higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(First paper)
NQF LEVEL 3

27 November 2023

This marking guideline consists of 10 pages.

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SECTION A

QUESTION 1

1.1 Moment of force
1.2 Inertia
1.3 Far-sightedness/hyperopia
1.4 Right-hand rule
1.5 Potential difference

(5 × 1) **[5]**

QUESTION 2

2.1 E (Diminished and erect)
2.2 B ($a = 0\ m.s^{-2}$)
2.3 C ($kg\ m.s^{-2}$)
2.4 F (Potential dividers)
2.5 A (Scalar)

(5 × 1) **[5]**

QUESTION 3

3.1 True✓✓

3.2 True✓✓

3.3 False✓✓ (Sound is a longitudinal wave).

3.4 False✓✓ (The frequency of sound represents the pitch).

3.5 False✓✓ (Lighting is related to electrical charges). (5 × 2) **[10]**

QUESTION 4

4.1 D
4.2 B
4.3 A
4.4 B
4.5 A

(5 × 3) **[15]**

TOTAL SECTION A: 35

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SECTION B

QUESTION 5

5.1 $v = \frac{d}{\Delta t}$✓

$v = \frac{400}{25}$✓

$v = 16\ m.s^{-1}$✓ (3)

5.2 $a = \frac{v_f - v_i}{\Delta t}$✓

$a = \frac{16-0}{25}$

$a = 0.64\ m.s^{-2}$✓ (3)

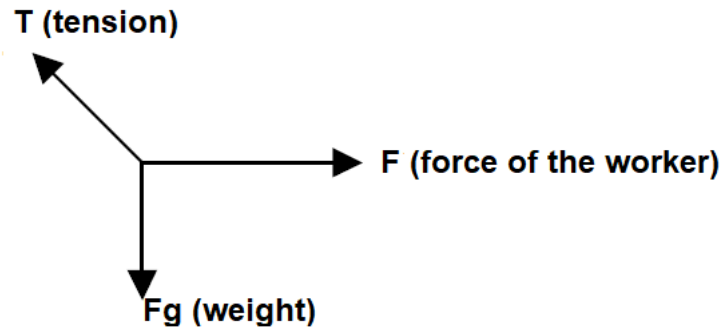
[6]

QUESTION 6

6.1 Yes (1)

6.2 There is no net (resultant) force acting on the body.
OR
The object is stationary/at rest. (2)

6.3



Criteria	Mark
Correct representation of T with an arrow	1
Correct representation of F with an arrow	1
Correct representation of Fg with an arrow	1

(3)

6.4 6.4.1 $\tan\theta = \frac{opposite}{adjascent}$

$\tan 30^0 = \frac{F}{960}$✓

F = 960 N✓ $\tan 30^0$✓

= 554,26 N✓ (4)

6.4.2 $\cos\theta = \frac{oadjascent}{resultant}$✓

$\cos 30^0 = \frac{960}{T}$✓

$T = \frac{960}{\cos 30^0}$✓

T = 1108,51 N✓ (4)
[14]

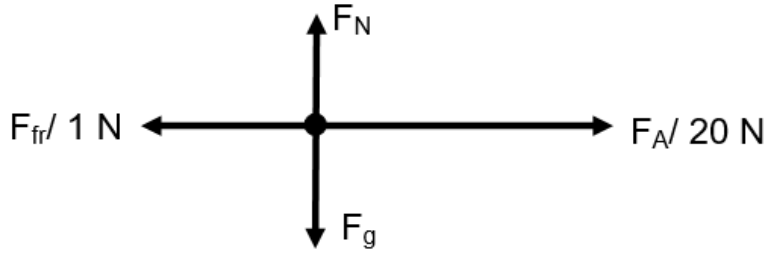
QUESTION 7

7.1 7.1.1 Your body will keep moving forward and fly off your skateboard✓ since the curb only stops the board, not yourself.✓ (2)

7.1.2 Newton's first law of motion/the law of inertia (1)

7.2 7.2.1 When a net force acts on an object, the object will accelerate in the direction of the force✓ the acceleration is directly proportional to the force and inversely proportional to the mass of the object.✓ (2)

7.2.2



Criteria	Mark
Correct label and direction of force F_A/20 N with an arrow	1
Correct label and direction of force F_N with an arrow	1
Correct label and direction of force Fg/W with an arrow	1
Correct label and direction of force Ffr/Friction with an arrow	1

(4)

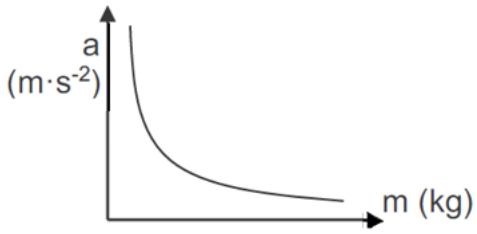
7.2.3

For Block Q	For Block P
Fnet = ma	Fnet = ma✓
T + (-1) = ma T-1=1 a T = 1 a +1…(1) ✓	FA + (-T) + (-Fr) = ma 20 –T-2= 3 a 18 – 3 a = T…(2)✓

Equation (1) = Equation (2) Both equations = T, so
1 a +1 = 18-3 a✓
1 a + 3 a =18-1✓
4 a =17
a = 17/4
a = 4, 25 m.s^{-2} ✓ (6)

7.2.4 Substitute a in either equation 1 or 2
In (1)
T = 1 a+1✓
T = 1(4, 25) + 1✓
T = 5, 25 N✓ (3)

7.2.5



Criteria	Mark
y (a) and x(m) axis are correctly drawn with arrows and meet at 0	1
a and m have correct SI units in brackets	1
Correct curve showing inverse proportion	2

(4)
[22]

QUESTION 8

8.1 The ratio of output force to input force. (2)

8.2 8.2.1 Class 3 (1)

8.2.2 $MA = \frac{load\ length}{effort\ length}$ ✓

$= \frac{40}{100}$ ✓✓

= 0,4✓ (4)

8.2.3 $MA = \frac{load}{effort}$ ✓

$0,4 \quad = \frac{load}{15}$

Load = 0,4✓ × 15✓

Load = 6 N✓ (4)

[11]

QUESTION 9

9.1 9.1.1 One oscillation of a particle produces one wavelength. So, one wavelength passes a point in 0,4 s. Eight wavelengths pass in 8 × 0,4 s✓

= 3,2 s ✓ (2)

9.1.2 Amplitude is the distance from the rest position to the crest

= 12,5 mm✓

= 0, 0125 m✓. (2)

9.1.3 The given distance is for 2 wavelengths.

$\lambda = \frac{0,68}{2}$ ✓

= 0,34 m ✓ (2)

9.1.4 $F = \frac{1}{T}$ ✓

$F = \frac{1}{0,4}$ ✓

= 2,5 Hz ✓ (3)

9.1.5 $v = f \lambda$ ✓

= 2,5 × 0,34 ✓

= 0,85 $m.s^{-1}$ ✓ (3)

9.2 Amplitude is the distance from the rest position to the crest. (2)

[14]

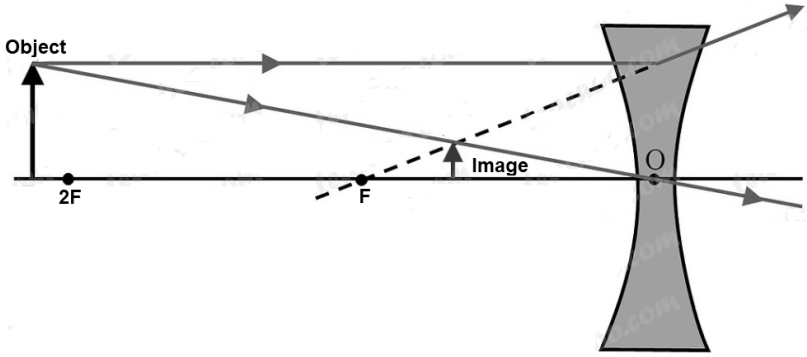
QUESTION 10

10.1 10.1.1
- Concave lens/Diverging lens.
- Convex lens/Converging lens. (2)

10.1.2 Myopia (1)

10.1.3 Concave lens (1)

10.1.4



Criteria	Mark
Correct ray parallel to the principal axis from the object to the lens with an arrow	1
Correct ray diverting from the parallel ray in the lens with an arrow and seeming to come from F	1
Correct ray straight from the top of the object through the centre of the lens with an arrow	1
A bigger erect object beyond 2F	1
Smaller erect image between F and the lens on the same side as the object	1
Correct shape of the lens	1

(6)

10.1.5 $M = \frac{-d_i}{d_o}$✓

3✓ $= \frac{-d_i}{10}$✓

di = -30 cm✓ (4)

[14]

QUESTION 11

11.1 A device for storing electrical charge. (2)

11.2 11.2.1 $C = \frac{\varepsilon_0 A}{d}$ ✓

$= \frac{(8.85\ X\ 10^{-12})(1)}{0.002}$ ✓✓

$= 4425 \times 10^{-12}$ F ✓ (4)

11.2.2 $C = \frac{Q}{V}$ ✓

$4\ 425 \times 10^{-12} = \frac{Q}{250}$ ✓

$Q = 110.6 \times 10^{-8}$ C ✓ (3)

11.2.3 Increase the potential difference (1)

11.3 11.3.1 Step-down (1)

11.3.2 $\frac{V_P}{V_S} = \frac{N_P}{N_S}$ ✓

$V_P = \frac{1200}{60} \times 24$ ✓

$V_P = 480$ ✓✓ (4)
[15]

QUESTION 12

12.1 Ohm's law states that the current that flows through most conductors is directly proportional to the potential difference across it✓ provided the temperature remains constant.✓ (2)

12.2.1 Effective resistance of parallel resistors

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$$

$$\therefore \frac{1}{R_T} = \frac{1}{15} + \frac{1}{30} \checkmark$$

$$\therefore \frac{1}{R_T} = \frac{2}{30} + \frac{1}{30}$$

$$\therefore \frac{1}{R_T} = \frac{3}{30}$$

$$R_T = \frac{30}{3}$$

$$\therefore R_T = 10\ \Omega \checkmark$$

R total = $R_{parallel}$ + R_{series}
= 10 + 10
= 20 Ω✓ (4)

12.2.2 R = V/I✓
20 = 45/I✓
I = 2,25 A✓ (3)

12.2.3 I series = 2,25 A
V_{series} = IR✓
= 2,25 × 10✓
= 22,5 V✓

$V_{parallel}$ = 22, 5 V [V_{II}=V_1=V_2…]

V of 15 Ω = 22,5 V✓ (4)

12.2.4 V of 30 Ω = IR✓
22,5 = I × 30✓

I = 22,5/30
= 0,75 A✓ (3)

12.2.5 The 15 Ω resistor (1)

12.2.6 Resistance is inversely proportional to the current. (2)

OR

The lesser the resistance, the more the current

OR

$R\alpha\frac{1}{I}$

[19]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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