

Designed for the students preparing for IAT 2025.

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TOP 50 MOST IMPORTANT CHEMISTRY QUESTIONS

- 1 . How many radial nodes does Ca^+ have in its 4s orbital?
 - 1) 3
 - 2) 1
 - 3) 0
 - 4) 2
- 2 . What is the smallest P-P-P bond angle in the highly reactive allotrope of phosphorus?
 - 1) 109°
 - 2) 45°
 - 3) 60°
 - 4) 120°
- 3 . Which parameters are plotted in the Ellingham diagram?
 - 1) ΔG° vs T
 - 2) $\Delta_r S^\circ$ vs T
 - 3) $\Delta_r H^\circ$ vs T
 - 4) $\Delta_r S^\circ$ vs P
- 4 . Given below are two statements: Statement I : Hyperconjugation is a permanent effect
Statement II : Hyperconjugation in ethyl cation ($\text{CH}_3 - \text{C}^+\text{H}_2$) involves the overlapping of $\text{Csp}^2 - \text{H}1\text{s}$ bond with empty 2p orbital of other carbon. Choose the correct option:
 - 1) Both Statement I and Statement II are false
 - 2) Statement I is incorrect but Statement II is correct
 - 3) Statement I is correct but Statement II is incorrect
 - 4) Both Statement I and Statement II are true

5 . Consider the following reaction: $\text{CH}_4(\text{g}) \rightarrow \text{C}(\text{g}) + 4\text{H}(\text{g})$; $\Delta_a H_0 = 1665 \text{ kJ mol}^{-1}$ What is the bond energy of C—H bond in KJ/mol

- 1) 1665
- 2) 1000
- 3) 416
- 4) 208

6 . The products of the reaction between aqueous solutions of $\text{K}_4[\text{Fe}(\text{CN})_6]$ and $\frac{1}{2} \text{H}_2\text{O}_2$ are

- 1) $\text{K}_3[\text{Fe}(\text{CN})_6]$ and KOH
- 2) $\text{K}_3[\text{Fe}(\text{CN})_6]$ and H_2O
- 3) $\text{K}_3[\text{Fe}(\text{CN})_6]$, H_2O and O_2
- 4) $\text{K}_4[\text{Fe}(\text{CN})_5(\text{OH})]$ and HCN

7 . Which of the following methods is suitable for the preparation of 1, 3, 5-tribromobenzene from benzene?

- A. (i) $\text{AlBr}_3/\text{Br}_2$, light (ii) separation of isomers.
- B. (i) $\text{HNO}_3/\text{H}_2\text{SO}_4$ (ii) Sn/HCl (iii) Br_2 (iv) NaNO_2/HCl (v) $\text{C}_2\text{H}_5\text{OH}$, Δ .
- C. (i) $\text{HNO}_3/\text{H}_2\text{SO}_4$ (ii) NaBH_4 (iii) $\text{Br}_2/\text{CH}_3\text{COOH}$ (iv) NaNO_2/HCl (v) H_3PO_2 .
- D. (i) $\text{HNO}_3/\text{H}_2\text{SO}_4$ (ii) H_2/Pd (iii) NaNO_2/HCl (iv) CuBr/HBr .

8 . Which among the solutions given below will not show a change in pH on dilution?

- (I). 0.1 M $\text{NH}_4\text{COOCH}_3$,
- (II). 0.1 M NaCl ,
- (III). 0.1 M NH_4OH ,
- (IV). 0.01 M H_2SO_4 .

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

9 . A black mineral A on heating in air gives a gas B. The mineral A on reaction with H_2SO_4 gives a gas C and a compound D. Bubbling C into an aqueous solution of B gives white turbidity. The Aqueous solution of compound D, on exposure to air, with NH_4SCN gives a red compound E. The compounds A and E respectively, are:

- A. PbS and $\text{Pb}(\text{SCN})_2$.
- B. NiS and $\text{Ni}(\text{SCN})_2$.
- C. FeS and $\text{Fe}(\text{SCN})_3$.
- D. CoS and $\text{Co}(\text{SCN})_2$.

10 . Phosphorus pentoxide, P_4O_{10} , has each phosphorus linked to:

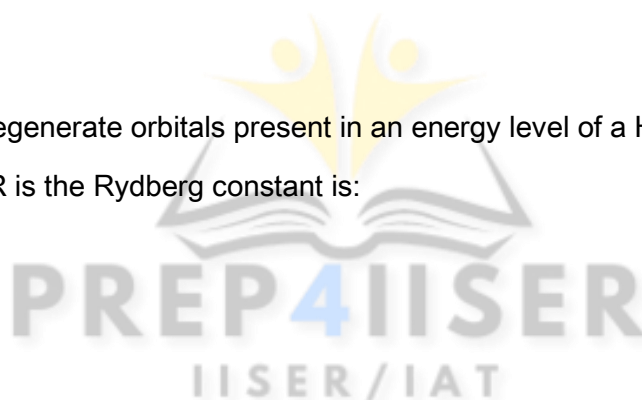
- A. 5 oxygen atoms with P – P bonds.
- B. 5 oxygen atoms.
- C. 4 oxygen atoms with P – P bonds.
- D. 4 oxygen atoms.

11. The radius of an atom of He is 0.05 nm. Assuming that one mole of a gas occupies 22.4 litres at STP, the fraction of the volume occupied by the atoms in a mole of He gas at STP is:

- A. 1.4×10^{-4}
- B. 1.4×10^{-5}
- C. 7.1×10^{-4}
- D. 7.1×10^{-5}

12 . The number of degenerate orbitals present in an energy level of a H-atom characterized by $E = -R/16$ where R is the Rydberg constant is:

- A. 16.
- B. 9.
- C. 4.
- D. 1.



13 . Formation of ammonia in Haber's process, $N_2 + 3H_2 \rightarrow 2NH_3$ ($\Delta H = -ve$) can be increased by:

- A. increase in temperature and pressure.
- B. increase in temperature.
- C. increase in the concentration of ammonia.
- D. increase in pressure.

14 . Choose the correct ordering for the dipole moments of the following molecules:

- A. $CO_2 \leq BF_3 < H_2O < H_2S$.
- B. $BF_3 < CO_2 < H_2S < H_2O$.
- C. $CO_2 = BF_3 < H_2S < H_2O$.
- D. $CO_2 < BF_3 < H_2S < H_2O$.

15 . The color of KMnO_4 is due to :

- A L \rightarrow M charge transfer transition
- B s - s^* transition
- C M \rightarrow L charge transfer transition
- D d - d transition

16. The synthesis of alkyl fluorides is best accomplished by :

- A Finkelstein reaction
- B Swarts reaction
- C Free radical fluorination
- D Sandmeyer's reaction

17 . Which of the following statements is correct for electromeric effect?

- A It is a temporary effect.
- B It is the property shown by π -bonds.
- C It takes place in the presence of a reagent, i.e., an electrophile or a nucleophile.
- D All are correct

18 . In

- (a) 2-Methyl pentane
- (b) -Dimethyl butane
- (c) 4-Ethyl-2,3-dimethyloctane
- (d) 4-(1-Methylethyl) heptane

How many of them have isopropyl group?

19 .The IUPAC name for the hydrocarbon represented by the Swastika sign is

- A Neononane
- B Tetraethylcarbon
- C 2-ethylpentane
- D - diethylpentane

20 . What is the percentage of nitrogen in the compound, if of an organic compound was digested according to Kjeldahl's method and the ammonia evolved

was absorbed in of solution. The excess sulphuric acid

required of solution for neutralization?

- A. 24
- B. 3
- C. 5
- D. 10

21 . Consider a cyclic process $P \rightarrow Q \rightarrow R \rightarrow P$ for a system. Among the following the combination of steps

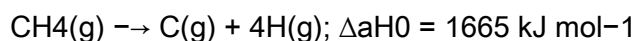
that can never lead to this cyclic process is

- A. $P \rightarrow Q$: Adiabatic irreversible; $Q \rightarrow R$: Adiabatic reversible; $R \rightarrow P$: Adiabatic reversible.
- B. $P \rightarrow Q$: Adiabatic irreversible; $Q \rightarrow R$: Adiabatic reversible; $R \rightarrow P$: Isothermal reversible.
- C. $P \rightarrow Q$: Adiabatic irreversible; $Q \rightarrow R$: Adiabatic reversible; $R \rightarrow P$: Isothermal irreversible
- D. $P \rightarrow Q$: Isothermal irreversible; $Q \rightarrow R$: Isothermal reversible; $R \rightarrow P$: Isothermal Reversible

22 . Which of the following statements is correct for electromeric effect?

- A It is a temporary effect.
- B It is the property shown by π -bonds.
- C It takes place in the presence of a reagent, i.e., an electrophile or a nucleophile.
- D All are correct

23 . Consider the following reaction:



Which of the statements is FALSE?

- A . ΔH° is the mean bond enthalpy of a C-H bond.
- B . All four C-H bonds in CH_4 are identical in bond length and energy.
- C . The energy required to break individual C-H bonds in successive steps is Different.
- D . Mean C-H bond enthalpies differ slightly from compound to compound.

24 . For the He^+ ion which of the following options is true?

- A. Energy of 3s is less than 3p.
- B. Energy of 3p is less than 3d.
- C. Energies of 3s, 3p, and 3d are all the same.
- D. Energy of 3s is same as 3p, but lower than 3d.

25 . For a free expansion of an ideal gas in an isolated chamber, which of the following statements is true?

- A. Entropy of the system increases.
- B. Temperature of the system decreases.
- C. Internal energy of the system decreases.
- D. Positive work is done by the system.

26 . The correct stability order of $-\text{C}---\text{N}$, $-\text{C}---\text{P}$, $-\text{C}---\text{As}$, and $-\text{C}---\text{Sb}$ bonds would be

- A. $-\text{C}---\text{N} > -\text{C}---\text{As} > -\text{C}---\text{Sb} > -\text{C}---\text{P}$.
- B. $-\text{C}---\text{As} > -\text{C}---\text{N} > -\text{C}---\text{P} > -\text{C}---\text{Sb}$.
- C. $-\text{C}---\text{N} > -\text{C}---\text{P} > -\text{C}---\text{As} > -\text{C}---\text{Sb}$.
- D. $-\text{C}---\text{Sb} > -\text{C}---\text{As} > -\text{C}---\text{P} > -\text{C}---\text{N}$.

27 . As predicted by VSEPR theory, the molecular shapes of XeF_2 and XeF_4 are respectively

- A. Bent and square planar.
- B. Linear and tetrahedral.
- C. Bent and tetrahedral.
- D. Linear and square planar.

28 . Which of the following statements holds true for Cu(I) and Cu(II) complexes?

- A. Cu(II) complexes are diamagnetic but Cu(I) complexes are paramagnetic.
- B. Both Cu(I) and Cu(II) complexes are paramagnetic.

- C. Both Cu(I) and Cu(II) complexes are diamagnetic.
D. Cu(II) complexes are paramagnetic but Cu(I) complexes are diamagnetic.

29 . Arrange the following compounds in increasing order of boiling point.
Propan-1-ol, butan-1-ol, butan-2-ol, pentan-1-ol

- A . Propan-1-ol, butan-2-ol, butan-1-ol, pentan-1-ol
B . Propan-1-ol, butan-1-ol, butan-2-ol, pentan-1-ol
C . Pentan-1-ol, butan-2-ol, butan-1-ol, propan-1-ol
D . Pentan-1-ol, butan-1-ol, butan-2-ol, propan-1-ol

30 . Para toluidine is treated with HNO_2 at ice cold conditions and then boiled with water.
The final product obtained is :

- A . Anthranilic acid
B . p-cresol
C . toluic acid
D . Phenol

31 . In the diazotization of aniline with sodium nitrite and hydrochloric acid, in the excess of HCl is used primarily to

- A . Suppress the concentration of free aniline available for coupling
B . Suppress hydrolysis of phenol
C . Insure a stoichiometric amount of nitrous acid
D . Neutralize the base liberated

32 . An organic compound A upon reacting with NH_3 gives B. On heating B gives C. C in presence of KOH reacts with Br_2 to give $\text{CH}_3\text{CH}_2\text{NH}_2$. A is :

- A . CH_3COOH
B . $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
C . $(\text{CH}_3)_2\text{CH COOH}$
D . $\text{CH}_3\text{CH}_2\text{COOH}$

33 . The most appropriate reaction for the conversion of bromobenzene to benzoic acid is:

- a. Reimer-tiemann reaction
b. Grignard reaction
c. Claisen reaction
d. Friedel-Crafts reaction

34 . On bromination, the electron rich phenoxide ion will be attacked most readily

- A . On the negatively charged oxygen atom
- B . On the ortho and para carbon atoms
- C . On the meta carbon atom
- D . On the ortho carbon atom

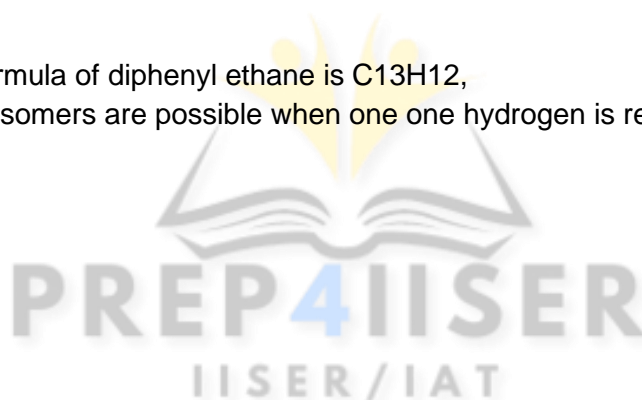
35 . The number of isomers obtained theoretically on monochlorination of 2 methyl butane.

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

36 . The molecular formula of diphenyl ethane is $C_{13}H_{12}$,

How many structural isomers are possible when one hydrogen is replaced by Bromine atom

- A . 4
- B . 6
- C . 7
- D . 8

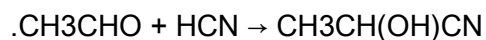


37 . Which organic structure among the following is not an isomer of the compound,



- A . $CH_3CH = CHCH_2CH_2CHO$
- B . $CH_3CH_2OCH = CHCH_2CH_3$
- C . $CH_3CH_2COCH_2CH_3$
- D . $(CH_3)_2CH - CO - CH_2CH_3$

38 . What would be the result of the reaction in which a chiral centre is produced?



- A . racemic mixture
- B . meso compound
- C . dextrorotatory
- D . laevorotatory

39 . The most stable compound among the following is?

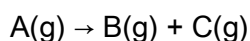
- A . cis-1, 3-cyclohexenediol
- B . trans-1, 3-cyclohexanediol
- C . cis-1, 2-cyclohexanediol
- D . trans-1, 2-cyclohexenediol

40 . The emf of the cells obtained by combining zinc and copper electrodes of the Daniell' cell with calomel ' electrodes are 1.083 volt and 0.018 volt respectively at 25°C. If, reduction potential of normal calomel electrode is + 0.28volt. find the emf of the Daniell cell.

41 . For the complete electrolysis of 1 mole of water using a voltage of 100V across two electrodes, the minimum amount of electrical energy (in Joule) to be spent is (F is the Faraday constant)

- A. 200F
- B. 100F
- C. F / 50
- D. F/100

42 . Consider the following reaction



The following data were obtained in a 500 ml flask at 300 K

Time(s) Total pressure (Torr)

0	80
2	120
4	240

The rate of reaction (in Torr s⁻¹) at t =8s is

- A. 2.5 ln 2
- B. 0.5 ln 2
- C. 2.0 ln 2
- D. 1.5 ln 2

43 . First-order reaction is found to have a half-life of one second (sec).

What will be the time required for 99.9% completion of the reaction?

- A. 0.693 sec
- B. 2 sec
- C. 10 sec

D. 69.3 sec

44 . A first order reaction takes 40 minute for 30% decomposition, the half life of the reaction is -

- A. 77,70 min
- B. 66.67 min
- C. 20.21 min
- D. 80 min

45 . 2. The alcohol that is chiral and can react with acidified dichromate under controlled conditions to give a aldehyde is -

- A. 2-ethyl-1-butanol
- B. 2-pentanol
- C. 2-methyl-1-butanol
- D. 2,2-dimethyl-1-butanol

46 . The species having a tetrahedral shape is -

- A. $[\text{PdCl}_4]^{2-}$
- B. $[\text{Ni}(\text{CN})_4]^{2-}$
- C. $[\text{Pd}(\text{CN})_4]^{2-}$
- D. $[\text{NiCl}_4]^{2-}$

47 . Among the metal carbonyls $[\text{Mn}(\text{CO})_6]^+$, $[\text{Ti}(\text{CO})_6]^+$, $[\text{Cr}(\text{CO})_6]$ and $[\text{V}(\text{CO})_6]^-$, the C-O bond order would be lowest in

- A. $[\text{Mn}(\text{CO})_6]^+$
- B. $[\text{Ti}(\text{CO})_6]^+$
- C. $[\text{Cr}(\text{CO})_6]$
- D. $[\text{V}(\text{CO})_6]^-$

48 . The species which possesses the highest spin angular momentum (S) is:

- A. $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$
- B. $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2$
- C. $[\text{Fe}(\text{NH}_3)_6]\text{Cl}_2$
- D. $[\text{Cu}(\text{NH}_3)_6]\text{Cl}_2$

49 . The polysaccharide that is used as a storage molecule in animals is

- A. Cellulose
- B. Chitin
- C. Starch
- D. Glycogen

50 . Which of the following combinations of aldehydes gives groups a cannizzaro reaction?

- A. CH_3CHO , HCHO
- B. $\text{C}_6\text{H}_5\text{CHO}$, CHCHO
- C. $\text{C}_6\text{H}_5\text{CHO}$, HCHO
- D. All of the above

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