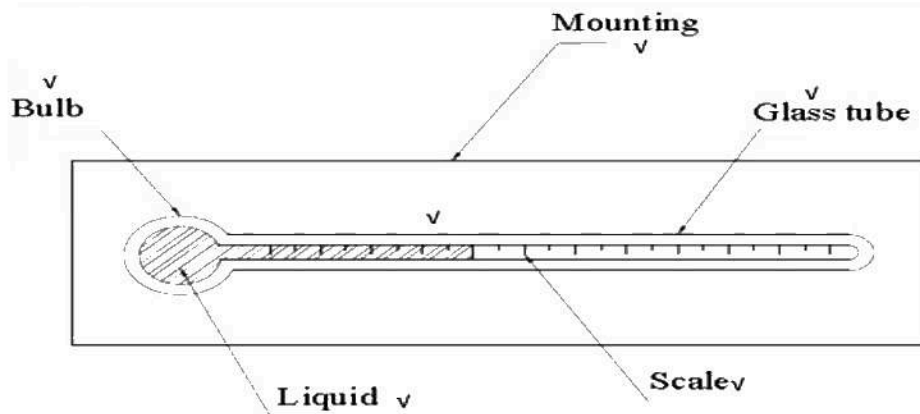
QUESTION 5: HEAT

- 5.1
- Change in temperature
 - Change in dimensions
 - Change in phase
 - Change in composition
 - Change in colour
 - Change in resistance
 - Electrical effect of heat
- (Any 2 × 1) (2)

- 5.2
- Original length
 - Rise in temperature
 - Type of material
- (3)

- 5.3 **Heat capacity** of a substance is the quantity of heat needed to increase the temperature of the substance. ✓
Specific heat capacity of a substance is the quantity of heat needed to increase the temperature of 1 kg of the substance by 1 °C. ✓ (2)

5.4



(3)

5.5

5.5.1 $\Delta l = l_f - l_0$
 $\Delta l = 2001,695 - 1\,959$ ✓
 $\Delta l = 42,695\text{ m}$ ✓

5.5.2 $\Delta t = t_f - t_0$
 $\Delta t = 185 - 23$ ✓
 $\Delta t = 162\text{ }^\circ\text{C}$ ✓

(2 × 2)

(4)
[14]

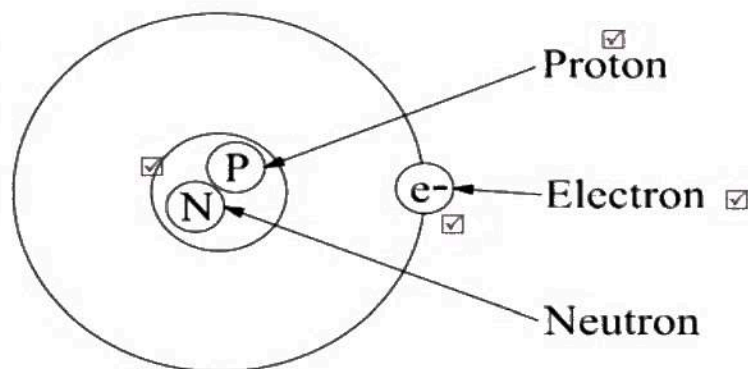
QUESTION 6: PARTICLE STRUCTURE OF MATTER

6.1

- 6.1.1
- Electrons
 - Protons
 - Neutrons

(3)

6.1.2



(4 × ½)

(2)
[5]

QUESTION 7: ELECTRICITY

7.1

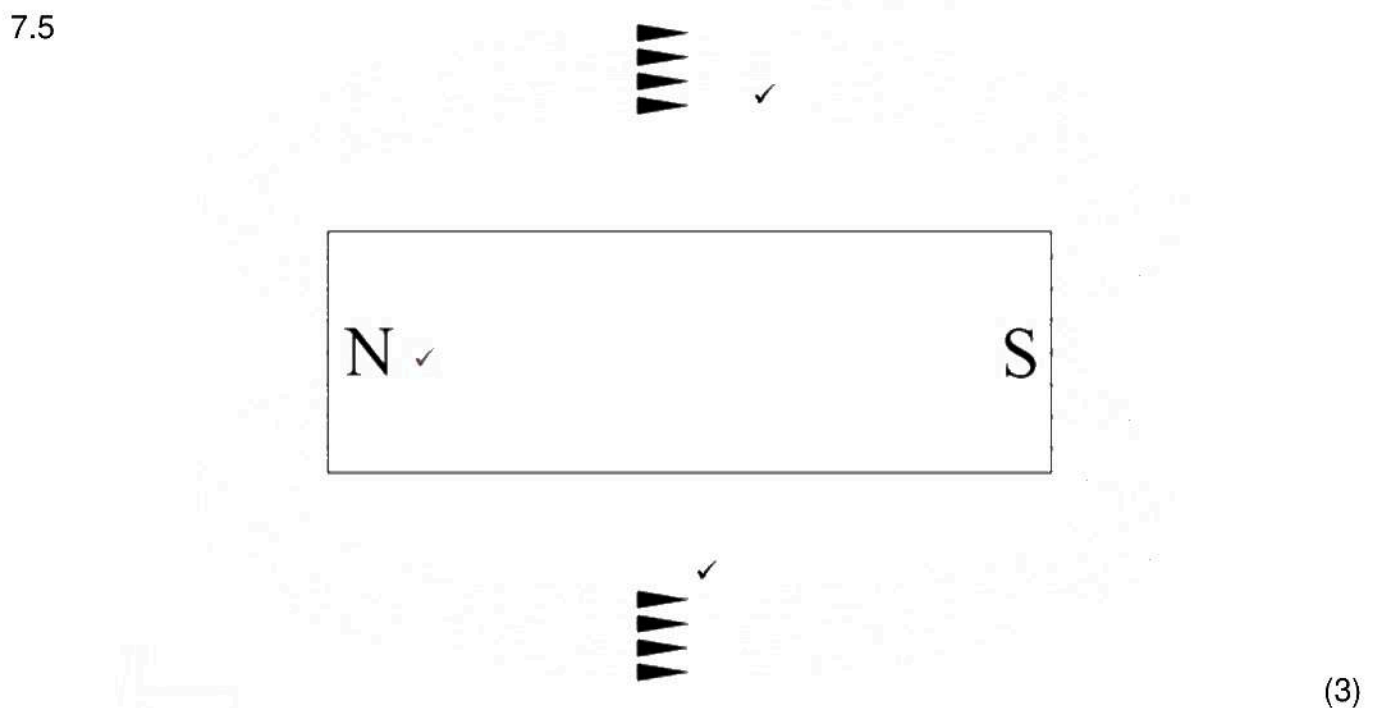
$R_T = R_1 + R_2 + R_3$
 $R_T = 16 + 35 + 29$ ✓
 $R_T = 80\ \Omega$ ✓

7.2 7.2.1 $V = I.R$
 $V = 21 \times 20 \checkmark$
 $V = 420 \text{ V} \checkmark$

7.2.2 $P = V.I$ or $P = V^2/R$ or $P = I^2.R$
 $P = 420 \times 21 \checkmark$ $P = 420^2/20$ $P = 21^2 \times 20$
 $P = 8\,820 \text{ W} \checkmark$ $P = 8\,820 \text{ W}$ $P = 8\,820 \text{ W}$
(2 × 2) (4)

7.3 Length ✓
 Cross-sectional area ✓
 Type of material ✓
 Temperature
(Any 3 × 1) (3)

- 7.4 • More windings
 • Iron core
 • Increase current
(Any 2 × 1) (2)



7.6 $Q = I^2.R.t$
 $Q = 11^2 \times 20 \times (15 \times 60) \checkmark$
 $Q = 2178000 \text{ J} \checkmark$
 $Q = 2,178 \text{ MJ}$
(2)

7.7 7.7.1 Conductor
 7.7.2 Insulator
 7.7.3 Conductor
(3 × 1) (3)
[19]

TOTAL: