

AGHS PHYSICS WORKSHOP

2018

three categories of questions in physics

- *statement questions*
- *calculations questions*
- *diagrammatical answering*

Statement questions

They are explain, list state, questions.

Avoid contradicting answers, e.g. virtual and real, enlarged and diminished, or answer that negates an earlier answer

List three characteristics of images formed by a convex mirror

upright ✓
virtual ✗
real ✗

upright ✓
virtual ✓

upright ✓
virtual ✗
Diminished
formed behind the
Real

- *Listing should start with answers that one is very sure of. Still check on contradictions.*
- *Check for questions that have two in one questions and answer them*
- *If possible, avoid numbering the answers.*

List two characteristics of images formed by a convex mirror

upright ✓

enlarged ✓

Virtual ✓

(i) Upright ✓
ii Virtual ✓

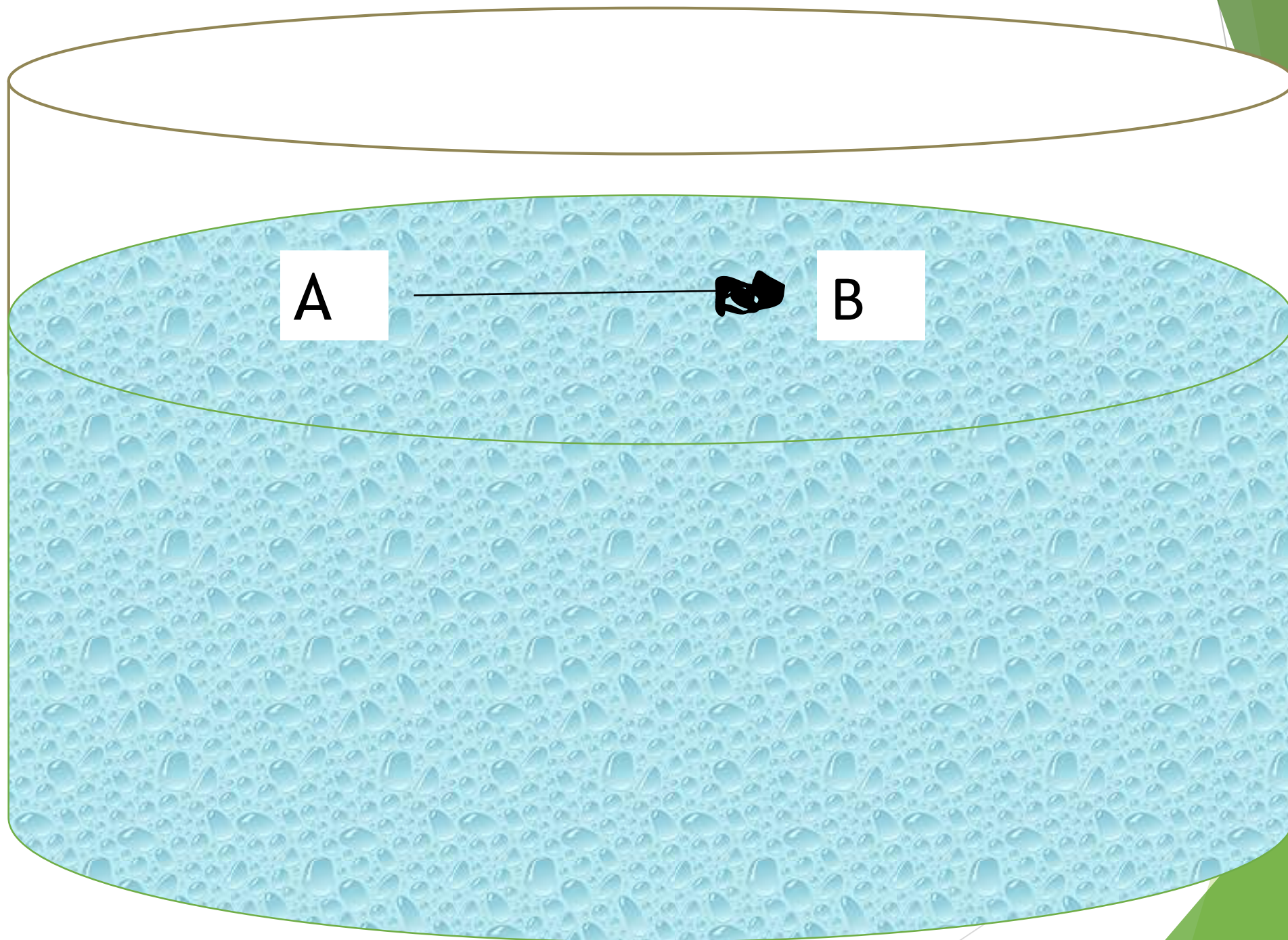
(ii) enlarged ✓

upright ✓
Virtual ✓

enlarged ✓

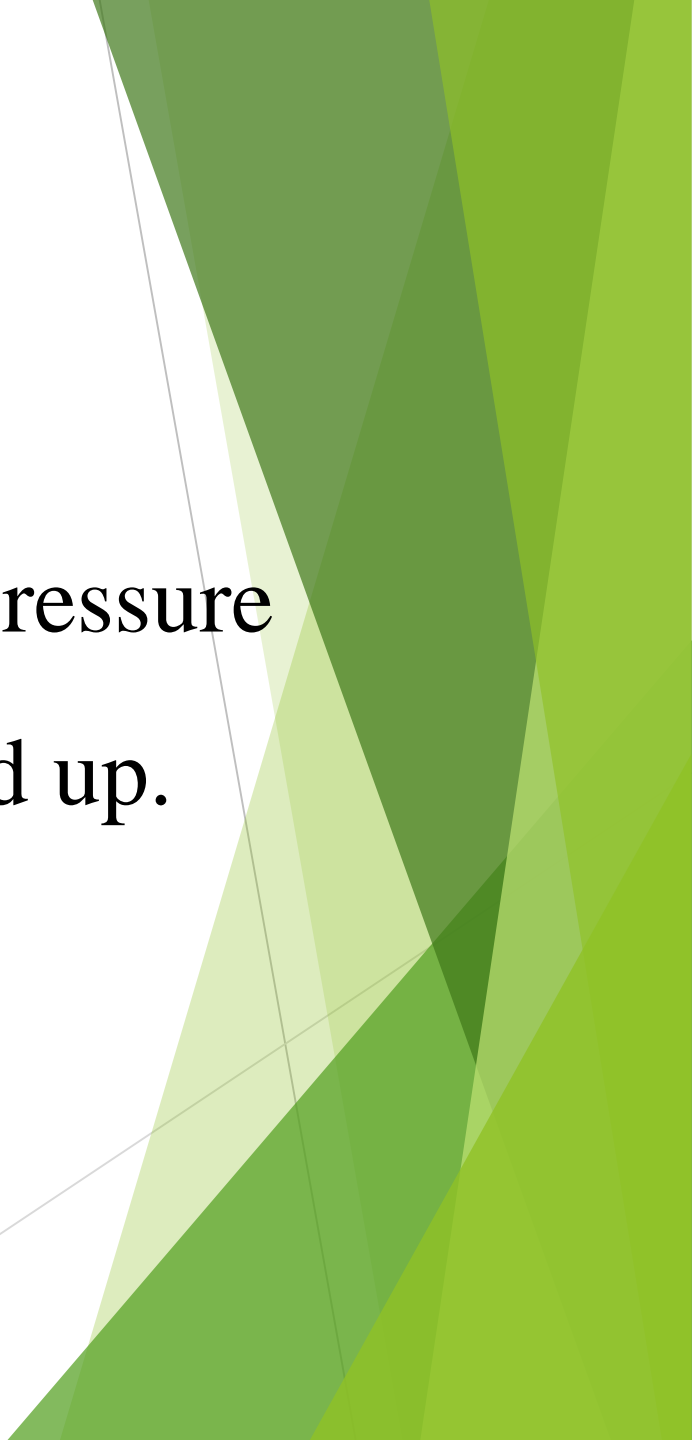
Comparative language should always be used in physics. Words like more, greater, least, reduced, increased, further should be used.

e.g. A matchstick AB was floated on the surface of still water in basin. A student touched end of the water at B with a detergent. State and explain the observation that was made. (2 marks)



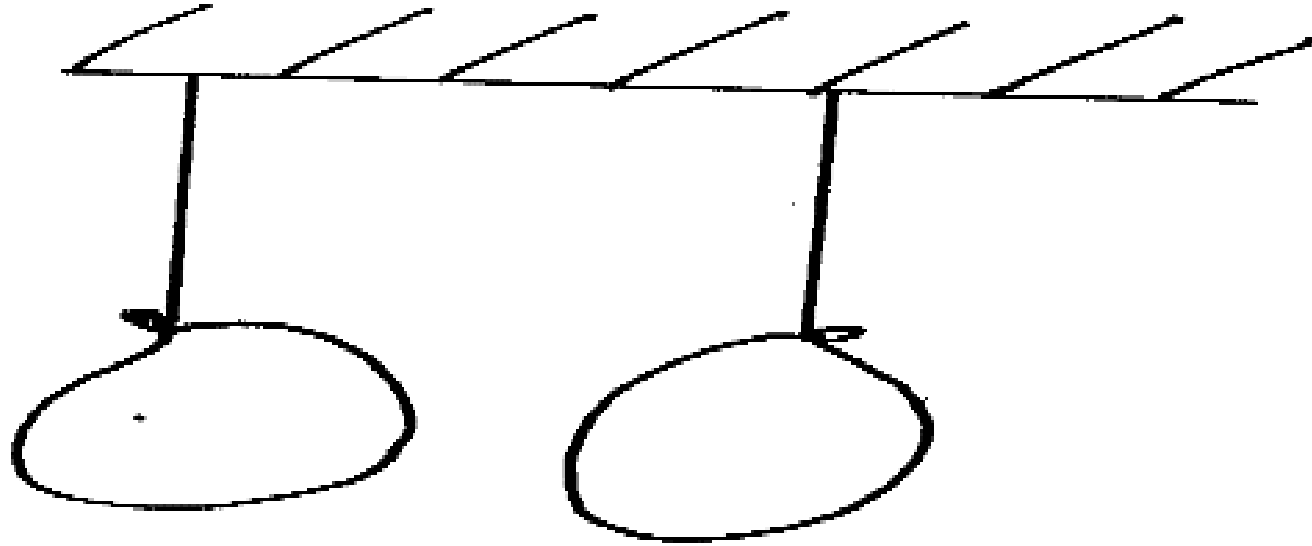
e.g. .A gas is enclosed in a glass container and the container is heated. Explain why the pressure of the gas increases. (3 mark)

answer: the molecules of gas particles gain more kinetic energy, or increase the speed. There is increased rate of collision between the molecules and the walls of the container. The rate of change in momentum of the gas molecules increase and this increases the pressure.



Using the idea of particles, explain why the pressure inside the tyre is increased when it is pumped up.

Figure 5 shows two inflated balloons hanging vertically on light threads.



When a stream of air is blown in the space between the balloons, they are observed to move towards each other. Explain this observation. (1mk)

Avoid answers that change physics principles, e.g. *explain why a bus carrying standing passengers is likely to overturn.*

One feels cold when stepping barefooted on a cemented floor than on a wooden floor. Explain.

Likely answer: cement is a good conductor of heat, so it absorbs heat from the foot than the wooden floor which is a poor conductor of heat.

Explain what would happen to the stability of a burning dripleless candle.

Likely answer: the centre of gravity reduce, hence it becomes stable

Explain why the level of the liquid in a thermometer first goes down before starting to rise on heating.

The likely answer: the bulb expands, increasing in volume, so the level goes down. The mercury then expands and rises up.

Correct answer: the bulb expands **first**. The mercury then expands **more than** the bulb.

Similar question pp1 2017 Q4

Observation

The level of the water in the glass tube falls slightly at first and then starts rising.

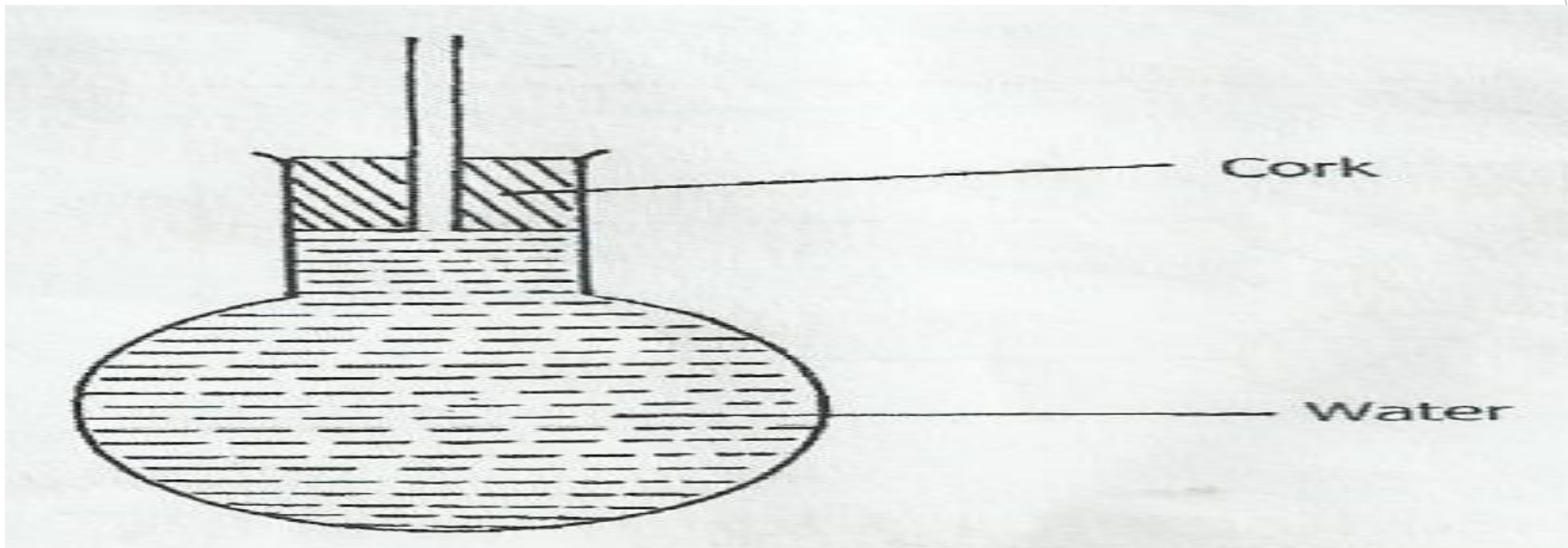
Explanation

The initial fall of the level of the water is due to the expansion of the glass flask which gets heated first. The water starts expanding when the heat finally reaches it, and it rises up the tube.

Note:

The water expands faster than glass.

When the flask is placed in iced water the level on water rose and then fell. Explain this observation. (1 mark)



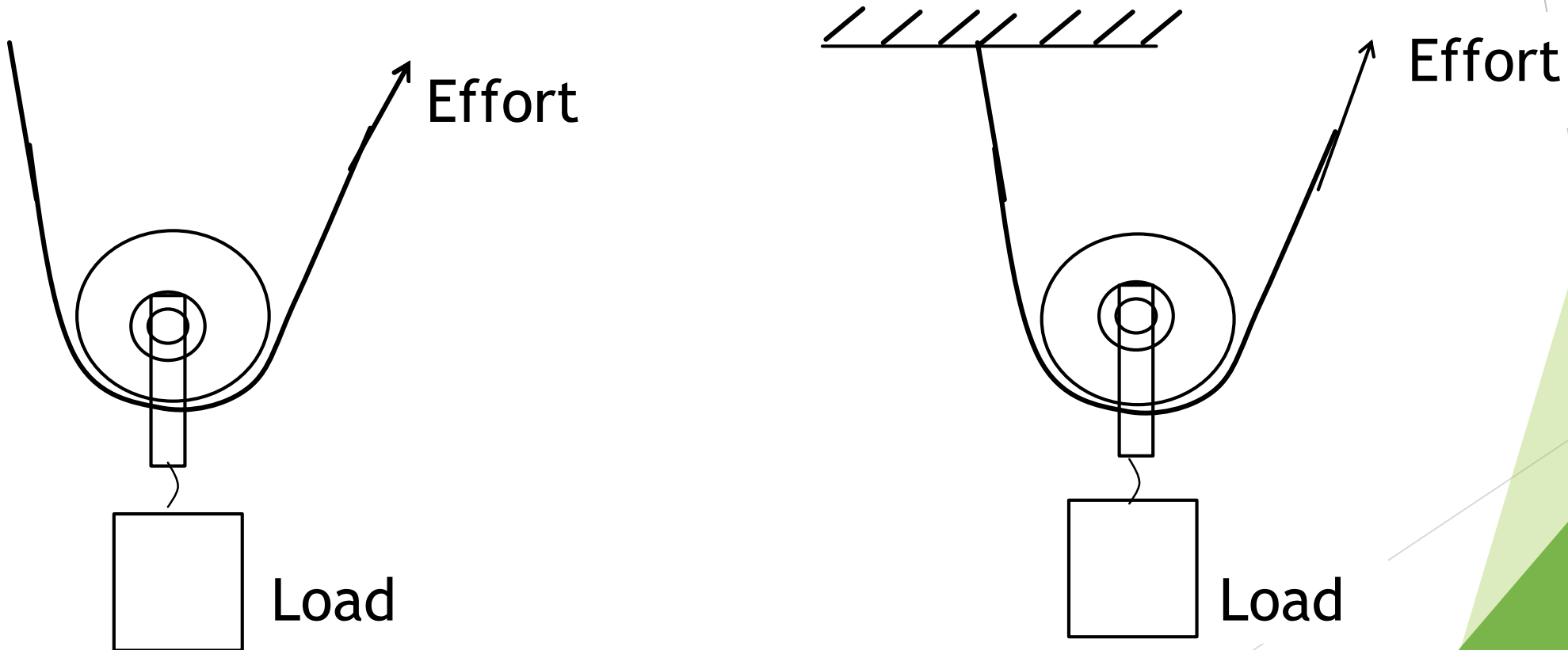
Grammatical error should not change the meaning of the statement



Laws and principles should always be stated as they are.

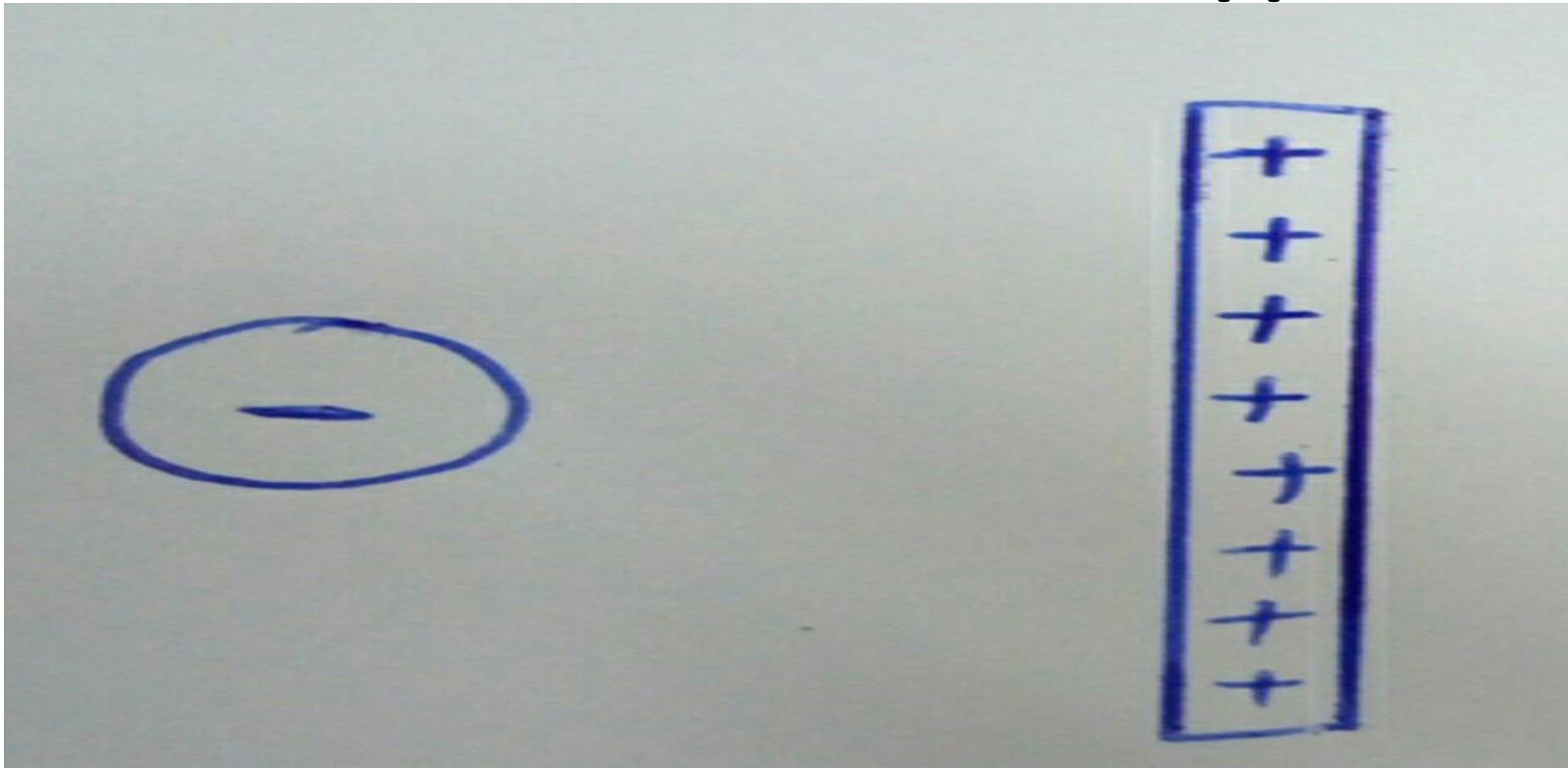
NB: in the law of floatation and Archimedes, fluid is used and not liquid or water.

- Workable (can be used) e.g. draw a diagram to show how a single pulley may be used to obtain a mechanical advantage of 2



1. magnetic field and electric field

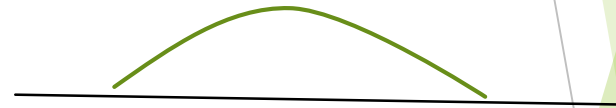
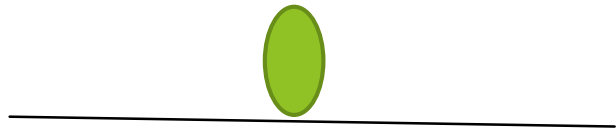
- Must have direction .draw the resulting electric field pattern. Must have direction. **2012 pp2 no 4**



NB. Sketch various magnetic fields across a soft iron ring, copper ring, u shape soft iron.

The figure below shows water drops on two surfaces. In a) the glass surface is smeared with wax while in b) the glass surface is clean

Explain the difference in the shapes of the drop



Answer

Cohesive forces between water molecules a) is greater than adhesive forces between molecules of wax molecules while in b) adhesive forces of water and glass molecules is greater than the cohesive forces between water molecules.

Calculation questions

♠ All working must be shown, no matter how simple they might appear to be.

In an experiment to determine the density of a liquid, the following readings were made.

Mass of empty density bottle = 20g

Mass of bottle filled with water = 70g

Mass of bottle filled with a liquid = 695g

Find the

- i. The volume of the bottle. (1 mk)
- ii. density of the liquid, given that density of water is 1000kgm^{-3} .
- iii. Find the mass of the liquid.

Similar question pp1 2017 Q2

♠ Formula with the right symbols should be used.

♠ $\rho = \frac{m}{v}$ and not $D = \frac{m}{v}$

♠ *proper substitution of the formular should be used
with correct units*

A formula is an equation and not an expression, e.g.

$$u^2 + 2as \quad \neq$$

$$\frac{MA}{VR} \times 100\% \quad \neq$$

$$\frac{\text{Power output}}{\text{power input}} \times 100\% \quad \neq$$

$$E = \frac{MA}{VR} \times 100\%$$

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- ✚ A boy on a bicycle accelerated uniformly at 1m/s^2 for 10 seconds from an initial velocity of 4m/s . Calculate the distance travelled in this time. (3 Marks)

Handwritten solution on lined paper:

$$a = 1\text{m/s}^2$$
$$t = 10\text{s}$$
$$u = 4$$
$$s = ut + \frac{1}{2}at^2 \quad \checkmark$$
$$s = 4(10) + \frac{1}{2}(1)(10^2) \quad \checkmark$$
$$40 + 50 = 90\text{m} \quad \checkmark$$

- A rubber tube is inflated to pressure of 2.7×10^5 pa and volume 3800cm^3 determine the new volume when the pressure is 2.5×10^5 pa.

The image shows a handwritten solution on lined paper, divided into two columns by a vertical line. The left column shows a direct application of Boyle's Law, and the right column shows the same problem using the combined gas law with the assumption of constant temperature.

Left column:

$$P_1 V_1 = P_2 V_2 \checkmark$$
$$2.7 \times 10^5 \times 3800 = 2.5 \times 10^5 V_2 \checkmark$$
$$V_2 = 4104 \text{ cm}^3 \checkmark$$

Right column:

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \checkmark$$

but $T_1 = T_2$ } \checkmark

calculation \checkmark

answer \checkmark

1. A bullet moving at a velocity of 300m/s hits a tree trunk of diameter 50cm. It emerges from the opposite side with a velocity of 150m/s. Determine the average deceleration of the bullet in the trunk. **(K.C.S.E 2001, P1)** (3 mks)

$$v^2 = u^2 + 2as \quad \checkmark$$

$$150^2 = 300^2 + 2a(0.5) \quad \checkmark$$

$$150^2 - 300^2 = a$$

$$a = -67500 \text{ m/s}^2 \quad \checkmark$$

$$150^2 = 300^2 + 2a(0.5) \quad \checkmark \quad \checkmark$$

$$150^2 - 300^2 = a$$

$$a = -67500 \text{ m/s}^2 \quad \checkmark$$

$$u^2 + 2as \quad \checkmark$$

$$150^2 = 300^2 + 2a(0.5) \quad \checkmark$$

$$a = -67500 \text{ m/s}^2 \quad \checkmark$$

Calculate the volume of 4.5kg of oil that has a density 0.8gcm^{-3} . (3 mks)

$$V = \frac{m}{\rho} \quad \textcircled{3}$$

$$V = \frac{4.5}{800}$$

$$= 0.00563\text{m}^3$$

$$v = \frac{m}{D}$$

$$v = \frac{4.5}{800}$$

$$= 0.00563\text{m}^3$$

$$V = \frac{4.5}{800}$$

$$= 0.00563\text{m}^3$$

Calculate the pressure exerted on the ground by a 20kg box whose area in contact with the ground is 0.35m^2 . (3 mks)

$$P = \frac{F}{A} \quad (3)$$

$$= \frac{200}{0.35}$$

$$571.4 \text{ pa}$$

$$P = \frac{f}{A} \quad (2)$$

$$= \frac{200}{0.35}$$

$$571.4 \text{ pa}$$

$$P = \frac{F}{A} \quad (2)$$

$$\frac{200}{0.35}$$

$$571.4 \text{ N/m}^2$$

$$P = \frac{f}{A} = \frac{200}{0.35}$$

$$= 571.4 \text{ newton per square metre}$$

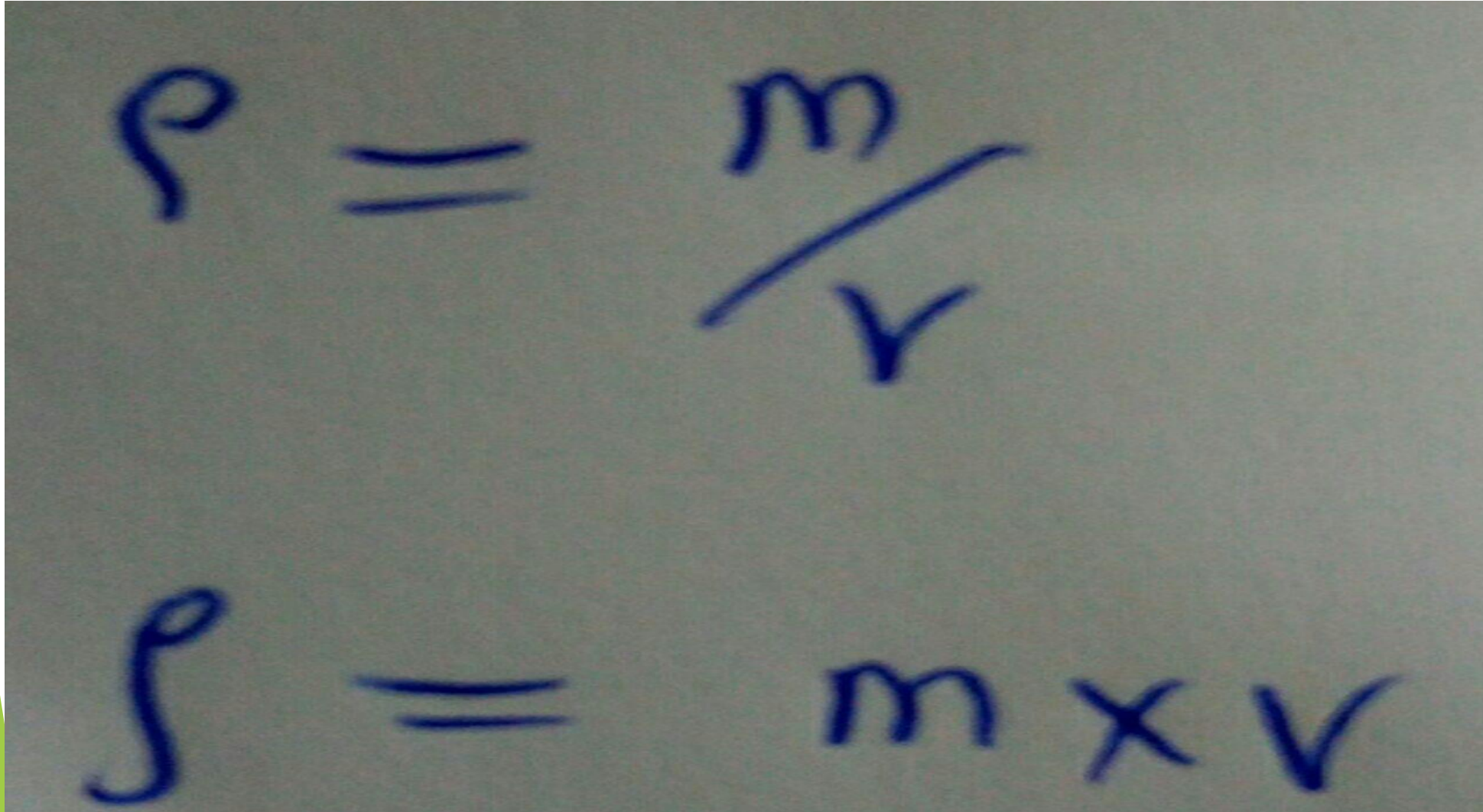
(3)

$$P = \frac{F}{A} = \frac{200}{0.35}$$

$$571.4$$

(2 1/2)

- Use of contradicting formula,
- One lose the formula mark



♠ The answers must have correct units with correct symbols

A unit is not a must if the frame of the questions gives you the unit to use. E.g.
Calculate the pressure exerted on the ground
in N/m^2 .

♠ In case a question asks you to state the unit, it must be written in words. E.g. define the term pressure and state its units.

♠ For a 2 marks question, formula or working is awarded the first mark.

♠ For a question involving two formulae, the formula leading to the final answer is the one awarded the mark. Any other formula is treated as part of the working. E.g. a car accelerates from 2m/s to 8m/s in 3 s. calculate the distance covered during this duration. (3 mks)

$$u = 2$$

$$v = 8$$

$$t = 3$$

$$a = \frac{v - u}{t}$$

$$a = \frac{8 - 2}{3} = 2$$

$$s = ut + \frac{1}{2}at^2$$

$$s = 2(3) + \frac{1}{2}(2)(3)^2$$

$$6 + 9 = 15 \text{ m}$$

♠ Some statements are treated as the formulae and are awarded accordingly, e.g.

- Clockwise moments = anticlockwise moments
- Heat lost=heat gained
- Upthrust =weight of the fluid displaced.
- Weight of the floating object=weight of the fluid displaced.
- Momentum before collision= momentum after collision
- Volume of the oil drop = volume of the oil patch.

A student who wanted to take a bath mixed 4kg of water at 80°C with 6kg of water at 20°C . determine the final temperature of the water. (3 mks

Similar question pp1 2017 Q11

A formulae is only marked once e.g. A block measuring 20cm by 10cm by 4cm rests on a flat surface. The block has a weight of 6N. Determine:

(i) The minimum pressure it exerts on the surface.

(3 marks)

(ii) The maximum pressure it exerts on the surface.

(2 marks)

- ♠ All answers should be to four significant figures unless exact answers, inclusive of standard form answers
 1.846×10^5 can be allowed but 1.85×10^5 is not allowed.

- Avoid premature approximation

♠ Parallel working is penalised

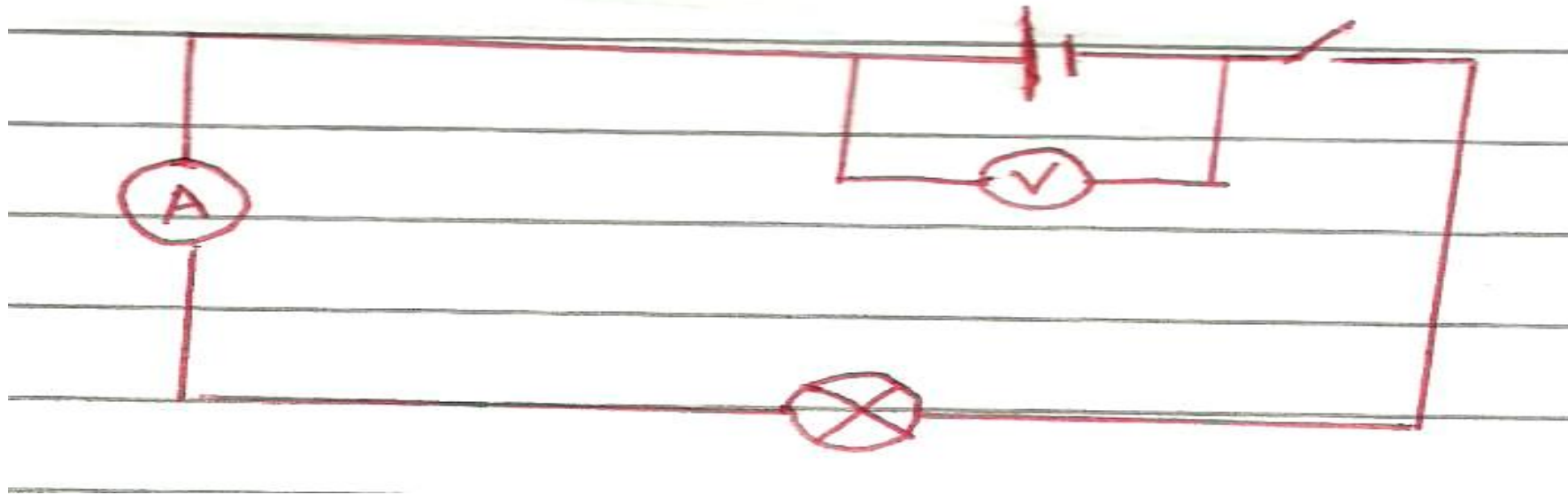
Cancelled work

- Marked accordingly
- If it is cancelled and an alternative given it is not marked
- If you canceled two the first working is marked

♠ In case of cancelling, direct the examiner to the new working which should also be numbered

♠ Transfer of error is allowed provided it is transferred correctly.

In the figure below, the voltmeter reads 2.1v when the switch is open.
When the switch is closed, the voltmeter reads 1.8v and the ammeter reads 0.1A.



Determine :-

i) The e.m.f of the cell

(1mk)

ii) The internal resistance of the cell.

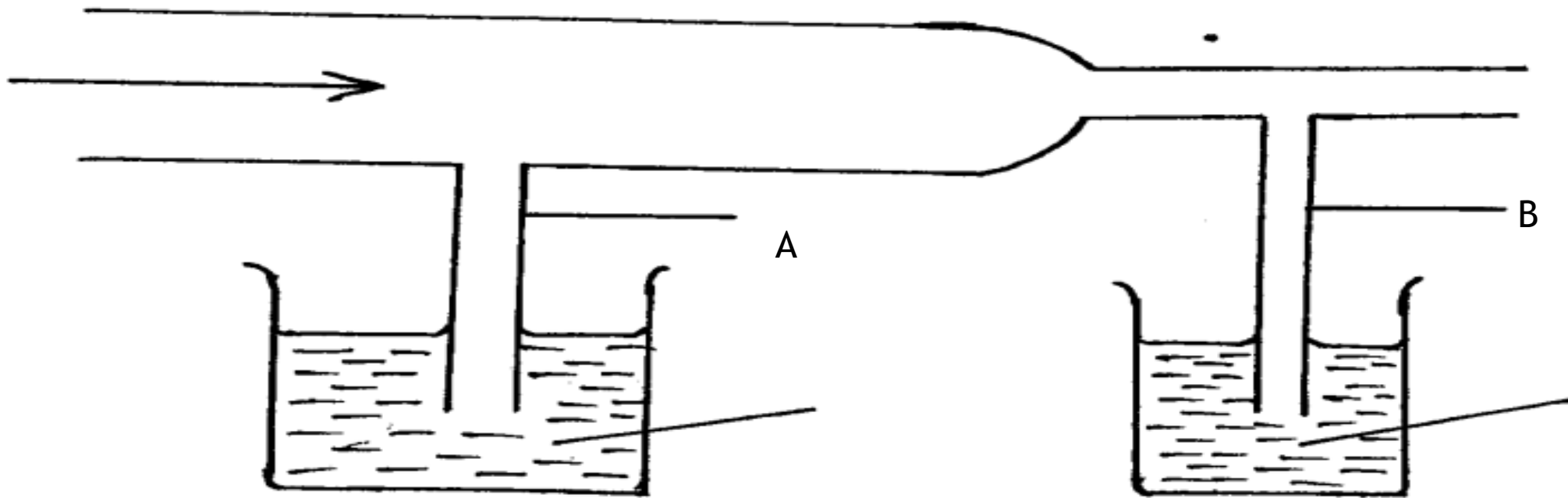
(3mks)

The resistance of the lamp.

Diagrammatical answering

This involves the questions like, show on the diagram, sketch a graph, indicate on the diagram, etc.

The figure 2 shows air flowing through a pipe of non-uniform cross sectional area. Two tubes **A** and **B** are dipped into the liquid as shown.

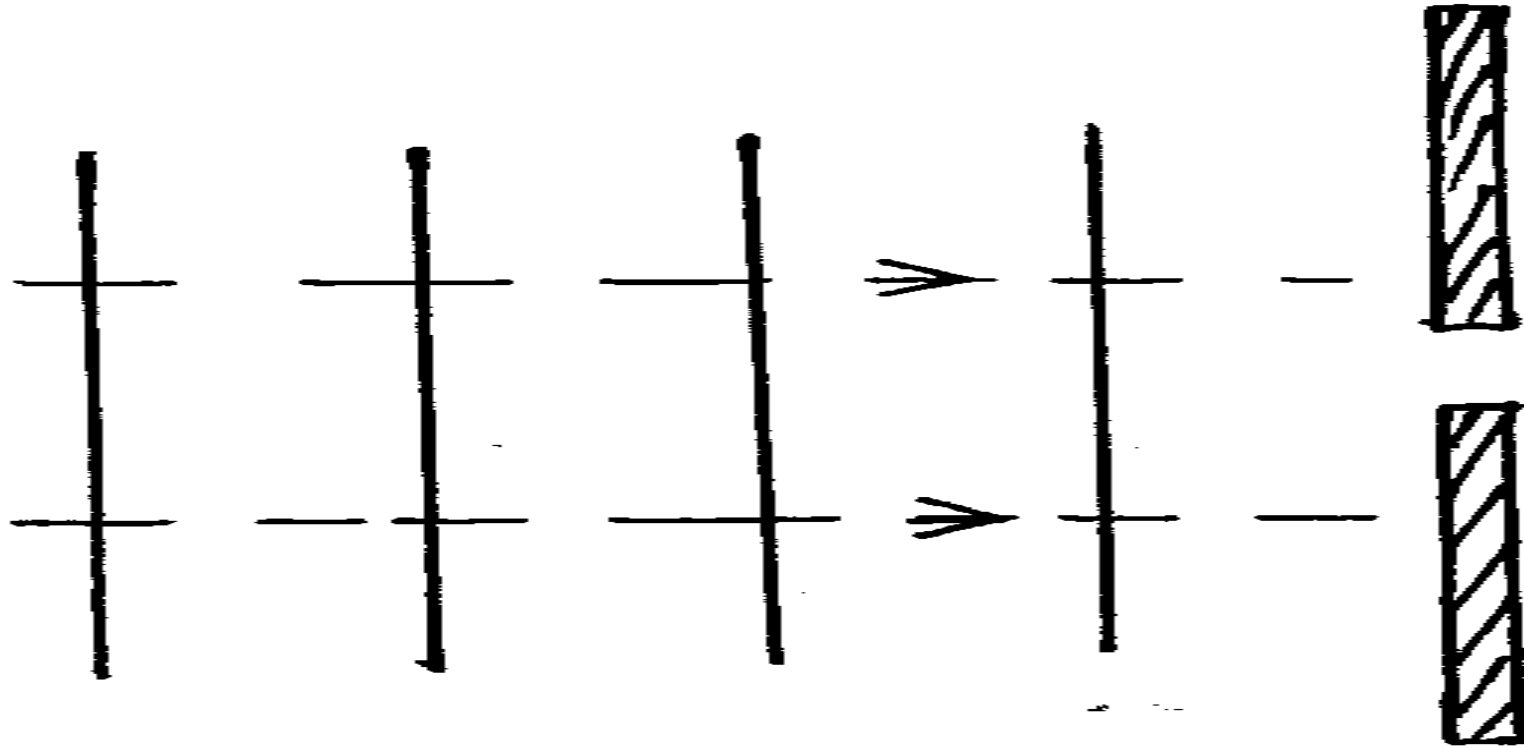


Indicate the level of the liquid in tubes **A** and **B** (1mk)

Showing the level of the liquids in tubes/containers, meniscus must be well drawn.

A small object O is placed 30cm away from diverging lens of focal length 10cm. Determine by scale drawing the position and nature of the image on the grid provided. (3mks)

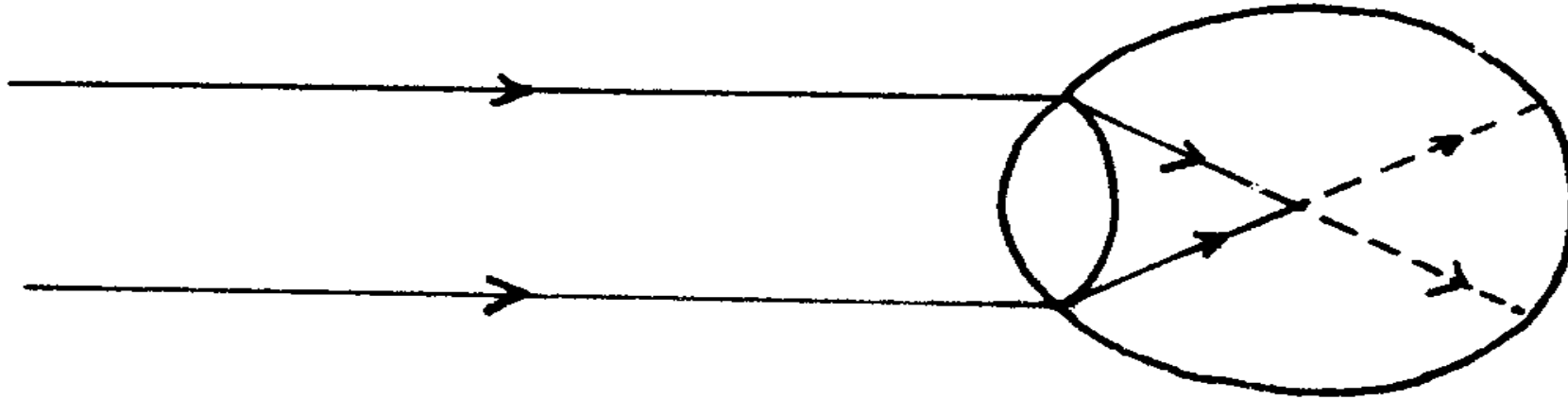
The figure below shows a series of wave fronts one wavelength apart approaching a gap between two barriers in a ripple tank.



Show on the figure what happens as the waves pass the gap.

(1mk)

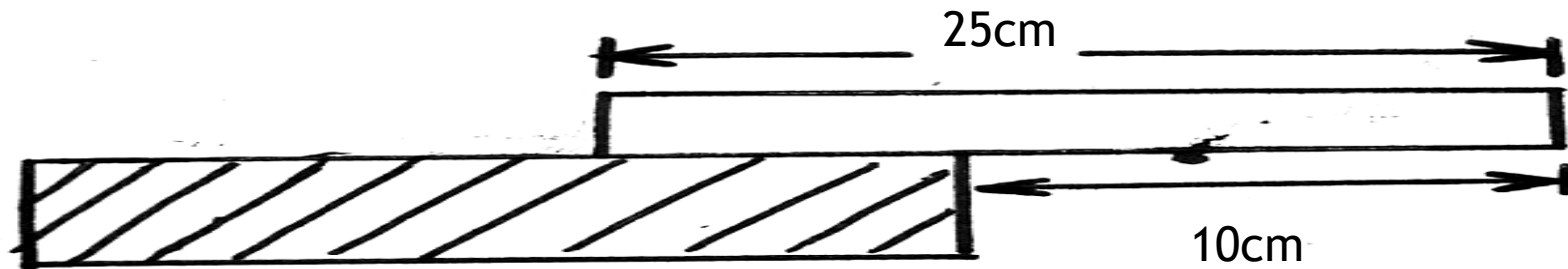
Figure below shows the behaviour of light rays from a distant object falling on the eye.



State the defect shown above (1mk)
On the figure, show how the defect above in part(i) can be corrected. (2mks)

NB: ray diagrams and lines of forces and vector quantities must be drawn by use of a straight edge and arrows. Labelling where necessary should be done. All ray diagrams for real rays must have arrows moving from the object. Virtual rays(disjointed lines) should not have arrows.

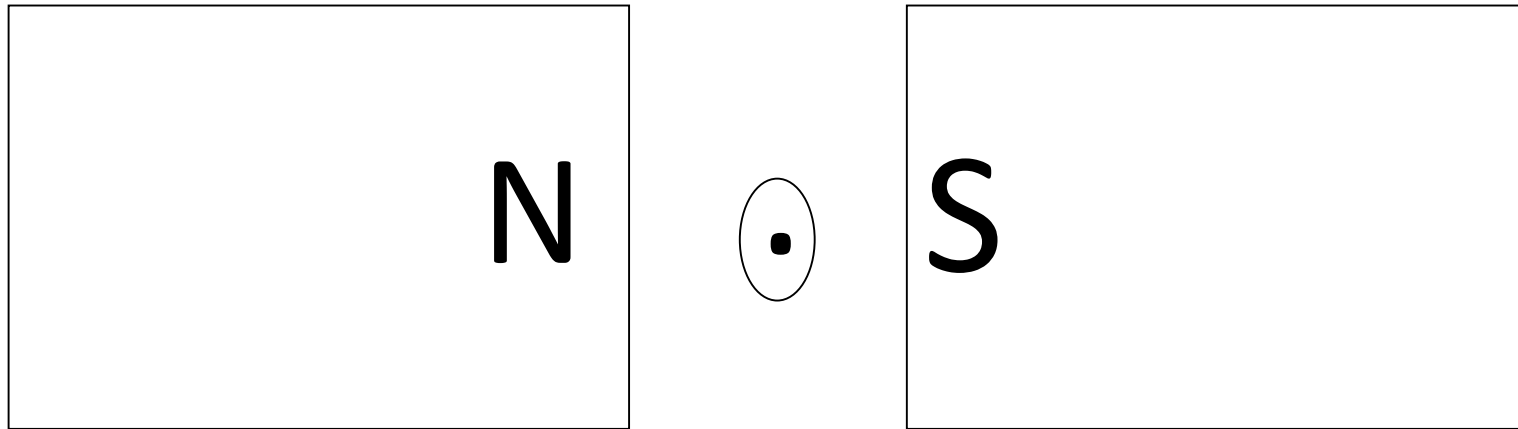
The figure below shows a uniform wooden block of mass 2kg and length 25cm lying on a bench. It hangs over the edge of the bench by 10cm



(a) Indicate on the diagram two forces acting on the wooden block to make it turn about the edge of the bench (1mk)

(b) Determine the minimum force that can be applied on the wooden block to make it turn about the edge of the bench (2mks)

- The diagram below shows a current carrying conductor placed in a magnetic field.



Show on the diagram the direction of force on the conductor
(1mk)

Points to note

The students need to master the following distinctions in the syllabus

-distinguish between

Mass and weight

Heat and temperature

Stable and unstable equilibrium

Streamline and turbulent flow

Real and virtual images

Primary and secondary cells

Soft and hard magnetic materials

Transverse and longitudinal waves

Magnetic And non magnetic materials

Speed and velocity

Soft and hard X-rays

Nuclear fission and fusion

Intrinsics and extrinsic semiconductors

Ohmic and non-ohmic

The element of comparison must be evident

No marks are earned where a candidate talks about only one of the quantities in the comparison no matter how correct

E.g, distinguish between mass and weight

Student: mass is measured in kilograms while weight is not is wrong since element of comparison is not clear.

The common terms to define in physics are as follows

1. Pressure
2. Moment of a force
3. Centre of gravity
4. Capacitance
5. Magnification
6. An electromagnet
7. Work, mechanical advantage, velocity ratio, efficiency
8. Specific heat capacity
9. Specific latent heat of fusion
10. Angular velocity or acceleration
11. Relative density
12. Absolute refractive index
13. Potential difference
14. Focal length or principal focus
15. Half-life
16. Photoelectric effect
17. Threshold frequency
18. Work function
19. Kilowatt hour

Let the students enjoy learning of physics from the foundation.

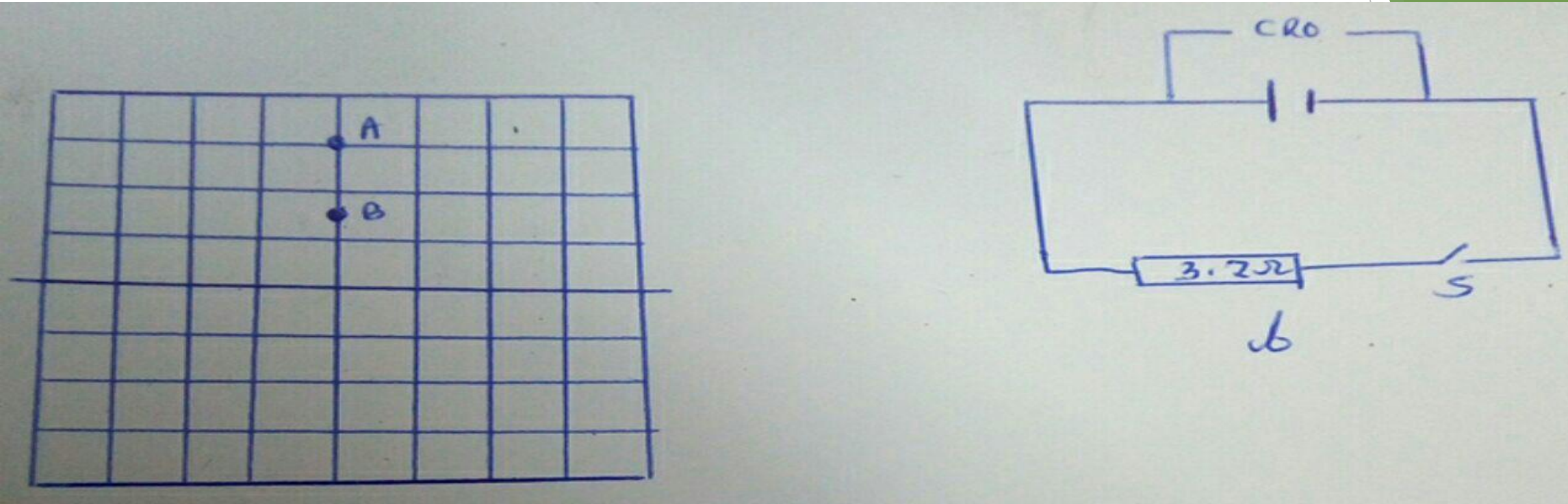
Train the learners to link a question to a topic.

For quick coverage of the syllabus, avoid writing notes on the board, but give hand outs.

Apply transfer of errors in marking if the performance is low during the internal marking

Let testing include all the topics
learnt. Some topics can be linked
in testing

The figure below the screen of a CRO whose y sensitivity was set at 0.5V per centimeter. The y plates were connected to the circuit in (b).



when the switch was open ,the spot moved to point A from the mean position on the screen. When the switch was closed, the spot moved to point B. calculate

The current in the circuit.

The internal resistance of the cell





KENYANS

They will still win, even on their hands

A person in a white hoodie and dark pants is climbing a large sand dune. The dune has distinct ripples and shadows cast across its surface. The sky is clear and blue, with the sun visible in the upper right corner, creating a bright glow.

“I can do all things through
CHRIST
which strengtheneth me.”

—Philippians 4:13

***I AM
VICTORIOUS!***

