higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

ENGINEERING SCIENCE N1

26 JULY 2018

This marking guideline consists of 10 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	B		
	1.1.2	C		
	1.1.3	C		
	1.1.4	A		
	1.1.5	B		
			(5 × 1)	(5)
1.2	1.2.1	Power		
	1.2.2	Matter		
	1.2.3	Specific heat capacity		
	1.2.4	Torque		
	1.2.5	Solidification		
			(5 × 1)	(5)
1.3	1.3.1	D		
	1.3.2	A		
	1.3.3	E		
	1.3.4	B		
	1.3.5	C		
			(5 × 1)	(5)
1.4	1.4.1	True		
	1.4.2	False		
	1.4.3	True		
	1.4.4	False		
	1.4.5	True		
			(5 × 1)	(5)
				[20]

TOTAL SECTION A: 20

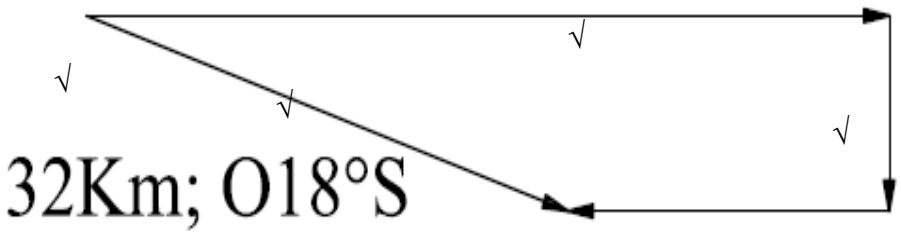
SECTION B

QUESTION 2: DYNAMICS

2.1 2.1.1 $Dist. = 50 + 10 + 20$ ✓

$\underline{Dist. = 80km}$ (1)

2.1.2



(2)

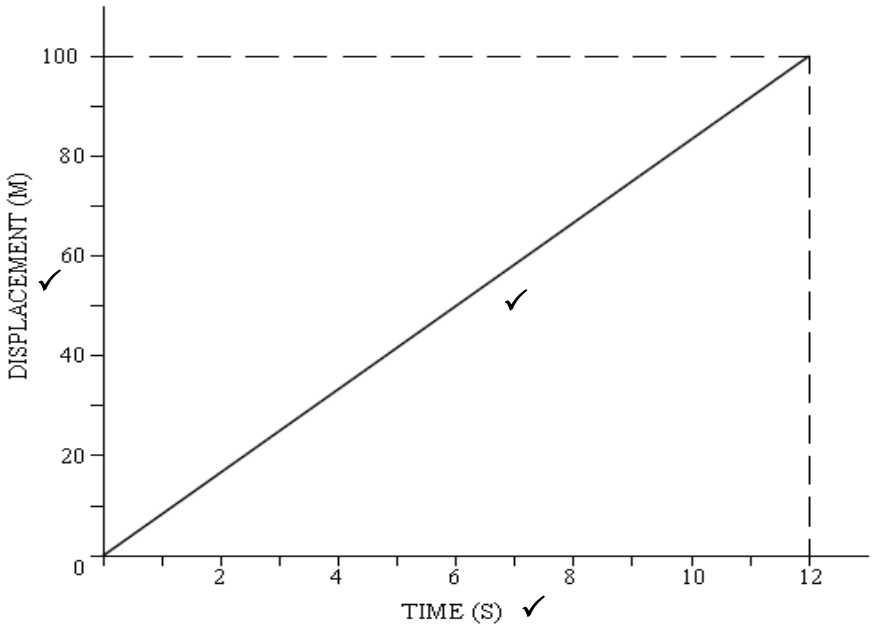
2.2 $v = \dfrac{45}{3,6}$

$\underline{v = 12,5m/s}$ ✓

$v_R = 12,5 - 1,3$

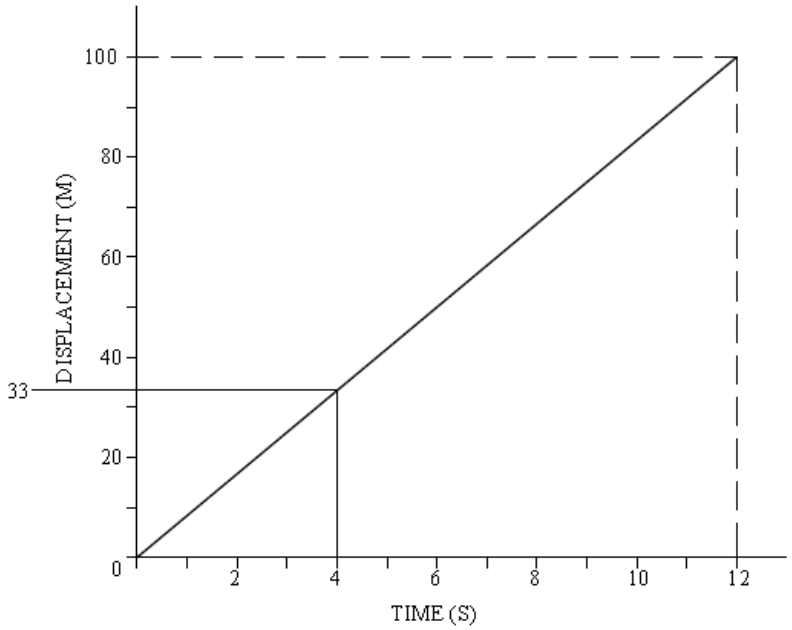
$v_R = 11.2m/s, East$ ✓ (2)

2.3 2.3.1



(3)

2.3.2

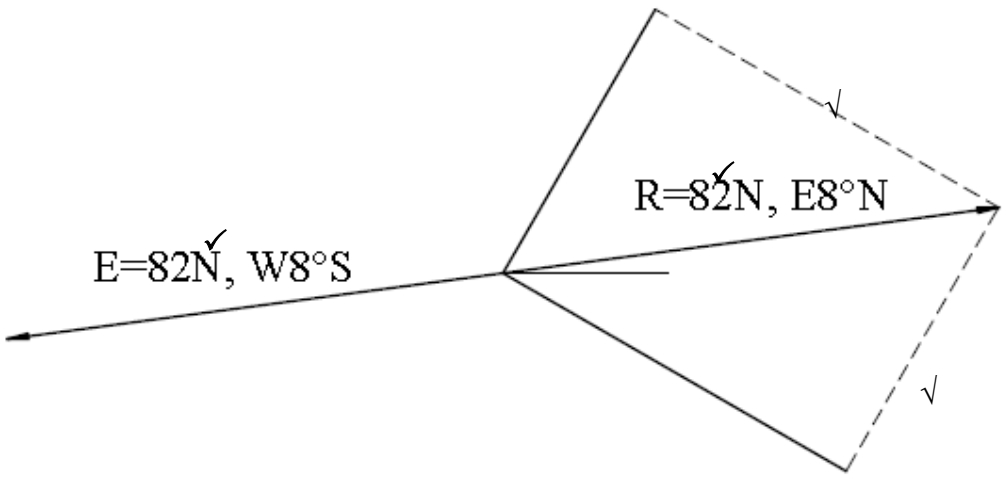


$s = 33m$ ✓ (1)

[9]

QUESTION 3: STATICS

3.1



(3)

3.2 3.2.1

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

$$MA = \frac{350 \times 9,8}{550} \checkmark$$

$$\underline{\underline{MA = 6,236}} \checkmark$$

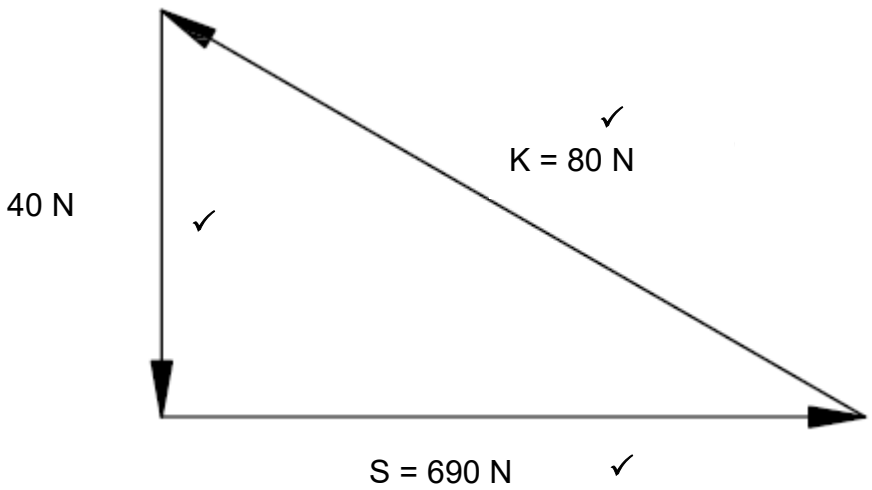
(2)

3.2.2 $$VR = \frac{D}{d}$$
$$VR = \frac{350}{250}$$
$$\underline{\underline{VR = 1,4}}\checkmark$$ (1)

3.3 $$r = \frac{300}{1000}$$
$$\underline{r = 0,3m}\checkmark$$

$$T = F.r$$
$$T = 850 \times 0,3\checkmark$$
$$\underline{\underline{T = 255N.m}}\checkmark$$ (3)

3.4



(3)

3.5 $$LM = RM\checkmark$$
$$20 \times 3 = F \times 1\checkmark$$
$$\underline{\underline{F = 60N}}\checkmark$$ (3)
[15]

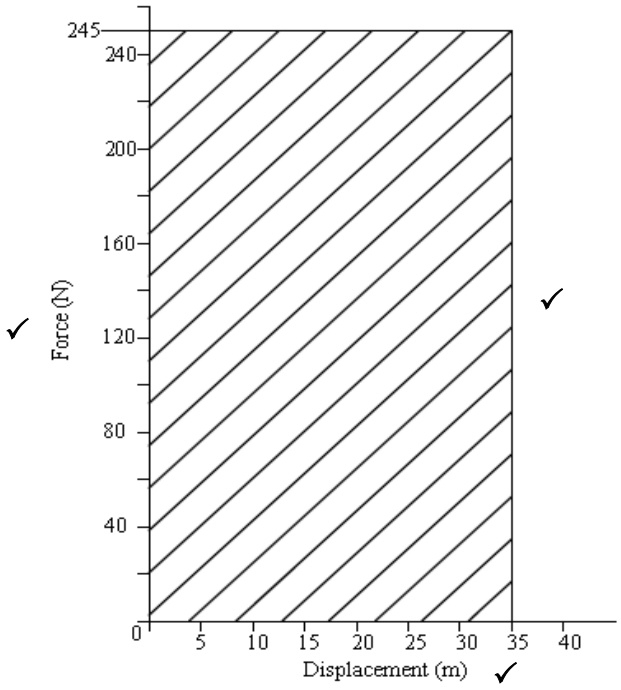
QUESTION 4: ENERGY WORK AND POWER

4.1 4.1.1

$$F = m \times 9{,}8$$
$$F = 25 \times 9{,}8$$
$$\underline{\underline{F = 245N}} \checkmark$$

(1)

4.1.2



(3)

4.1.3

$$A = l \times b$$
$$W = F.s$$
$$W = 245 \times 35$$
$$\underline{\underline{W = 8575\ J}}$$

(1)

4.2 4.2.1

$$v = \frac{115}{3{,}6}$$
$$\underline{\underline{v = 31{,}944\ m/s}}$$

(1)

4.2.2

$$P = F.v$$
$$P = 1200 \times 31{,}944$$
$$P = 38332{,}8\ W$$
$$\underline{\underline{P = 38{,}333\ kW}}$$

(1)

4.3 4.3.1 Kinetic energy
4.3.2 Heat energy
4.3.3 Chemical energy

(3 × 1) (3)
[10]

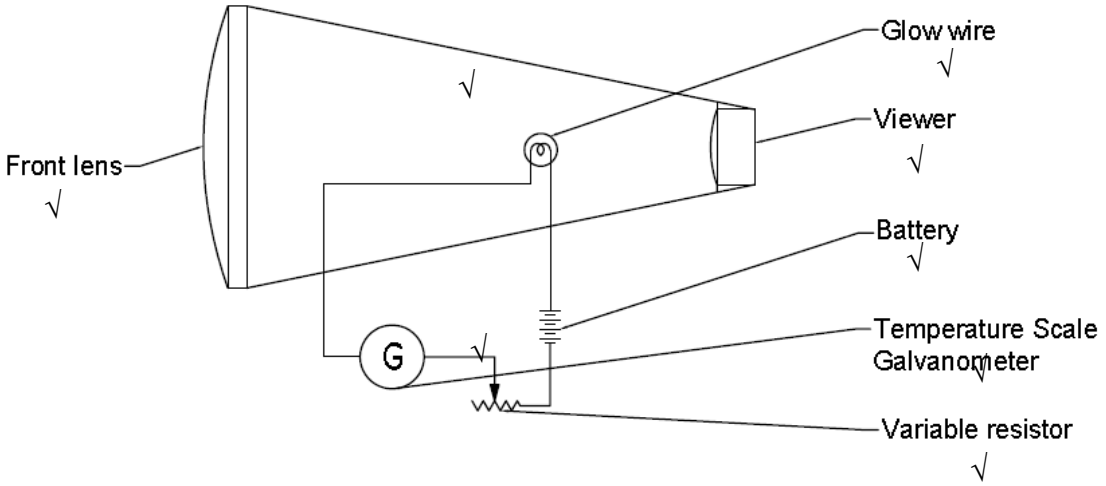
QUESTION 5: HEAT

5.1 Temperature is the measurement of the degree of heat.✓
Heat is a form of energy.✓ (2)

5.2 5.2.1 Conduction
5.2.2 Convection
5.2.3 Convection
5.2.4 Radiation

(4 × ½) (2)

5.3



(4)

5.4
- Change in dimensions
- Change in temperature
- Change of phase
- Change of composition
- Change in colour.
- Change in resistance
- Conduction of electricity

(Any 2 × 1) (2)

5.5 Each material has its own expansion rate. (1)

5.6 5.6.1 $Q = m.c\Delta t$

$$\Delta t = \frac{Q}{m.c}$$

$$\Delta t = \frac{60{,}5 \times 10^3}{3 \times 390}$$ ✓

$$\underline{\underline{\Delta t = 224{,}074\ °C}}$$ ✓

(224,074 should read 51,709) (2)

5.6.2 $\Delta t = t_f \quad t_o$

$t_f = \Delta t + t_o$

$t_f = 224{,}074 + 18$

$t_f = 242{,}074\ °C$ ✓

(replace 224,074 with 51,709) (1)

5.7 5.7.1 $L_f = L_o + \Delta L$

$L_f = 4{,}6 + 0{,}00545$

$L_f = 4{,}60545\ m$ ✓ (1)

5.7.2 $\Delta t = t_f \quad t_o$

$\Delta t = 85 \quad 13$

$\Delta t = 72\ °C$ ✓ (1)

[16]

QUESTION 6: PARTICLE STRUCTURE OF MATTER

6.1 Adding of heat and the taking away of heat.✓ (1)

6.2
- Solid: ice, rock, wood, etc.
- Liquid: water, oil, petrol, etc.
- Gas: steam, hydrogen oxygen, etc. (3)

6.3 6.3.1 Melting
6.3.2 Condensation
6.3.3 Solidification
(3 × 1) (3)

6.4 6.4.1 Electron√
6.4.2 Proton√
6.4.3 Nucleus√
6.4.4 Neutron√
(4 × ½) (2)

[9]

QUESTION 7: ELECTRICITY

7.1
- Length of the conductor
- Cross sectional area
- Type of conductor
- Temperature of conductor

(Any 1 × 1) (1)

7.2
$$I = \frac{V}{R}$$
$$I = \frac{220}{26} \checkmark$$
$$\underline{\underline{I = 8{,}462\ A}} \checkmark$$
(2)

7.3 7.3.1
$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$
$$\frac{1}{R_t} = \frac{1}{7} + \frac{1}{9} + \frac{1}{15} \checkmark$$
$$\underline{\underline{R_t = 3{,}119\ \Omega}} \checkmark$$
(2)

7.3.2
$$I = \frac{V}{R}$$
$$I = \frac{12}{3{,}119} \checkmark$$
$$\underline{\underline{I = 3{,}847\ A}} \checkmark$$
(2)

7.4
- More turns
- Use a core
- Higher current

(Any 1 × 1) (1)

7.5
$$Q = I^2.R.t$$
$$t = \frac{Q}{I^2.R}$$
$$t = \frac{1579 \times 10^3}{22{,}6^2 \times 125} \checkmark$$
$$\underline{\underline{t = 24{,}732 s}} \checkmark$$
(2)

7.6
$$V = \frac{P}{I}$$
$$V = \frac{120}{8} \checkmark$$
$$\underline{\underline{V = 15V}} \checkmark$$
(2)

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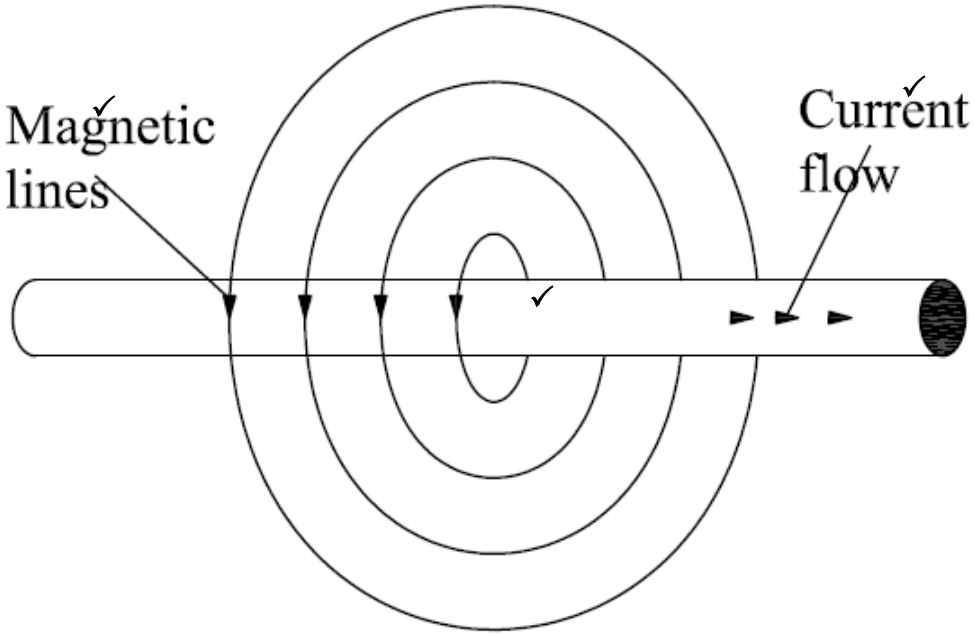
7.7



(3)

7.8
- Relay
- Doorbell
- Electrical motors
- Loudspeakers

(Any 1 × 1) (1)

7.9 7.9.1 Resistance will increase. (1)
7.9.2 Resistance will decrease. (1)

7.10 When the switch of the bell is closed current will flow through the solenoid, and the soft iron core will become magnetised.✓ The iron core will attract the iron bar connected to the striker.✓ The striker will hit the gong. When the switch is released the striker will return to its original position.✓ (3)

[21]

TOTAL SECTION B: 80
GRAND TOTAL: 100

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