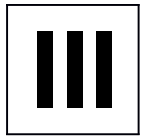


[Science] Physics O Level Exam Paper
Preliminary Examination Set [III]
Secondary Four Express & Five Normal



CANDIDATE NAME:

CLASS:

INDEX NUMBER:

Science(Physics)

5076/01

Paper 1 Multiple Choice

5077/01

2024

30 min

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class and index number on the Answer Sheet 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** or **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet 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.

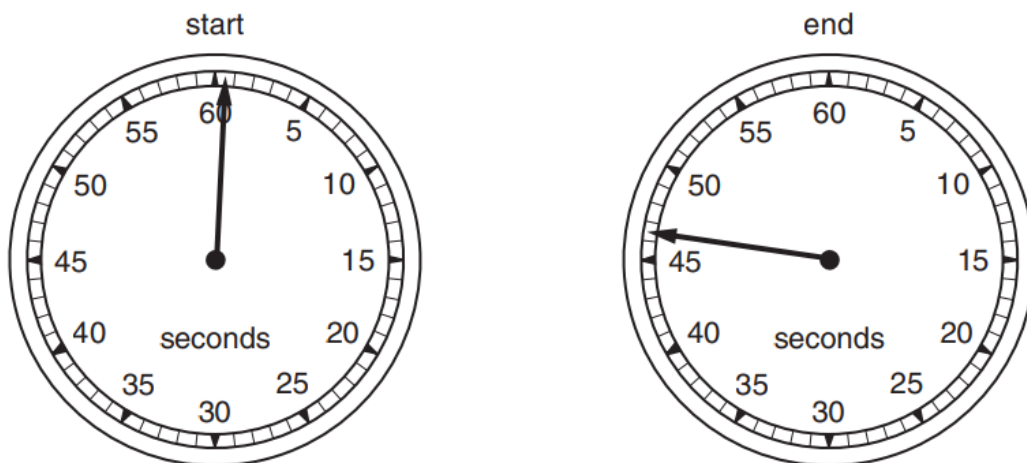
The use of an approved scientific calculator is expected, where appropriate.

- 1 The diameter of an atom is approximately 0.1 nm.

What is the diameter of the atom in SI unit?

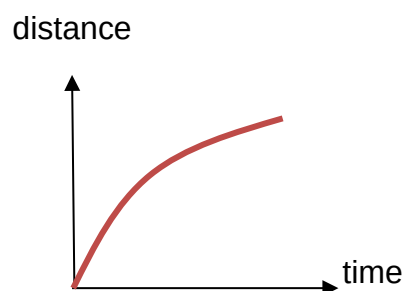
- A** $1 \times 10^8 \text{ cm}$ **B** $1 \times 10^{-7} \text{ cm}$ **C** $1 \times 10^{-9} \text{ m}$ **D** $1 \times 10^{-10} \text{ m}$

- 2 A stopwatch is used to time a race. The diagrams show the watch at the start and at the end of the race.



How long did the race take?

- A** 45.7 s **B** 46.0 s **C** 46.5 s **D** 47.0 s
- 3 The following distance-time graph shows the motion of a car.



What is the motion of the car?

- A** constant acceleration
B constant deceleration
C constant speed
D increasing speed

- 4** A student tries to find the density of a metal block using the following steps.

step 1 - He measures the weight with a spring balance.

step 2 - He measures the sides of the block using a rule to calculate the volume of the block.

step 3 - He divides the weight by the volume to find the density.

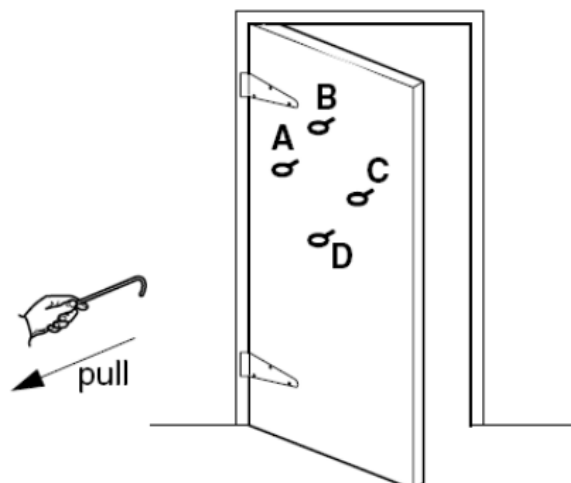
Why does his method not give the density?

- A** Density is volume divided by weight.
 - B** He should have measured the surface area, not the volume.
 - C** He should have used the mass in his calculation, not the weight.
 - D** Weight is not measured with a spring balance.
- 5** A 1 kg toy train is moving on a smooth and horizontal track with a constant speed of 0.5 m/s.

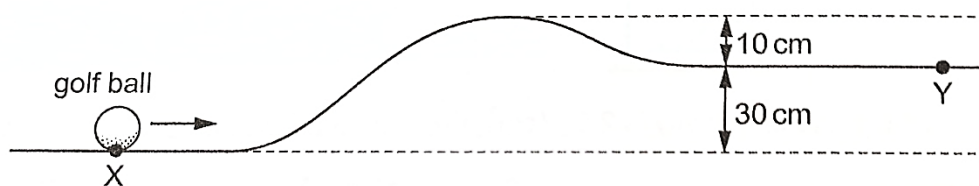
What is the resultant force acting on the toy train?

- A** 0 N
 - B** 0.5 N
 - C** 1.5 N
 - D** 2.0 N
- 6** Four rings are screwed into a door as shown. The door can be opened by putting a hook into one of the rings and pulling it.

Which ring should be used if the pulling force is to be as small as possible?



- 7 A golf ball is travelling horizontally as shown.



What is the minimum speed the golf ball must have at X to enable it to reach point Y?

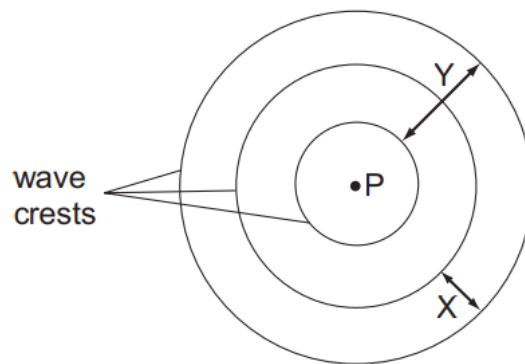
- A** 1.4 m/s **B** 2.4 m/s **C** 2.8 m/s **D** 4.0 m/s
- 8 The diagram represents the molecules of a gas in a closed container of constant volume.



What happens to the molecules when the gas is heated?

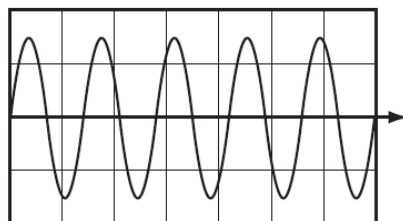
- A** They expand.
B They hit the walls less often.
C They move further apart.
D They move more quickly.
- 9 Which statement describes the application of conduction?
- A** Greenhouse is made of glass.
B Heating element is placed at the bottom of an electric kettle.
C Space blankets has a shiny and smooth surface.
D Thermal wear contains porous materials like wool.

- 10** A vertical stick is dipped up and down in water at P. In two seconds, three wave crests are produced on the surface of the water.

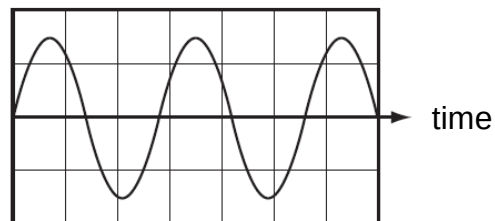


Which statement is true?

- A** Distance X is the amplitude of the waves.
 - B** Distance Y is the wavelength of the waves.
 - C** Each circle represents a wavefront.
 - D** The frequency of the waves is 3 Hz.
- 11** The diagrams show the wave shapes of two different sounds. The scales are the same in each diagram.



sound 1



sound 2

How does sound 2 compare with sound 1?

- A** Sound 2 has a higher pitch than sound 1.
- B** Sound 2 has a lower pitch than sound 1.
- C** Sound 2 is louder than sound 1.
- D** Sound 2 is quieter than sound 1.

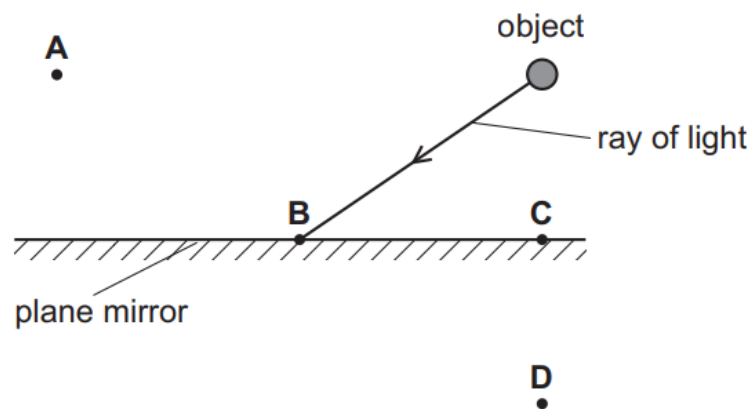
- 12** When sections of a large metal pipe have been welded together, they are checked to discover whether there are any cracks in the joints.

Which component of the electromagnetic spectrum is used for this purpose?

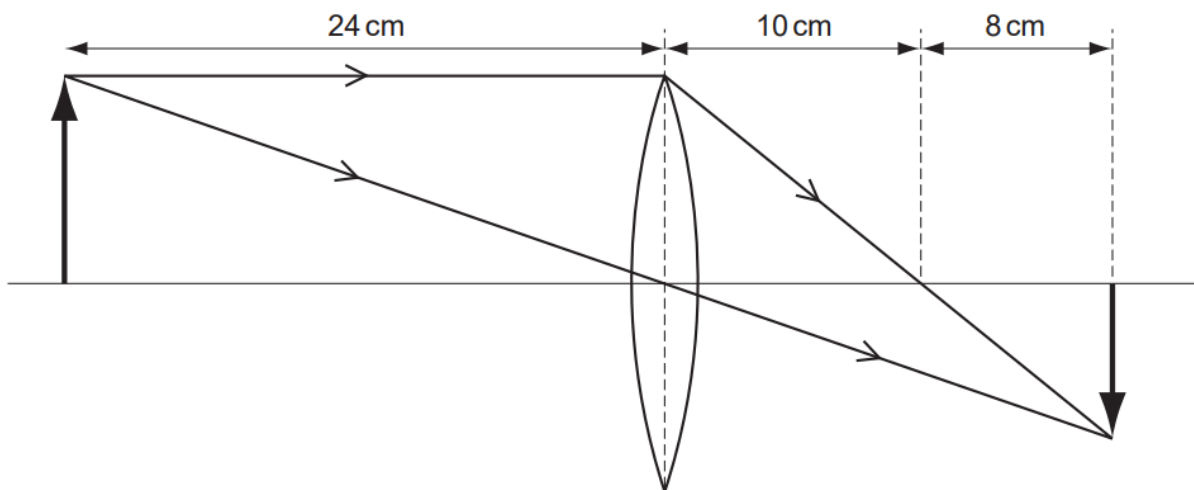
- A** infra-red
- B** radiowaves
- C** microwave
- D** X-ray

- 13** A plane mirror is used to form an image of an object.

At which labelled point is the image formed?



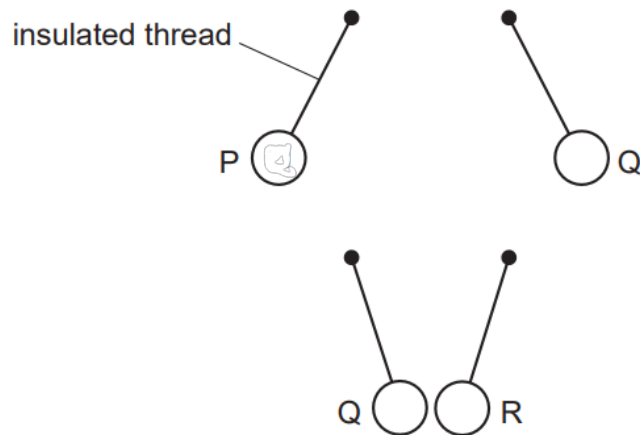
- 14** The ray diagram shows how an image is formed by a converging lens.



What is the focal length of this lens?

- A** 8 cm
- B** 10 cm
- C** 18 cm
- D** 24 cm

- 15** Three charged balls, P, Q and R, are suspended by insulated threads. Ball P is positively charged.

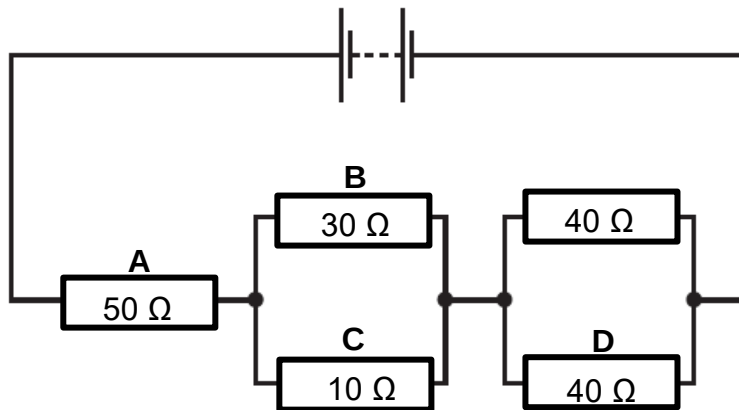


What are the charges on Q and on R?

	Q	R
A	negative	negative
B	negative	positive
C	positive	negative
D	positive	positive

- 16** The diagram shows a circuit containing five resistors connected to a battery.

In which resistor is the current the largest?

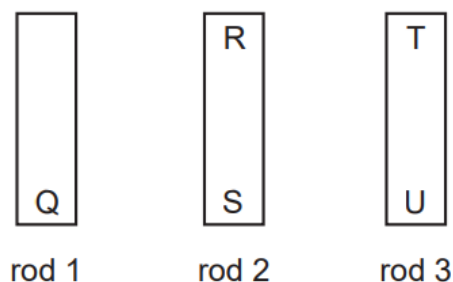


- 17** An electric water heater with power rating of 1.8 kW has a current of 8.0 A flowing in its live wire.

What is the voltage of the neutral wire?

- A** 0 V **B** 4.4 V **C** 14.4 V **D** 225 V

- 18** The ends of three metal rods are tested by holding end Q of rod 1 close to the others in turn.



The results are as follows.

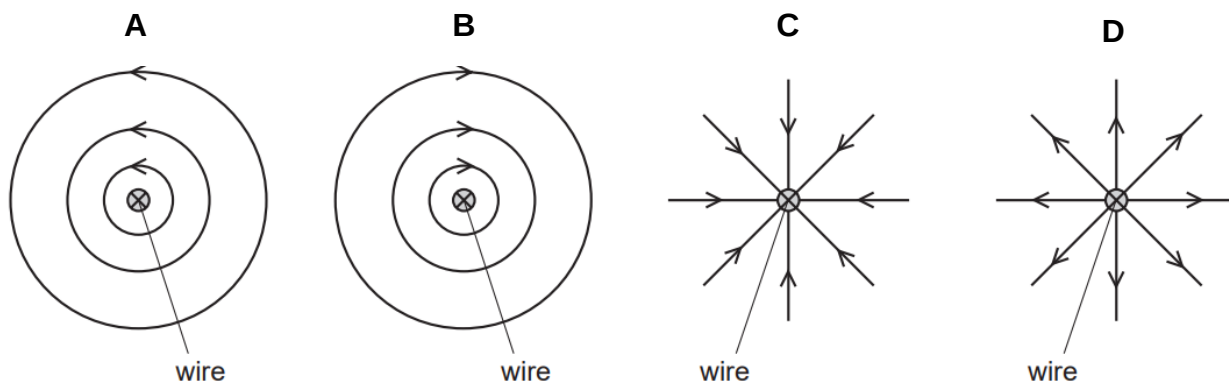
End Q attracts end R, S and T.

End Q repels end U.

Which of the metal rods is a magnet?

- A** rod 1 only
 - B** rod 1 and rod 2 only
 - C** rod 1 and rod 3 only
 - D** rod 3 only
- 19** The diagrams show a straight wire carrying a current into the paper.

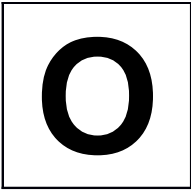
Which diagram shows the magnetic field pattern due to this current?



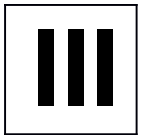
- 20** The half-life of a radioactive substance is 5 hours. A sample is tested and found to contain 0.48 g of the substance.

How much of the substance was present in the sample 20 hours after the sample was tested?

- A** 0.03 g **B** 0.12 g **C** 1.92 g **D** 7.68 g



[Science] Physics O Level Exam Paper
Preliminary Examination Set [III]
Secondary Four Express & Five Normal



CANDIDATE NAME:

CLASS:

INDEX NUMBER:

Science(Physics)

Paper 2 Theory

5076/03

2024

5078/03

1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid/tape.

Section A

Answer **all** questions.

Section B

Answer **all** questions. Question 11 has a choice of parts to answer.

Candidates are reminded that **all** quantitative answers should include appropriate units.
The use of an approved scientific calculator is expected, where appropriate.
Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.

Section A	
Section B	
Total	

Section A

Answer **all** the questions in the spaces provided.

- 1** Fig. 1.1 shows how the speed of a car varies with time. The car is initially travelling at a constant speed.

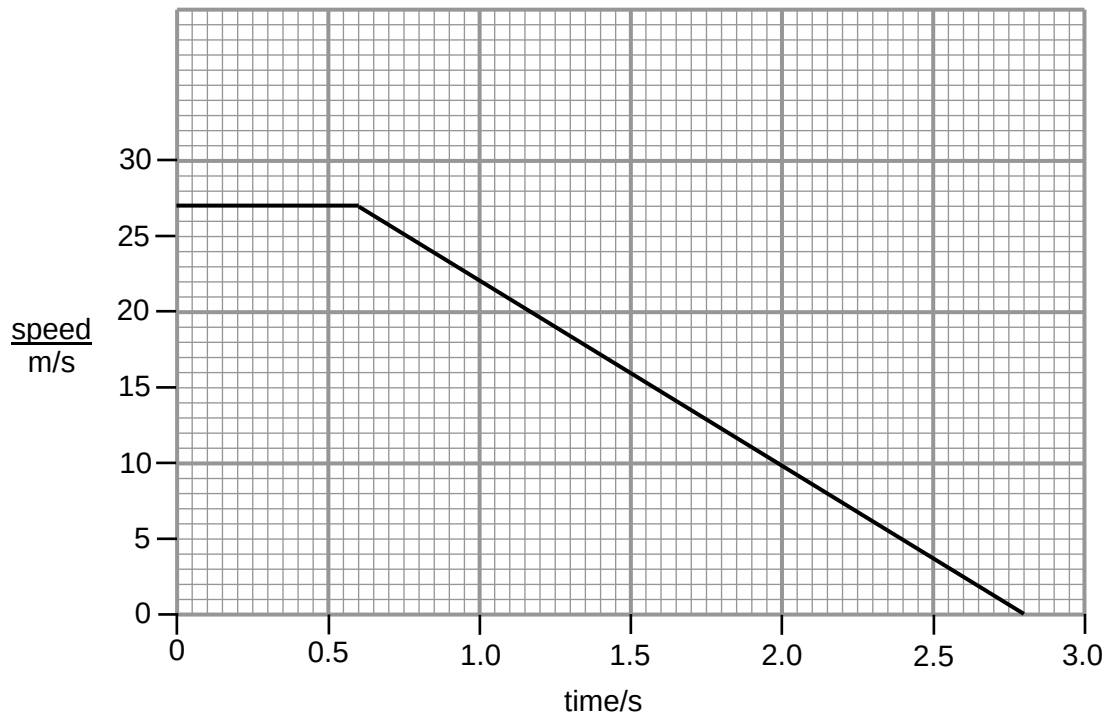


Fig. 1.1

At time = 0 s, the driver sees an obstacle on the road 50 m in front of the car.

He then steps on the brake pedal to bring the car to a stop. From time = 0 s till rest, the car travels in a straight path.

- (a)** Explain why the car continues travelling at constant speed immediately after time = 0 s.

.....

.....

[1]

- (b) Using the graph in Fig. 1.1, determine if the car had collided with the obstacle. Show all calculations in the space provided and state your answer below.

.....
 [2]

- (c) Calculate the deceleration of the car.

deceleration = m/s^2 [2]

- (d) The driver and car have a total mass of 1600 kg.

Calculate the braking force acting on the car while it is decelerating.

braking force = N [2]

- 2 Fig. 2.1 shows a parachutist of mass 80 kg falling vertically downwards. The parachute is not opened yet. The gravitational field strength g is 10 N/kg.



Fig. 2.1

- (a) Calculate the weight of the parachutist.

weight = N [1]

(b) State the name of another force acting on the parachutist.

..... [1]

(c) After falling for some time with the parachute closed, the parachutist reaches a constant speed.

Explain, in terms of forces acting on the parachutist, why the parachutist falls at constant speed.

.....
..... [2]

3 Fig. 3.1 shows a table-top of weight 60 N which is hinged at P.

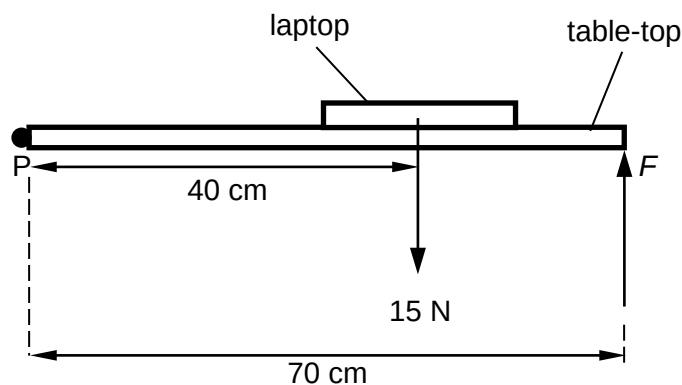


Fig. 3.1

The centre of gravity of the table-top is 25 cm from P. The table-top is supported by a vertical force F , 70 cm from P.

A laptop of weight 15 N is placed on the table-top so that its weight acts 40 cm from P.

(a) On Fig. 3.1, draw the weight of the table-top and indicate its distance from P. [1]

(b) Calculate

(i) the total clockwise moment of the table-top and the laptop about P,

total clockwise moment = Nm [2]

(ii) the force F .

$F = \dots\dots\dots$ N [2]

(c) The laptop is now moved nearer to P.

State how this affects the magnitude of force F needed to support the table-top.

.....

..... [2]

4 The speed of light in different materials is shown in Fig. 4.1.

material	air	water	glass
speed of light (m/s)	3.0×10^8	2.3×10^8	2.0×10^8

Fig. 4.1

Fig. 4.2 shows what happens to light as it passes from water into air.

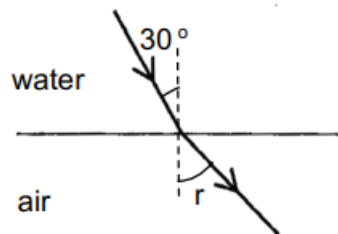


Fig. 4.2

- (a)** The angle of incidence of light when it travels from water to air is 30° .

Using information in Fig. 4.1, calculate the angle of refraction, r , to the nearest degree.

angle $r = \dots\dots\dots^\circ$ [3]

- (b)** State and explain what will happen to light as it passes from water into glass.

.....

..... [2]

- 5** Fig. 5.1 is a full-scale diagram that represents a sound wave of frequency 5.1 kHz in air.

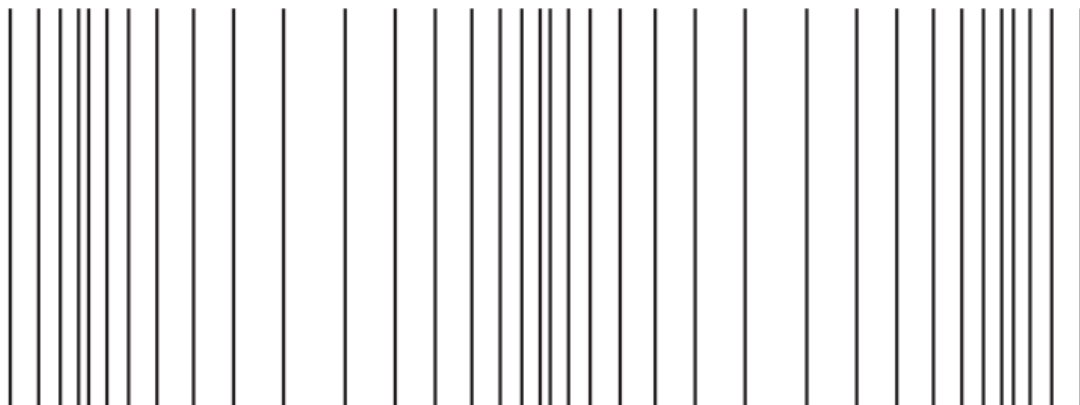


Fig. 5.1

- (a)** Determine the wavelength of this sound wave.

wavelength = cm [1]

- (b)** Calculate the speed of the sound in air.

speed = m/s [2]

- (c) (i) State two ways how sound waves are different from electromagnetic waves.

.....

 [2]

- (ii) Satellites are often used to observe the Earth from space using different types of electromagnetic waves.

State the type of electromagnetic waves used under the following applications.

taking pictures of cloud formation:

detection of forest fires: [2]

6 Fig. 6.1 shows the electrical wiring in a table lamp.

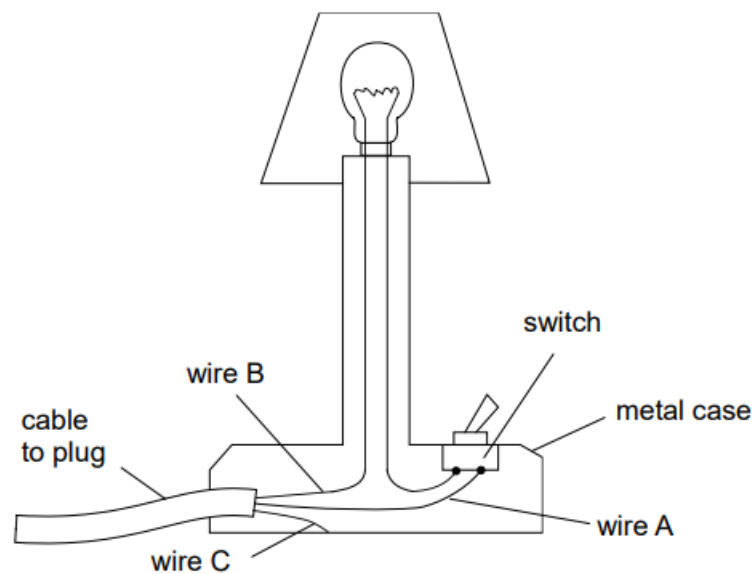


Fig. 6.1

- (a) Explain why wire A rather than wire B is connected to the live terminal in the plug.

.....
 [2]

- (b) The lamp is marked “230 V, 100 W’.
- (i) Calculate the current in the lamp when it is working normally.

current = A [2]

- (ii) A second lamp is connected in parallel with the first lamp.
Compare the brightness of the second lamp as compared to the
lamp in (i) and explain why.

.....
..... [2]

- 7 Fig. 7.1 below shows a coil of wire C connected to switch S and a strong battery. A compass is placed on the right end of coil C. When switch S is open, the North pole of the compass points to the right as shown.

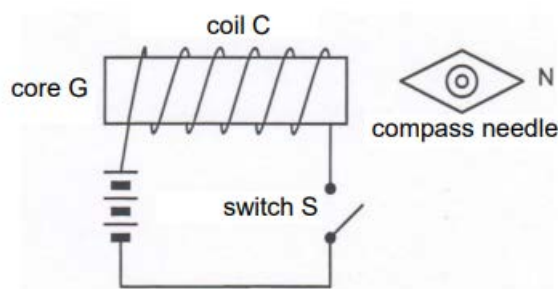


Fig. 7.1

- (a) When switch S is closed, state and explain what happens to the North pole of the compass.

.....
..... [2]

- (b) Switch S is then opened again after some time.
State what happens to the North pole of the compass if core G is made of

- (i) soft iron,

.....
..... [1]

(ii) steel.

.....
.....

[1]

- (c) The strong battery is now replaced with an alternating current power supply and the switch is closed.
Describe what happens to the North pole of the compass.

.....
.....

[1]

8 Fig. 8.1 shows information on radioactive isotopes.

radioactive isotope	type of radiation	half-life	penetration through human flesh
A	alpha	300 years	2 mm
B	beta	7 hours	60 mm
C	gamma	7 hours	> 10 m
D	alpha	9 seconds	2 mm
E	gamma	3 years	> 10 m

Fig. 8.1

- (a) A doctor implants radioactive isotope A into a patient to treat a localised cancer which is a few mm in size. The isotope will remain within the patient for a few weeks for the treatment to complete.

Use Fig. 8.1 to suggest which isotope the doctor should use and explain why.

.....
.....

[2]

- (b) Describe one beneficial use and one harmful effect of nuclear radiation on humans.

.....
.....

[2]

- 9 In a hydroelectric power station, water supplied from a reservoir flows down to the turbines which are 120 m below the reservoir, as shown in Fig. 9.1. The water turns the turbines, which in turn, turns the generators to generate electricity.

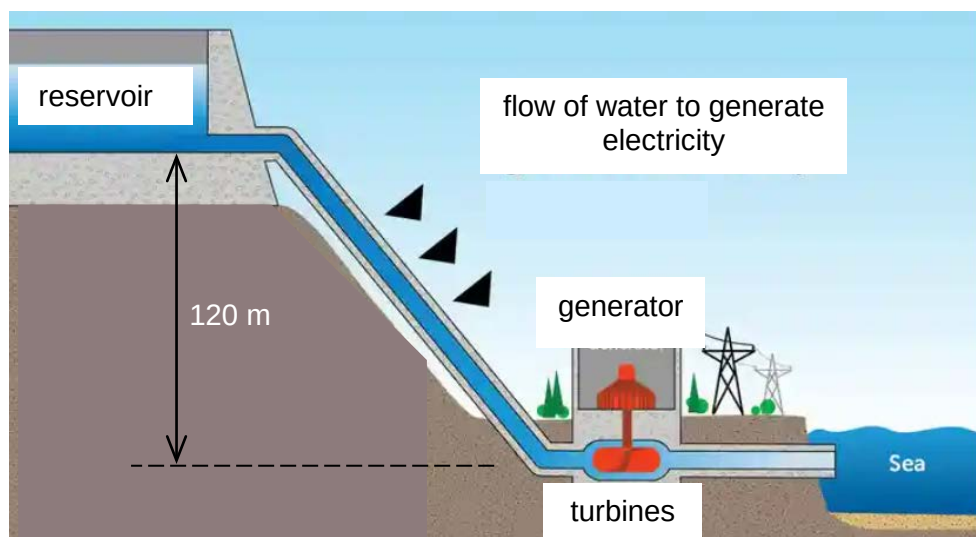


Fig. 9.1

- (a) The water passes through the turbines at a rate of 1.5 m^3 per second. The density of water is 1000 kg/m^3 .

Calculate the mass of water passing through the turbine each second.

mass =kg [2]

- (b) Calculate the loss in energy in the gravitational potential store each second as the water flows from the reservoir to the turbines.

loss in gravitational potential energy = J [2]

- (c) Using your answer from (a) and (b), calculate the maximum speed of the water that enters the turbine each second.

maximum speed = m/s² [2]

- (d) Suggest why the actual speed of the water at the turbine is lesser than the answer calculated in part (c).

.....
..... [1]

- (e) At each turbine, the pressure of the water on each blade of the turbine is 8 000 N/m² and the area of contact between the water and the blade is 4.0 m².

Calculate the force exerted by the water on each blade of the turbine.

force = N [2]

- (f) Suggest how the speed of rotation of the turbine can be increased.

.....
..... [1]

Section B

Answer **one** question from this section.

- 10** An industrial fan system is operated using a 220 V mains supply, as shown in Fig. 10.1. The circuit diagram shows the arrangement of the fan motors in the system. The resistors A, B, C and D represent the resistances of the motors. The resistors are identical.

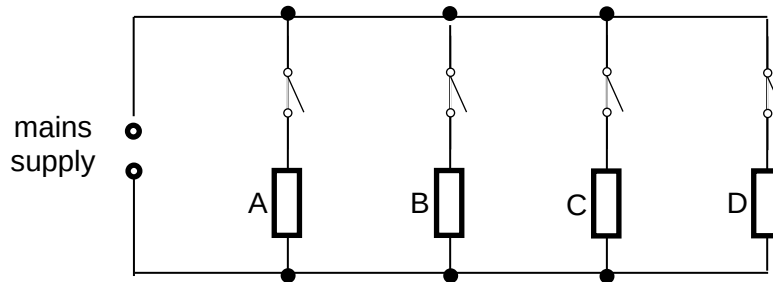


Fig. 10.1

Each resistor operates at a power of 0.88 kW when switched on.

- (a)** Calculate the current in each resistor when switched on.

current = A [2]

- (b)** Calculate the resistance of each resistor.

resistance = Ω [2]

- (c)** Calculate the total resistance of the fan system.

total resistance = Ω [2]

- (d) The fan system has a single fuse fitted to it, not shown in Fig. 10.1.

Explain if a fuse with a 5 A rating can be used in the fan system.

.....

..... [1]

- (e) An electronic engineer suggests connecting the fans in series to increase the total resistance of the circuit.

- (i) Calculate the current in the circuit if the fans are connected in series.

current = A [2]

- (ii) One reason why the fans are not connected in series is that all the fans will not work if one of them was faulty.

Suggest **another** reason why the fans should not be connected in series.

.....

..... [1]

- 11 Two copper cans A and B are placed equal distances from a radiant heater, as shown in Fig. 11.1.

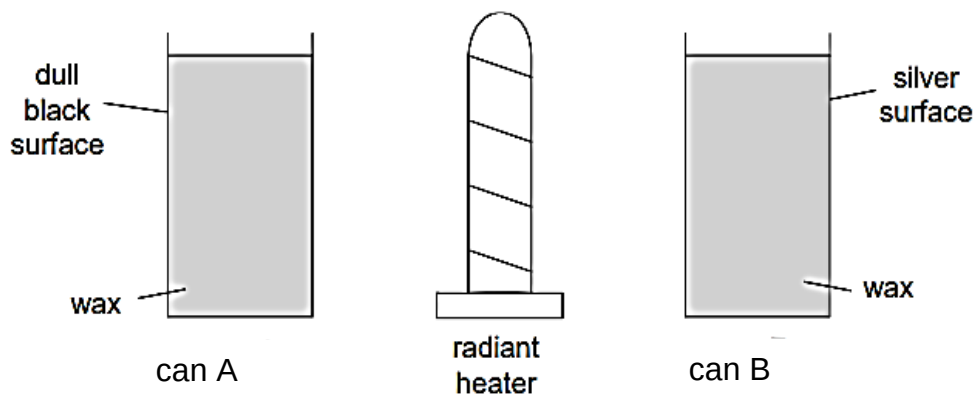


Fig. 11.1

The two cans have the same mass and are of the same shape and size. Can A is painted dull black and can B is painted silver. The cans contain equal masses of solid wax.

When the heater is switched on, thermal energy from the heater reaches the solid wax in the cans by means of radiation through the air and by conduction through the walls of the cans.

- (a) Describe how energy is transferred via heating through the walls of the cans.

.....
.....
.....

[2]

- (b) Explain why thermal energy cannot be conducted effectively through the air between the radiant heater and the cans.

.....
.....

[1]

- (c) Fig. 11.2 shows the variation with time of the temperature of the wax in can B.

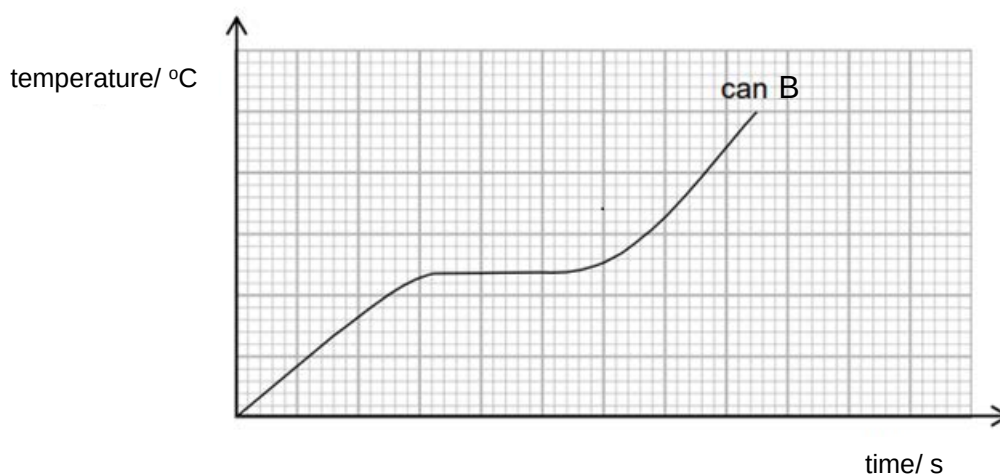


Fig. 11.2

- (i) On Fig. 11.2, draw a graph to show how the temperature in can A changes with time. [2]
- (ii) Explain any differences between the shape of the graph for can A and that for can B.

.....

..... [1]

- (d) Describe how the motion and the arrangement of the molecules of the wax changes as the wax is heated.

.....

.....

.....

.....

.....

[4]

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