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CEDAR GIRLS' SECONDARY SCHOOL
Preliminary Examination Two 2016
Secondary Four

PHYSICS

Paper 1

5059/01

24 August 2016

1 hour

Candidates answer on the OMR Form.

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.
Check the number of printed pages on both sides of the paper.

There are **forty** questions in this section. Answer **all** questions. For each question, there are 4 possible answers, **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the Optical Mark Reader (OMR) Form.

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

Hand in OMR Form separately.

Additional Materials:

OMR Form

Information to Candidates

Take the weight of 1 kg to be 10 N.
Take speed of light to be 3×10^8 m/s in vacuum.

This document consists of 17 printed pages

[Turn over

- 1 A vernier calipers is used to measure the length of a rod. Diagram 1 shows part of the vernier calipers scales when the jaws are fully closed. Diagram 2 shows the vernier calipers scales when the jaws are closed around the ends of the rod.

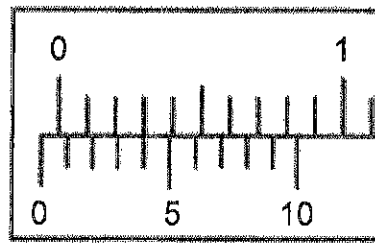


Diagram 1

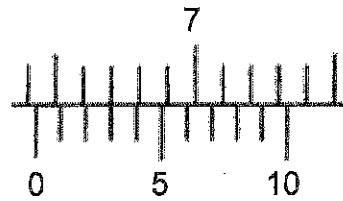


Diagram 2

What is the length of the rod?

- A 6.39 cm B 6.40 cm C 6.43 cm D 6.49 cm

- 2 Which of the following statement(s) is/are a vector quantity?

- (i) The rate of transferring heat to the pan.
- (ii) The rate of change in displacement.
- (iii) The rate of flow of electric charge.
- (iv) The pull on a mass.

- A (iv) only
 B (i) and (iii) only
 C (ii) and (iv) only
 D (ii), (iii) and (iv) only

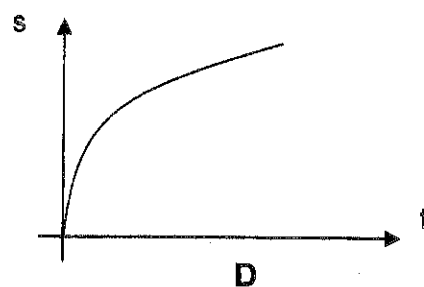
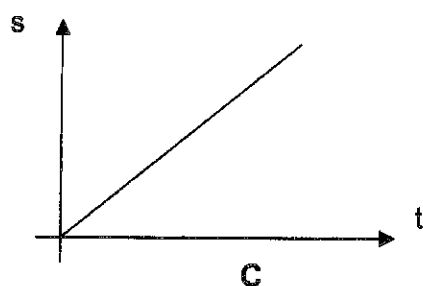
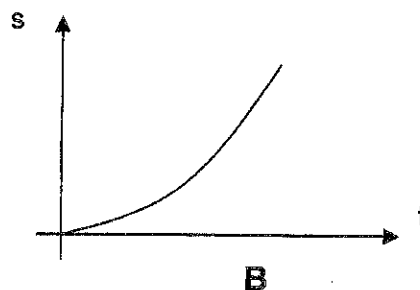
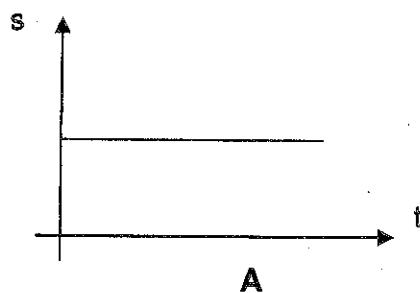
- 3 A mass of a liquid of density p is thoroughly mixed with an equal mass of another liquid of density $2p$. No change of the total volume occurs.

What is the density of the liquid mixture?

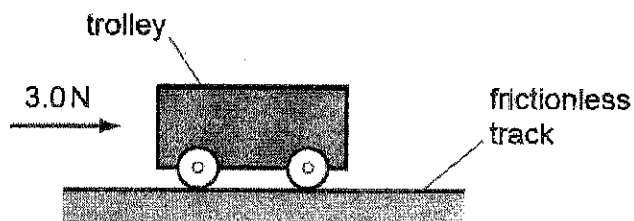
- A $\frac{4}{3}p$ B $\frac{3}{2}p$ C $\frac{5}{3}p$ D $3p$

- 4 A car moves with constant speed and decelerates later.

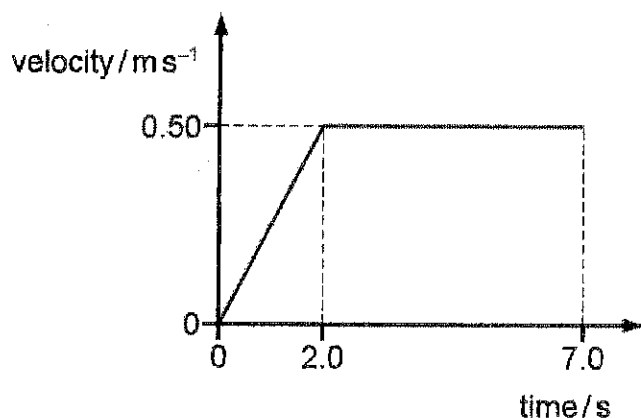
Which of the following graphs shows the distance-time graph for the car?



- 5 A trolley is pushed with a force of 3.0 N for 2.0 s along a frictionless track.



The graph shows the velocity of the trolley against time.



How much work is done by the force on the trolley?

- A 1.5 J B 3.0 J C 6.0 J D 9.0 J

- 6 A body is initially at rest. Two forces are then applied to it; one is constant, the other acts in the opposite direction with a magnitude that is proportional to the velocity of the object.

Which statement best describes the motion of the object?

- A The acceleration will increase from zero to a maximum.
- B The acceleration will increase from zero to a maximum and then decrease.
- C The velocity will increase from zero to a maximum.
- D The velocity will increase from zero to a maximum and then decrease.

- 7 The list contains three energy resources P, Q and R.

P geothermal energy from hot rocks

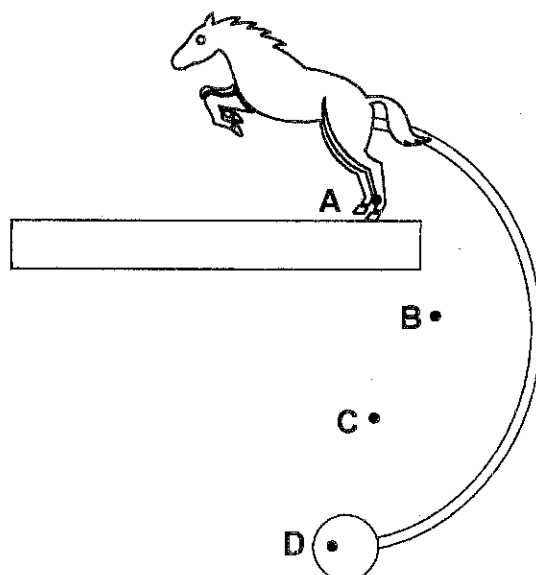
Q nuclear fission in reactors

R sunlight on solar panels

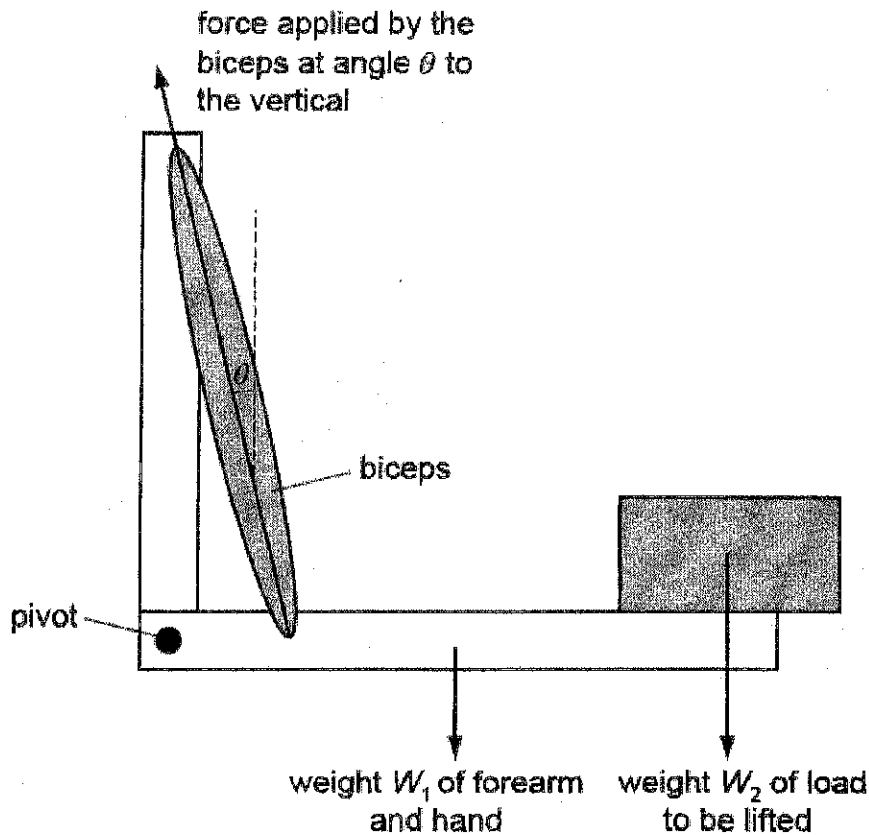
Which of these resources are renewable?

- A P and Q only
- B P and R only
- C Q and R only
- D P, Q and R

- 8 The diagram below shows the rest position of a balancing toy on the edge of a table. Which position is most likely to be the centre of mass of the toy?



- 9 The diagram shows a model of an arm. A force applied by the biceps muscle can hold the arm in equilibrium while it supports a load.



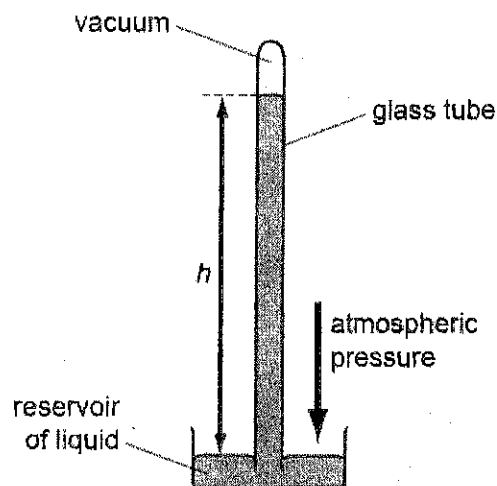
Which statement is correct when the arm is in equilibrium in the position shown?

- A The force at the pivot is zero.
 - B The force from the biceps is bigger when the load is moved nearer to the pivot.
 - C The force from the biceps is equal to $W_1 + W_2$.
 - D The resultant force on the biceps is zero.
- 10 A vehicle is used to explore under the sea. The force due to the water on its horizontal rectangular window, which measures 50.0 cm by 40.0 cm, is 8.24×10^6 N.

At what depth is the window? (Density of sea water is 1.03×10^3 kg/m³).

- A 40.8 m
- B 163 m
- C 4.0×10^3 m
- D 4.0×10^4 m

- 11 A barometer can be used to measure atmospheric pressure as shown.



For a barometer containing water, the height h is 10.4 m. A second barometer, with a glass tube which has twice the cross-sectional area, contains alcohol.

density of water = $1.0 \times 10^3 \text{ kg/m}^3$

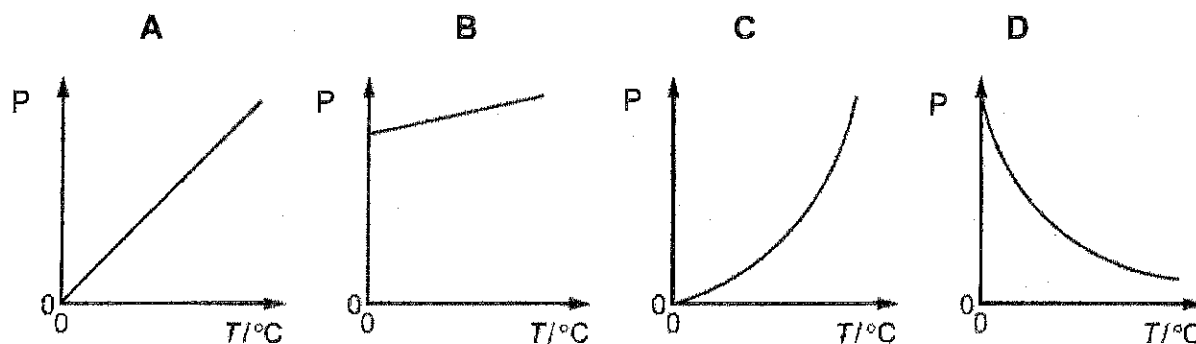
density of alcohol = $0.8 \times 10^3 \text{ kg/m}^3$

What is the height h of the alcohol?

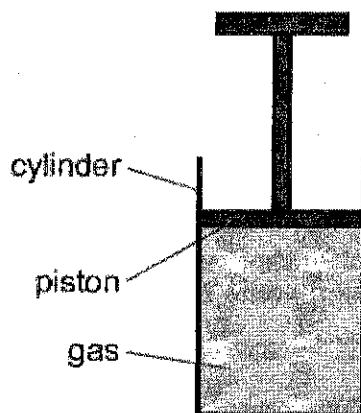
- A 4.2 m B 6.5 m C 8.3 m D 13.0 m
- 12 Which of the following physical properties is **not** used to measure temperature?
- A volume of fixed mass of liquid
- B electrical resistance of a platinum wire
- C electromotive force
- D pressure and volume of a gas

- 13 A fixed mass of gas in a syringe at 0°C is heated at constant volume.

Which graph shows the variation of pressure P with temperature T , measured in $^{\circ}\text{C}$?



- 14 A piston is supported by gas trapped in a cylinder.



The piston moves upwards when the trapped gas in the cylinder is heated.

What happens to the molecules of the gas?

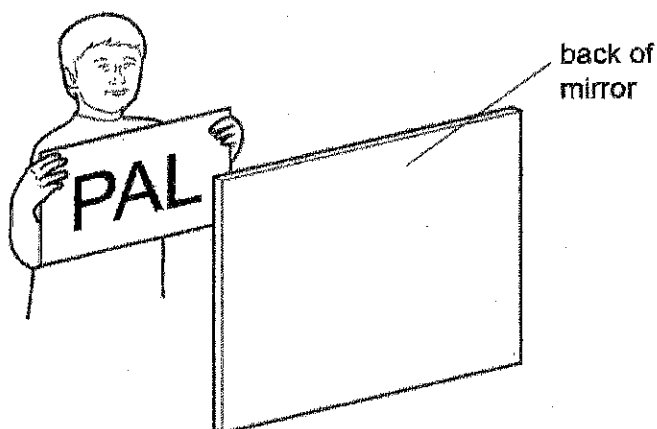
- A They hit the piston more frequently.
 - B They hit the piston with a smaller force.
 - C They have a larger size.
 - D They have more kinetic energy.
- 15 A metal block X of mass m , specific heat capacity c and temperature 80°C is placed in good thermal contact with a second metal block Y of mass $2m$, specific heat capacity $2c$ and temperature 30°C . Assume no energy losses to the surroundings.

What will be the final temperature of both blocks?

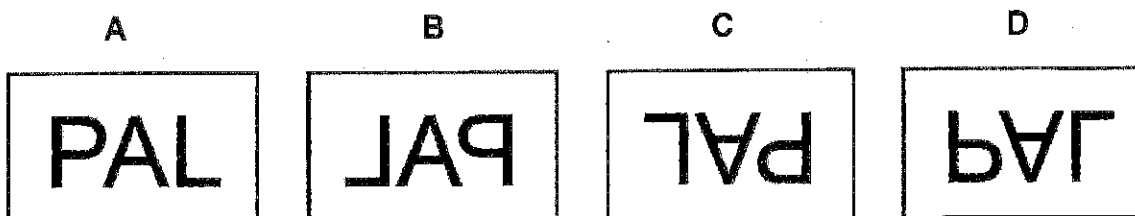
- A 40°C
- B 50°C
- C 55°C
- D 110°C

- 16 Which statement concerning the evaporation and boiling of a liquid is true?
- A Boiling always occurs at a higher temperature than evaporation.
 - B Evaporation and boiling are unaffected by changes in the surface area of the liquid.
 - C Evaporation occurs at any temperature whereas the boiling point depends on the atmospheric pressure.
 - D Evaporation results in the loss of the most energetic molecules from a liquid whereas in boiling, all molecules have the same energy.
- 17 A gas in the process of condensation will
- A not give off or take in any heat because there is no change in temperature.
 - B give off heat because its molecules are losing kinetic energy.
 - C give off heat because intermolecular forces are forming.
 - D take in heat in order to break the intermolecular forces.

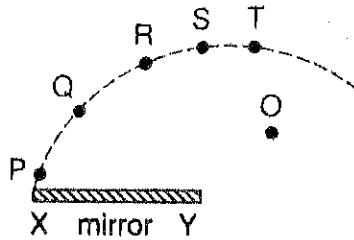
- 18 A piece of paper has 'PAL' written on it.
A student holds the paper in front of a plane mirror.



What does the student see?

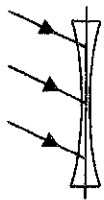


- 19 The diagram shows an object O is placed in front of a mirror XY.

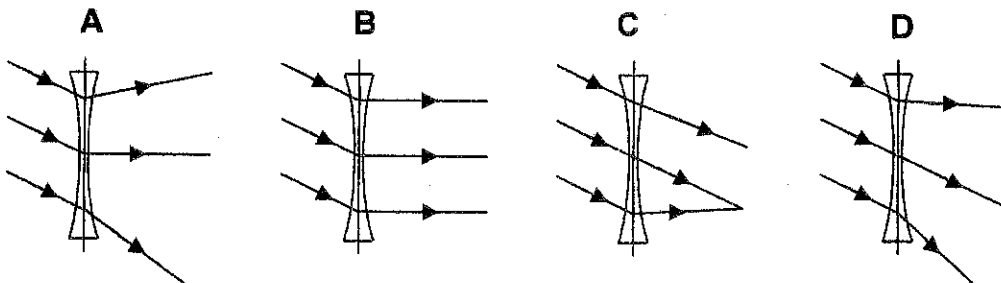


An observer will be able to see the image if he stands between points

- A P and Q.
 - B Q and R.
 - C R and S.
 - D S and T.
- 20 A ray of light from air is incident on the surface of a glass block with an angle of incidence of 65° . The refractive index of the glass is 1.45. The light ray changes direction when entering the glass.
- How much the ray deviate as it enters the block?
- A 21.4°
 - B 26.3°
 - C 38.7°
 - D 51.3°
- 21 Three rays of light fall on a thin lens as shown



Which diagram shows the path of the rays after passing through the lens?

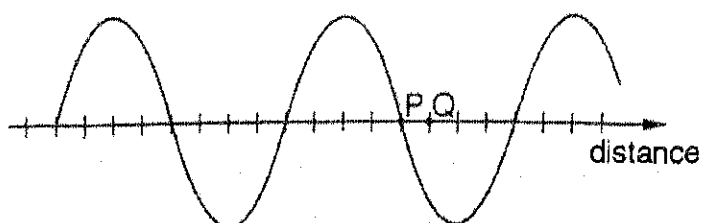


- 22 An object placed at 28 cm from a thin converging lens produces an image of the same size as the object.

When object is moved to 20 cm from the same lens, the image produced will be

- A real, inverted, diminished.
- B real, inverted, magnified.
- C virtual, upright, magnified.
- D virtual, upright, diminished.

- 23 The diagram shows a transverse wave at a particular instant. The wave is travelling to the right. The frequency of the wave is 12.5 Hz.



At the instant shown the displacement is zero at the point P.

What is the shortest time to elapse before the displacement is zero at point Q?

- A 0.01 s
- B 0.03 s
- C 0.08 s
- D 0.10 s

- 24 Studies show that black holes and neutron stars are capable of emitting high power X-rays in deep space.

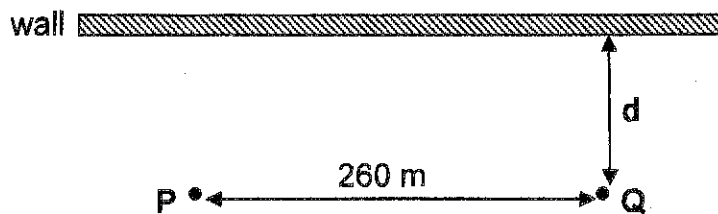
Which of the following could be the frequency of X-rays in space?

- A 3.0×10^9 Hz
- B 3.0×10^{12} Hz
- C 3.0×10^{18} Hz
- D 3.0×10^{20} Hz

- 25 What is the approximate range of audible wavelength for a young person?

- A 170 mm to 340 m
- B 17 m to 59 m
- C 17 mm to 17 m
- D 17 μ m to 340 μ m

- 26 Two persons **P** and **Q** are positioned 260 m apart from each other.

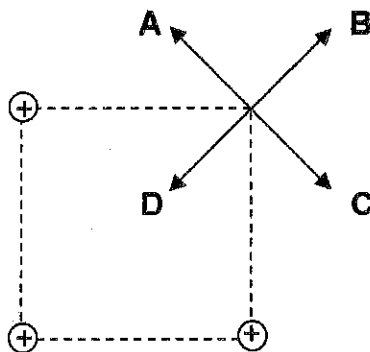


When **P** gives a clap, the time interval between the two sounds heard by **Q** is 0.20s. If the speed of sound is 340 m/s, what is the approximate distance, **d** from **Q** to the wall?

- A** 68 m **B** 100 m **C** 136 m **D** 260 m

- 27 The diagram shows point charges, each of equal magnitude of positive charge, placed at three corners of a square.

What is the direction of the resultant electric field at the fourth corner?



- 28 To charge an isolated metal sphere by induction, the following four processes are required.

- P** The sphere is earthed by touching it.
- Q** The earth connection is removed from the sphere.
- R** A charged rod is brought close to the sphere.
- S** The charged rod is removed.

In which order can these stages be carried out to charge the isolated metal sphere?

- A** $P \rightarrow Q \rightarrow R \rightarrow S$
- B** $P \rightarrow R \rightarrow S \rightarrow Q$
- C** $R \rightarrow P \rightarrow Q \rightarrow S$
- D** $R \rightarrow P \rightarrow S \rightarrow Q$

- 29** Four lamps have filaments made from the same material. The lamps are connected in parallel across a battery.

Which filament lamp transfers the most energy into heat and light per second?

	length of filament	cross-sectional area of filament
A	L	2A
B	2L	2A
C	L	A
D	2L	A

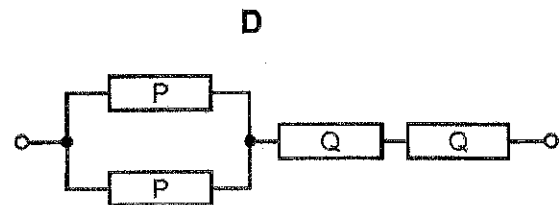
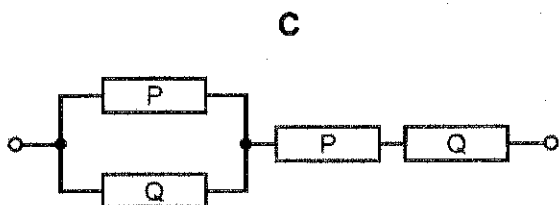
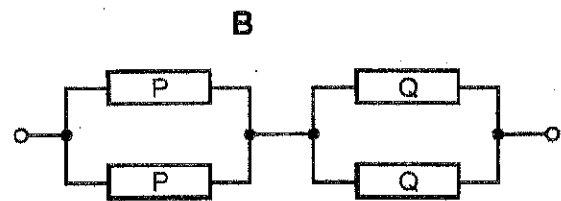
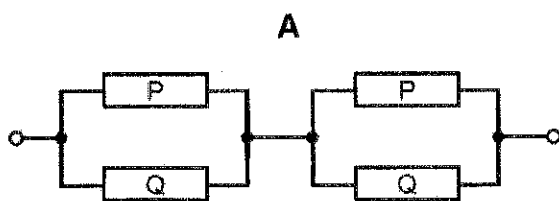
- 30** A torch is switched on and left until its battery is flat. During this time, the current in the lamp remains steady at 0.60 A for three hours and then decreases uniformly to zero in the next hour.

What is the total charge passing through the lamp?

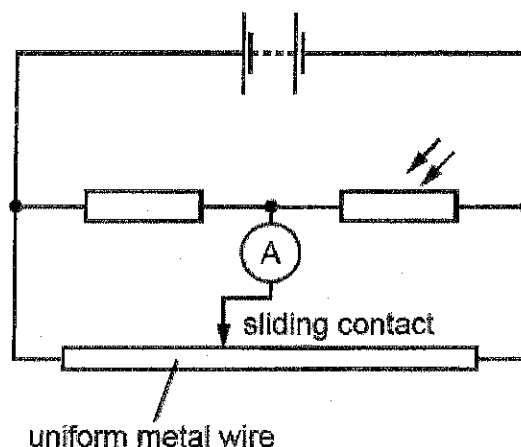
- A** $1.2 \times 10^2 \text{ C}$
B $4.3 \times 10^3 \text{ C}$
C $7.6 \times 10^3 \text{ C}$
D $8.6 \times 10^3 \text{ C}$

- 31** In the diagrams, resistor P has twice the resistance of resistor Q.

Which network has the lowest resistance?



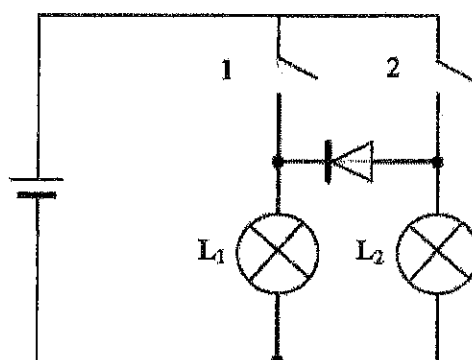
- 32 In the potentiometer circuit shown, the reading on the ammeter is zero.



The light-dependent resistor (LDR) is then covered up and the ammeter gives a non-zero reading.

Which change could return the ammeter reading to zero?

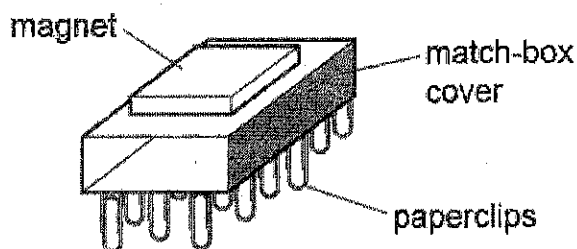
- A Decrease the supply voltage.
 - B Increase the supply voltage.
 - C Move the sliding contact to the left.
 - D Move the sliding contact to the right.
- 33 The circuit shows how two lamps L_1 and L_2 are connected to a battery through two switches 1 and 2 and a diode.



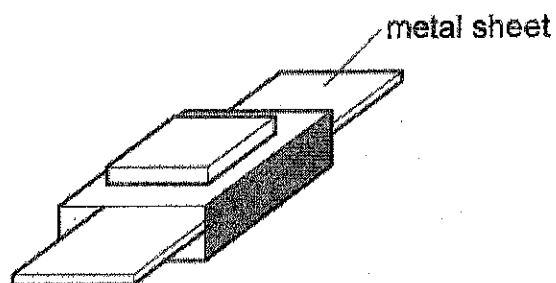
Which of the following best describes the operation of this circuit?

	switch 1 closed switch 2 open	switch 2 closed switch 1 open
A	both bulbs light up	L_2 light up
B	none	both bulbs light up
C	L_1 light up	both bulbs light up
D	both bulbs light up	L_1 light up

- 34** A teacher sticks a magnet to the top surface of a match-box cover. The bottom surface is placed in a small tray of iron paperclips. As the match-box cover is lifted up, a large number of paperclips are held on the bottom surface.



Sheets of metal are placed inside the match-box cover, between the magnet and the paperclips.

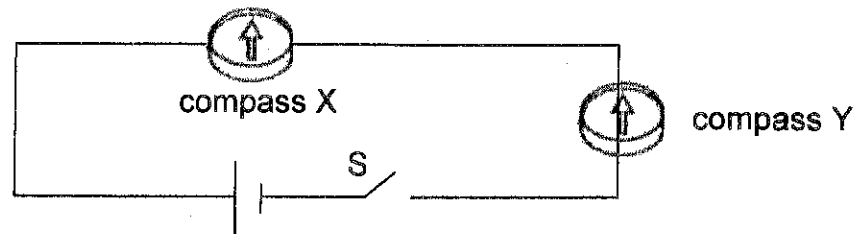


When sheet X is placed inside, the paperclips stay attached. When sheet Y is placed inside, all the paperclips fall off.

Which metals are the sheets made from?

	sheet X	sheet Y
A	aluminium	copper
B	copper	iron
C	iron	aluminium
D	iron	copper

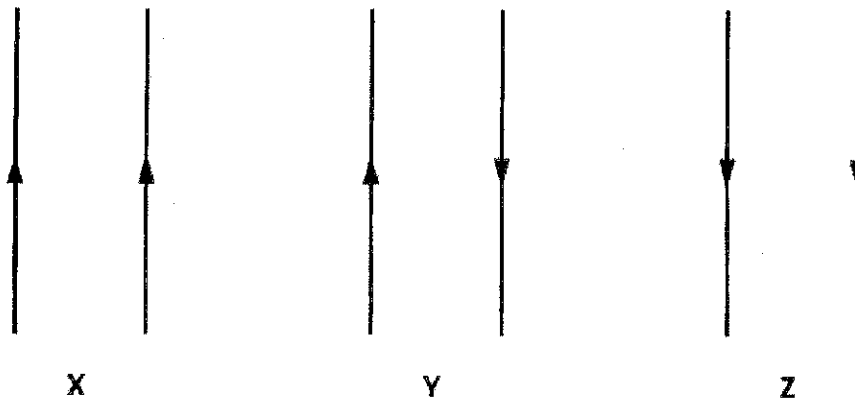
- 35 The diagram shows a circuit with a wire connected to a battery through the switch S. A compass X is placed above the wire and compass Y is placed below the wire.



When the switch is closed, which of the following diagrams correctly shows the orientation of the compass needles?

- | | compass X | compass Y |
|---|-----------|-----------|
| A | | |
| B | | |
| C | | |
| D | | |

- 36 The diagram shows the direction of currents through three pairs of parallel wires.

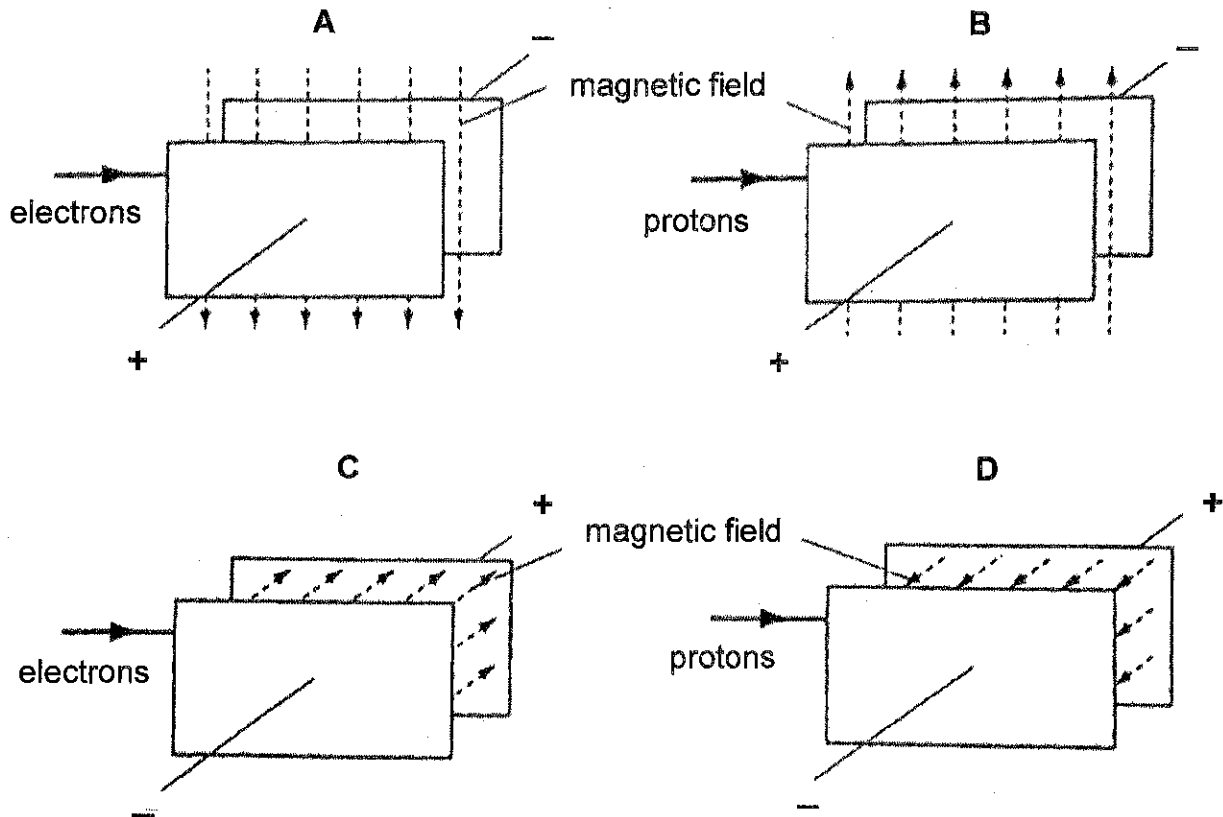


Which forces do the pairs of wires experience?

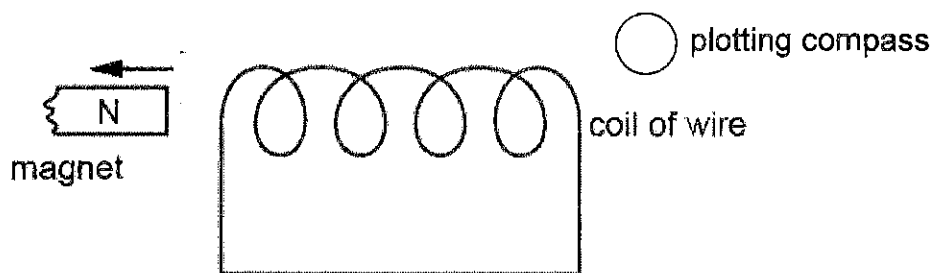
- | | X | Y | Z |
|---|------------|------------|------------|
| A | attraction | repulsion | attraction |
| B | attraction | none | repulsion |
| C | none | attraction | none |
| D | repulsion | attraction | repulsion |

- 37 The diagrams show different particle beams entering a region between two metal plates in which there are uniform electric and magnetic fields.

In which arrangement would it be possible for the beam to pass through undeflected?



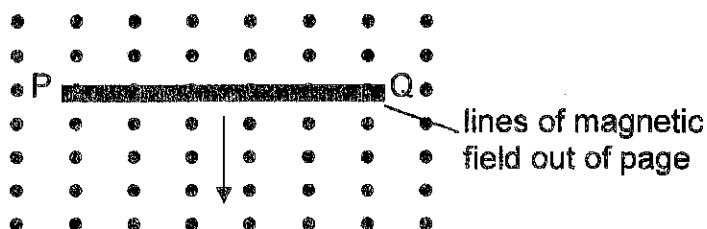
- 38 The diagram shows the north pole of a magnet moving out of a coil of wire. A small plotting compass is placed near the coil of wire.



In which direction does the plotting compass set momentarily when the magnet moved out?



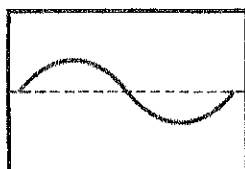
- 39 A copper rod PQ is placed horizontally as shown below. It is released and then falls vertically, cutting across the lines of magnetic field pointing out of the page. Neglecting air resistance, which of the following statements is/are correct?



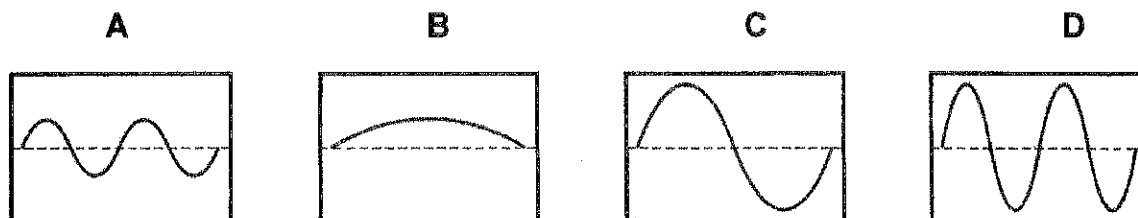
- (i) A voltage is induced across PQ
- (ii) A steady induced current is generated in the rod
- (iii) The copper rod falls with an acceleration that is less than the acceleration due to gravity

- A (i) only
- B (ii) only
- C (i) and (ii) only
- D (ii) and (iii) only

- 40 The coil of an a.c. generator is rotated and the output is displayed on the screen of a cathode-ray oscilloscope (c.r.o.). The diagram shows the trace on the screen.



Assuming that the settings on the c.r.o. are unaltered, which trace appears on the screen when the number of turns in the coil is doubled and the speed of rotation of the coil is halved?



END OF PAPER



CEDAR GIRLS' SECONDARY SCHOOL

Preliminary Examination Two 2016

Secondary Four

CANDIDATE
NAME

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CLASS

4	
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INDEX
NUMBER

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PHYSICS

Paper 2 Physics

5059/02

17 August 2016

1 hour 45 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer **all** the questions in this section.

Answer only one of the two alternative questions in **Question 12 and Question 13**.

Write your answers in the spaces provided on the question paper.

For calculations, take speed of light in air to be 3×10^8 m/s.

1 kg of mass to have a weight of 10 N (unless otherwise indicated).

Submit **Section A** and **Section B** separately.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 80.

For Examiner's Use

80

This document consists of **18** printed pages and **0** blank page.

[Turn Over

Section A (50 marks)

For
Examiner's
Use

- 1 A rocket blasts off vertically from rest on a launch pad on Earth with a constant upward acceleration of 2.50 m/s^2 . At 20.0 s after taking off, the engines suddenly fail and the rocket begins free fall.

- (a) At the instant the engine fails, calculate
(i) the velocity of the rocket

velocity : [1]

- (ii) the height of the rocket

height : [1]

- (b) How long does it take for the rocket to reach the highest point after taking off?

time : [2]

- (c) On the following axes, sketch the velocity-time graph from the time the rocket launches till it reaches the highest point.

velocity/ ms^{-1} 

[2]

[Turn Over]

- 2 Fig. 2.1 shows a balloon just before take-off. The balloon's basket is attached to the ground by two fixing ropes. The ropes make an angle of 50° with the ground and each has a tension of 400 N.

For
Examiner's
Use

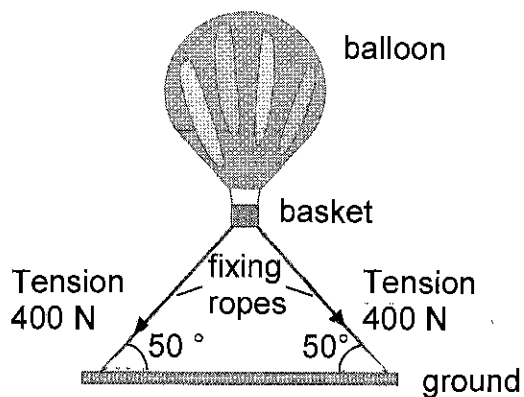


Fig. 2.1

- (a) In the space provided, draw a scale diagram to determine the magnitude of the resultant of the two tensions in the ropes.

magnitude : [3]

[Turn Over

- (b) If the total weight of the balloon and its basket is 2000 N, determine the upward lift exerted on the balloon. Ignore the weight of the ropes.

upward lift : [2]

- (c) The balloon takes off when the two ropes are simultaneously released from the ground. Explain in terms of forces why the balloon will experience an upward acceleration.

.....

.....

.....

.....

.....

[2]

- 3 Fig. 3.1 shows two workers **A** and **B** carrying a compressor unit on a 3.0 m long uniform plank. The plank has a mass of 2.0 kg. Worker **A** lifts at one end with a force of 480 N and the other lifts at the opposite end with a force of 640 N.

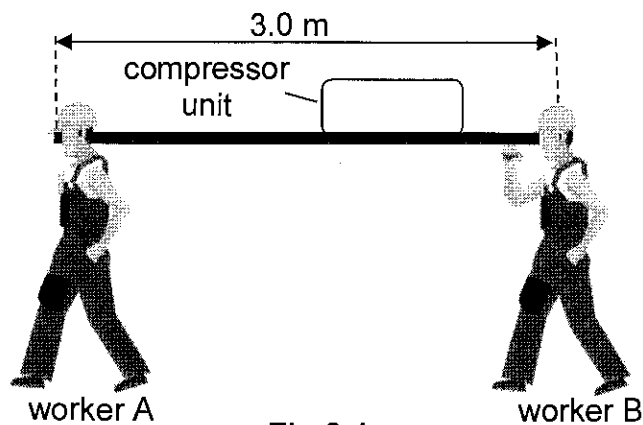


Fig 3.1

- (a) What is the weight of the compressor unit?

weight : [2]

- (b) How far away is the center of gravity of the compressor unit from worker A?

distance : [2]

- 4 An old steam engine, such as the one shown in Fig. 4.1, heats water to its boiling point and then converts the water to steam.

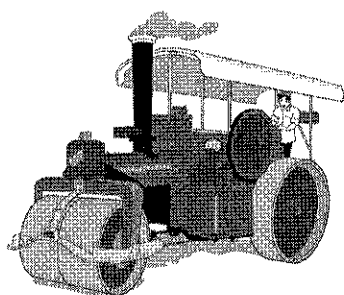


Fig. 4.1

- (a) Every 20 minutes the engine converts 65 kg of water at a temperature of 23 °C to steam at 100 °C.

Specific heat capacity of water = 4200 J/(kgK).

Specific latent heat of vaporisation of water = 2.26×10^6 J/kg.

Calculate

- (i) the total amount of heat energy required every 20 minutes,

heat energy : [2]

- (ii) the average power required for the heating and vaporising processes.

power : [1]

- (b) The steam engine exerts a driving force of 4000 N when travelling at a constant speed of 5.0 m/s.

- (i) Calculate the power output of the steam engine.

power output : [1]

- (ii) Calculate the percentage efficiency of the steam engine.

efficiency : [1]

- 5 Ultraviolet radiation is commonly used in water filtration devices to kill microscopic organisms in the water. Fig. 5.1 shows an ultraviolet lamp emitting ultraviolet waves to sterilize the water. It takes 1.76×10^{-9} s to produce 1×10^6 complete waves.

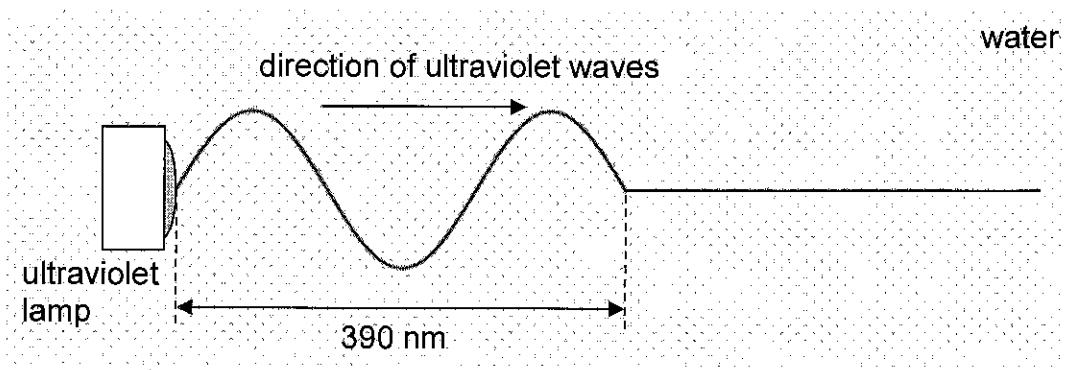


Fig. 5.1

- (a) What is the frequency and speed of the ultraviolet radiation in water?

frequency :

wave speed : [3]

- (b) State one harmful effect of prolonged human exposure to solar ultraviolet radiation.

..... [1]

- 6 (a) Sometimes, when people have been riding in a car, they get an electric shock from the door handle as they get out of the car. Suggest why this happens.

..... [2]

- (b) A plastic rod is rubbed with a cloth and becomes positively charged. After charging, the rod is held close to the suspended table-tennis ball shown in Fig. 6.1. The table-tennis ball is covered with metal paint and is initially uncharged.

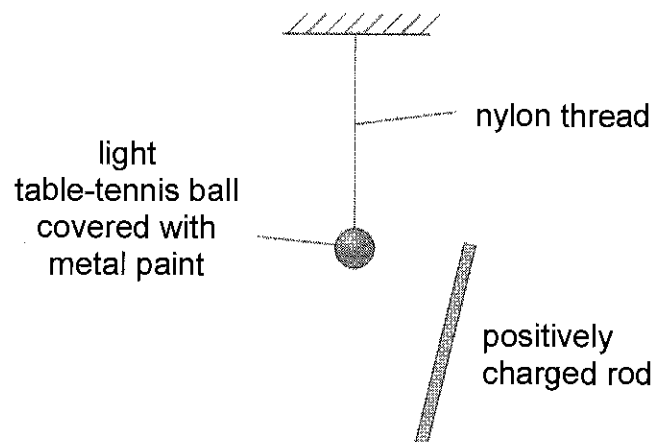


Fig. 6.1

Describe and explain what happens to the metal-painted ball as the rod is brought near it.

..... [3]

- 7 Fig. 7.1 shows the coil of a loudspeaker attached to a cardboard cone. One pole of a stationary cylindrical magnet lies near to the coil.

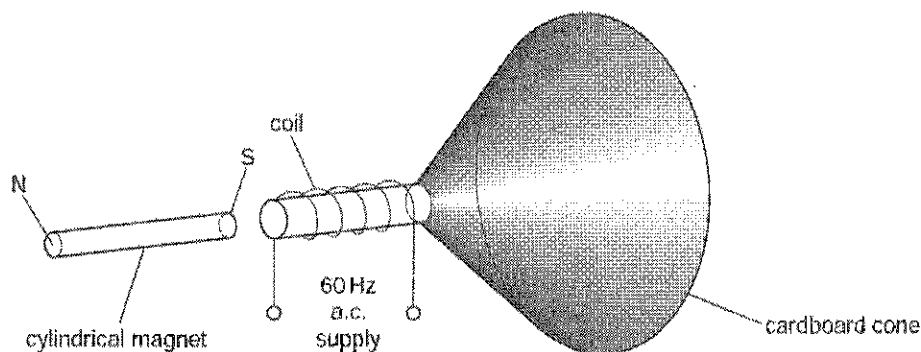


Fig. 7.1

There is an alternating current in the coil of the loudspeaker. A student hears the note produced.

- (a) Explain why the cone of the loudspeaker vibrates.

.....

.....

.....

.....

.....

[3]

- (b) A stronger cylindrical magnet is now used. State the difference in the note heard. Explain why.

.....

.....

[2]

- 8 Fig. 8.1 shows how an a.c. generator is driven by lowering a 5 kg weight. A 12 W lamp is connected to the output of the generator and will glow at normal brightness when the 5 kg weight is lowered at a steady speed of 1.2 m/s.

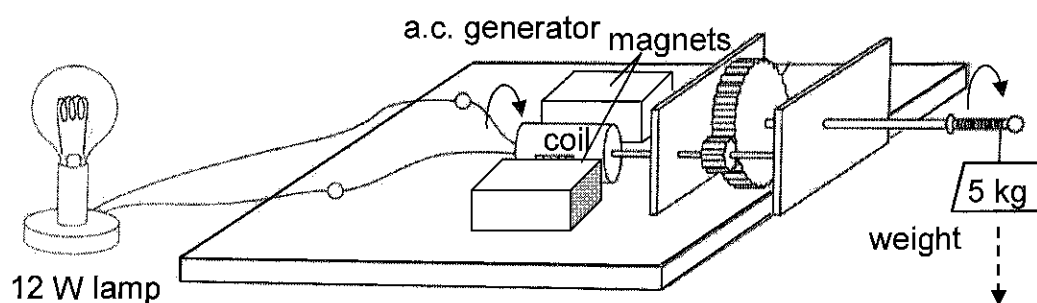


Fig. 8.1

[Turn Over]

- (a) Explain why the lamp will light up when the coil of the generator rotates.

.....

[3]

- (b) What is the loss in gravitational potential energy of the 5 kg weight in 2.0 s?

loss in gravitational potential energy : [2]

- (c) What is the power supplied to the generator by the weight?

power : [1]

- (d) Suggest two reasons why the power delivered in the lamp is less than the value obtained in (c).

1.
 2. [2]

- 9 Fig. 9.1 shows a transformer.

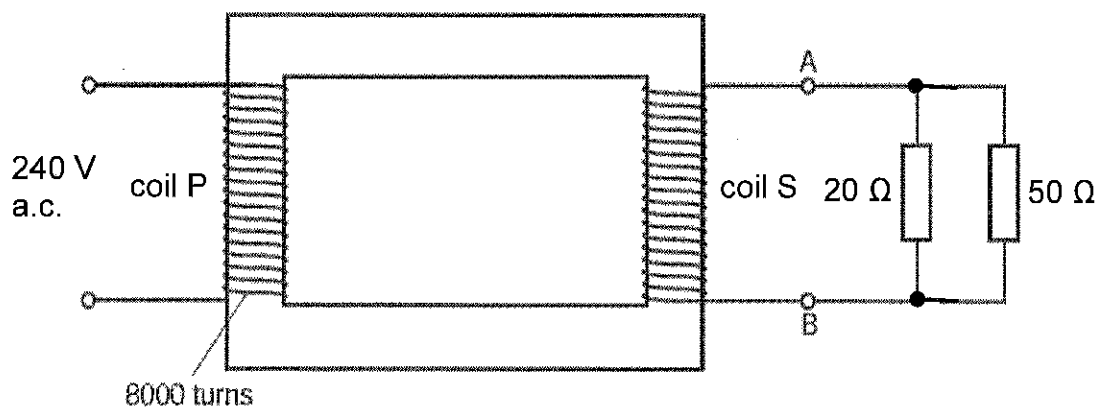


Fig. 9.1

- (a) Assume the transformer is 100% efficient and the input to the primary coil P is 240 V. This coil has 8000 turns of wire. The voltage obtained between terminals A and B is 12 V.

- (i) Calculate the number of turns of wire in the secondary coil S.

number of turns : [2]

- (ii) Two resistors, $20\ \Omega$ and $50\ \Omega$ are connected parallel across the terminals A and B.

Calculate

1. the current in coil S,

current : [1]

2. the current in coil P.

current : [1]

- (b) (i) Describe how two transformers are used to transmit electrical energy from the main power station to a distant sub power station.

.....

.....

..... [1]

- (ii) Explain why this is necessary.

.....

.....

..... [1]

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Section B (30 Marks)

- 10 During a practice jump, an airborne jumper of total mass 105 kg exits from the side of a helicopter which is stationary at a high altitude. When the jumper leaves the aircraft, he is high enough in altitude that the air resistance can be considered negligible and he falls as a freely falling body for 11.5 s until he pulls the parachute cord. When the parachute cord is pulled, we assume that the parachute deploys immediately and exerts a total air resistance force of magnitude $F_D = dv^2$, where $d = 20 \text{ N m}^{-2} \text{ s}^2$ is the drag coefficient due to air resistance, and v is the velocity of the jumper. The jumper achieves terminal velocity 5.0 s after the opening of the parachute. The jumper lands on the ground 20.0 s after achieving terminal velocity.

The jumper landed straight on hard concrete and felt a strain in his knees and limped off after practice. He was later advised by his instructor to look out for soft grass patches to land for the next jump.

- (a) Draw a free-body diagram of the jumper when the parachute is opened. [2]

- (b) Calculate the terminal velocity of the jumper after the parachute is opened.

Terminal Velocity = [2]

- (c) Sketch the velocity – time graph of the jumper from the instance that he jumps off the plane until he reaches the ground. [3]

- (d) Explain how landing on a soft grass patch decreases the amount of force that the jumper will experience upon impact.

.....

.....

..... [2]

.....

- (e) Suggest another way that the jumper can act during the landing to reduce the force he experiences upon impact.

.....

..... [1]

.....

- 11 A current carrying wire is held between the poles of the horseshoe magnet that is placed on an electronic balance as shown in Fig. 11.1. The reading on the balance is 340 g when there is a current flowing through the wire.

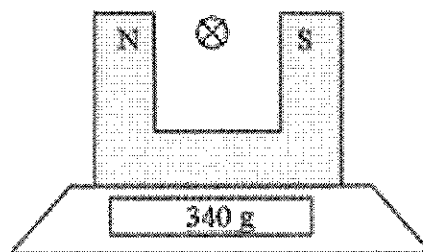


Fig. 11.1

- (a) (i) On Fig. 11.1, draw the magnetic fields due to the horseshoe magnet. [1]
- (ii) On Fig. 11.1, draw an arrow on the wire to indicate the direction of the force acting on the wire. [1]
- (iii) State and explain how the reading displayed on the balance will change if the current in the wire is switched off.

[2]

- (b) Fig 11.2 shows a simple D.C motor.

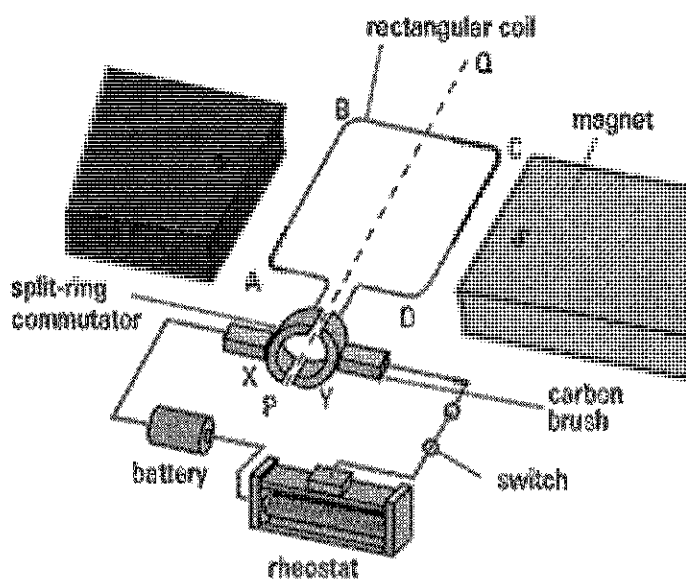


Fig. 11.2

- (i) Describe and explain how the rectangular coil completes one revolution when a current passes through the coil.

[4]

- (ii) State two things that could be done to increase the turning effect of the coil.

[2]

EITHER

- 12 (a) The voltage supplied in one particular household is 240 V. There is an earthed ring main house power circuit containing four electrical sockets. The circuit includes a 20 A fuse as shown in Fig. 12.1.

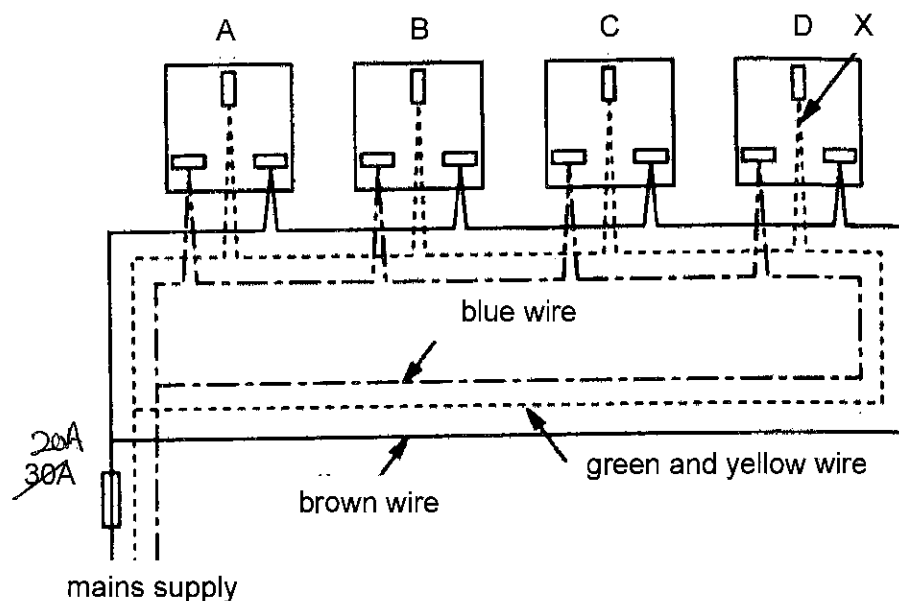


Fig 12.1

- (i) Is it advisable to run four 1.5 kW electrical appliances with the four different sockets at the same time? Explain.

[2]

- (ii) A break develops in the two earth wires at X. A device is plugged into socket D and is found to work normally. Is it safe to use socket D with the break in the wires at X? Explain.

[2]

- (b) Fig. 12.2 below shows the power - time graph for an electric ~~lamp~~^{heater} running off a 240 V supply.
The electric heater is rated 350 W, 240 V.

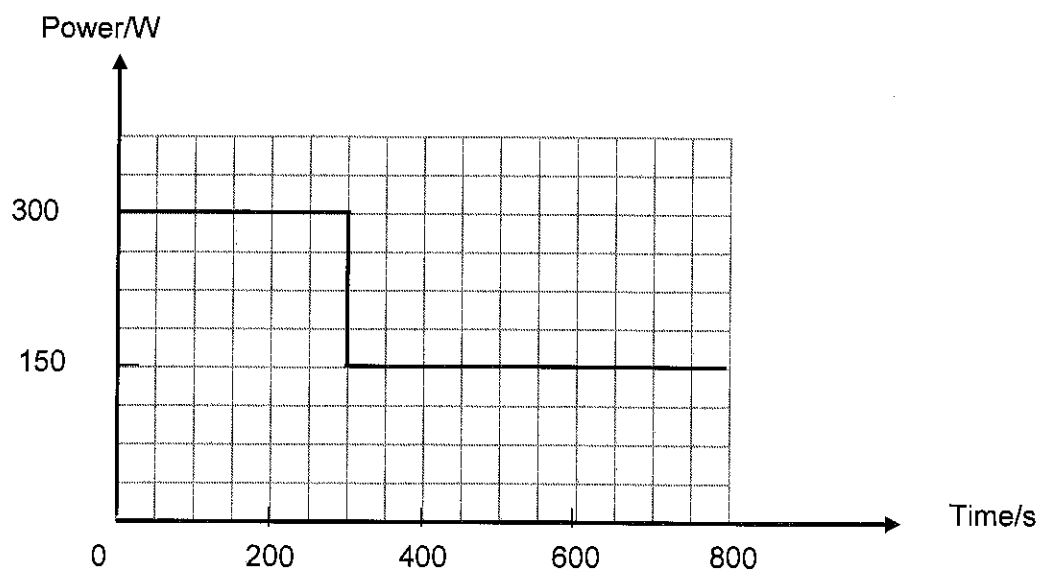


Fig 12.2

- (i) With reference to Fig. 12.2, calculate the cost of operating the electrical heater for 8000 s if Singapore Power charges \$0.24 for each kilowatt-hour of electrical energy.

Energy = _____ [2]

- (ii) What is the effective resistance of the heater when its power output is 300 W?

Resistance = _____ [2]

- (c) Fig. 12.3 shows the V-I characteristics of a light bulb in the electric lamp.

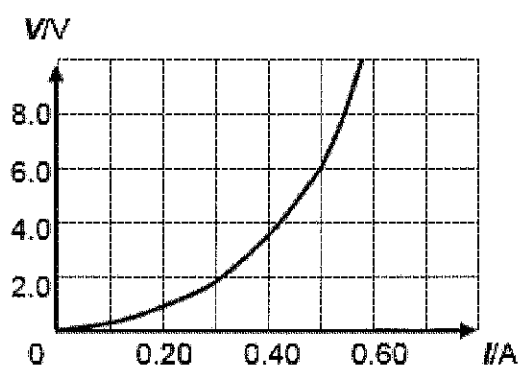


Fig. 12.3

Does the light bulb obey Ohm's law? Justify your answer.

.....

.....

.....

.....

[2]

OR

- 13 Fig. 13.1 shows a solar water heating system. The heater is made from a glass-covered wooden box and the copper pipe inside is painted black. The heater is put on an inclined surface. Oil circulates between the heater and the water storage tank via the copper pipe.

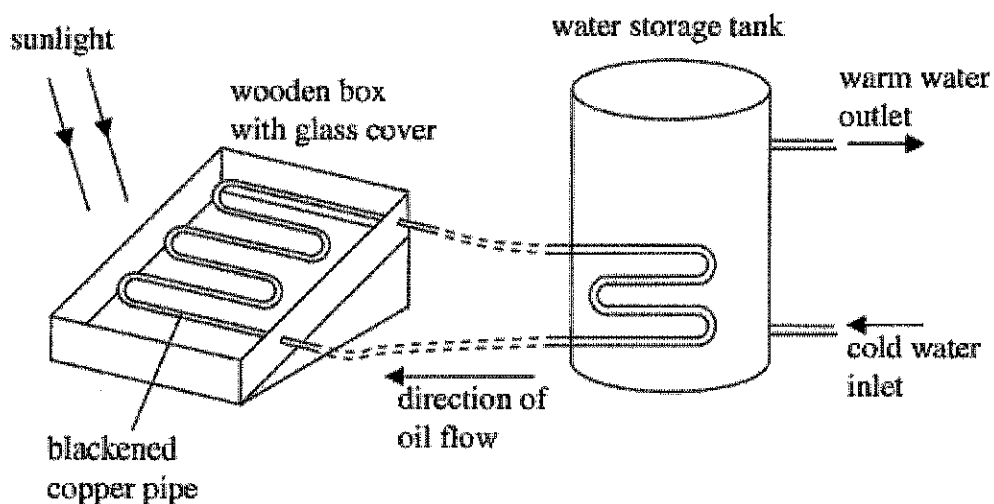


Fig. 13.1

- (a) Explain why the copper pipe inside the box is painted black.

[1]

- (b) Suggest 2 reasons why the wooden box is covered by a sheet of glass.

[2]

- (c) Explain why the oil circulates in the system in the direction as indicated in Fig. 13.1.

[2]

- (d) If the wooden box is sealed and made air-tight, how would the air pressure inside change when temperature increases? Explain briefly in terms of kinetic theory.

[3]

- (e) State and explain the process(es) by which water is heated in the storage tank.

[2]