higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(First paper)
NQF LEVEL 3

XX February 2020

This marking guideline consists of 8 pages.

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SECTION A

QUESTION 1

1.1 Frequency
1.2 Pitch
1.3 Newton's first law
1.4 Virtual
1.5 Resonance

(5 × 1) **[5]**

QUESTION 2

2.1 C
2.2 J
2.3 H
2.4 B
2.5 D

(5 × 1) **[5]**

QUESTION 3

3.1 True
3.2 False
3.3 False
3.4 False
3.5 True

(5 × 2) **[10]**

QUESTION 4

4.1 A
4.2 C
4.3 B
4.4 B
4.5 D

(5 × 3) **[15]**

TOTAL SECTION A: 35

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SECTION B

QUESTION 5

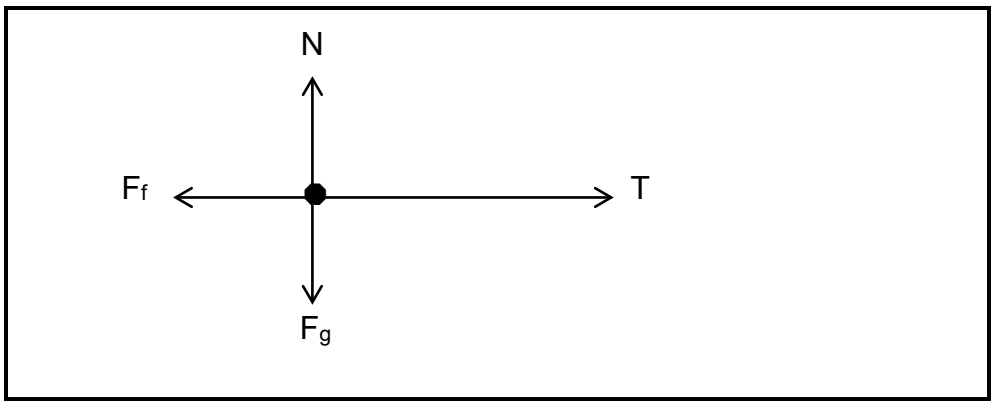
5.1 5.1.1 Force
5.1.2 Length
5.1.3 Volume

(3 × 1) (3)

5.2 The potential difference across the ends of a conductor is directly proportional to the current in the conductor provided the temperature is constant. (2)
[5]

QUESTION 6

6.1 6.1.1



N or F_N – Normal force/Normal✓
F_f – Force of friction/friction✓
T or F_T – Tension✓
F_g or w – Force of gravity/gravitational force/weight✓ (4)

6.1.2 Take the direction of acceleration as +ve

F_{net} = ma✓
mg – T = ma
(3)(9,8) – T ✓ = 3(0,8)✓
T = 27 N✓ (4)

6.1.3 F_{net} = ma✓
$T - F_f$ = ma
27 – F_f ✓ = 6 (0,8)✓
F_f = 22,2 N✓ (4)

6.1.4 Increase (2)

6.2 6.2.1 Car B (1)

6.2.2 $a = \frac{\Delta v}{\Delta t}$ ✓
$= \frac{vf - vi}{\Delta t}$
$= \frac{0-20}{20}$ ✓
$= -1\ m \cdot s^{-2}$ ✓

$F_{net} = ma$
$= (1\ 000)(-1)$ ✓
$= -1\ 000\ N$ ✓ (5)

6.2.3 Car A's displacement = ½ (20 × 20) ✓
= 200 m ✓ (2)

6.2.4 Car B's displacement = ½ 10 × 20 ✓ + ½ 20 × 20 – ½ (10 × 10) ✓
= 250 m ✓ (3)

6.2.5 Car B (1)
[26]

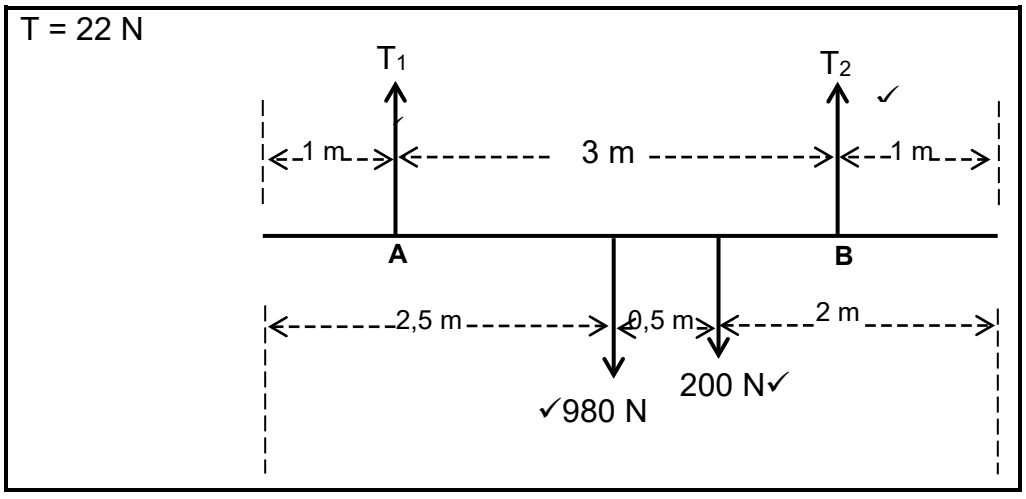
QUESTION 7

7.1 The first condition states that the sum of forces in one direction is equal to sum of forces in the opposite direction.

OR

The second condition states that the sum of clockwise moments/torques is equal to the sum of counterclockwise moments/torques about any point or axis of rotation. (1 × 2) (2)

7.2 7.2.1



(4)

Positive marking of QUESTIONS 7.2.2 and 7.2.3.

7.2.2 ∑clockwise moment about A = ∑anticlockwise moment about A✓

980 × 1,5 m ✓ + 200 N × 2 m✓ = T_1 × 0 m + T_2 × 3 m✓

T_2 = 623,33 N✓ (5)

7.2.3 ∑upward forces = ∑downward forces✓

T_1 + T_2 = 980 + 200

T_1 + 623,33 = 980 + 200✓

T_1 = 556,67 N✓ (3)

Positive marking of QUESTIONS 7.3.1 to 7.3.3.

7.3 7.3.1 IMA = VR = 2πR/pitch✓

= 2(3,14) 10/0,05✓

= 1 256,6✓ (3)

7.3.2 Efficiency = $\frac{AMA}{IMA}(100)$✓

20 = $\frac{AMA}{1256,6}(100)$✓

AMA = 251,32✓ (3)

7.3.3 AMA = $\frac{load}{effort}$✓

251,32 = $\frac{200}{effort}$✓

Effort = 0,796 N✓ (3)

[23]

QUESTION 8

8.1 8.1.1 When charged✓ particles accelerate✓ (2)

8.1.2
- Produced by vibrating objects
- Produced by vibrations

(Any 1 × 2) (2)

8.2 8.2.1 Loudness: The attribute of a sound that determines the magnitude of the auditory sensation produced and that primarily depends on the amplitude of the sound waves

8.2.2 Sound intensity: The average rate at which sound energy passes through a unit area normal to that direction

(2 × 2) (4)

8.3 8.3.1 $V = f\lambda$ ✓

$340 = (5\ 000)\ \lambda$✓

$\lambda = 0{,}068$ m✓ (3)

8.3.2 $V = \frac{distance}{time\ taken}$ ✓

$340 = \frac{200}{\Delta t}$ ✓

$\Delta t = 0{,}59\ s$✓ (3)

8.3.3 140 m (2)
[16]

QUESTION 9

9.1 9.1.1 Two point charges will exert an attractive or repulsive force on each other. The force is directly proportional to the product of the charges and inversely proportional to the square of the distance between them. (2)

Positive marking of QUESTIONS 9.1.2 and 9.1.3.

9.1.2 $F = kQ_1 Q_2 / r^2$✓

$= (9 \times 10^9 \times -0{,}5 \times 10^{-6}$✓ $\times 250 \times 10^{-9}$✓$) / 0{,}1$✓

$= -11\ 250\ 10^{-6}$ N

$= -1{,}125 \times 10^{-2}$ N✓ (5)

9.1.3 $E = \frac{F}{q}$ ✓

$= \frac{1{,}125\ X\ 10^{-2}}{250\ X\ 10^{-9}}$ ✓

$= 45\ 000$ N·C^{-1} OR $4{,}5 \times 10^4$ N·C^{-1}✓ (3)

9.2 9.2.1 B to A (2)

9.2.2 According to Lenz's law✓ the solenoid will generate a magnetic field to oppose✓ the approaching north pole.
The solenoid forms a north pole✓ (3)

9.2.3 Left (1)

9.2.4
- Increasing the number of turns in the solenoid
- Increasing the speed at which the magnet moves towards the solenoid
- Using a stronger bar magnet (Any 2 × 2) (4)

9.3
- Double✓ the area✓ of the plates.
- Halve✓ the distance✓ between the plates.
- Use a substance of double ✓ the present dielectric. ✓ (Any 4 × 1) (4)

[24]

QUESTION 10

Positive marking of QUESTIONS 10.1 to 10.4.

10.1
$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$$
$$\frac{1}{R_p} = \frac{1}{8} + \frac{1}{2} \checkmark$$
$$R_p = 1{,}6\ \Omega \checkmark$$

Total external resistance = 1,6 + 4 = 5,6 Ω ✓ (4)

10.2
$V_1 = I\,R$ ✓
$8{,}4 = I\ (5{,}6)$ ✓
$I = 1{,}5\ A$ ✓ (3)

10.3 EMF = I (R + r) ✓
= 1,5✓ (5,6 + 0,6) ✓
= 9,3 V ✓ (4)

10.4 OPTION 1

$V_2 = I\,R$ ✓
$= (1{,}5)(4)$ ✓
$= 6\ V$ ✓

OPTION 2

$V_p = I\,R_p$ ✓
$= (1{,}5)(1{,}6)$✓
$= 2{,}4\ V$

$V_2 = 8{,}4 - 2{,}4 = 6$ V ✓ (3)

10.5 10.5.1 9,3 V
10.5.2 0 V
(2 × 1) (2)

10.6 Decrease (1)

10.7 The circuit current is inversely proportional✓ to the circuit resistance.
As the circuit resistance increases,✓ the circuit current decreases.✓
The reading on V_2 is directly proportional to the circuit current.✓ (4)
[21]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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