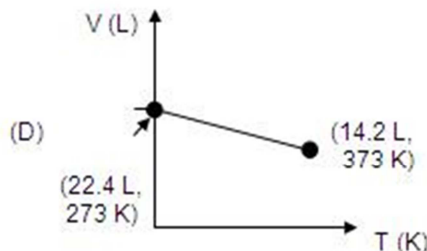
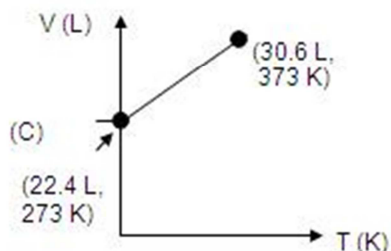
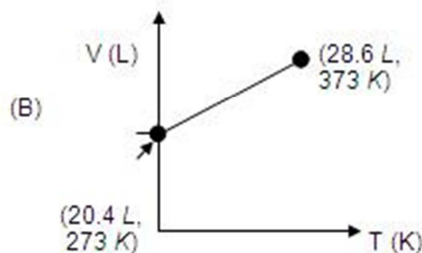
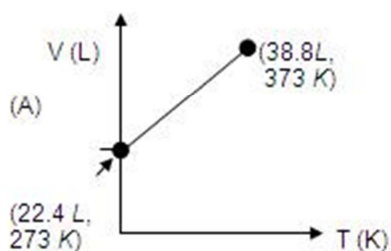


IIT-JEE-Chemistry-Screening-2002**SCREENING**

1. How many moles of electron weighs one kilogram?

- (A) 6.023×10^{23}
- (B) $1/9.108 \times 10^{31}$
- (C) $6.023/9.108 \times 10^{54}$
- (D) $1/(9.108 \times 6.023) \times 10^8$

2. Which of the following volume (V) – temperature (T) plots represents the behavior of one mole of an ideal gas at the atmospheric pressure?



3. If the Nitrogen atom had electronic configuration $1s^7$, it would have energy lower than that of the normal ground state configuration $1s^2 2s^2 2p^3$, because the electrons would be closer to the nucleus. Yet $1s^7$ is not observed because it violates

- (A) Heisenberg uncertainty principle
- (B) Hund's rule
- (C) Pauli exclusion principle
- (D) Bohr postulate of stationary orbits

4. Rutherford's experiment, which established the nuclear model of the atom, used a beam of

- (A) β -particles, which impinged on a metal foil and got absorbed
- (B) γ -rays, which impinged on a metal foil and got scattered
- (C) Helium atoms, which impinged on a metal foil and got scattered
- (D) Helium nuclei, which impinged on a metal foil and got scattered

5. When the temperature is increased, surface tension of water

- (A) Increases
- (B) Decreases
- (C) Remains constant
- (D) Shows irregular behaviour

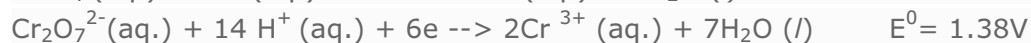
6. A substance $A_x B_y$ crystallizes in a face centered cubic (FCC) lattice in which atoms 'A' occupy each corner of the cube and atoms 'B' occupy the centers of each face of the cube. Identify the correct composition of the substance $A_x B_y$

- (A) AB_3
- (B) A_4B_3
- (C) A_3B
- (D) Composition cannot be specified

7. Consider the chemical reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$. The rate of this reaction can be expressed in terms of time derivative of concentration of $N_2(g)$, $H_2(g)$, or $NH_3(g)$. Identify the correct relationship amongst the rate expressions

- (A) Rate = $-d[N_2]/dt = -1/3 d[H_2]/dt = 1/2 d[NH_3]/dt$
- (B) Rate = $-d[N_2]/dt = -3 d[H_2]/dt = 2 d[NH_3]/dt$
- (C) Rate = $d[N_2]/dt = 1/3 d[H_2]/dt = 1/2 d[NH_3]/dt$
- (D) Rate = $-d[N_2]/dt = -d[H_2]/dt = d[NH_3]/dt$

8. Standard electrode potential data are useful for understanding the suitability of an oxidant in a redox titration. Some half cell reactions and their standard potentials are given below



Identify the only **incorrect** statement regarding the quantitative estimation of aqueous $Fe(NO_3)_2$.

- (A) MnO_4^- can be used in aqueous HCl
- (B) $Cr_2O_7^{2-}$ can be used in aqueous HCl
- (C) MnO_4^- can be used in aqueous H_2SO_4

(D) $\text{Cr}_2\text{O}_7^{2-}$ can be used in aqueous H_2SO_4

9. Specify the coordination geometry around and hybridization of N and B atoms in a 1:1 complex of BF_3 and NH_3

(A) N: tetrahedral, sp^3 ; B: tetrahedral, sp^3

(B) N: pyramidal, sp^3 ; B: pyramidal, sp^3

(C) N: pyramidal, sp^3 ; B: planar, sp^2

(D) N: pyramidal, sp^3 ; B: tetrahedral, sp^3

10. One mole of a 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, $\Delta U = 30.0 \text{ L atm}$. The change in enthalpy (ΔH) of the process in L atm is

(A) 40.0

(B) 42.0

(C) 44.0

(D) Not defined, because pressure is not constant

11. Consider the following equilibrium in a closed container



At a fixed temperature, the volume of the reaction container is halved. For this change, which of the following holds true regarding the equilibrium constant (K_p) and degree of dissociation (α)?

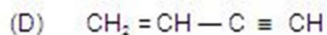
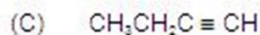
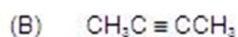
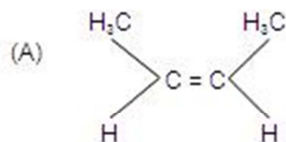
(A) Neither K_p nor α change

(B) Both K_p and α change

(C) K_p changes, but α does not change

(D) K_p does not change, but α change

12. Which of the following hydrocarbons has the lowest dipole moment?



13. Compound 'A' (molecular formula $\text{C}_3\text{H}_8\text{O}$) is treated with acidified potassium dichromate to form a product 'B' (molecular formula $\text{C}_3\text{H}_6\text{O}$). 'B' forms a shining silver mirror on warming with ammoniacal silver nitrate. 'B' when treated with an aqueous solution of $\text{H}_2\text{NCONHNH}_2$ and sodium acetate gives a product 'C'. Identify the structure of 'C'

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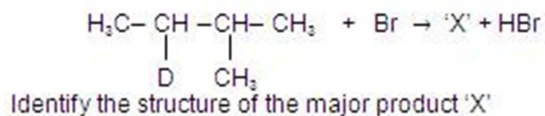
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- (C) X = dilute aqueous NaOH, 20⁰C; Y = Br₂/ CHCl₃, 0⁰C
 (D) X = concentrated aqueous NaOH, 80⁰C; Y = Br₂/ CHCl₃, 0⁰C

- 17.** Identify a reagent from the following list which can easily distinguish between 1-butyne and 2-butyne
- (A) Bromine, CCl₄
 (B) H₂, Lindlar catalyst
 (C) Dilute H₂SO₄, HgSO₄
 (D) Ammoniacal CuCl₂ solution

- 18.** Consider the following reaction



- (A) $\begin{array}{c} \text{H}_3\text{C}-\text{CH}-\text{CH}-\text{CH}_2 \\ | \quad | \\ \text{D} \quad \text{CH}_3 \end{array}$
- (B) $\begin{array}{c} \text{H}_3\text{C}-\text{CH}-\text{C}-\text{CH}_3 \\ | \quad | \\ \text{D} \quad \text{CH}_3 \end{array}$
- (C) $\begin{array}{c} \text{H}_3\text{C}-\text{C}-\text{CH}-\text{CH}_3 \\ | \quad | \\ \text{D} \quad \text{CH}_3 \end{array}$
- (D) $\begin{array}{c} \text{H}_3\text{C}-\text{CH}-\text{CH}-\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$
- 19.** Which of the following acids has the smallest dissociation constant?
- (A) CH₃CHFCOOH
 (B) FCH₂CH₂COOH
 (C) BrCH₂CH₂COOH
 (D) CH₃CHBrCOOH
- 20.** Which of the following compounds exhibits stereoisomerism?
- (A) 2-methylbutene- 1
 (B) 3-methylbutyne-1
 (C) 3-methylbutanoic acid
 (D) 2-methylbutanoic acid

21. The nodal plane in the Π -bond of ethane is located in
- (A) The molecular plane
 - (B) A plane parallel to the molecular plane
 - (C) A plane perpendicular to the molecular plane which bisects the carbon - carbon σ -bond at right angle
 - (D) A plane perpendicular to the molecular plane which contains the carbon - carbon σ -bond
22. Polyphosphates are used as water softening agents because they
- (A) Form soluble complexes with anionic species
 - (B) Precipitate anionic species
 - (C) Form soluble complexes with cationic species
 - (D) Precipitate cationic species
23. Identify the correct order of acidic strengths of CO_2 , CuO , CaO , H_2O
- (A) $\text{CaO} < \text{CuO} < \text{H}_2\text{O} < \text{CO}_2$
 - (B) $\text{H}_2\text{O} < \text{CuO} < \text{CaO} < \text{CO}_2$
 - (C) $\text{CaO} < \text{H}_2\text{O} < \text{CuO} < \text{CO}_2$
 - (D) $\text{H}_2\text{O} < \text{CO}_2 < \text{CaO} < \text{CuO}$
24. Identify the least stable ion amongst the following
- (A) Li^-
 - (B) Be^-
 - (C) B^-
 - (D) C^-
25. Which of the following molecular species has unpaired electrons (s)?
- (A) N_2
 - (B) F_2
 - (C) O_2^-
 - (D) O_2^{2-}
26. A gas 'X' is passed through water to form a saturated solution. The aqueous solution of treatment with silver nitrate gives a white precipitate. The saturated aqueous solution also dissolves magnesium ribbon with evolution of a colourless gas 'Y'. Identify 'X' and 'Y'.
- (A) $\text{X} = \text{CO}_2$, $\text{Y} = \text{Cl}_2$
 - (B) $\text{X} = \text{Cl}_2$, $\text{Y} = \text{CO}_2$
 - (C) $\text{X} = \text{Cl}_2$, $\text{Y} = \text{H}_2$
 - (D) $\text{X} = \text{H}_2$, $\text{Y} = \text{Cl}_2$

- 27.** An aqueous solution of a substance gives a white precipitate on treatment with dilute hydrochloric acid, which dissolves on heating. When hydrogen sulfide is passed through the hot acidic solution, a black precipitate is obtained. The substance is a
- (A) Hg_2^{2+} salt
 - (B) Cu^{2+} salt
 - (C) Ag^+ salt
 - (D) Pb^{2+} salt
- 28.** Which of the following process is used in extractive metallurgy of magnesium?
- (A) Fused salt electrolysis
 - (B) Self reduction
 - (C) Aqueous solution electrolysis
 - (D) Thermite reduction
- 29.** Identify the correct order of solubility of Na_2S , CuS and ZnS in aqueous medium
- (A) $\text{CuS} > \text{ZnS} > \text{Na}_2\text{S}$
 - (B) $\text{ZnS} > \text{Na}_2\text{S} > \text{CuS}$
 - (C) $\text{Na}_2\text{S} > \text{CuS} > \text{ZnS}$
 - (D) $\text{Na}_2\text{S} > \text{ZnS} > \text{CuS}$
- 30.** Anhydrous ferric chloride is prepared by
- (A) Heating hydrated ferric chloride at a high temperature in a stream of air
 - (B) Heating metallic iron in a stream of dry chlorine gas
 - (C) Reaction of ferric oxide with hydrochloric acid
 - (D) Reaction of metallic iron with hydrochloric acid