

Sec 4 Physics

Exam papers with worked solutions

SET A PAPER 1 QUESTION

Compiled by

THE PHYSICS CAFE

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name and index number on the OTAS in the spaces provided.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers, **A, B, C** and **D**.

Chose the one you consider correct and record your choice in soft pencil on the answer sheet.

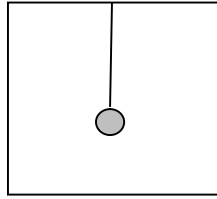
Read the instructions on the OTAS very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

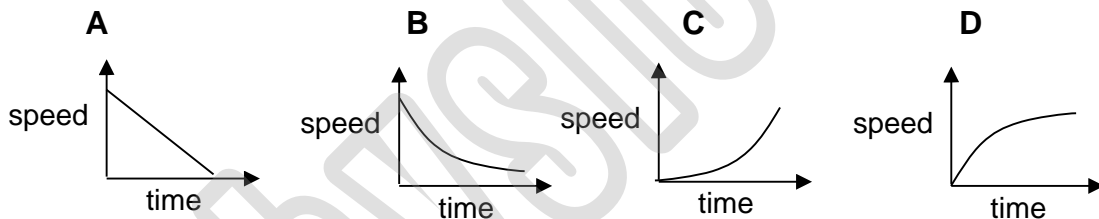
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- 4 The diagram below shows a simple pendulum hung from the ceiling of a stationary LRT train.



If the train starts to move from rest, in a direction to the left, the simple pendulum will be

- A shifted slightly to the left.
 - B shifted slightly to the right.
 - C hanging with the string vertical.
 - D oscillating about the vertical.
- 5 A car accelerates from rest. The acceleration gradually decreases. Which graph shows how the speed of the car changes?



- 6 A rectangular box is made to accelerate along a rough floor by a force of 12 N. When the 12 N force is removed, the box will
- A stop at once.
 - B start slowing down to a stop.
 - C slow down for a while then continue to travel at constant speed.
 - D continue to travel at constant speed for a while and then slows down.
- 7 A 1000 kg mass rests on a horizontal frictionless surface. It is accelerated by a force of 2000 N. Calculate the time taken for the 1000 kg mass to travel 100m.
- A 5 s B 10 s C 20 s D 50 s

- 8 A boy throws a stone from the top of a hill into the water. The path of the ball is shown in the diagram below

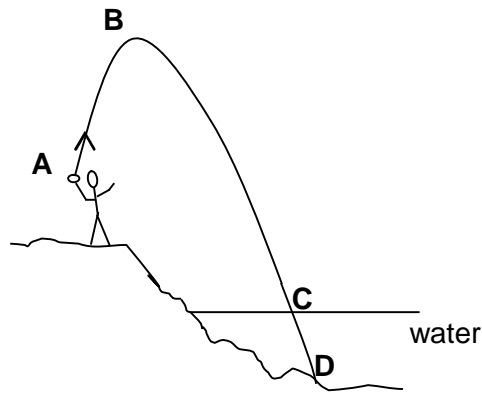
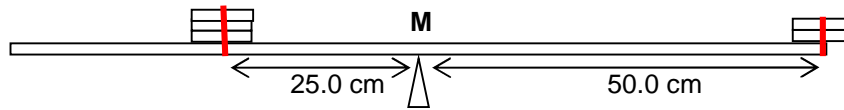


Fig. 8

At which point does the stone have the most kinetic energy?

- 9 What are the energy changes in hydroelectric power production?
- A electrical \rightarrow potential \rightarrow kinetic
 - B electrical \rightarrow kinetic \rightarrow potential
 - C potential \rightarrow kinetic \rightarrow electrical
 - D kinetic \rightarrow potential \rightarrow electrical
- 10 It is estimated that 7 000 kg of water pours over the Niagara Falls every second. If the Falls are 50 m high, and if the energy of the falling water could be harnessed, what is the available power?
- A 3.5 kW
 - B 3.5×10^3 kW
 - C 3.5×10^6 kW
 - D 3.5×10^9 kW

- 11 A uniform metre-rule is supported at its mid point **M**. Three 50-cent coins are attached securely 25.0 cm from the pivot and two 50-cent coins are attached 50.0 cm from the pivot as shown below.



To balance the system, another 50-cent coin must be placed

- A at the extreme left end of the rule.
 - B on top of the set of two coins.
 - C on top of the set of three coins.
 - D at the mid point M.
- 12 The diagram below shows the cross-section of a reservoir dam. The dam is built to enable it to withstand the water pressure.

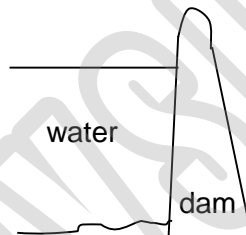
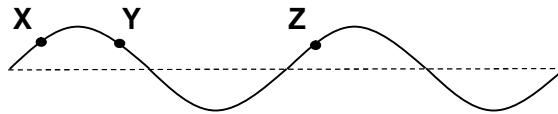


Fig. 12

This pressure depends upon the

- A volume of water in the reservoir.
- B surface area of the water in the reservoir.
- C thickness of the wall of the dam.
- D depth of water at the particular point on the dam.

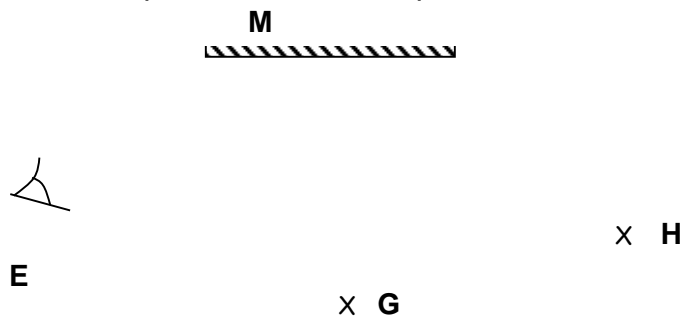
- 13 The diagram below shows an instantaneous position of a string as a transverse progressive wave travels along it from left to right.



Which one of the following correctly shows the directions of the velocities of the points X, Y and Z on the string?

	X	Y	Z
A	→	→	→
B	→	←	→
C	↓	↓	↓
D	↓	↑	↓

- 14 An object is placed 100 m away from a camera. Its image is projected through the camera lens onto the film. The image projected is
- A real, magnified, upright and laterally inverted.
- B real, diminished and inverted.
- C virtual, magnified, upright and laterally inverted.
- D virtual, diminished and inverted.
- 15 Two objects **G** and **H** are placed in front of a plane mirror **M** as shown below.



An observer at **E** looking at the mirror, can see

- A the image of **G** only.
- B the image of **H** only.
- C the images of both **G** and **H**.
- D none of the above.

- 16 The ray **XY** is directed on the surface of a rectangular glass block **PQRS** as shown below.

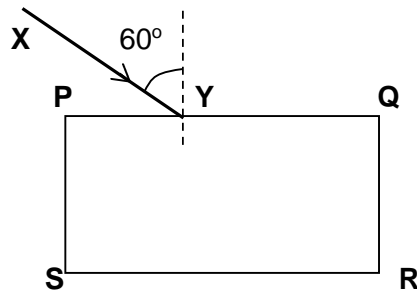
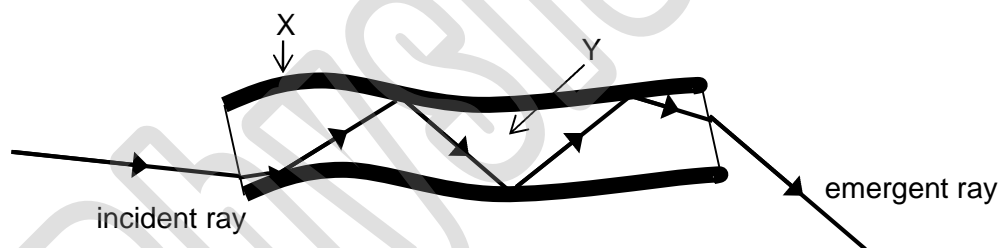


Fig. 16

Which of the following statements is true?

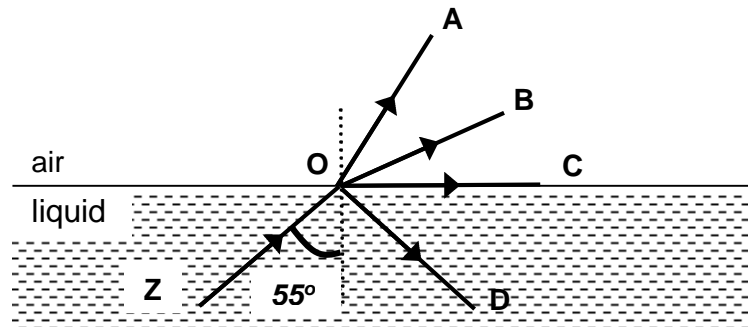
- A The ray is refracted away from the normal in the glass block.
 - B The emergent ray makes an angle of 30° with the normal.
 - C There is a dim reflected ray when **XY** strikes the surface **PQ**.
 - D Total internal reflection occurs as the ray is incident on **PQ**.
- 17 The diagram below shows how light travels through the optical fibre of an endoscope. It is used to look into the stomachs of ulcer patients.



Which of the following statement is **NOT** true?

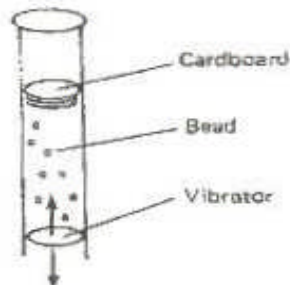
- A No light is lost through the optical fibre.
- B The refractive index of Y is greater than the refractive index of X.
- C The refractive index of X is less than the refractive index of air.
- D The light in the optical fibre obeys the laws of reflection.

- 18 A ray of light **ZO** is incident onto a liquid-air surface as shown below. The refractive index of the liquid is 1.6 Which is the most probable path of the ray after striking the surface at O?



- 19 Which one of the following is true of all components in the electromagnetic spectrum?
- A The magnetic field and electric field oscillate independently.
 - B The speed is constant at 3×10^8 m/s.
 - C The frequency is constant as it changes medium.
 - D The wavelength is constant as it changes medium.
- 20 Which one of the following will **not** alter the pitch of a note played on a guitar?
- A Changing the tension of the string.
 - B Changing the length of the string.
 - C Changing the thickness of the string.
 - D Changing the amplitude of vibration of the string.
- 21 Which one of the following is true about the internal energy of a beaker of boiling water?
- A It is gaining both kinetic energy and potential energy.
 - B It is gaining kinetic energy only, as the molecules move faster.
 - C It is gaining potential energy, as the molecules break bonds.
 - D It is gaining potential energy only, as the molecules move further apart.

- 22 The diagram below shows a 3-dimensional simulation of a gas vibrating in a container. The beads are set in motion by the vibrator and they kept the cardboard afloat



- Which of the following will not increase the pressure in the container?
- A Increasing the number of cardboards.
 - B Increasing the speed of the vibrator.
 - C Increasing the volume of the each bead.
 - D Increasing the number of beads in the container.
- 23 A car radiator is very efficient in removing the heat generated from its engine. Which of the following statement best explains this?
- A A high temperature difference between the engine and air allows a high rate of heat loss.
 - B The car engine is made of metal, which is a good conductor.
 - C The design allows convection current to remove the heat quickly.
 - D The engine water evaporates, removing large amount of latent heat.
- 24 The lengths of mercury thread in the stem of a mercury thermometer are given in three situations

Length in melting ice = 20 mm
Length in steam above boiling water = 170 mm
Length in liquid X = 50 mm

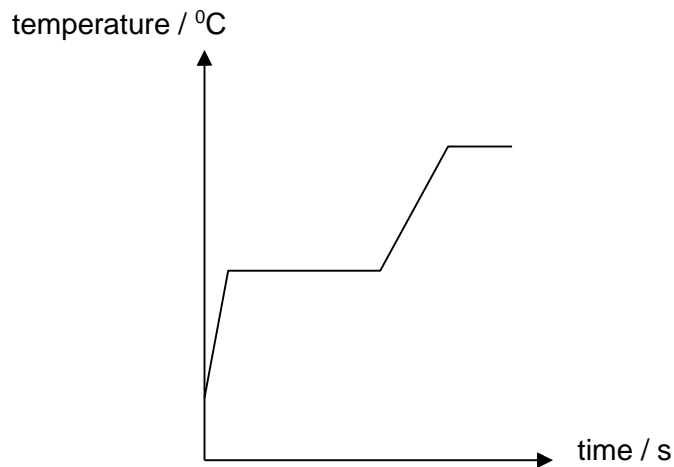
What is the temperature of liquid X?

- A 20 °C
- B 25 °C
- C 30 °C
- D 33 °C

- 25** The property of a type of cooking pot is that when they are removed from the source of heat, the soup may continue to keep warm for a long time.

The explanation for this effect is that the pot

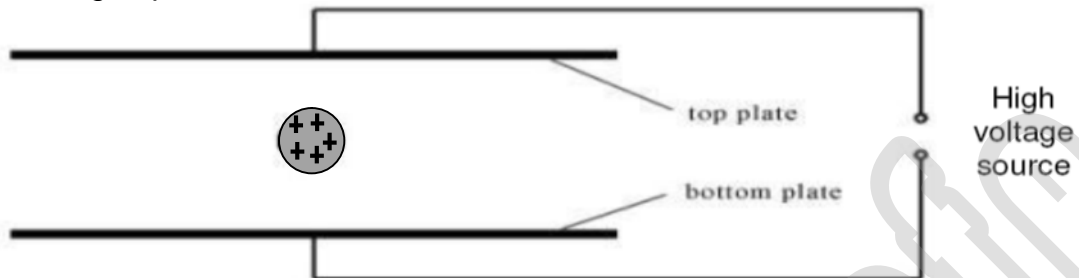
- A** is made of very good conducting material.
 - B** is made of very good insulating material.
 - C** has a very high specific heat capacity.
 - D** has a very low specific heat capacity.
- 26** A pure substance is heated using a constant power supply. It is insulated to minimize heat lost to the surrounding. The temperature - time graph of the substance is plotted and shown below.



Which of the following is true about the substance?

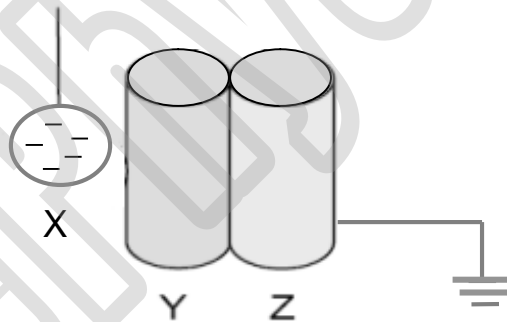
- A** Its latent heat of vaporization is larger than latent heat of fusion.
- B** Its heat capacity is larger than latent heat of fusion.
- C** Its heat capacity in liquid state is lower than that in solid state.
- D** Its heat capacity in liquid state is higher than that in solid state.

- 27 The diagram below shows two conductor plates connected to a high voltage source. A positively charged oil drop with a weight of 0.01 N is placed in between the two charged plates and it stays suspended in the air. What are the charges on the two plates and the electrostatic force acting on the oil drop by the charged plates?



	Top plate	Bottom plate	Electrostatic force
A	Positive	Positive	0 N
B	Positive	Negative	0.01 N up
C	Negative	Negative	0 N
D	Negative	Positive	0.01 N up

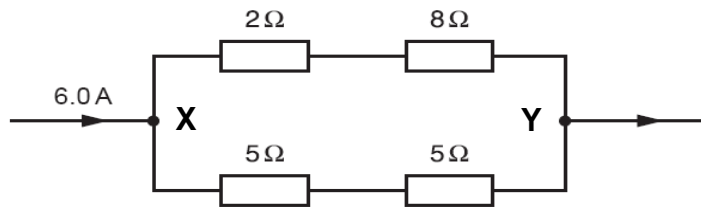
- 28 A negatively charged metal sphere **X** is brought close to two metal rods **Y** and **Z**. **X** is not touching rod **Y**. Rod **Z** is then momentarily earthed.



Which one of the following correctly describes the charge on rod **Y** and **Z**?

- | | Rod Y | Rod Z |
|----------|--------------------|--------------------|
| A | No net charge | No net charge |
| B | No net charge | Negatively charged |
| C | Positively charged | No net charge |
| D | Positively charged | Positively charged |

29 The diagram shows part of an electric circuit.



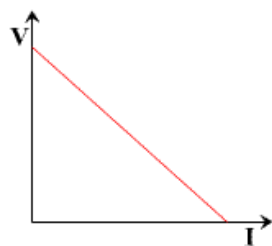
What is the potential difference across points X and Y?

- A** 30 V **B** 60 V **C** 90 V **D** 120 V

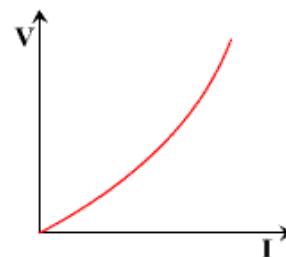
30 A wire of length **L** and area **A** has a resistance of **R**. Which one of the following changes to the wire will double its resistance?

	Area of wire	Length of wire
A	double	double
B	double	no change
C	halve	double
D	halve	no change

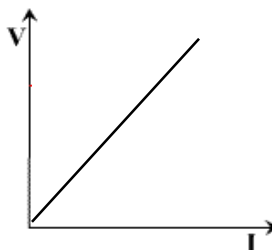
31 The diagrams show the voltage-current graphs for four electrical devices. Which diagram shows that of a lamp?



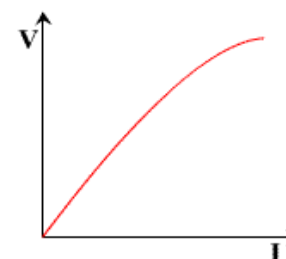
A



B



C



D

- 32 Fig. 32.1 shows the oscilloscope trace produced by an input of 2.0 V at 50 Hz. Fig. 32.2 shows the trace from a new input on the same oscilloscope.

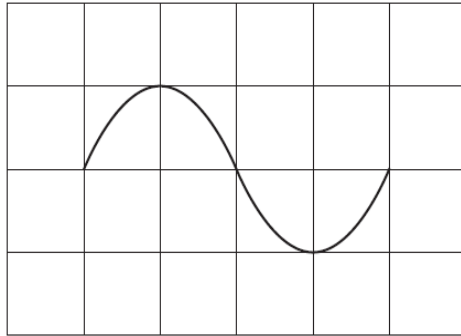


Fig. 32.1

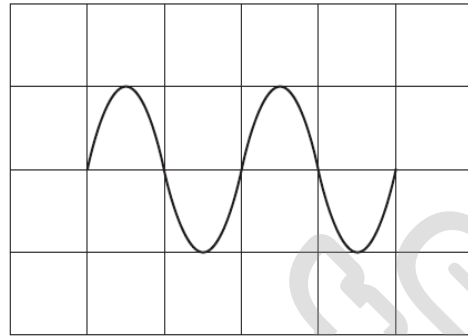
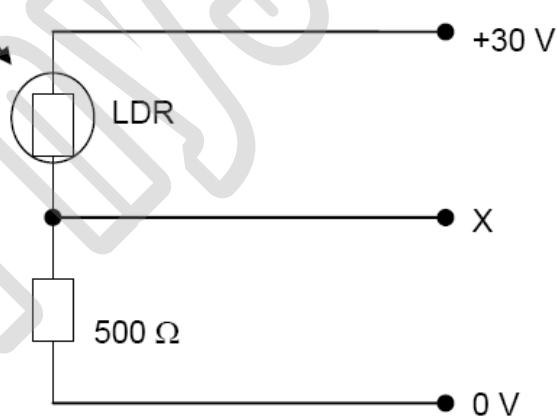


Fig. 32.2

What is the value of the new input?

- A 1.0V at 50 Hz
 - B 2.0V at 100 Hz
 - C 4.0 v at 50 Hz
 - D 4.0 V at 100 Hz
- 33 The light dependent resistor (LDR) and a 500Ω resistor form a potential divider between voltage lines held at +30 V and 0 V as shown in the diagram below.



The resistance of the LDR is 1000Ω in the dark but then drops to 100Ω in bright light. What is the corresponding change in the potential at X?

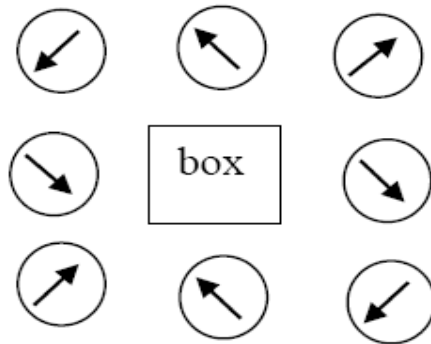
- A A fall of 25 V
- B A fall of 15 V
- C A rise of 10 V
- D A rise of 15 V

- 34 If the cost of 1 kWh of electricity is 80 cents, what is the total cost of operating the following electrical appliances for 3 hours?

Electrical appliance	Rating
Television	135 W
Air-conditioner	2.75 kW
Lamps	100 W

- A \$7.16 B \$12.24 C \$73.40 D \$429.80

- 35 The diagram below shows a box which has a magnet hidden inside it. Compasses are placed around the box and the needles point in the directions shown.



Which diagram shows how the magnet is placed inside the box?

