HWA CHONG INSTITUTION
JC2 Preliminary Examinations
Higher 1

CANDIDATE NAME		**CT GROUP**	**15S**
CENTRE NUMBER		**INDEX NUMBER**	

PHYSICS

8866/01

Paper 1 Multiple Choice

22 September 2016

1 hour

Additional Materials: Optical Mark Sheet

INSTRUCTIONS TO CANDIDATES

Write in soft pencil.

Write your name, CT, NRIC or FIN number on the optical mark sheet (OMS). Shade your NRIC or FIN 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 OMS.

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.

Data

speed of light in free space,

$c = 3.00 \times 10^{8}$ m s^{-1}

elementary charge,

$e = 1.60 \times 10^{-19}$ C

the Planck constant,

$h = 6.63 \times 10^{-34}$ J s

unified atomic mass constant,

$u = 1.66 \times 10^{-27}$ kg

rest mass of electron,

$m_e = 9.11 \times 10^{-31}$ kg

rest mass of proton,

$m_p = 1.67 \times 10^{-27}$ 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,	$1/R = 1/R_1 + 1/R_2 + \ldots$

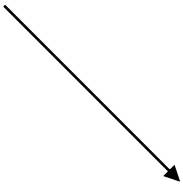
1 Which of the following is **not** a unit of energy?

A W s **B** N m **C** kW h **D** N s^{-1}

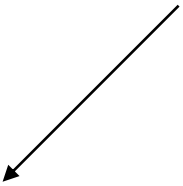
2 The initial velocity of an object is shown by the vector ***u***. The final velocity of the object is shown by the vector ***v***.

Which arrow shows the change in velocity of the object?

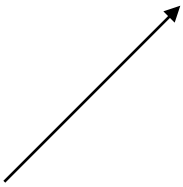
A



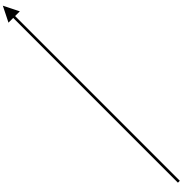
B



C



D



3 A cylindrical vessel is completely filled with liquid of mass (20 ± 1) g. The vessel has internal diameter (2.5 ± 0.1) cm and length (5.0 ± 0.1) cm. Using these values, the density of the liquid is calculated to be 814.89 kg m^{-3}. The calculated value of density should be quoted as

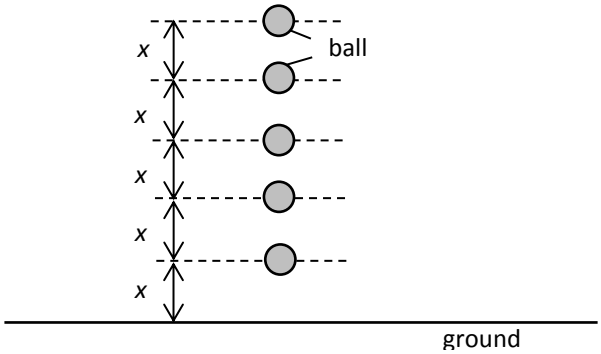
A (815 ± 1) kg m^{-3}

B (810 ± 90) kg m^{-3}

C (800 ± 100) kg m^{-3}

D (814.9 ± 0.2) kg m^{-3}

4 Five balls are arranged equidistance from each other as shown below.



The five balls are dropped at the same time. The balls should hit the ground at

A the same time

B equal time intervals

C decreasing time intervals

D increasing time intervals

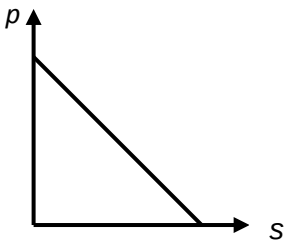
5 A tennis ball is served 2.5 m above ground at an angle of 5° above the horizontal direction with an initial speed of 30 m s^{-1}. After how long does the ball hit the ground?

A 0.3 s **B** 0.6 s **C** 1.0 s **D** 1.9 s

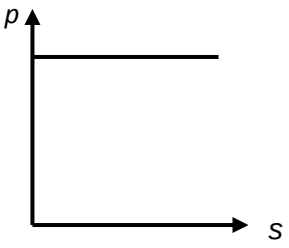
6 A railway carriage is travelling at a constant speed along a straight horizontal track. The brakes are then applied, which result in a constant force opposing the carriage's motion. Other forms of friction such as air resistance can be neglected.

Which of the graphs below best represents the variation of the momentum p with distance travelled s, taken from the moment the brakes are first applied?

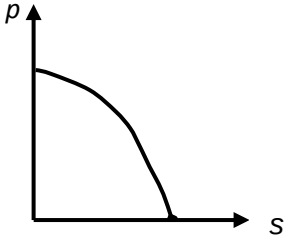
A



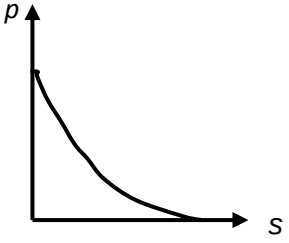
B



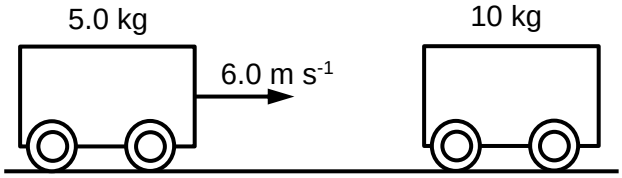
C



D



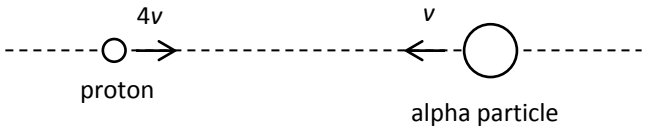
7 A trolley of mass 5.0 kg travelling at a speed of 6.0 m s^{-1} collides head-on and locks together with another trolley of mass 10 kg which is initially at rest. The collision lasts 0.20 s.



What is the total kinetic energy of the two trolleys after the collision and the average force acting on each trolley during this collision?

	Total kinetic energy after the collision / J	Average force on each trolley / N
A	30	150
B	75	150
C	30	100
D	75	100

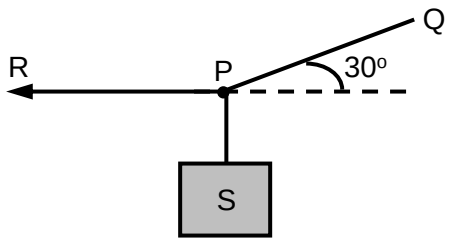
8 A proton travelling at speed $4v$ and an alpha particle at a speed v undergo a head-on, elastic collision. An alpha particle is a helium nucleus with 2 protons and 2 neutrons.



After the collision, what are the speeds of the two particles?

	Speed of the alpha particle	Speed of the proton
A	0	0
B	$0.6v$	$2.4v$
C	v	$4v$
D	$4v$	v

9 In the figure below, a body S of weight W hangs vertically by a thread tied at P to a string RPQ.



If the system is in equilibrium, what is the tension in section RP?

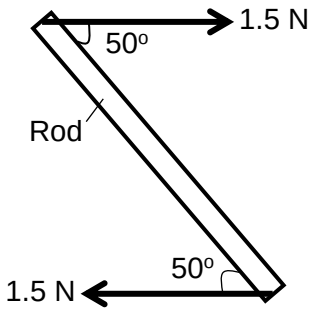
A $W \cos 60^\circ$

B $W \tan 60^\circ$

C $W \cos 30^\circ$

D $W \tan 30^\circ$

10 A pair of equal and opposite forces of magnitude 1.5 N is applied to the ends of a 0.50 m rod as shown below.



What is the magnitude of the torque of the couple on the rod when it is in the position shown above?

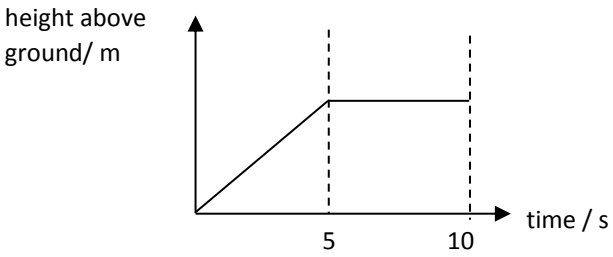
A 0.29 N m

B 0.38 N m

C 0.57 N m

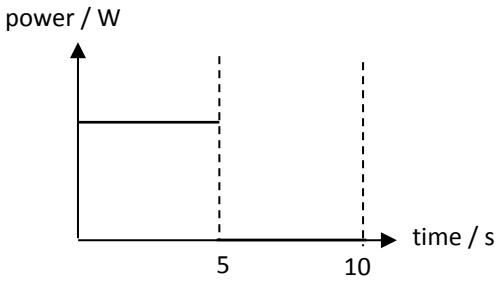
D 0.75 N m

11 A crane lifts a load at constant speed vertically for the first five seconds. It then holds it at a fixed height for another five seconds. The variation of the height of the load above the ground is shown in the graph below.

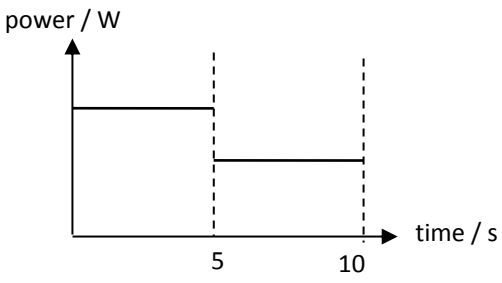


Which of the following graphs shows the variation of power supplied to the load with time?

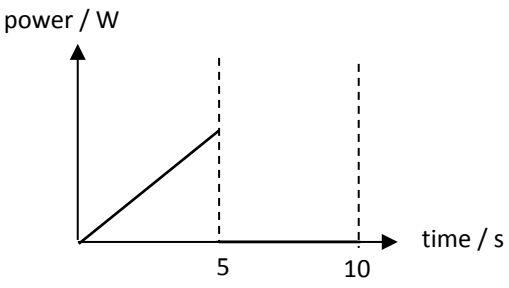
A



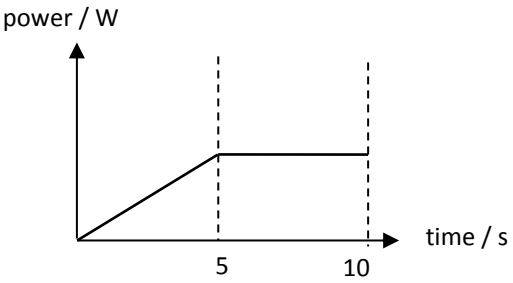
B



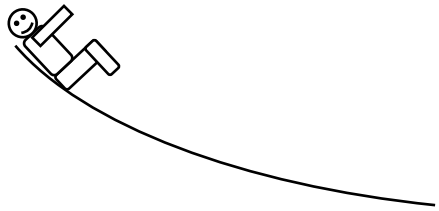
C



D



12 A child slides down a smooth slope. There are two forces acting on him, namely his weight, *W* and the normal contact force, *N*.



Which of following best indicates the work done by *W* and *N*?

	Work done by *W*	Work done by *N*
A	positive	negative
B	positive	zero
C	negative	negative
D	negative	zero

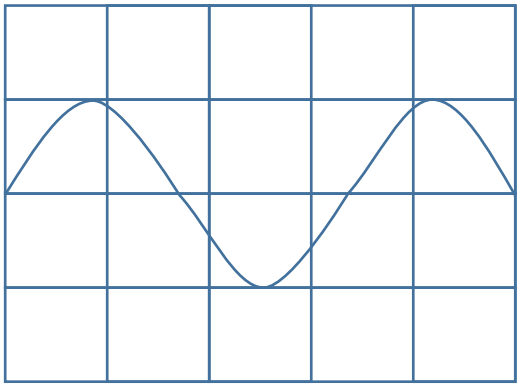
13 The drag force acting on a car moving at velocity *v* through still air is proportional to v^2.

When the car is travelling at 20 m s^{-1} on a level road, the power required to overcome the drag force is 4800 W.

What is the power required when the car travels at 25 m s^{-1}?

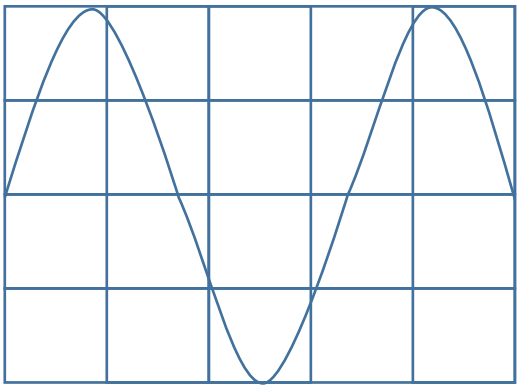
A 6000 W **B** 7500 W **C** 8000 W **D** 9400 W

14 A tuning fork is placed near a microphone which is connected to a cathode ray oscilloscope. The figure on the right shows a picture of the screen of the cathode ray oscilloscope.

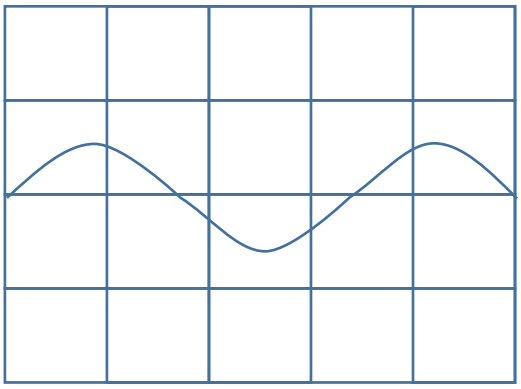


Which of the following diagrams show the screen of the cathode ray oscilloscope if the time-base is doubled?

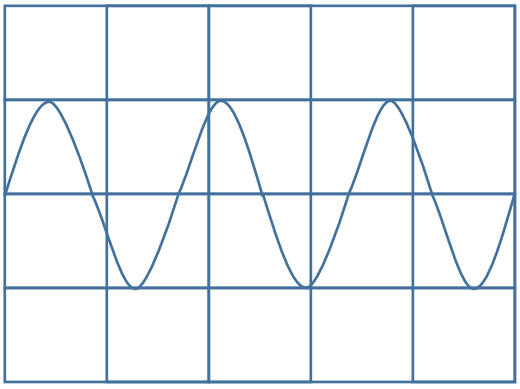
A



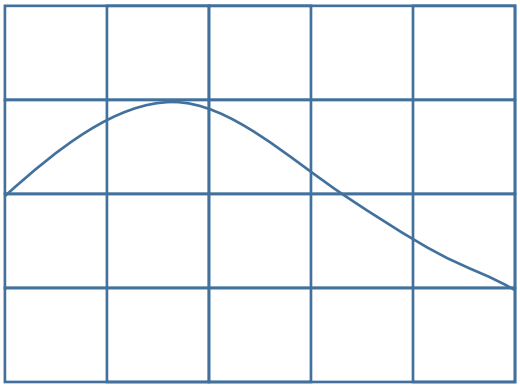
B



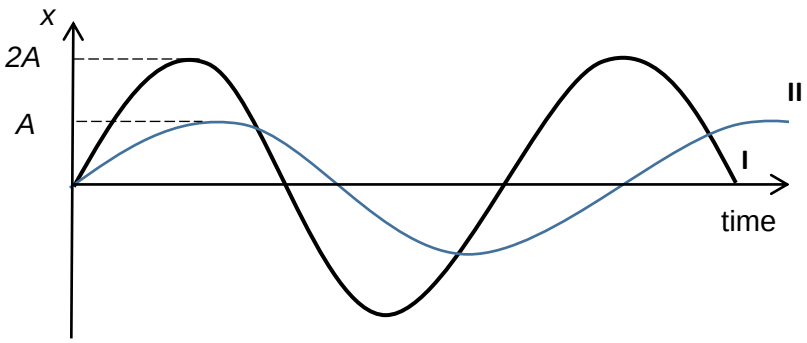
C



D



15 The graph shows the variation in the displacement, x at a point with respect to time, due to two transverse waves I and II passing through the point.



Which of the following statements is correct?

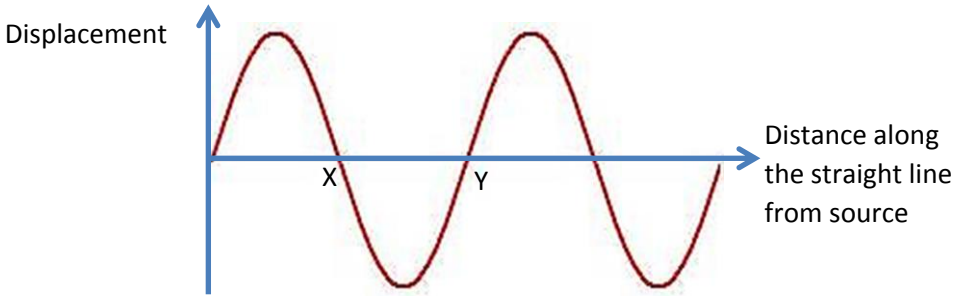
A Wave I has a shorter wavelength and its intensity is double that of wave II

B Wave I has a shorter wavelength and its intensity is four times of wave II.

C Wave I has a longer wavelength and its intensity is double that of wave II.

D Wave I has a longer wavelength and its intensity is four times of wave II.

16 As a sound wave passes through a region of space, the displacement of the air molecules along a straight line is plotted as shown below.



Which of the following correctly describes the sound wave at locations X and Y?

	X	Y
A	Compression	Compression
B	Compression	Rarefaction
C	Rarefaction	Compression
D	Rarefaction	Rarefaction

17 Which of the following cannot be explained by the principle of superposition?

A The amplification of sound by speaking through a paper cone.

B The quality of a musical note made from different musical instruments.

C The water ripple eventually disappearing as it spreads outwards.

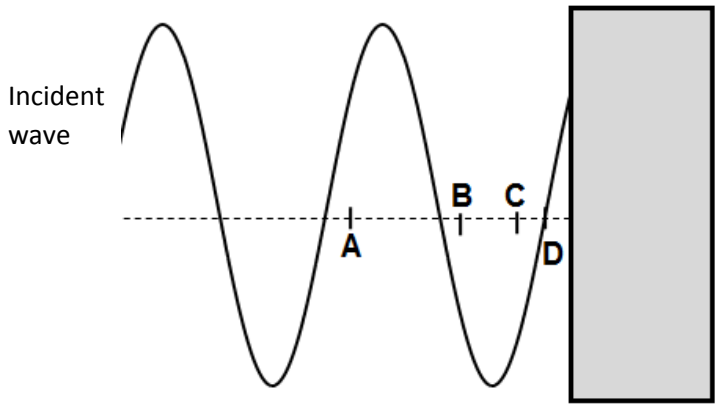
D The fringe pattern produced by monochromatic light passing through a narrow slit.

18 Two waves, one having twice the amplitude of the other, are superposed. At point P, the waves have a phase difference of π rad. At point Q, they are in phase.

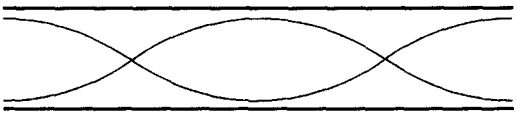
What is the ratio $\frac{\text{intensity at point P}}{\text{intensity at pointQ}}$?

A $\frac{1}{9}$ **B** $\frac{1}{4}$ **C** $\frac{1}{3}$ **D** $\frac{1}{2}$

19 Stationary water waves are set up in a water tank. The diagram shows the wave profile of a wave traveling towards the side of the water tank. This wave overlaps with the reflected wave that travels away from the side of the water tank. Which labeled position is the location of a node of the stationary wave nearest to the side of the water tank?



20 A stationary wave is formed in the air in an open tube as represented in the diagram.



How many antinodes are formed by a stationary wave of twice the frequency?

A 2 **B** 4 **C** 5 **D** 6

21 Why does the current increase when the potential difference applied across a resistor is increased?

A The rise in temperature increases the thermal motion of the charge carriers.

B The mean time between collision increases

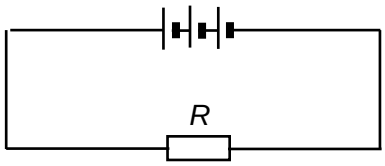
C The acceleration of the charge carriers between collision increases.

D More charge carriers are released.

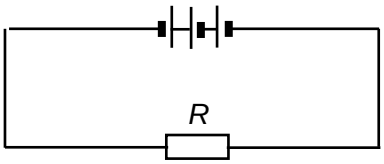
22 An electrical source with internal resistance *r* is used to operate an electric heater of resistance *R*. What fraction of the total power is delivered to the heater?

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

23 Three identical cells each having an e.m.f. of 1.5 V and a constant internal resistance of 2.0 Ω are connected in series with a 4.0 Ω resistor *R*, firstly as in circuit (i), and secondly as in circuit (ii).



Circuit (i)



Circuit (ii)

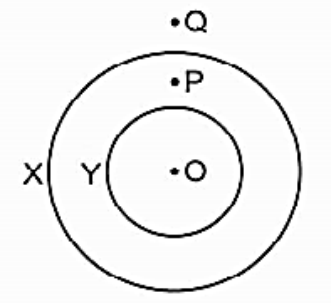
What is the ratio $\frac{\text{power in R in circuit (i)}}{\text{power in R in circuit (ii)}}$?

A 9.0 **B** 7.2 **C** 5.4 **D** 3.0

24 A battery has an e.m.f. *V* and internal resistance *r*. Two voltmeters are used, one at a time, to measure the terminal potential of the battery. One voltmeter has a resistance of *r*. The other voltmeter has a resistance of 10*r*. Which of the following correctly gives the readings of the two voltmeters?

	Reading of voltmeter of resistance *r*	Reading of voltmeter of resistance 10*r*
A	Nearly *V*	Nearly *V*
B	*V/2*	Nearly *V*
C	Nearly *V*	*V/2*
D	*V/2*	*V/10*

25 X and Y are two coaxial circular coils lying on a table. O, P and Q are three points on the table.

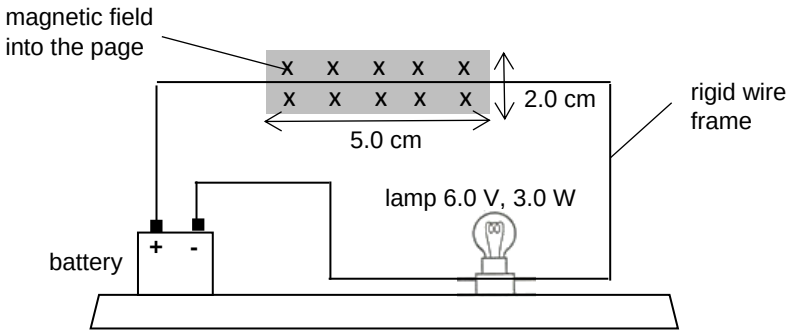


Initially, the currents in X and Y result in no magnetic flux density at O. The direction of current Y is now reversed.

How does the magnitude if the magnetic flux density change at P and Q?

	P	Q
A	decreases	increases
B	decreases	decreases
C	increases	increases
D	increases	decreases

26 The diagram shows a rigid conducting wire loop connected to a 6.0 V battery. The circuit stands on a top pan balance. A uniform horizontal magnetic field of strength 45 mT acts at right angles into the page to the straight top part of the conducting loop as indicated in the diagram. This magnetic field only extends over the shaded region. The balance reads 153.860 g.



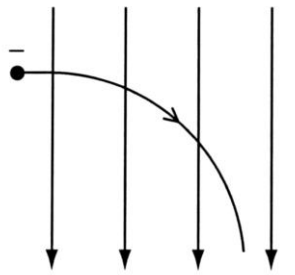
Determine the new balance reading when there is no current in the loop.

A 152.735 g **B** 153.745 g **C** 153.975 g **D** 154.985 g

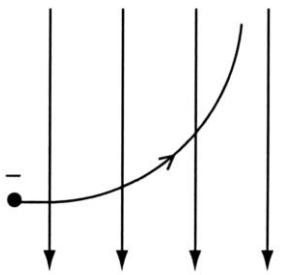
27 A negatively charged particle enters a uniform magnetic field.

Which diagram represents the path of the particle in the magnetic field?

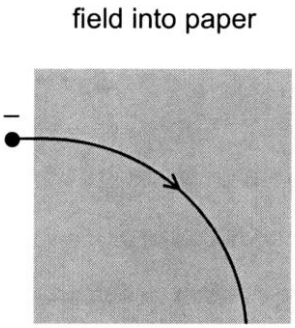
A



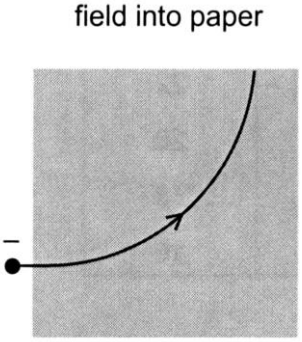
B



C



D



28 The following are some statements on photoelectric effect. Which of the following statements is true?

A No emission of electrons occurs for very low intensity of illumination.

B Doubling the frequency of radiation will double the stopping potential.

C For a given metal, there is a minimum frequency of radiation below which no emission of photoelectrons occurs.

D The velocity of the emitted photoelectrons will increase if the intensity of the incident radiation increases on the metal surface.

29 If the de Broglie waves associated with each of the following particles are to have the same wavelength, which particle must have the smallest velocity?

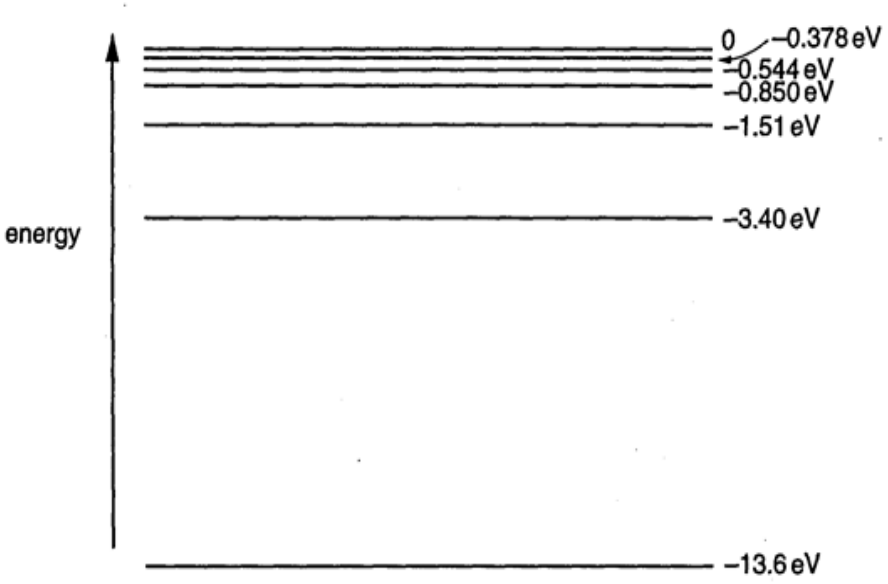
A proton

B electron

C neutron

D alpha particle (Helium nucleus consisting of 2 protons and 2 neutrons)

30 Some of the energy levels in atomic hydrogen are shown in the figure below.



Photons of 13.00 eV are incident on a sample of cold hydrogen gas. What is the maximum number of spectral lines that can be observed from the emission spectrum of the gas?

A zero **B** 1 **C** 3 **D** 6

End of Paper