RIVER VALLEY HIGH SCHOOL
YEAR 6 PRELIMINARY EXAMINATIONS II

H1 PHYSICS 8866
PAPER 1
26 SEPTEMBER 2016

1 HOUR

CANDIDATE NAME									
CENTRE NUMBER	S					**INDEX NUMBER**				
CLASS	6								

INSTRUCTIONS TO CANDIDATES

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Read these notes carefully.
Write your name, centre number, index number and class in the spaces at the top of this page and on all the Answer Sheet.

*There are **forty** 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 **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 on the Question Paper.
The use of an approved scientific calculator is expected where appropriate.

The total number of marks for this paper is **30**.

This document consists of **17** printed pages.

Data

speed of light in free space,	c	=	3.00×10^{8} m s^{-1}
elementary charge,	e	=	1.60×10^{-19} C
the Planck constant,	h	=	6.63×10^{-34} J s
unified atomic mass constant,	u	=	1.66×10^{-27} kg
rest mass of electron,	m_e	=	9.11×10^{-31} kg
rest mass of proton,	m_p	=	1.67×10^{-27} kg
acceleration of free fall,	g	=	9.81 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,	$R = R_1 + R_2 + \ldots$
resistors in parallel,	$1/R = 1/R_1 + 1/R_2 + \ldots$

For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the one you consider to be correct.

1 Which of the following contains one base unit and one derived unit?

A	ampere	kilograms
B	ampere	coulomb
C	joule	newton
D	joule	coulomb

2 A digital multimeter is used to measure the current in a circuit. The reading in the multimeter is found to fluctuate between 1.98 A and 2.02 A. It is specified in the instrument that it has a uncertainty of ± 1 %.

Which value of the current should be recorded by the student?

A (2.00 ± 0.04) A

B (2.00 ± 0.03) A

C (2.00 ± 0.02) A

D (2.00 ± 0.01) A

3 In an experiment to determine the acceleration of free fall using a falling body, what would lead to a value that is larger than actual?

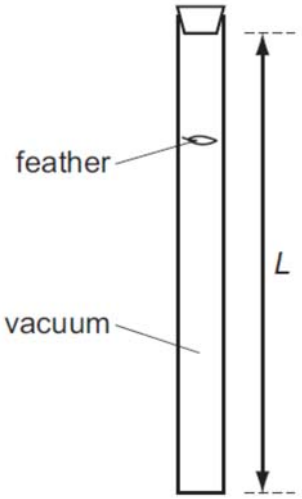
A presence of air resistance

B dimensions of the body are too large

C measured time longer than true time

D measured distance longer than true distance

4 The diagram shows a laboratory experiment in which a feather falls from rest in a long evacuated vertical tube of length *L*.



The feather takes time *T* to fall from the top to the bottom of the tube.

How long will the feather take to fall 0.50 *L* from the top of the tube?

A 0.13 *T*

B 0.25 *T*

C 0.50 *T*

D 0.71 *T*

5 A ball is thrown vertically upward at time $t = 0$. It reaches a height *h* and returns to its original position at $t = 4.0$ s.

What is its displacement at time $t = 1.5$ s ?

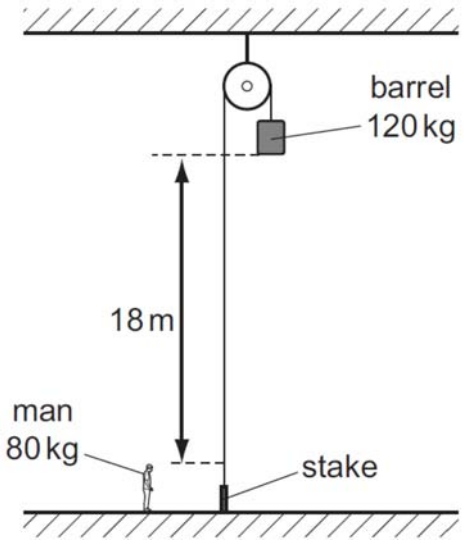
A 0.5 *h*

B 0.75 *h*

C 0.83 *h*

D 0.94 *h*

6 The diagram shows a barrel suspended from a frictionless pulley on a building. The rope supporting the barrel goes over the pulley and is secured to a stake at the bottom of the building.



A man stands close to the stake. The bottom of the barrel is 18 m above the man's head. The mass of the barrel is 120 kg and the mass of the man is 80 kg.
The man keeps hold of the rope after untying it from the stake and is lifted upwards as the barrel falls.

What is the man's upward speed when his head is level with the bottom of the barrel?

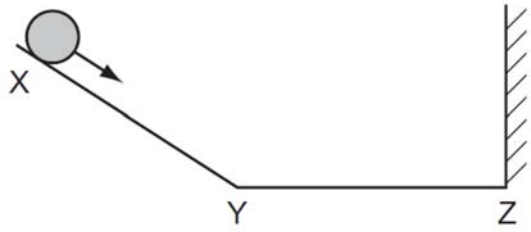
A 5.2 m s^{-1}

B 5.9 m s^{-1}

C 9.4 m s^{-1}

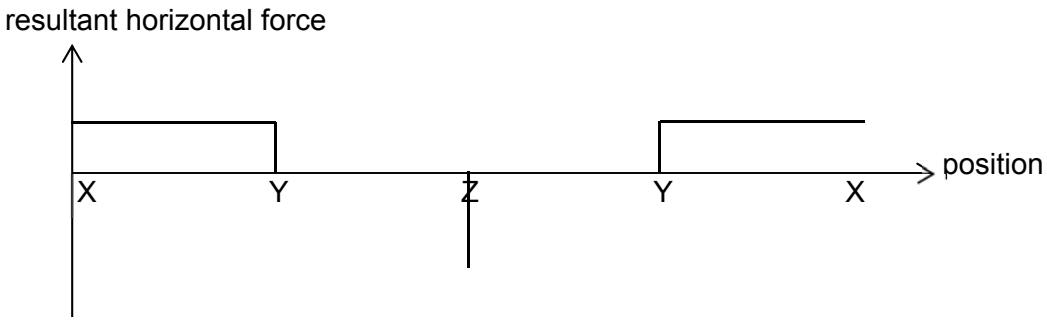
D 10 m s^{-1}

7 A ball is released from rest on a smooth slope XY.
It moves down the slope, along a smooth horizontal surface YZ and rebounds at Z.
Then it moves back to Y and comes to rest momentarily somewhere on XY.

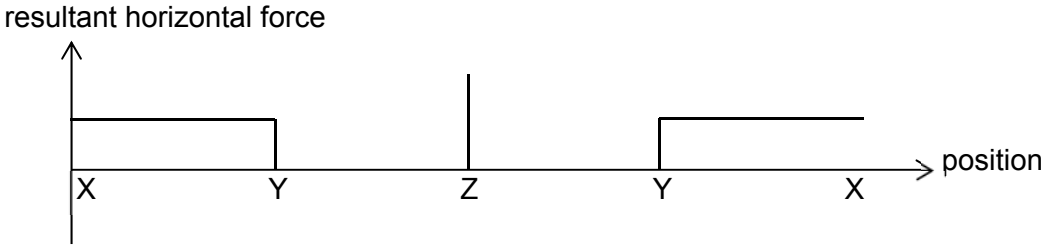


Which graph represents the resultant horizontal force on the ball?

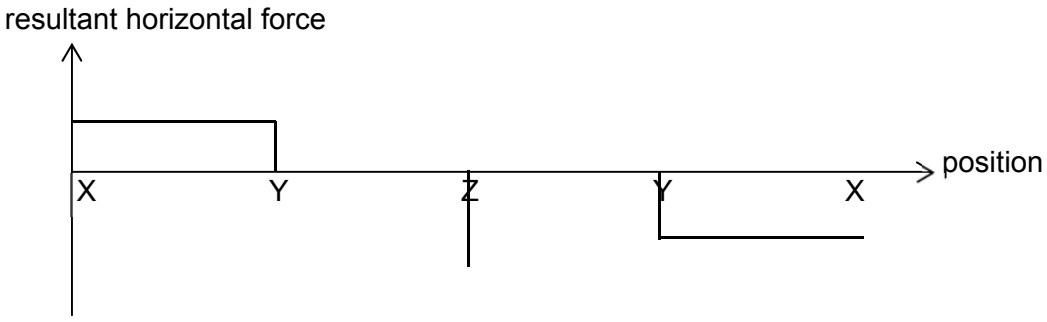
A



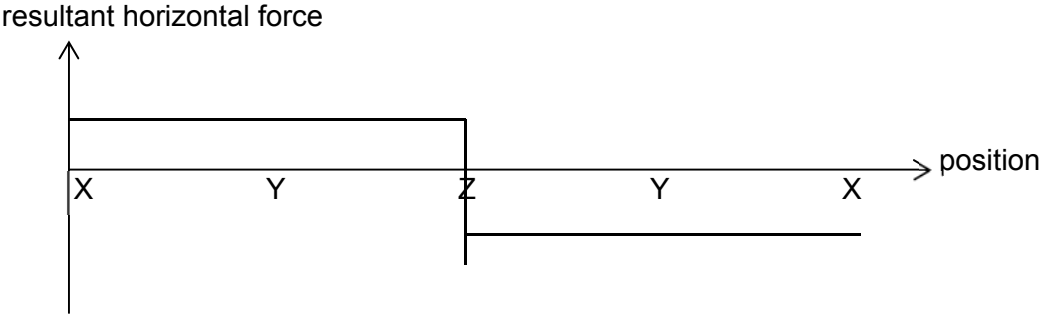
B



C

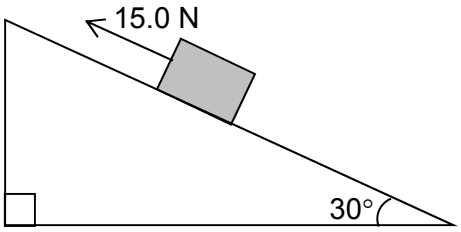


D



8 A block of mass 2.0 kg moves up a slope at constant speed when a force of 15.0 N is applied to it as shown below. The force is parallel to the slope. When the force of 15.0 N is removed, the block slows down to a rest.

What will be its subsequent motion ?



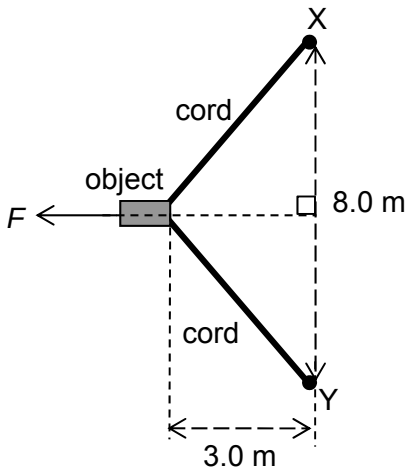
A It remains at rest on the slope.

B It slides down with a constant speed.

C It slides down with an acceleration of 2.3 m s^{-2}.

D It slides down with an acceleration of 4.9 m s^{-2}.

9 Two elastic cords are attached to an object resting on a smooth horizontal surface. The other ends of the cords are attached to fixed supports X and Y at a distance 8.0 m apart. Each of the cords has a force constant of 2.0 N m^{-1} and of original length 4.0 m. When a force *F* is applied to the object through a line of action cutting the midpoint of XY, the cords stretch to a length such that the object rests in equilibrium.



What is the force *F* ?

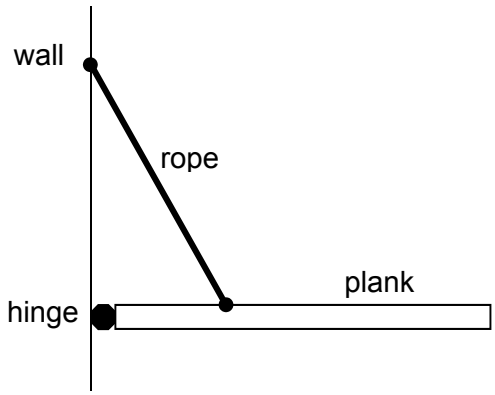
A 2.4 N

B 3.0 N

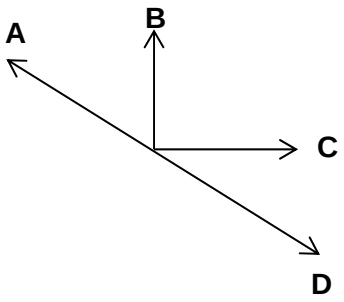
C 4.8 N

D 12 N

10 A uniform plank is held horizontally by a rope and a hinge as shown below.



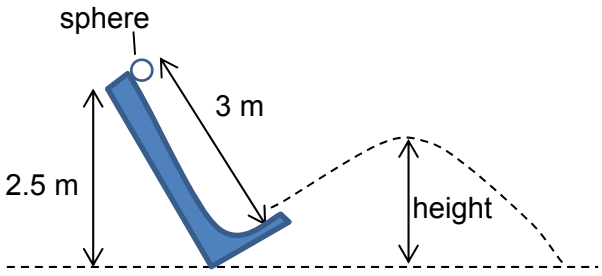
Which arrow could represent the direction of the force the hinge exerts on the plank ?



11 A sphere is released from rest at the top of a smooth incline 3.0 m long and at a height of 2.5 m from the ground. When it reaches the end of the incline, it projects out and lands somewhere on the ground.

If there is no loss of mechanical energy (gravitational and kinetic energy), what is the maximum height it can reach before touching the ground?

Assume air resistance and friction are negligible.



A Less than 2.5 m

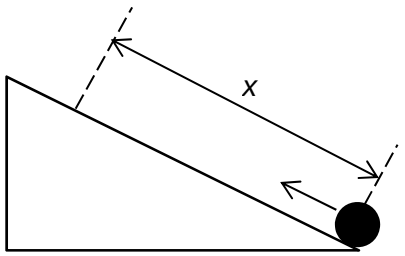
B 2.5 m

C Between 2.5 m and 3.0 m

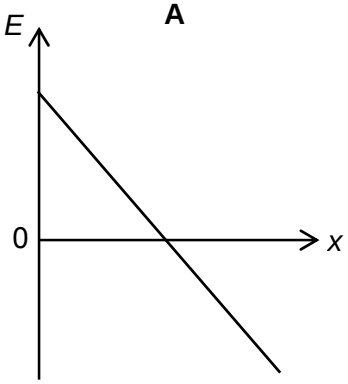
D 3.0 m

12 A small object placed at the bottom of a smooth slope is given a momentary force up the slope.

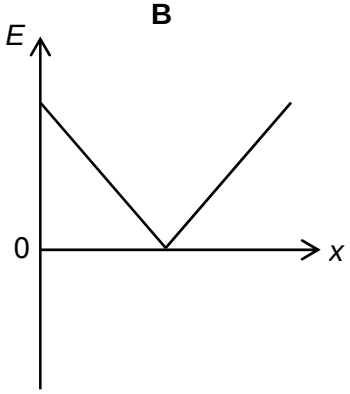
Which of the following shows the variation of its kinetic energy E with the distance x as it goes up and then down the slope?



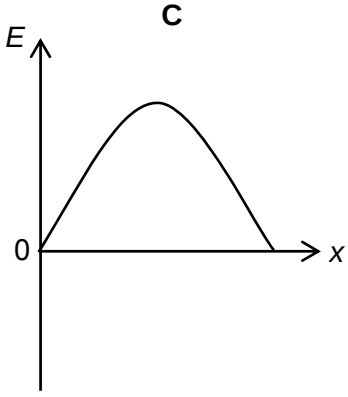
A



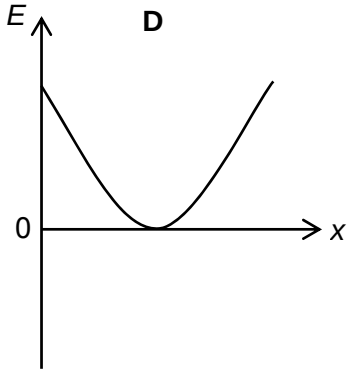
B



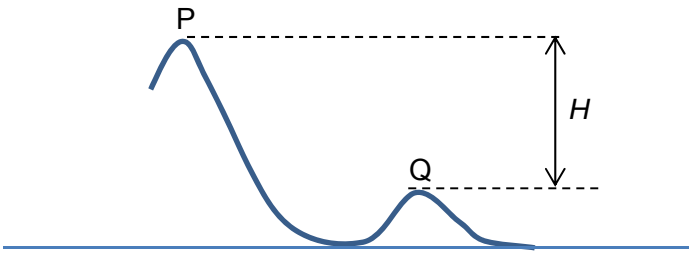
C



D



13 A cart of mass 5.0 kg rolls along a track and reaches point P with a speed of 2.0 m s^{-1}. When it reaches point Q, its speed increases by 8 times. The total work done against resistive forces from P to Q is 200 J.



What is the difference in the height *H* of the two points P and Q ?

A 7.1 m

B 12.8 m

C 14.1 m

D 16.9 m

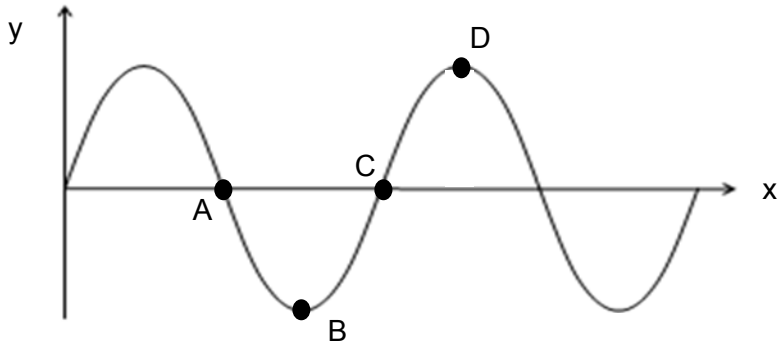
14 Given that the average solar intensity on Earth is 1300 W m^{-2}, what is the amount of solar radiation incident on Mars?

Earth's distance away from Sun:	150 million km
Mars' distance away from Sun:	230 million km
Earth's radius:	6400 km
Mars' radius:	3400 km

A 2.0×10^{10} W **B** 4.0×10^{10} W **C** 2.0×10^{16} W **D** 4.0×10^{16} W

15 The figure below shows variation of the distance *x* along a sound wave of displacement *y* of particles in the wave.

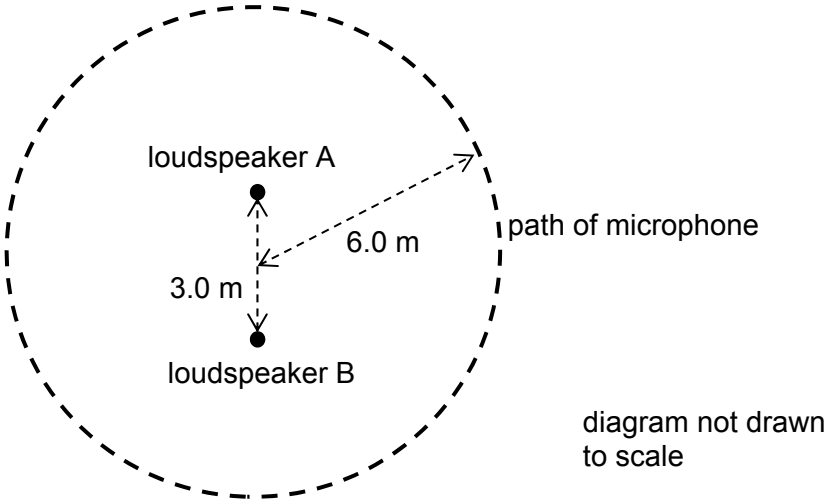
Given that the wave is moving to the right at the instant shown, and that displacement to the right is defined as positive, which of the points shows a region of compression?



16 Two plane-polarised waves with amplitude x_0 have their planes of polarization perpendicular to each other.
What is the difference in amplitudes of the resultant waves when they meet in phase and out of phase?

A zero **B** 0.707 x_0 **C** x_0 **D** 1.41 x_0

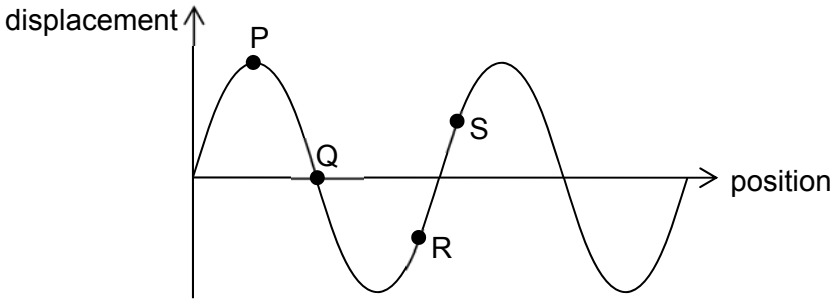
17 Two small and identical loudspeakers are placed 3.0 m apart. The loudspeakers are in phase and emit sound of wavelength 1.0 m uniformly in all directions.



A microphone is moved in a circular path for one complete round of radius 6.0 m.
How many maxima will be detected?

A 8 **B** 10 **C** 12 **D** 14

18 A transverse wave travels from left to right. The diagram below shows how, at a particular instance of time, the displacement of the particles P, Q, R and S in the medium varies with their positions.



Which of the following statements about the particles is correct?

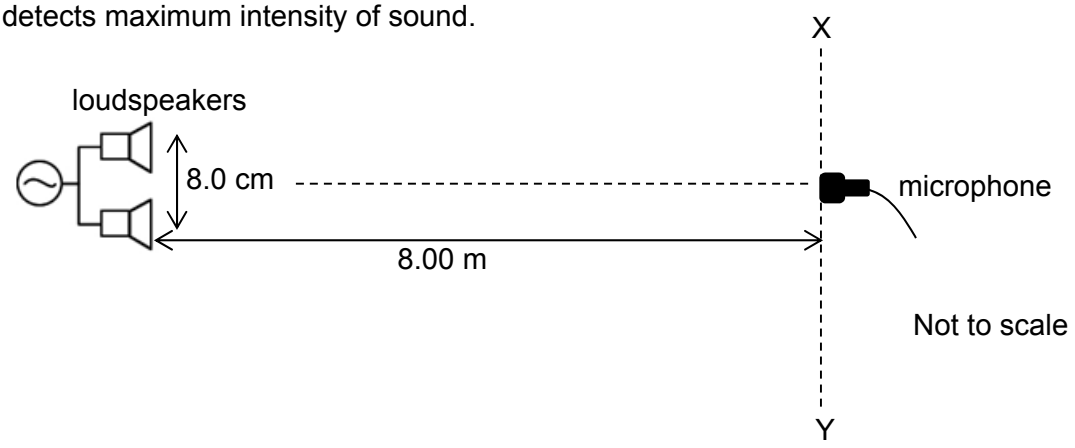
A R has a larger velocity than Q.

B P and Q are instantaneously at rest.

C Both R and S are moving downwards.

D P has maximum amplitude and Q has minimum amplitude.

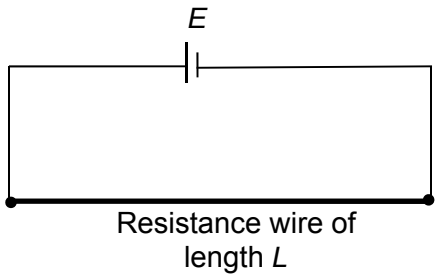
19 Two identical loudspeakers, connected to the same signal generator, produces sound of frequency 20 kHz. The loudspeakers are 8.0 cm apart and 8.00 m away from a line XY parallel to the loudspeakers. A microphone placed equidistant from the 2 loudspeakers detects maximum intensity of sound.



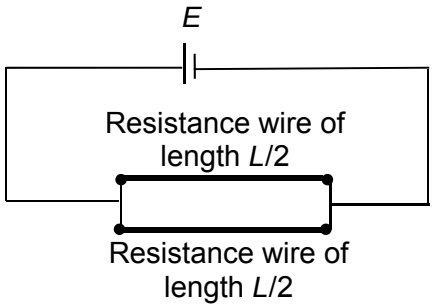
Taking the speed of sound in air to be 340 m s^{-1}, how far must the microphone move along XY in order to detect the first minimum intensity?

A 0.017 m **B** 0.85 m **C** 1.70 m **D** 3.40 m

20 A piece of resistance wire of resistivity ρ and length L has resistance R . It is connected to a cell of electromotive force E of negligible resistance.

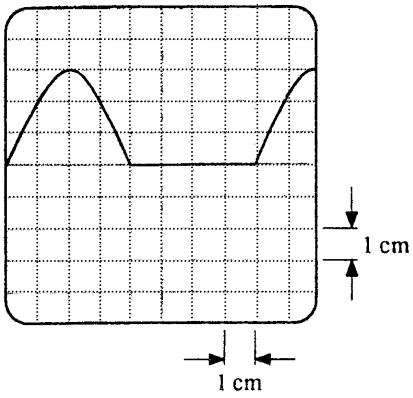


When the wire is cut into two and connected in parallel as shown below, what is the resistivity of both the wires and the effective resistance in the circuit?



	Resistivity	**Effective resistance**
A	ρ	R
B	ρ	R / 4
C	ρ / 2	R
D	2 ρ	R / 4

21 A voltage source connected to a c.r.o. has the following display on its screen.



The voltage setting is 4.0 V cm^{-1} and the time base is 40 μs cm^{-1}.
Which of the following shows the correct values of the source's voltage and its frequency?

	Peak voltage / V	**frequency / Hz**
A	3.0	3.2×10^{-4}
B	12.0	3.1×10^{3}
C	3.0	3.1×10^{3}
D	12.0	3.2×10^{-4}

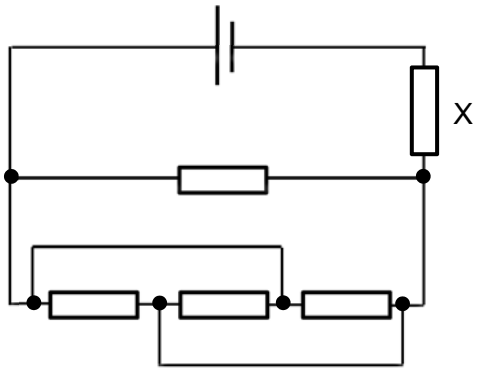
22 Two wires A and B of the same material are connected in parallel to a battery. The length of A is half that of B and it has half the radius of B.

What fraction of the total current passes through A?

A 0.33 **B** 0.50 **C** 0.67 **D** 0.75

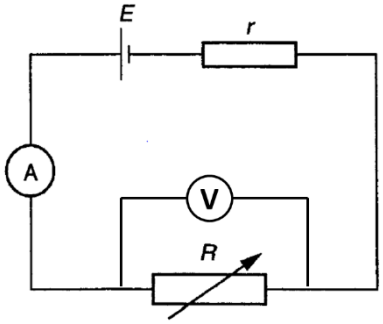
23 Five identical resistors are connected as shown in the circuit.

If the power dissipated by X is 2.0 W, what is the total power supplied by the battery?



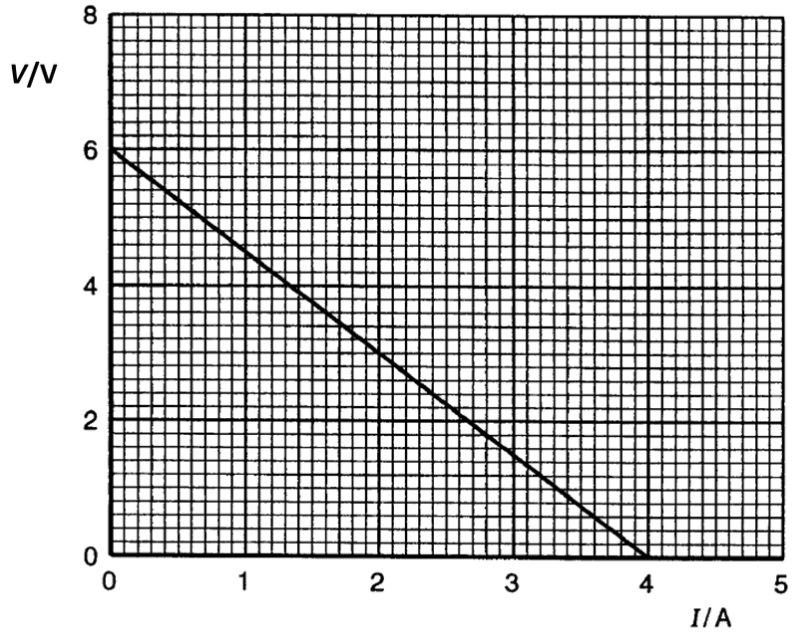
A 2.5 W **B** 3.5 W **C** 7.5 W **D** 10 W

24 A battery of e.m.f. *E* and internal resistance *r* is connected to a variable resistor of resistance *R*, as shown in the figure below.



The current I in the circuit is measured with an ammeter of negligible resistance, and the potential difference *V* across *R* is measured with a **voltmeter of very high resistance**.

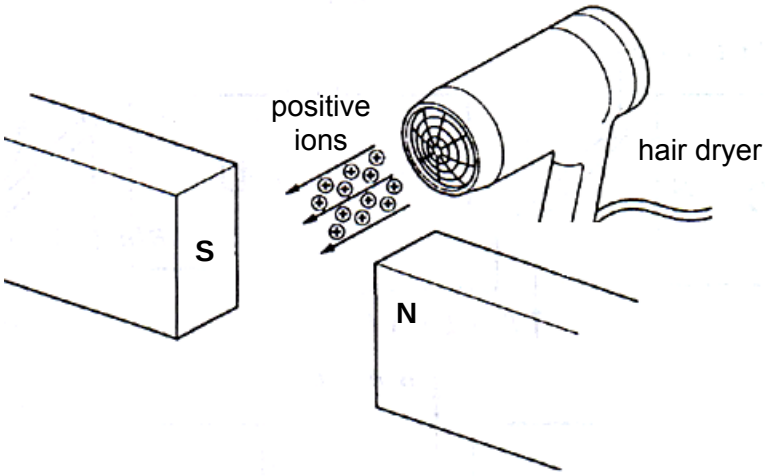
Having taken a series of voltage and current readings, the following voltage-current graph was obtained.



Which of the following set of data is correct when a current of 1.20 A flows in the circuit?

	E.m.f. of the cell, E / V	Internal resistance of the cell, r / Ω
A	4.2	1.5
B	4.2	3.5
C	6.0	1.5
D	6.0	3.5

25 A hair-dryer produces hot air containing positive ions. The air is directed between the polarities of a strong magnet placed horizontally as shown below.



The ions will be deflected

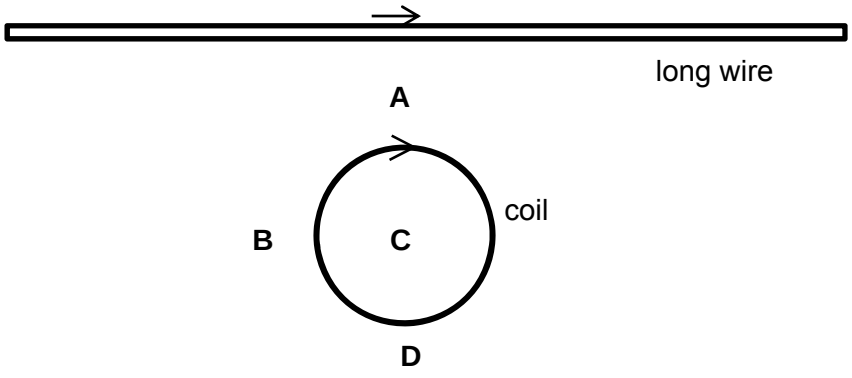
A towards the south pole S.

B towards the north pole N.

C upwards.

D downwards.

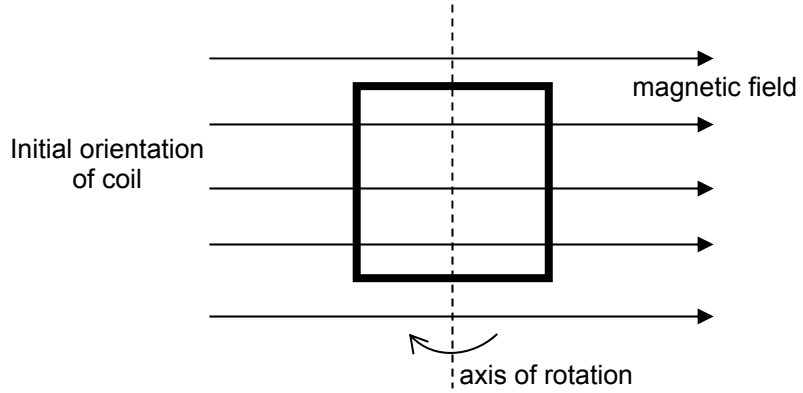
26 A long straight wire is placed next to a coil. The wire carries a current of 1 A to the right while the coil carries a clockwise current of 1 A.



Which region **A**, **B**, **C** or **D** has the largest magnitude of magnetic flux density ?

27 A square coil is placed in a uniform horizontal magnetic field as shown below.

It rotates about a vertical axis due to the magnetic forces acting on its sides when a constant direct current flows in it.



Which of the following statements is true ?

A There are no forces acting on the horizontal sides of the coil for the entire duration of rotation.

B The torque on the coil varies in magnitude as it rotates.

C The force acting on the coil is largest after it rotates 90°.

D The torque is largest after the coil rotates 90°.

28 The photoelectric effect is seen when an incident beam of light of wavelength 400 nm releases electrons from a target. The stopping potential for this experiment is 2.0 V.

What is be the stopping potential if light of wavelength 800 nm is used instead?

A 4.0 V

B 1.0 V

C 0.45 V

D No electrons will be emitted

29 An electron of mass m is accelerated from rest through a potential difference. Its kinetic energy after the acceleration is E.

Which of the following is the de Broglie wavelength of the electron after acceleration?

A $\dfrac{h}{2mE}$

B $\sqrt{\dfrac{E}{2m}}$

C $\dfrac{m^2v^2}{h}$

D $\dfrac{h}{\sqrt{2mE}}$

30 An atom absorbs a photon of wavelength 380 nm and then re-emits the energy through two electronic transitions such that the atom returns its original energy level. If one of the emitted photon has a wavelength of 650 nm, what is the type of radiation that could represent the other emitted photon?

A ultraviolet ray **B** infrared **C** red light **D** violet light

END OF PAPER