higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(First paper)
NQF LEVEL 2

23 November 2022

This marking guideline consists of 9 pages.

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SECTION A

QUESTION 1

1.1 Weight
1.2 Speed
1.3 Antinode
1.4 Critical angle
1.5 Magnetic shielding

(5 × 1) **[5]**

QUESTION 2

2.1 F
2.2 J
2.3 A
2.4 E
2.5 D

(5 × 1) **[5]**

QUESTION 3

3.1 False
3.2 False
3.3 True
3.4 True
3.5 False

(5 × 2) **[10]**

QUESTION 4

4.1 D
4.2 A
4.3 D
4.4 B
4.5 D

(5 × 3) **[15]**

TOTAL SECTION A: 35

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SECTION B

QUESTION 5: MEASUREMENTS

5.1 5.1.1 2×10^6 kg
5.1.2 $3{,}4 \times 10^{-1}$ A
(2 × 1) (2)

5.2 5.2.1 MPa
5.2.2 μA
5.2.3 mg
(3 × 1) (3)

5.3 5.3.1 Burette/Graduated cylinder
5.3.2 Voltmeter
(2 × 1) (2)
[7]

QUESTION 6: MOTION

6.1 Average speed is the total distance travelled✓ divided by the total elapsed time taken to travel the distance.✓

OR

Average speed is the distance✓ per time ratio.✓ (2)

6.2 6.2.1

$$\vec{V}_A = \frac{\Delta S}{\Delta t}\checkmark$$
$$= \frac{0}{5\,400}\checkmark$$
$$= 0 \text{ m/s}\checkmark$$

6.2.2

$$V_A = \frac{D}{\Delta t}\checkmark$$
$$= \frac{5\,000 \times 2}{45 \times 2 \times 60}\checkmark$$
$$= 1{,}85 \text{ m/s}\checkmark$$

OR

$$V_A = \frac{D}{\Delta t}\checkmark$$
$$= \frac{5 \times 2}{\left({}^{45 \times 2}/_{60}\right)}\checkmark$$
$$= 6{,}67 \text{ km/h}\checkmark$$

(2 × 3) (6)

6.3 6.3.1

$$v = u + at$$
$$a = \frac{v - u}{t}\checkmark$$
$$= \frac{25 - 10}{20 - 15}\checkmark$$
$$= 3 \text{ m/s}^2\checkmark$$

(3)

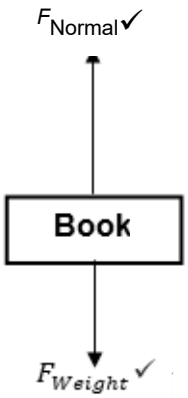
6.3.2
$$S_1 = ut + \frac{1}{2}at^2$$
$$= 10 \times 15 + \frac{1}{2} \times 0 \times 15^2$$
$$= 150 \text{ m}✓$$
$$v^2 = u^2 + 2as$$
$$S_2 = \frac{v^2 - u^2}{2a}$$
$$= \frac{25^2 - 10^2}{2 \times 3}$$
$$= \frac{625 - 100}{6}$$
$$= 87{,}5 \text{ m}✓$$
$$S_3 = ut + \frac{1}{2}at^2$$
$$S_3 = 25 \times 5 + \frac{1}{2} \times 0 \times 5^2$$
$$= 125 \text{ m}✓$$
$$S_{Total} = S_1 + S_2 + S_3$$
$$= 150 + 87{,}5 + 125✓$$
$$= 362{,}5 \text{ m}✓$$ (5)

6.3.3
$$V_A = \frac{S_{Total}}{t_{Total}}✓$$
$$= \frac{362{,}5}{40}✓$$
$$= 9{,}06 \text{ m/s}✓$$ (3)

[19]

QUESTION 7: ENERGY

7.1 7.1.1



(2)

7.1.2
$$w = mg✓$$
$$= 0{,}6 \times 9{,}8✓$$
$$= 5{,}88 \text{ N}✓$$ (3)

7.2 $(E_P + E_k)initial = (E_P + E_k)\text{final}$✓: The mechanical energy of an isolated system remainst constant/ is conserved.✓✓

OR

$(mgh + \frac{1}{2}mv^2)initial = (mgh + \frac{1}{2}mv^2)\text{final}$✓: The mechanical energy of a isolated system remains constant/ is conserved.✓✓

(3)

7.3 7.3.1 $E_p = mgh$✓
$= 8 \times 9{,}8 \times 10$✓
$= 784\ \text{J}$✓ (3)

7.3.2 $v^2 = u^2 + 2gs$✓
$v = \sqrt{2gs}$
$= \sqrt{2 \times 9{,}8 \times (10 - 4)}$✓✓
$v = \sqrt{117{,}6}$
$= 10{,}84\ \text{m/s}$✓

OR

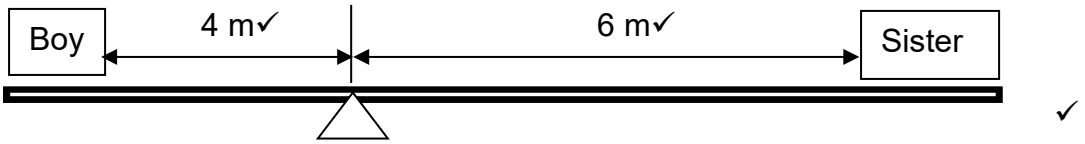
$E_T = E_P + E_K$✓
$E_K = 784 - (8 \times 9{,}8 \times 4)$✓
$v^2 = \frac{470{,}4 \times 2}{8}$✓
$v = \sqrt{117{,}6}$
$= 10{,}84\ \text{m/s}$✓ (4)

[15]

QUESTION 8: MECHANICAL ADVANTAGE

8.1 First-class lever,✓ because pivot or the fulcrum is between a boy (load) and his sister (effort).✓ (2)

8.2



✓

(3)

8.3 $F_B \times S_B = F_S \times S_S$✓

$F_S = \frac{18 \times 9{,}8 \times 4}{6}$✓✓

$= 117{,}6\ \text{N}$✓ (4)

8.4 $MA = \frac{F_L}{F_E} = \frac{F_B}{F_S}$✓
$= \frac{18 \times 9{,}8}{117{,}6}$✓
$= \frac{176{,}4}{117{,}6}$
$= 1{,}5$✓ (3)

[12]

QUESTION 9: WAVES, SOUND AND LIGHT

9.1 9.1.1 Transverse wave✓ (1)

9.1.2 Amplitude is the maximum extent of vibration or oscillation from its equilibrium position.✓ (1)

9.1.3 $\text{Amplitude} = \frac{7}{2}$✓ $= 3{,}5\ \text{m}$✓ (2)

9.1.4 2,5 waves✓ (1)

9.1.5
$$f = \frac{1}{T}$$
$$= \frac{1}{0{,}4}$$
$$= 2{,}5\ \text{Hz}$$✓

OR

$$v = \frac{D}{t}$$✓
$$= \frac{10}{0{,}8}$$✓
$$= 12{,}5\ \text{m/s}$$✓

$$v = f\lambda$$✓
$$= 2{,}5 \times 5$$✓
$$= 12{,}5\ \text{m/s}$$✓ (4)

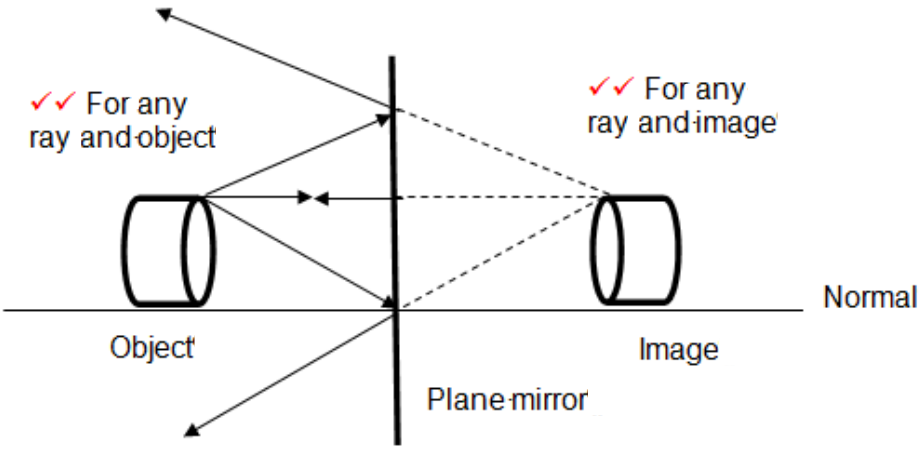
9.1.6 D✓ and H✓ (2)

9.2 9.2.1 Half a wavelength is the distance between the two consecutive node.✓ **OR T**he distance between the two consecutive antinodes (1)

9.2.2 At the node there is destructive interference✓ because of zero disturbance✓ and at the antinode there is constructive interference✓ because maximum disturbance.✓ (4)

9.2.3 A stationary wave results from two progressive waves of equal frequency and similar amplitudes, travelling in opposite directions and in phase so that nodes and antinode coincide.✓✓ (2)

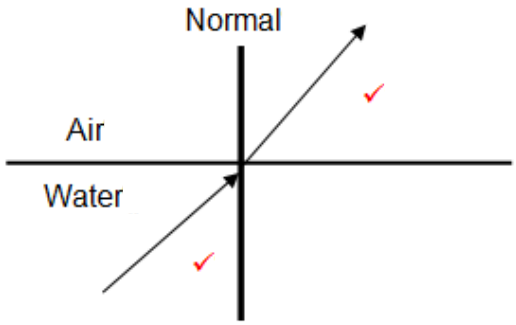
9.3



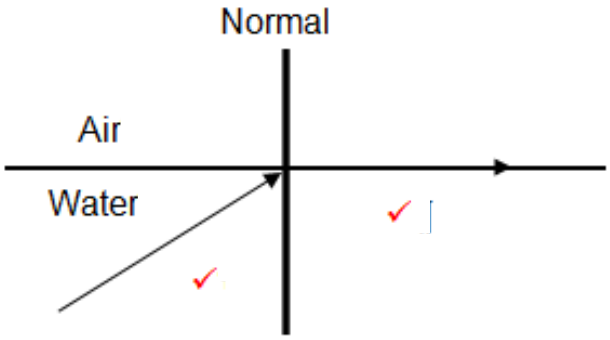
- Same size as object
- Same distance as object
- Virtual

(Any ONE) (5)

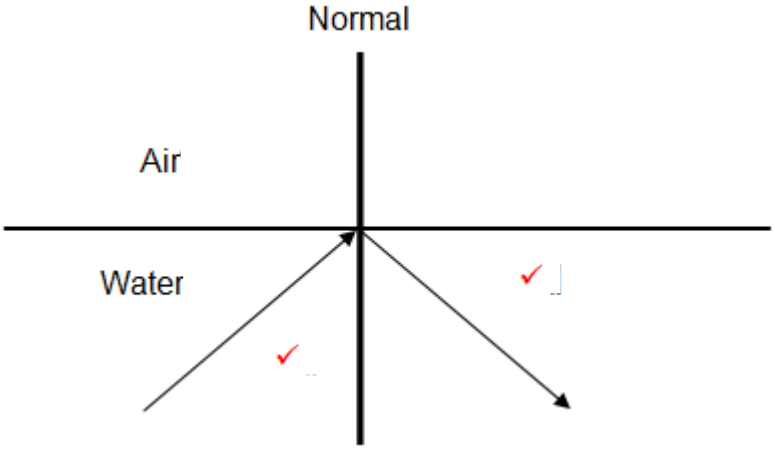
9.4 9.4.1



9.4.2



9.4.3



(3 × 2) (6)

9.5 QUESTION 9.4.3 (1)
[30]

QUESTION 10: MAGNETISM

10.1 10.1.1 Noncontact force is applied on an object by another body that is not in direct contact with it.✓✓

OR

Noncontact force is exerted on an object by another body without touching the object.✓✓ (2)

10.1.2
- Gravitational
- Electrostatic
- Nuclear
- Magnetic (Any 2 × 1) (2)

10.1.3 Y represents the south pole,✓ because the field lines with an arrow✓ are drawn from north to south poles of magnet.✓ (3)

10.1.4 Attraction (1)

10.2 10.2.1 +5 μC (1)

10.2.2
$$Q = \frac{Q_A + Q_B}{2}\checkmark$$
$$5 = \frac{-2 + Q_B}{2}\checkmark$$
$$Q_B = (5 \times 2) + 2\checkmark$$
$$= 12\ \mu C\checkmark$$ (4)

10.2.3 A to B (1)
[14]

QUESTION 11: ELECTRICITY

11.1 11.1.1
$R_T = R_\parallel + R_S\checkmark$
$R_\parallel = 9 - 2 = 2\ \Omega\checkmark$
$R_\parallel = \frac{R_1 \times R_2}{R_1 + R_2}\checkmark$
$2 = \frac{6x}{x+6}\checkmark$
$2x + 12 = 6x$
$6x - 2x = 12$
$x = \frac{12}{4}$
$x = 3\ \Omega\checkmark$

$R_T = R_\parallel + R_S\checkmark$
$R_\parallel = 9 - 7$
$= 2\ \Omega\checkmark$
$\frac{1}{R_\parallel} = \frac{1}{x} + \frac{1}{R_{6\,\Omega}}\checkmark$
$\frac{1}{x} = \frac{1}{2} - \frac{1}{6}$
$x = \frac{6}{3-1}\checkmark$
$= 3\ \Omega\checkmark$ (5)

11.1.2
$V_2 = I_T R_{7\Omega}$
$= 2 \times 7\checkmark$
$= 14\ V\checkmark$ (2)

11.1.3 $I_{6\Omega} = \frac{V}{R_{6\Omega}}$
$= \frac{18-14}{6}$✓
$= 0{,}67$ A✓

$I_{3\Omega} = \frac{V}{R_{3\Omega}}$
$\frac{18-14}{3}$✓ $= 1{,}33$ A✓
$I_{\parallel} = I_{6\,\Omega} + I_{3\,\Omega}$
$= 0{,}67 + 1{,}33$
$= 2$ A✓ (5)

11.1.4 $Q = It$
$= 2 \times 50$✓
$= 100$ C✓ (2)

11.2 Decreases (1)

11.3 If the resistor is removed, the total resistance of the circuit increases because $R\ \alpha\ \frac{1}{I}$ if R increases and V is constant and I of the circuit decreases.✓✓ (2)

11.4 Direct current (DC) (1)
[18]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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