

JEE-MAIN EXAM APRIL, 2024

Date: - 04-04-2024 (SHIFT-1)

CHEMISTRY

SECTION-A

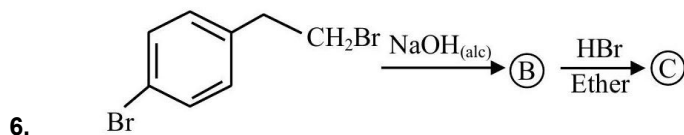
- What pressure (bar) of H_2 would be required to make emf of hydrogen electrode zero in pure water at $25^\circ C$?
 (1) 10^{-14} (2) 10^{-7} (3) 1 (4) 0.5
- The correct sequence of ligands in the order of decreasing field strength is :
 (1) $CO > H_2O > F^- > S^{2-}$ (2) $^-OH > F^- > NH_3 > CN^-$
 (3) $NCS^- > EDTA^{4-} > CN^- > CO$ (4) $S^{2-} > ^-OH > EDTA^{4-} > CO$
- Match List -I with List II :

List - I		List - II	
Mechanism steps		Effect	
(A)		(I)	- E effect
(B)		(II)	- R effect
(C)		(III)	+ E effect
(D)		(IV)	+ R effect

Choose the correct answer from the options given below :

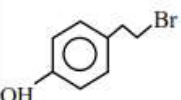
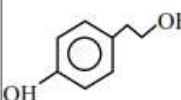
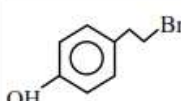
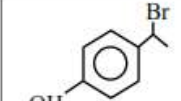
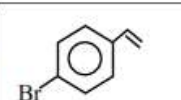
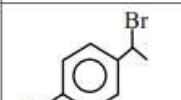
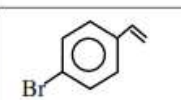
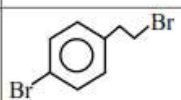
- (1) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)
- (2) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)
- (3) (A) - (II), (B) - (IV), (C) - (III), (D) - (I)
- (4) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

4. What will be the decreasing order of basic strength of the following conjugate bases?
 ${}^{-}\text{OH}$, RO^{-} , $\text{CH}_3\text{COO}^{-}$, Cl^{-}
- (1) $\text{Cl}^{-} > \text{OH}^{-} > \text{RO}^{-} > \text{CH}_3\text{COO}^{-}$ (2) $\text{RO}^{-} > \text{OH}^{-} > \text{CH}_3\text{COO}^{-} > \text{Cl}^{-}$
 (3) $\text{OH}^{-} > \text{RO}^{-} > \text{CH}_3\text{COO}^{-} > \text{Cl}^{-}$ (4) $\text{Cl}^{-} > \text{RO}^{-} > \text{OH}^{-} > \text{CH}_3\text{COO}^{-}$
5. In the precipitation of the iron group (III) in qualitative analysis, ammonium chloride is added before adding ammonium hydroxide to :
- (1) prevent interference by phosphate ions (2) decrease concentration of OH^{-} ions
 (3) increase concentration of Cl^{-} ions (4) increase concentration of NH_4^{+} ions

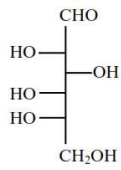
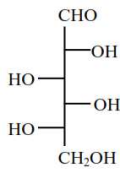
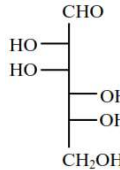
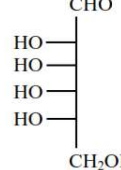


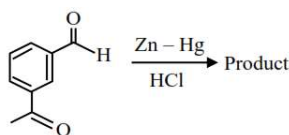
Identify (B) and (C) and how are (A) and (C) related ?

(B) (C)

(1)			functional group isomers
(2)			Derivative
(3)			position isomers
(4)			chain isomers

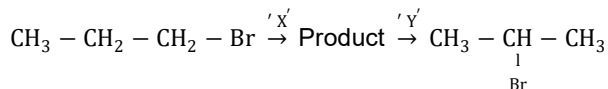
7. One of the commonly used electrode is calomel electrode. Under which of the following categories calomel electrode comes?
- (1) Metal - Insoluble Salt - Anion electrodes (2) Oxidation - Reduction electrodes
 (3) Gas - Ion electrodes (4) Metal ion-Metal electrodes
8. Number of complexes from the following with even number of unpaired "d" electrons is
 $[\text{V}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$, $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Ni}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$
 [Given atomic numbers : V = 23, Cr = 24, Fe = 26, Ni = 28, Cu = 29]
- (1) 2 (2) 4 (3) 5 (4) 1

9. Which one of the following molecules has maximum dipole moment?
 (1) NF_3 (2) CH_4 (3) NH_3 (4) PF_5
10. Number of molecules/ions from the following in which the central atom is involved in sp^3 hybridization is NO_3^- , BCl_3 , ClO_2^- , ClO_3
 (1) 2 (2) 4 (3) 3 (4) 1
11. Which among the following is incorrect statement ?
 (1) Electromeric effect dominates over inductive effect
 (2) The electromeric effect is, temporary effect
 (3) The organic compound shows electromeric effect in the presence of the reagent only
 (4) Hydrogen ion (H^+) shows negative electromeric effect
12. Given below are two statements :
 Statement I : Acidity of α -hydrogens of aldehydes and ketones is responsible for Aldol reaction.
 Statement II : Reaction between benzaldehyde and ethanal will NOT give Cross - Aldol product. In the light of above statements, choose the most appropriate answer from the options given below.
 (1) Both Statement I and Statement II are correct.
 (2) Both Statement I and Statement II are incorrect.
 (3) Statement I is incorrect but Statement II is correct.
 (4) Statement I is correct but Statement II is incorrect.
13. Which of the following nitrogen containing compound does not give Lassaigne's test ?
 (1) Phenyl hydrazine (2) Glycine
 (3) Urea (4) Hydrazine
14. Which of the following is the correct structure of L-Glucose?
- (1)  (2)  (3)  (4) 
15. The element which shows only one oxidation state other than its elemental form is :
 (1) Cobalt (2) Scandium (3) Titanium (4) Nickel
16. Identify the product in the following reaction :



- (1)  (2)  (3)  (4) 

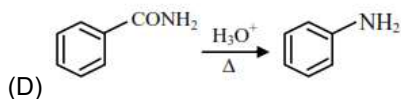
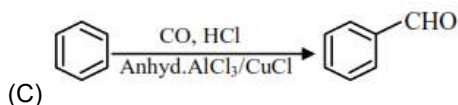
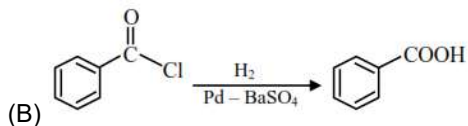
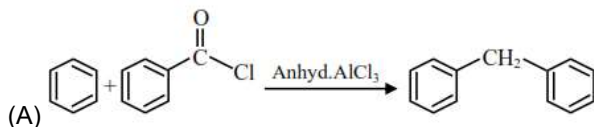
17. Number of elements from the following that CANNOT form compounds with valencies which match with their respective group valencies is
B, C, N, S, O, F, P, Al, Si
(1) 7 (2) 5 (3) 6 (4) 3
18. The Molarity (M) of an aqueous solution containing 5.85 g of NaCl in 500 mL water is :
(Given : Molar Mass Na: 23 and Cl: 35.5gmol⁻¹)
(1) 20 (2) 0.2 (3) 2 (4) 4
19. Identify the correct set of reagents or reaction conditions 'X' and 'Y' in the following set of transformation.



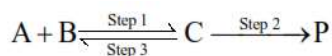
- (1) X = conc.alc. NaOH, 80°C, Y = Br₂/CHCl₃
 (2) X = dil.aq. NaOH, 20°C, Y = HBr /acetic acid
 (3) X = conc.alc. NaOH, 80°C, Y = HBr/ acetic acid
 (4) X = dil.aq. NaOH, 20°C, Y = Br₂/CHCl₃
20. The correct order of first ionization enthalpy values of the following elements is :
 (A) O (B) N (C) Be (D) F (E) B
 Choose the correct answer from the options given below :
 (1) B < D < C < E < A (2) E < C < A < B < D
 (3) C < E < A < B < D (4) A < B < D < C < E

SECTION-B

21. The enthalpy of formation of ethane (C₂H₆) from ethylene by addition of hydrogen where the bondenergies of C – H, C – C, H – H are 414 kJ, 347 kJ, 615 kJ and 435 kJ respectively is kJ.
22. The number of correct reaction(s) among the following is



23. X g of ethylamine is subjected to reaction with NaNO_2/HCl followed by water; evolved dinitrogen gas which occupied 2.24 L volume at STP.
 X is _____ $\times 10^{-1}$ g.
24. The de-Broglie's wavelength of an electron in the 4th orbit is _____ πa_0 . (a_0 = Bohr's radius)
25. Only 2 mL of KMnO_4 solution of unknown molarity is required to reach the end point of a titration of 20 mL of oxalic acid (2M) in acidic medium. The molarity of KMnO_4 solution should be _____ M.
26. Consider the following reaction
 $\text{MnO}_2 + \text{KOH} + \text{O}_2 \rightarrow \text{A} + \text{H}_2\text{O}$.
 Product 'A' in neutral or acidic medium disproportionate to give products 'B' and 'C' along with water.
 The sum of spin-only magnetic moment values of B and C is BM. (nearest integer)
 (Given atomic number of Mn is 25)
27. Consider the following transformation involving first order elementary reaction in each step at constant temperature as shown below.



Some details of the above reaction are listed below.

Step	Rate constant (sec^{-1})	Activation energy (kJ mol^{-1})
1	k_1	300
2	k_2	200
3	k_3	E_{a3}

- If the overall rate constant of the above transformation (k) is given as $k = \frac{k_1 k_2}{k_3}$ and the overall activation energy (E_a) is 400 kJ mol^{-1} , then the value of E_{a3} is _____ kJ mol^{-1} (nearest integer)
28. 2.5 g of a non-volatile, non-electrolyte is dissolved in 100 g of water at 25°C . The solution showed a boiling point elevation by 2°C . Assuming the solute concentration is negligible with respect to the solvent concentration, the vapour pressure of the resulting aqueous solution is _____ mm of Hg (Nearest Integer)
 [Given : Molal boiling point elevation constant of water (K_b) = $0.52 \text{ K kg mol}^{-1}$,
 1 atm pressure = 760 mm of Hg, molar mass of water = 18 g mol^{-1}]
29. The number of different chain isomers for C_7H_{16} is _____.
30. Number of molecules/species from the following having one unpaired electron is
 $\text{O}_2, \text{O}_2^{-1}, \text{NO}, \text{CN}^{-1}, \text{O}_2^{2-}$

NTA ANSWERS

1.	(1)	2.	(1)	3.	(1)	4.	(2)	5.	(2)	6.	(3)	7.	(1)
8.	(1)	9.	(3)	10.	(1)	11.	(4)	12.	(4)	13.	(4)	14.	(1)
15.	(2)	16.	(4)	17.	(4)	18.	(2)	19.	(3)	20.	(2)	21.	(125)
22.	(1)	23.	(45)	24.	(8)	25.	(8)	26.	(4)	27.	(100)	28.	(707)
29.	(9)	30.	(2)										