



JURONG JUNIOR COLLEGE

Preliminary Examination 2015

Name		Class	15S
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PHYSICS

8866/01

Higher 1

Multiple Choice

18 Sep 2015

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 13 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 Four students A to D were measuring the potential difference across a piezo-electric material.

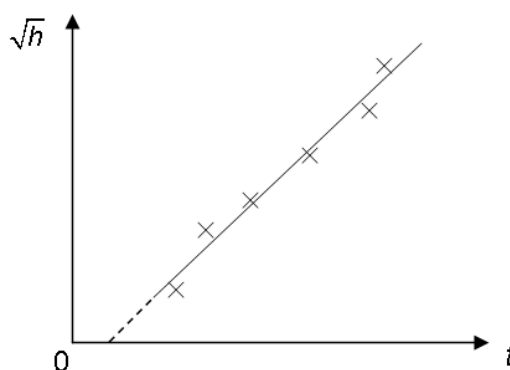
If the actual potential difference is 1.65×10^{-2} V, which student's measurement was accurate but not precise?

Potential difference / 10^{-2} V						Mean / 10^{-2} V
A	1.61	1.65	1.65	1.58	1.61	1.62
B	1.69	1.70	1.69	1.70	1.69	1.69
C	1.66	1.68	1.63	1.64	1.65	1.65
D	1.65	1.64	1.65	1.65	1.66	1.65

- 2 A boat changes its velocity from 8 m s^{-1} due north to 6 m s^{-1} due east.
What is its change in velocity?

- A 2 m s^{-1} at a direction of 37° east of north
 B 2 m s^{-1} at a direction of 53° east of north
 C 10 m s^{-1} at a direction of 37° east of south
 D 10 m s^{-1} at a direction of 53° west of south

- 3 A student measures the time t for a ball to fall from rest through a vertical distance h and obtains the graph as shown.



Which of the following is an explanation for the intercept?

- A Air resistance has not been taken into account.
 B There is a constant delay between starting the stopwatch and releasing the ball.
 C There is an error in the stopwatch so that it always runs faster.
 D The student should have taken several readings for each vertical height h and use the average.

- 4 A car accelerates uniformly through three gear changes with the following average speeds: 20 m s^{-1} for 2.0 s , 30 m s^{-1} for 2.0 s , 40 m s^{-1} for 8.0 s .

What is the overall average speed of the car?

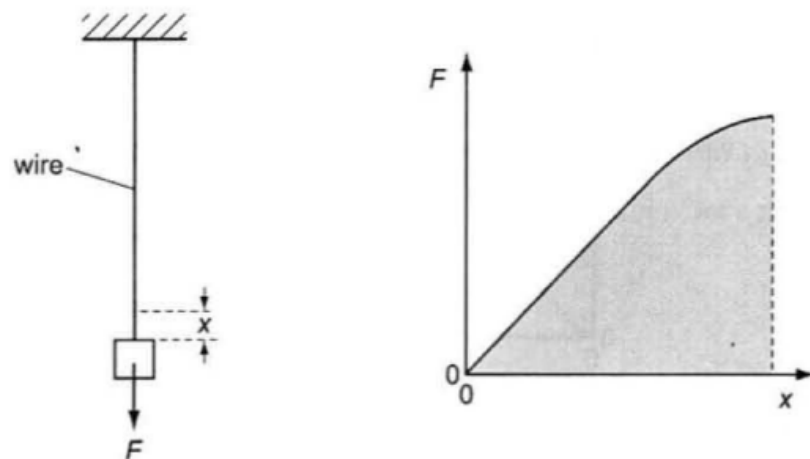
- A** 25 m s^{-1} **B** 30 m s^{-1} **C** 35 m s^{-1} **D** 37 m s^{-1}

- 5 A marble rolls off the edge of a horizontal table with a speed of 2.0 m s^{-1} . The edge of the table is 1.2 m above the floor.

What is the horizontal distance the marble is away from the edge of the table when it hits the floor?

- A** 0.49 m **B** 0.99 m **C** 1.9 m **D** 2.3 m

- 6 A wire fixed at its upper end, is subjected to an increasing load F by increasing the mass attached to its lower end. A graph of F against the extension x of the wire is shown.

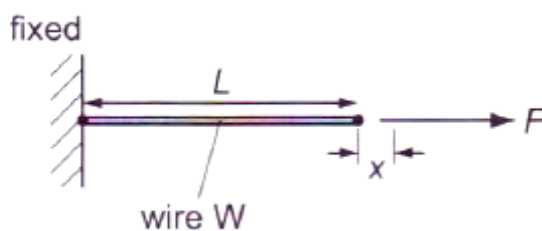


The wire is stretched beyond its elastic limit.

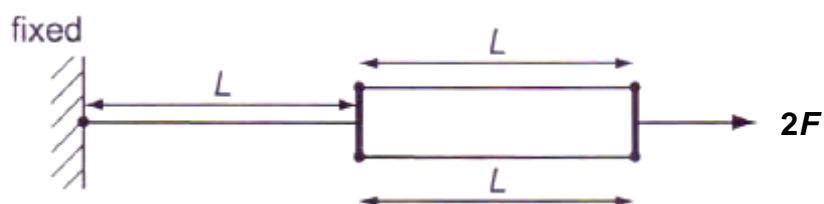
What does the shaded area on the graph represent?

- A** the work done by F on the wire
B the amount of elastic potential energy stored in the wire
C the amount of heat produced in the wire
D the loss of gravitational potential energy of the mass

- 7 A wire W , initially of length L , is fixed at one end and pulled by a force F at the other end. The wire extends by x .



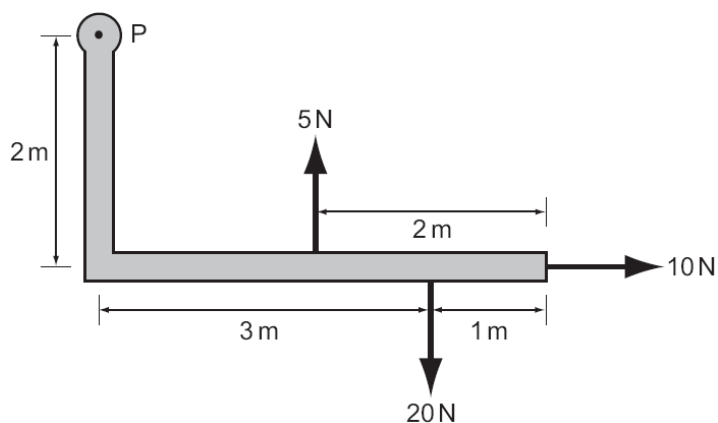
Three wires, all identical with wire W , are connected as shown to form a composite wire.



The composite wire is fixed at one end and pulled by force $2F$ at its other end. What is the total extension of the composite wire?

- A $\frac{3}{2}x$ B $2x$ C $\frac{8}{3}x$ D $3x$

- 8 An L-shaped rigid lever arm is pivoted at point P.



Three forces act on the lever arm, as shown in the diagram.

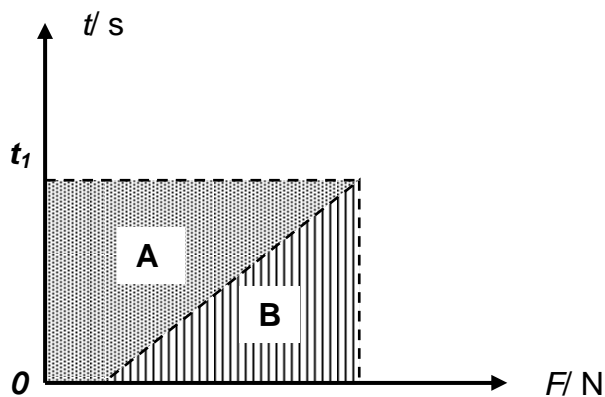
What is the magnitude of the resultant moment of these forces about point P?

- A 30 N m B 35 N m C 50 N m D 90 N m

- 9 When a 1000 kg car and a 10000 kg truck collide head-on, why is the passenger in the car more likely to experience a bigger force by a seat belt compare to a passenger in the truck?

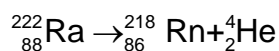
A The car experiences a bigger force than the truck.
 B The passenger on the car experiences a larger impulse.
 C The car undergoes a larger change of velocity than the truck.
 D The force on the car is the same as the truck.

- 10 A student sketched a time-force graph of an object with mass m as shown below.



Which of the following correctly show how the change in velocity can be determined between time $t = 0$ s to $t = t_1$?

- A Gradient of the graph $\times m$
 B $\frac{\text{Area A}}{m}$
 C $\frac{\text{Area B}}{m}$
 D Area B $\times m$
- 11 $^{222}_{88}\text{Ra}$, initially at rest, undergoes alpha decay (with the emission of ^4_2He), and becomes $^{218}_{86}\text{Rn}$ as reflected in the equation below:



What is the magnitude of the ratio $\left| \frac{\text{momentum of } ^{218}_{86}\text{Rn}}{\text{momentum of } ^4_2\text{He}} \right|$?

- A 0.018 B 1.00 C 54.5 D Cannot be determined

- 12 A man intends to position a box by giving a push and letting go. He misjudges his push and the box goes only one-third of the way to the intended position.

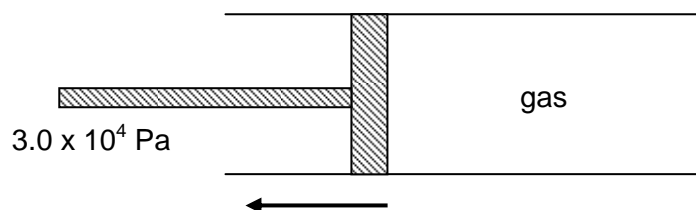
If the initial speed of the box after the push is v_0 and the resistive force acting on the box is constant, what should the initial speed of the box be for it to slide to the intended position?

- A $\sqrt{2} v_0$ B $\sqrt{3} v_0$ C $\sqrt{6} v_0$ D $3 v_0$

- 13 A car of mass m is accelerated horizontally from rest to a speed v by a constant force F . How much work is done on the car during this acceleration?

- A $\frac{1}{2}Fv$ B Fv C mv^2 D $\frac{1}{2}mv^2$

- 14 Gas is enclosed in a cylinder by an air-tight, frictionless piston of cross-sectional area 25.0 cm^2 . When a constant external pressure of $3.0 \times 10^4 \text{ Pa}$ is exerted on the piston, it settles at a distance from the end of the cylinder.



The gas is then heated and expands such that the piston moves 5.0 mm . The work done on the gas is

- A -380 J B -0.38 J C 0.38 J D 380 J

- 15 Which statement describes the electric potential difference between two points in a wire?

- A The force required to move a unit positive charge between the two points.
 B The ratio of the energy dissipated to the current flowing between the two points.
 C The ratio of the power dissipated to the electric charge flow between the two points.
 D The ratio of the power dissipated to the current flowing between the two points.

- 16 Two wires made of the same material and length are connected in parallel to the same voltage supply. Wire P has a diameter of 2 mm. Wire Q has a diameter of 1 mm.

What is the ratio $\frac{\text{current in P}}{\text{current in Q}}$?

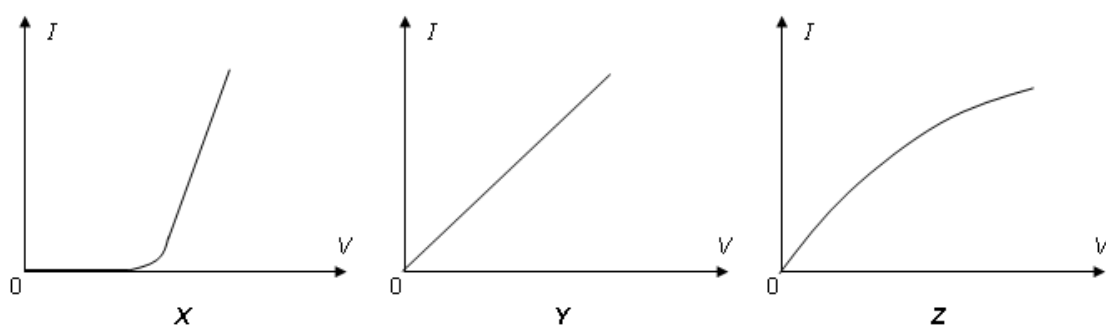
A $\frac{1}{4}$

B $\frac{1}{2}$

C 2

D 4

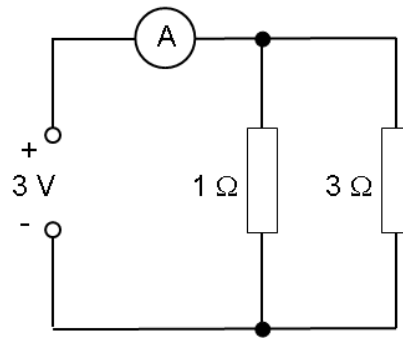
- 17 The graphs show the variation with potential difference V of the current I for three different circuit components.



Which row of the table correctly identifies the circuit components?

	Metal wire at constant temperature	Semiconductor diode	Filament lamp
A	X	Z	Y
B	Y	X	Z
C	Y	Z	X
D	Z	X	Y

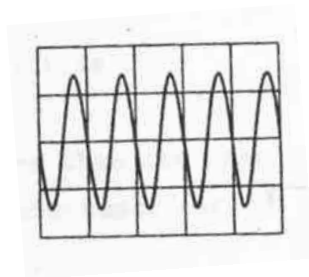
- 18 In the circuit shown below, the ammeter has negligible resistance.



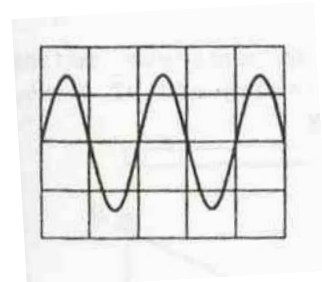
How will the ammeter reading change if the $1\ \Omega$ resistor is removed?

- A Decrease by 1 A
 B Decrease by 3 A
 C Increase by 1 A
 D Increase by 3 A
- 19 A student is supplied with three identical resistors each of resistance $1.0\ \Omega$. Using all the three resistors, which of the following effective resistance is not achievable?
- A $0.33\ \Omega$ B $0.67\ \Omega$ C $1.3\ \Omega$ D $1.5\ \Omega$
- 20 The Y-input terminals of an oscilloscope are connected to a voltage supply of peak value $7.0\ \text{V}$ and frequency $50\ \text{Hz}$.
 The time-base is set at $20\ \text{ms}$ per division and the Y-sensitivity is set at $5.0\ \text{V}$ per division.
 Assuming that all diagrams are drawn to scale, which trace will be obtained?

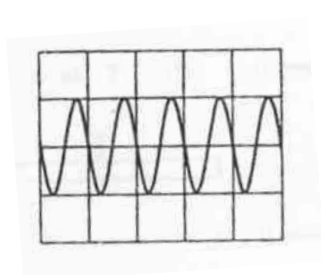
A



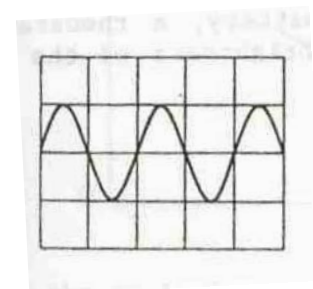
B



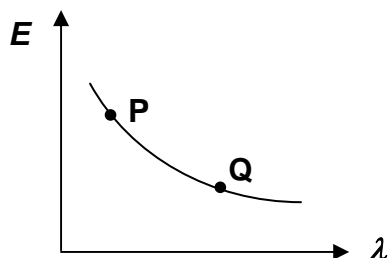
C



D



- 21 The figure below shows the relationship between the energy of a photon of electromagnetic radiation E and its wavelength λ . Points P and Q marked on the graph represent two types of electromagnetic radiation.



Which row of the table correctly identifies the type of electromagnetic radiation represented by **P** and **Q**?

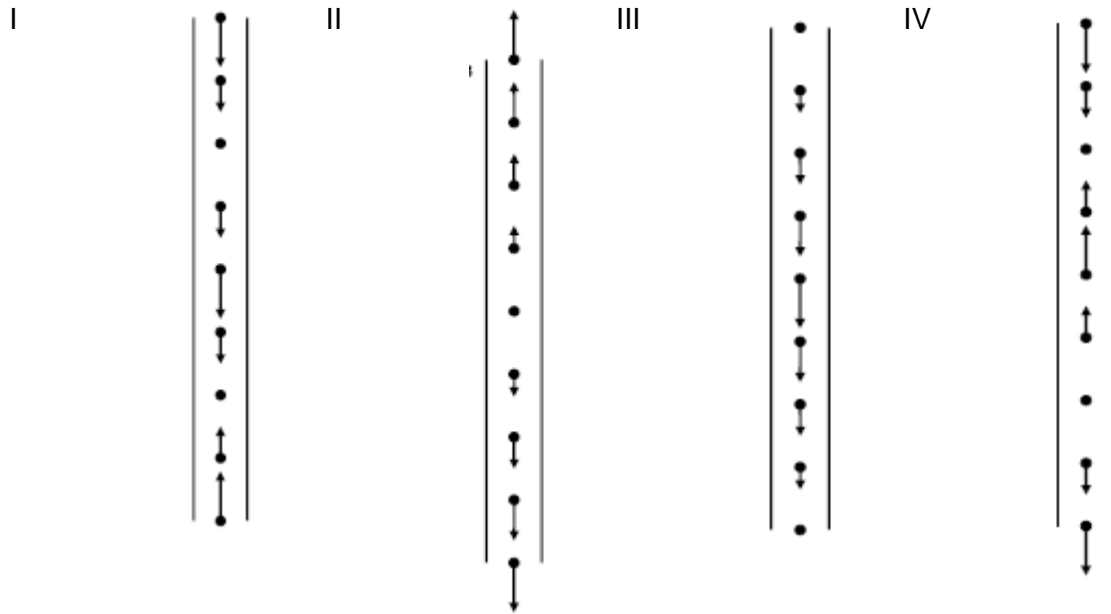
	P	Q
A	infra-red	X-ray
B	microwave	gamma ray
C	ultraviolet	radiowave
D	microwave	ultraviolet

- 22 An air column open at one end and closed at the other end is at resonance. Which one of the following statements is always true?
- A** There is an odd number of nodes.
- B** There is an even number of nodes.
- C** The total number of nodes and antinodes is an odd number.
- D** The total number of nodes and antinodes is an even number.
- 23 In a Young's double slit experiment, the intensity at the centre of the fringe pattern is I . If one of the two identical slits is now closed, the intensity at the centre of the pattern is

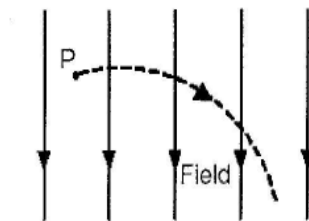
- A** I **B** $\frac{I}{\sqrt{2}}$ **C** $\frac{I}{2}$ **D** $\frac{I}{4}$

- 24** The arrows on the diagrams represent the movement of the air molecules in a pipe in which a stationary longitudinal wave has been set up. The length of each arrow represents the amplitude of the motion, and the arrow head shows the direction of motion at a particular instant.

Which of the following diagrams shows a possible stationary wave that could be set up in the pipe?



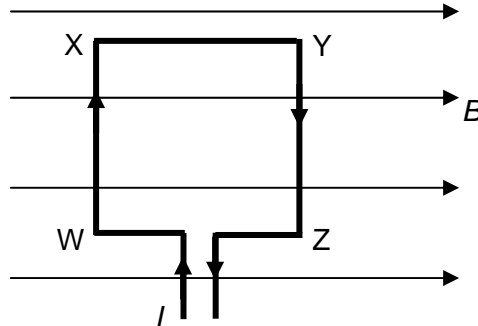
- A** II only **B** III only **C** II and IV **D** I, II and IV
- 25** Suppose a particle P is projected in a uniform field which can be magnetic, electric or gravitational as shown below:



For the particle to move in the plane of the paper in a circular path as indicated, the conditions would have to be:

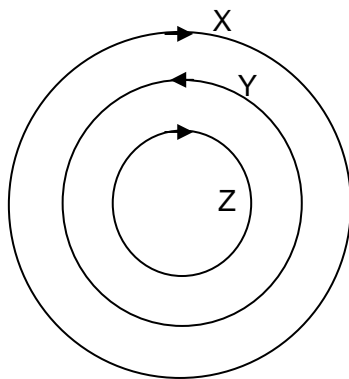
	Particle	Field
A	positively charged	Electric
B	positively charged	Magnetic
C	Uncharged	Gravitational
D	There are no conditions which could produce such a motion in this case.	

- 26 The figure below shows a square coil WXYZ of sides 0.25 m, lying in a vertical plane and carrying a current I of 2.0 A. The magnetic flux density B of 0.010 T is parallel to XY.



What is the magnitude of the torque and its direction when viewed from the top?

- A 1.3×10^{-3} N m, anticlockwise
 B 1.3×10^{-3} N m, clockwise
 C 2.5×10^{-3} N m, anticlockwise
 D 2.5×10^{-3} N m, clockwise
- 27 Three concentric coils X, Y and Z that are equally spaced apart, carry the same current in the directions as shown in the diagram.



Which of the following statement on coil X is correct?

- A The directions of the forces acting on X are outwards, away from the centre of X.
 B The directions of the forces acting on X are inwards, towards the centre of X.
 C Coil X experiences forces that cause it to start rotating.
 D Coil X experiences forces perpendicular to the plane of X, into the diagram.

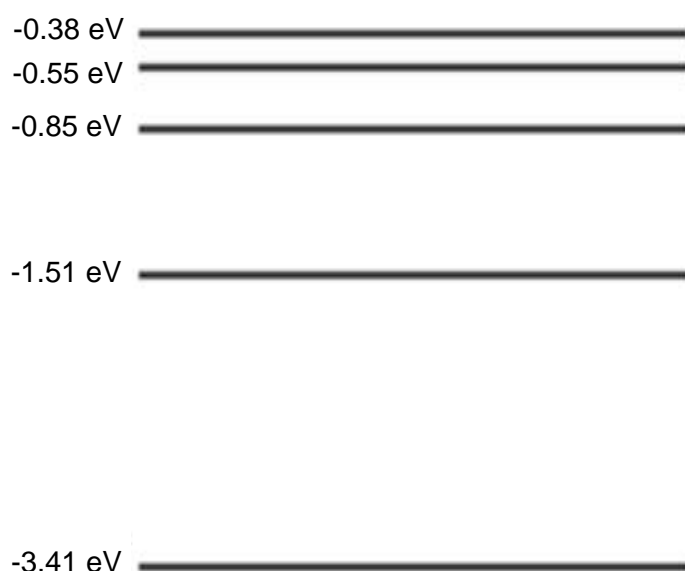
- 28 The work function of platinum is twice that of calcium. If the minimum photon energy required to emit photoelectrons from the surface of platinum is E , then that for the surface of calcium would be

A $2E$ B $\frac{3E}{2}$ C $\frac{E}{2}$ D Cannot be determined

- 29 The de Broglie wavelength of a particle that has kinetic energy K is λ . The wavelength λ is proportional to

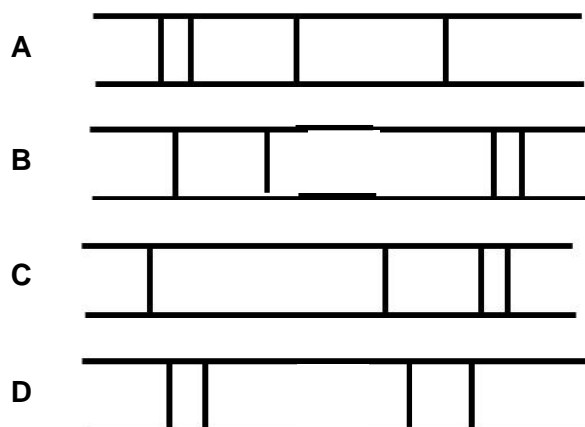
A $K^{\frac{1}{2}}$ B K^{-1} C $K^{\frac{1}{2}}$ D K^2

- 30 Some energy levels for a hydrogen atom are shown in the diagram.



In the spectra below, the frequency scale is linear and increases to the right.

Which spectrum best corresponds to the possible transitions when the electrons of an excited hydrogen atom fall to the -3.41 eV level?



End of Paper