

# Competishun

52/6, Opposite Metro Mas Hospital, Shipra Path, Mansarovar

**Date:** 11/01/2025

**Time:** 3 hours

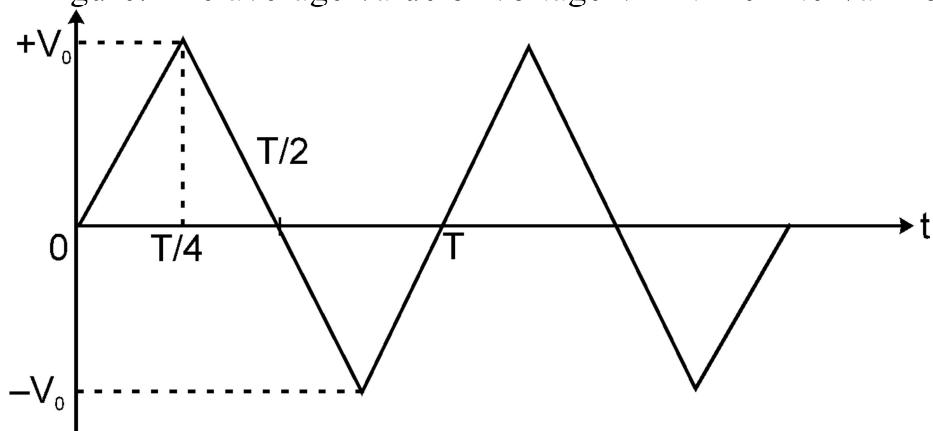
**Max. Marks:** 300

## Graph Related PCM Test (24-25)

# Physics

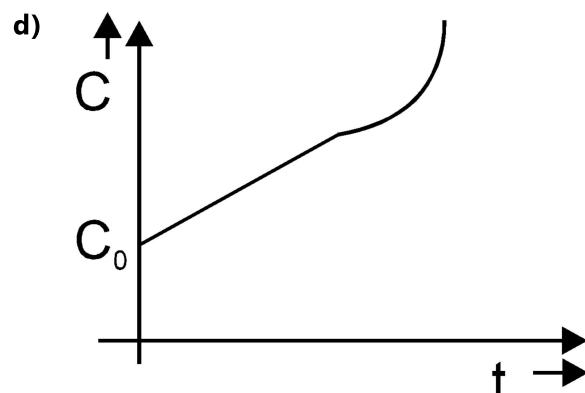
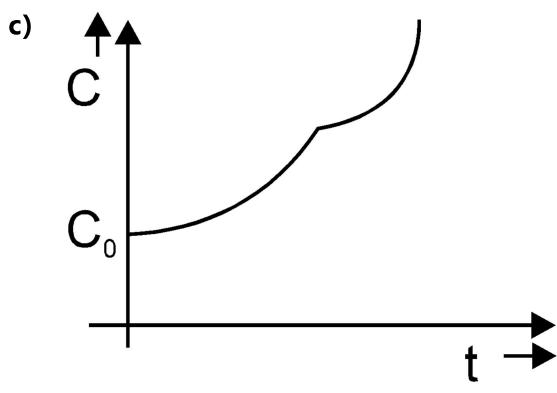
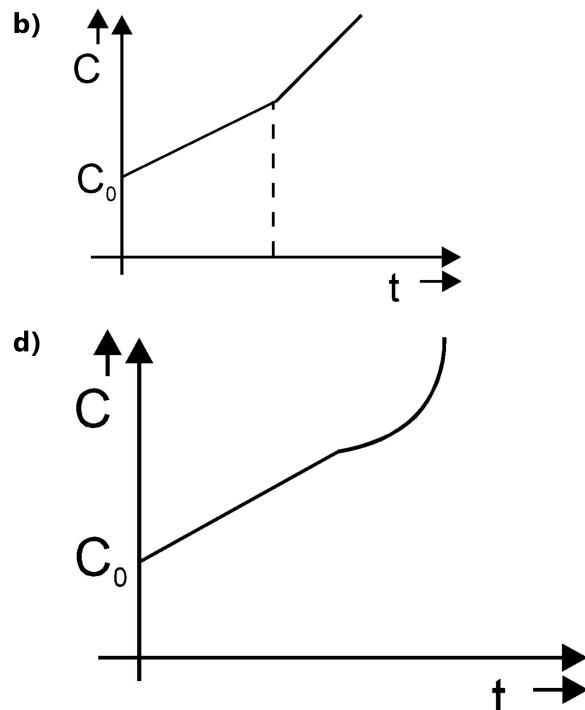
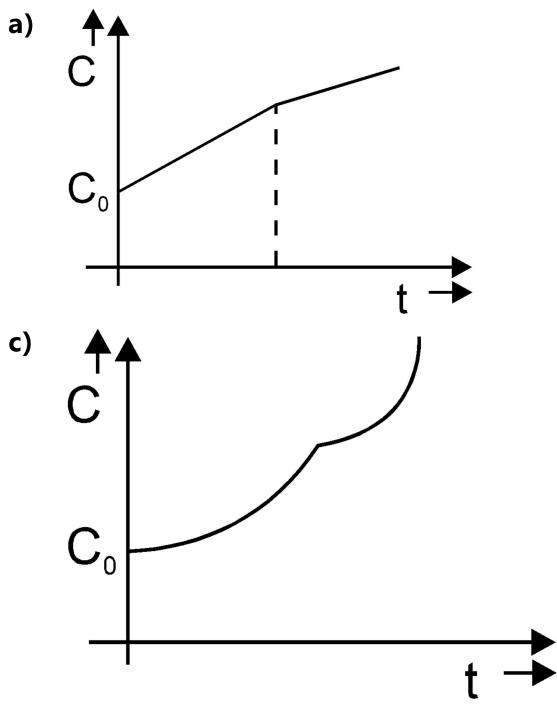
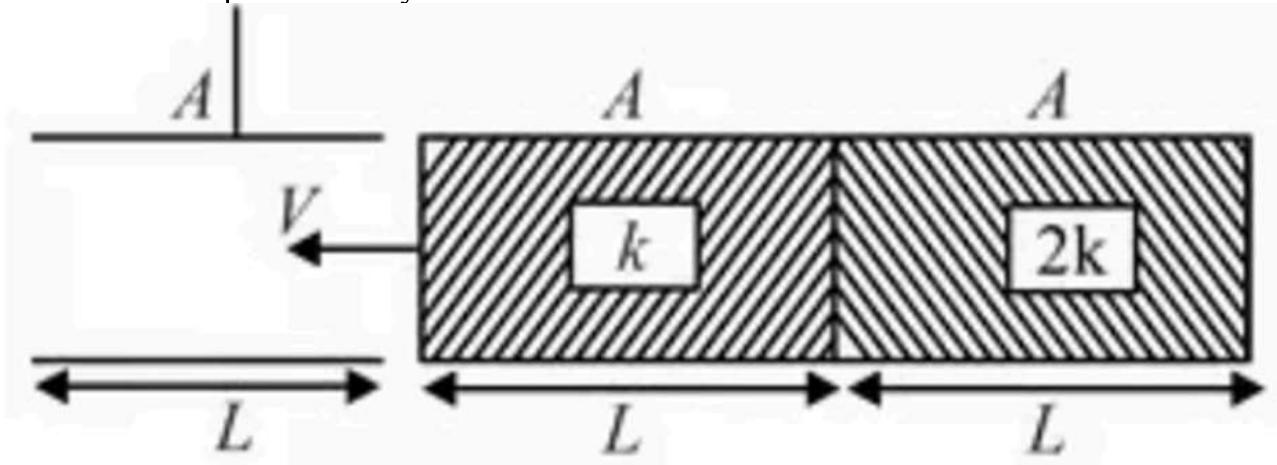
### Single Choice Question

- Q1** The voltage time ( $V - t$ ) graph for triangular wave having peak value  $V_0$  is as shown in figure. The average value of voltage  $V$  in time interval from  $t = 0$  to  $T$  is :

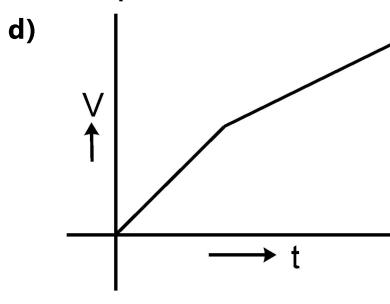
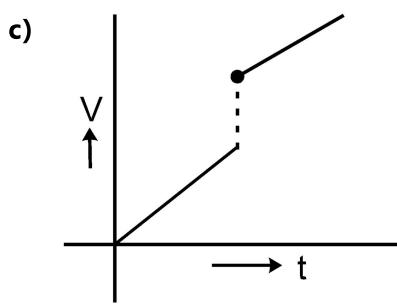
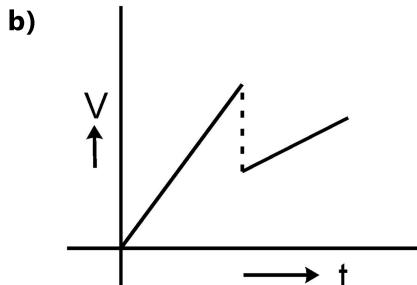
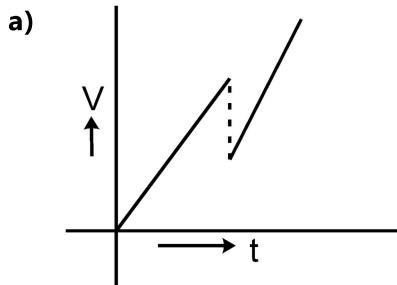


- a) 0      b)  $\frac{V_0}{2}$       c)  $\frac{V_0}{\sqrt{2}}$       d) None of these

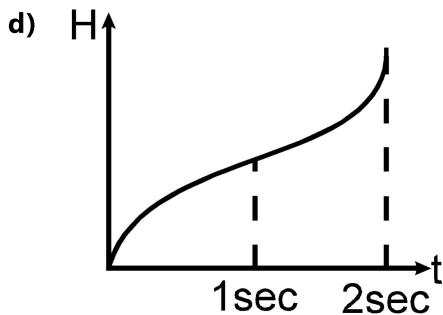
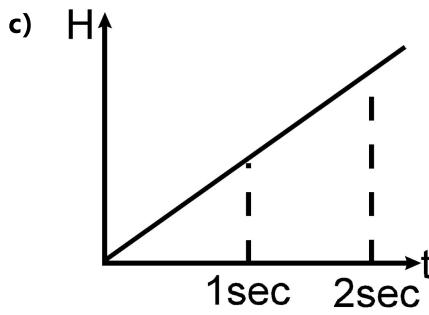
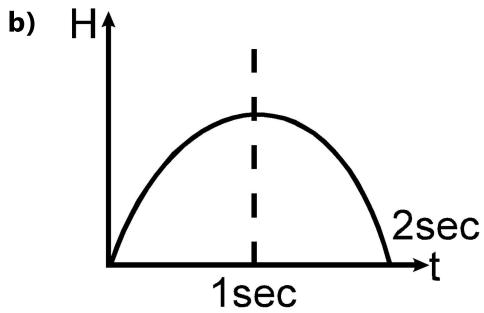
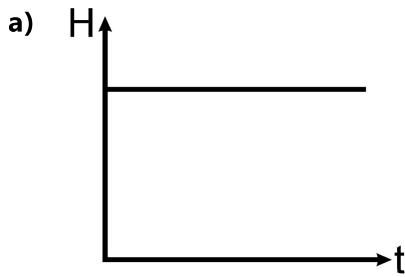
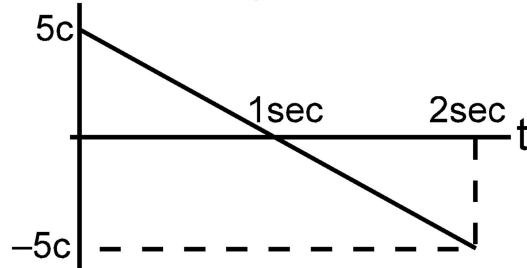
- Q2** A parallel plate capacitor without any dielectric has capacitance  $C_0$ . A dielectric slab is made up of two dielectric slabs of dielectric constants  $K$  and  $2K$  and is of same dimensions as that of capacitor plates and both the parts are of equal dimensions arranged serially as shown. If this dielectric slab is introduced (dielectric  $K$  enters first) in between the plates at constant speed, then variation of capacitance with time will be best represented by:



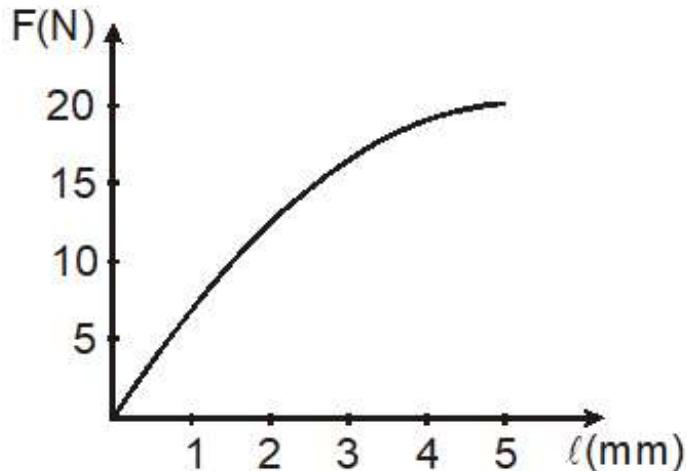
- Q3** Two balls of same mass are released simultaneously from heights  $h$  &  $2h$  from the ground level. The balls collide with the floor & stick to it. Then the velocity-time graph of centre of mass of the two balls is best represented by :



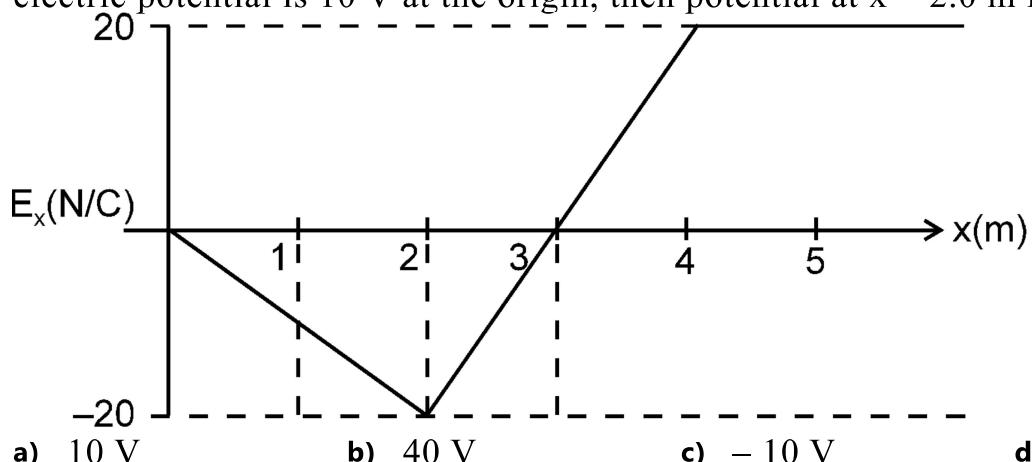
- Q4** A charge passing through a resistor is varying with time as shown in the figure. The amount of heat generated in time ' $t$ ' is best represented (as a function of time) by:



- Q5** The force ( $F$ )-extension ( $\ell$ ), graph shows that the strain energy stored in the material under test, for an extension of 4mm, is greater than which of the following values?

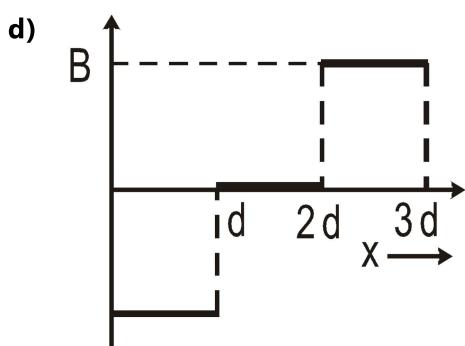
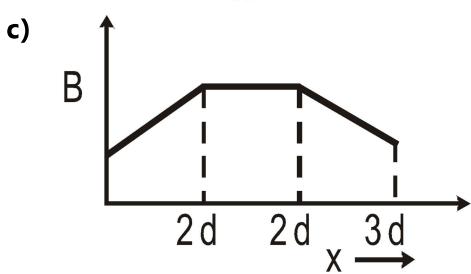
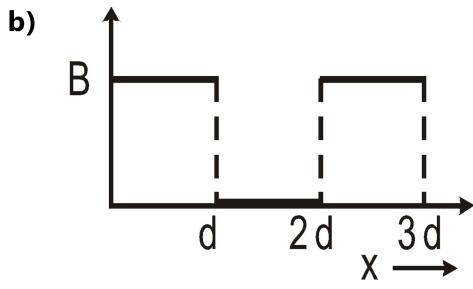
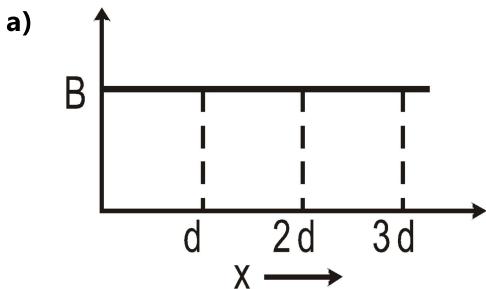
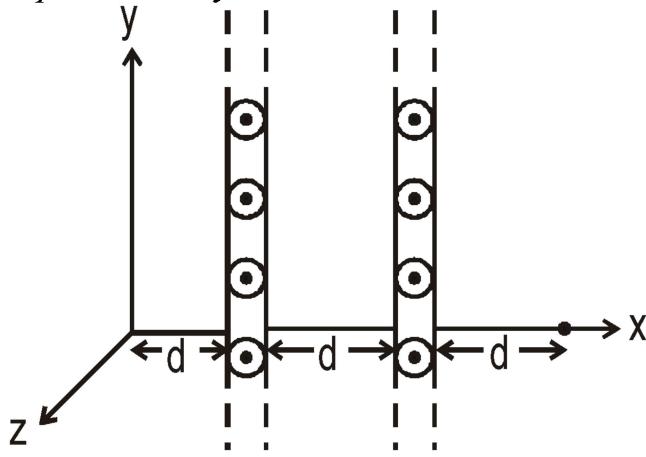


- Q6** A graph of the  $x$  component of the electric field as a function of  $x$  in a region of space is shown. The  $Y$  and  $Z$  components of the electric field are zero in this region. If the electric potential is 10 V at the origin, then potential at  $x = 2.0$  m is :

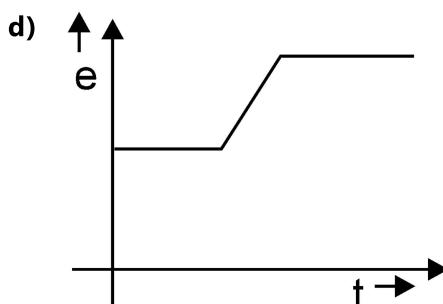
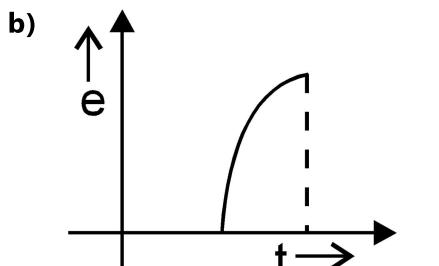
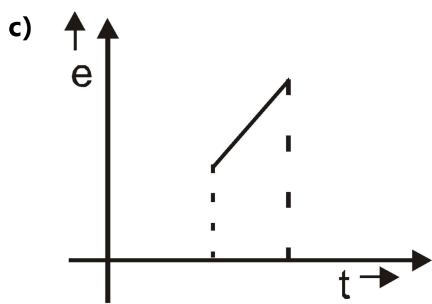
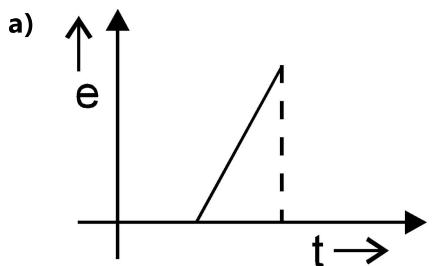
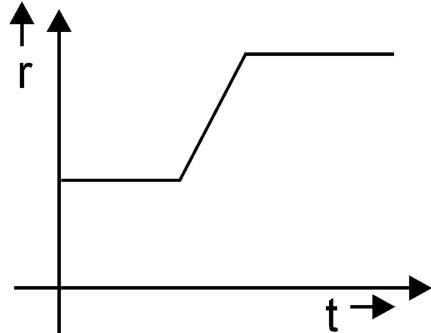


- a) 10 V      b) 40 V      c) -10 V      d) 30 V

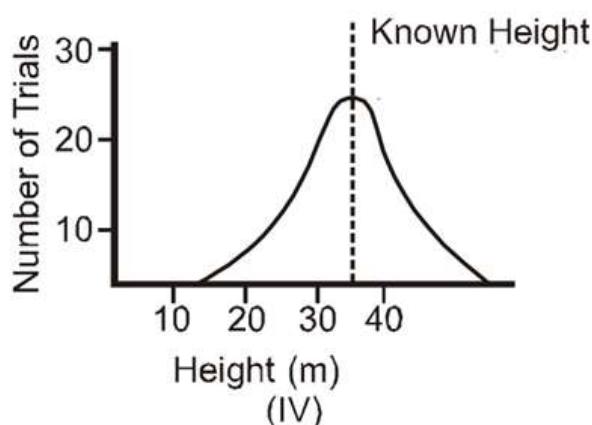
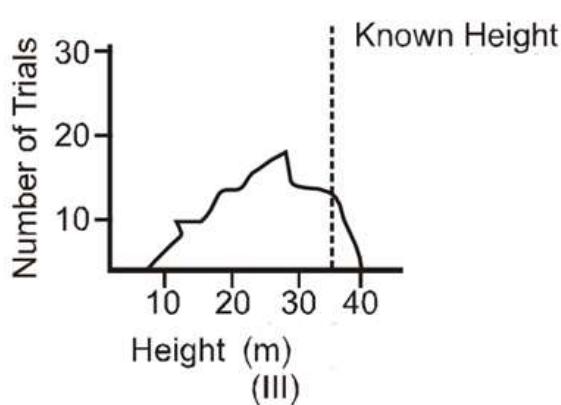
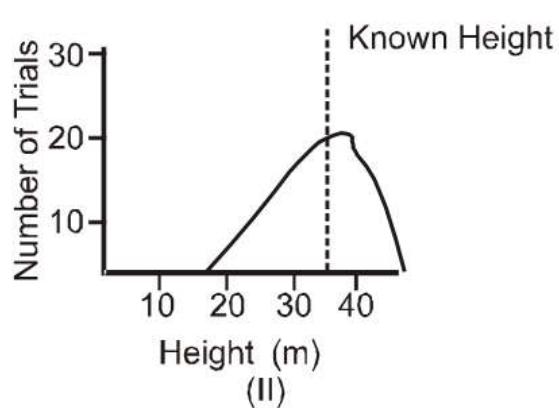
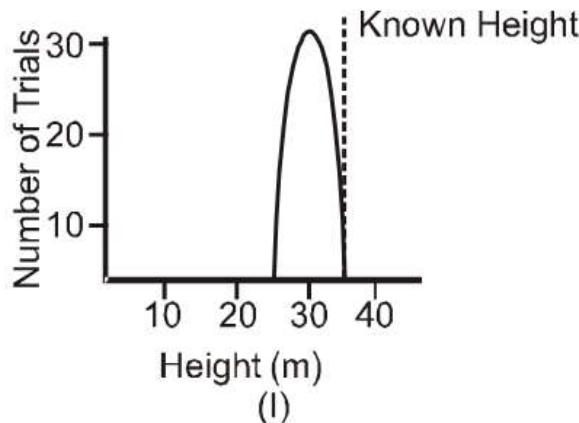
- Q7** Two large conducting planes carrying current perpendicular to x-axis are placed at  $(d, 0)$  and  $(2d, 0)$  as shown in figure. Current per unit width in both the planes is same and current is flowing in the outward direction. The variation of magnetic induction (taken as positive if it is in positive y-direction) as function of 'x' ( $0 \leq x \leq 3d$ ) is best represented by :



- Q8** Radius of a circular ring is changing with time and the coil is placed in uniform constant magnetic field perpendicular to its plane. The variation of 'r' with time 't' is shown in the figure. Then induced e.m.f.  $\epsilon$  with time will be best represented by :



- Q9** Four students measure the height of a tower. Each student uses a different method and each measures the height many different times. The data for each are plotted below. The measurement with highest precision is :



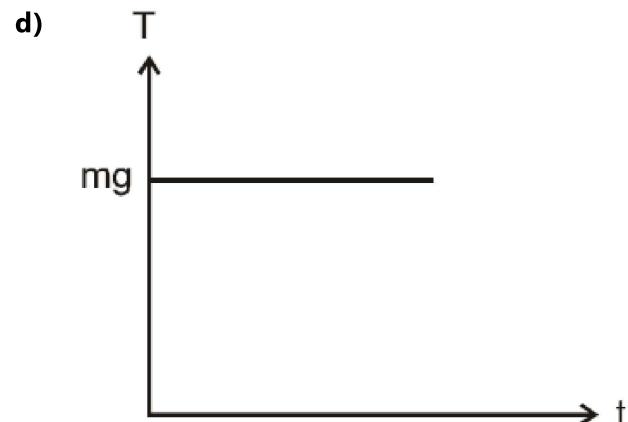
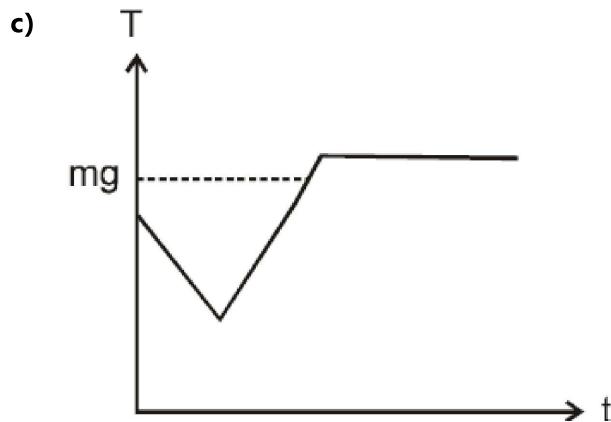
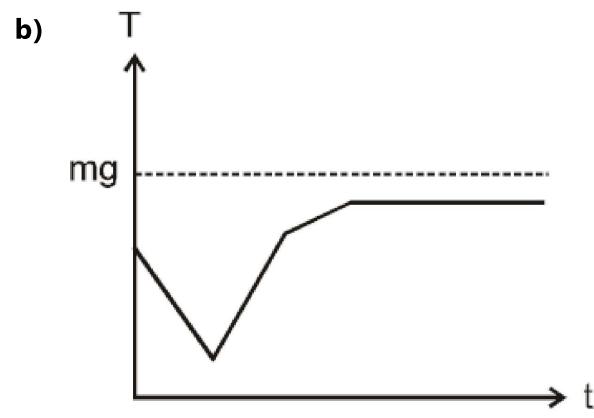
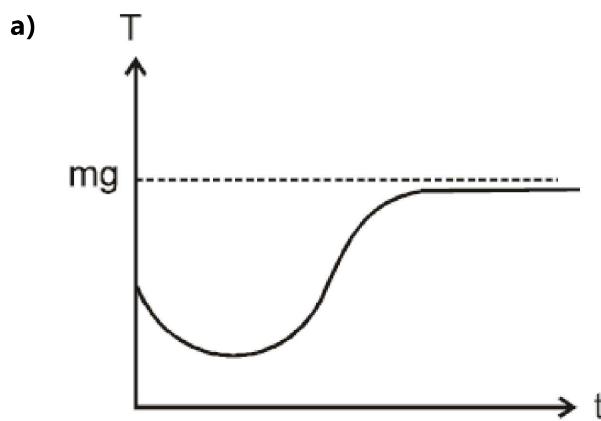
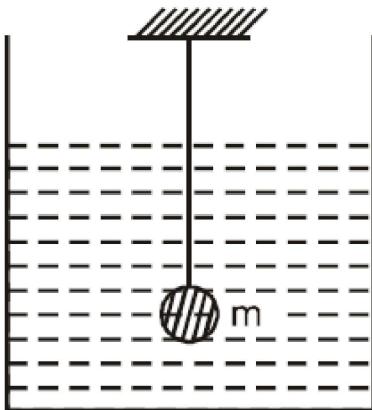
a) I

b) II

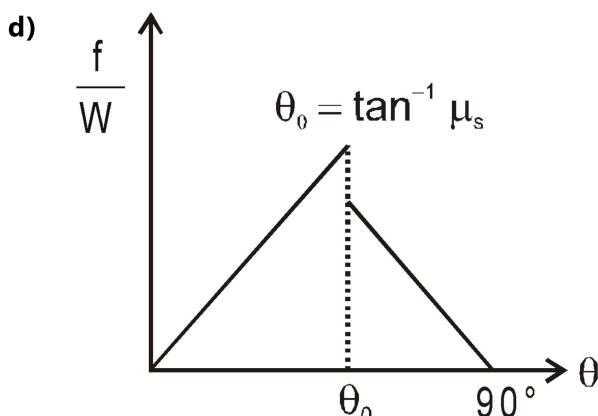
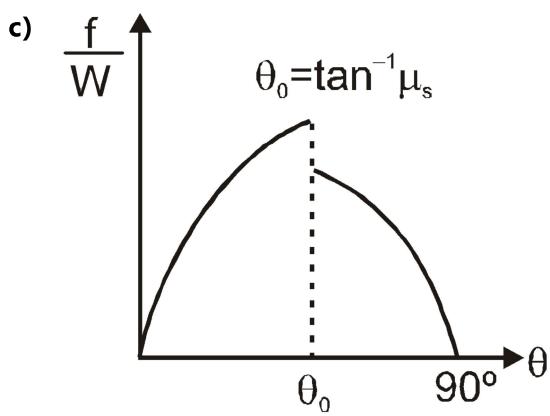
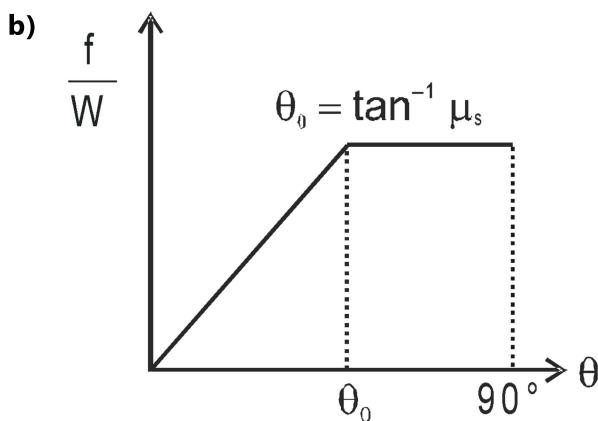
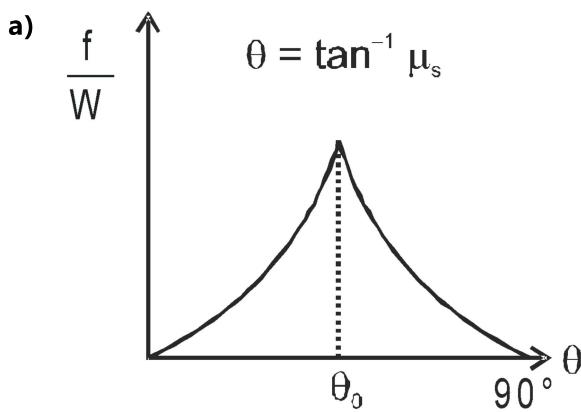
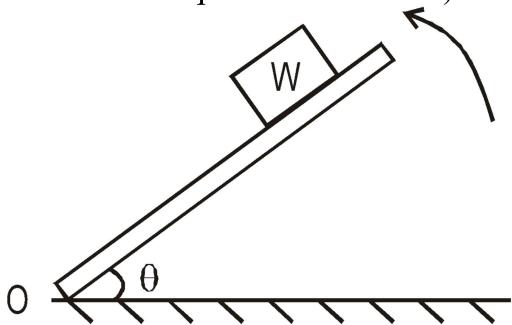
c) III

d) IV

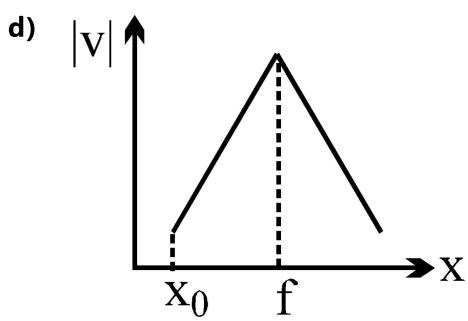
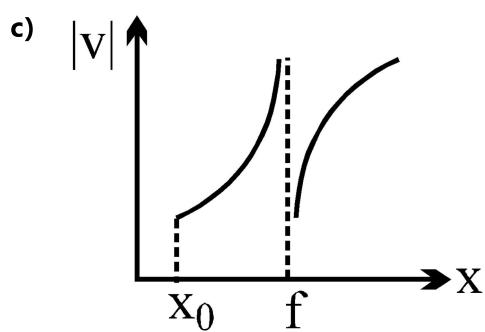
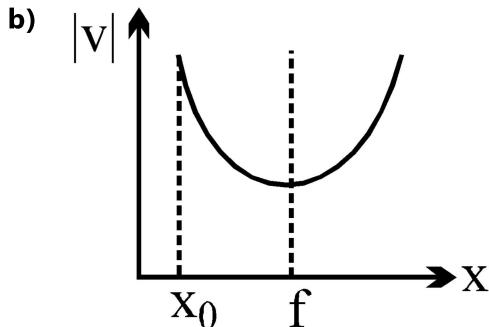
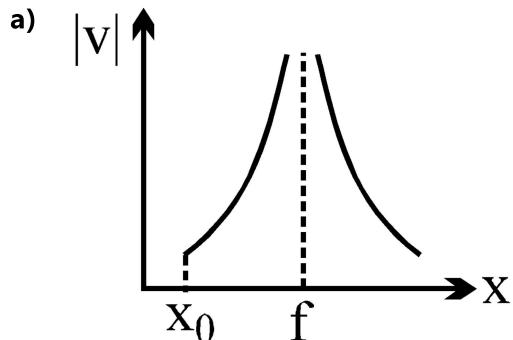
- Q10** Initially tension in string is non-zero and water at  $0^{\circ}\text{C}$ . Now temperature of water is increased slowly at constant rate (consider vaporisation of water also). Then tension in string with time will be best represented as : (neglect change in volume of ball)



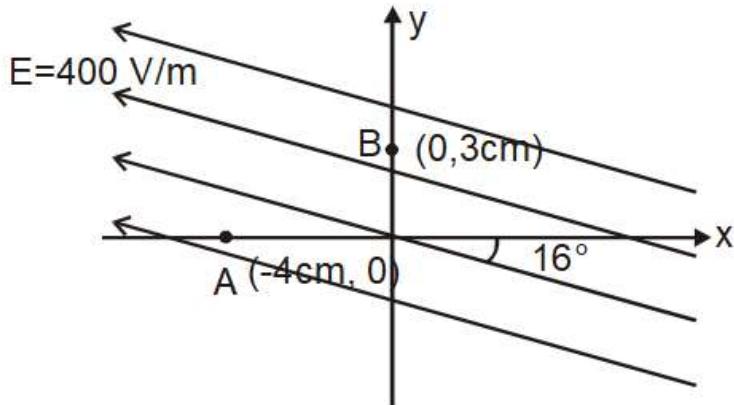
- Q11** A block of weight  $W$  rests on a rough horizontal plank hinged at point 'O'. The plank starting from horizontal position rotates such that the angle  $\theta$  it makes with horizontal increases slowly upto  $90^\circ$ . If  $f$  is the friction between the block and the plank, identify the graph of  $\frac{f}{W}$  versus  $\theta$ . ( $\mu_s$  and  $\mu_k$  are coefficients of static and kinetic friction between the plank and block) ?



- Q12** A point source is situated at a distance  $x < f$  from the pole of the concave mirror of focal length  $f$ . At time  $t = 0$ , the point source starts moving away from the mirror with constant velocity. Which of the graphs below represents best, variation of image distance  $|v|$  with the distance  $x$  between the pole of mirror and the source.

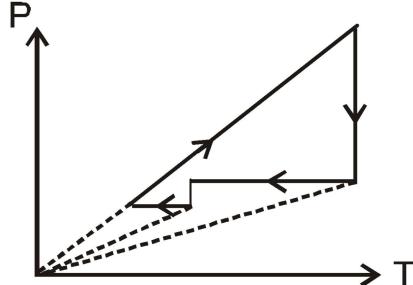


- Q13** A uniform electric field of  $400 \text{ V/m}$  exists in space as shown in graph. Two points A and B are also shown with their co-ordinates. The potential difference  $V_B - V_A$  in volts, is :

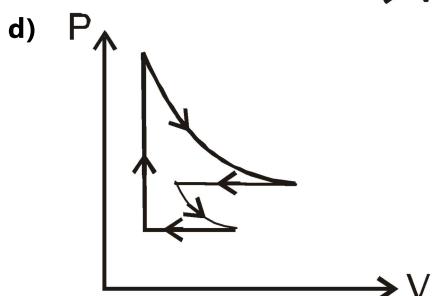
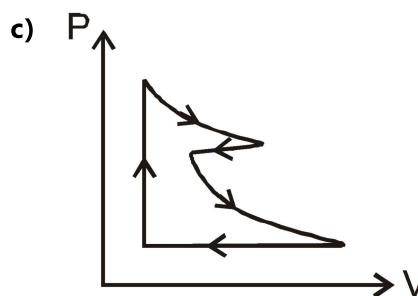
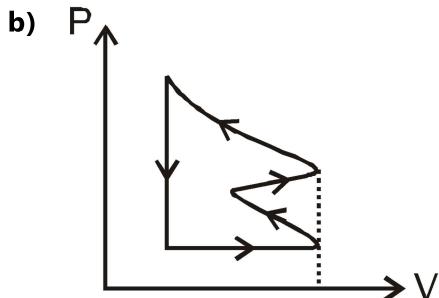
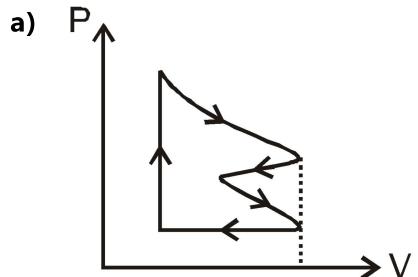


- a) 18 V      b) 15 V      c) 12 V      d) 8 V

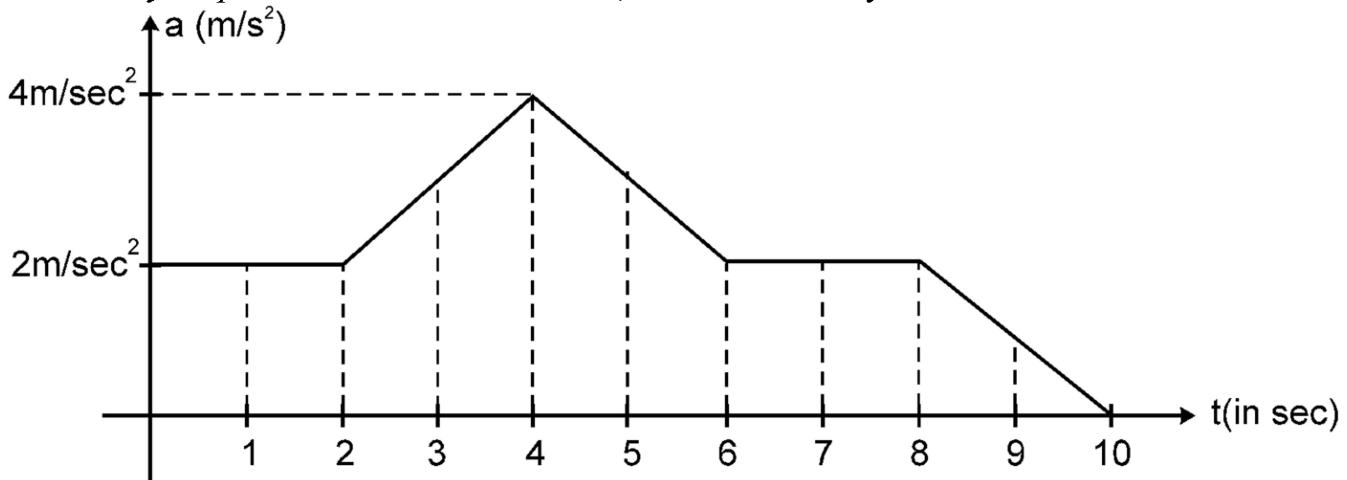
**Q14** P-T curve for a cyclic process is as shown`



P-V graph for this process will be :

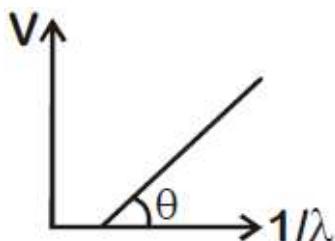


**Q15** Acceleration-time graph of a particle moving in a straight line is shown in the figure. If velocity of particle at  $t = 0$  is 1 m/sec, then its velocity at the end of 10 sec will be :



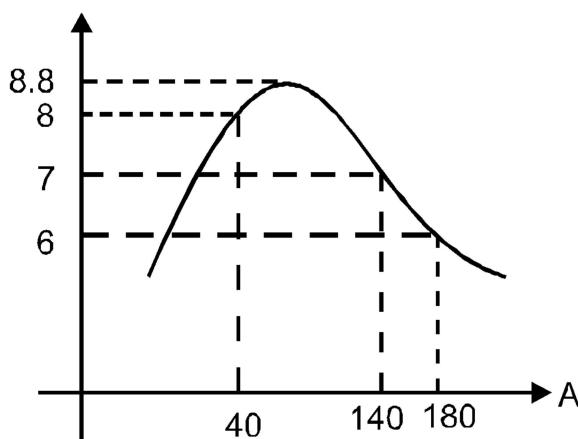
- a) 18 m/sec opposite to the initial direction.
- b) 23 m/sec along the initial direction.
- c) 18 m/sec along the initial direction
- d) 23 m/sec in the opposite direction.

- Q16** In a photoelectric effect experiment, the graph of stopping potential  $V$  versus reciprocal of wavelength obtained is shown in the figure. As the intensity of incident radiation is increased



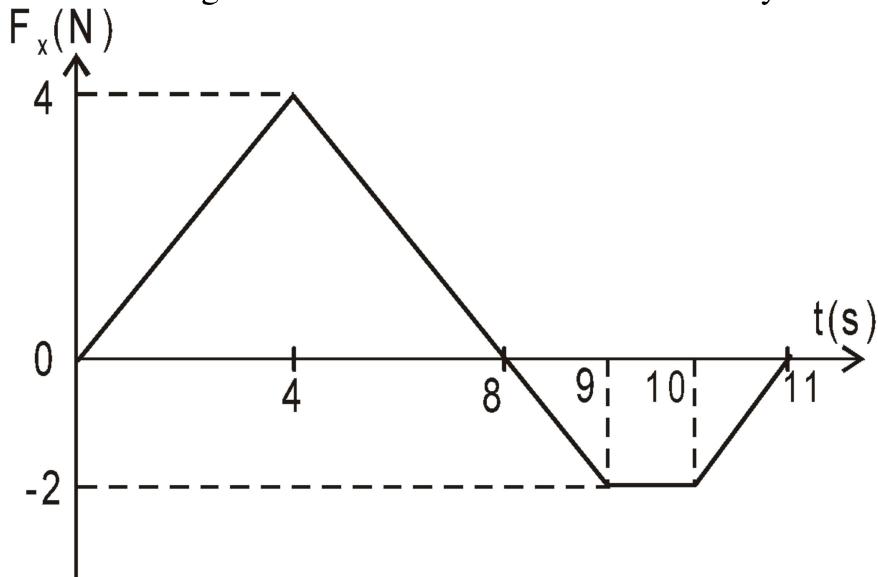
- a) Slope of the straight line get more steep
  - b) Graph does not change
  - c) Straight line shifts to left
  - d) Straight line shifts to right
- Q17** A heavy nucleus  $x(A = 180)$  breaks into two nuclie  $y (A = 140)$  and  $z (A = 40)$ . Energy released during fission reaction is :

BE/A(in MeV)



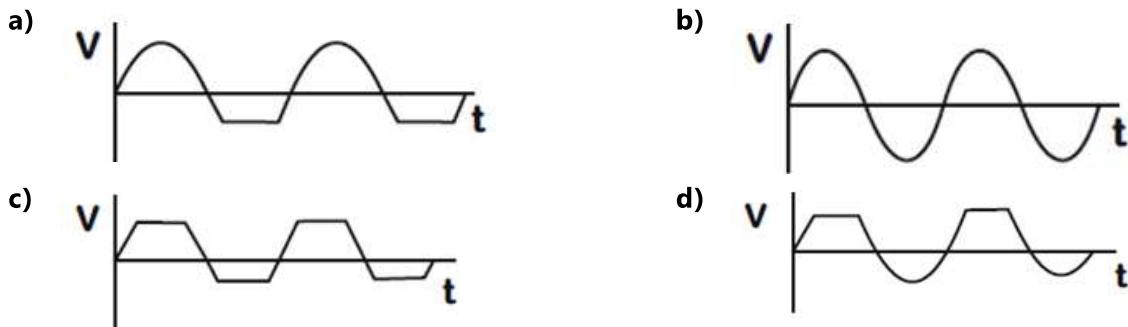
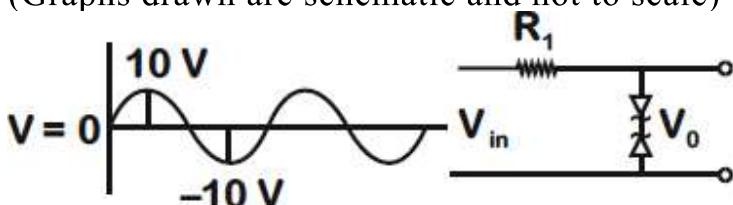
- a) 110 MeV
- b) 220 MeV
- c) 200 MeV
- d) Energy is not released

- Q18** A 2 kg toy car can move along x axis. Graph shows resultant force  $F_x$ , acting on the car which begins at rest at time  $t = 0$ . The velocity of the particle at  $t = 10$  s is :

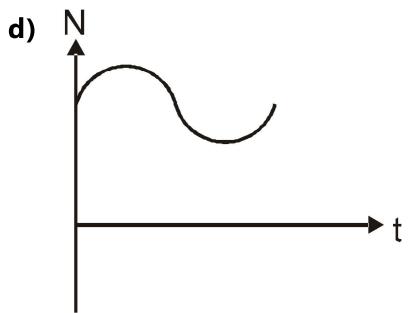
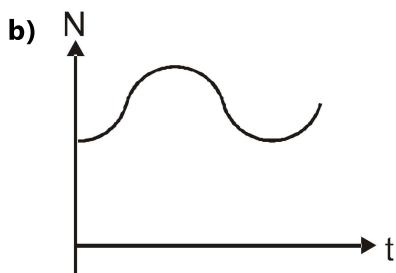
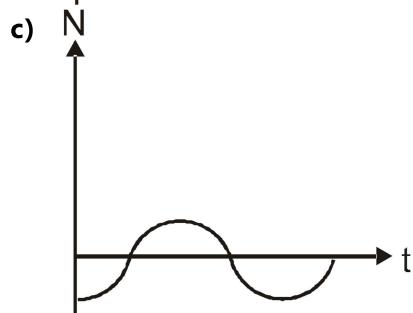
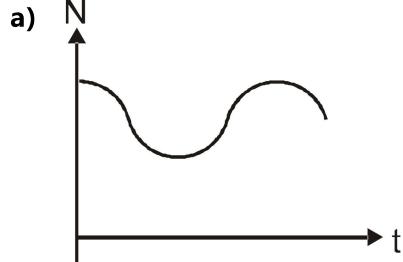
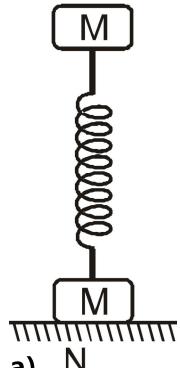


- a)  $-i$  m/s      b)  $-1.5 i$  m/s      c)  $6.5 i$  m/s      d)  $13 i$  m/s

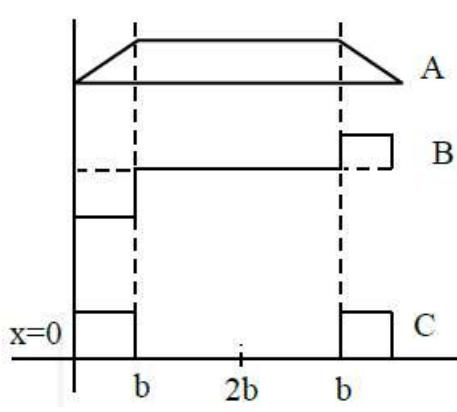
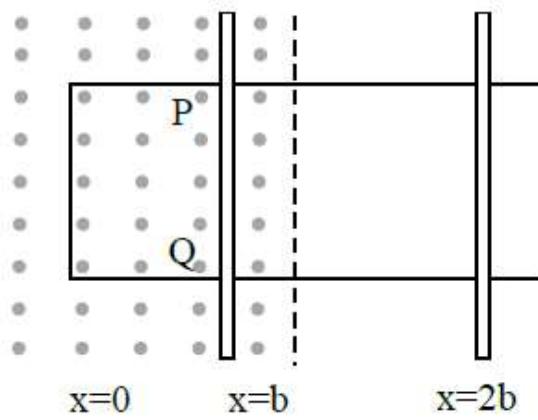
- Q19** Take the breakdown voltage of the zener diode used in the given circuit as 6 V. For the input voltage shown in figure below, the time variation of the output voltage is (Graphs drawn are schematic and not to scale)



- Q20** Two blocks of same mass  $M$  each are as shown. One of them is on the ground and other is on the vertical spring. Both of them are in equilibrium. The upper mass is pushed down by a small distance and released at  $t = 0$ . Choose the correct graph that shows the variation of normal reaction from ground with time :



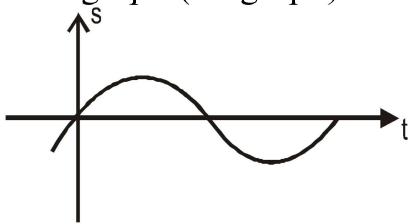
- Q21** The arm PQ of a rectangular conductor is moving from  $x = 0$  to  $x = 2b$  outwards and then inwards from  $x = 2b$  to  $x = 0$  as shown in the figure. A uniform magnetic field perpendicular to the plane is acting from  $x = 0$  to  $x = b$ . Identify the graph showing the variation of different quantities with distance :



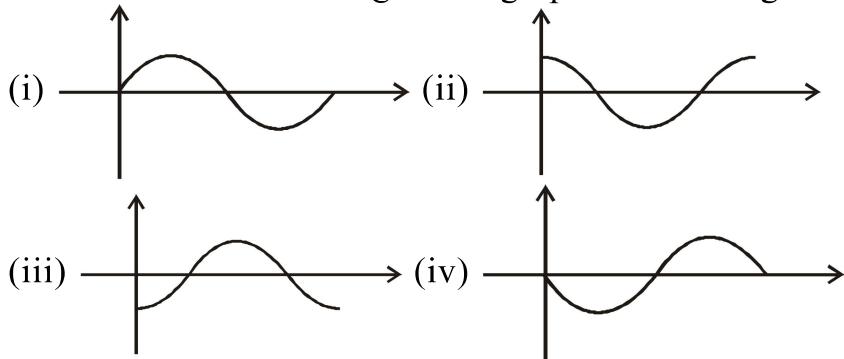
- a) A-Flux, B-Power dissipated, C-EMF  
 b) A-Power dissipated, B-Flux, C-EMF  
 c) A-Flux, B-EMF, C-Power dissipated  
 d) A-EMF, B-Power dissipated, C-Flux

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**Q22** A sound wave is travelling towards left (negative x-axis) and its displacement versus time graph (s-t graph) is as shown for particles at  $x = 0$ .

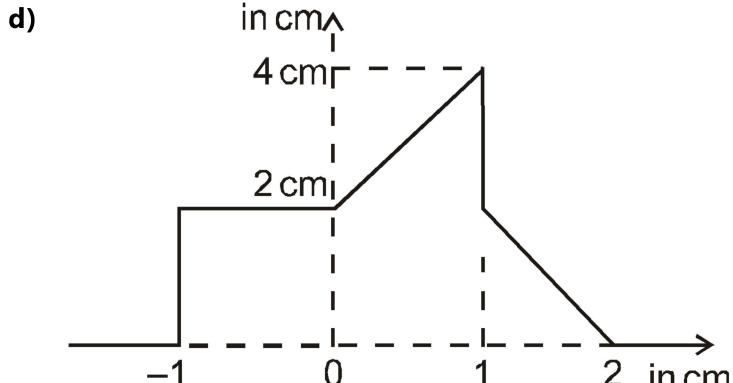
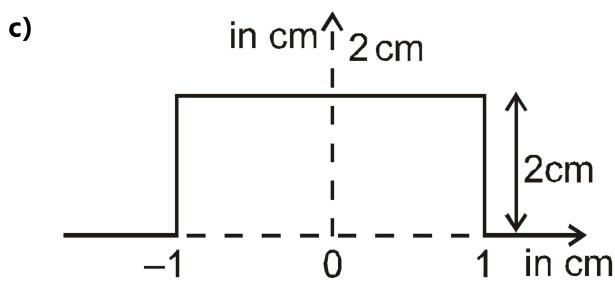
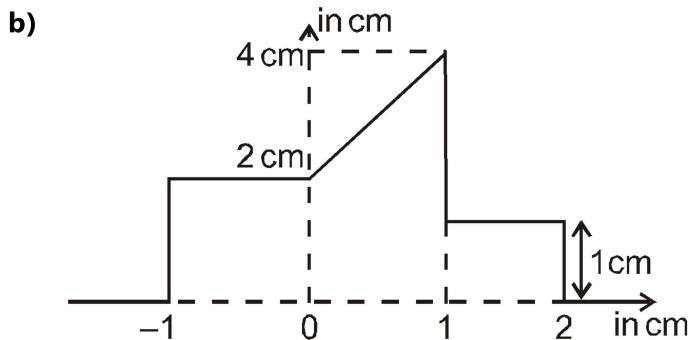
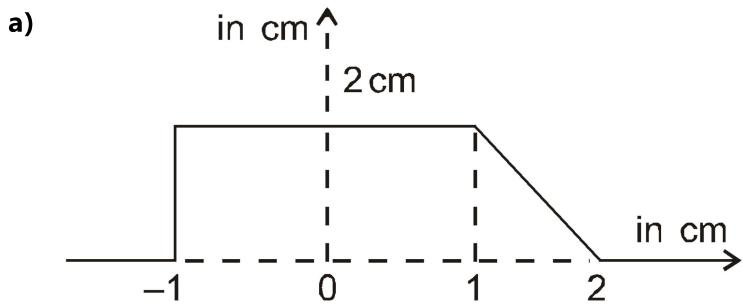
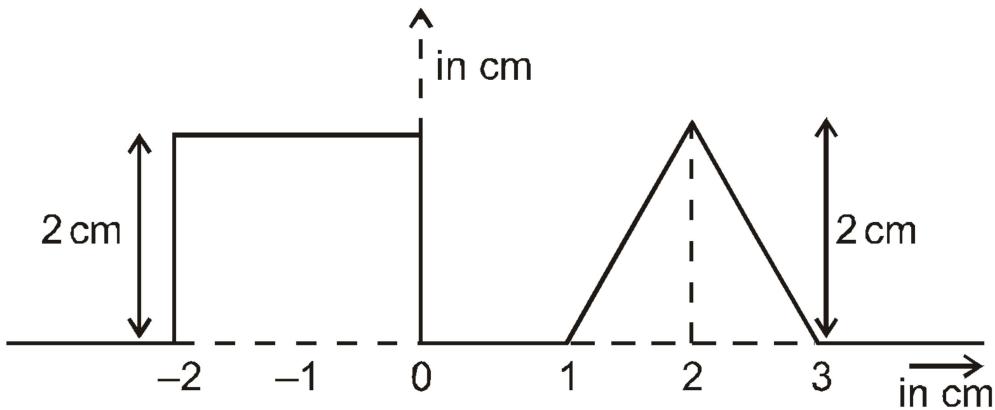


Choose correct matching of the graphs. P is change in pressure

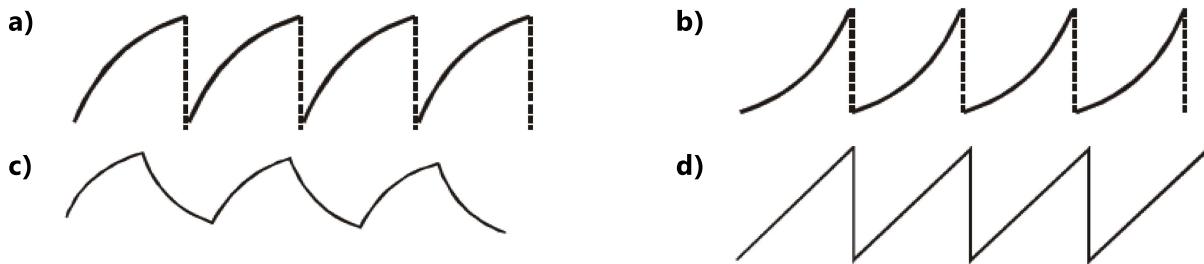
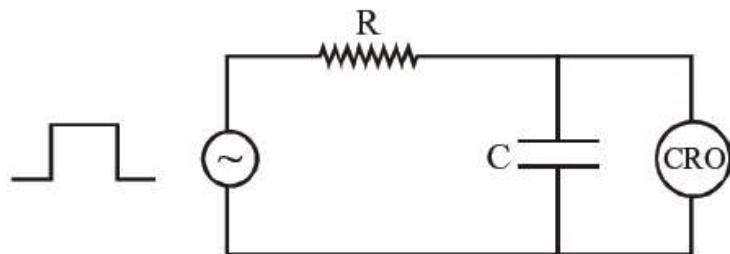


- a) Graph (i) shows  $P - t$  for  $x = 0$  and graph (iv) shows  $P - x$  at  $t = 0$
- b) Graph (iii) shows  $P - t$  for  $x = 0$  as well as  $P - x$  at  $t = 0$
- c) Graph (iv) shows  $P - t$  for  $x = 0$  and graph (i) shows  $P - x$  at  $t = 0$
- d) Graph (ii) shows  $P - t$  for  $x = 0$  and graph (ii) shows  $P - x$  at  $t = 0$

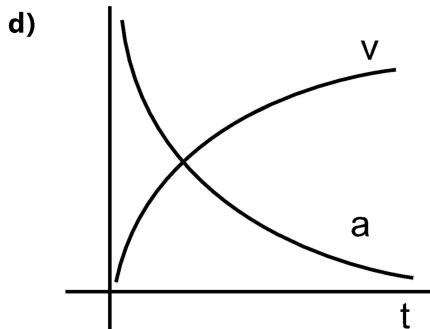
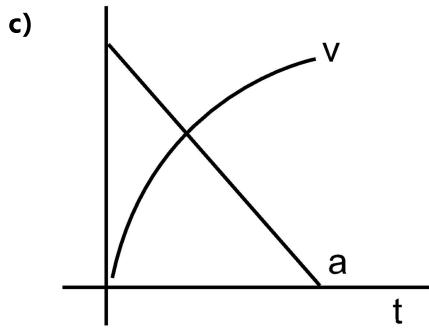
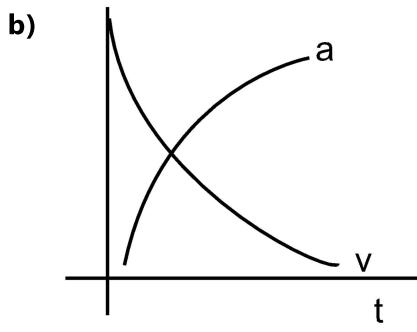
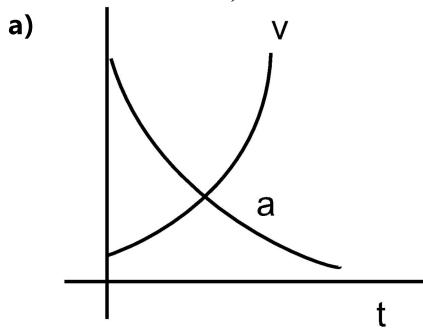
- Q23** The figure shows at time  $t = 0$  second, a rectangular and triangular pulse on a uniform wire are approaching each other. The pulse speed is 0.5 cm/s. The resultant pulse at  $t = 2$  second is



**Q24** An RC circuit as shown in the figure is driven by a AC source generating a square wave. The output wave pattern monitored by CRO would look close to :



**Q25** Which of the following option correctly describes the variation of the speed  $v$  and acceleration ' $a$ ' of a point mass falling vertically in a viscous medium that applies a force  $F = -kv$ , where ' $k$ ' is constant , on the body ?( Graphs are schematic and not drawn to scale)

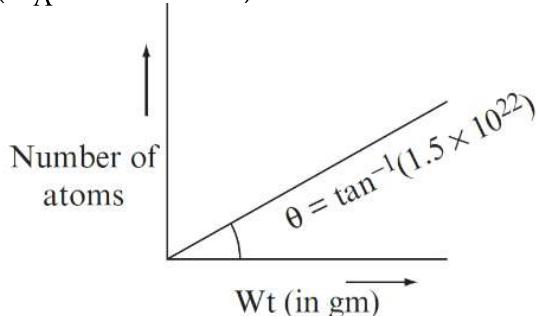


# Chemistry

## Single Choice Question

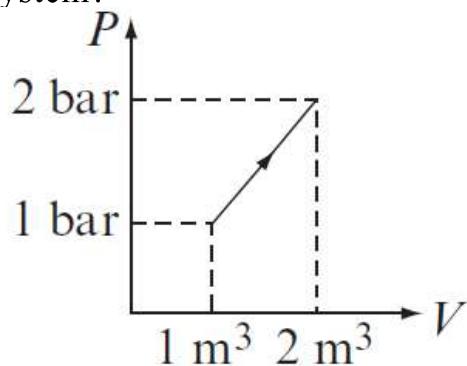
**Q26** A graph is plotted for an element by putting its mass on  $X$ -axis and the corresponding number of atoms on  $Y$ -axis. What is the atomic mass of the element for which the graph is plotted?

$$(N_A = 6.0 \times 10^{23})$$



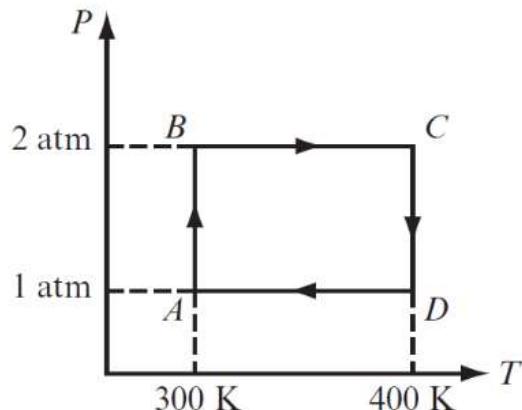
- a) 80      b) 40      c) 0.025      d) 20

**Q27** A system absorbs 100 kJ heat in the process shown in the figure. What is  $U$  for the system?



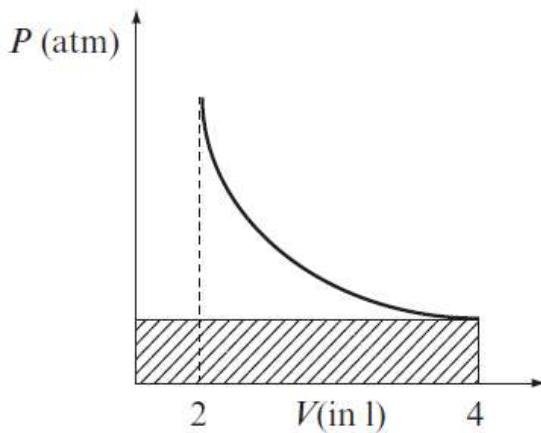
- a) -50 kJ      b) +50 kJ      c) +150 kJ      d) -150 kJ

**Q28** Two moles of helium gas undergoes a cyclic process as shown in the figure. Assuming ideal behaviour of gas, the magnitude of net work done by the gas in this cyclic process is



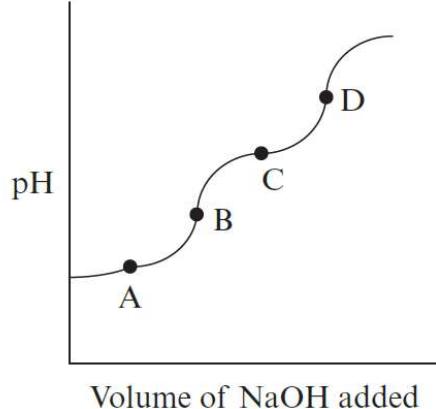
- a) 0      b)  $100R \ln 2$       c)  $100R \ln 4$       d)  $200R \ln 4$

**Q29** A student is calculating the work done by 2 mole of an ideal gas in a reversible isothermal expansion shown in the figure. By mistake he calculated the area of the shaded area in the PV graph shown, as work and answered the magnitude of work equal to 49.26 L-atm. What is the correct magnitude of work done by the gas in L-atm? ( $R = 0.0821 \text{ L-atm/K-mol}$ )

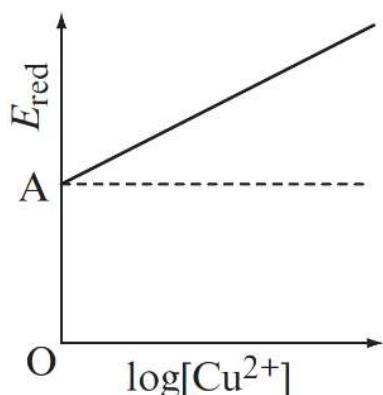


- a) 49.26      b) 98.52      c) 78.63      d) 34.14

**Q30** For the titration of a dibasic weak acid  $\text{H}_2\text{A}$  ( $p^{K_{a(2)}} - P^{K_{a(1)}} \geq 2$ ) with a strong base, pH versus volume of the base graph is as shown in the figure. The value of  $P^{K_{a(1)}}$  and  $p^{K_{a(2)}}$  may be equal to the pH values corresponding to the points.

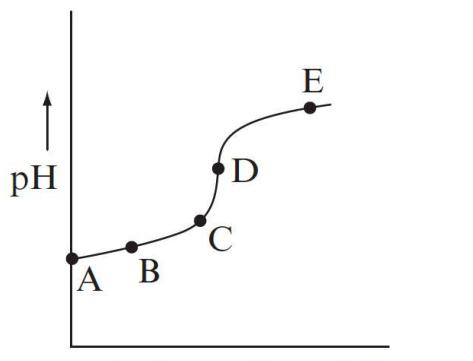


- a) B and D, respectively
  - b) A and B, respectively
  - c) C and D, respectively
  - d) A and C, respectively
- Q31** For the process:  $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$ ;  $\log[\text{Cu}^{2+}]$  vs.  $E_{\text{red}}$  graph is shown in the figure, where  $OA = 0.34$  V. The electrode potential of the half-cell of  $\text{Cu}|\text{Cu}^{2+}$  (0.1 M) will be [2.303  $RT/F = 0.06$ ]



- a)  $-0.31$  V
- b)  $+0.31$  V
- c)  $-0.37$  V
- d)  $+0.37$  V

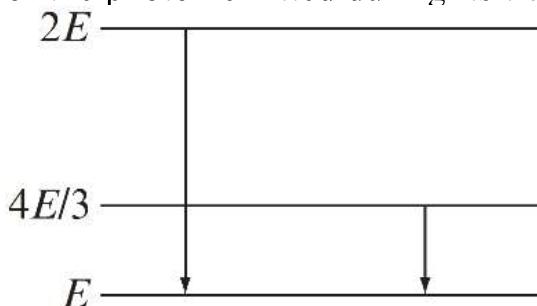
**Q32** The curve in the figure shows the variation of pH during the course of titration of a weak acid, HA with a strong base (NaOH). At which point in the titration curve is the concentration of the acid may be equal to that of its conjugate base?



ml of NaOH added →

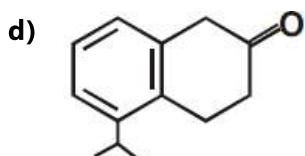
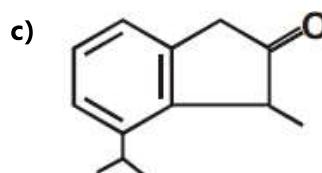
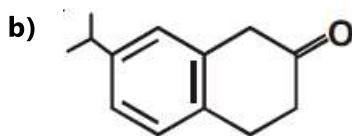
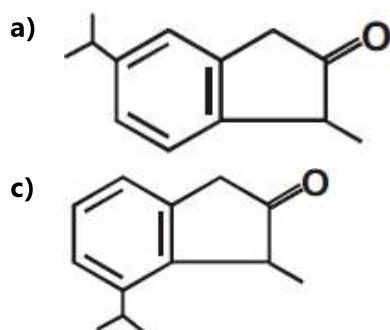
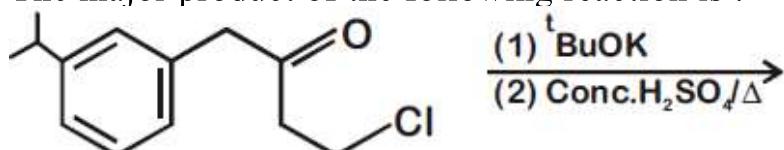
- a) Point D      b) Point E      c) Point C      d) Point B

**Q33** The given diagram indicates the energy levels of a certain atom. When the system moves from  $2E$  level to  $E$  level, a photon of wavelength  $\lambda$  is emitted. The wavelength of the photon emitted during its transition from  $4E/3$  level to  $E$  level is.

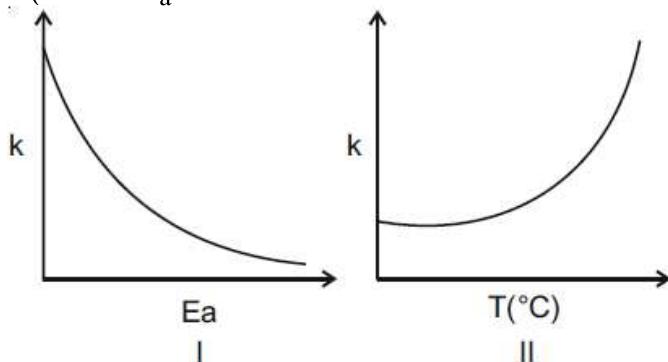


- a)  $\lambda/3$       b)  $3\lambda/4$       c)  $4\lambda/3$       d)  $3\lambda$

**Q34** The major product of the following reaction is :



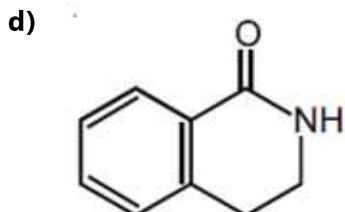
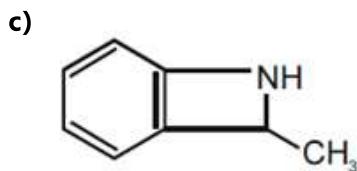
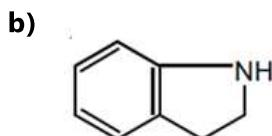
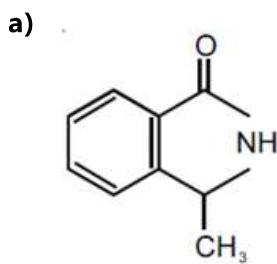
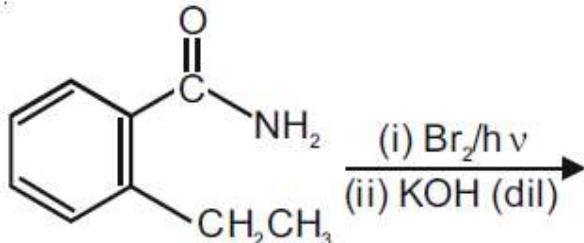
**Q35** Consider the given plots for a reaction obeying Arrhenius equation ( $0^{\circ}\text{C} < T < 300^{\circ}\text{C}$ ) : (k and  $E_a$  are rate constant and activation energy, respectively)



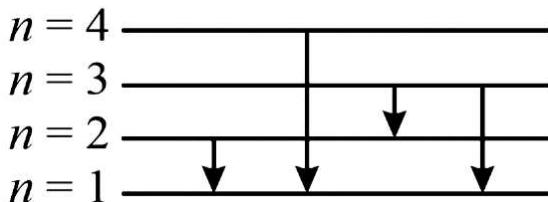
Choose the correct option:

- a) I is wrong but II is right
- b) Both I and II are correct
- c) Both I and II are wrong
- d) I is right but II is wrong

**Q36** The major product of the following reaction

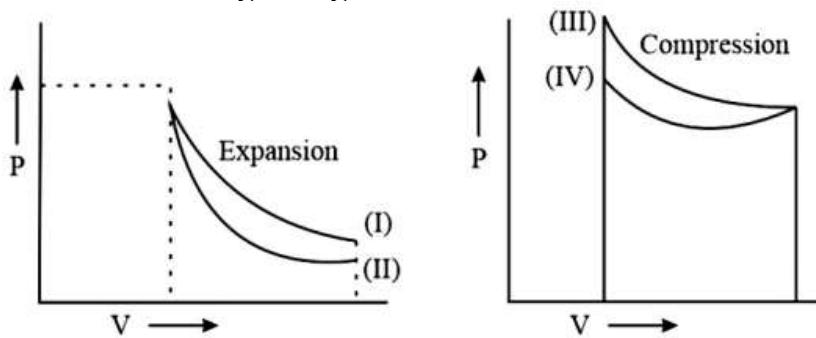


**Q37** Suppose that a hypothetical atom gives a red, green, blue and violet line in the spectrum. Which jump according to figure would give off the red spectral line?



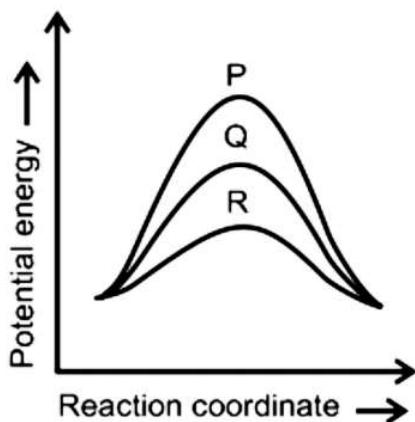
- a)  $3 \rightarrow 1$       b)  $2 \rightarrow 1$       c)  $4 \rightarrow 1$       d)  $3 \rightarrow 2$

**Q38** Which of the figures given below show the adiabatic process?



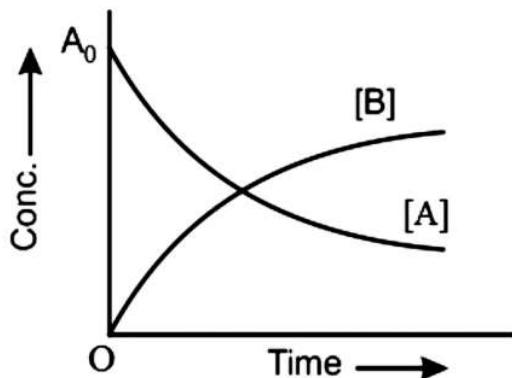
- a) II, III      b) I, III      c) II, IV      d) I, IV

**Q39** If a homogeneous catalytic reaction can take place through three alternative paths as depicted below, the catalytic efficiency of P, Q, R representing the relative case would be;



- a)  $P > Q > R$       b)  $Q > P > R$       c)  $P > R > Q$       d)  $R > Q > P$

**Q40** At the point of intersection of the two curves shown, the concentration of B is given by ..... for the first order reaction  $A \rightarrow nB$ .



- a)  $\frac{nA_0}{2}$       b)  $\frac{A_0}{n-1}$       c)  $\frac{nA_0}{n+1}$       d)  $\left(\frac{n-1}{n+1}\right)A_0$

**Q41** For an isothermal process, the essential condition is

- a)  $\Delta T = 0$       b)  $\Delta H = 0$       c)  $\Delta U = 0$       d)  $dT = 0$

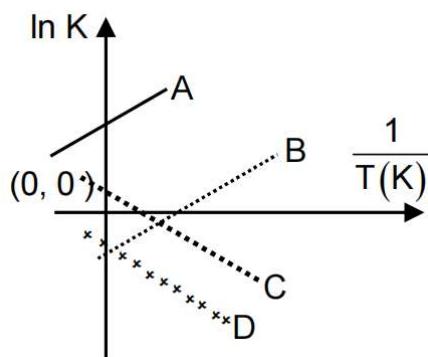
**Q42** One mole of an ideal gas undergoes the following cyclic process.

- (i) Isochoric heating from  $(P_1, V_1, T_1)$  to double temperature.
- (ii) Isobaric expansion to double volume.
- (iii) Linear expansion (on P–V curve) to  $(P_1, 8V_1)$ .
- (iv) Isobaric compression to initial state.

If  $T_1 = 300$  K, then the magnitude of net work done by the gas in the cyclic process is

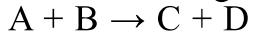
- a) 2400 cal      b) 1200 cal      c) 4800 cal      d) 3600 cal

**Q43** Which of the following lines correctly show the temperature dependence of equilibrium constant, K, for an exothermic reaction?

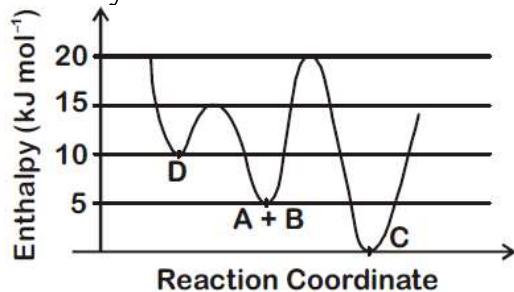


- a) C and D      b) A and D      c) A and B      d) B and C

**Q44** Consider the given plot of enthalpy of the following reaction between A and B.



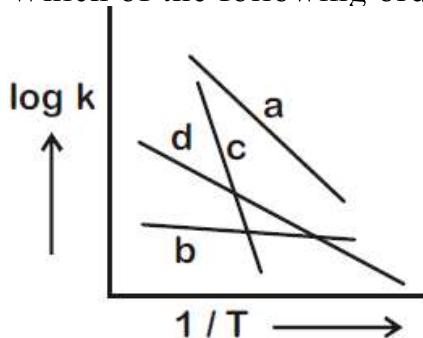
Identify the incorrect statement.



- a) Activation enthalpy to form C is 5  $\text{kJ mol}^{-1}$  less than that to form D
- b) D is kinetically stable product
- c) Formation of A and B from C has highest enthalpy of activation
- d) C is the thermodynamically stable product

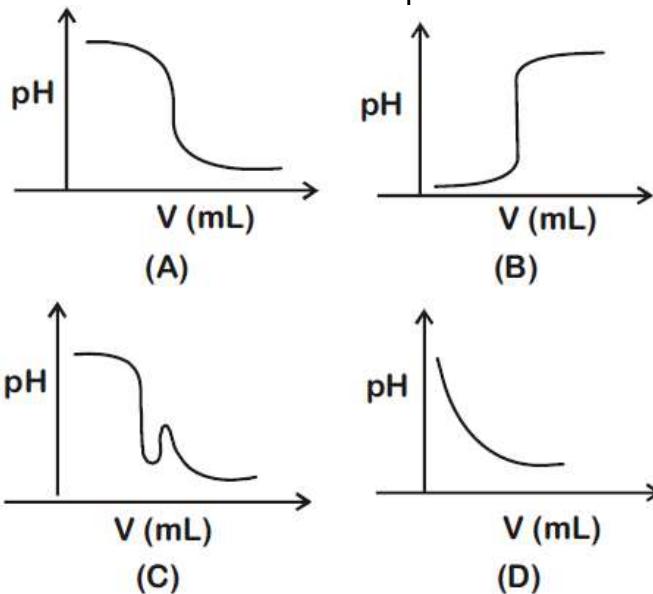
**Q45** Consider the following plots of rate constant versus  $\frac{1}{T}$  for four different reactions.

Which of the following orders is correct for the activation energies of these reactions?



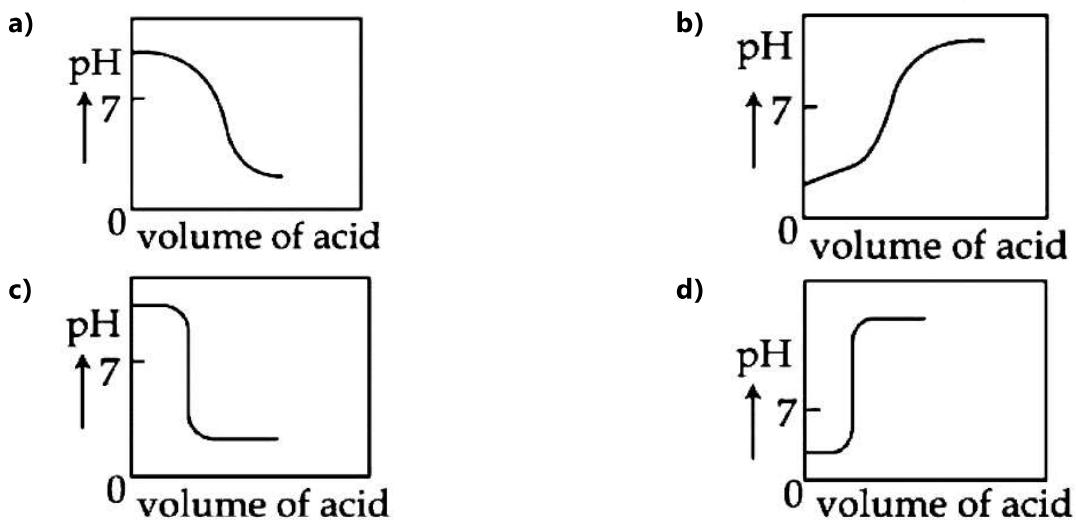
- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>a) <math>E_b &gt; E_a &gt; E_d &gt; E_c</math></li> <li>c) <math>E_a &gt; E_c &gt; E_d &gt; E_b</math></li> </ul> | <ul style="list-style-type: none"> <li>b) <math>E_c &gt; E_a &gt; E_d &gt; E_b</math></li> <li>d) <math>E_b &gt; E_d &gt; E_c &gt; E_a</math></li> </ul> |
|--|--|

**Q46** In an acid-base titration, 0.1 M HCl solution was added to the NaOH solution of unknown strength. Which of the following correctly shows the change of pH of the titration mixture in this experiment?

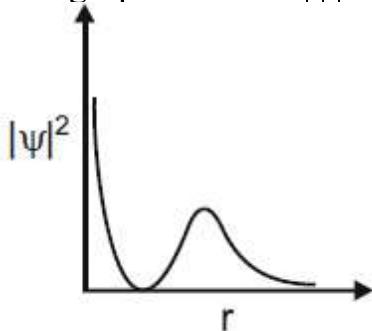


- a) (A)                    b) (C)                    c) (B)                    d) (D)

**Q47** The Plot of pH-metric titration of weak base  $\text{NH}_4\text{OH}$  vs strong acid HCl looks like:

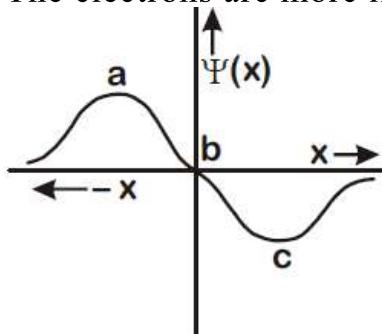


**Q48** The graph between  $|\psi|^2$  and  $r$  (radial distance) is shown below. This represents :



- a) 1s orbital
- b) 2s orbital
- c) 2p orbital
- d) 3s orbital

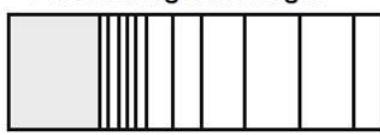
**Q49** The electrons are more likely to be found :



- a) In the region a and c
- b) Only in the region c
- c) Only in the region a
- d) In the region a and b

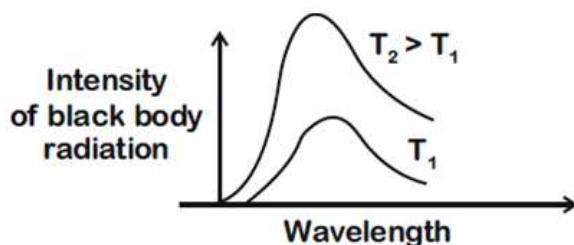
**Q50** The figure that is not a direct manifestation of the quantum nature of atoms is

- a) → Increasing wavelength

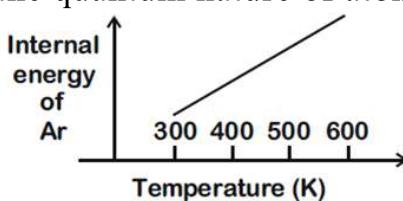


Absorption spectrum

- c)



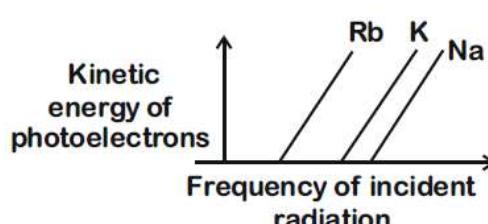
- b)



Internal energy of Ar

Temperature (K)

- d)



Rb    K    Na

# Mathematics

## Single Choice Question

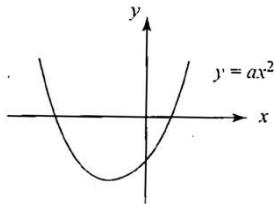
**Q51** If the equation  $x^2 + ax + b = 0$  has distinct real roots and  $x^2 + a|x| + b = 0$  has only one real root, then which of the following is true

- a)  $b = 0, a > 0$
- b)  $b = 0, a < 0$
- c)  $b > 0, a < 0$
- d)  $b < 0, a > 0$

**Q52** If the equation  $|x^2 + bx + c| = k$  has four real roots, then

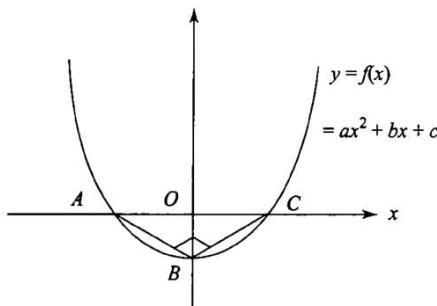
- a)  $b^2 - 4c > 0$  and  $0 < k < \frac{4c - b^2}{4}$
- b)  $b^2 - 4c < 0$  and  $0 < k < \frac{4c - b^2}{4}$
- c)  $b^2 - 4c > 0$  and  $k > \frac{4c - b^2}{4}$
- d) none of these

**Q53** Let  $f(x) = ax^2 + bx + c$ . Consider the following diagram. Then



- a)  $c < 0$
- b)  $b > 0$
- c)  $a + b - c > 0$
- d) All of these

**Q54** In the given figure, vertices of  $\Delta ABC$  lie on  $y = f(x) = ax^2 + bx + c$ . The  $\Delta ABC$  is right angled isosceles triangle whose hypotenuse  $AC = 4\sqrt{2}$  units.



$y = f(x)$  is given by

- a)  $y = x^2 - 2\sqrt{2}$
- b)  $y = x^2 - 12$
- c)  $y = \frac{x^2}{2} - 2$
- d)  $y = \frac{x^2}{2\sqrt{2}} - 2\sqrt{2}$

**Q55** The number of points  $f(x) = \begin{cases} [\cos \pi x] & 0 \leq x \leq 1 \\ |2x-3|[x-2], & 1 < x \leq 2 \end{cases}$  is discontinuous at is ( $[\cdot]$  denotes the greatest integral function)

- a) Two
- b) Three
- c) Four
- d) Zero

**Q56** A point where function  $f(x) = [\sin [x]]$  is not continuous in  $(0, 2\pi)$ ,  $[\cdot]$  denotes the greatest integer  $\leq x$ , is

- a)  $(3, 0)$
- b)  $(2, 0)$
- c)  $(1, 0)$
- d) none of these

**For More Material Join: @JEEAdvanced\_2025**

**Q57** Let  $f(x) = \begin{cases} \min\{x, x^2\}, & x \geq 0 \\ \max\{2x, x^2 - 1\}, & x < 0 \end{cases}$ .

Then which of the following is not true?

- a)  $f(x)$  is continuous at  $x = 0$ .
- b)  $f(x)$  is not differentiable at  $x = 1$ .
- c)  $f(x)$  is not differentiable at exactly three points
- d) None of these.

**Q58** If  $f(x) = \begin{cases} |1-4x^2|, & 0 \leq x < 1 \\ [x^2 - 2x], & 1 \leq x < 2 \end{cases}$ ,

where  $[.]$  denotes the greatest integer function, then  $f(x)$  is

- |                                  |                          |
|----------------------------------|--------------------------|
| a) differentiable for all $x$    | b) continuous at $x = 1$ |
| c) non-differentiable at $x = 1$ | d) none of these         |

**Q59**  $f(x) = \max\{x/n, |\sin \pi x|\}$ ,  $n \in N$ , has maximum points of non-differentiability for  $x \in (0, 4)$ . Then  $n$  cannot be

- |      |      |      |      |
|------|------|------|------|
| a) 4 | b) 2 | c) 5 | d) 6 |
|------|------|------|------|

**Q60** Which of the following statements is true for the function

$$f(x) = \begin{cases} \sqrt{x}, & x \geq 1 \\ x^3, & 0 \leq x \leq 1 \\ \frac{x^3}{3} - 4x, & x < 0 \end{cases}$$

- a) It is monotonic increasing  $\forall x \in R$ .
- b)  $f'(x)$  fails to exist for three distinct real values of  $x$ .
- c)  $f'(x)$  changes its sign twice as  $x$  varies from  $-\infty$  to  $\infty$ .
- d) The function attains its extreme values at  $x_1$  and  $x_2$ , such that  $x_1 x_2 > 0$ .

**Q61**  $f(x) = \begin{cases} 2 - |x^2 + 5x + 6|, & x \neq -2 \\ a^2 + 1, & x = -2 \end{cases}$ .

Then the range of  $a$ , so that  $f(x)$  has maxima at  $x = -2$ , is

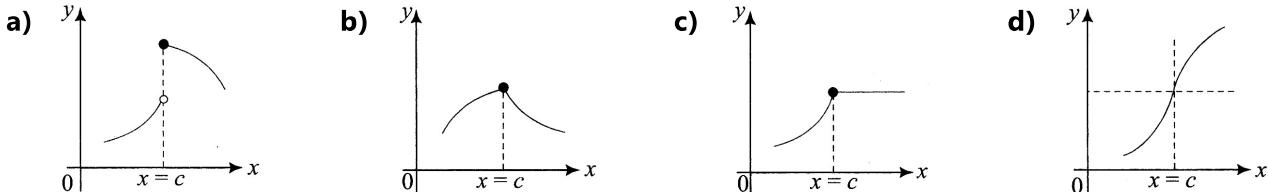
- |              |              |            |            |
|--------------|--------------|------------|------------|
| a) $ a  > 1$ | b) $ a  < 1$ | c) $a > 1$ | d) $a < 1$ |
|--------------|--------------|------------|------------|

**Q62** Let  $f(x) = ax^2 - b|x|$ , where  $a$  and  $b$  are constants. Then at  $x = 0$ ,  $f(x)$  has

- a) a maxima whenever  $a > 0, b > 0$
- b) a maxima whenever  $a > 0, b < 0$
- c) neither a maxima nor a minima whenever  $a > 0, b < 0$
- d) None of these

- Q63** Let  $f(x) = \sin x + ax + b$ . Then which of the following is/are true?
- $f(x) = 0$  has only one real root which is positive if  $a > 1, b < 0$ .
  - $f(x) = 0$  has only one real root which is negative if  $a > 1, b > 0$ .
  - $f(x) = 0$  has only one real root which is negative if  $a < -1, b < 0$ .
  - All of these

- Q64** In which of the following graphs is  $x = c$  is not point of inflection?



- Q65** Which of the following is false about point of extremum  $x = a$  of function  $y = f(x)$ ?
- At  $x = a$ , function  $y = f(x)$  may be discontinuous.
  - At  $x = a$ , function  $y = f(x)$  may be continuous but non-differentiable.
  - At  $x = a$ , function  $y = f(x)$  may have point of inflection.
  - None of these.

- Q66** Let  $f(x) = \min(x+1, \sqrt{1-x})$  for all  $x \leq 1$ . Then the area bounded by  $y = f(x)$  and the  $x$ -axis is

- $\frac{7}{3}$  sq. units
- $\frac{1}{6}$  sq. units
- $\frac{11}{6}$  sq. units
- $\frac{7}{6}$  sq. units

- Q67** The area of the closed figure bounded by  $x = -1, x = 2$ , and  $y = \begin{cases} -x^2 + 2, & x \leq 1 \\ 2x - 1, & x > 1 \end{cases}$  and the abscissa axis is

- $16/3$  sq. units
- $10/3$  sq. units
- $13/3$  sq. units
- $7/3$  sq. units

- Q68** The area of the region bounded by  $x^2 + y^2 - 2x - 3 = 0$  and  $y = |x| + 1$  is

- $\frac{\pi}{2} - 1$  sq. units
- $2\pi$  sq. units
- $4\pi$  sq. units
- $\pi/2$  sq. units

- Q69** The area bounded by  $y = 3 - |3 - x|$  and  $y = \frac{6}{|x+1|}$  is

- $\frac{15}{2} - 6$  In 2 sq. units
- $\frac{13}{2} - 3$  In 2 sq. units
- $\frac{13}{2} - 6$  In 2 sq. units
- None of these

- Q70** Let  $f : R \rightarrow R$  be a differentiable function  $\forall x \in R$ . If the tangent drawn to the curve at any point  $x \in (a, b)$  always lies below the curve, then

- $f'(x) > 0, f''(x) < 0 \quad \forall x \in (a, b)$
- $f'(x) < 0, f''(x) < 0 \quad \forall x \in (a, b)$
- $f'(x) > 0, f''(x) > 0 \quad \forall x \in (a, b)$
- none of these

- Q71** The volume of the greatest cylinder which can be inscribed in a cone of height 30 cm and semi-vertical angle  $30^\circ$  is  
**a)**  $4000 \pi/3 \text{ cm}^3$     **b)**  $400 \pi/3 \text{ cm}^3$     **c)**  $4000 \pi/\sqrt{3} \text{ cm}^3$     **d)** none of these

- Q72** Let  $f : \mathbf{R} \rightarrow \mathbf{R}$  be defined as,

$$f(x) = \begin{cases} -55x, & \text{if } x < -5 \\ 2x^3 - 3x^2 - 120x, & \text{if } -5 \leq x \leq 4 \\ 2x^3 - 3x^2 - 36x - 336, & \text{if } x > 4 \end{cases}$$

Let  $A = \{x \in \mathbf{R} : f \text{ is increasing}\}$ . Then A is equal to :

- a)**  $(-\infty, -5) \cup (4, \infty)$     **b)**  $(-5, \infty)$   
**c)**  $(-\infty, -5) \cup (-4, \infty)$     **d)**  $(-5, -4) \cup (4, \infty)$

**Q73**

Let  $f : \mathbf{R} \rightarrow \mathbf{R}$  be defined as  $f(x) = \begin{cases} -\frac{4}{3}x^3 + 2x^2 + 3x, & x > 0 \\ 3xe^x, & x \leq 0 \end{cases}$ . Then f is

increasing function in the interval

- a)**  $(-\frac{1}{2}, 2)$     **b)**  $(0, 2)$     **c)**  $(-1, \frac{3}{2})$     **d)**  $(-3, -1)$

- Q74** The number of distinct real roots of the equation  $3x^4 + 4x^3 - 12x^2 + 4 = 0$  is

- a)** 1    **b)** 2    **c)** 3    **d)** 4

- Q75** The number of real roots of the equation  $e^{4x} + 2e^{3x} - e^x - 6 = 0$  is :

- a)** 2    **b)** 4    **c)** 1    **d)** 0

## Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
<b>Ans.</b>	<b>A</b>	<b>B</b>	<b>B</b>	<b>C</b>	<b>C</b>	<b>D</b>	<b>D</b>	<b>A</b>	<b>A</b>	<b>A</b>
Que.	11	12	13	14	15	16	17	18	19	20
<b>Ans.</b>	<b>C</b>	<b>A</b>	<b>C</b>	<b>D</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>C</b>	<b>C</b>	<b>A</b>
Que.	21	22	23	24	25	26	27	28	29	30
<b>Ans.</b>	<b>C</b>	<b>B</b>	<b>D</b>	<b>C</b>	<b>D</b>	<b>B</b>	<b>A</b>	<b>C</b>	<b>D</b>	<b>D</b>
Que.	31	32	33	34	35	36	37	38	39	40
<b>Ans.</b>	<b>A</b>	<b>D</b>	<b>D</b>	<b>B</b>	<b>B</b>	<b>A</b>	<b>D</b>	<b>A</b>	<b>D</b>	<b>C</b>
Que.	41	42	43	44	45	46	47	48	49	50
<b>Ans.</b>	<b>D</b>	<b>A</b>	<b>C</b>	<b>A</b>	<b>B</b>	<b>A</b>	<b>A</b>	<b>B</b>	<b>A</b>	<b>B</b>
Que.	51	52	53	54	55	56	57	58	59	60
<b>Ans.</b>	<b>A</b>	<b>A</b>	<b>D</b>	<b>D</b>	<b>B</b>	<b>D</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>C</b>
Que.	61	62	63	64	65	66	67	68	69	70
<b>Ans.</b>	<b>A</b>	<b>A</b>	<b>D</b>	<b>C</b>	<b>D</b>	<b>D</b>	<b>A</b>	<b>A</b>	<b>C</b>	<b>C</b>
Que.	71	72	73	74	75					
<b>Ans.</b>	<b>A</b>	<b>D</b>	<b>C</b>	<b>D</b>	<b>C</b>					