

Candidate Name _____

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**ANDERSON JUNIOR COLLEGE****2014 JC2 Preliminary Examination****PHYSICS****8866/01****Higher 1****Paper 1 Multiple Choice****Tuesday 2 September 2014****1 hour**

Additional materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Write your **name**, **class index number** and **PDG** in the spaces at the top of this page.

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

Write your **name**, **PDG**, **NRIC/FIN** and shade the **7 digits of your NRIC/FIN** in soft pencil on the Multiple Choice Answer Sheet.There are **thirty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Multiple Choice 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 question paper.

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

This document consists of **14** printed pages.

Data

speed of light in free space,	$c = 3.00 \times 10^8 \text{ m s}^{-1}$
elementary charge,	$e = 1.60 \times 10^{-19} \text{ C}$
the Planck constant,	$h = 6.63 \times 10^{-34} \text{ J s}$
unified atomic mass constant,	$u = 1.66 \times 10^{-27} \text{ kg}$
rest mass of electron,	$m_e = 9.11 \times 10^{-31} \text{ kg}$
rest mass of proton,	$m_p = 1.67 \times 10^{-27} \text{ kg}$
acceleration of free fall,	$g = 9.81 \text{ m s}^{-2}$

Formulae

uniformly accelerated motion,	$s = ut + \frac{1}{2} at^2$ $v^2 = u^2 + 2as$
work done on/by a gas,	$W = p\Delta V$
hydrostatic pressure,	$p = \rho gh$
resistors in series,	$R = R_1 + R_2 + \dots$
resistors in parallel,	$1/R = 1/R_1 + 1/R_2 + \dots$

1 Which of the following pairs of physical quantities are both vector quantities?

- A work done, electric current
- B work done, electric field strength
- C force, electric current
- D force, electric field strength

2 The diameter D of a sphere is measured to be 5.0 cm with a fractional uncertainty of 0.02. What is the absolute uncertainty and fractional uncertainty of the radius R of the sphere?

	absolute uncertainty of R	fractional uncertainty of R
A	0.05 cm	0.01
B	0.1 cm	0.01
C	0.05 cm	0.02
D	0.1 cm	0.02

3 The precision and accuracy of a measurement is affected by:

	precision	accuracy
A	Systematic error	Random error
B	Random error	Random error
C	Systematic error	Systematic error
D	Random error	Systematic error

4 Which estimate is realistic?

- A The power of a toaster is 500 kW.
- B The kinetic energy of a bus travelling on a highway is 500 kJ.
- C The temperature of a hot oven is 500 K.
- D The volume of an Olympic size swimming pool is 500 m³.

5 A golf ball travels with an initial speed v_0 and it went only one-third of the way to the hole. Assuming the force of resistance due to the grass remains the same, what new initial speed should the ball travel for the ball to go into the hole?

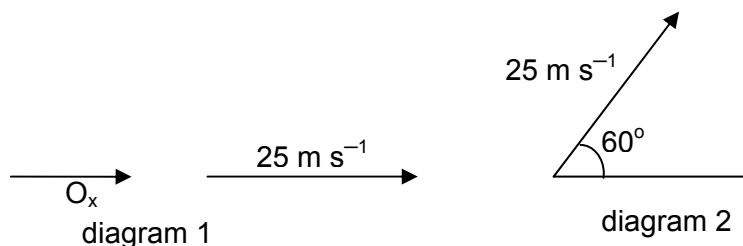
A $\sqrt{2}v_0$

B $\sqrt{3}v_0$

C $\sqrt{6}v_0$

D $3v_0$

- 6 A particle has an initial velocity of 25 m s^{-1} in the O_x direction, as shown in diagram 1. At a later time its velocity is 25 m s^{-1} at an angle of 60° to O_x (diagram 2). (Directions are indicated by measuring angles anticlockwise from the direction O_x .)



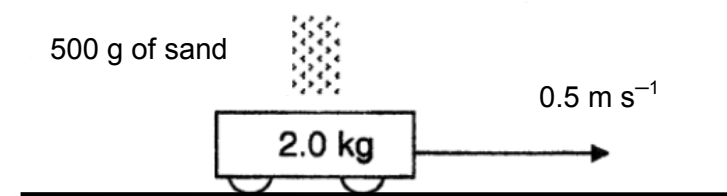
The change of velocity that has taken place in this interval is

- A zero.
 B 167 m s^{-1} at an angle of 30° to O_x .
 C 25 m s^{-1} at an angle of 120° to O_x .
 D 167 m s^{-1} at an angle of 210° to O_x .
- 7 An aeroplane flying in a straight line at a constant height of 500 m with a speed of 200 m s^{-1} drops an object. The object takes a time t to reach the ground and travels a horizontal distance d in doing so.

Taking g as 10 m s^{-2} and ignoring air resistance, which one of the following gives the values of t and d ?

	t/s	d/km
A	10	2
B	10	5
C	25	5
D	25	10

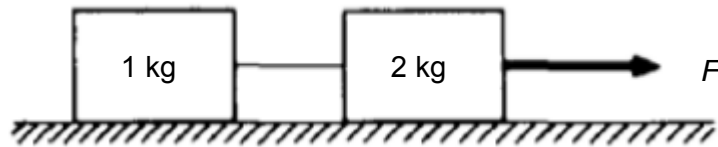
- 8 The diagram shows a trolley moving on a frictionless horizontal table at a speed of 0.5 m s^{-1} . 500 g of sand is then released onto the trolley.



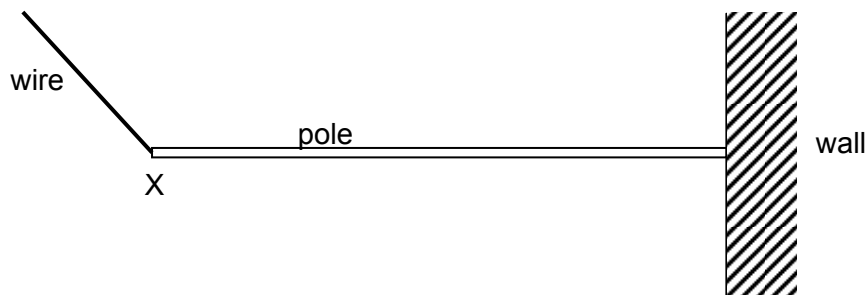
What is the change in the momentum of the trolley?

- A zero B 0.15 N s C 0.20 N s D 1.80 N s

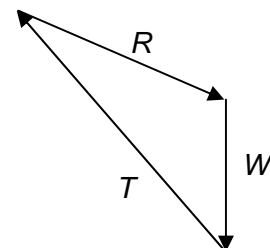
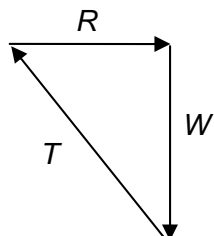
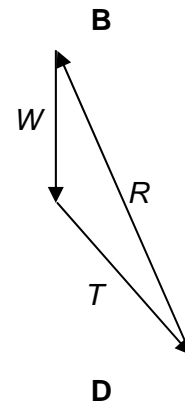
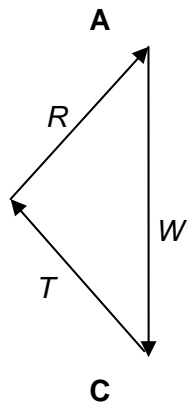
- 9 When the frictionless system shown below is accelerated by an applied force of magnitude, F . What is the tension in the string between the blocks?



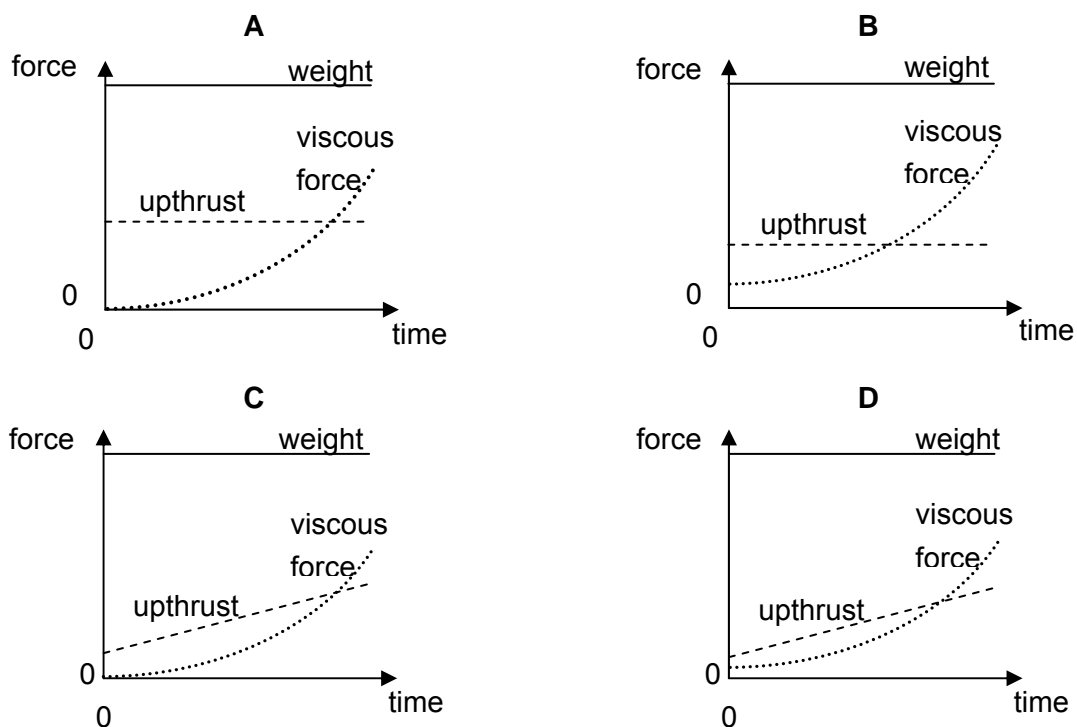
- A $\frac{1}{3}F$ B $\frac{1}{2}F$ C F D $2F$
- 10 A pole of weight W is attached to a wall. It is held horizontal by a wire attached at point X of the pole where T is the force of the wire. The pole experiences a reaction force R from the wall.



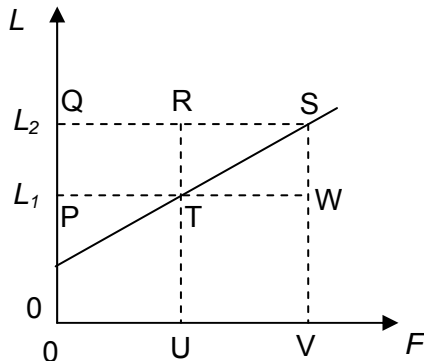
Which triangle of forces could correctly represent the three forces acting on the pole?



- 11 A ball bearing was released from rest in a viscous liquid. Which of the following graphs would represent the variation of the forces acting on the ball bearing with time?



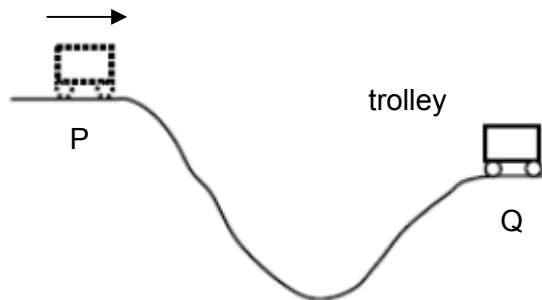
- 12 The diagram below shows the variation with force F of the length L of a spring.



Which area represents the work done by the spring when its length changes from L_1 to L_2 ?

- A STUVS
- B STWS
- C PQSTP
- D RSTR

- 13** A man lifts a 10 kg sack of rice from a ground to above his head using his both hands. The sack of rice does not experience a change in kinetic energy between the two positions. Which of the following statement is correct?
- A** The work done on rice sack by gravity is less than the work done on rice sack by man.
- B** The work done on rice sack by gravity is more than the work done on rice sack by man
- C** The work done on rice sack by gravity is equal to the work done on rice sack by man.
- D** There is no work done on the rice sack.
- 14** A motor driving a pump raises 0.10 m^3 of water through a vertical height of 5.0 m in a time of 10 minutes. If the efficiency of the pump is 60%, what is the power generated by the motor? (Take the density of water to be 1000 kg m^{-3})
- A** 4.9 W **B** 8.2 W **C** 14 W **D** 82 W
- 15** A trolley moves along a track from P to Q, as shown in the diagram. The trolley has a kinetic energy of 5 kJ at P. Its potential energy at Q is 40 kJ less than at P. The work it does against friction from P to Q is 10 kJ.

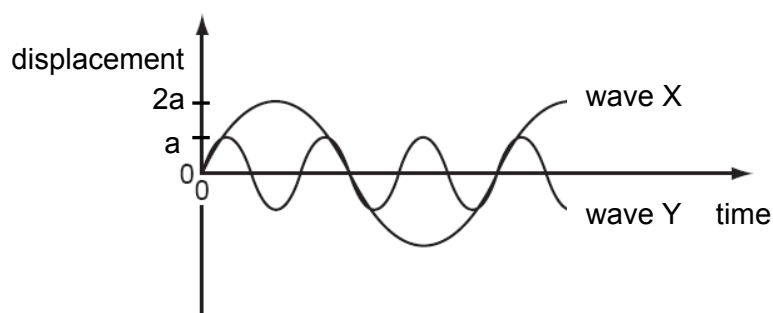


The kinetic energy of the trolley at Q is

- A** 30 kJ **B** 35 kJ **C** 45 kJ **D** 55 kJ
- 16** The period of a radio wave is $0.011 \mu\text{s}$.
What is the wavelength of the wave?
- A** $3.6 \times 10^{-3} \text{ m}$ **B** 3.3 m **C** 3.6 m **D** $3.3 \times 10^3 \text{ m}$

- 17 The intensity of a progressive wave, besides being dependent on the amplitude of the wave, is also proportional to the square of the frequency.

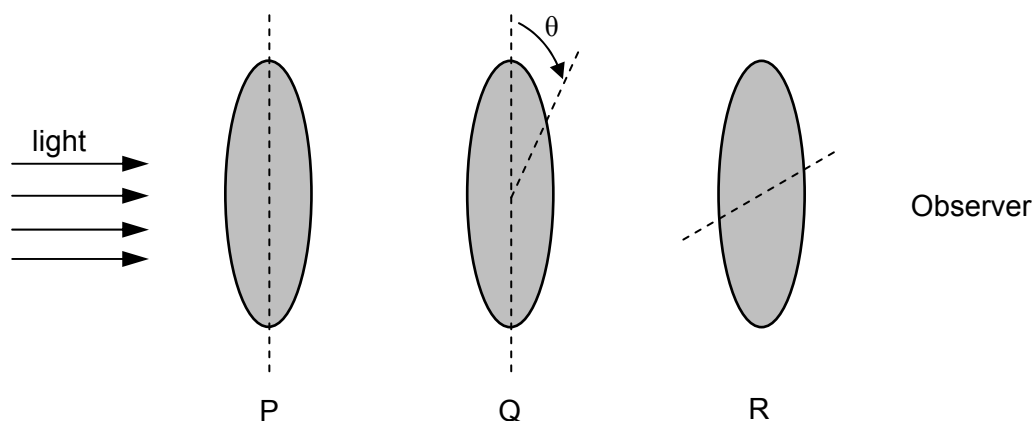
The diagram shows two waves X and Y.



The intensity of wave X is I_0 .

What is the intensity of wave Y?

- A $0.028 I_0$ B $0.11 I_0$ C $0.44 I_0$ D $2.25 I_0$
- 18 Polaroids P, Q and R are aligned such that the axes of polarisation of P and Q are aligned to each other and the axis of polarisation R is perpendicular to that of P and Q as shown.

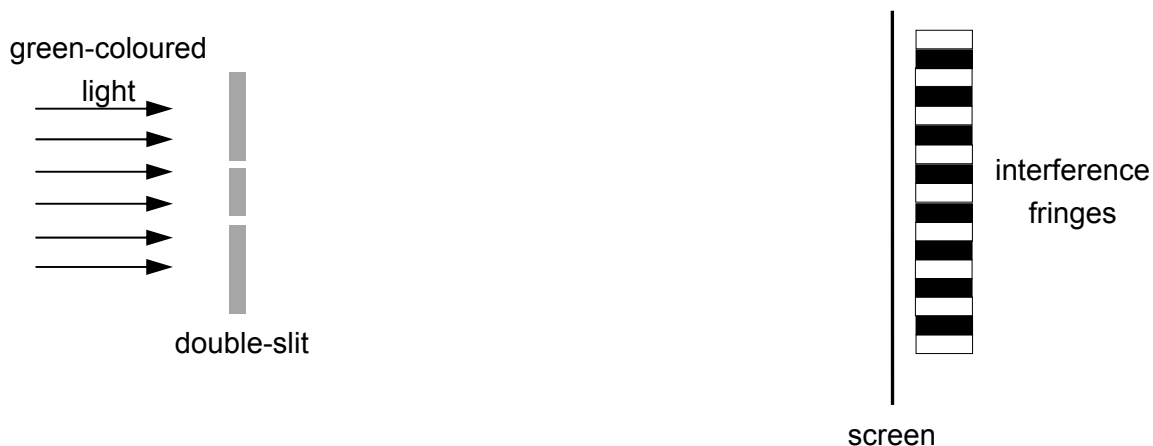


Polaroid Q is then rotated about its centre through an angle θ until its axis of polarisation is aligned with that of R.

Which of the following describes the change in light intensity seen by the observer?

- A Light intensity remains zero all the time.
- B Light intensity was maximum initially and decreases to zero.
- C Light intensity decreases to zero and then increases back to maximum.
- D Light intensity increases to maximum and then decreases back to zero.

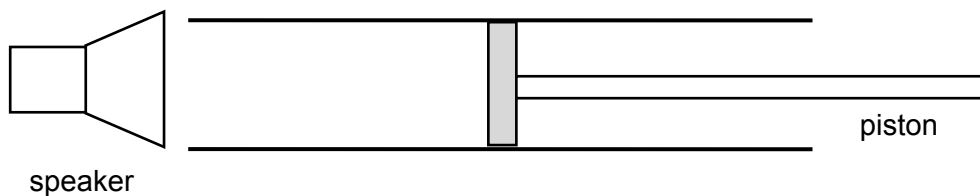
- 19** A double-slit interference of green-coloured light was set up as shown and interference fringes are formed on the screen.



Which change would increase the distance between adjacent fringes?

- A** Use orange-coloured light.
 - B** Reduce the width of each slit.
 - C** Use a double-slit where the slits are further apart.
 - D** Move the double-slit closer to the screen.
- 20** Which statement is true for standing waves?
- A** Energy is transferred through the wave.
 - B** All points in the wave vibrate in phase.
 - C** The wavelength of the wave is the distance between adjacent nodes.
 - D** Neighbouring points in the wave have different amplitudes of vibration.

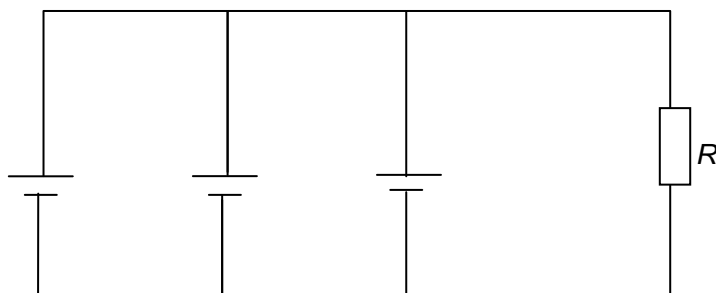
- 21 A speaker producing sound of frequency 2500 Hz is placed at the open end of a closed pipe containing a gas.



As the piston is moved along the pipe, a series of 6 loud sounds was heard. The first loud sound was observed when the piston was 4.0 cm away from the open end, and the sixth loud sound was observed when the piston was 37 cm away from the open end.

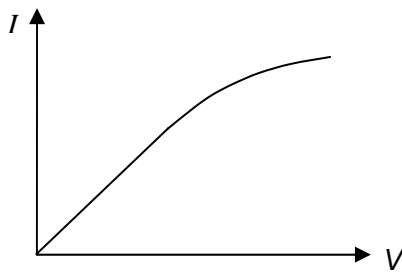
What is the speed of sound in the gas?

- A 270 m s⁻¹ B 330 m s⁻¹ C 370 m s⁻¹ D 400 m s⁻¹
- 22 Three identical electrical sources each with internal resistance r are used to operate a lamp of resistance R as shown in figure below.
What fraction of the total power is lost due to the internal resistance of the sources?

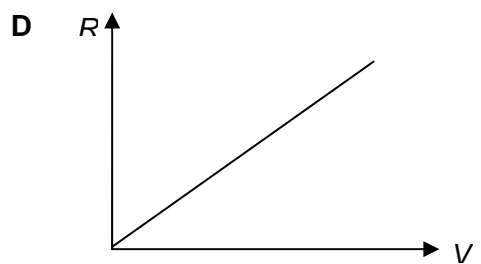
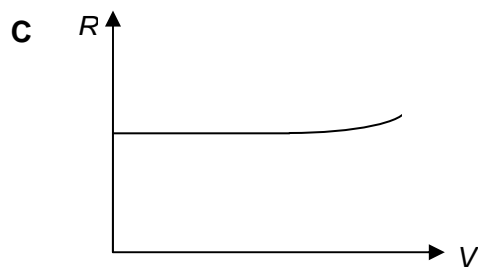
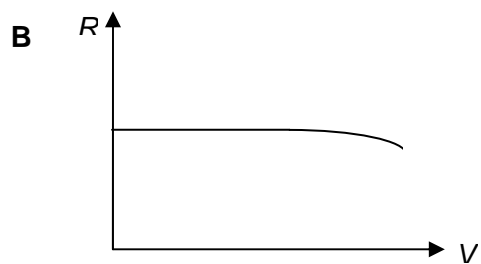
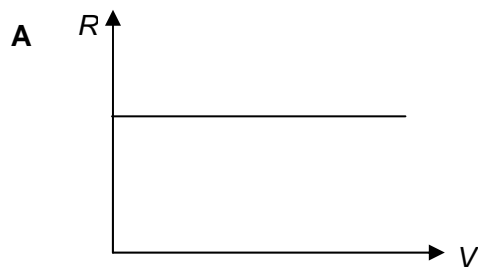


- A $\frac{3R+r}{3R}$
- B $\frac{3R-r}{3R}$
- C $\frac{r}{3R+r}$
- D $\frac{3R}{3R+r}$

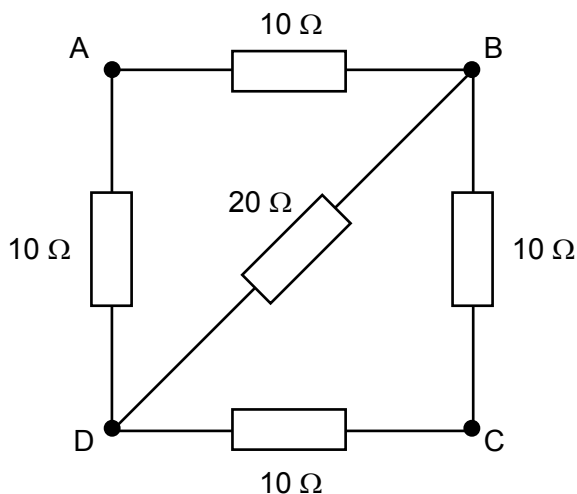
- 23 The current I flowing through a component varies with the potential difference V across it as shown.



Which graph best represents how the resistance R varies with V ?

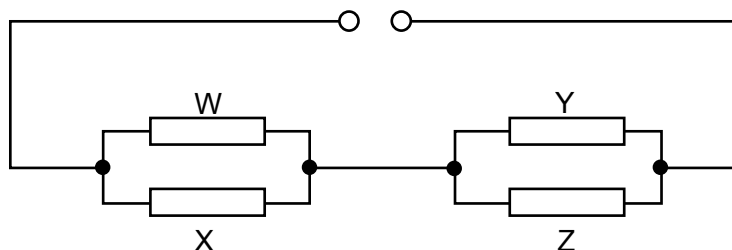


- 24 In the circuit shown, four identical resistors of resistance $10\ \Omega$ are connected in a square with a $20\ \Omega$ resistor connected across the diagonal. A fixed power supply is connected across BD.



How will the power to the circuit change if the fixed power supply is connected across AB instead?

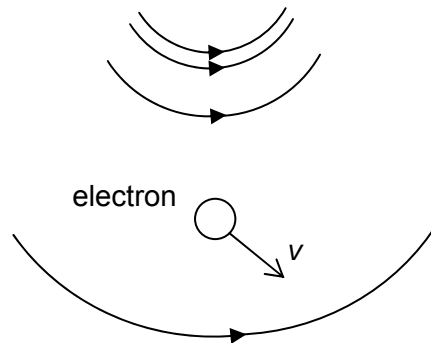
- A The power will remain the same.
 - B The power will decrease.
 - C The power will increase.
 - D Not enough information to determine how the power will change.
- 25 Four resistors of equal values are connected as shown.



How will the current through the resistors change when resistor W is removed?

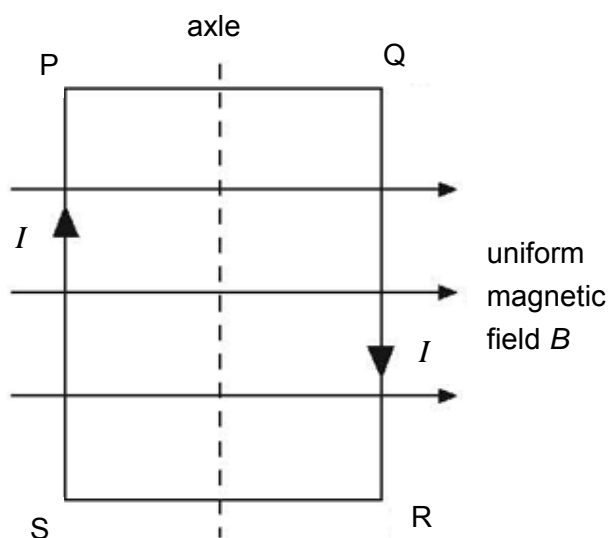
- A The current through X will increase and the currents through Y and Z will decrease.
- B The current through X will decrease and the currents through Y and Z will increase.
- C The current through X will increase and the currents through Y and Z will remain unaltered.
- D The currents through X, Y and Z will all decrease.

- 26 An electron moves with a velocity v in a non-uniform magnetic field. The diagram shows the motion of the electron in the region of the magnetic field at a particular instant in time.



What is the direction of the force acting on the electron at this instant?

- A Upwards towards the top of the paper.
 - B In the same direction as the velocity of the electron.
 - C Out of the plane of the paper.
 - D Into the plane of the paper.
- 27 A coil PQRS mounted on an axle, has its plane parallel to the flux lines of a uniform magnetic field B , as shown.



When a current I is switched on, and before the coil is allowed to move,

- A there are no forces due to B on the sides SP and QR.
- B there are no forces due to B on the sides PQ and RS.
- C sides SP and QR tend to attract each other.
- D sides PQ and RS tend to attract each other.

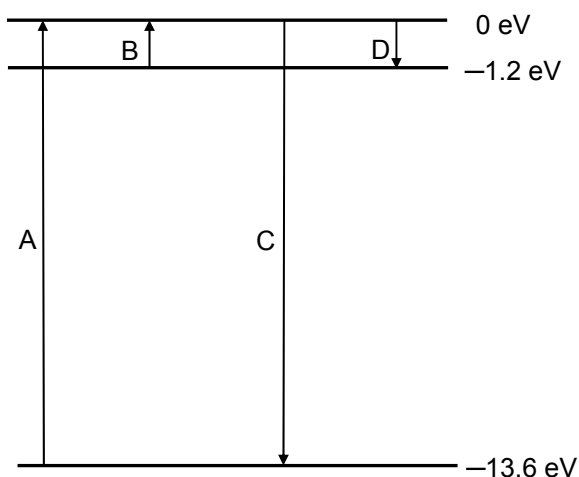
- 28** In an experiment to investigate the photoelectric effect, monochromatic light is incident on a metal surface. The photoelectric current and the maximum kinetic energy of the photoelectrons are measured.

Which one of the following correctly shows the change, if any, in the photoelectric current and in the maximum kinetic energy of the photoelectrons when light of the same intensity but higher frequency is incident on the same metal surface?

	photoelectric current	maximum kinetic energy
A	decreases	no change
B	decreases	increases
C	no change	decreases
D	no change	increases

- 29** The diagram below shows some possible electron transitions between three principal energy levels in the hydrogen atom.

Which transition is associated with the absorption of a photon of the longest wavelength?



- 30** According to the de Broglie hypothesis, matter waves are associated with
- A** electrons only
 - B** charged particles only
 - C** neutral particles only
 - D** all particles

