



# JURONG JUNIOR COLLEGE

## 2014 JC2 Preliminary Examinations

Name		Class	14S
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### PHYSICS

8866/01

#### Higher 1

Multiple Choice

19 Sep 2014

1 hour

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

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### 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.

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(This question paper consists of 17 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**

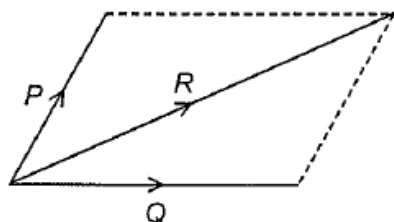
uniformly accelerated motion,	$s = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2as$
work done on/by a gas,	$W = p \Delta V$
hydrostatic pressure,	$p = \rho gh$
resistors in series,	$R = R_1 + R_2 + \dots$
resistors in parallel,	$1/R = 1/R_1 + 1/R_2 + \dots$

1 Which of the following estimations is correct?

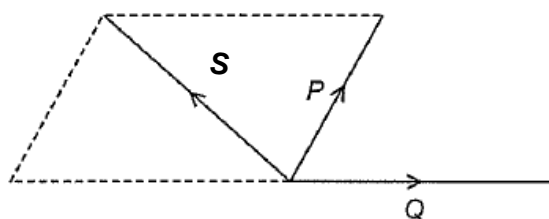
- A The temperature in the domestic refrigerator is 200 K.
- B The volume of a pen is  $4.0 \times 10^{-3} \text{ m}^3$ .
- C The current drawn by a laptop is 15 A.
- D The surface area of a standard soccer ball is  $0.15 \text{ m}^2$ .

2  $P$  and  $Q$  represent two forces.

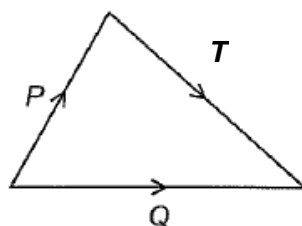
**Fig. 2.1**, **2.2** and **2.3** represent three possible vector diagrams for  $P$  and  $Q$ .



**Fig. 2.1**



**Fig. 2.2**



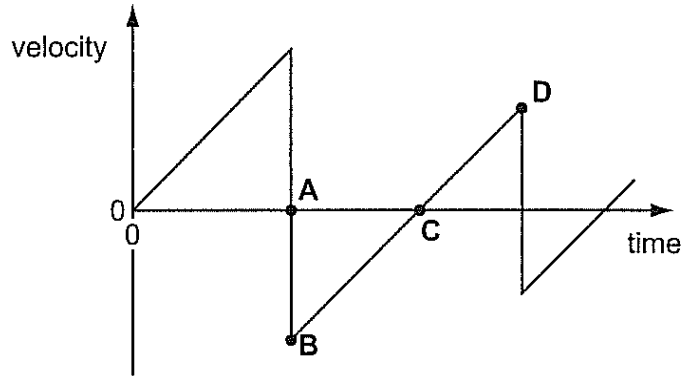
**Fig. 2.3**

Which of the following correctly represents the vectors  $R$ ,  $S$  and  $T$ ?

	$R$	$S$	$T$
<b>A</b>	$P + Q$	$Q - P$	$P - Q$
<b>B</b>	$P + Q$	$P - Q$	$Q - P$
<b>C</b>	$P - Q$	$P + Q$	$Q - P$
<b>D</b>	$Q - P$	$P - Q$	$P + Q$

- 3 A ball is released from rest above a hard, horizontal surface. The graph shows how the velocity of the bouncing ball varies with time.

At which point on the graph does the ball reach its maximum height after the first bounce?

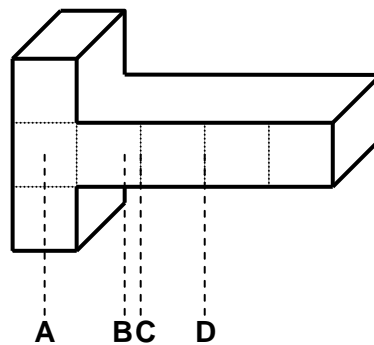


- 4 A lift is moving upwards with an acceleration of  $4.0 \text{ m s}^{-2}$ . A ball, held  $2.5 \text{ m}$  above the floor of the lift and at rest with respect to the lift, is released.

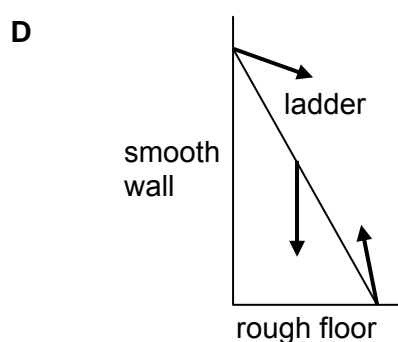
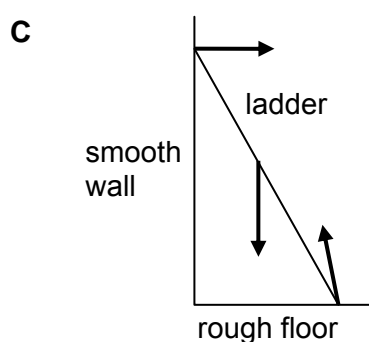
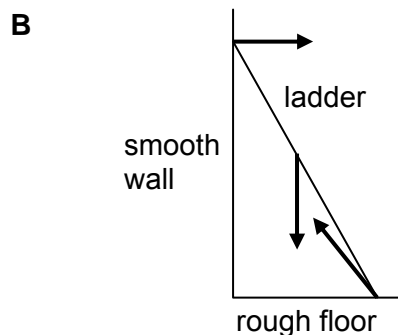
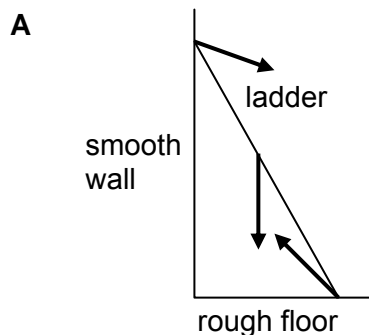
How long does it take for the ball to reach the floor of the lift?

- A**  $0.60 \text{ s}$                       **B**  $0.71 \text{ s}$                       **C**  $0.93 \text{ s}$                       **D**  $1.1 \text{ s}$

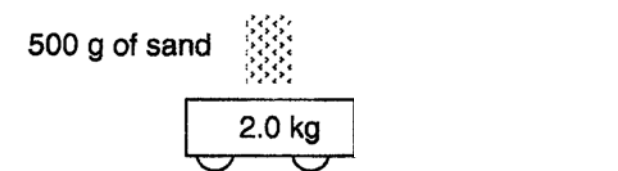
- 5 An object of uniform density with uniform cross sectional area is shown in the diagram (drawn to scale). Along which vertical line is its centre of gravity most probably located?



- 6 A ladder on a rough floor is leaning against a smooth wall. Which diagram correctly shows all the forces acting on it?



- 7 The diagram shows a 2.0 kg trolley moving on a frictionless horizontal table at a speed of  $0.5 \text{ m s}^{-1}$  and 500 g of sand is then released onto the trolley.

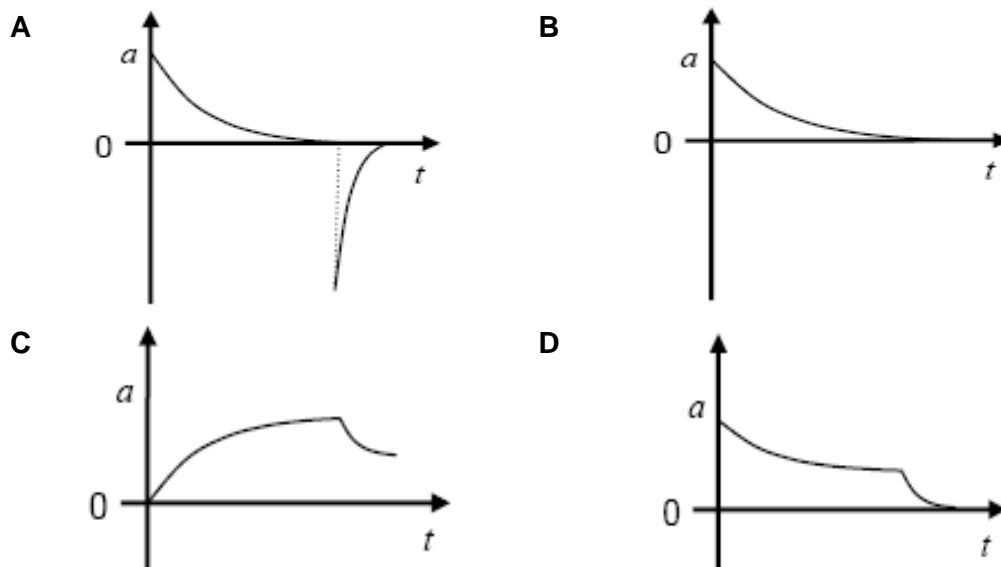


What is the change in the momentum of the trolley? (excluding the sand)

- |                   |                   |
|-------------------|-------------------|
| <b>A</b> zero     | <b>B</b> 0.15 N s |
| <b>C</b> 0.20 N s | <b>D</b> 1.80 N s |

- 8 A parachutist jumps out of a plane. After some time, he pulls the cord to release his parachute.

Which graph best represents the variation with time  $t$  of vertical acceleration  $a$  during the entire descent?



- 9 Two masses moving to the right as shown below make a head-on elastic collision.

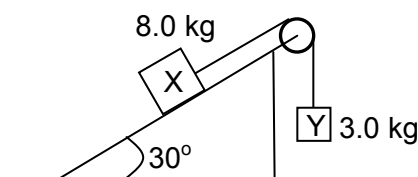


Determine their velocities after the collision?

	4.0 kg mass	3.0 kg mass
<b>A</b>	1.6 m s <sup>-1</sup> to the left	4.6 m s <sup>-1</sup> to the right
<b>B</b>	1.6 m s <sup>-1</sup> to the left	4.6 m s <sup>-1</sup> to the left
<b>C</b>	2.4 m s <sup>-1</sup> to the left	5.4 m s <sup>-1</sup> to the right
<b>D</b>	2.4 m s <sup>-1</sup> to the right	5.4 m s <sup>-1</sup> to the right

- 10 Two bodies X and Y weighing 8.0 kg and 3.0 kg respectively are connected by a light cord passed over a light-free running pulley, as shown.

Starting from rest, X moves down on a smooth plane inclined at  $30^\circ$  to the horizontal.



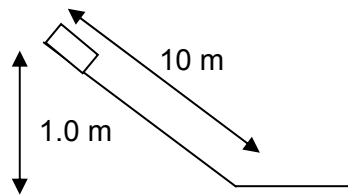
When X has travelled 2.0 m along the plane, what is the total kinetic energy of the system?

- A 2.0 J  
 B 20 J  
 C 77 J  
 D 98 J
- 11 A pump draws a volume  $V$  of water up a vertical height  $h$  from a slow-moving river and discharges it through a nozzle with speed  $v$ . The entire process takes place in time  $t$ . The density of water is  $\rho$ .

Determine the effective power of the pump.

- A  $\frac{\rho Vgh}{t}$   
 B  $\frac{\rho Vv^2}{2t}$   
 C  $\frac{\rho Vgh + 2\rho Vv^2}{2t}$   
 D  $\frac{2\rho Vgh + \rho Vv^2}{2t}$

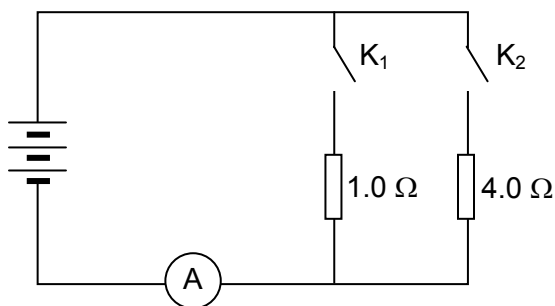
- 12 A body of mass 1.0 kg initially at rest slides down a rough inclined plane that is 1.0 m high and 10 m long as shown in the diagram below.



The body experiences a constant frictional force of 0.50 N over the slope.  
Calculate the kinetic energy of the body at the base of the plane.

- A 4.8 J
  - B 9.3 J
  - C 10 J
  - D 15 J
- 13 Which of the following devices is usually considered to be ohmic in nature?
- A The tungsten filament of a light bulb
  - B A semiconductor diode
  - C A thermistor
  - D A piece of copper wire
- 14 A cell of e.m.f.  $E$  delivers a charge of  $Q$  to an external circuit.  
Which statement is correct?
- A The total energy dissipation in the cell and the external circuit is  $EQ$ .
  - B The energy dissipated in the external circuit is  $EQ$ .
  - C The energy dissipated within the cell is  $EQ$ .
  - D The external resistance is  $EQ$ .

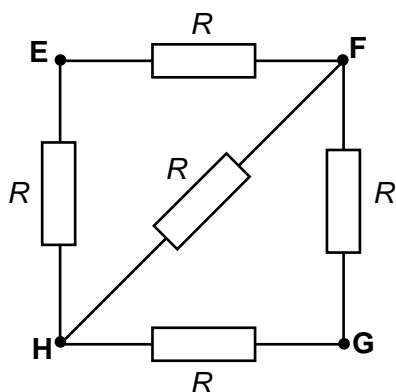
- 15 A circuit is set up as shown.



If  $K_1$  is closed and  $K_2$  is opened, the ideal ammeter reads 2.0 A. If  $K_2$  is closed and  $K_1$  is opened, the ideal ammeter reads 1.0 A.

The internal resistance of the battery is

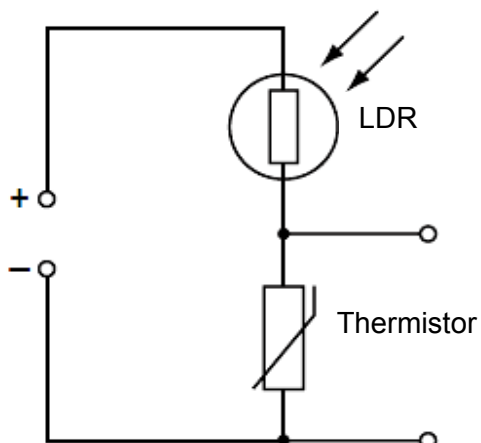
- A** zero                      **B** 1.0  $\Omega$ .                      **C** 2.0  $\Omega$ .                      **D** 4.0  $\Omega$ .
- 16 Five resistors of resistance  $R$  are connected as shown.



Between which two points is the resistance of the combination a **maximum**?

- A** E and F  
**B** F and H  
**C** F and G  
**D** E and G

- 17 The diagram shows a light-dependent resistor (LDR) and a thermistor connected in series to a d.c. source.



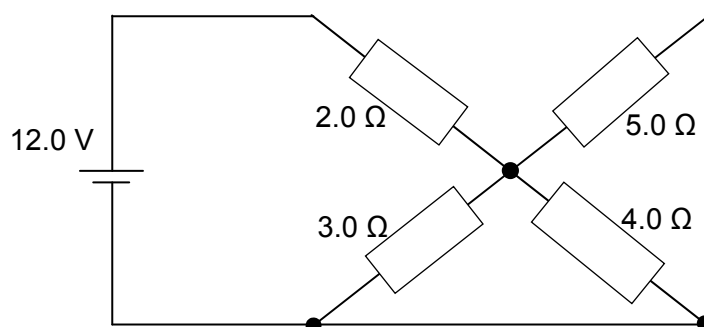
The resistance of a LDR decreases with increasing incident light intensity and increases with decreasing incident light intensity.

The resistance of a thermistor decreases with increasing temperature and increases with decreasing temperature.

Under which set of conditions will the potential difference across the thermistor have the smallest value?

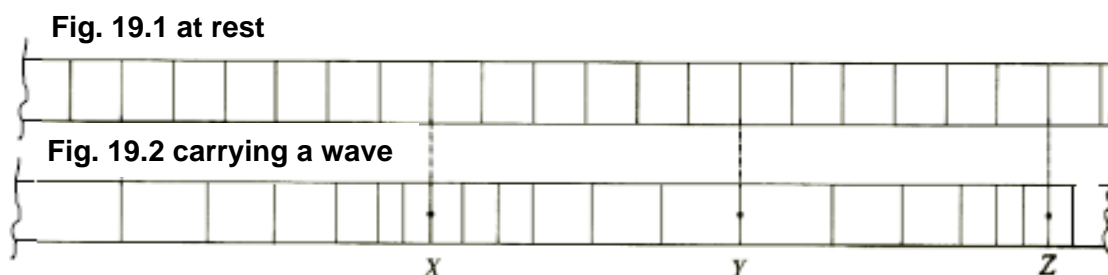
	<b>Illumination</b>	<b>Temperature</b>
<b>A</b>	Low	High
<b>B</b>	High	Low
<b>C</b>	Low	Low
<b>D</b>	High	High

- 18 A cell of e.m.f. 12.0 V with negligible internal resistance is connected to 4 resistors as shown.



What is the current flowing through the 5.0  $\Omega$  resistor in diagram above?

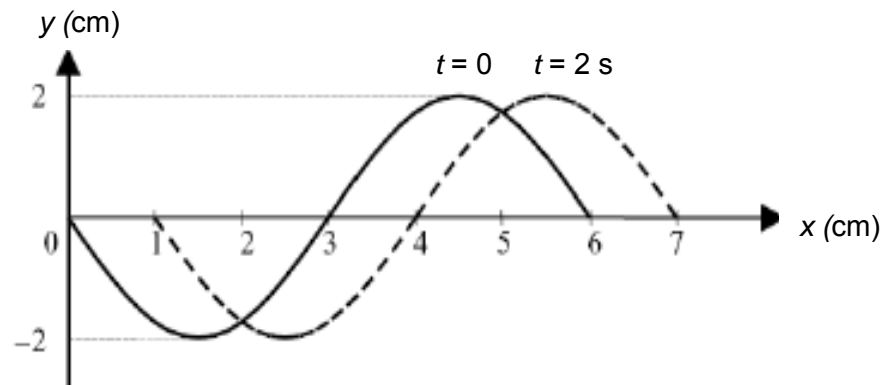
- A zero                      B 0.94 A                      C 1.2 A                      D 1.6 A
- 19 In **Fig. 19.1**, the vertical lines show the equilibrium positions of some particles when they are at rest in a medium. In **Fig. 19.2**, the vertical lines show the positions of the particles at an instant when a longitudinal wave passes through the medium from left to right.



Which statement about the longitudinal wave is correct?

- A The distance between **Y** and **Z** is one full wavelength.
- B The amplitude of vibration of **Y** is greater than the amplitude of vibration of **X**.
- C The displacement of **X** at that instant is zero.
- D The phase difference between **X** and **Y** is  $2\pi$  rad.

- 20 The figure shows the positions of a travelling wave at time intervals  $t = 0$  and  $t = 2$  s.

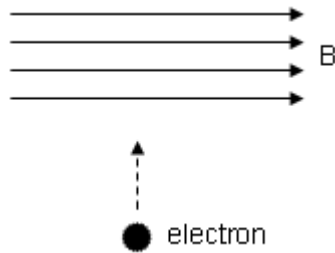


Calculate the speed of the wave.

- A  $0.5 \text{ cm s}^{-1}$   
 B  $2.0 \text{ cm s}^{-1}$   
 C  $0.5 \text{ m s}^{-1}$   
 D  $2.0 \text{ m s}^{-1}$
- 21 A speaker of a public address system operating at  $2000 \text{ W}$ , radiates sound uniformly in all directions.
- If a typical adult ear has a surface area of  $2.1 \times 10^{-3} \text{ m}^2$  and assuming that the sound from the speaker strikes the surface of the ear perpendicularly, how much power is intercepted by the ear of an adult standing  $78 \text{ m}$  away from the speaker?
- A  $2.6 \times 10^{-2} \text{ W}$   
 B  $4.3 \times 10^{-3} \text{ W}$   
 C  $2.2 \times 10^{-4} \text{ W}$   
 D  $5.5 \times 10^{-5} \text{ W}$

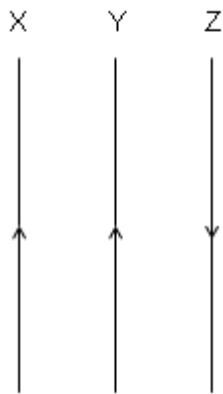
- 22** A wave is diffracted as it passes through an opening in a barrier.  
The amount of diffraction that the wave undergoes depends on both the
- A** amplitude and frequency of the incident wave
  - B** wavelength and speed of the incident wave
  - C** wavelength of the incident wave and the size of the opening
  - D** amplitude of the incident wave and the size of the opening
- 23** Which of the followings is always *true* for a stationary wave?
- A** All particles have the same amplitude.
  - B** No energy is transferred from one end of the wave to the other.
  - C** The particles in the wave oscillate perpendicularly to the direction of wave travel.
  - D** All particles vibrate at the same frequency as the wave.
- 24** Two waves of the same frequency are superposed at a point in phase.  
The total intensity at that point is proportional to
- A** the sum of the intensities of the two waves.
  - B** the square of the sum of the two amplitudes.
  - C** the square of the mean value of the two amplitudes.
  - D** the square of the difference of the two amplitudes.

- 25 An electron is projected at right angles to a uniform magnetic field  $B$  as shown in the diagram below.



Assuming no other fields are present, state the direction of the magnetic force experienced by the electron just as it enters the field.

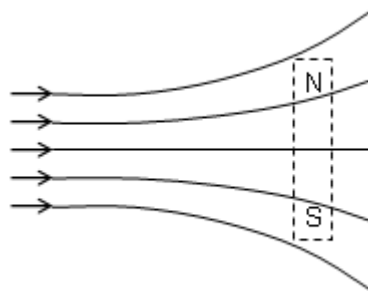
- A Into the plane of the paper
  - B Out of the plane of the paper
  - C To the left
  - D To the right
- 26 The diagram below shows three parallel wires X, Y and Z carrying currents of equal magnitude in the directions shown. Wire Y is placed between wires X and Z and is equidistant from them.



The resultant force acting on wire Y due to the currents in wires X and Z is

- A perpendicular to the plane of the paper.
- B zero.
- C to the left.
- D to the right.

- 27 A bar magnet is placed in a non-uniform magnetic field as shown in the diagram.



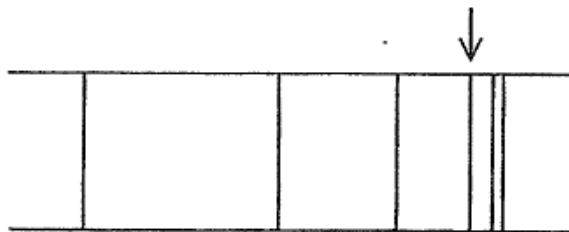
Which of the following describes the subsequent motion of the magnet?

	Rotation	Movement
<b>A</b>	Anticlockwise	To the left
<b>B</b>	Anticlockwise	To the right
<b>C</b>	Clockwise	To the left
<b>D</b>	Clockwise	To the right

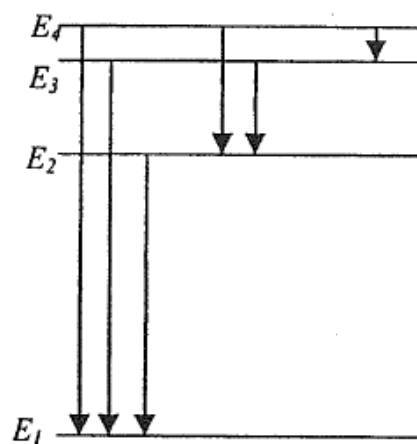
- 28 The particles listed below have the same de Broglie wavelength.  
Which one must have the lowest velocity?

- A** Proton, with a mass of  $1u$
- B**  ${}^4_2\text{He}$  nucleus, with a mass of  $4u$
- C**  ${}^2_1\text{H}$  nucleus, with a mass of  $2u$
- D** Electron, with a mass of  $\frac{1}{1840}u$

- 29 The spectral emission line indicated by the arrow in **Fig. 29.1** is produced by a transition between energy levels in **Fig. 29.2**.



**Fig. 29.1**

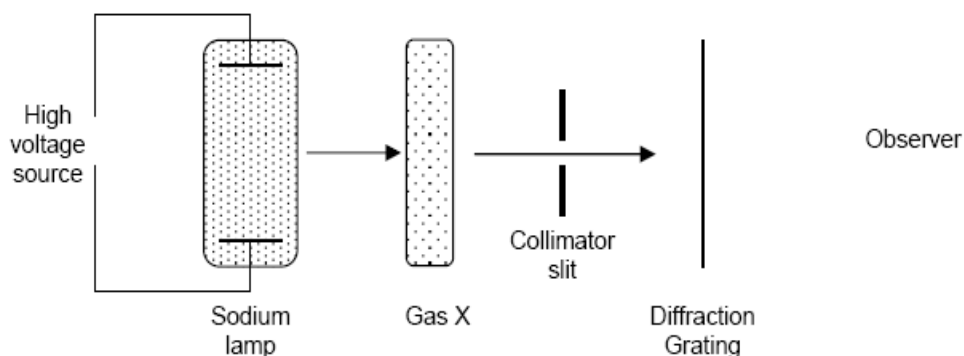


**Fig. 29.2**

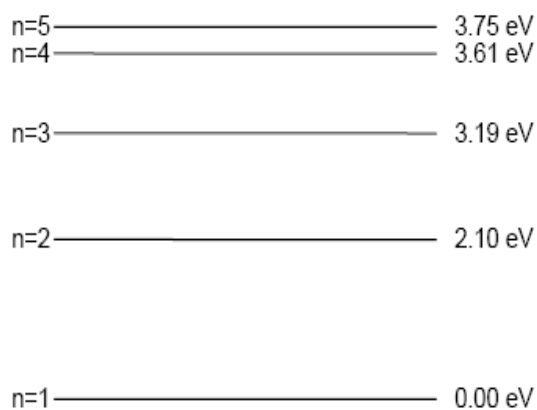
Which transition is it?

- A  $E_4$  and  $E_1$
- B  $E_3$  and  $E_2$
- C  $E_2$  and  $E_1$
- D  $E_4$  and  $E_2$

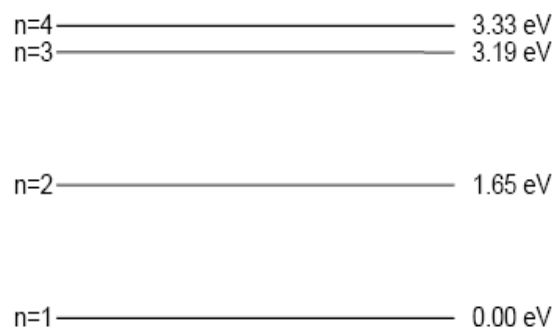
- 30 A spectrometer is set up to observe the spectrum produced by the sodium lamp as shown in **Fig. 30.1**. A container of Gas X is placed in its path.



**Fig. 30.1**



**Fig. 30.2 Sodium atom**



**Fig. 30.3 Gas X**

Given the energy levels of the lowest states of sodium (**Fig. 30.2**) and Gas X (**Fig. 30.3**), which of the following statements is true?

- A** 4 spectra lines are observed
- B** 8 spectra lines are observed
- C** 9 spectra lines are observed
- D** 10 spectra lines are observed

**End of paper**