

1. The total number of ions produced from the complex $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$ in aqueous solution will be:

1. 2
2. 3
3. 4
4. 5

2. Arrange the following in **decreasing order of number of molecules** contained in:

- (A) 16 g of O_2
(B) 16 g of CO_2
(C) 16 g of CO
(D) 16 g of H_2

1. (A), (B), (C), (D)
2. (D), (C), (A), (B)
3. (B), (A), (D), (C)
4. (C), (B), (D), (A)

3. A molecule **X** associates in a solvent as:

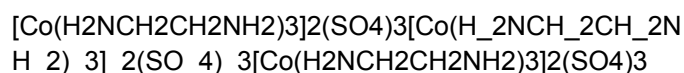


For a given concentration, the **van't Hoff factor = 0.80** and fraction of associated molecules = **0.3**.

The value of **n** is:

1. 2
2. 3
3. 1
4. 5

4. The oxidation number of **Co** in the complex



is:

1. 3
2. 4
3. 2
4. 5

5. The correct structure of **dipeptide Gly-Ala (glycyl alanine)** is:

1. $\text{H}_2\text{N}-\text{CH}_2-\text{CO}-\text{NH}-\text{CH}(\text{CH}_3)-\text{COOH}$
2. $\text{HOOC}-\text{CH}_2-\text{NH}-\text{CO}-\text{CH}(\text{CH}_3)-\text{NH}_2$
3. $\text{HOOC}-\text{CH}(\text{CH}_3)-\text{NH}-\text{CO}-\text{CH}_2-\text{NH}_2$
4. $\text{H}_2\text{N}-\text{CH}(\text{CH}_3)-\text{CO}-\text{NH}-\text{CH}_2-\text{COOH}$

6. Copper crystallizes in **FCC lattice** with unit cell edge length **361 pm**.

The radius of Cu atom is:

1. 127 pm
2. 181 pm
3. 157 pm
4. 108 pm

7. If **75% of a first-order reaction** completes in **32 minutes**, the time required for **50% completion** is:

1. 16 min
2. 78 min

3. 8 min
4. 4 min

8. Which compound will be **repelled in an external magnetic field**?

1. $\text{Na}_2[\text{CuCl}_4]$
2. $\text{Na}_2[\text{CdCl}_4]$
3. $\text{K}_4[\text{Fe}(\text{CN})_6]$
4. $\text{K}_3[\text{Fe}(\text{CN})_6]$

9. Spin-only magnetic moment of $[\text{Mn}(\text{CN})_6]^{4-}$ is:

1. 5.90 BM
2. 1.73 BM
3. 4.90 BM
4. 3.87 BM

10. Correct **increasing order of boiling points**:

Pentan-1-ol, n-Butane, Pentanal, Ethoxyethane

1. Ethoxyethane < Pentanal < n-Butane < Pentan-1-ol
2. Pentanal < n-Butane < Ethoxyethane < Pentan-1-ol
3. n-Butane < Pentanal < Ethoxyethane < Pentan-1-ol
4. n-Butane < Ethoxyethane < Pentanal < Pentan-1-ol

11. Identify product **D** in the reaction sequence starting from **phenol** involving:

- Zn dust
- $\text{CH}_3\text{Cl} / \text{AlCl}_3$
- $\text{K}_2\text{Cr}_2\text{O}_7 / \text{H}_2\text{SO}_4$
- $\text{H}_2\text{SO}_4 + \text{HNO}_3$

Options:

1. o-Nitrobenzoic acid
2. p-Nitrobenzoic acid
3. o,p-Dinitrobenzoic acid
4. m-Nitrobenzoic acid

12. Gold number ranges of lyophilic colloids:

- A = 0.005–0.01
B = 0.15–0.25
C = 0.04–1.0
D = 15–25

Which is **best protective colloid**?

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

13. Reaction of **aniline with conc. HNO_3 and H_2SO_4 (298 K)** gives **47% of**:

1. p-Nitroaniline
2. o-Nitroaniline
3. m-Nitroaniline

4. 2,4-Dinitroaniline

4. $\text{CO} + \text{AlCl}_3$

14. Increasing order of **basic strength**:

$\text{C}_2\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$, $(\text{C}_2\text{H}_5)_3\text{N}$, $\text{C}_6\text{H}_5\text{NH}_2$

Options given.

19. Formaldehyde undergoes **Cannizzaro reaction** because:

- (A) It has α -hydrogen
- (B) It does not have α -hydrogen
- (C) It does not undergo self-oxidation reduction
- (D) It undergoes self-oxidation reduction

Options given.

15. Which compound gives **Hell-Volhard-Zelinsky reaction**?

- 1. $\text{R-CH}_2\text{-COOH}$
- 2. $\text{R}_3\text{C-CHO}$
- 3. R_2CO
- 4. H-COOH

20. In reaction:

$(\text{CH}_3)_3\text{C-O-CH}_3 + \text{HI} \rightarrow (\text{CH}_3)_3\text{C-O-CH}_3 + \text{HI} + (\text{CH}_3)_3\text{C-O-CH}_3 + \text{HI}$

Products formed are **CH_3OH and $(\text{CH}_3)_3\text{CI}$** because:

- (A) leaving group forms less stable carbocation
- (B) leaving group forms more stable carbocation
- (C) reaction follows SN_1
- (D) reaction follows SN_2

16. Increasing order of **acidic strength**:

HCOOH , FCH_2COOH , $\text{NO}_2\text{CH}_2\text{COOH}$, ClCH_2COOH

Options given.

Options given.

17. Increasing order of **reactivity toward nucleophilic addition**:

Benzaldehyde, p-Tolualdehyde, p-Nitrobenzaldehyde, Acetophenone

Options given.

21. Aniline **does not undergo Friedel-Crafts reaction** because:

- (A) forms salt with AlCl_3
- (B) N gets negative charge
- (C) N gets positive charge
- (D) N acts as deactivating group

Options given.

18. In **Gattermann-Koch reaction**, the electrophile is:

- 1. CO^+
- 2. $\text{HCl} + \text{CO}_2 + \text{AlCl}_3$
- 3. HCO^+

22. Chlorine is **ortho-para directing though electron withdrawing** because:

- (A) $-\text{I}$ effect
- (B) destabilises carbocation
- (C) accepts electrons by resonance
- (D) releases electrons by resonance

Options given.

23. In **Etard reaction**, final product is:

1. Aromatic aldehyde
2. Aromatic chloride
3. Aromatic amine
4. Aromatic alcohol

24. Match protein structures:

- (A) Specific sequence of amino acids
(B) Folding due to H-bonding
(C) Fibrous proteins
(D) Arrangement of multiple polypeptides

With:

Primary, Secondary, Tertiary, Quaternary structure.

25. Match reagents:

- (A) Tollens reagent
(B) Jones reagent
(C) Lucas reagent
(D) Fehling solution

With respective chemicals.

26. Match reactions:

Swarts, Finkelstein, Sandmeyer, Wurtz.

27. Match biomolecules with diseases/functions:

Vitamin A, Thiamine, Glucocorticoids, Estradiol.

28. Match **alkenes with products** in **acidic hydration reaction** (diagram-based question).

29. Which among the following is **not an analgesic**?

1. Morphine
2. Heroin
3. Codeine
4. Ranitidine

30. Increasing order of **acidity (pKa)**:

- (A) BrCH_2COOH
(B) ClCH_2COOH
(C) FCH_2COOH
(D) HCOOH

31. For **SN2 reaction**, the increasing order of reactivity of the following alkyl halides is:

- (A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$
(B) $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{CH}_3$
(C) $(\text{CH}_3)_3\text{CBr}$
(D) $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$

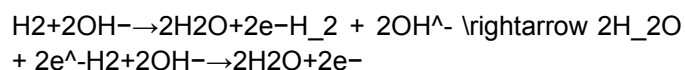
Options:

1. (A) < (B) < (C) < (D)
2. (A) < (C) < (B) < (D)
3. (B) < (A) < (D) < (C)
4. (C) < (B) < (D) < (A)

Passage for Questions 32–35

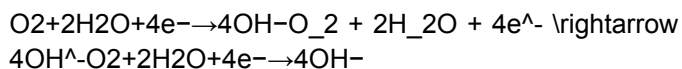
A **fuel cell** converts chemical energy into electrical energy. In hydrogen fuel cells:

Anode reaction:



Cathode reaction:

CUET UG 2024
Previous Year Question



67.2 L of H₂ at STP reacts in 15 minutes.

32. Number of **moles of hydrogen oxidised** is:

1. 0.33 mol
 2. 33.3 mol
 3. 3 mol
 4. 1.33 mol
-

33. Number of **moles of electrons produced** in oxidation of **67.2 L H₂ at STP**:

1. 2 mol
 2. 4 mol
 3. 1 mol
 4. 6 mol
-

34. Quantity of **electricity produced** in oxidation of **67.2 L H₂** is:

1. 96500 C
 2. 579000 C
 3. 193000 C
 4. 48250 C
-

35. If the current produced is used to deposit **Ag from Ag⁺ solution**, the amount of silver deposited is:

1. 324 g
-

2. 648 g

3. 108 g

4. 216 g

36. Which of the following statements about **fuel cells** is correct?

1. Energy efficiency is lower than combustion engines
 2. Produces electricity directly from fuel oxidation
 3. Requires intermediate mechanical energy conversion
 4. Produces large amounts of pollutants
-

37. Which of the following **does not occur at cathode** in electrochemical cells?

1. Reduction
 2. Gain of electrons
 3. Oxidation
 4. Positive electrode in galvanic cell
-

38. The **standard electrode potential** of a half-cell depends on:

1. Temperature
 2. Nature of electrode
 3. Concentration of ions
 4. All of these
-

39. In electrolysis, **Faraday's first law** states that:

1. Mass deposited \propto current
2. Mass deposited \propto time
3. Mass deposited \propto charge passed
4. Mass deposited independent of charge

40. The **relationship between Gibbs free energy and cell potential** is:

1. $\Delta G = nFE^\circ$
2. $\Delta G = -nFE^\circ$
3. $\Delta G = -F/E^\circ$
4. $\Delta G = nF/E^\circ$

41. Which of the following is **not a colligative property**?

1. Relative lowering of vapour pressure
2. Osmotic pressure
3. Boiling point
4. Surface tension

42. The van't Hoff factor ***i*** is defined as:

1. Observed colligative property / calculated value
2. Calculated value / observed value
3. Ratio of molality to molarity
4. Ratio of osmotic pressure to temperature

43. Which electrolyte shows **maximum deviation from ideal behaviour**?

1. NaCl
2. KCl
3. $AlCl_3$
4. Glucose

44. For a **weak electrolyte**, molar conductivity:

1. decreases with dilution
2. increases with dilution
3. remains constant
4. first increases then decreases

45. Kohlrausch's law helps determine:

1. Degree of dissociation
2. Limiting molar conductivity
3. Solubility of sparingly soluble salts
4. All of these

46. The **conductance of a solution** depends on:

1. Distance between electrodes
2. Area of electrodes
3. Nature of electrolyte
4. All of these

47. The unit of **molar conductivity** is:

1. $\text{S cm}^2 \text{ mol}^{-1}$
 2. $\Omega \text{ cm}$
 3. S cm^{-1}
 4. $\Omega^{-1} \text{ cm}$
-

48. Which of the following factors **does not affect rate of reaction**?

1. Concentration
 2. Temperature
 3. Catalyst
 4. Colour of reactants
-



49. The Arrhenius equation is:

1. $k = Ae^{-E_a/RT}$
 2. $k = Ae^{E_a/RT}$
 3. $k = A/RT$
 4. $k = RT/A$
-

50. The **activation energy** of a reaction is:

1. Minimum energy required for reactants to react
 2. Energy released during reaction
 3. Difference between enthalpy of reactants and products
 4. Total energy of reaction
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