JURONG JUNIOR COLLEGE
2016 JC2 Preliminary Examinations

Name		Class	16S

PHYSICS **8866/01**

Higher 1

Multiple Choice **15 Sep 2016**

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write your **name** and **class** in the spaces provided at the top of this page.

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and index number on the Answer Sheet in the spaces provided.

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 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.

(This question paper consists of 20 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	=	ρgh
resistors in series,	R	=	$R_1 + R_2 + \ldots$
resistors in parallel,	$1/R$	=	$1/R_1 + 1/R_2 + \ldots$

1 What is the order-of-magnitude of the mass of a single sheet of A4 paper?

A 0.01 g

B 0.3 g

C 1 g

D 30 g

2 In an experiment to measure the viscosity η of a liquid, the following equation was used.

$$\eta = \frac{kr^2}{v}$$

where $r = (0.83 \pm 0.01)$ mm

$v = (0.065 \pm 0.002)$ m s^{-1}

$k = (93.7 \pm 0.1)$ N m^{-3}.

How should the value of η be expressed?

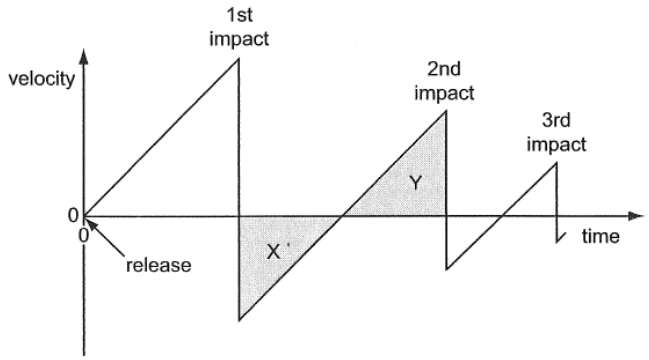
A $(9.93 \pm 0.54) \times 10^{-4}$ N s m^{-2}

B $(9.9 \pm 0.6) \times 10^{-4}$ N s m^{-2}

C $(9.93 \pm 0.42) \times 10^{-4}$ N s m^{-2}

D $(9.9 \pm 0.4) \times 10^{-4}$ N s m^{-2}

3 A ball is released from rest above a horizontal surface. The graph shows the variation with time of its velocity.



Why are areas X and Y equal?

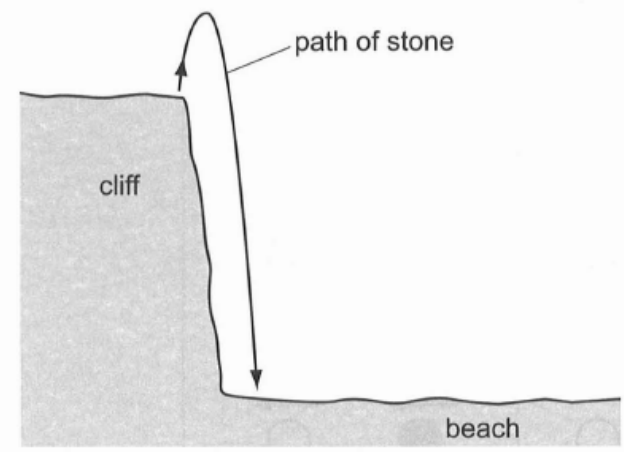
A For one impact, the speed at which the ball hits the surface equals the speed at which it leaves the surface.

B The ball rises and falls through the same distance between impacts.

C The acceleration of the ball is the same during its upward and downward motion.

D The speed at which the ball leaves the surface after an impact is equal to the speed at which it returns to the surface for the next impact.

4 A stone is thrown upwards from a point of the edge of a cliff. After the stone has reached its maximum height, it falls pass the cliff edge to the beach as shown.

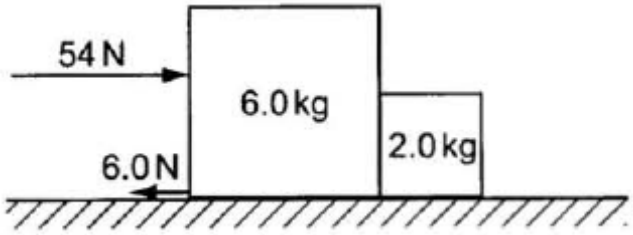


The initial vertical component of the velocity of the stone is 10 m s^{-1}. The time taken between the stone passing the edge of the cliff on its way down and hitting the beach is 1.2 s.

Ignoring air resistance, what is the height of the cliff?

A 5 m **B** 7 m **C** 12 m **D** 19 m

5 A force of 54 N pushes two touching blocks of mass 6.0 kg and 2.0 kg along a flat surface. The frictional force between the blocks and the surface is 6.0 N.



What is the magnitude of the resultant force on the 6.0 kg mass?

A 12 N

B 36 N

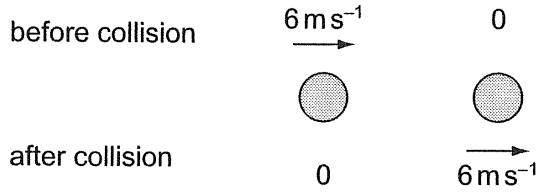
C 45 N

D 48 N

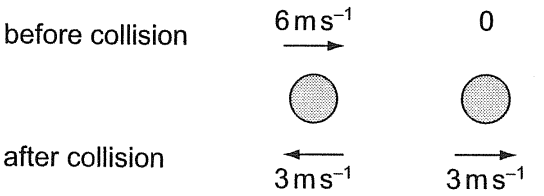
6 Two spheres of equal mass collide head-on. Before the collision, one sphere is stationary and the other is moving with speed 6 m s^{-1} directly towards the stationary sphere.

Which diagram represents an elastic collision?

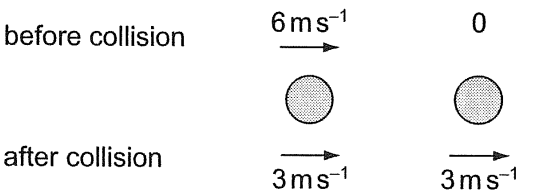
A



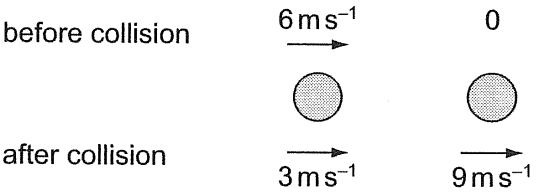
B



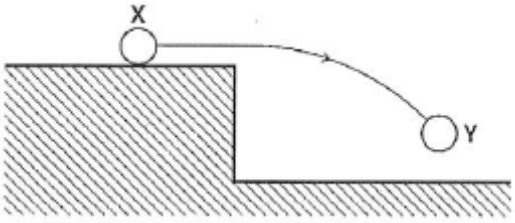
C



D

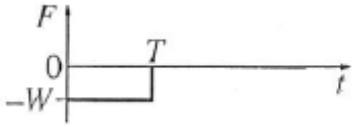


7 A ball of weight *W* slides along a smooth horizontal surface until it falls off the edge at time *T*.

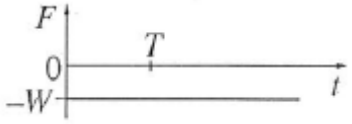


Which graph represents how the resultant vertical force *F*, acting on the ball, varies with time *t* as the ball moves from position X to position Y?

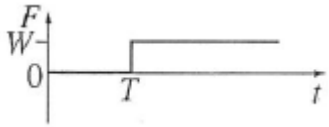
A



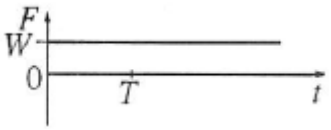
B



C

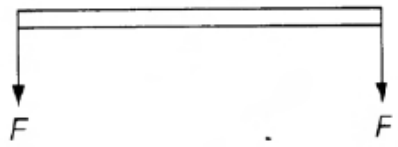


D

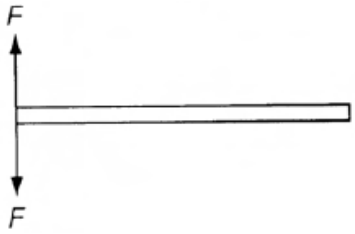


8 In which situation could the pair of forces applied to the rigid object produce a couple?

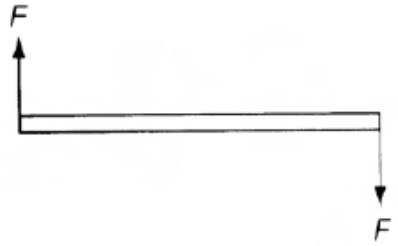
A



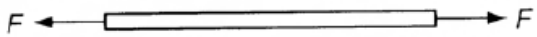
B



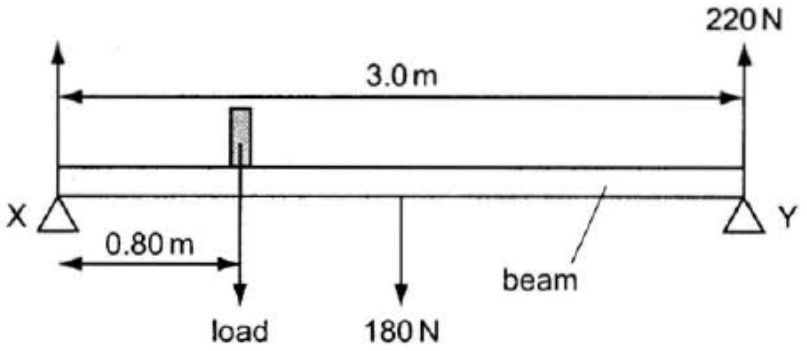
C



D



9 A uniform beam in a roof structure has a weight of 180 N. It is supported in two places X and Y, a distance 3.0 m apart. A load is placed on the beam a distance of 0.80 m from X. The support provided by Y is 220 N.



What is the value of the load?

A 270 N

B 490 N

C 520 N

D 830 N

10 A constant force *F* is applied to a stationary object of mass *m* on a frictionless surface. A constant acceleration increases the velocity of the object to some value *v* in a time *t*. It covers a distance *s* during this time.

Which value of kinetic energy is given to the object?

A Fst

B Fv

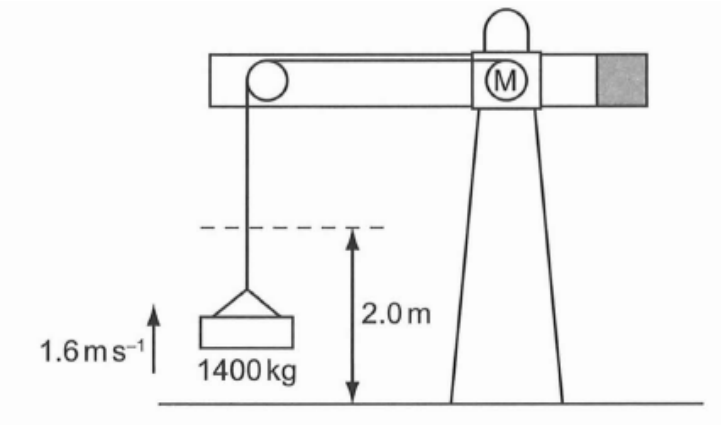
C Fs

D $\frac{ms}{2t}$

11 Which row in the table gives the gravitational potential energy, the elastic potential energy and the kinetic energy of a bungee jumper during the first fall? Air resistance is negligible.

		gravitational potential energy/kJ	elastic potential energy/kJ	kinetic energy/kJ
A	top	120	0	0
	middle	60	10	50
	bottom	0	120	0
B	top	120	0	0
	middle	60	30	30
	bottom	0	60	60
C	top	120	0	0
	middle	60	30	60
	bottom	0	120	0
D	top	120	0	0
	middle	60	60	0
	bottom	0	120	0

12 The motor M in a crane is used to lift a total mass of 1400 kg through a height of 2.0 m at a constant speed of 1.6 m s^{-1}. The motor is 20% efficient.



What is the minimum input power to motor M?

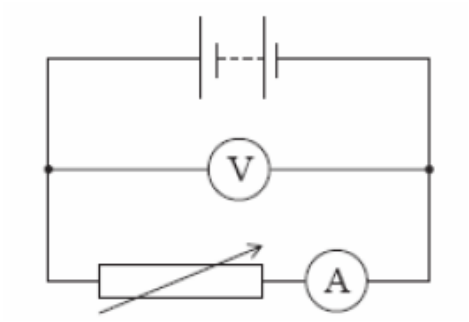
A 11 kW

B 22 kW

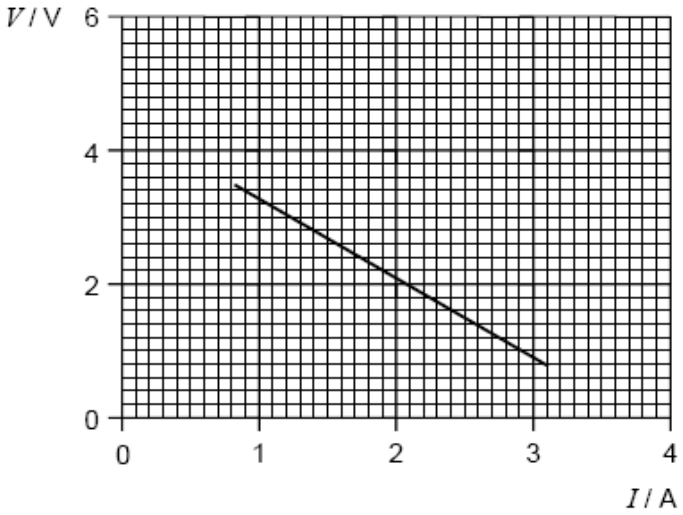
C 110 kW

D 140 kW

13 To investigate the variation of current I in a variable resistor with the potential difference V across it, the circuit shown below was used.



The variation of current I with V is shown below.



From the data it can be shown that the internal resistance of the battery is

A 0.2 Ω

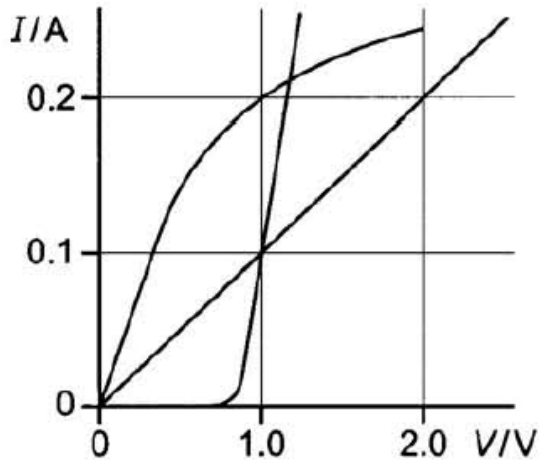
B 0.5 Ω

C 1.2 Ω

D 1.8 Ω

14 The graph shows the *I*-*V* characteristics of three electrical components, a diode, a filament lamp and a resistor, plotted on the same axes.

Which statement is correct?



A The resistance of the resistor equals that of the filament lamp when $V = 0.8$ V.

B The resistance of the diode is constant above 0.8 V.

C The resistance of the filament lamp is twice that of the resistor at 1.0 V.

D The resistance of the diode equals that of the filament lamp at about 1.2 V.

15 A generator, with output power P and output voltage V, is connected to a factory by cables of total resistance R.

Determine the power dissipated in the cables.

A P

B $\frac{V^2}{R}$

C $\left(\frac{P}{V}\right)^2 R$

D $P - \frac{V^2}{R}$

16 Bulb A has a power rating of 1000 W, 120 V. Bulb B has a power rating of 1000 W, 240 V. The bulbs are connected in series and powered by a source of e.m.f. E = 30 V. The resistance of bulbs A and B is assumed to be constant.

Which of the following must be **true**?

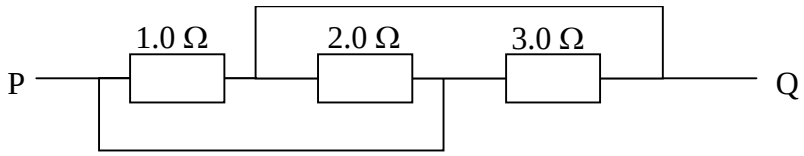
A Bulb B will be brighter than bulb A.

B Current through bulb B is higher than the current through bulb A.

C Bulb A and bulb B have the same resistance value.

D Bulb A has higher resistance than bulb B.

17 Three resistors are connected as shown in the diagram using connecting wires of negligible resistance.



What is the approximate resistance between points P and Q?

A 0.55 Ω

B 0.80 Ω

C 2.0 Ω

D 2.2 Ω

18 A row of 25 decorative lights, connected in series, is connected to a mains supply. When the supply is switched on, the lights do not work. The owner uses a voltmeter to test the circuit. When the voltmeter is connected across the third bulb in a row, a reading of zero is obtained.

Which of the following **cannot** be the only fault in the circuit?

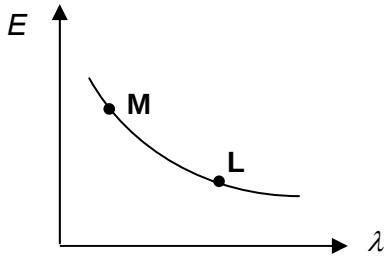
A The filament of one of the other bulbs has broken.

B The filament of the third bulb has broken.

C The fuse in the mains supply has blown.

D There is a break in the wire from the supply to the lights.

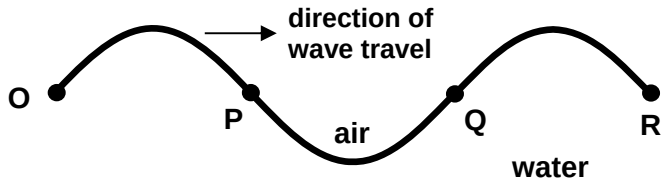
19 The figure below shows the relationship between the energy of a photon of electromagnetic radiation E and its wavelength λ. Points **L** and **M** marked on the graph represent two types of electromagnetic radiation.



Which of the following pairs of electromagnetic radiation correctly identifies **L** and **M**?

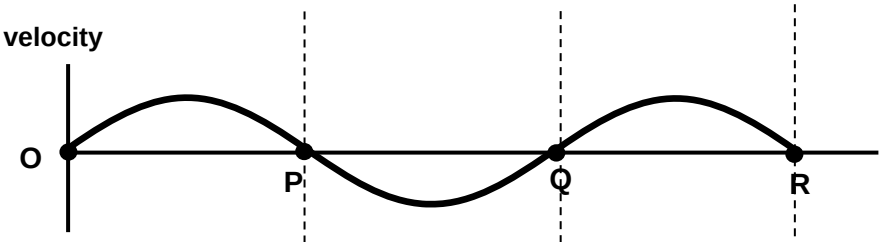
	L	**M**
A	X-ray	infra-red
B	gamma ray	microwave
C	ultraviolet	microwave
D	radiowave	ultraviolet

20 At a particular instant the profile of a surface wave on water is as indicated below.

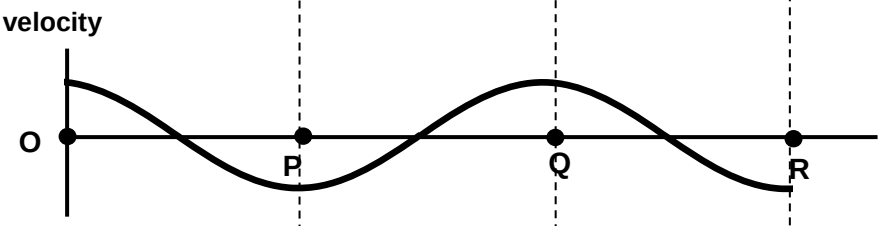


Which of the graphs below best represents the vertical velocity of the water molecules at this instant, taking upward velocity as positive?

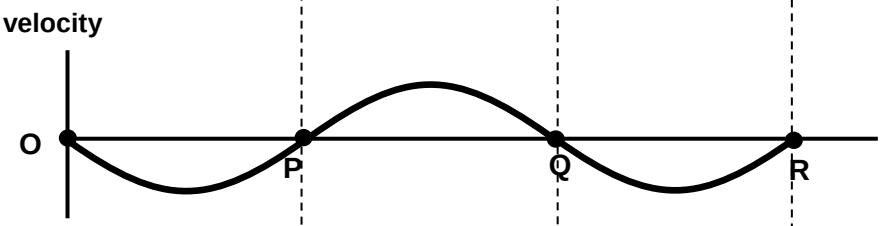
A



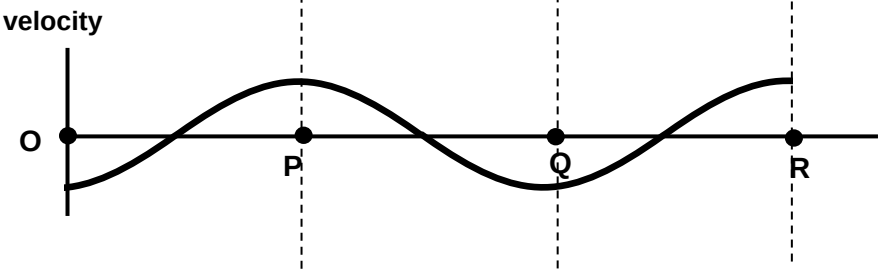
B



C



D



21 A sound wave cannot undergo

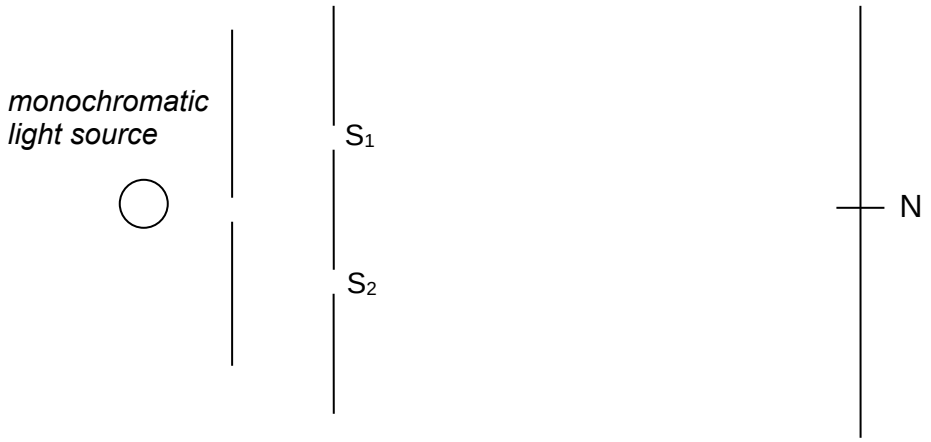
A Interference

B Polarization

C Refraction

D Reflection

22 The diagram shows a Young's Double Slits experiment and the light source from S_1 and S_2 are assumed to have equal amplitude. N is the centre of the central bright fringe. The light intensity at N for the central bright fringe is $2I$.



Which of the following is the best estimate for the light intensity at N when S_2 is covered?

A 0.5 I

B 1.0 I

C 1.4 I

D 2.0 I

23 A taut wire is set into resonance with a node at either end and another single node at the centre of the wire. Which one of the following statements is *not* correct?

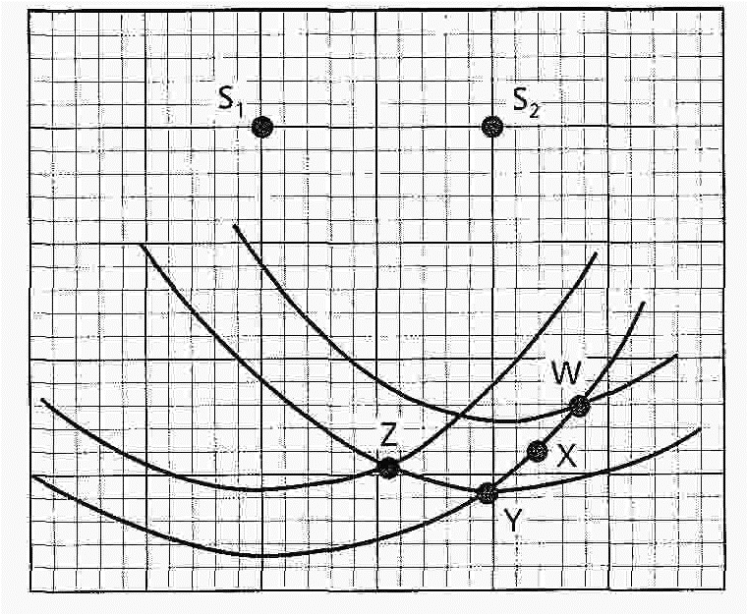
A The wavelength of the wave on the wire is equal to the length of the wire.

B All points to one side of the centre vibrate in phase with one another.

C Any two points on either side of the centre have a phase difference of 90°.

D Two points equidistant from the centre on either side of the centre have the same amplitude of vibration.

24 S_1 and S_2 are two identical sources of waves that are in phase. The instantaneous positions of two wave crests from each source are shown below.



Which of the following is true?

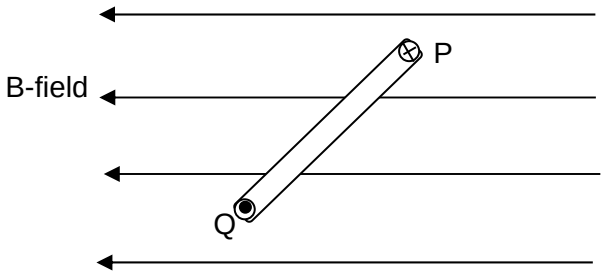
A X is a point of constructive interference.

B W is a point of destructive interference.

C $S_1Z - S_2Z = (2n-1)\left(\frac{\lambda}{2}\right)$ where n is an integer.

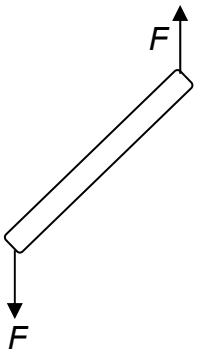
D $S_1Y - S_2Y = n\lambda$ where n is an integer.

25 The figure below shows the top view of a current carrying coil in a uniform magnetic field at a particular instant in time. The current at P is flowing perpendicularly into the plane of the paper and the current at Q is flowing perpendicularly out of the plane of the paper.

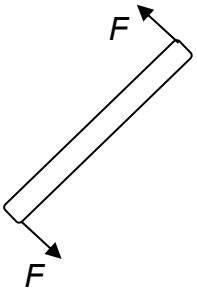


Which of the following correctly shows the direction of the forces, *F* acting on the coil at that instant in time?

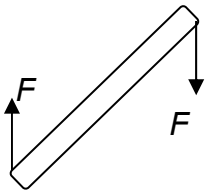
A



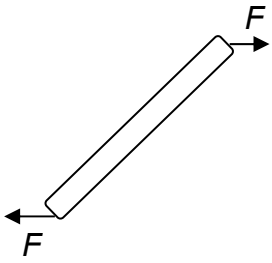
B



C

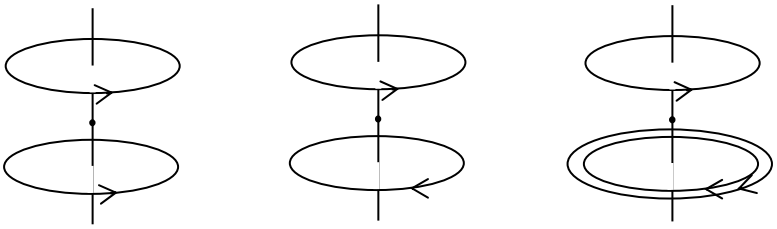


D



26 The figure below shows three arrangements of circular loops, centered on vertical axes and carrying identical currents in the directions indicated.

Rank the arrangement according to the magnitudes of the magnetic fields (from the smallest to the largest) at the midpoints between the loops on the axes.



1 2 3

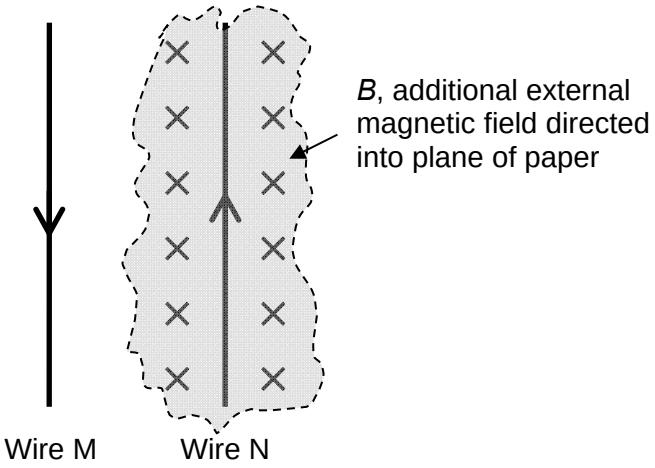
A 1, 2, 3

B 2, 1, 3

C 2, 3, 1

D 3, 1, 2

27 Two long straight horizontal wires run parallel to each other, carrying currents in opposite directions as shown in the diagram below. Wire N is in a region where an additional *external* magnetic field, *B*, is directed into the plane of the paper.



Which of the following statements is correct?

A The net force on wire N acts to the left.

B The net force on wire N acts to the right.

C The net force on wire N acts either to the left or right depending on the magnitude of the currents and the strength of the external magnetic field.

D The net force on wire N is zero.

28 White light from a tungsten filament lamp is passed through cool sodium vapour and viewed through a spectrometer.

Which of the following best describes the spectrum that would be seen?

A dark lines on a coloured background

B white lines on a coloured background

C coloured lines on a black background

D coloured lines on a white background

29 When an atom absorbs radiation of wavelength λ_1, it makes a transition from its ground state of energy E_1 to an excited state of energy E_3. Then it makes a second transition to a state of lower energy E_2, emitting radiation of wavelength λ_2.

What is the wavelength of the radiation emitted by the atom when it makes a third transition back to the ground state?

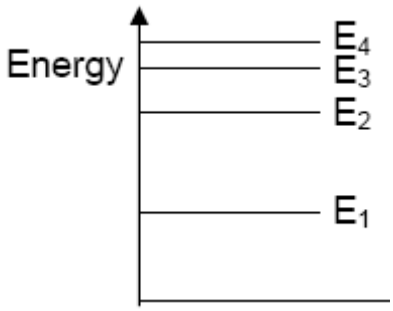
A $\lambda_1 - \lambda_2$

B $\lambda_2 - \lambda_1$

C $\dfrac{\lambda_1\lambda_2}{\lambda_1 - \lambda_2}$

D $\dfrac{\lambda_1\lambda_2}{\lambda_2 - \lambda_1}$

30 The diagram below represents, drawn to scale, the energy levels for an electron in a certain atom.



It is observed that the emission spectrum of this atom produces a red, a green and a blue line.

Which of the following transitions will most likely give rise to these lines?

	Blue	**Red**	**Green**
A	E_2 to E_1	E_3 to E_2	E_4 to E_3
B	E_3 to E_1	E_4 to E_3	E_3 to E_2
C	E_4 to E_2	E_3 to E_2	E_4 to E_1
D	E_4 to E_1	E_2 to E_1	E_3 to E_1

End of paper