

PROVISIONAL MARKING KEY
PHYSICS PAPER I



SOUTH EAST EDUCATION DIVISION

2024 MALAWI SCHOOL CERTIFICATE OF EDUCATION MOCK EXAMINATION

PHYSICS

PAPER I

SECTION A (70 Marks)

1. a. Pressure

work

energy

frequency

power

(Any one, 1 mark)

b. Parallax error occurs when there is an apparent shift in the position of an object (1)
when viewed at different angles (1)

c. (i). Vernier caliper (1)

(ii). - Measures small distances with high accuracy.

- has higher precision of measurements

- Allows for versatile measurements

(Any one, 1 mark)

- Reduces sources of error in measurement.

d. - posters

- video conferencing (Any two, 1 mark each)

- scientific journals

- publications

2. a. Absolute temperature is the temperature measured in Kelvins (1)

b. $T_2 = (V_2 \times T_1)/V_1$ (1) formula

$= (800\text{cm}^3 \times (27 + 273))\text{K}/500\text{cm}^3$ (1) substitution

$= 480\text{K}$ (1)

c. The particles in a plastic spoon gain kinetic which makes them to vibrate (1).
This weakens the intermolecular forces (1).

3. a. -used in industries

-cancer treatment

-Carbon – 14 dating

b. Using $N(t) = N_0(1/2)^{t/T}$ (1) formula

$N_0 = 100$, $T = 20$, $t = 40$ minutes

$N_{(40)} = 100(1/2)^{40/20}$

$N_{(40)} = 100(1/2)^2$ (1) simplification



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$$N_{(40)} = 25g \quad (1)\text{answer}$$

Let n be equal to the number of half lives

A be the half lives

T = total time

$$A(n) = T$$

$$20(n) = 40 \quad (1)$$

$$n = 40/20$$

$$n = 2$$

$$\therefore \frac{1}{2} \times \frac{1}{2} \times 100g \quad (1)$$

$$= 25g \quad (1)$$

- c. It occurs when unstable nucleus disintegrates on its own **(1)** due to its instability **(1)**

4. a. $I = V/R$
 $= 8V/2\Omega \quad (1) \text{ simplification}$
 $= 4A \quad (1) \text{ answer}$

- b. Voltage across parallel network
 $= 16V - 8V \quad (1) \text{ finding the voltage across parallel network}$
 $= 8V .$

Current flowing through 8Ω resistor

$$I = 8\Omega/8V \quad (1) \text{ finding the current through } 8\Omega \text{ resistor}$$

$$= 1A$$

$$\text{Current passing through } N = 4A - 1A = 3A$$

$$R = V/I = 8V/3A = 2.67\Omega \quad (1) \text{ answer}$$

- c. Heating magnet until it is red hot and then placing it pointing in the E – W direction **(1)** **OR**

The magnetic domains vibrate **(1)** and point in different direction **(1)**.

- b. -Upright
 -virtual (any two, 1 mark each)
 -magnified

- c. When the temperature increases the density of air decreases **(1)** and hence the speed of sound increases **(1)**.

6. a. It states that force applied to an object is directly proportional to the product of mass and its acceleration **(1)**

b. $f = ma$



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$$a = f/m$$

$$= 2N/3kg \quad (1)$$

$$= 8m/s^2 \quad (1)$$

i. this is the rate of change of displacement.

ii. $W = \theta/t$

$$= 180 \times 2$$

$$= 6 \text{ rad/s}$$

Or $= 18.84 \text{ rad/s}$

7. a. Transverse waves

b. Wave X can pass through a vacuum while wave Y cannot pass through a vacuum.

Wave X produces crests and troughs while wave Y produces compressions and rarefactions.

The disturbance of wave X are perpendicular to the direction of travel while the disturbances of wave Y are parallel to the direction of travel. **(Any two, 1 mark each)**

c. Depth = $\frac{1}{2} \times \text{speed of sound} \times \text{time taken}$ **(1) formula**

$$= \frac{1}{2} \times 3000 \text{ m/s} \times 5 \text{ s} \quad (1)$$

$$= 7,500 \text{ m} \quad (1)$$

8. a. It is the product of force and perpendicular distance in the line of action of the force.

b. Moment = force $\times$ perpendicular distance **(1)**

$$= 600 \text{ N} \times 0.25 \text{ m} \quad (1)$$

$$= 150 \text{ Nm} \quad (1)$$

c. i. The force constant of the spring increases **(1)**

ii. $F = ke \quad (1)$

$$= 1500 \text{ N/m} \times 0.2 \text{ m} \quad (1)$$

$$= 300 \text{ N} \quad (1)$$

9. a. i. 4 **(1)**

ii. Because there are 4 pulleys. **(1)**

b. Workdone = Force $\times$ distance **(1)**

$$= 150 \text{ N} \times 10 \text{ m} \quad (1)$$

$$= 1500 \text{ J}$$

c.

$$\text{Efficiency} = \frac{MA}{VR} \times 100\% \quad (1)$$

$$\text{Efficiency} = \frac{4}{6} \times 100\% \quad (1)$$

$$= 66.67\% \quad (1)$$

10. a. - it causes objects to crush.

- it enables one to drink a liquid



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-It causes a coin to be difficult to lift up when a drop water is under it

-It causes a cardboard to stick to an inverted glass tumbler containing water.

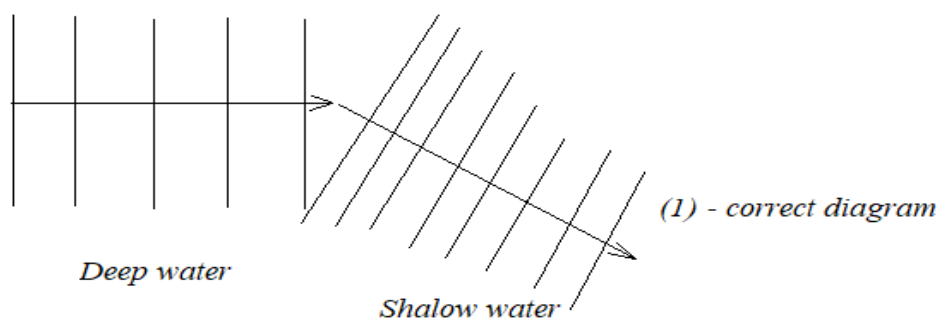
(Any two, 1 mark each)

- b. When the atmospheric pressure is high, the air pushes the mercury down in the container and rises in a tube to a certain height.⁽¹⁾ The height of the mercury in the narrow tube correspond to the value of the atmosphere pressure. ⁽¹⁾
- c. Through the use expansion joints ⁽¹⁾/gaps/sliding bearings allowing for movement ⁽¹⁾ and preventing structural damage.

SECTION B (30 marks)

11. a. -Place a card on top of a plastic cup.(1)
-put a coin at the entre of the card. (1)
-Slide the card quickly (1)
-Observe the results (1)
If the coin falls into the cup instead of following the card, then the coin resisted the motion (inertia). (1)
- b. The gas bulb is placed in the environment whose temperature is to be measured. (1)
When the temperature rises (1), the pressure of the gas increases the volume of the gas through expansion. (1) The gas pushes mercury down and the move higher (rises) (1) in the longer column. The height difference which is between the mercury levels give the pressure of the gas in the bulb at the temperature of the environment.(1)
12. a. When the temperature of an insulator increases, the electrons in the valency band (non-conducting) get heated (1) and become excited (1). They fail to jump through the forbidden gap (1) because it is very wide (1) hence there are no delocalized electrons in the conduction band. (1)

b.



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When the water waves travel from a deeper region to shallow region the velocity decreases (1) as the depth decreases (1) hence the wave bends (1) and the wave changes its direction towards the normal to the shore. (1)

13. a. *During the positive half-cycle of the AC input, one of the diodes in full wave-rectifier becomes forward biased, allowing current to flow through the load (1). Simultaneously, the other diode in the circuit becomes reverse –biased and does not conduct (1)*
During the negative half –cycle, the roles of the diodes switch; the previously reverse biased diode becomes forward-biased and vice versa (1)
As a result, current continues to flow in the same direction through the load during both halves of the AbC cycle (1).
This configuration produces a more continuous DC output, effectively doubling the frequency of the pulsating waveform (1).
- b. *Initially, when the object is dropped, it accelerates (1) under the influence of gravity. As the speed of an object increases (1), air resistance also increases (1) and the point is reached where weight of the object is equal to upward force (1). At this point, an object moves at a constant velocity called terminal velocity and there is no further acceleration for the object (1).*

