

END OF TERM I 2023

S.2 PHYSICS ASSESSMENT

Time allowed: 1 hour 30 minutes

X
60

Instruction: Answer all questions in this paper

1. (a) Jerry has bought an irregular plot of land, he wishes to know the area of his plot of land, explain what Jerry can do in order to determine area of his plot of land. (4marks)

- Divide the plot of land into small square units and determine the area of each square unit.
- Count the total number of full square units, and also determine the total area of all full square units.
- Count the total number of half square units.
∴ Area of the plot = total area of full + number of half squares

$A = N + N/2$

- (b) The Head teacher instructed the school Carpenter to make a notice board of dimensions **1.5m** by **0.5m**. If each notice is written on a Piece of dimensions **21cm** by **30 cm**, what is the maximum number of notices that can be put on the notice board at any one time. (4marks)

- Area of the notice board = $L \times W = (1.5 \times 0.5) = 0.75 \text{ m}^2$
- Area of a piece of notice = $L \times W = (21 \times 30) = 630 \text{ cm}^2$
 $= \frac{630}{10000} = 0.063 \text{ m}^2$
number of notices = $\frac{\text{Area of the notice board}}{\text{Area of a piece of notice}}$
 $= \frac{0.75}{0.063} = 11.9$

The maximum number of notices is 11.9 notices

2. (a) Nathan wishes to obtain the **external diameter of water pipe**, **length of the football pitch**, **diameter of the wire**, and **height of his friend**.

As a physics learner who have learnt about measurements, help Nathan to identify which measuring instruments, he can use to measure the above lengths accurately.

- i) external diameter of water pipe: Vernier caliper (4marks)
ii) length of the football pitch: Tape measure
iii) Diameter of the wire: Micrometer screw gauge
iv) Height of his friend: Tape measure

@1mark

- (b) Suggest a reason why it is not advisable to take only one measurement of the diameter of a wire. (1 mark)

To minimise error since the average value is more accurate.

- (c) A counter book of 384 pages is bound with sheets of paper, each of thickness 0.2mm, and two hard covers of thickness 0.6mm. What is the thickness of the book in meters? (4 marks)

number of sheets of paper = $\frac{384}{2} = 192$ sheets of paper

Total thickness of sheets = $(192 \times 0.2) = 38.4 \text{ mm}$

Thickness of two cover = $(0.6 \times 2) = 1.2 \text{ mm}$

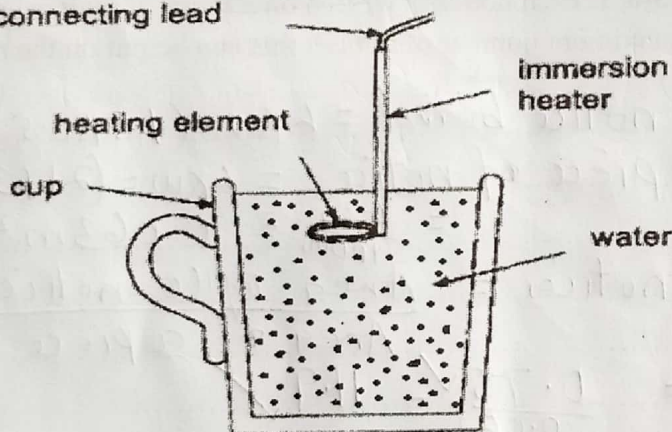
Total thickness of book = $38.4 + 1.2 = 39.6 \text{ mm} = \frac{39.6}{1000} = 0.0396 \text{ m}$

- (d) A log of wood has more mass than a copper coin, but it does not sink in water. Explain why. (2 marks)

The mass of log and coin does not determine its density. A log has more volume hence less dense while coin has less volume hence more dense.

3. (a) The figure below shows an electric heater being used to heat up water in a cup.

connecting lead



- (i) With the heating element in the position shown above, the water at the bottom remains cold even after sometime. Explain why this is so. (2 marks)

Convection currents cannot be set up effectively, and water is a poor conductor of heat.

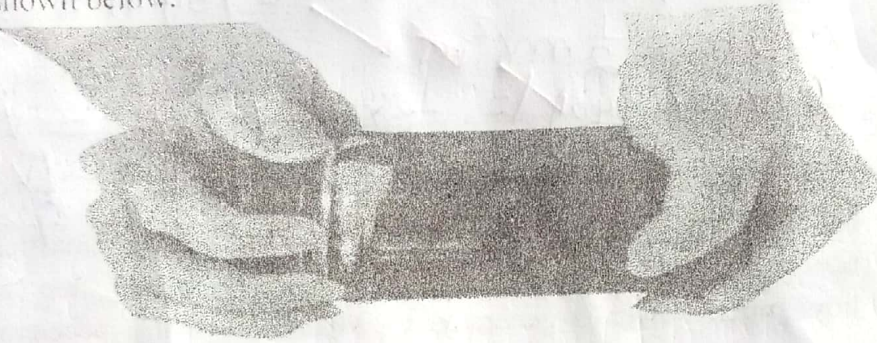
- (ii) The heating element is now placed at the bottom of the cup. Describe how all the water in the cup is heated with the heating element in its new position. (3 marks)

When the water at the bottom gets heated up, the water expands and becomes less dense and rises. The water at the upper part being denser sinks, and convection currents are formed to heat up all the water molecules.

- (iii) Suggest a way to reduce heat loss to the surrounding by the hot water. (2marks)
- Explain your answer.

✓ - Place a cover on the ~~top~~ cup to ~~any~~ one
reduce heat loss by Convection ~~or~~
✓ ~~or~~ - Include Insulating material around the cup
to reduce heat loss by Conduction ✓.

(b) It is common to unsuccessfully open a tight metal lid on a glass jar as shown below:



Using the knowledge of expansion, explain briefly how you would open the lid with ease. (1 mark) (2 marks)

Tight metal lid should be heated ✓
So that it expands ✓ and become loose (2)

4. (a) The pictures in the figure below showing kids playing on a slide with the help of their father Mr. John. Study it and answer the questions that follow



- (i) Sarah is climbing the ladder. How do you think her potential is changing? (1 mark)

Potential energy of Sarah is
Increasing ✓ as she climbs the ladder. (1)

- (i) Comment on the potential energies of Jovia and peter. (1mark)

Potential energy of Jovia is higher than the potential energy of Peter. Since Jovia is at a higher height than Peter.

- (ii) Calculate the Sarah's speed as she will be reaching the ground if she is at a height of 340cm. (4mark)

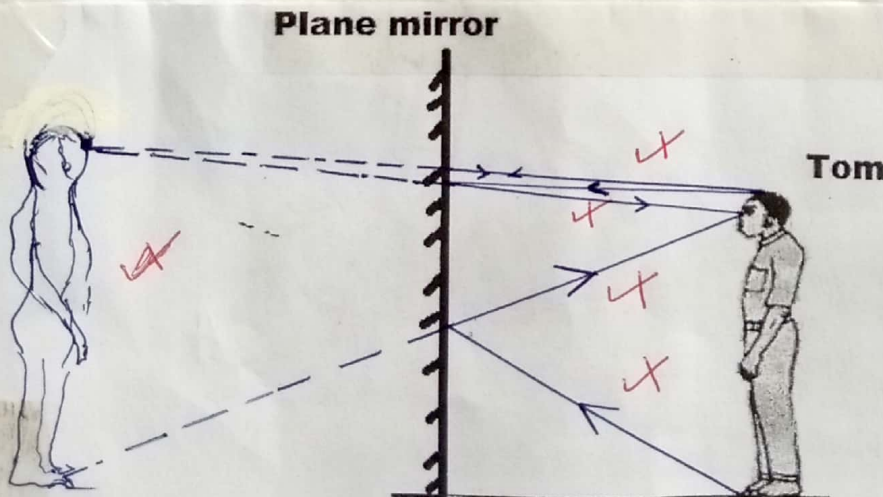
Loss in P.E = Gain in K.E
 $mgh = \frac{1}{2}mv^2$
 $m \times 10 \times \left(\frac{340}{100}\right) = \frac{1}{2} \times m \times v^2$
 $68 = \frac{1}{2}v^2$
 $136 = v^2$
 $v = 11.66 \text{ m/s}$
 Sarah's speed is 11.66 m/s

- (b) Mike has a mass of 58kg, and he is practicing gymnastics. He takes 6seconds to climb a flight of stairs of 36 steps. If each step is 12cm high, how much power is generated by Mike? Given that acceleration due to gravity $g = 10 \text{ m/s}^2$. (3mark)

Power = $\frac{\text{Work done}}{\text{time taken}}$
 distance = $(36 \times \frac{12}{100}) = 4.32 \text{ m}$
 Force $F = mg = (58 \times 10) = 580 \text{ N}$
 Power = $\frac{F \times d}{t} = \frac{580 \times 4.32}{6} = 420.5 \text{ W}$

5. (a) Tom stood in front of a plane mirror as shown in the figure below.

- (i) Draw a ray diagram to show how he may see his image in the mirror. (2marks)

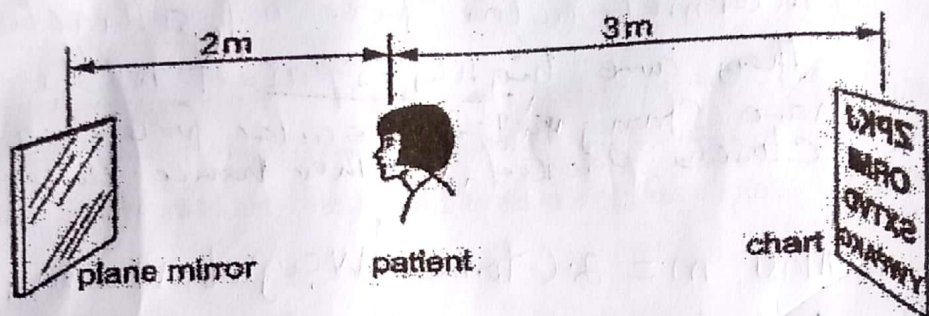


(ii) Identify the characteristics of image of Tom formed on the mirror.

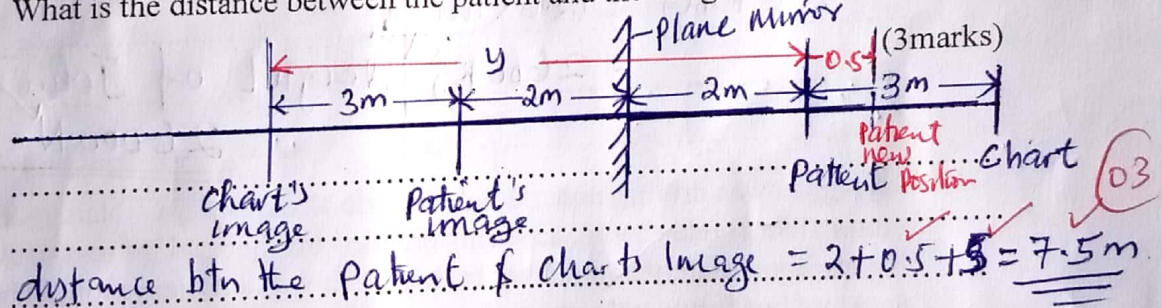
(3marks)

- The Image is Virtual ✓ formed behind the mirror. (03)
- Laterally inverted ✓
- The Image is upright ✓
- Object distance is the same as image distance to the mirror. (Any three @ 1 mark.)

(b) The diagram below shows a patient having her eyes tested. A chart with letters on it is placed behind her and she sees the chart reflected in a plane mirror. The patient is told to move 0.5m away from the plane mirror.



What is the distance between the patient and the image of the chart now?



6. (a) Kinetic theory of matter state that 'matter consists of tiny invisible particles in the state of continuous random motion'. A teacher instructed S.2 students to come up with every day examples demonstrating the existence of particles in matter. Keith, a S.2 students presented his example before the whole class. His presentation was 'when someone closes him or herself in a dark room with a closed windows and doors, and looks into a ray of light penetrating through one small hole in one piece of iron sheet, dust particles were seen moving in a zig- zag pattern' the teacher confirm Keith's findings

(i) explain why the dust particle are seen moving in a zig- zag pattern

Dust particles collides with invisible air molecules (2marks)
 Since they have weak force of attraction and (02)

- (ii) State and explain what would be observed within the ray of light when the temperature of the room gets hotter. (2marks)

The molecules gain kinetic energy, and move faster leading to frequent collisions between molecules themselves and also with the walls. (02)

- (b) During a physics class activity, Madrine realised that it's easier to compress a balloon filled with air than ice cubes. Explain this phenomenon. (2marks)

Air filled in a balloon have weak intermolecular force of attraction, and they are highly spaced while ice cubes have strong intermolecular force of attraction and closely packed together hence easier to compress air. (02)

- (c) John's car has a mass of 2.6 tonnes. What is the weight of his car.

Mass, $m = 2.6 \text{ tonnes}$	Weight, $W = mg$ (2marks)
but $1 \text{ ton} = 1000 \text{ Kg}$	$= (2600 \times 10) = 26000 \text{ N}$
$2.6 \text{ tonnes} = (2.6 \times 1000)$	
$= 2600 \text{ Kg}$	Weight of John's car is
	<u><u>26000 N.</u></u>

7. (a) Agnes was driving under a light drizzle along Naalya – Namugongo road, a motor rider (boda- boda), suddenly skidded off the road in front of Agnes's car. Agnes immediately applied her brakes but it was a useless move. There was an accident but fortunately enough, no one sustained injuries.

- (i) What was the problem between the tyre of Agnes's car and the road surface? (1mark)

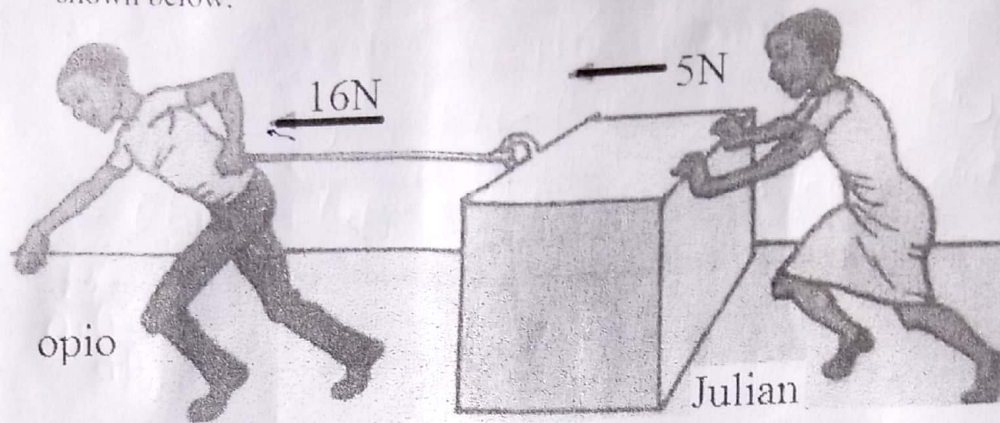
There was little friction between the car tyres and the road surface. (02)

- (ii) Considering the above scenario, how is friction useful. (3marks)

- Friction is useful in stopping moving objects
- Helps in lighting match box
- Friction is used while riding, walking, writing, feeling. (03)

Any three @ 1mark

- (c). Opio is pulling a box using a rope while Julian is pushing using the box as shown below.



If Opio is exerting **16N** and Julian is exerting **5N**, Find the value of frictional force experienced between the box and the ground, if the resultant force is **14N**. (3marks)

$$\begin{array}{l}
 \begin{array}{c} 16N \leftarrow \\ \leftarrow 5N \end{array} \quad \boxed{} \quad \rightarrow F \\
 \Rightarrow (16+5) - F = 14 \quad \checkmark \\
 21 - F = 14 \quad \checkmark \\
 -F = 14 - 21 \quad \checkmark \\
 -F = -7 \quad \checkmark \\
 \underline{F = 7N} \quad \checkmark \quad \text{END} \\
 \text{units correct unit}
 \end{array}$$

The frictional force experienced between the box and the ground is 7N

03