higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(First paper)
NQF LEVEL 2

8 December 2020

This marking guideline consists of 8 pages.

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SECTION A

QUESTION 1

1.1 Acceleration
1.2 Anion
1.3 1 N
1.4 Oscillation
1.5 Insulators

(5 × 1) **[5]**

QUESTION 2

2.1 D
2.2 A
2.3 G
2.4 E
2.5 F

(5 × 1) **[5]**

QUESTION 3

3.1 True
3.2 True
3.3 False
3.4 False
3.5 True

(5 × 2) **[10]**

QUESTION 4

4.1 C
4.2 D
4.3 C
4.4 C
4.5 C

(5 × 3) **[15]**

TOTAL SECTION A: 35

SECTION B

QUESTION 5

5.1 5.1.1 Volt (1)

5.1.2
- Kilogram
- Gram
- Ton

(Any 1 × 1) (1)

5.1.3 Ohm (1)

5.2 5.2.1 Triple balance/scale/mass meter

5.2.2 Clocks or stopwatch

(2 × 1) (2)

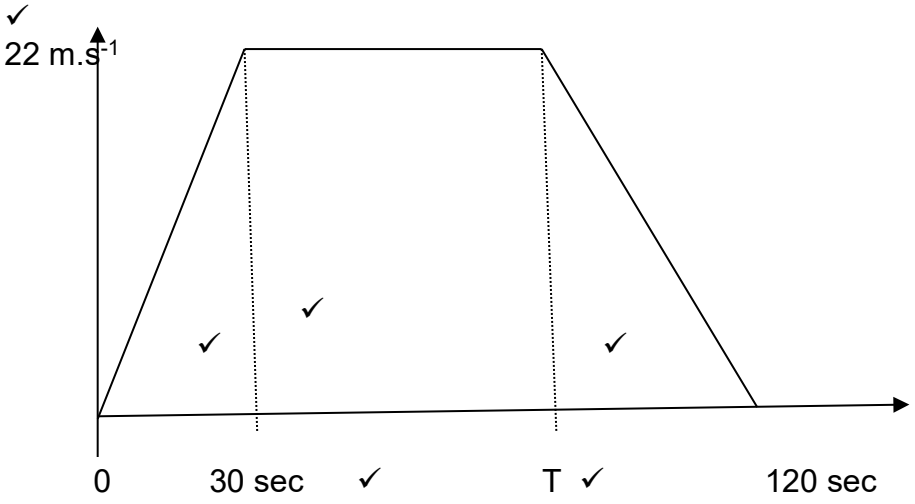
5.3 Volume = L × B ×H
= 0,5 m × 0,35 m × 2,5 m✓✓
= 0,44 m^3 ✓✓ (4)
[9]

QUESTION 6: MECHANICS

6.1
- Speed: distance travelled in a certain time. It is a scalar quantity
- Velocity: The displacement travelled in a certain time. It is a vector quantity.

(2 + 2) (4)

6.2 6.2.1 ✓

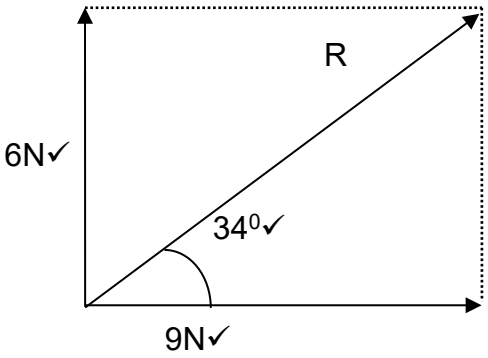


(6)

6.2.2 Displacement = area under graph
= ½BH + LxB + ½BH
2145 = ½ (30x22) + [(22 x (T-30)] + ½ [(120-T) x 22)]✓
2145 = ½ (30x22) + [(22 x (T-30)] + ½ (2640-22T)
2145 = 330 + (22T- 660) + (1320-11T) ✓
2145 = 990 + 11T
1155 = 11T
T = 1155/11✓
T = 105 seconds✓ (4)

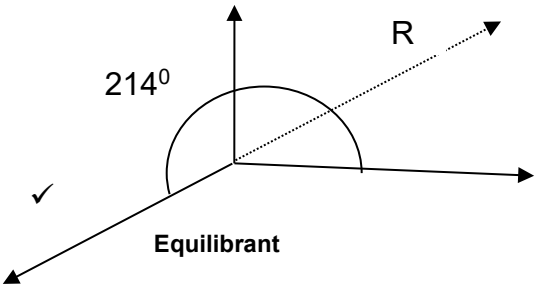
6.3 6.3.1 Single force that has the same effects as two or more forces (2)

6.3.2



Scale = 10 mm = 1N
Resultant = 108 mm✓
R = (108 ÷ 10) mm × 1N
R= 10,8 N and 34° with 9N force✓✓ (6)

6.3.3



The equilibrant has the same magnitude but opposite in direction to the resultant of all the forces acting on a body. (2)
Equilibrant = 10,8 N✓ and forms 214° with 9N force **[24]**

QUESTION 7: MECHANICS

7.1 work done = force × distance✓
work done = (mass × acceleration) × distance
1J = 1 kg.m.s^{-2} × m✓
1 J = kg.m^2.s^{-2}✓ (3)

7.2 7.2.1 $E_k = \frac{1}{2}mv^2$
$= \frac{1}{2}(10)(20)^2$✓
= 200J✓✓ (3)

7.2.2 (E_k + Ep) at highest point = (E_k + Ep) at the bottom/ground
$E_k + 0 = 0 + mgh$ ✓

$200 = 10 \times 9{,}8 \times h$✓

$h = \frac{200}{9{,}8 \times 10}$✓
= 2,04 m✓✓ (4)

7.3
- Electrical energy
- Nuclear energy
- Thermal energy (3)

7.4 Work put into the machine✓ equals the work done by the machine✓✓ (3)

7.5 7.5.1 $\text{Efficiency} = \frac{MA}{VR}$

$0{,}85 = \frac{MA}{7}$✓✓ (3)

$\therefore MA = 0{,}85 \times 7$
= 5,95✓

7.5.2 Effort required to overcome resistance

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

$5{,}95 = \frac{1300}{\text{effort}}$ ✓✓

$\text{Effort} = \frac{1300}{5{,}95}$
= 218,5 N✓ (4)

7.6 No
Efficiency is defined as $E = \frac{MA}{VR} \times 100$✓
No machine is 100% efficient, so velocity ratio will always be greater than MA✓✓ (3)
[26]

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QUESTION 8

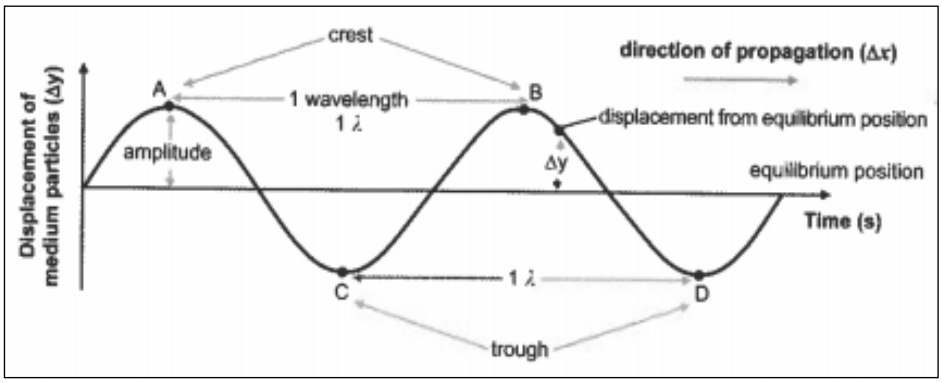
8.1 8.1.1 If two wave pulses travel through the same space/medium at the same moment,✓ the pulses combine and the amplitude of the combined pulses equal the sum✓ of the amplitude of the individual pulses.✓

8.1.2 Two waves overlapping✓ in such a way that they amplify each other (forming single pulse with greater amplitude)✓✓

8.1.3 Two waves overlapping✓ in such a way that they weaken✓/neutralise each other✓ (form a single pulse with smaller amplitude)

(3 × 3) (9)

8.2



(6)

8.3 8.3.1 $V = f \times \lambda$

$330 \text{ m/s} = 10 \times \lambda$

$\lambda = \frac{330}{10}$✓

$= 33 \text{ m}$✓✓ (3)

8.3.2 $T = 1/f$

$= 1/10$✓

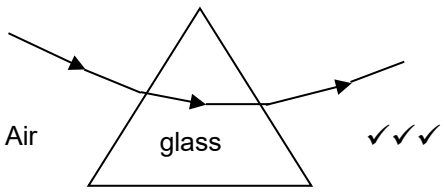
$= 0{,}1 \text{ sec}$✓ (2)

8.4 8.4.1 D (2)

8.4.2 i, e (2)

8.4.3 When a light ray is shone obliquely through a triangular glass prism (3)

8.5



✓✓✓

(3)

[30]

QUESTION 9

9.1 9.1.1 Object has more electrons than protons and has a net -ve charge. (3)

9.1.2 Electrons are transferred from the PVC rod to the sphere and the sphere acquires a negative charge that distributes across its surface. (4)

9.1.3 Graphite layer is a conductor of electricity causing charge to distribute across the surface of the sphere and not concentrate on one point. (2)

9.1.4 Law of conservation of charge states that the charge cannot be created or destroyed but only separated or transferred from one object to another. (3)

9.2 9.2.1 $R_T = R_1 + R_2 + R_3$✓
$R_T = 15 + 20 + 30$✓
$R_T = 65\ \Omega$ ✓✓ (4)

9.2.2 $I_T = \frac{V_T}{R_T}$

$= \frac{220}{65}$✓✓

$= 3.38$ A✓✓ (4)

9.2.3 $V_{15\Omega} = I.R$

$= 3{,}38\ A \times 15\ \Omega$ ✓

$\therefore V_{15\Omega} = 50{,}7$ V✓

$V_{20\Omega} = I.R$

$= 3{,}38\ A \times 20\ \Omega$ ✓

$\therefore V_{20\Omega} = 67{,}6$ V✓

$V_{30\Omega} = I.R$

$= 3{,}38\ A \times 30\ \Omega$ ✓

$\therefore V_{30\Omega} = 101{,}4$ V✓ (6)

[26]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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