


- 1 $N_2 + 3H_2 \rightleftharpoons 2NH_3$
Which is correct statement if N_2 is added at equilibrium condition?
- (A) The equilibrium will shift to forward direction because according to II law of thermodynamics the entropy must increases in the direction of spontaneous reaction.
(B) The condition for equilibrium is $G_{N_2} + 3G_{H_2} = 2G_{NH_3}$ where G is Gibbs free energy per mole of the gaseous species measured at that partial pressure. The condition of equilibrium is unaffected by the use of catalyst, which increases the rate of both the forward and backward reactions to the same extent.
(C) The catalyst will increase the rate of forward reaction by α and that of backward reaction by β .
(D) Catalyst will not alter the rate of either of the reaction.
- 2 The electrons, identified by n & l ; (i) $n = 4, l = 1$ (ii) $n = 4, l = 0$
(iii) $n = 3, l = 2$ (iv) $n = 3, l = 1$ can be placed in order of increasing energy, from the lowest to highest as :
- (A) (iv) < (ii) < (iii) < (i) (B) (ii) < (iv) < (i)
(C) (i) < (iii) < (ii) < (iv) (D) (iii) < (i) < (iv) < (ii)
- 3 X ml of H_2 gas effuses through a hole in a container in 5 sec. The time taken for the effusion of the same volume of the gas specified below under identical conditions is :
- (A) 10 sec, He (B) 20 sec, O_2 (C) 25 sec, CO (D) 55 sec, CO_2
- 4 When NO_2 is bubbled into water, it disproportionates completely into HNO_2 and HNO_3 .
 $2NO_2 + H_2O (l) \longrightarrow NHO_2 (aq.) + HNO_3 (aq.)$
- The concentration of NO_2^- in a solution prepared by dissolving 0.05 mole of NO_2 gas in 1 litre H_2O is $\{K_a (HNO_2) = 5 \times 10^{-4}\}$ is
- (A) $\sim 5 \times 10^{-4}$ (B) $\sim 4.8 \times 10^{-5}$ (C) $\sim 4.8 \times 10^{-3}$ (D) $\sim 2.55 \times 10^{-2}$
- 5 Which of the following is most soluble in water?
- (A) MnS ($K_{sp} = 8 \times 10^{-37}$) (B) ZnS ($K_{sp} = 7 \times 10^{-16}$)
(C) Bi_2S_3 ($K_{sp} = 1 \times 10^{-72}$) (D) $Ag_3(PO_4)$ ($K_{sp} = 1.8 \times 10^{-18}$)

Space for rough work

- 6 The incorrect statement among the following is:
 (A) the first ionisation potential of Al is less than the first ionisation potential of Mg
 (B) the second ionisation potential of Mg is greater than the second ionisation potential of Na
 (C) the first ionisation potential of Na is less than the first ionisation potential of Mg
 (D) the third ionisation potential of Mg is greater than the third ionisation potential of Al
- 7 A solid has a structure in which W atoms are located at the corners of a cubic lattice, O atom at the centre of the edges and Na atom at centre of the cubic. The formula for the compound is
 (A) NaWO_2 (B) NaWO_3 (C) Na_2WO_3 (D) NaWO_4
- 8 The density of CaF_2 (fluorite structure) is 3.18 g/cm^3 . The length of the side of the unit cell is
 (A) 253 pm (B) 344 pm (C) 546 pm (D) 273 pm
- 9 For the reaction $3 \text{A}(\text{g}) + \text{B}(\text{g}) \rightleftharpoons 2 \text{C}(\text{g})$ at a given temperature, $K_c = 9.0$. What must be the volume of the flask, if a mixture of 2.0 mol each of A, B and C exist in equilibrium?
 (A) 6L (B) 9L (C) 36 L (D) None of these
- 10 The orbital diagram in which the Aufbau's principle is violated is
- | | | | | | | | | | |
|-----|----------------------|----------------------|------------|------------|-----|----------------------|----------------------|----------------------|------------|
| | $2s$ | $2p_x$ | $2p_y$ | $2p_z$ | | $2s$ | $2p_x$ | $2p_y$ | $2p_z$ |
| (A) | $\uparrow\downarrow$ | $\uparrow\downarrow$ | \uparrow | \uparrow | (B) | \uparrow | $\uparrow\downarrow$ | \uparrow | \uparrow |
| (C) | $\uparrow\downarrow$ | \uparrow | \uparrow | \uparrow | (D) | $\uparrow\downarrow$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ | \uparrow |

Space for rough work

- 11 The correct set of quantum numbers for the unpaired electron of chlorine atom is
- | | | | | | | | |
|-----|---|---|---|-----|---|---|---|
| | n | l | m | | n | l | m |
| (A) | 2 | 1 | 0 | (B) | 2 | 1 | 1 |
| (C) | 3 | 1 | 1 | (D) | 3 | 0 | 0 |
- 12  $\xrightarrow[-H_2O]{H^+}$ (mixture) $\xrightarrow{Br_2}$ 5 compounds of molecular formula $C_4H_8Br_2$
 Number of compounds in X will be:
 (A) 2 (B) 3 (C) 4 (D) 5
- 13 The compressibility of a gas is less than unity at STP. Therefore []
 (A) $V_m > 22.4$ L (B) $V_m < 22.4$ L (C) $V_m = 22.4$ L (D) $V_m = 44.8$ L
- 14 Give the correct order of initials **T** (true) or **F** (false) for following statements.
 (I) If an ion has 2 electrons in K shell, 8 electrons in L shell and 6 electrons in M shell, then number of S electrons present in that element is 6.
 (II) The maximum number of electrons in a subshell is given by $2n^2$.
 (III) If electron has magnetic number -1 , then it cannot be present in s-orbital.
 (IV) Only one radial node is present in 3p orbital.
 (A) TTFF (B) FFTF (C) TFFT (D) FFTF
- 15 The decreasing size of K^+ , Ca^{2+} , Cl^- & S^{2-} follows the order:
 (A) $K^+ > Ca^{2+} > S^{2-} > Cl^-$ (B) $K^+ > Ca^{2+} > Cl^- > S^{2-}$
 (C) $Ca^{2+} > K^+ > Cl^- > S^{2-}$ (D) $S^{2-} > Cl^- > K^+ > Ca^{2+}$

Space for rough work

- 16 Sulfide ion in alkaline solution reacts with solid sulfur to form polysulfide ions having formulas S_2^{2-} , S_3^{2-} , S_4^{2-} and so on. The equilibrium constant for the formation of S_2^{2-} is 12 (K_1) & for the formation of S_3^{2-} is 132 (K_2), both from S and S^{2-} . What is the equilibrium constant for the formation of S_3^{2-} from S_2^{2-} and S?
 (A) 11 (B) 12 (C) 132 (D) None of these
- 17 For the following gases equilibrium. $N_2O_4(g) \rightleftharpoons 2NO_2(g)$
 K_p is found to be equal to K_c . This is attained when
 (A) $0^\circ C$ (B) 273 K (C) 1 K (D) 12.19 K
- 18 Which of the following sets of quantum numbers represent an impossible arrangement
- | | n | l | m | m_s | | n | l | m | m_s |
|-----|---|---|----|---------------|-----|---|---|---|---------------|
| (A) | 3 | 2 | -2 | $\frac{1}{2}$ | (B) | 4 | 0 | 0 | $\frac{1}{2}$ |
| (C) | 3 | 2 | -3 | $\frac{1}{2}$ | (D) | 5 | 3 | 0 | $\frac{1}{2}$ |
- 19 Which of the following statements is correct in the rock-salt structure of an ionic compounds?
 (A) coordination number of cation is four whereas that of anion is six.
 (B) coordination number of cation is six whereas that of anion is four.
 (C) coordination number of each cation and anion is four.
 (D) coordination number of each cation and anion is six.
- 20 The coordination number of cation and anion in Fluorite CaF_2 and CsCl are respectively
 (A) 8:4 and 6:3 (B) 6:3 and 4:4 (C) 8:4 and 8:8 (D) 4:2 and 2:4

Space for rough work

- 21 A gas undergoes dissociation as $A_4(g) \longrightarrow 4A(g)$ in a closed rigid container having volume 22.4 litres at 273 K. If the initial moles of A_4 taken before dissociation is 1 then
The total pressure (in atm) after 50% completion of the reaction (assuming ideal behaviour)
(A) 1/2 (B) 2 (C) 2.5 (D) 4
- 22 If the gases are not ideal & at the beginning total pressure observed is less than 1 atm then
(A) compressibility factor of $A_4 > 1$ (B) compressibility factor of $A_4 < 1$
(C) compressibility factor of $A_4 = 1$ (D) compressibility factor of $A > 1$
- 23 If the gases are non-ideal & after 100% dissociation total pressure is greater than 4 atm, then
(A) The compression of A (g) will be easier than that of ideal gas
(B) The compression of A (g) will be difficult than that of ideal gas
(C) The compression of A (g) will be same as that of ideal gas
(D) A cannot be compressed
- 24 Which one has sp^2 hybridisation
(A) CO_2 (B) SO_2 (C) N_2O (D) CO
- 25 The correct IUPAC name of the compound $CH_3 - CH_2 - \overset{\overset{CH_3}{|}}{C} = C - \underset{\underset{C_2H_5}{|}}{CH} - \overset{\overset{CH_3}{|}}{C} - CH_2 - CH_2 - CH_3$:
(A) 5-ethyl-3, 6-dimethyl non-3-ene (B) 5-ethyl-4, 7-dimethyl non-3-ene
(C) 4-methyl-5, 7-diethyl oct-2-ene (D) 2,4-ethyl-5-methyl oct-2-ene

Space for rough work

- 26 10 ml of $\frac{M}{200}$ H_2SO_4 is mixed with 40 ml of $\frac{M}{200}$ H_2SO_4 . The pH of the resulting solution is
(A) 1 (B) 2 (C) 2.3 (D) none of these
- 27 Pick out among the following species not isoelectronic with CO_2 :
(A) N_3^- (B) $(CNO)^-$ (C) $(NCN)^{2-}$ (D) NO_2^-
- 28 The reaction of propene with HOCl proceeds via the addition of –
(A) H^+ in first step (B) Cl^+ in first step
(C) OH^- in first step (D) Cl^+ and OH^- in single step
- 29 1 CC of 0.1 N HCl is added to 99 CC solution of NaCl. The pH of the resulting solution will be
(A) 7 (B) 3 (C) 4 (D) 1
- 30 The order of strength of hydrogen bonds is:
(A) $ClH \dots Cl > NH \dots N > OH \dots O > FH \dots F$ (B) $ClH \dots Cl < NH \dots N < OH \dots O < FH \dots F$
(C) $ClH \dots Cl < NH \dots N > OH \dots O > FH \dots F$ (D) $ClH \dots Cl < NH \dots N < OH \dots O > FH \dots F$

Space for rough work

- 31 The enthalpy of vapourization of a liquid is 30 kJ mol^{-1} and entropy of vapourization is $75 \text{ J mol}^{-1} \text{ K}$. The boiling point of the liquid at 1 atm is
 (A) 250 K (B) 400 K
 (C) 450 K (D) 600 K
- 32 One mol of non-ideal gas undergoes a change of state (2.0 atm, 3.0 L, 95 K) to (4.0 atm, 5.0 L, 245 K) with a change in internal energy (ΔU) = 30.0 L-atm. The change in enthalpy (ΔH) of the process in L-atm.
 (A) 40.0
 (B) 42.3
 (C) 44.0
 (D) not defined, because pressure is not constant
- 33 The ratio between the r. m. s. velocity of H_2 at 50 K and that of O_2 at 800 K is :
 (A) 4 (B) 2 (C) 1 (D) 1/4
- 34 One element has atomic weight 39. Its electronic configuration is $1s^2, 2s^2 2p^6, 3s^2 3p^6 4s^1$. The true statement for that element is:
 (A) High value of IE (B) Transition element
 (C) Isotone with ${}_{18}\text{Ar}^{38}$ (D) None
- 35 In a solid "AB" having NaCl structure "A" atoms occupy the corners of the cubic unit cell. If all the face-centred atoms along one of the axes are removed, then the resultant stoichiometry of the solid is
 (A) AB_2 (B) A_2B (C) A_4B_3 (D) A_3B_4
- 36 1-chlorobutane on reaction with alcoholic potash gives –
 (A) 1-butene (B) 1-butanol (C) 2-butene (D) 2-butanol
- 37 The hybridisation of carbon atoms in C–C single bond of $\text{HC}\equiv\text{C}-\text{CH}=\text{CH}_2$ is –
 (A) sp^3-sp^3 (B) sp^2-sp^3 (C) $sp-sp^2$ (D) sp^2-sp^2
- 38 One mole of N_2O_4 (g) at 300 k is kept in a closed container under one atm. It is heated to 600 k when 20 % by mass of N_2O_4 (g) decomposes to NO_2 (g) . The resultant pressure is :
 (A) 1.2 atm (B) 2.4 atm (C) 2.0 atm (D) 1.0 atm
- 39 The molar heat capacity of a monoatomic gas for which the ratio of pressure and volume is one.
 (A) $4/2 R$ (B) $3/2 R$ (C) $5/2 R$ (D) zero
- 40 The correct order of radii is:
 (A) $\text{N} < \text{Be} < \text{B}$ (B) $\text{F}^- < \text{O}^{2-} < \text{N}^{3-}$ (C) $\text{Na} < \text{Li} < \text{K}$ (D) $\text{Fe}^{3+} < \text{Fe}^{2+} < \text{Fe}^{4+}$

Space for rough work

- 41 The r.m.s. velocity of hydrogen is $\sqrt{7}$ times the r.m.s. velocity of nitrogen. If T is the temperature of the gas :
- (A) $T(\text{H}_2) = T(\text{N}_2)$ (B) $T(\text{H}_2) > T(\text{N}_2)$
 (C) $T(\text{H}_2) < T(\text{N}_2)$ (D) $T(\text{H}_2) = \sqrt{7} T(\text{N}_2)$
- 42 Propyne and propene can be distinguished by –
- (A) conc. H_2SO_4 (B) Br_2 in CCl_4 (C) dil. KMnO_4 (D) AgNO_3 in ammonia
- 43 Ionic radii of:
- (A) $\text{Ti}^{4+} < \text{Mn}^{7+}$ (B) $^{35}\text{Cl}^- > ^{37}\text{Cl}^-$ (C) $\text{K}^+ > \text{Cl}^-$ (D) $\text{P}^{3+} > \text{P}^{5+}$
- 44 A gas will approach ideal behaviour at :
- (A) low temperature and low pressure (B) low temperature and high pressure
 (C) low pressure and high temperature (D) high temperature and high pressure
- 45 Two mole of an ideal gas is expanded isothermally and reversibly from 1 litre to 10 litre at 300 K. The enthalpy change (in kJ) for the process is
- (A) 11.4 kJ (B) –11.4 kJ
 (C) 0 kJ (D) 4.8 kJ
- 46 For which of the following change $\Delta H \neq \Delta E$?
- (A) $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \longrightarrow 2\text{HI}(\text{g})$ (B) $\text{HCl}(\text{aq}) + \text{NaOH}(\text{aq}) \longrightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
 (C) $\text{C}(\text{s}) + \text{O}_2(\text{g}) \longrightarrow \text{CO}_2(\text{g})$ (D) $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \longrightarrow 2\text{NH}_3(\text{g})$
- 47 Given ΔH for the process $\text{Li}(\text{g}) \longrightarrow \text{Li}^{3+}(\text{g}) + 3\text{e}^-$ is 19800 kJ/mole & IE_1 for Li is 520 then IE_2 & IE_3 of Li^+ are respectively (approx, value)
- (A) 11775, 7505 (B) 19280, 520 (C) 11775, 19280 (D) Data insufficient
- 48 The ratio of difference in wavelengths of 1st and 2nd lines of Lyman series in H–like atom to difference in wavelength for 2nd and 3rd lines of same series is:
- (A) 2.5 : 1 (B) 3.5 : 1 (C) 4.5 : 1 (D) 5.5 : 1
- 49 For the reaction : $2\text{HI}(\text{g}) \rightleftharpoons \text{H}_2(\text{g}) + \text{I}_2(\text{g})$, the degree of dissociated (α) of $\text{HI}(\text{g})$ is related to equilibrium constant K_p by the expression
- (A) $\frac{1+2\sqrt{K_p}}{2}$ (B) $\sqrt{\frac{1+2K_p}{2}}$ (C) $\sqrt{\frac{2K_p}{1+2K_p}}$ (D) $\frac{2\sqrt{K_p}}{1+2\sqrt{K_p}}$
- 50 The vapour density of N_2O_4 at a certain temperature is 30. What is the % dissociation of N_2O_4 at this temperature?
- (A) 53.3% (B) 106.6% (C) 26.7% (D) None

Space for rough work