# CHEMISTRY

## BOOKS - G.R. BATHLA & SONS CHEMISTRY (HINGLISH)

## MISCELLANEOUS (TOPICS OF GENERAL INTEREST)

**Example**

**1.** The dipole moment of $LiH$ is $1.964 \times 10^{-29} C - m$ and the interatomic diatance between $Li$ and $H$ in this molceule is $1.596 Å$ .What is the per cent ionic character in $LiH$.

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**2.** Calculate the screening constant in $Zn$.

a. For a $4s$-electron b. For a $3d$-electron

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**3.** Calculate the $\%$ of free $SO_3$ in oleum ( a solution of $SO_3$ in $H_2SO_4$) that is labelled $109\,\%\ H_2SO_4$ by weight.

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**4.** Calculate a value of effective magnetic moment $\mu_{eff}$ of $Ce^{3+}$ ion.

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## Illustration

**1.** The volume strength of $1\cdot 5$ N $H_2O_2$ solution is

A. $4.8$

B. $5.2$

C. $8.8$

D. $8.4$

**Answer: D**

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**2.** Commerical $11.2$ volume $H_2O_2$ solution has a molarity of

A. $1.0$

B. $0.5$

C. $11.2$

D. $1.12$

**Answer: A**

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**3.** What is the volume of $O_2$ liberated at NTP by complete decomposition of 100 mL of 2M solution of $H_2O_2$ ?

A. $22.4L$

B. $2.24L$

C. $0.224L$

D. $224L$

**Answer: B**

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## Set I Objective Questions

**1.** Efficiency of energy conversion in nuclear fission of uranium and nuclear fusion of hydrogen are respectively:

A. $0.09\ \%$ , $0.35\ \%$

B. $0.35\ \%$ , $0.09\ \%$

C. $0.09\ \%$ , $0.09\ \%$

D. $0.35\ \%$ , $0.35\ \%$

**Answer: A**

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**2.** Effective magnetic moment of actinides with 'n' unpaired electrons can be calculated using following relation:

A. $g\sqrt{J(J+1)}BM$

B. $\sqrt{n(n+1)}BM$

C. $\sqrt{n(n+2)}BM$

D. $1.9\sqrt{n+1}BM$

**Answer: A**

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**3.** Which of the following will weigh less in presence of external magnetic field ?

A. $Cr_{24}$

B. $Mn_{29}$

C. $Co_{27}$

D. $Zn_{30}$

**Answer: D**

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**4.** Magnetic susceptibility of a paramagnetic substance:

A. is independent of temperature

B. increases with decrease of temperature

C. attain the maxima at null point

D. increases rapidly above Curie temperature

**Answer: C**

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**5.** In $PCl_3F_2$ molecules, select the correct statement about two (P-F) bonds:

A. Both (P-F) bonds are equatorial

B. Both (P-F) bonds are axial

C. One (P-F) bond is axial and one (P-F) bond is equatorial

D. can not be predicted

**Answer: B**

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**6.** $BrCl_3$ molecule involves $\left(sp^3d\right)$ hybridization, the d-orbital contributing this hybridization will be :

A. $d_{xy}$

B. $d_{yz}$

C. $d_{x^2-y^2}$

D. $d_{z^2}$

**Answer: C**

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**7.** $PCl_5$ molecule involves $\left(sp^3d\right)$ hybridization, the d-orbital contributing this hybridization will be :

A. $d_{xy}$

B. $d_{yz}$

C. $d_{zx}$

D. $d_{z^2}$

**Answer: D**

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**8.** The percentage ionic character of a covalent bond (A-B) is about 50%, the electronegativity difference of the two elements will be :

A. 1.5

B. 2.1

C. 0.9

D. 1.2

**Answer: B**

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**9.** All these molecules have $sp^3$ hybridization, select the molecule in which all the bond do not have same percentage (s) character:

A. $CH_4$

B. $CCl_4$

C. $NH_3$

D. $CCl_2F_2$

**Answer: D**

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**10.** What will be the volume strength of molar solution of $H_2O_2$ ?

A. $5.6$

B. $22.4$

C. $11.2$

D. $10.4$

**Answer: C**

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**11.** The volume strength of $10NH_2O_2$ is :

A. 112

B. $11.2$

C. $0.112$

D. 56

**Answer: D**

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**12.** Match the following:

| Set I | Set II |
|---|---|
| A. 10 Vol $H_2O_2$ | 1. per hydrol |
| B. 20 Vol $H_2O_2$ | 2. 5.358 N |
| C. 30 Vol $H_2O_2$ | 3. 1.785 M |
| D 100 Vol $H_2O_2$ | 4. 3.03 % |

The correct match is :

A. A-4, B-3, C-2, D-1

B. A-1, B-2, C-3, D-4

C. A-1, B-3, C-2, D-4

D. A-4, B-2, C-3, D-1

**Answer: A**

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**13.** Which of the following sulphates will be insoluble in water due to high lattice energy?

A. $BaSO_4$

B. $BeSO_4$

C. $Na_2SO_4$

D. $K_2SO_4$

**Answer: A**

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**14.** Which of the following is most soluble in water ?

A. Li+

B. Na+

C. K+

D. Rb+

**Answer: A**

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**15.** Which of the following relation is correct ?

(where $T_i$ = Inversion temperature, $T_c$ = Critical temperature)

A. $T_c = 6.75T_i$

B. $T_i = 6.75T_c$

C. $T_i > 6.75T_c$

D. $T_c > 6.75T_i$

**Answer: B**

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**16.** Joule's law is represented by which of the following conditions?

A. $\left(\frac{\partial U}{\partial V}\right)_T = 0$

B. $\left(\frac{\partial U}{\partial P}\right)_T = 0$

C. $\left(\frac{\partial U}{\partial T}\right)_P = 0$

D. $\left(\frac{\partial U}{\partial T}\right)_V = 0$

**Answer: A**

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**17.** Select the correct condition (s) for spontaneity:

A. $(\partial G)_{T,P} < 0$

B. $(\partial H)_{S,P} < 0$

C. $(\partial U)_{S,V} < 0$

D. All of these

**Answer: D**

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**18.** Select the wrong statement among the following:

A. Orbital angular momentum $= \sqrt{l(l+1)}\frac{h}{2\pi}$

B. Resultant angular momentum and resultant magnetic moment are in same direction

C. Resultant angular momentum and resultant magnetic moment are in opposite direction

D. Orbital angular momentum has (2l+1) orientations

**Answer: B**

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**19.** Which of the following is not correctly matched ?

A.
| Molecule | (d-orbital present in the hybrid orbitals) |
|---|---|
| $SF_4$ | $sp^3d \quad (d_{z^2})$ |

B.
| Molecule | (d-orbital present in the hybrid orbitals) |
|---|---|
| $IF_5$ | $sp^3d^2 \quad (d_{x^2-y^2}, d_{z^2})$ |

C.
| Molecule | (d-orbital present in the hybrid orbitals) |
|---|---|
| $XeF_6$ | $sp^3d^3 \quad (d_{xy}, d_{yz}, d_{zx})$ |

D.
| Molecule | (d-orbital present in the hybrid orbitals) |
|---|---|
| $XeF_2$ | $sp^3d \quad (d_{x^2} - d_{y^2})$ |

**Answer: D**

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## Brain Stroming Problems

**1.** If $x_1, x_2$ and $x_3$ are enthalpies of H-H , O=O and O-H bonds respectively , and $x_4$ is the enthalpy of vaporisation of water , estimate the standard enthalpy of combustion of hydrogen:

A. $x_1 + \frac{x_2}{2} - 2x_3 + x_4$

B. $x_1 + \frac{x_2}{2} - 2x_3 - x_4$

C. $x_1 + \frac{x_2}{2} - x_3 + x_4$

D. $2x_3 - x_1 - \frac{x_2}{2} - x_4$

**Answer: B**

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**2.** Which of the following is the correct relation between solubility product of $MX_4$ ?

A. $S = \left[\frac{K_{sp}}{256}\right]^{1/5}$

B. $S = [128K_{sp}]^{1/4}$

C. $S = [256K_{sp}]^{1/5}$

D. $S = \left[\frac{K_{sp}}{128}\right]^{1/4}$

**Answer: A**

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**3.** An atom has x energy level , then total number of lines in its spectrum are :

A. $1 + 2 + 3 + .... + (x + 1)$

B. $1 + 2 + 3 + .... + x^2$

C. $1 + 2 + 3 + ... + x$

D. $1 + 2 + 3 + ... + (x - 1)$

**Answer: D**

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**4.** Consider the reaction :

$2H_2(g) + 2NO(g) \rightarrow N_2(g) + 2H_2(g)$

The rate law for this reaction is :

Rate = $k[H_2][NO]^2$

Under what conditions could these steps represent mechanism?

Step 1: $2NO(g) \Leftrightarrow N_2O_2(g)$
Step 2: $N_2O_2 + H_2 \rightarrow N_2O + H_2O$
Step 3: $N_2O + H_2 \rightarrow H_2O + N_2$

A. These steps cannot be the mechanism under any circumstances.

B. Theses steps could be the mechanism if step 2 is the slowest step

C. These steps could be the mechanism if step 3 is the slowest step

D. These step could be the mechanism if step 3 is the slowest step

**Answer: C**

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**5.** An electron moves arounf protons (nucleus) in a circle of radius 'r'. Assuming that the uncertainty of momentum of electron is of the same order as the momentum itself, the momentum of electron will be :

A. $\frac{h}{4\pi r}$

B. $\frac{h}{2\pi r}$

C. $4\pi hr$

D. $2\pi hr$

**Answer: A**

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**6.** Kinetic energy of 0.3 mole of 'He' gas in a container of maximum capacity of 4 litre at 5 atm, must be :

$\left(R = 0.821 \text{atm litre mol}^{-1} K^{-1}\right)$

A. 30 atm litre

B. 100 atm litre

C. 9 atm litre

D. 11.11 atm litre

**Answer: A**

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**7.** What will be the maximum spin multiplicity for 4d-orbital?

A. 4

B. 6

C. 5

D. 10

**Answer: B**

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**8.** For a given one mole of ideal gas kept at 6.5 atm in a container of capacity 2.463 litre. The Avogadro proportionality constant for the hypothesis is: (see figure)

A. $0.406$

B. $2.46$

C. $22.4$

D. none of these

**Answer: B**

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**9.** $A(s) \Leftrightarrow B(g) + C(g)$. Total pressure at time of equilibrium is 40 atmosphere. If all the contents of this reactor have been shifted to another reactor of double capacity, then the total equilibrium pressure in the new reactor will be: (in atmosphere)

A. 20

B. 40

C. 400

D. 1600

**Answer: B**

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**10.** Gadolinium-153 is used in the detection of osteoporosis disease of bones. Half-life of gadolinium-153 is 500 days. After how many days, on an average, the nuclide can be considered absent from the body of patients ?

A. 500 days

B. 1000 days

C. Infinite

D. 350 days

**Answer: C**

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**11.** Amount of energy required to excite an electron of an atom from the lower energy state to its next higher energy state is defined as:

A. ionization potential

B. electron afinity

C. critical potential

D. reduction potential

**Answer: C**

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**12.** Consider the values of $\Delta H\left(\text{in} kJmol^{-}\right)$ and for $\Delta S\left(\text{in} mol^{-}K^{-1}\right)$ given for four different reactions. For which reaction will $\Delta G$ increases the most (becoming more positive) when the temperature is increased form $0^{\circ}C\text{to}25^{\circ}C$?

A. $\Delta H^{\circ} = 50^{\circ}, \Delta S^{\circ} = 50$

B. $\Delta H^{\circ} = 90, \Delta S^{\circ} = 20$

C. $\Delta H^{\circ} = -20, \Delta S^{\circ} = -50^{\circ}$

D. $\Delta H^{\circ} = -90, \Delta S^{\circ} = -20$

**Answer: C**

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**13.** The energy of the orbitals decreases in the order:

A. $s > p > sp^3 > sp > sp^2$

B. $p > sp^3 > sp^2 > sp > s$

C. $sp^3 > sp^2 > sp > s > p$

D. $s > sp > sp^2 > sp^3 > p$

**Answer: B**

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**14.** Which of the following is an example of associated colloid ?

A. Protein + Water

B. Soap + Water

C. Rubber + Benzene

D. $As_2O_3 + Fe(OH)_3$

**Answer: B**

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**15.** Which of the gas can displace remaining all the gases from the surface of adsorbent ?

A. CO

B. $H_2$

C. $O_2$

D. $N_2$

**Answer: A**

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**16.** Which of the following pairs is correctly matched ?

A.
| Experimental | Phenomenon |
|---|---|
| X-ray spectra | Charge on the nucleus |

B.
| Experimental | Phenomenon |
|---|---|
| $\alpha$ – particle scattering | Quantized electron orbit |

C.
| Experimental | Phenomenon |
|---|---|
| Emission spectra | Qunatization of energy |

| | | |
|---|---|---|
| D. | Experimental | Phenomenon |
| | The photoelectric effect | The nuclear atom |

**Answer: C**

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**17.** Arrangement of the following group of orbitals in which they fill the electrons:

(5f, 6p, 4p, 6s, 4d, 4f)

A. 4p, 4d, 6s, 4f, 6p, 5f

B. 6s, 4d, 4f, 5f, 4p, 6p

C. 6s, 4p, 4d, 4f, 5f, 6p

D. 4d, 4p, 4f, 5f, 6s, 6p

**Answer: A**

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**18.** $\pi^{\circ}$ meson is exchanged between :

A. proton and neutron

B. proton and proton

C. neutron and neutron

D. may be between teo protons ot two neutrons

**Answer: D**

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**19.** If nuclecus in an excited state fall to a lower energy level, energy is emitted as :

A. $\alpha$ -rays

B. $\beta$-rays

C. $\gamma$-rays

D. X-rays

**Answer: C**

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**20.** Minimum amount of energy required to remove a proton is approximately:

A. 2MeV

B. 4 MeV

C. 6 MeV

D. 8 MeV

**Answer: A**

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**21.** Mark the incorrect statement :

A. Semiconductors are basically insulator

B. In metal crystal condution occurs because molecular orbitals extend over the whole crystal and there is no energy gap between filled and unfilled molecular orbitals

C. Mobile electrons account for high thermal and electrical conduction of metals

D. When a metal is heated with a non-metals, the resulting compound is never an ionic compound

**Answer: D**

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**22.** A certain sample of cuprous sulphide is found to have the composition $Cu_{1.92}S_{1.00}$ because of incorporation of $Cu^{2+}$ and $Cu^{+}$ ions in the crystal then ratio of $Cu^{2+}$ and $Cu^{+}$ ions is :

A. $0.08:1.00$

B. $1:23$

C. $1:24$

D. $1:1$

**Answer: B**

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**23.** Given :

(i) $NH_3(g) + 3Cl_2(g) \rightarrow NCl_3(g) + 3HCl(g), \Delta H_1$

(ii) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)\ , \Delta H_2$

(iii) $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)\ , \Delta H_3$

Express the enthalpy of formation of $NCl_3(g)\left(\Delta H_f\right)$ in terms of $\Delta H_1$, $\Delta H_2$ and $\Delta H_3$:

A. $\Delta H_f = \Delta H_1 - \frac{\Delta H_2}{2} + \frac{3}{2}\Delta H_3$

B. $\Delta H_f = \Delta H_1 + \frac{1}{2}\Delta H_2 - \frac{3}{2}\Delta H_3$

C. $\Delta H_f = \Delta H_1 - \frac{1}{2}\Delta H_2 - \frac{3}{2}\Delta H_3$

D. $\Delta H_f = \Delta H_1 + \frac{1}{2}\Delta H_2 + \frac{3}{2}\Delta H_3$

**Answer: B**

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**24.** A sponteneous process may be defined as:

A. a process which is exothermic and evolves a lot of heat

B. a process which is slow and reversible

C. a process which takes place only in presence of a catalyst

D. a process that occurs without nay input from the surroundings

**Answer: D**

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**25.** In the sequence of reaction,

$L \xrightarrow{k_1} M \xrightarrow{k_2} N \xrightarrow{k_3} O$

$k_3 > k_2 > k_1$

The rate determining step of the reaction is :

A. $L \rightarrow M$

B. $M \rightarrow N$

C. $N \rightarrow O$

D. $L \rightarrow O$

**Answer: A**

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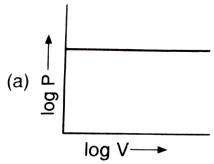
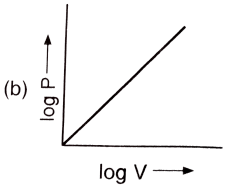
**26.** The plot of log V against log P at constant temperature for a fixed mass of gas is :

A.




B.

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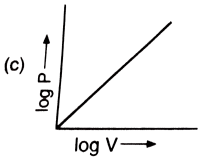
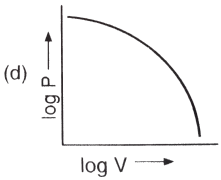



D.




**Answer: B**

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**27.** When mercuric iodide is added to the aqueous solution of potassium iodide, then:

A. freezing point is raised

B. freezing point does not change

C. freezing point is lowered

D. boiling point does not change

**Answer: A**

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**28.** The van der Waal's constant 'b' for water vapour is 0.03 litre $mol^{-1}$.

The radius of water vapour molecule is :

A. $1448cm$

B. $1.448\tilde{A}...$

C. $1.448\text{pm}$

D. $1.448nm$

**Answer: B**

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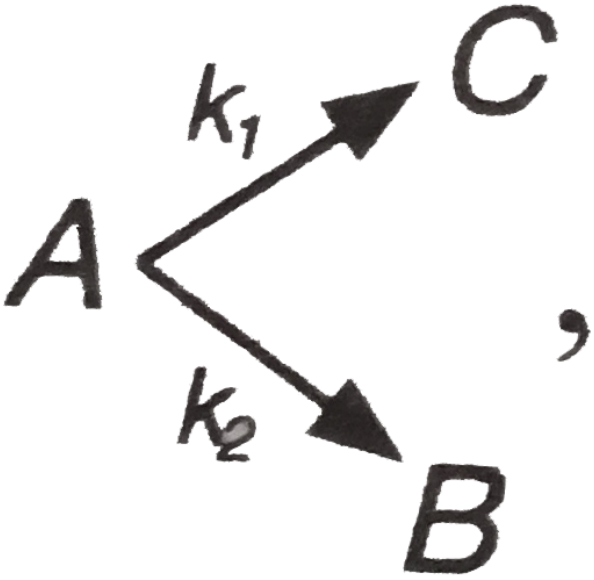
**29.** For a reaction




, the overall rate constant is related to individual rate constant by :

A. $k = k_1 - k_2$

B. $k_1 / k_2$

C. $k_1 k_2$

D. $k_1 + k_2$

**Answer: D**

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**30.** $N_2O_5$ decomposes to $N_2O_4$ and $O_2$ as

$$N_2O_5 \rightarrow N_2O_4 + \frac{1}{2}O_2$$

The pressure $p_t$ at any stage is related to $p_0$ and 'x', the fraction of dissociation, as :

A. $p_0$

B. $\left(1 + \frac{1}{2}x\right)p_0$

C. $1 - \frac{3}{2}p_0$

D. $\frac{3}{2}xp_0$

**Answer: B**

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**31.** $C^{14}$ a $\beta$- active nucleus is present in $\overset{14}{C}H_4$. A sample of $\left(\overset{14}{C}H_4\right)$ is kept in a closed vessel shows increase in pressure with time. It is due to the formation of :

A. $\overset{14}{N}H_3$ and $H_2$

B. $\overset{11}{B}H_3$ and $H_2$

C. $\overset{14}{C}_2H_4$ and $H_2$

D. $\overset{12}{C}H_3 - \overset{14}{N}H_2$ and $H_2$

**Answer: A**

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**32.** The radioactivity of a sample is $R_1$ at a time $T_1$ and $R_2$ at time $T_2$. If the half-life of the specimen is T, the number of atoms that have disintegrated in the time $(T_2 - T_1)$ is proporational to

A. $\frac{(R_1 - R_2)T}{0.693}$

B. $R_1T_1 - R_2T_2$

C. $\frac{(R_1 - R_2)}{T}$

D. $(R_1 - R_2)$

**Answer: A**

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**33.** Interstitial hole is called tetrahedral because:

A. it is formed by four spheres

B. it is formed by four spheres and the centre of which forms a regular tetrahedron

C. coordination number of hole is 3

D. none of the above

**Answer: B**

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**34.** A solid is formed by three elements X,Y and Z, X atoms form a fcc lattice with Y atoms occupying all tetrahedral voids. Z atoms occupying half the octahedral voids. The formula of the solids is :

A. $X_2Y_4Z$

B. $XY_2Z_4$

C. $X_4Y_2Z$

D. $X_4YZ_2$

**Answer: A**

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**35.** Pick out the pair in which the energy change of one is reverse of the energy change in the other:

(1) radio (2) fluorescent lamp (3) toaster (4) photoelectric cell

A. 1 and 2

B. 2 and 3

C. 2 and 4

D. 3 and 4

**Answer: C**

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**36.** Consider the following statements about first order reaction:

(1) The rate of reaction is directly proportional to the concentration of the reactant.

(2) Its half-life period is always constant.

(3) Concentration of reactant falls exponentially.

(4) It has low activation energy.

Of these statements:

A. 1, 3 and 4 are correct

B. 1, 2 and 4 are correct

C. 1, 2 and 3 are correct

D. 2, 3 and 4 are correct

**Answer: C**

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**37.** Which one of the following is the correct order of energies of 3p, 3d, 4s and 4p orbitals as per Aufbau principle?

A. $3p < 3d < 4s < 4p$

B. $3p < 4s < 3d < 4p$

C. $3d < 4s < 4p < 3p$

D. $3d < 3p < 4p < 4s$

**Answer: B**

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**38.** In the emission line spectra of hydrogen atom, how many lines can be accounted for by all possible electron transitions between five lowest energy levels within the atom ?

A. 4

B. 5

C. 10

D. 20

**Answer: C**

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**39.** In a closed container at 1 atm pressure, 2 mole of $SO_2(g)$ and 1 mole of $O_2(g)$ were allowed to react to form $SO_3(g)$ under the influence of a catalyst. The following reaction occurred:

$2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$

At equilibrium it was found that $50\,\%$ of $SO_2(g)$ was converted to $SO_3(g)$. The partial pressure of $O_2(g)$ at equilibrium will be :

A. 0.66 atm

B. 0.493 atm

C. 0.33 atm

D. 0.2 atm

**Answer: D**

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**40.** The electronic configuration $1s^2, 2s^2 2p^5, 3s^1$ describes which one of the following?

A. An excited state of fluorine

B. The ground state of neon

C. The excited state of $O^{2-}$

D. The ground state of fluroide ion $\left(F^{-}\right)$

**Answer: C**

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**41.** When acetone and chloroform are mixed, hydrogen bonding takes placce between them, such a liquid pair will cause :

A. positive deviation from Raoult's law

B. negative deviation from Raoult's law

C. no deviation from Raoult's law

D. cannot be predicted

**Answer: B**

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**42.** A maxima or minima obtained in the temperature. Composition curve of a mixture of two liquids indicates:

A. that the liquids are immiscible with one another

B. that the liquids are partially miscible at the maximum or minimum

C. an azeotropic mixture

D. a eutectic formation

**Answer: A**

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**43.** The electrode reactions for charging of a lead battery are :

$PbSO_4 + 2e \rightarrow Pb + SO_4^{2-}$

$PbSO_4 + 2H_2O \rightarrow PbO_2 + SO_4^{2-} + 4H^+ + 2e$

The electrolyte in the battery is an aqueous solution of $H_2SO_4$. After this battery has been charged:

A. the sulphuric acid will be more concentrated

B. the sulphuric acid will be less concentrated

C. the concentration of $H_2SO_4$ will be unchanged

D. $H_2SO_4$ will have been completely decomposed

**Answer: A**

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**44.** $pH$ of a $0.1M$ monobasic acid is found to be $2$. Hence, its osmotic pressure at a given temperature T K is

A. 0.1 RT

B. 0.11 RT

C. 1.1 RT

D. 0.01 RT

**Answer: B**

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**45.** Rate constant k=2.303 $\min^{-1}$ for a particular reaction. The initial concentration of the reactant is 1 mol/litre then rate of reaction after 1 minute is:

A. $2.303M\ \min^{-1}$

B. $0.2303M\ \min^{-1}$

C. $0.1M\ \min^{-1}$

D. none of these

**Answer: B**

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**46.** Entropy change for an adiabatic reversible process is :

A. positive

B. zero

C. negative

D. infinity

**Answer: B**

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**47.** From separate solution of four sodium salts NaW, NaX, NaY and NaZ are having pH7, 9, 10 and 11 respectively. When the solution was 0.1 M, the strongest acid is :

A. HW

B. HX

C. HY

D. HZ

**Answer: A**

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**48.** Two first order reactions have half-lives in the ratio 8:1, calculate the ratio of time intervals $t_1 : t_2$. The time $t_1$ and $t_2$ are the time period foe $\left(\frac{1}{4}\right)^{th}$ and $\left(\frac{3}{4}\right)^{th}$ completion respectively:

A. $1 : 0.0301$

B. $0.125 : 0.602$

C. $1 : 0.602$

D. none of these

**Answer: C**

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**49.** For a reaction $A(s) + 2B^{\oplus} \rightarrow A^{2+} + 2B$

$K_c$ has been found to be $10^{12}$. The $E^{c-}{}_{.cell}$ is

A. $0.354V$

B. $0.708V$

C. $0.0098V$

D. $1.36V$

**Answer: A**

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**50.** What is the molarity of HCl in a solution prepared by dissolving 5.5 g HCl in 200g ethanol if the density of solution is 0.79g/mL?

A. $0.58M$

B. $0.21M$

C. $0.93M$

D. $1.7M$

**Answer: A**

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## Set Ii Obejctive Questions

**1.** When mercuric iodide is added to aqueous KI solution:

A. freezing point is raised

B. osmotic pressure is raised

C. boiling point is elevated

D. vapour pressure is raised

**Answer: A::D**

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**2.** The correct statements are :

A. Smoke is carbon dispersed in air

B. Butter is water dispersed in fat

C. Greater is the valency of ion more will be its coagulating power

D. More is the gold number of a lyophobic sol, more is protecting power

**Answer: A::B::C**

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**3.** Select the correct statements among the following:

A. Order can be zero

B. Order cannot have fractional value.

C. Order is a theoretical quantity

D. Order is equal to molecularity for decomposition of $N_2O_5$ giving $N_2O_4$ and $O_2$

**Answer: A::D**

Watch Video Solution

**4.** Rate law for a chemical reactions is :

Rate $= k[A]^{1/2}[B]^{1}$

Choose the correct options among the following :

A. Order of the reaction is 3/2

B. Unit of its rate constant is $\text{litre}^{1/2} mol^{-1/2} \sec^{-1}$

C. Unit of rate is mol $\text{litre}^{-1} \sec^{-1}$

D. Its molecularity is always 3

**Answer: A::B::C**

Watch Video Solution

**5.** Liquid benzene burns in oxygen according to:

$2C_6H_6 + 15O_2 \rightarrow 12CO_2 + 6H_2O$

If density of liquid benzene is 0.88g/cc, what volume of $O_2$ at STP is needed to complete the combustion of 39 cc of liquid benzene?

A. 11.2 litre

B. 74 litre

C. $0.074m^3$

D. $37dm^3$

**Answer: B::C**

View Text Solution

**6.** For the reaction,

$N_2H_4(l) + 2H_2O_2(l) \rightarrow N_2(g) + 4H_2O(g)$

heats of formation of $N_2H_4, H_2O_2, H_2O$ are 12, -45 and $-57.8\text{kcal mol}^{-1}$. Internal energy change for this reaction is/are at 298 K:

A. $-153.2\text{kcal mol}^{-1}$

B. $-641.142 kJ mol^{-1}$

C. $-24.8 kcal mol^{-1}$

D. $-309 \text{kcal mol}^{-1}$

**Answer: A::B**

Watch Video Solution

**7.** Which of the following electrolytes have same osmotic pressure as that of 0.1 M KCl ?

A. 0.1 M HCl

B. 0.1 M NaCl

C. 0.1 M CsCl

D. None of these

**Answer: A::B::C**

Watch Video Solution

**8.** Select the correct statements about the following reaction:

$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g), \Delta H = -22.4\text{kcal mol}^{-1}$

A. Increase in pressure will favour forward reaction

B. Addition of inert gas forms more $NH_3$

C. At low temperature, there is forwad shift

D. Catalyst will increase the amount of $NH_3$

**Answer: A::B::C**

Watch Video Solution

**9.** Which among the following is/are correct about penetrating power ?

A. $\alpha$ -rays are less penetrating than $\beta$-rays

B. $\beta$-rays are less penetrating than $\gamma$-rays

C. $\alpha, \beta, \gamma$ rays have equal penetrating power

D. $\gamma$-rays are most penetrating

**Answer: A::B::D**

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**10.** Select the natural series among the following:

A. $(4n + 1)$

B. $(4n + 2)$

C. 4n

D. $(4n + 3)$

**Answer: B::C::D**

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**11.** Select the correct conclusion (s) about average life:

A. Average life $= 1/\lambda$

B. Average life $= 1.44 \times t_{1/2}$

C. The time in which 63.2% element decays is called average life

D. None of the above

**Answer: A::B::C**

View Text Solution

**12.** Which of the following statements are correct ?

A. 1 faraday is the charge of 1 mole electron.

B. 1 faraday is used to deposit 1g equivalent of a substance

C. 5.6 litre $O_2$ will be evolved at STP by 1 faraday charge.

D. 11.2 litre $Cl_2$ will be evolved at STP by 1 faraday charge

**Answer: A::B::C::D**

Watch Video Solution

**13.** Select the species having zero oxidation state at the underlined elements :

A. $(CH_3)_2\underline{S}O$

B. $\underline{C}_{12}H_{22}O_{11}$

C. $H_2\underline{S}_2O_3$

D. $\underline{N}_2H_4$

**Answer: A::B**

View Text Solution

**14.** $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$

$'\alpha'$ is the degree of dissociation of $PCl_5$ at equilibrium pressure 'P'. Which among the following is the correct expression for degree of dissociation of $'\alpha'$ ?

A. $\alpha = \sqrt{\frac{K_p}{P + K_p}}$

B. $\alpha = \sqrt{\frac{P + K_p}{K_p}}$

C. $\alpha = \sqrt{K_p P}$

D. $\alpha = \sqrt{P / K_p}$

**Answer: A**

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**15.** In Wilson cloud Chamber, the track is formed by :

A. $\alpha$-rays

B. $\beta$-rays

C. $\gamma$-rays

D. all of these

**Answer: A::B**

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**16.** Select the correct relation :

A. $N_0 = N.10^{\lambda t / 2.303}$

B. $N_0 = Ne^{\lambda t}$

C. $N_0 = N\frac{\lambda}{10^{2.303t}}$

D. $N = N_0 e^{-\lambda t}$

**Answer: A::B::D**

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**17.** For the first order reaction, $t_{99\%} = x \times t_{90\%}$, the value of 'x' will be :

A. 10

B. 6

C. 3

D. 2

**Answer: D**

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**18.** Which among of the following has same kinetic energy as $O_2$ gas at NTP ?

A. $H_2$

B. $N_2$

C. $CO_2$

D. None of these

**Answer: A::B::C**

View Text Solution

**19.** Which among the following is correct about $\gamma$-rays ?

A. High energy electrons

B. Low energy electrons

C. High energy electromagnetic waves

D. High energy positrons

**Answer: C**

View Text Solution

**20.** The rms speed at NTP of a gas can be calculated from the expression:

A. $\sqrt{3P/d}$

B. $\sqrt{3PV/M}$

C. $\sqrt{3RT/M}$

D. $\sqrt{3d/P}$

**Answer: A::B::C**

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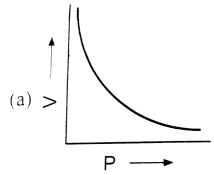
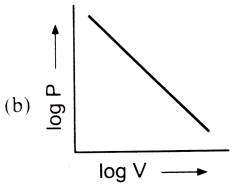
**21.** The graph representing Boyle's law is (are):

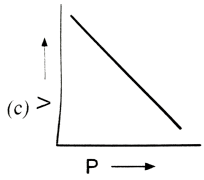
A.



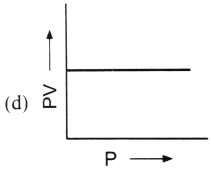

B.




C.




D.




**Answer: A::B::D**

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**22.** For diatomic molecules, the correct relation is/are

A. $C_P = 7/2R$

B. $C_V = 5/2R$

C. $\gamma = 1.4$

D. $C_P = 3/2R$

**Answer: A::B::C**

View Text Solution

**23.** An ideal gas :

A. has no intermolecular attraction

B. molecules do not collide with each other

C. the product of P and V is constant at a fixed temperature for definite mass

D. can be liquefied easily

**Answer: A::C**

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**24.** Extensive properties among the following is/are:

A. refractive index

B. volume

C. density

D. mass

**Answer: B::D**

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**25.** Which of the following statements regarding equilibrium is/are true ?

A. Equilibrium constant varies with temperature

B. Equilibrium constant varies with catalyst

C. The reaction stops when the equilibrium is reached

D. The equilibrium constant depends on the concentration of reactants

**Answer: A::B**

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## Set Iii Single Digit Answer Type Questions

**1.** The number of neutrons accompanying the formation of $._{54}Xe^{139}$ and $._{38}Sr^{94}$ from the absorption of a slow neutron by $._{92}U^{235}$, followed by nuclear fission is

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**2.** The compressibility factor Z for an ideal gas will be .....

Watch Video Solution

**3.** A gas is found to have the molecular formula $(C_3O_2)_n$. Its vapour density is 34. The value of n will be .....

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**4.** For a first order reaction, $t_{7/8} = n \times t_{1/2}$.

The value of n will be ..... .

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**5.** The van't Hoff factor for aqueous solution of $CuSO_4.5H_2O$ will be.....

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**6.** The number of radial nodes in 3d orbitals will be.....

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**7.** The half life of radioactive isotope is 3 hour. If the initial mass of isotope were 256 g, the mass of it remaining undecayed after 18 hr is a)12 g b)16 g c)4 g d)8 g

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**8.** A hydrate of magnesium iodide has a formula $Mgl_2.xH_2O.A1.055g$ sample is heated to a constant weight of $0.695g$. What is the value of $x$ ?

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**9.** $HNO_3$ oxidies $NH_4^+$ ions to nitrogen and itself gets reduced to $NO_2$. The moles of $HNO_3$ required by 1 mole of $(NH_4)_2SO_4$ is:

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**10.** The $pH$ of an aqueous solution of $0.1M$ solution of a weak monoprotic acid which is $1\%$ ionised is

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**11.** The solubility of $A_2B_3$ is S mol $L^{-1}$. Its solubility product is $108s^n$. The value of 'n' will be.....

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**12.** Orbital angular momentum of 3s orbitals will be .....

View Text Solution

**13.** In the sequence of the following nuclear reaction,

$X_{98}^{238} \xrightarrow{-\alpha} Y \xrightarrow{-\beta} L \xrightarrow{n\alpha} {}_{.90}M^{218}$

What is the value of n?

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**14.** If $3/4$ quantity of a radioactive substance disintegrates in 2 hours, its half $-$ life period will be a)$15min$ b) $30min$ c)$60min$ d)$90min$

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**15.** Potassium ferrocyanide is 50% ionised in aqueous solution, its van't Hoff factor will be..... .

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**16.** Standard Gibbs free enegry change $\Delta G^{\Theta}$ for a reaction is zero. The value of the equilibrium constant will be:

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**17.** Number of faraday required to convert 1 mol $Cr_2O_7^{2-}$ to $Cr^{3+}$ ion is....

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**18.** The ratio of the rate of diffusion of helium and methane under indentical conditions of pressure and temperature will be

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**19.** Total number of electrons present in $11.2 litre$ of $NH_3$ at $STP$ are:

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**20.** How many Balmer lines in the spectrum will be observed when electrons return from 7th shell to 2nd shell ?

View Text Solution

## Set Iv Assertion Reason Type Questions

**1.** Statement-1: $CH_4, CO_2$ has value of Z (compressibility factor) less than one, generally. Statement-2: $Z < 1$ is due to repulsive forces among the molecules.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: A**

Watch Video Solution

**2.** (A) More is the value of van der Waal's constant 'a', greater is the tendency of liquefaction.

(R) 'a' measures the magnitude of force of attraction among the molecules.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: A**

Watch Video Solution

**3.** (A) Crystalline solids are anisotropic.

(R) Crystalline solids are not as closely packed as amorphous solids.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: C**

Watch Video Solution

**4.** (A) Antiferromagnetic substances possess zero magnetic moment.

(R) $MnO$ is an antiferromagnetic substance.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: B**

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**5.** (A) Isotonic solutions do not show osmosis.

(R) Isotonic solutions have equal osmotic pressure

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: A**

Watch Video Solution

**6.** (A) In a gaseous reaction, $K_c$ is unitless when $\Delta n = 0$.

(R) Unit of $K_c = \left(molL^{-1}\right)^{\Delta n}$.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: A**

View Text Solution

**7.** (A) Strength of acidic character of oxyacids lies in the following sequence:

$HClO_4 > HBrO_4 > HIO_4$

(R) Greater is the oxidation state of a halogen, more is the acidic character of its oxyacid.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: B**

View Text Solution

**8.** Assertion (A) : The molecularity of the reaction

$H_2 + Br_2 \rightarrow 2HBr$ is 2.

Reason (R ): The order of the reaction is $3/2$.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: B**

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**9.** Assertion: Half-life period of a reaction of first order is independent of initial concentration.

Reason: Half-life period for a first order reaction $t_{1/2} = \frac{2.303}{K}\log 2$.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: A**

Watch Video Solution

**10.** (A) For reaction $2NH_3(g) \rightarrow N_2(g) + 3H_2(g), \qquad \Delta H > \Delta E$

(R) Enthalpy change is always greater than internal energy change.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: C**

Watch Video Solution

**11.** (A) $.^{20}Ne$ and $.^{22}Ne$ are isotones.

(R) Noble gases do not exist as isotopes as they are not reactive.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: D**

View Text Solution

**12.** (A) $3d_{z^2}$ orbital is spherically symmetrical.

(R) $3d_{z^2}$ orbital is the only d-orbital which is spherical in shape.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: D**

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**13.** Assertion(A): The kinetic of the photo electron ejected increases with increases in intensity of incident light.

Reason(R): Increase in intensity of incident light increases the rate of emission.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) is false but reason (R) is true

**Answer: D**

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**14.** (A) $._{56}^{133}Be + e^- \rightarrow ._{55}^{133}Cs + \text{X-ray}$

It is a process of K-electron capture.

(R) The atomic number decreases by one unit as a result of K-capture.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: B**

View Text Solution

**15.** (A) Vapour pressure is a coliigative property.

(R) Colligative property depends on the number of solute particles dissolved in the solution.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) is false but reason (R) is true

**Answer: D**

View Text Solution

**16.** (A) Entropy decreases when a egg is boiled.

(R) It is solidified due to denaturation of albumin.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: A**

View Text Solution

**17.** (A) 1 faraday = 96,500 coulomb.

It is a charge of 1 mole electrons.

(R) 1 faraday charge liberates one gram equivalent of substance at an electrode.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: B**

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**18.** The elctrical resistance of a column of $0.05MNaOH$ solution of diameter $1cm$ and length $50cm$ is $5.55 \times 10^3 ohm$. Calculate its resisteivity , conductivity, and molar conductivity.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) and reason (R) both are false

**Answer: C**

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**19.** (A) If water is heated to 350K, then pOH will increase to 8.

(R) $K_w$ increase with increase in temperature.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) is false but reason (R) is true

**Answer: D**

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**20.** (A) Magnetic quantum number can have the value 0,...., (n-1).

(R) Magnetic quantum number specifies the number of orbitals.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) is false but reason (R) is true

**Answer: D**

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**21.** (A) Emitted radiations lie in visible region when electrons jump from higher level to n=2 in hydrogen.

(R) Balmer series radiations belong to visible range in H-atoms.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) is false but reason (R) is true

**Answer: A**

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**22.** Statement -I : Energy emitted when an electron jump from $5 \rightarrow 2$ (energy level) is less than when an

electron jump from $2 \rightarrow 1$ in all 'H' like atom.

Statement -II : The|total energy dofference| between $1^{st}\&2^{nd}$ energy level is greater than that of any

two energy level provided level $1$ is not part of those two energy levels.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) is false but reason (R) is true

**Answer: A**

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**23.** (A) In general phenolphthalein is used as an indicator for the titration of weak acid $(CH_3COOH)$ and strong base (NaOH).

(R) At equivalence point solution is basic.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) is false but reason (R) is true

**Answer: B**

Watch Video Solution

**24.** (A) pH of $10^{-7}$ M NaOH solution exists between 7 to 7.3 at $25^{\circ}C$.

(R) Due to common ion effect ionization of water is supressed.

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) is false but reason (R) is true

**Answer: A**

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**25.** (A) 3s, 3p and 3d subshells in hydrogen have same energy.

(R) Energy of subshells in hydrogen atom, depends on the principle quantum number (n) and azimuthal quantum number (l).

A. Both (R) and (A) are true and reason is the correct explanation of assertion.

B. Both (R) and (A) are true but reason is not correct explanation of assertion

C. Assertion (A) is true but reason (R) is false

D. Assertion (A) is false but reason (R) is true

**Answer: C**

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## Set V Matching Type Questions

**1.** Match the List-I with List-II and pick up the correct matching from the codes given below:

| List-I | List-II |
|---|---|
| A. $\left(\frac{\partial E}{\partial V}\right)_T = 0$ | 1. Isothermal process |
| B. $W = -\Delta E$ | 2. $-nFE^\circ$ |
| C. $\Delta E = 0$ | 3. Adiabatic reaction |
| D. $\Delta G^\circ$ | 4. van der Waals' gas |
| E. $\left(\frac{\partial T}{\partial P}\right)_H \neq 0$ | 5. Ideal gas |

A. A-2 B-1 C-4 D-5 E-3

B. A-2 B-5 C-1 D-4 E-3

C. A-3 B-1 C-2 D-5 E-4

D. A-5 B-3 C-1 D-2 E-4

**Answer: D**

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**2.** Match the Colunm-I with Column-II :

| Column-I | Column-II |
|---|---|
| (I) $^{40}_{20}Ca$ | 1. Unstable, $\alpha$-emitter |
| (II) $^{133}_{53}I$ | 2. Unstable, $\beta$-emitter |
| (III) $^{121}_{53}I$ | 3. Unstable, positron emitter |
| (IV) $^{232}_{90}Th$ | 4. Stable |

A. I-1 II-2 III-3 IV-4

B. I-4 II-3 III-2 IV-1

C. I-4 II-2 III-3 IV-1

D. I-4 II-3 III-1 IV-2

**Answer: C**

View Text Solution

**3.** Match the List-I with List-II and select the correct answer using the options given below the lists:

| List-I (Electrochemical parameter) | List-II (Units) |
|---|---|
| (I) Ionic mobility | 1. $cm^{-1}$ |
| (II) Cell constant | 2. $ohm^{-1}\ cm^{-1}$ |
| (III) Specific conductance | 3. $ohm^{-1}\ cm^{2}\ mol^{-1}$ |
| (IV) Molar conductance | 4. $cm^{2}\ V^{-1}\ s^{-1}$ |

A. I-4 II-1 III-2 IV-3

B. I-2 II-3 III-4 IV-1

C. I-3 II-1 III-2 IV-4

D. I-1 II-2 III-3 IV-4

**Answer: A**

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**4.** Match the Colunm-I with Column-II and select the correct answer using the sequences given below:

| Column-I (Compounds) | Column-II (Oxidation state of nitrogen) |
|---|---|
| A. $NaN_3$ | 1. +5 |
| B. $N_2H_4$ | 2. +1 |
| C. $NH_2OH$ | 3. $-1/3$ |
| D. $N_2O_5$ | 4. $-2$ |

A. $\begin{matrix} A & B & C & D \\ 3 & 4 & 2 & 1 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 4 & 3 & 1 & 2 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 3 & 4 & 1 & 2 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 4 & 3 & 2 & 1 \end{matrix}$

**Answer: A**

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**5.** Match the Colunm-I with Colunm-II and pick up the correct alternate:

| Column-I | | Column-II |
|---|---|---|
| (I) | For spontaneous reaction | A. $\Sigma(\mathrm{BE})_R - \Sigma(\mathrm{BE})_P$ |
| (II) | For endothermic reaction | B. $\Delta H = \Delta E$ |
| (III) | Bond dissociation energy | C. $\Delta G = -\mathrm{ve}$ |
| (IV) | For solids and liquids in a thermochemical reaction | D. $\Sigma H_P > \Sigma H_R$ |

A. I-C II-A III-D IV-B

B. I-B II-D III-A IV-C

C. I-C II-D III-B IV-A

D. I-C II-D III-A IV-B

**Answer: D**

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**6.** Match the Column-I with Column-II and pick up the correct answer:

| | Column-I | Column-II |
|---|---|---|
| (I) | Nickel | A. Conversion of alcohol to gasoline |
| (II) | ZSM-5 | B. Alkylation of benzene |
| (III) | $SiO_2$ | C. Hydrogenation of oil |

A. I-C II-A III-B

B. I-A II-B III-C

C. I-C II-B III-A

D. I-B II-C III-B

**Answer: A**

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**7.** Match the List-I (enzymes) with List-II (metals) and select the correct answer using the codes given below the lists:

| List-I | List-II |
|---|---|
| A. Nitrogenase | 1. Cu |
| B. Cytochrome oxidase | 2. Mo |
| C. Cytochrome-C | 3. Zn |
| D. Carboxypeptidase | 4. Fe |

A. $\begin{matrix} A & B & C & D \\ 1 & 2 & 4 & 3 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 2 & 1 & 3 & 4 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 2 & 1 & 4 & 3 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 1 & 2 & 3 & 4 \end{matrix}$

**Answer: B**

View Text Solution

**8.** Match the Colunm-I with Colunm-II and select the correct answer:

| Column-I | Column-II |
|---|---|
| (I) Curie | A. $10^6$ dis $sec^{-1}$ |
| (II) Rutherford | B. $3.7 \times 10^{10}$ dis $sec^{-1}$ |
| (III) Becquerel | C. 1 dis $sec^{-1}$ |

A. I-B II-A III-C

B. I-B II-C III-A

C. I-A II-B III-C

D. I-C II-B III-A

**Answer: A**

View Text Solution

**9.** Match the List-I with List-II:

| List-I | List-II |
|---|---|
| (I). $\Delta H = q_P$ | 1. $\Delta S^\circ = 0$ |
| (II). Kirchhoff's equation | 2. State function |
| (III). $H^+(aq.)$ | 3. Path function |
| (IV). Spontaneous process | 4. $\Delta G > 0$ |
| | 5. $\Delta S^\circ_{\text{Total}} > 0$ |
| | 6. $\Delta H_2 - \Delta H_1 = \Delta C_p(T_2 - T_1)$ |

A.

| $(I)$ | $(II)$ | $(III)$ | $(IV)$ |
|---|---|---|---|
| 1 | 2 | 4 | 5 |

B.

| $(I)$ | $(II)$ | $(III)$ | $(IV)$ |
|---|---|---|---|
| 5 | 4 | 3 | 6 |

C.

| $(I)$ | $(II)$ | $(III)$ | $(IV)$ |
|---|---|---|---|
| 2 | 6 | 1 | 1 |

D.

| $(I)$ | $(II)$ | $(III)$ | $(IV)$ |
|---|---|---|---|
| 6 | 2 | 5 | 1 |

**Answer: C**

View Text Solution

**10.** Match the List-I with List-II:

| | List-I | List-II |
|---|---|---|
| (I) | Mixing of two ideal gases | 1. $\Delta G_{mix} = 0$ |
| (II) | Criterion for irreversibility | 2. $1/P$ |
| (III) | Isobaric thermal coefficient of an ideal gas | 3. $1/T$ |
| (IV) | Joule-Thomson effect | 4. $\Delta S_{Total} > 0$ |
| | | 5. $\Delta G_{mix} < 0$ |
| | | 6. $\Delta H = 0$ |

A.

| $(I)$ | $(II)$ | $(III)$ | $(IV)$ |
|---|---|---|---|
| 1 | 2 | 4 | 5 |

B.

| $(I)$ | $(II)$ | $(III)$ | $(IV)$ |
|---|---|---|---|
| 5 | 4 | 3 | 6 |

C.

| $(I)$ | $(II)$ | $(III)$ | $(IV)$ |
|---|---|---|---|
| 2 | 6 | 1 | 5 |

D.

| $(I)$ | $(II)$ | $(III)$ | $(IV)$ |
|---|---|---|---|
| 6 | 2 | 5 | 1 |

**Answer: B**

View Text Solution

**11.** Match the List-I with List-II:

| | List-I | List-II |
|---|---|---|
| (I) | Translational kinetic energy | 1. $\frac{3}{2}P$ |
| (II) | Rotational kinetic energy of $CO_2$ | 2. 15/13 |
| (III) | Translational kinetic energy per unit volume | 3. 7/5 |
| (IV) | $\gamma$ for $CO_2$ at very high temperature | 4. Function of $T$ only |
| | | 5. $RT$ |
| | | 6. $\frac{3}{2}RT$ |

A. $\begin{matrix}(I) & (II) & (III) & (IV)\\ 3 & 4 & 5 & 1\end{matrix}$

B. $\begin{matrix}(I) & (II) & (III) & (IV)\\ 4 & 5 & 1 & 2\end{matrix}$

C. $\begin{matrix}(I) & (II) & (III) & (IV)\\ 5 & 6 & 2 & 3\end{matrix}$

D. $\begin{matrix}(I) & (II) & (III) & (IV)\\ 6 & 1 & 3 & 4\end{matrix}$

**Answer: D**

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**12.** Match the Colunm-X with Column-Y:

| Column-X (Colloids) | | Column-Y (Classification) | |
|---|---|---|---|
| (I) | Rain cloud | A. | Sol |
| (II) | Milk of magnesia | B. | Aerosol |
| (III) | Soap suds | C. | Gel |
| (IV) | Butter | D. | Foam |

**Codes:**

| | (I) | (II) | (III) | (IV) |
|---|---|---|---|---|
| (a) | A | B | C | D |
| (b) | A | C | B | D |
| (c) | B | A | D | C |
| (d) | B | A | C | D |

A. $\begin{matrix}(I) & (II) & (III) & (IV)\\ A & B & C & D\end{matrix}$

B. $\begin{matrix}(I) & (II) & (III) & (IV)\\ A & C & B & D\end{matrix}$

C. $\begin{matrix}(I) & (II) & (III) & (IV)\\ B & A & D & C\end{matrix}$

D. $\begin{matrix}(I) & (II) & (III) & (IV)\\ B & A & C & D\end{matrix}$

**Answer: C**

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**13.** Match the List-I with List-II and select the correct answer from given codes:

| List-I (Spectrum) | List-II (Region) |
|---|---|
| A. Lyman | 1. Ultraviolet |
| B. Paschen | 2. Visible |
| C. Balmer | 3. Near infrared |
| D. Pfund | 4. Far infrared |

**Codes:**

| | A | B | C | D |
|---|---|---|---|---|
| (a) | 1 | 3 | 2 | 4 |
| (b) | 1 | 2 | 3 | 4 |
| (c) | 4 | 3 | 2 | 1 |
| (d) | 1 | 2 | 4 | 3 |

A.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 1 | 3 | 2 | 4 |

B.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

C.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 4 | 3 | 2 | 1 |

D.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 1 | 2 | 4 | 3 |

**Answer: A**

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**14.** Match the List-I with List-II and select the correct answer:

| List-I | List-II |
|---|---|
| A. Critical temperature | 1. $a / Rb$ |
| B. Boyle temperature | 2. $2a / Rb$ |
| C. Inversion temperature | 3. $T / T_c$ |
| D. Reduced temperature | 4. $8a / 27Rb$ |

A.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 4 | 1 | 2 | 3 |

B.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 2 | 1 | 4 | 3 |

C.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 4 | 3 | 2 | 1 |

D.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 2 | 3 | 1 | 4 |

**Answer: A**

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**15.** Match the List-I, List-II and List-III and select the answer from the given codes:

| List-I (Order) | List-II (Unit of rate constant) | List-III (Relation between half-life and initial concentration) |
|---|---|---|
| A. Zero | (i) $L^2\ mol^{-2}\ s^{-1}$ | 1. $t_{1/2}$ = Constant |
| B. First | (ii) $L\ mol^{-1}\ s^{-1}$ | 2. $t_{1/2} \propto \frac{1}{a}$ |
| C. Second | (iii) $s^{-1}$ | 3. $t_{1/2} \propto a$ |
| D. Third | (iv) $mol\ L^{-1}\ s^{-1}$ | 4. $t_{1/2} \propto \frac{1}{a^2}$ |

A. $\begin{matrix} A & B & C & D \\ i-2 & ii-4 & iii-3 & iv-1 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ i-4 & iv-3 & ii-2 & iii-1 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ iv-3 & iii-1 & ii-2 & i-4 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ ii-2 & i-1 & iii-3 & iv-4 \end{matrix}$

**Answer: C**

View Text Solution

**16.** Match the List-1 (solutions of salts) with List-II (pH of the solutions) and select the correct answer using the codes given below the lists:

| List-I | List-II |
|---|---|
| A. Weak acid and strong base | 1. $\frac{1}{2}\,pK_w$ |
| B. Strong acid and weak base | 2. $\frac{1}{2}[pK_w - pK_b + pK_a]$ |
| C. Weak acid and weak base | 3. $\frac{1}{2}[pK_w - pK_b - \log c]$ |
| D. Strong acid and strong base | 4. $\frac{1}{2}[pK_w + pK_a + \log c]$ |

**Codes:**

| | A | B | C | D |
|---|---|---|---|---|
| (a) | 4 | 3 | 2 | 1 |
| (b) | 1 | 2 | 3 | 4 |
| (c) | 2 | 3 | 4 | 1 |
| (d) | 3 | 2 | 1 | 4 |

A.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 4 | 3 | 2 | 1 |

B.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

C.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 2 | 3 | 4 | 1 |

D.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 3 | 2 | 1 | 4 |

**Answer: A**

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**17.** Match the List-I with List-II and choose the correct answer from the codes:

| List-I (Electrolyte) | List-II (Solubility product) |
|---|---|
| A. $Bi_2S_3$ | 1. $4s^3$ |
| B. $Al(OH)_3$ | 2. $27s^4$ |
| C. CdS | 3. $108s^5$ |
| D. $CaF_2$ | 4. $s^2$ |

A. $\begin{matrix} A & B & C & D \\ 1 & 2 & 3 & 4 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 2 & 3 & 1 & 4 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 4 & 3 & 2 & 1 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 3 & 2 & 4 & 1 \end{matrix}$

**Answer: D**

View Text Solution

**18.** Match the following combinations of electrical units with their terms as single unit:

| Electrical unit | Single unit |
|---|---|
| (I). ampere-second | A. coulomb |
| (II). volt-ampere | B. ohm |
| (III). volt-ampere$^{-1}$ | C. ampere |
| (IV). watt/ampere ohm | D. watt |
| (V). joule /ampere second | E. volt |

A. $\begin{matrix} A & B & C & D & E \\ I & III & IV & II & V \end{matrix}$

B. $\begin{matrix} A & B & C & D & E \\ I & II & III & IV & V \end{matrix}$

C. $\begin{matrix} A & B & C & D & E \\ V & IV & III & II & I \end{matrix}$

D. $\begin{matrix} A & B & C & D & E \\ I & V & IV & II & III \end{matrix}$

**Answer: A**

View Text Solution

**19.** Match the List-I with List-II and select the correct answer from the given codes:

| List-I (Thermodynamic properties) | List-II (Relation) |
|---|---|
| A. Free energy change of a reaction ($\Delta G$) | 1. $-RT \log K$ |
| B. Standard enthalpy change ($\Delta H^\circ$) of a reaction | 2. $RT^2 \left(\frac{d \ln K}{dT}\right)_P$ |
| C. Standard entropy change ($\Delta S^\circ$) | 3. $-nFE$ |
| D. Standard free energy change ($\Delta G^\circ$) | 4. $-\left(\frac{d \Delta G}{dT}\right)_P$ |

A.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 3 | 2 | 4 | 1 |

B.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

C.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 4 | 3 | 2 | 1 |

D.

| $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|
| 2 | 3 | 1 | 4 |

**Answer: A**

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**20.** Match the List-I, List-II and List-III:

| List-I | List-II | List-III |
|---|---|---|
| A. $\Delta G > 0$ | X. $\Delta S > 0$ | 1. Non-spontaneous |
| B. $\Delta G < 0$ | Y. $\Delta S < 0$ | 2. Spontaneous |
| C. $\Delta G = 0$ | Z. $\Delta S = 0$ | 3. Equilibrium |

Select the correct answer from the following codes:

A. $\begin{matrix} A & B & C \\ (Y, 1) & (X, 2) & (Z, 3) \end{matrix}$

B. $\begin{matrix} A & B & C \\ (X, 2) & (Y, 3) & (Z, 1) \end{matrix}$

C. $\begin{matrix} A & B & C \\ (X, 3) & (Y, 1) & (Z, 2) \end{matrix}$

D. $\begin{matrix} A & B & C \\ (Y, 1) & (X, 3) & (Z, 2) \end{matrix}$

**Answer: A**

View Text Solution

**21.** Match the Colunm-I with Column-II:

| Column-I | Column-II |
|---|---|
| (a) Spontaneous process | (p) $\Delta H =$ |
| (b) Heat flow from high temperature of system towards low | (q) $\Delta G =$ |
| (c) Exergonic process | (r) $\Delta S_{tota}$ |
| (d) Increase in the randomness of system of heating | (s) $\Delta G =$ |

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**22.** Match the items of Column-I with the items of Column-II:

| Column-I (Metal) | Column-II (Packing/coordination numbe |
|---|---|
| (a) Na | (p) ccp |
| (b) Cu | (q) bcc |
| (c) Au | (r) 12 |
| (d) K | (s) 8 |

View Text Solution

**23.** Match the Colunm-I with Column-II and Column-III: l = Edge length of unit cell,

r = Radius of spherical constituent unit

| Column-I | Column-II | Column-III |
|---|---|---|
| (a) Simple cubic unit cell | (p) $l\sqrt{3} = 4r$ | (u) 74% occupied space |
| (b) Face-centred cubic unit cell | (q) $l = 2r$ | (v) 67.98% occupied space |
| (c) Body-centred cubic unit cell | (r) $l\sqrt{2} = 4r$ | (w) 52.33% occupied space |

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**24.** Match the List-I with List-II:

| List-I | List-II |
|---|---|
| (a) Silicon doped with phosphorus | (p) Acceptor level above valence bond |
| (b) Metal excess non-stoichiometry in NaCl | (q) *n*-type semiconductor |
| (c) Ge doped with Ga | (r) Donor level just below the conduction band |
| (d) Anion vacancy with trapped electron | (s) F-centre |

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**25.** Match the solids in List-I with their properties in List-II:

| List-I | List-II |
|---|---|
| (a) MnO | (p) Ferromagnetic solid |
| (b) ZnO | (q) Antiferromagnetic solid |
| (c) $CrO_2$ | (r) Zero magnetic moment |
| (d) TiO | (s) Attracted in magnetic field |

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**26.** Match the List-I with List-II:

| List-I | List-II |
|---|---|
| (a) The highest temperature at which liquid $CO_2$ exists | (p) $\frac{V_{real}}{V_{ideal}}$ |
| (b) $8a/27Rb$ | (q) Critical temperature |
| (c) Compressibility factor $Z = 3/8$ at | (r) Ideal gas |
| (d) Compressibility factor $Z = 1$ for | (s) 30.98° C |

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**27.** Match the physical properties of Column-I with their values in Column-II:

| Column-I | Column-II |
|---|---|
| (a) SATP | (p) 1 bar/1 atm |
| (b) Temperature in STP | (q) 99.6° C |
| (c) Pressure in NTP | (r) 273.15 K |
| (d) Standard boiling point of | (s) 298.15 K |

SATP $\rightarrow$ Standard ambient temperature and pressure

STP $\rightarrow$ Standard temperature and pressure

NTP $\rightarrow$ Normal temperature and pressure

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**28.** Match the quantities in Column-I with their units in Column-II:

| Column-I | Column-II |
|---|---|
| (a) Coefficient of viscosity | (p) L $mol^{-1}$ |
| (b) van der Waals' constant '$b$' | (q) N s $m^{-2}$ |
| (c) Molar volume of gas at STP = 22.4 . . . | (r) Pa s |
| (d) van der Waals' constant '$a$' | (s) $L^2$ atm $mol^{-2}$ |

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**29.** Match the temperature in List-I with its value in List-II:

| List-I | List-II |
|---|---|
| (a) Critical temperature | (p) $a/Rb$ |
| (b) Boyle's temperature | (q) $\theta$ |
| (c) 1/2 [Inversion temperature] | (r) $T/T_c$ |
| (d) Reduced temperature | (s) $8a/27Rb$ |

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**30.** Match the items of Column-I with its proportional term in the items of Column-II:

| Column-I | Column-II |
|---|---|
| (a) Kinetic energy | (p) Mole fraction |
| (b) Partial pressure of a gas | (q) Density |
| (c) Rate of diffusion | (r) Molar mass |
| (d) Vapour pressure of a liquid | (s) Absolute temperature |

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**31.** Match the List-I with List-II and List-III:

| List-I (Solids) | List-II (Unit cell) | List-III (Coordination number) |
|---|---|---|
| (a) Rock salt | (p) Face-centred cubic, anion in tetrahedral void | (w) 6 |
| (b) Fluorite | (q) Face-centred cubic, cation in octahedral void | (x) Cation (8), anion (4) |
| (c) AgI, ZnS | (r) Face-centred cubic, cation in alternate tetrahedral void | (y) Cation (4), anion (8) |
| (d) $Na_2O$ | (s) Face-centred cubic, cation in tetrahedral void | (z) Cation (4), anion (4) |

View Text Solution

**32.** Match the Column-I with Column-II. Choose the correct one from the alternatives (a), (b), (c) and (d).

| Column-I | Column-II |
|---|---|
| P. Wilkinson catalyst | I. *trans* – $IrCl(CO)(PPh_3)_2$ |
| Q. Speier catalyst | II. Hydrosilylation |
| R. Water gas shift catalyst | III. $RhCl(PPh_3)_3$ |
| S. Zeolite ZSM-5 catalyst | IV. Synthetic gasoline |
| | V. Hydroformylation |
| | VI. Zinc-copper oxide |

A. $\begin{matrix}(a) & (b) & (c) & (d)\\ P-III & P-I & P-V & P-III\end{matrix}$

B. $\begin{matrix}(a) & (b) & (c) & (d)\\ Q-II & Q-V & Q-II & Q-VI\end{matrix}$

C. $\begin{matrix}(a) & (b) & (c) & (d)\\ R-VI & R-III & R-VI & R-IV\end{matrix}$

D. $\begin{matrix}(a) & (b) & (c) & (d)\\ S-IV & S-IV & S-IV & S-II\end{matrix}$

**Answer: D**

View Text Solution

**33.** Match the Column-I with Column-II. Choose the correct one from the alternatives (a), (b), (c) and (d).

| Column-I | Column-II |
|---|---|
| P. Low temperature | I. $\frac{a}{V^2}$ |
| Q. Mean speed | II. Maxwellian distribution |
| R. Internal pressure | III. $b$ |
| S. Excluded volume | IV. Adiabatic demagnetisation |
| | V. $\left(a+\frac{b}{V^2}\right)$ |

A. $\begin{matrix}(a) & (b) & (c) & (d)\\ P-IV & P-V & P-I & P-IV\end{matrix}$

B. $\begin{matrix}(a) & (b) & (c) & (d)\\ Q-II & Q-IV & Q-II & Q-V\end{matrix}$

C. $\begin{matrix}(a) & (b) & (c) & (d)\\ R-I & R-II & R-III & R-III\end{matrix}$

D. $(a)$ $(b)$ $(c)$ $(d)$
$S-III$ $S-III$ $S-IV$ $S-II$

**Answer: A**

View Text Solution

**34.** Match the List-I and List-II:

| List-I | List-II |
|---|---|
| (A) The limits of pH values of buffer solution. | (i) $5\times10^{-12}$ |
| (B) The $[H_3O]^+$ concentration in 0.001 $M$ $Ba(OH)_2$ solution. | (ii) Equal |
| (C) The buffer capacity of a solution is maximum when conc. of salt to that of acid is : | (iii) 1st order reaction |
| (D) Hydrolysis of ethyl acetate in acidic solution. | (iv) $pK_a \pm 1$ |

A. $(A)$ $(B)$ $(C)$ $(D)$
$iv$ $ii$ $i$ $iii$

B. $(A)$ $(B)$ $(C)$ $(D)$
$iv$ $i$ $iii$ $ii$

C. $(A)$ $(B)$ $(C)$ $(D)$
$i$ $iv$ $ii$ $iii$

D. $(A)$ $(B)$ $(C)$ $(D)$
$iv$ $i$ $ii$ $iii$

**Answer: D**

View Text Solution

**35.** Match the List-I and List-II:

| List-I | List-II |
|---|---|
| (A) Rate constant has the same unit as the rate of reaction. | (i) One |
| (B) Reactions having apparent molecularity more than three. | (ii) Zero order reaction |
| (C) Reactions having molecularity two but order of reaction is one. | (iii) Complex reaction |
| (D) For a reaction, $A \rightarrow B$, the rate of reaction doubles as the concentration of $A$ is doubled. | (iv) Pseudo unimolecular reaction |

A. $\begin{matrix}(A) & (B) & (C) & (D)\\ ii & iv & iii & i\end{matrix}$

B. $\begin{matrix}(A) & (B) & (C) & (D)\\ ii & iii & iv & i\end{matrix}$

C. $\begin{matrix}(A) & (B) & (C) & (D)\\ iii & ii & iv & i\end{matrix}$

D. $\begin{matrix}(A) & (B) & (C) & (D)\\ ii & iv & i & iii\end{matrix}$

**Answer: B**

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**36.** Match the Column-I with Column-II:

| Column-I | | Column-II | |
|---|---|---|---|
| (a) | de Broglie equation | (p) | $\lambda = \frac{h}{p}$ |
| (b) | Lyman series | (q) | $\lambda = \frac{h}{\sqrt{2Em}}$ |
| (c) | Wavelength associated with particle of mass $m$ | (r) | Transition from higher shell to $K$-shell |
| (d) | $6.6 \times 10^{-19}$ J energy per photon | (s) | Ultraviolet radiation |

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**37.** Match the Column-I with Column-II:

| Column-I | | Column-II | |
|---|---|---|---|
| (a) | Mn | (p) | Radius ratio (0.732–1) |
| (b) | Body-centred cubic | (q) | Hexagonal close-packed |
| (c) | ABC ABC ABC | (r) | Packing (0.68) |
| (d) | Be | (s) | Number of constituent units in one unit cell (1) |

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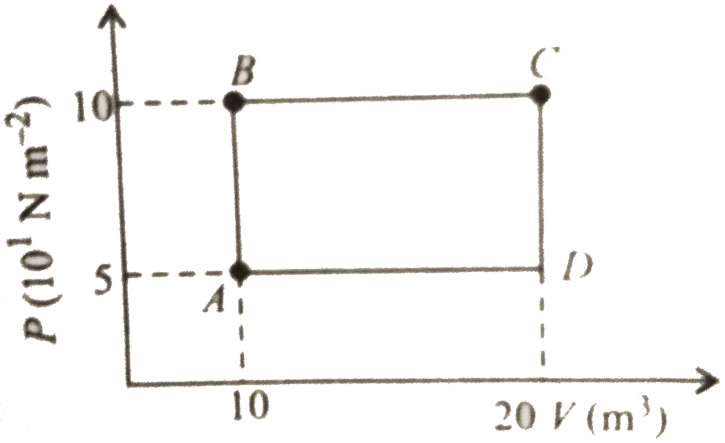
## Set Vi Problems On Graphical Aptitude

**1.** A sample of $2kg$ of helium (assumed ideal) is taken through the process $ABC$ and another sample of $2kg$ of the same gas is taken through the process $ADC$. Then the temperature of the states $A$ and $B$ are (given $R = 8.3Jmol^{-1}K^{-1}$)




A. $T_A = 120.5K, T_B = 120.5K$

B. $T_A = 241K, T_B = 241K$

C. $T_A = 120.5K, T_B = 241K$

D. $T_A = 241K, T_B = 482K$

**Answer: C**

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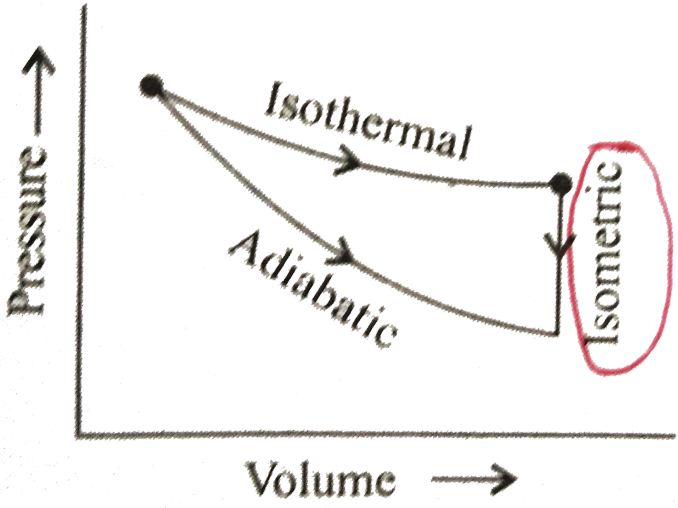
**2.** An ideal diatomic gas is caused to pass through a cycle shown on the $P - V$ diagram in figure, where $V_2 = 3.00V_1$. If $P_1$, $V_1$,and $T_1$ specify the state 1, then the temperature of the state 3 is




A. $(T_1/3)^{1.4}$

B. $T_1/3^{1.4}$

C. $T_1 / 3^{0.4}$

D. cannot be determined

**Answer: C**

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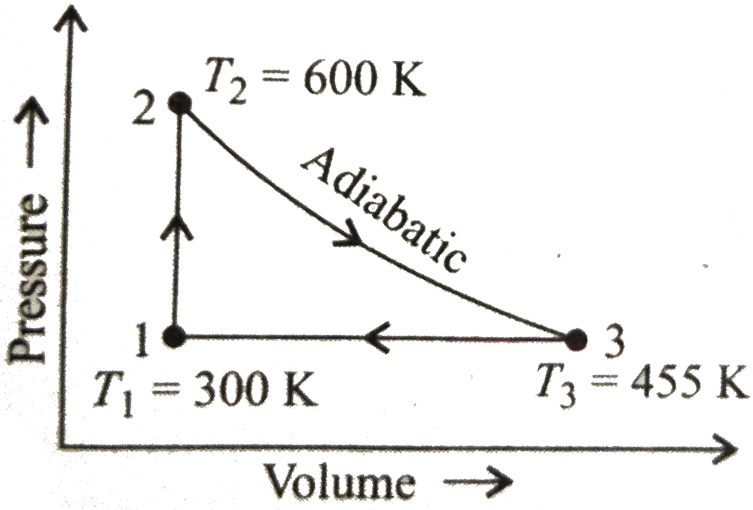
**3.** A heat engine carries one mole of an ideal mono-atomic gas around the cycle as shown in the figure below. Process $1 \rightarrow 2$ takes place at constant volume, process $2 \rightarrow 3$ is adiabatic and process $3 \rightarrow 1$ takes place at constant pressure. Then the amount of heat added in the process $1 \rightarrow 2$

is




A. 3740 J

B. $-3740J$

C. 1810 J

D. 3220 J

**Answer: A**

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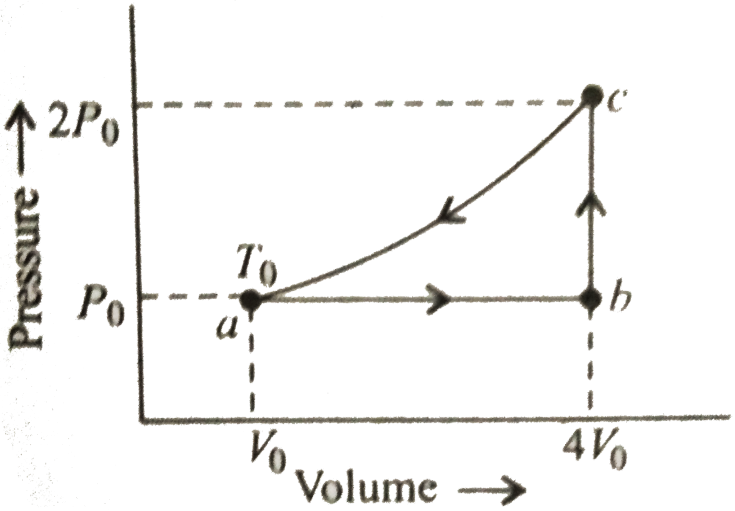
**4.** One mole of an ideal mono-atomic gas is caused to go through the cycle shown in the figure below. Then the change in the internal enegry in expanding the gas from $a$ to $c$ along the path $abc$ is:




A. $3P_0V_0$

B. $6RT_0$

C. $4.5RT_0$

D. $10.5RT_0$

**Answer: D**

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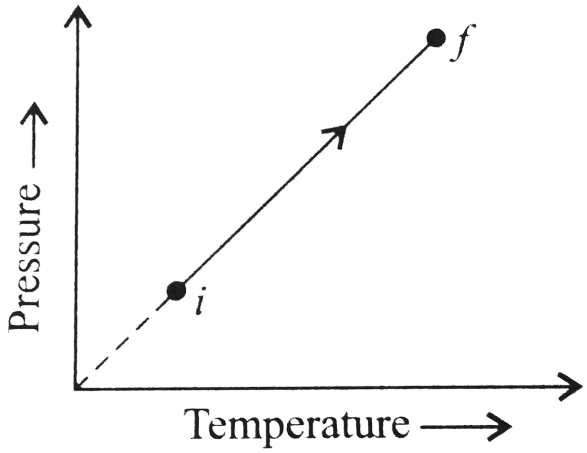
**5.** A thermodynamic system consists of a cylinder-piston attangement with ideal gas in it. It goes from the state $i$ to the state $f$ as shwon in the figure. The work done by gas during the process is




A. is zero

B. is negative

C. is positive

D. nothing can be predicted

**Answer: A**

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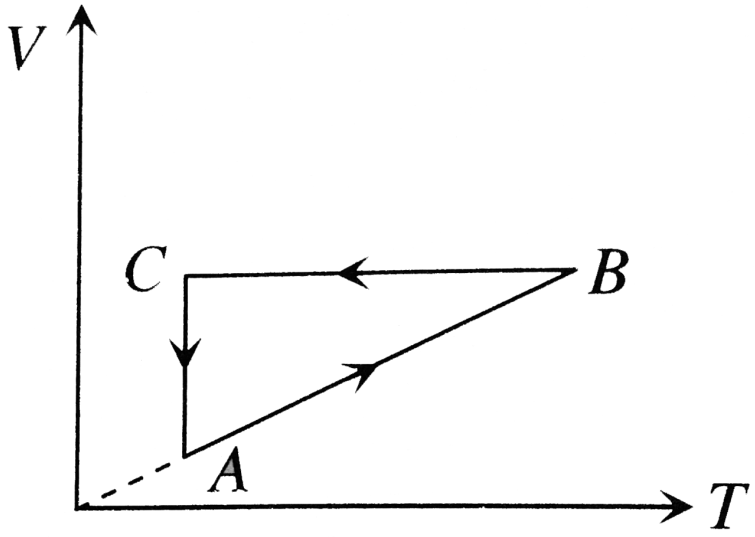
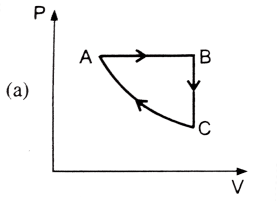
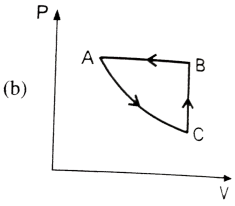
**6.** A cyclic process $ABCA$ is shown in the $V - T$ diagram process on the $P - V$



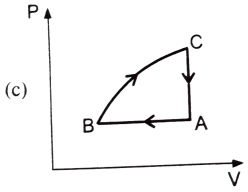

A.



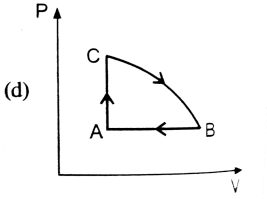

B.



C.




D.




**Answer: C**

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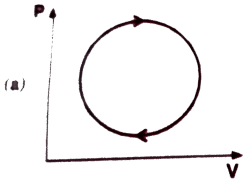
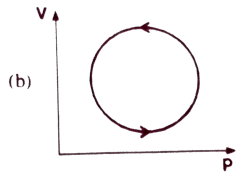
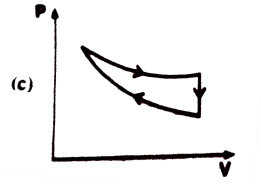
**7.** The following are the $P - V$ diagram for cyclic process for a gas. In which of these processes, heat is not obsorbed by the gas?

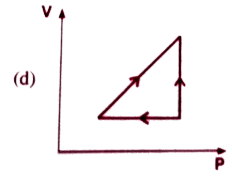
A.




B.



C. 


D. 


**Answer: D**

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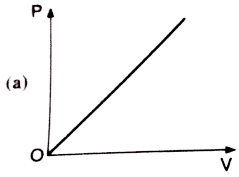
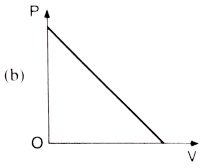
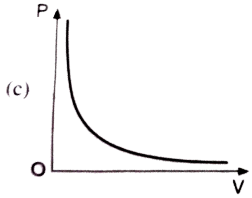
**8.** The graph betwene $P$ and $V$ at constant temperature should look like

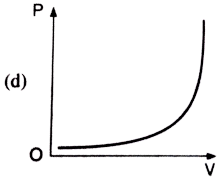
A. 


B. 

C.




D.




**Answer: A**

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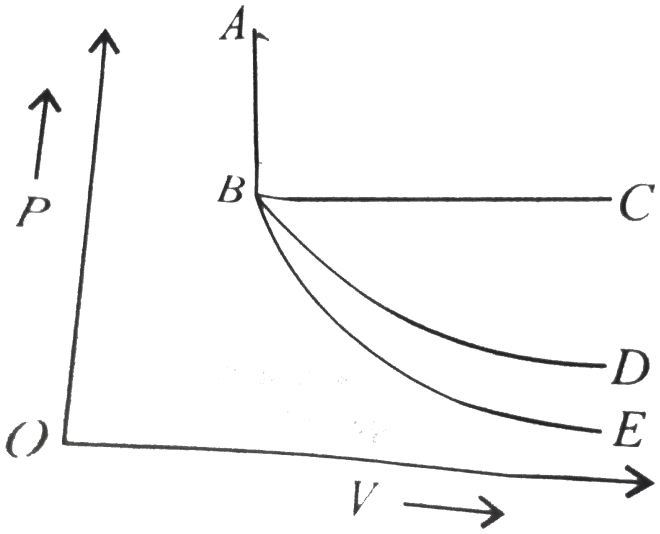
**9.** In $P - V$ diagram shown below,




A. AB represents adiabatic process

B. AB represents isothermal process

C. AB represents isobaric process

D. AB represents isochoric process

**Answer: C**

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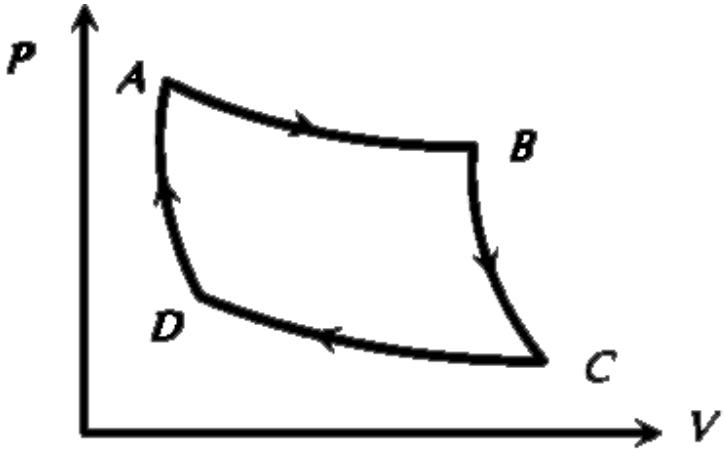
**10.** The P - V graph of an ideal gas cycle is shown here as below. The adiabatic process is described by




A. AB and BC

B. AB and CD

C. AD and BC

D. BC and CD

**Answer: D**

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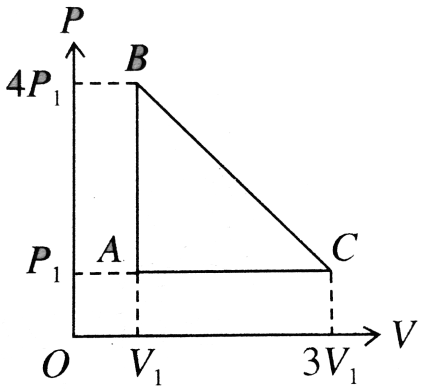
**11.** An ideal gas is taken around the cycle $ABCA$ shown in $P-V$ diagram. The net work done by the gas during the cycle is equal to




A. $12P_1V_1$

B. $6P_1V_1$

C. $3P_1V_1$

D. $P_1V_1$

**Answer: C**

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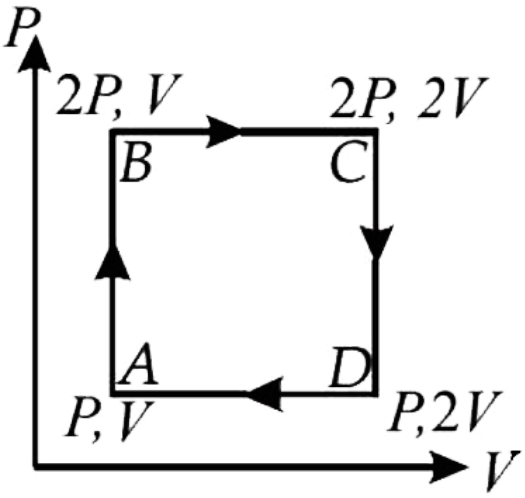
**12.** An ideal monoatomic gas is taken round the cycle ABCDA as shown in the P-V diagram. The work done during the cycle is




A. PV

B. 2PV

C. $\frac{1}{2}PV$

D. zero

**Answer: C**

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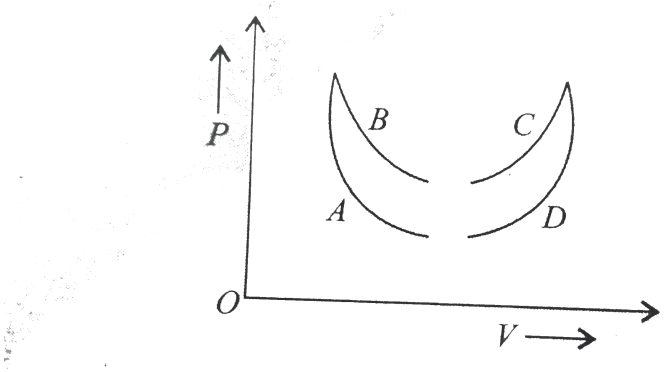
**13.** Four curves $A$, $B$, $C$ and $D$ are drawn in figure for a given amount of gas. The curve which represents adiabatic and isothermal changes, respectively, is




A. C and D respectively

B. D and C respectively

C. A and B respectively

D. B and A respectively

**Answer: C**

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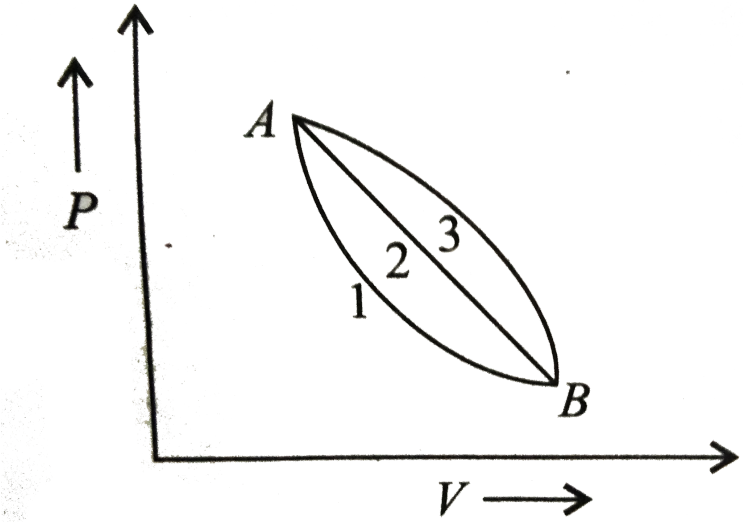
**14.** A given mass of gas expands from state $A$ to state $B$ by three paths $1$, $2$, and $3$ as shown in the figure below. If $w_1$, $w_2$ and $w_3$, respectively, be the work done by the gas along three paths, then




A. $W_1 > W_2 > W_3$

B. $W_1 < W_2 < W_3$

C. $W_1 = W_2 = W_3$

D. $W_1 > W_2, W_1 < W_3$

**Answer: B**

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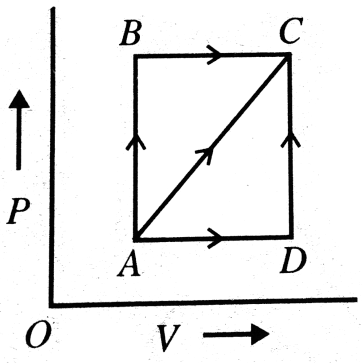
**15.** A thermodynamic process is shown in Fig. The pressures and volumes corresponding to some points in the figure are

$P_A = 3 \times 10^4 Pa\ V_A = 2 \times 10^{-3} m^3$

$P_B = 8 \times 10^4 Pa\ V_D = 5 \times 10^{-3} m^3$

In the process $AB$ $600J$ of heat is added to the system. The change in internal energy of the system in the process $AB$ would be




A. 560 J

B. 800 J

C. 600 J

D. 640 J

**Answer: B**

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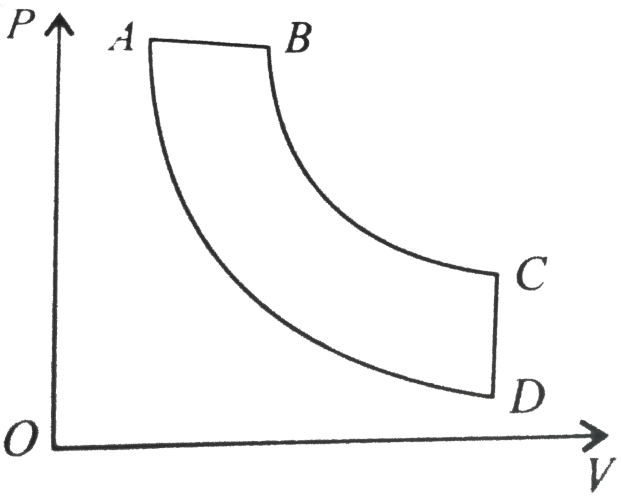
**16.** In the pressure-volume diagram given below, the isochoric, isothermal, isobaric, and isoentropic parts, respectively, are:




A. BA, AD, DC, CB

B. DC, CB, BA, AD

C. AB, BC, CD, DA

D. CD, DA, AB, BC

**Answer: D**

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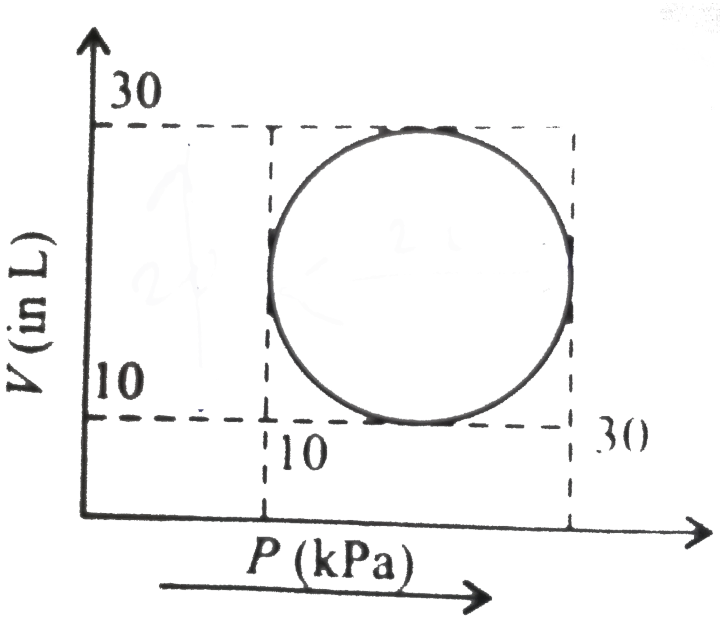
**17.** Heat energy absorbed by a system in going through a cyclic process shown in figure is



A. $10^{7}\pi J$

B. $10^{4}\pi J$

C. $10^{2}\pi J$

D. $10^{-3}\pi J$

**Answer: C**

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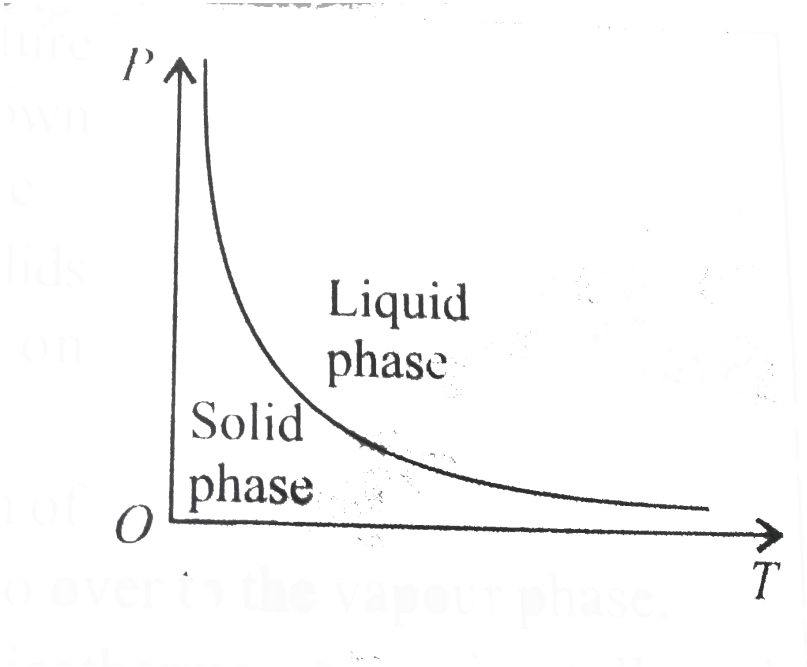
**18.** The pressure -temperature $(P-T)$ phase diagram shown below corresponds to the

a. Curve of fusion of solids that expand on solidification.

b. Curve of sublimation of solides that directly go over to the vapour

phase.




A. curve of fusion of solids that expand on solidification

B. curve of sublimation of solids that directly go over to the vapour phase

C. curve of fusion of solids that contract on solidification

D. curve of fusion of solids that do not change in volume upon solidification

**Answer: C**

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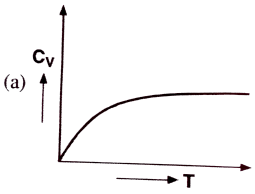
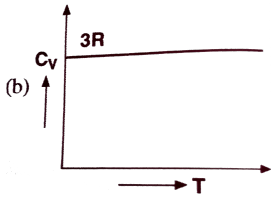
**19.** Graph for specific heat at constant volume for a monoatomic gas

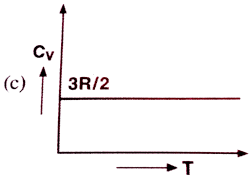
A.



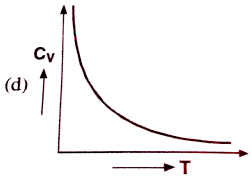

B.




C.




D.




**Answer: C**

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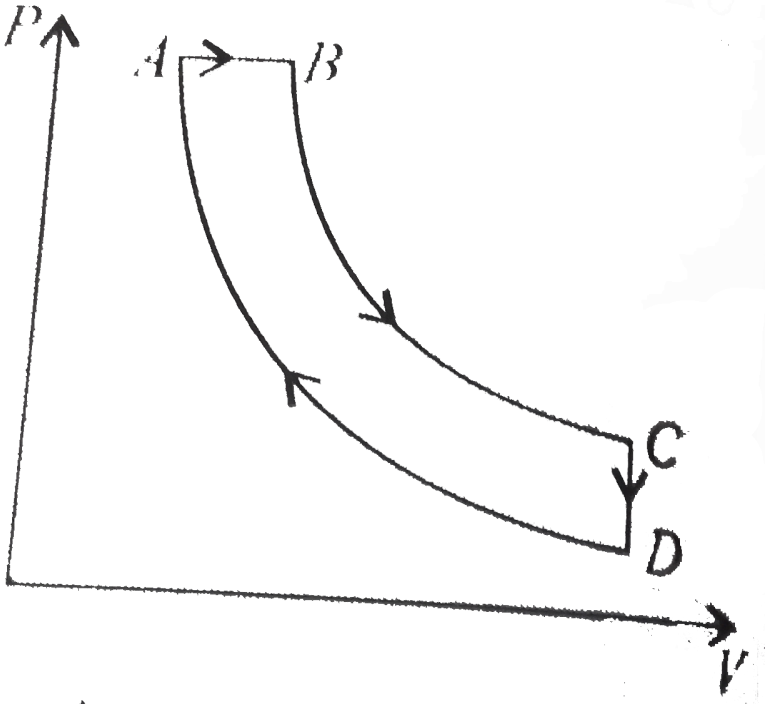
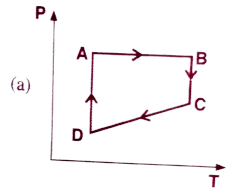
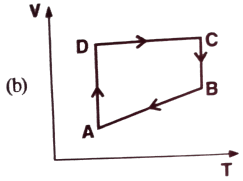
**20.** A cyclic process $ABCD$ is shown in the $P - V$ diagram. Which of the following curves represents the same process?



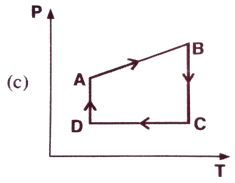

A.



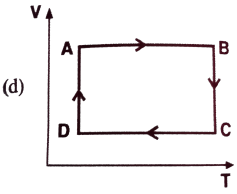

B.



C.




D.




**Answer: C**

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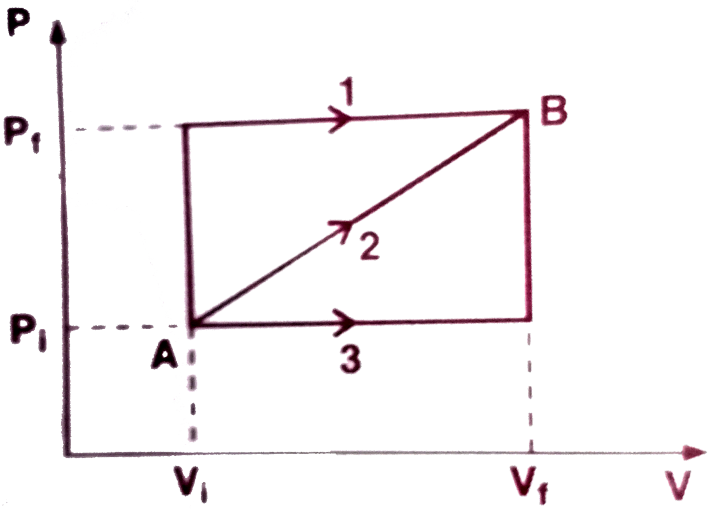
**21.** A system is taken from state A to B through three different paths 1,2 and 3. The work done is maximum is :




A. process 1

B. process 2

C. process 3

D. equal in all magnitude

**Answer: D**

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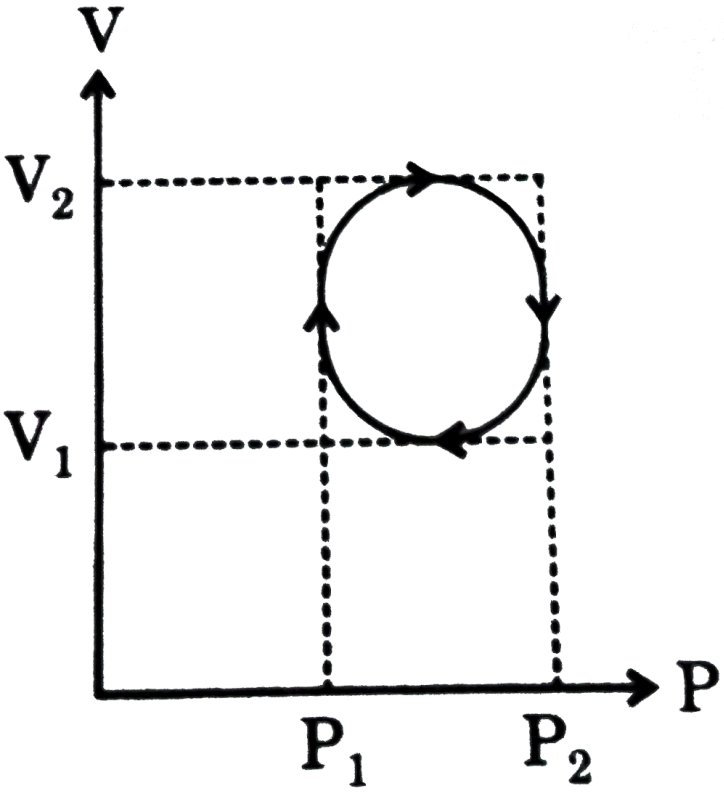
**22.** In the cyclic process shown in P-V diagram the magnitude of work done is :




A. $\pi\left(\frac{P_2 - P_1}{2}\right)^2$

B. $\pi\left(\frac{V_2 - V_1}{2}\right)^2$

C. $\frac{\pi}{4}(P_2 - P_1)(V_2 - V_1)$

D. $\pi(P_2V_2 = P_1V_1)$

**Answer: B**

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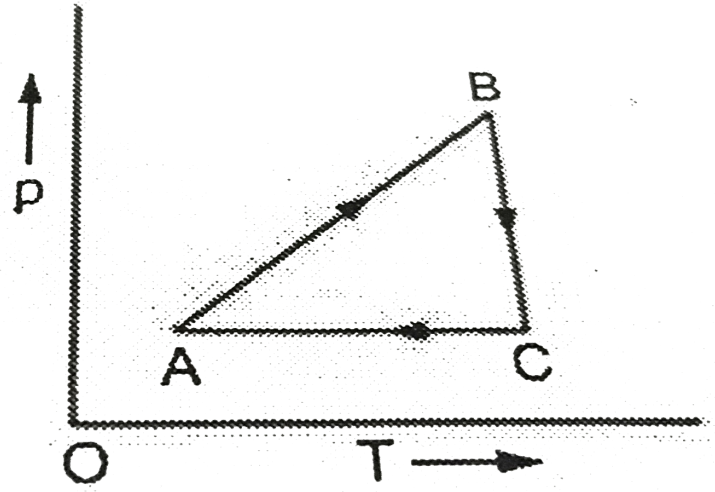
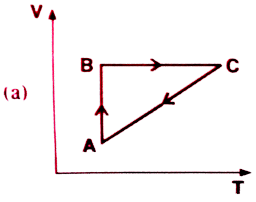


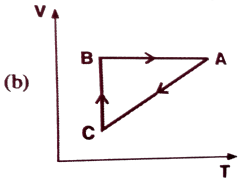

**23.**

A cyclic process is shown in the p-T diagram. Which of the curves show the same process on a V-T diagram?

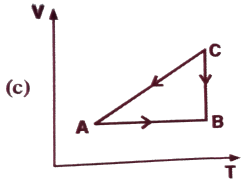
A.



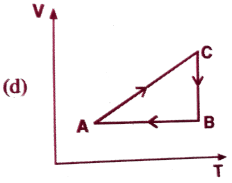
B.




C.




D.




**Answer: C**

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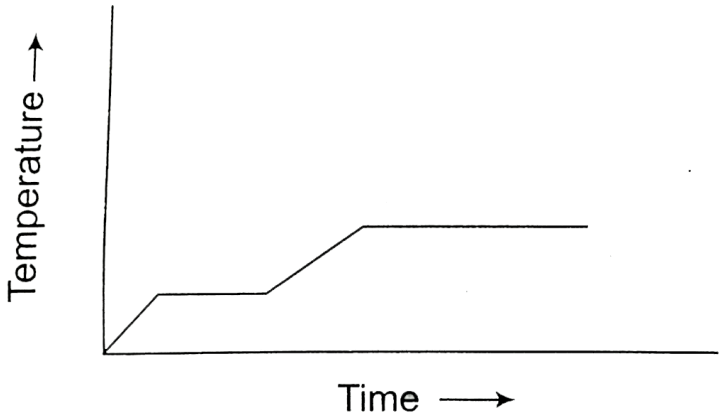


**24.**

Heat is supplied to a certain homogeneous sample of matter, at a uniform rate. Its temperature is plotted against time, as shown Which of the following conclusions can be drawn?

(i) Its specific heat capacity is greater in the solid state than the liquid state.

(ii) Its specific heat capacity is greater in the liquid state than in the solid state.

(iii) Its latent heat of vaporization is greater than its latent heat of fusion.

(iv) Its latent heat of vaporization is smaller than its latent heat of fusion

A. Its specific heat capacity is greater in the solid state than in the liquid state.

B. Its specific heat capacity is smaller in the solid state than in the liquid state.

C. Its latent heat of vaporization is greater than its latent heat of fusion.

D. Its latent heat of vaporization is smaller than its latent heat of fusion.

**Answer: C**

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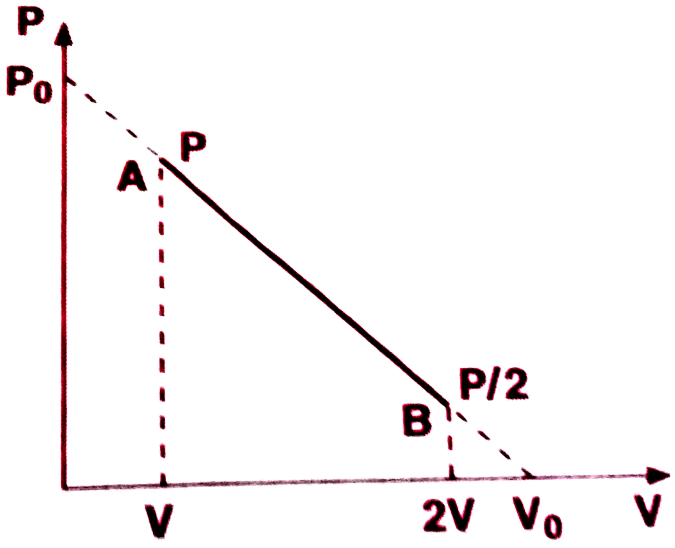
**25.** An ideal gas is taken from the state A (pressure P, volume V) to the state B (pressure P/2, volume 2V) along a straight line path in the P-V

diagram. Select the wrong statement from the following:




A. The work done by the gas in the process A to B exceeds the work that would be done by if the system were taken from A to B along the isotherm.

B. In the T-V diagram, the path AB becomes a part of parabola.

C. In the P-T diagram, the path AB becomes a part of hyperbola.

D. In going from A to B, the temperature T of the gas first increases to a maximum value and then decreases.

**Answer: C**

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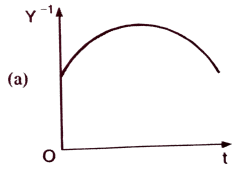
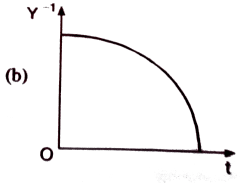
**26.** The radioactive nucleus of an element X decays to a stable nucleus of element Y.A graph of the rate of romation of Y against time would look like:

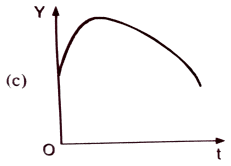
A.



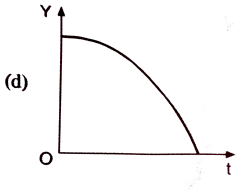

B.




C.




D.



**Answer: C**

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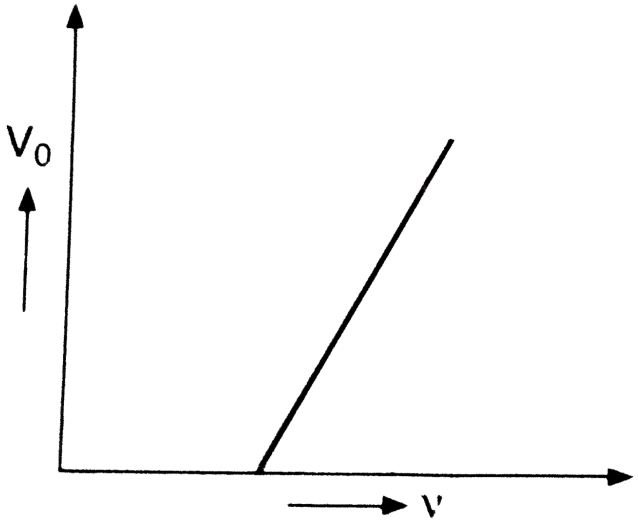
**27.** In photoelectric effect the slope of straight line graph between stopping potential $(V_0)$ and freqency of incident light (v) gives:




A. charge on electron

B. work function of emitter

C. Planck's constant

D. ratio of Planck's constant to charge on electron

**Answer: D**

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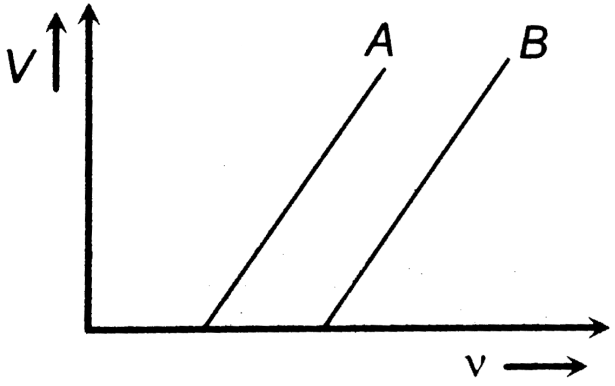
**28.** The stopping potential as a function of the frequency of the incident radiation is plotted for two different photoelectric surfaces $A$ and $B$. The graphs show that work function of $A$ is




A. greater than that of B

B. smaller than that of B

C. same as that of B

D. such that no comparison can be done from given graphs

**Answer: B**

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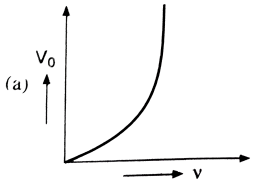
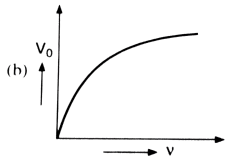
**29.** Which of the following is the graph between the frequency (v) of the incident radiations and the stopping potential ?

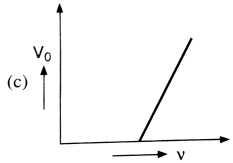
A.



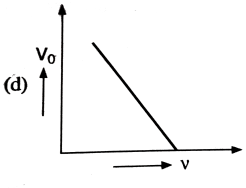

B.




C.




D.



**Answer: C**

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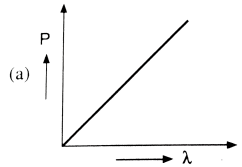
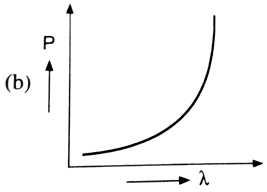
**30.** Which of the following figure represents the variation of particle momentum and the associated de - Broglie wavelength ?

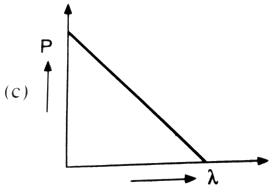
A.



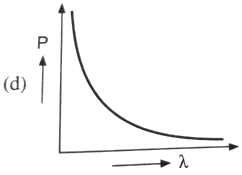

B.




C.




D.



**Answer: D**

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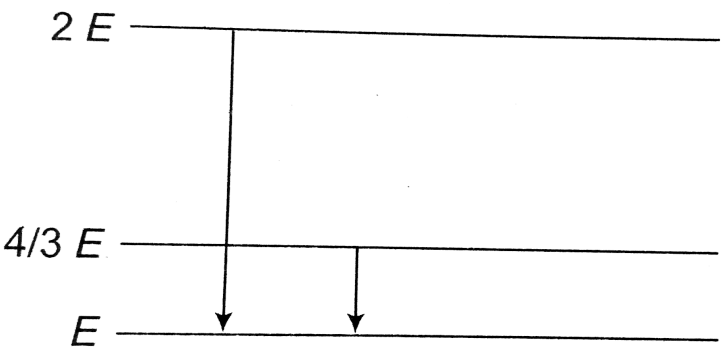
**31.** The follwing diagram indicates the energy levels of a certain atom when the system moves from $2E$ level to $E$, a photon of wavelength $\lambda$ is emitted. The wavelength of photon produced during its transition from $\frac{4E}{3}$ level to $E$ is




A. $\lambda/3$

B. $3\lambda/4$

C. $4\lambda/3$

D. $3\lambda$

**Answer: D**

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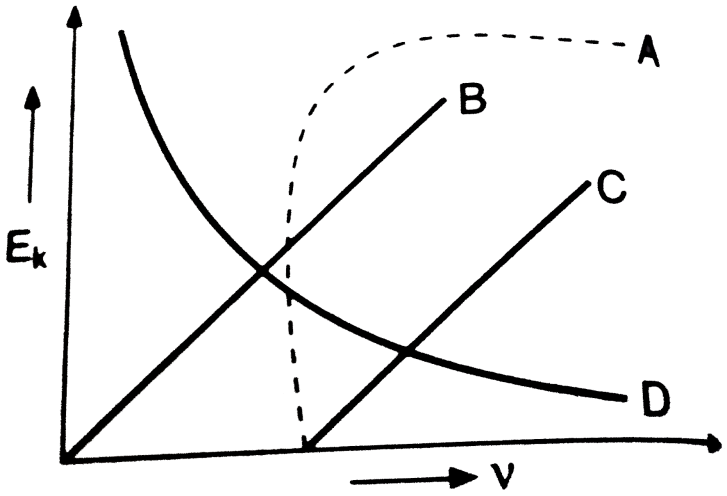
**32.** The maximu kinetic energy $(E_k)$ of the photoelectron varies with frequency (v) of the incident light as shown by the curve:




A. A

B. B

C. C

D. D

**Answer: C**

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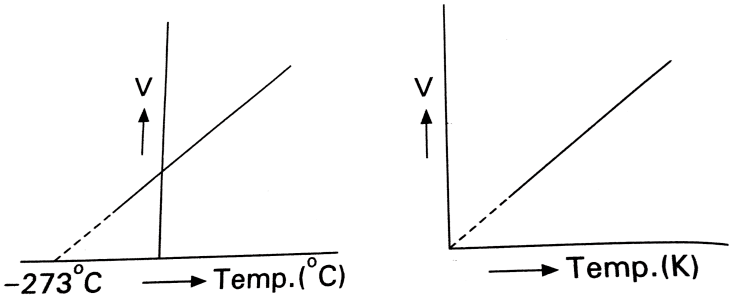
**33.** The following graphs illustrate:




A. Dalton's law

B. Charles's law

C. Boyle's law

D. Gay-Lussac's law

**Answer: B**

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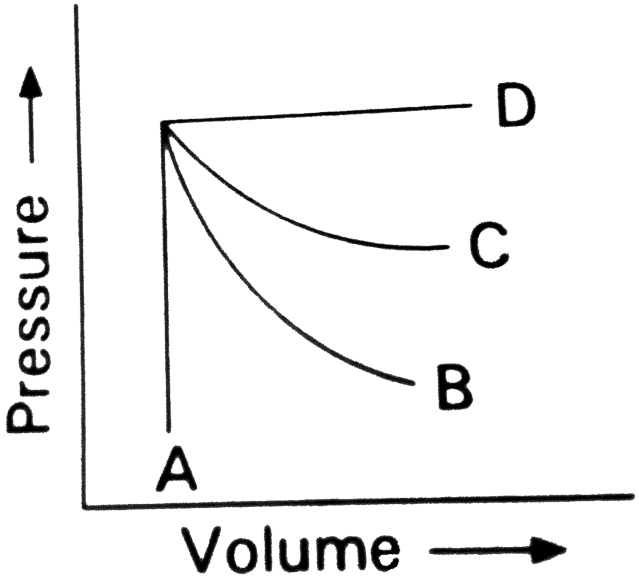
**34.** In the following graph:




A. A' represents isochoric process

B. B' represents adiabatic process

C. C' represents isothermal process

D. D' represents isobaric process

**Answer: A::B::C::D**

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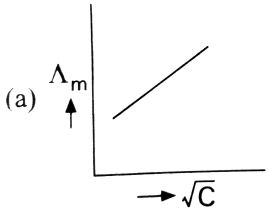
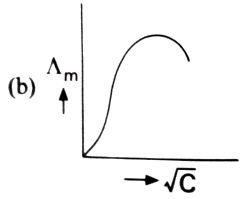
**35.** The variation of $\wedge_m$ of acetic acid with concentration is correctly represented by

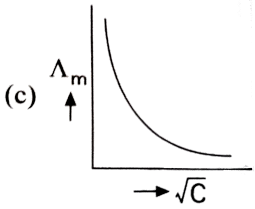
A.

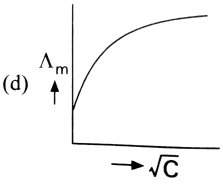



B.




C.






D.

**Answer: C**

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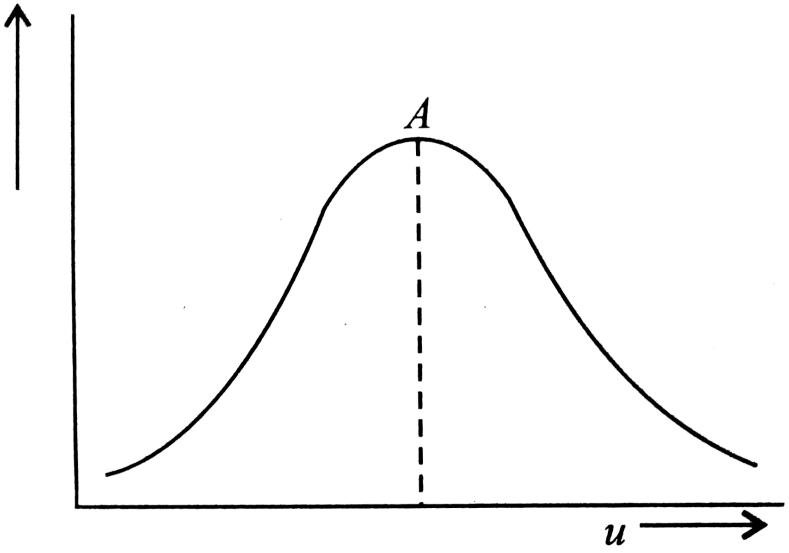
**36.** Distribution of molecules with velocity is represented by the curve




Velocity corresponding to point $A$ is

A. $\sqrt{\frac{2RT}{M}}$

B. $\sqrt{\frac{3RT}{M}}$

C. $\sqrt{\frac{8RT}{M}}$

D. none of these

**Answer: A**

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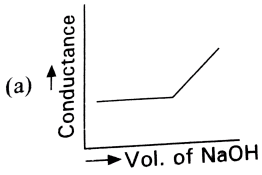
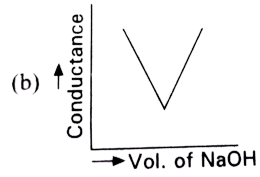
**37.** $CH_3COOH$ is neutralized by NaOH. Conductometric titration curve will be of the type:

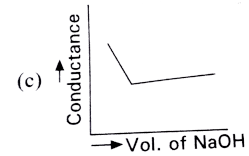
A.



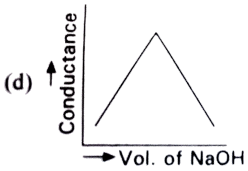

B.




C.



D.




**Answer: A**

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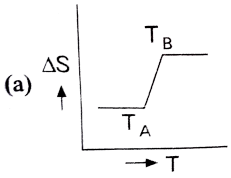
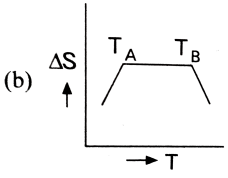
**38.** If for a given substance, melting point is $T_B$ and freezing point is $T_A$ then correct variation of entropy is by graph between entropy change and temperature is

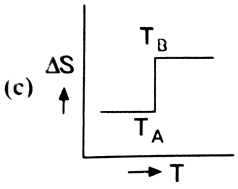
A.



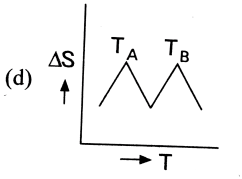

B.



C.




D.




**Answer: A**

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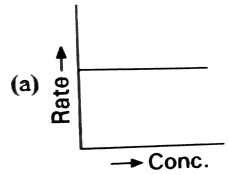
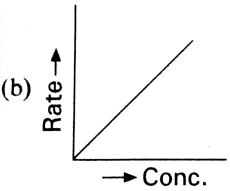
**39.** Which of the following represents zero order reaction ?

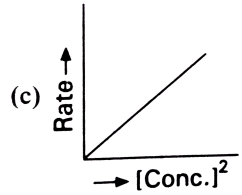
A.



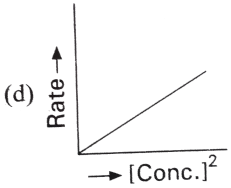

B.



C.




D.




**Answer: A**

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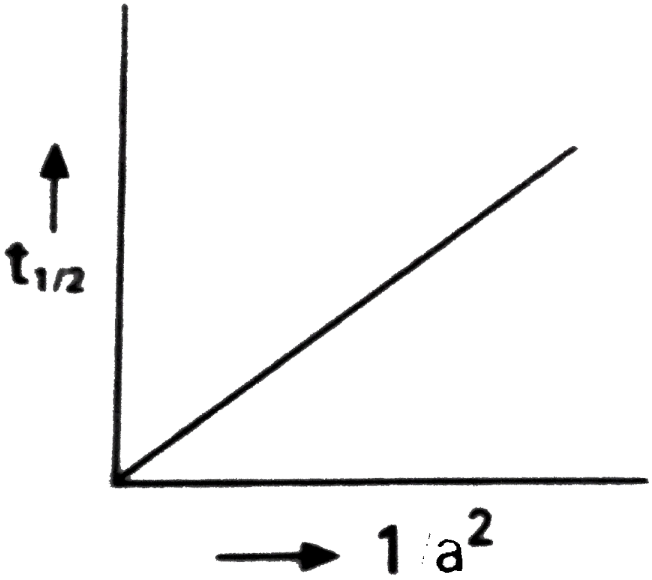
**40.** This graph represents:




A. first order reaction

B. zero order reaction

C. second order reaction

D. third order reaction

**Answer: D**

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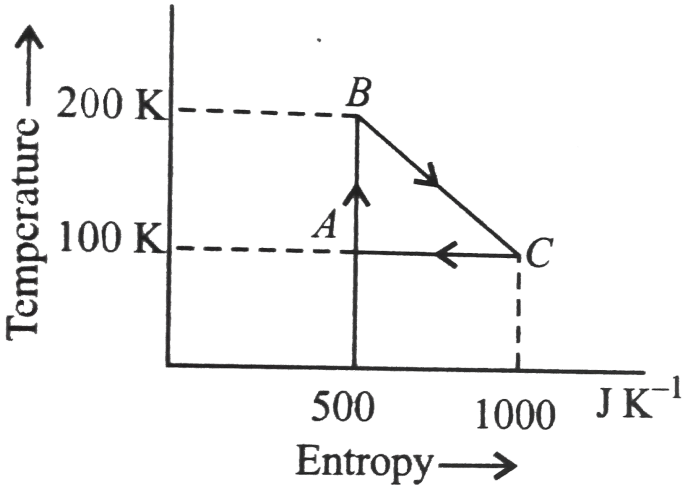
**41.** The efficiency of the reversible cycle shown in the given figure is




A. 33.33 %

B. 56 %

C. 66 %

D. 16.7 %

**Answer: A**

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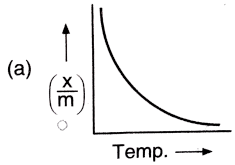
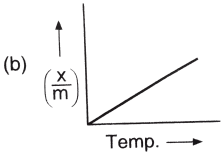
**42.** Which of the following curves represents the chemical adsorption ?

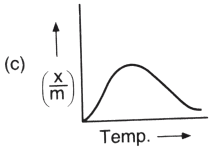
A.



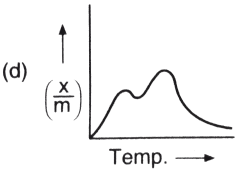

B.




C.




D.




**Answer: C**

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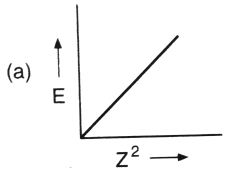
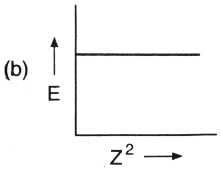
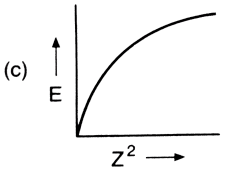
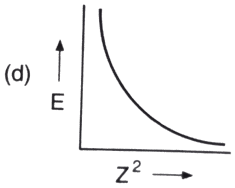
**43.** Energy of electron varies with atomic number as the following curve/line:

A. 


B. 


C. 


D. 


**Answer: D**

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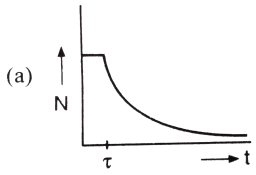
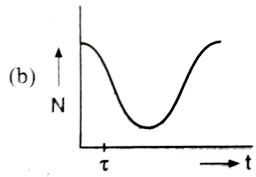
**44.** A radioactive sample consists of two distinct species having equal number of atoms initially. The mean life of one species is $\tau$ and that of the other is $5\tau$. The decay products in both cases are stable. A plot is made of the total number of radioactive nuclei as a function of time. Which of the following figure best represents the form of this plot?

(a), (b), (c), (d)

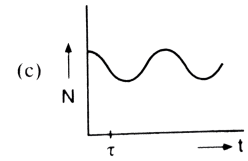
A.



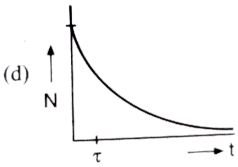

B.




C.




D.



**Answer: D**

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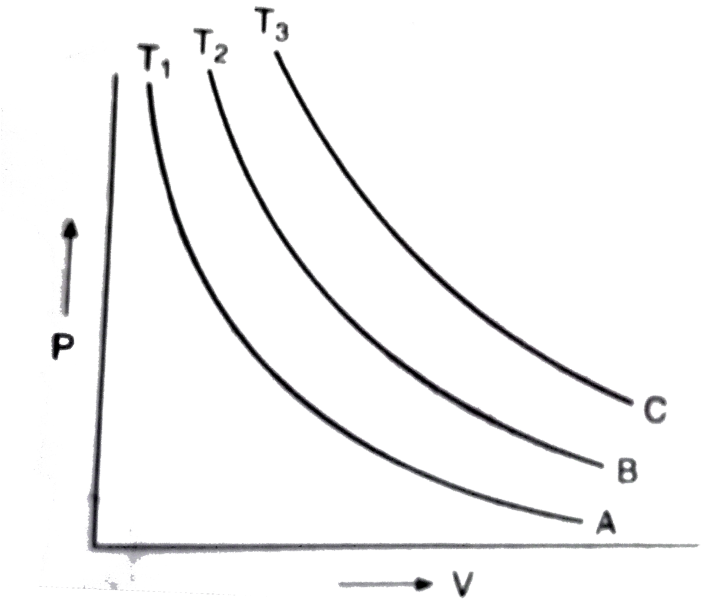
**45.** In following isothermal graphs A, B and C at temperatures $T_1, T_2$ and $T_3$, the correct order of temperatures will be :




A. $T_1 > T_2 > T_3$

B. $T_1 > T_3 > T_2$

C. $T_3 > T_2 > T_1$

D. $T_3 > T_2 > T_2$

**Answer: D**

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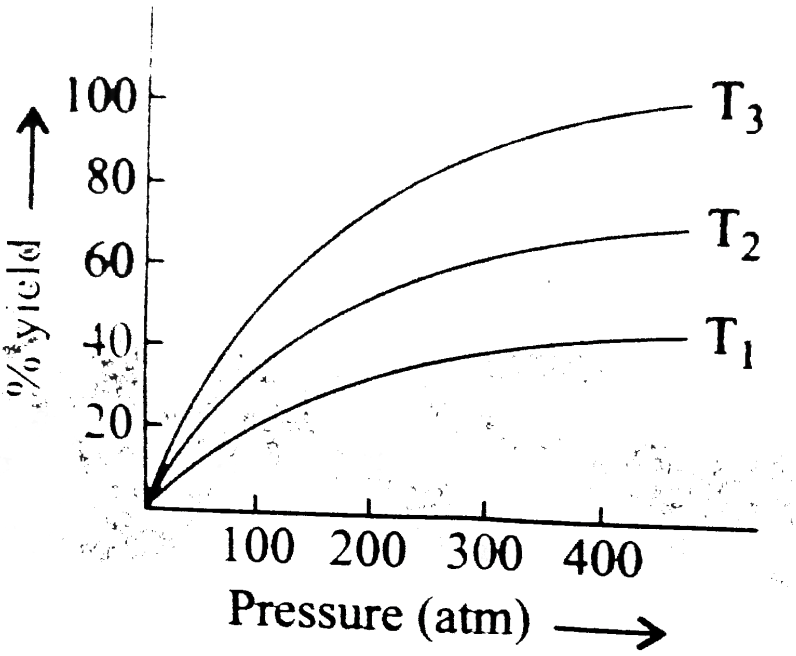
**46.** $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g), \Delta H^{\ominus} = -22.4kJ$

The pressure inside the chamber is $100$ atm and temperature at $300K$

The preparation of ammonia by Haber's process is an exothermic reaction. If the preparation follows the following temperature-pressure relationship for its $\%$ yield. Then for temperature $T_1, T_2$ and $T_3$ the

correct option is:




A. $T_3 > T_2 > T_1$

B. $T_1 > T_2 > T_3$

C. $T_1 = T_2 = T_3$

D. none of these

**Answer: B**

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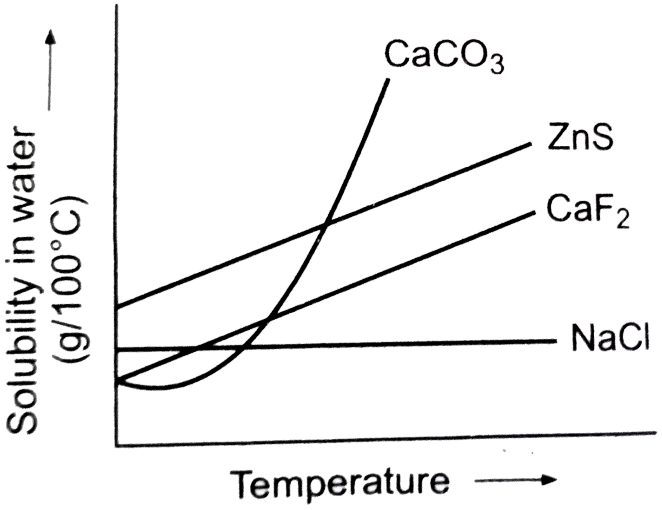
**47.** From the given graph, predict the compound which would be most easily purified by recrystallisation from aqueous solution:




A. ZnS

B. $CaCO_3$

C. $CaF_2$

D. NaCl

**Answer: D**

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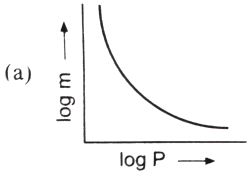
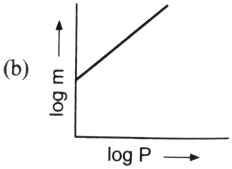
**48.** Which of the following curves represents the Henry's law ?

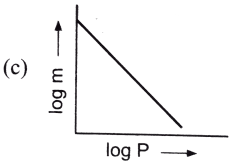
A.



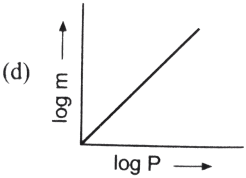

B.




C.




D.




**Answer: B**

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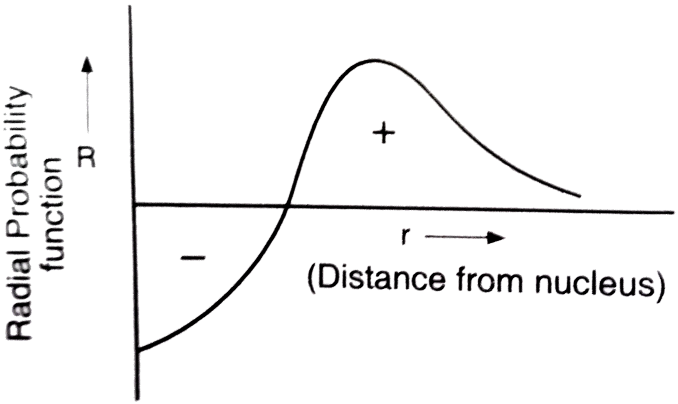


**49.**

Number of nodes in above plot is :

A. 1

B. 2

C. 3

D. 4

**Answer: A**

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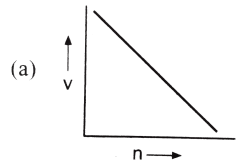
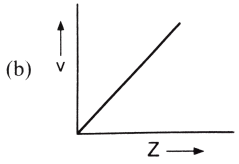
**50.** Which of the following is not correct for the velocity of electron?

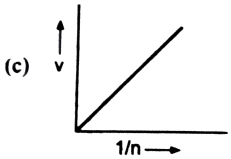
A.



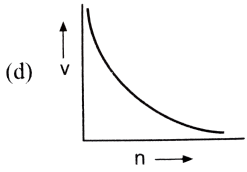

B.




C.




D.




**Answer: A**

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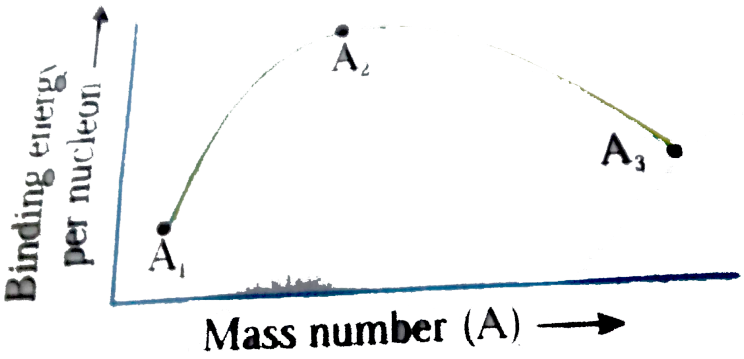
**51.** A small amount of solution containing a radioactive nucleide $A^x$ was administrated into the blood of a patient. The activity of the nucliede id $2 \times 10^3$dps. Its half life is 15 hours. After 5 hours a sample of the blood drawn out from the patient. It,s activity was 16 dpm per mL.

In the following graph, binding energy per nucleon is plotted against mass number (a). three elements $A_1, A_2$ and $A_3$ are located in the graph. Select the false statement about the graph.




a)elment $A_2$ is more stable b)element $A_3$ is less stable than $A_2$ c)element $A_1$ is more stable than both $A_2$ and $A_3$ d)$A_2$ is metallic element

A. element $A_2$ is more stable than $A_1$

B. element $A_3$ is less stable than $A_2$

C. element $A_1$ is more stable than both $A_2$ and $A_3$

D. $A_2$ is metallic element

**Answer: C**

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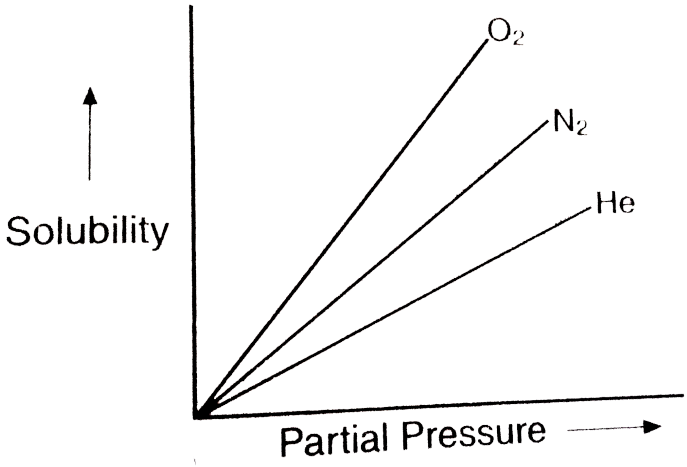
**52.** Molar solubility of helium, nitrogen and oxygen are plotted against partial pressure of the gas at constant temperature.




Henry's law constant for these gases will lie in following sequences?

A. $O_2 > N_2 > He$

B. $O_2 < N_2 < He$

C. $O_2 = N_2 = He$

D. $O_2 > N_2 < He$

**Answer: B**

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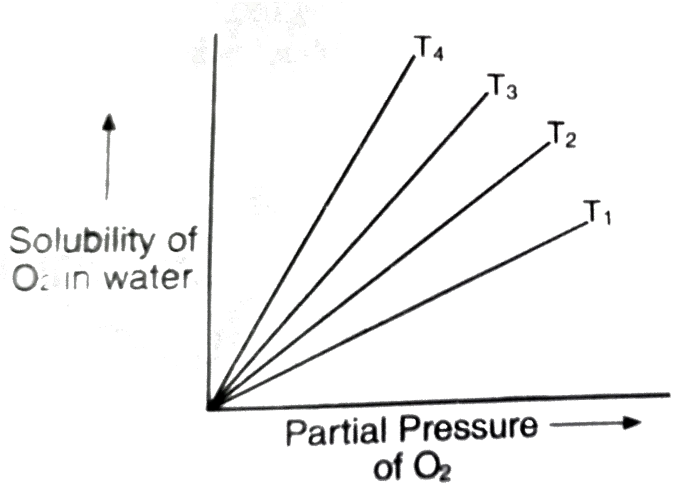
**53.** Solubility of oxygen gas in water follows Henry's law. When the solubility is plotted against partial pressure at a definite temperature we get following plot.




Which of the following sequences of temperatures is correct ?

A. $T_1 = T_2 = T_3 = T_4$

B. $T_1 > T_2 > T_3 > T_4$

C. $T_1 < T_2 < T_3 < T_4$

D. $T_1 > T_2 < T_3 > T_4$

**Answer: B**

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