

- 1 The approximate diameter of the earth is 13×10^6 m and the diameter of a nitrogen atom is 15×10^{-11} m.

How are these values expressed with prefixes?

	diameter of the Earth	diameter of nitrogen atom
A	1.3×10^{-2} Mm	1.5×10^{-1} μ m
B	1.3×10^{-2} Gm	1.5×10^{-1} μ m
C	1.3×10^{-2} Mm	1.5×10^{-1} nm
D	1.3×10^{-2} Gm	1.5×10^{-1} nm

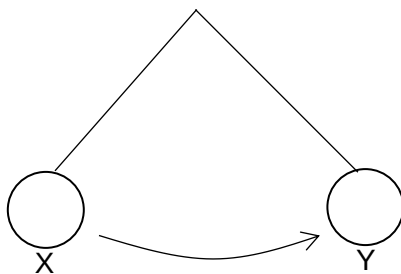
- 2 The list below shows several physical quantities.

length, acceleration, density, speed, velocity, time, mass

How many base quantities and scalar quantities are there?

	base quantities	vector quantities
A	2	2
B	2	5
C	3	2
D	3	5

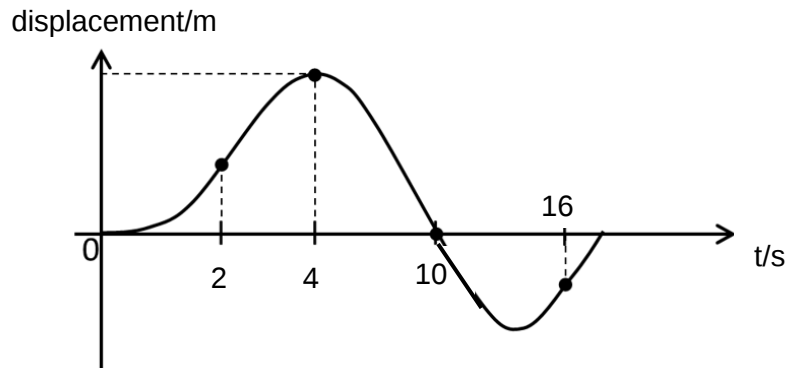
- 3 A pendulum makes 20 complete oscillations in 15 seconds.



What is the frequency of the oscillations?

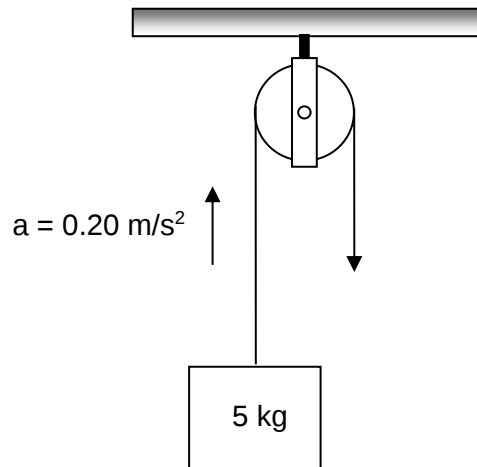
- A 0.75 Hz. B 1.33 Hz
C 1.50 Hz D 2.67 Hz

- 4 The displacement–time graph of a car is shown.



At what time does the car make a U-turn?

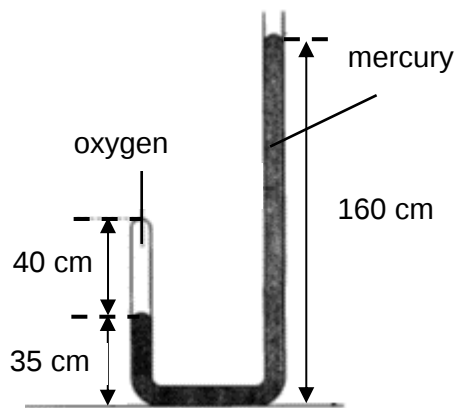
- A at 2 s B at 4 s **C at 10 s** D at 16 s
- 5 A pulley is used to lift a mass of 5.0 kg at an acceleration of 0.20 m/s^2 as shown.



What is the tension in the string?

- A 1.0 N B 10.0 N
C 50.0 N **D 51.0 N**
- 6 A car of mass 500 kg starts from rest on a level road. If the effective horizontal force from engine is 2000 N, determine the time taken for the car to reach a speed of 25 m/s? Assume that all frictional forces are negligible.
- A 3.13 s **B 6.25 s**
C 20.0 s D 78.0 s

- 7 Oxygen is compressed in the sealed end of a long J-tube by means of a column of mercury open to the atmosphere where atmospheric pressure is 76 cm Hg.



What is the pressure of oxygen acting on the mercury?

- A 120 cm Hg B 125 cm Hg
C 201 cm Hg D 236 cm Hg
- 8 Newton's third law of motion applies to an action-reaction pair of forces. Which statement concerning the pair of forces is **not** correct?
- A The two forces are acting on the same body.
B The two forces are acting on different bodies.
C The two forces are always opposite in direction.
D The two forces are at all times equal in magnitude.
- 9 Which pair of forces are contact forces?
- A gravitational force and air resistance
B magnetic force and air resistance
C normal force and friction
D tension and electrostatic force

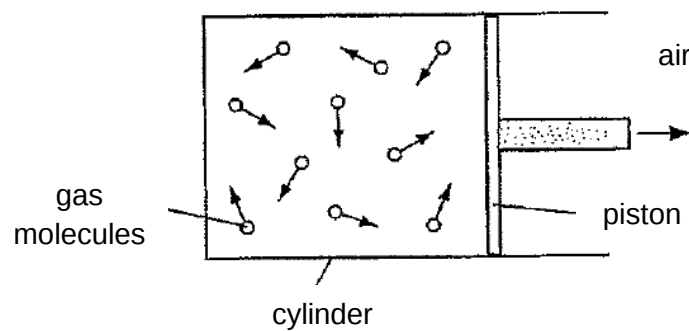
10 Which of the following is a renewable source of energy?

- A Coal
- B Natural gas
- C Petroleum
- D Tidal energy**

11 Which of the following objects has the highest inertia?

object	density / gcm^{-3}	volume / cm^3
A	6	4.6
B	9	3.6
C	14	2.6
D	18	1.6

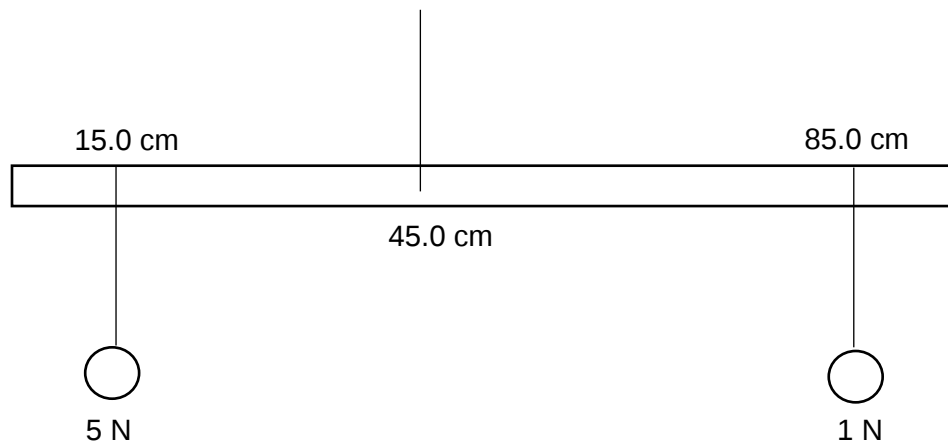
12 Gas inside a cylinder is heated slowly to a higher temperature. The pressure inside the cylinder remains constant as the piston moves outwards.



How do the speed of the gas molecules and their rate of collision with the piston compare with their initial values at the lower temperature?

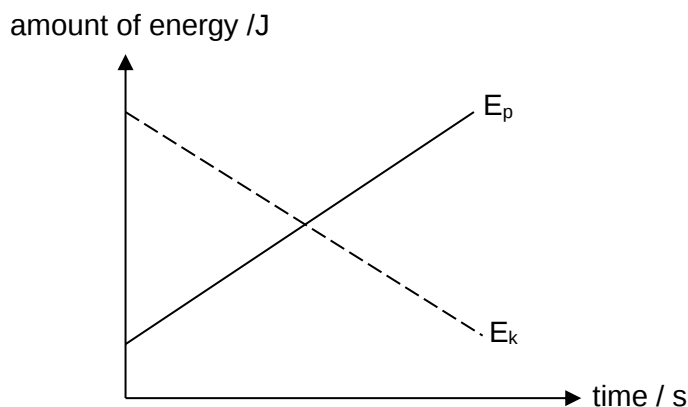
	rate of collision	speed of molecules
A	greater	greater
B	reduced	greater
C	same	greater
D	greater	same

- 13** The diagram shows a 4 N non-uniform metre rule suspended freely by a string at 45 cm mark. Two weights are hanging on the metre rule to keep it horizontal.



Which marking would indicate the position of centre of gravity of the metre rule?

- A** 2.5 cm **B** 27.5 cm **C** 42.5 cm **D** 72.5 cm
- 14** The change in the gravitational potential store (E_p) and kinetic store (E_k) possessed by an object was recorded and the results are shown below.



Which of the following **correctly** identifies the object?

- I A book falling off the table.
 - II A ball rolling across the floor.
 - III A ball that has been kicked upwards.
 - IV A car driving uphill at a constant speed.
- A** I only **B** III only
C III and IV only **D** II, III and IV only

- 15 An escalator carries 20 passengers of average mass of 60 kg. It travels 4.2 m in height in one minute each floor. What is the minimum power of the escalator for its operation to lift these passengers from the first floor to the third floor?

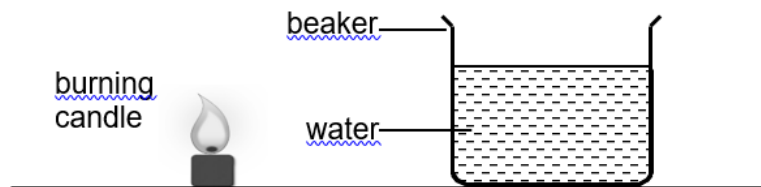
A 252 W
B 840 W
C 5040 W
D 50 400 W

- 16 Pollen grains are placed in a transparent illuminated box and water is added. The pollen grains are seen to move randomly on the surface of the water when viewed with a microscope.

What is the cause of the random motion of the pollen grains?

- A The pollen grains absorb light and this increase their kinetic store.
B The pollen grains are moving randomly because they have internal store.
C The pollen grains are moving randomly because they collide with the water molecules.
D The pollen grains are moving due to convection currents caused by the water being heated by the light.

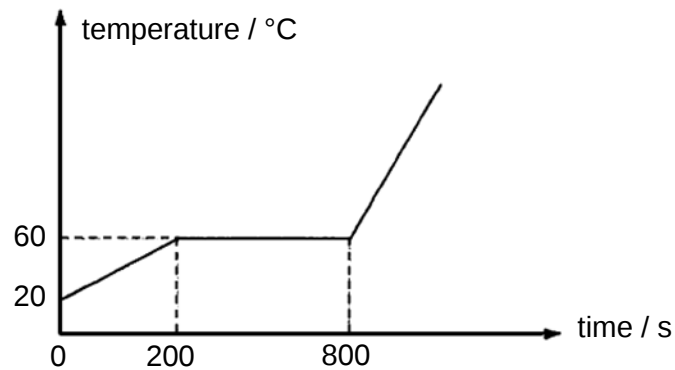
- 17 The diagram shows a beaker of water placed near a burning candle.



How does energy transfer from the candle to the water in the beaker?

- A convection and conduction
B convection and radiation
C radiation and conduction
D radiation and convection

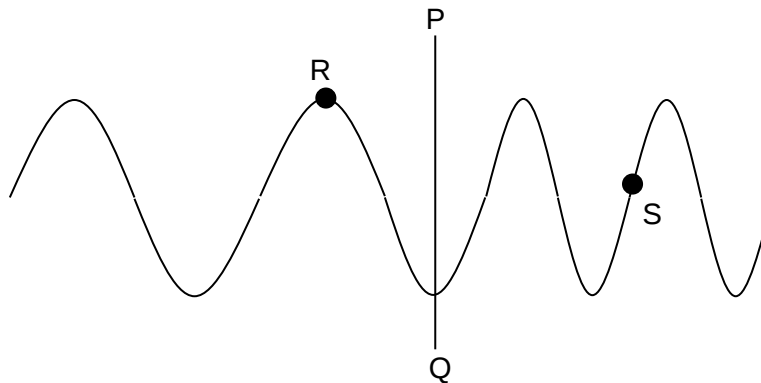
- 18 The diagram shows a graph of temperature against time when 0.50 kg of solid is being heated.



If heat energy is supplied to the solid at a constant rate of 175 W, what is the specific latent heat of fusion of the salt?

- A $5.3 \times 10^3 \text{ J/kg}$ B $7.0 \times 10^4 \text{ J/kg}$
C $2.1 \times 10^5 \text{ J/kg}$ D $2.8 \times 10^5 \text{ J/kg}$

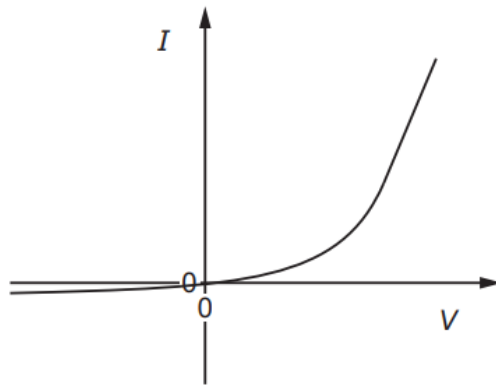
- 19 The diagram below shows a water wave in a ripple tank.



The wave has a speed of 16 cm/s at R. The water waves cross a boundary PQ where the distance between crests changes from 4.0 cm to 2.5 cm. What is the velocity of the wave at point S?

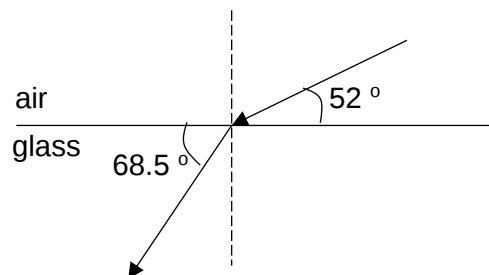
- A 6.4 cm/s B 10 cm/s
C 16 cm/s D 40 cm/s

- 20 The graph shows the I–V characteristic for a semiconductor diode



Which statement can be deduced from the graph?

- A Above a certain positive potential difference the diode obeys Ohm's law.
 - B Current is directly proportional to potential difference when the current in the diode is in one direction.
 - C The diode has zero resistance when the current in the diode is in one direction.
 - D The resistance of the diode depends upon the potential difference across it.**
- 21 The diagram below shows a light ray passing from air to glass.



What is the critical angle of the glass?

- | | | | |
|----------|--------------|----------|--------------|
| A | 34.5° | B | 36.5° |
| C | 49.4° | D | 57.9° |

- 22** Sound contains energy in different frequency ranges. Different animals can hear different frequency ranges of sound. The table shows information about some animals.

animal	frequency range / Hz
bird	250 – 21 000
dolphin	50 – 300 000
elephant	5 – 10 000
mouse	1 000 – 100 000

How many of the animals can detect ultrasound?

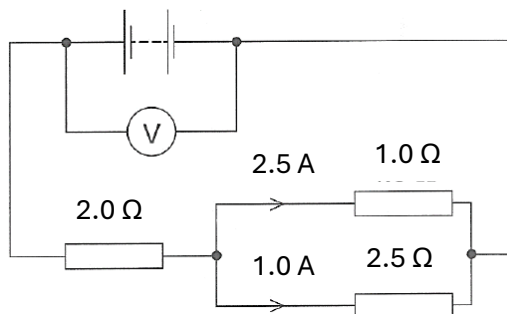
- A** 1 **B** 2 **C** 3 **D** 4
- 23** Part of the electromagnetic spectrum is shown.

radio wave	microwaves	P	visible light
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What is a possible application of P?

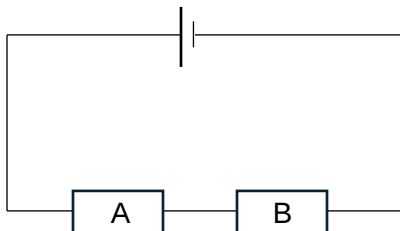
- A** cancer treatment **B** intruder alarm
C radar communication **D** sterilisation of medical equipment
- 24** Blocks of silver are made by pouring hot, liquefied silver into moulds. The silver cools to its melting point and begins to solidify. What happens to its temperature and its internal energy as it solidifies?
- A** Its temperature drops and its internal energy decreases.
B Its temperature drops and its internal energy remains unchanged.
C Its temperature remains constant and its internal energy remains unchanged.
D Its temperature remains constant and its internal energy decreases.

- 25 The circuit diagram shows a $2.0\ \Omega$ resistor connected in series with a parallel arrangement of a $1.0\ \Omega$ resistor and a $2.5\ \Omega$ resistor.



The currents in the two parallel resistors are shown.
What is the reading on the voltmeter?

- A 7.0 V B 5.0 V
C 9.5 V D 12.0 V
- 26 A 1.0 m length of wire, having a cross-sectional area of $0.40\ \text{mm}^2$, has a resistance of $2.0\ \Omega$.
What is the resistance of a 0.50 m length of wire (made of the same material), with a cross-sectional area of $0.80\ \text{mm}^2$?
- A 0.5 Ω B 1.0 Ω C 2.0 Ω D 8.0 Ω
- 27 In the following circuit, the voltage across resistor A is 2 V and the voltage across resistor B is 1 V.

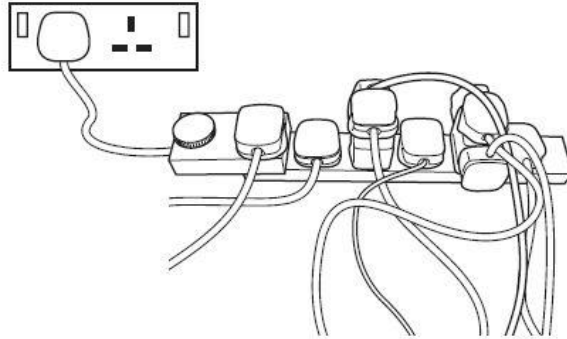


Which of the following statements is/are **correct**?

- 1 More charges pass through resistor A than resistor B in each second.
- 2 For each coulomb of charge, resistor A consumes 1 J of energy more than resistor B.
- 3 The current flowing in the circuit is 3 A.

- A 2 only B 1 and 2 only
C 2 and 3 only D 1, 2 and 3

- 28 The diagram shows an unsafe use of an extension cable.



What is the electrical hazard?

- A The danger of melting the fuse.
- B The danger of an electric shock.
- C The danger of overheating the cable.
- D The danger of burning out the appliances.

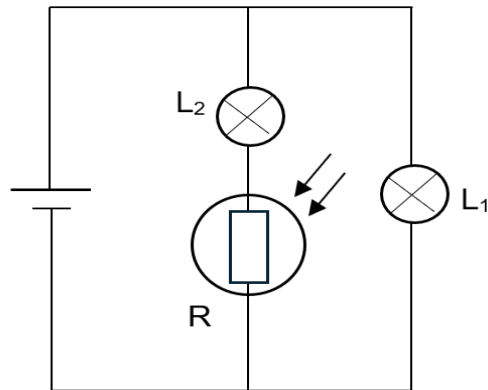
- 29 The cost of 1 kWh of electricity is 25 cents.

appliance	duration used	power rating
heater	2 h	3 kW
lamp	80 mins	100 W

What is the total cost when all the appliances are used for the duration shown?

- A 153 cents
- B 240 cents
- C 260 cents
- D 240 150 cents

- 30 In the circuit shown, R is a light-dependent resistor.

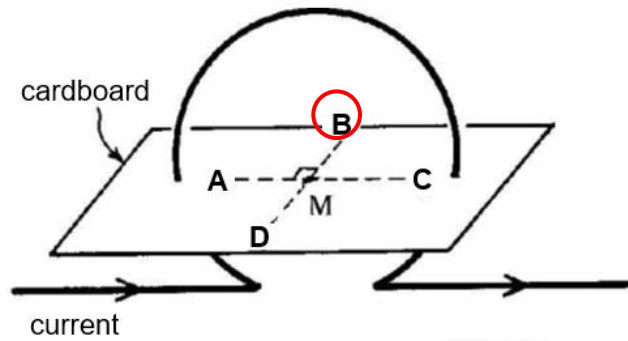


The light intensity on R increases. What happens to the brightness of the two lamps L_1 and L_2 ?

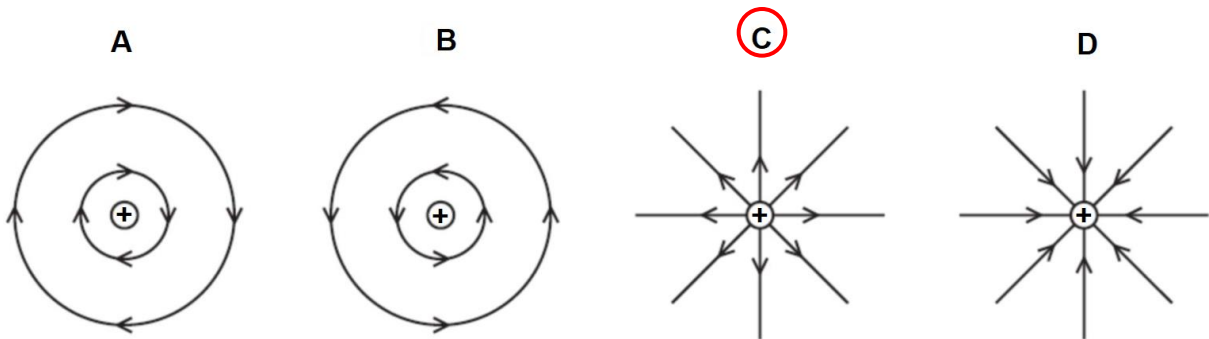
	L_1	L_2
A	decreases	decreases
B	decreases	increases
C	stays the same	decreases
D	stays the same	increases

- 31 End X of a metal rod attracts the S-pole of a compass needle. What does this show about the rod?
- A** It could be made of copper but is not permanently magnetized.
 - B** It could be made of copper with a N-pole at X.
 - C** It could be made of steel but may not be a magnet.
 - D** It could be made of steel with a S-pole at X.

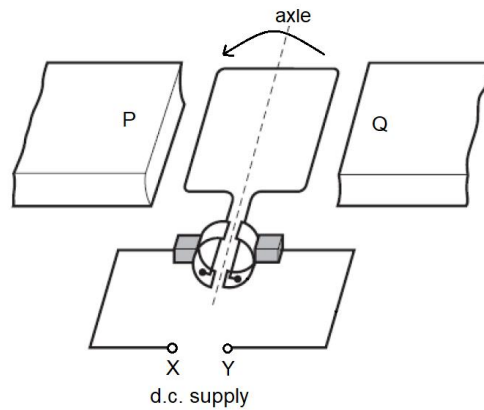
- 32 A compass is placed at point M on the cardboard as shown in the diagram below. In which direction will the north pole of the compass needle be pointing?



- 33 Which diagram shows the electric field pattern of an isolated positive point charge?



34 The diagram shows a simple d.c. motor.



The table shows some possible combinations of the polarity of the magnet and direction of current flowing in the armature.

	polarity of P,Q	direction of current
1	P is N-pole, Q is S-pole	Y to X
2	P is S-pole, Q is N-pole	Y to X
3	P is N-pole, Q is S-pole	X to Y

Which combination(s) will make the armature turn in the direction shown?

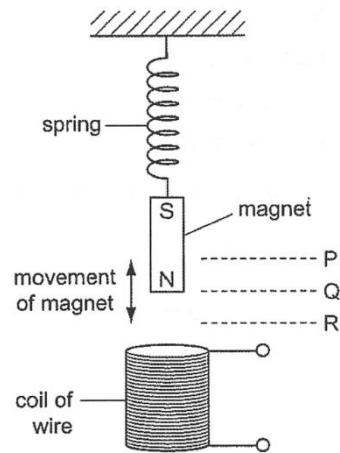
A 1 only

B 1 and 2

C 1 and 3

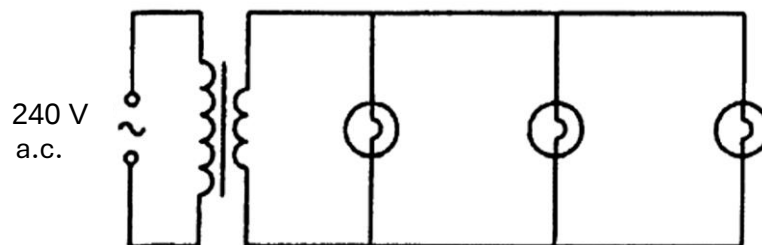
D 2 and 3

- 35 A magnet moves up and down above a coil of wire.



The bottom of the magnet moves up and down between P and R.
Where is the bottom of the magnet when there is no induced electromotive force (e.m.f.) in the coil?

- A at P and Q
 - B at P and R
 - C at Q only
 - D at R only.
- 36 A transformer as shown below is 80% efficient. Each light bulb is “12V 24W” and is working at the rated value.



What is the primary current in the circuit?

- A 0.13 A
- B 0.26 A
- C 0.30 A
- D 0.38 A

- 37** 150 kW of power is to be delivered from a power station at 25 kV via supply lines to a factory. The supply lines carry a total resistance of $8.0\ \Omega$. What is the power loss in the supply lines?

A 25.0 W **B** 48.0 W
C 78.1 W **D** 288 W

- 38** In an experiment to find the half-life of a radioactive isotope, the following results were obtained.

activity/counts per min	4100	2800	1900	1300	900	600
time/min	0	2	4	6	8	10

What is the approximate half-life of the isotope?

A 2 min **B** 4 min **C** 6 min **D** 10 min

- 39** Cs-137 is a radio-isotope used to determine the thickness of the walls of steel pipes. Cs-137 is chosen because it emits

A α -particles **B** β -particles
C γ -rays **D** microwaves

- 40** A nucleus consists of 90 protons and 144 neutrons. After emitting two beta particles followed by an alpha particle, this nucleus has

A 86 protons and 140 neutrons
B 86 protons and 142 neutrons
C 90 protons and 140 neutrons
D 90 protons and 142 neutrons

End of Paper 1