

JEE-MAIN EXAM FEBRUARY, 2024

Date: - 01-02-2024 (SHIFT-2)

CHEMISTRY**SECTION-A**

- The transition metal having highest 3rd ionisation enthalpy is :
 (1) Cr (2) Mn (3) V (4) Fe
 So Mn has highest 3rd IE among all the given elements due to d⁵ configuration.
- Given below are two statements :
 Statement (I) : A π bonding MO has lower electron density above and below the inter-nuclear axis.
 Statement (II) : The π^* antibonding MO has a node between the nuclei.
 In the light of the above statements, choose the most appropriate answer from the options given below:
 (1) Both Statement I and Statement II are false
 (2) Both Statement I and Statement II are true
 (3) Statement I is false but Statement II is true
 (4) Statement I is true but Statement II is false
- Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A) : In aqueous solutions Cr^{2+} is reducing while Mn^{3+} is oxidising in nature.
 Reason (R) : Extra stability to half filled electronic configuration is observed than incompletely filled electronic configuration.
 In the light of the above statement, choose the most appropriate answer from the options given below:
 (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 (3) (A) is false but (R) is true
 (4) (A) is true but (R) is false
- Match List - I with List - II.

List-I (Reactants) (A) Phenol, Zn/Δ (B) Phenol, CHCl_3 , NaOH , HCl (C) Phenol, CO_2 , NaOH , HCl (D) Phenol, Conc. HNO_3	List-II Products (I) Salicylaldehyde (II) Salicylic acid (III) Benzene (IV) Picric acid
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Choose the correct answer from the options given below.

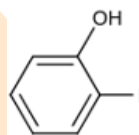
(1) (A)-(IV), (B), (II), (C)-(I), (D)-(III) (3) (A)-(III), (B)-(I), (C)-(II), (D)-(IV)	(2) (A)-(IV), (B)-(I), (C)-(II), (D)-(III) (4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)
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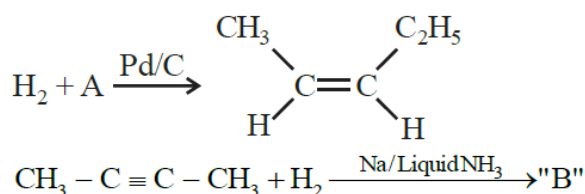
5. Given below are two statements :

Statement (I) : Both metal and non-metal exist in p and d-block elements.

Statement (II) : Non-metals have higher ionisation enthalpy and higher electronegativity than the metals.

In the light of the above statements, choose the most appropriate answer from the option given below:

- (1) Both Statement I and Statement II are false
 (2) Statement I is false but Statement II is true
 (3) Statement I is true but Statement II is false
 (4) Both Statement I and Statement II are true
6. The strongest reducing agent among the following is:
 (1) NH_3 (2) SbH_3 (3) BiH_3 (4) PH_3
7. Which of the following compounds show colour due to d-d transition?
 (1) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (2) $\text{K}_2\text{Cr}_2\text{O}_7$ (3) K_2CrO_4 (4) KMnO_4
8. The set of meta directing functional groups from the following sets is:
 (1) $-\text{CN}$, $-\text{NH}_2$, $-\text{NHR}$, $-\text{OCH}_3$ (2) $-\text{NO}_2$, $-\text{NH}_2$, $-\text{COOH}$, $-\text{COOR}$
 (3) $-\text{NO}_2$, $-\text{CHO}$, $-\text{SO}_3\text{H}$, $-\text{COR}$ (4) $-\text{CN}$, $-\text{CHO}$, $-\text{NHCOCH}_3$, $-\text{COOR}$
9. Select the compound from the following that will show intramolecular hydrogen bonding.
 (1) H_2O (2) NH_3 (3) $\text{C}_2\text{H}_5\text{OH}$ (4) 
10. Lassaigne's test is used for detection of :
 (1) Nitrogen and Sulphur only
 (2) Nitrogen, Sulphur and Phosphorous Only
 (3) Phosphorous and halogens only
 (4) Nitrogen, Sulphur, phosphorous and halogens
11. Which among the following has highest boiling point?
 (1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ (2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2 - \text{OH}$
 (3) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$ (4) $\text{H}_5\text{C}_2 - \text{O} - \text{C}_2\text{H}_5$
12. In the given reactions identify A and B.



- (1) A : 2-Pentyne B : trans -2 - butene
 (2) A : n - Pentane B : trans -2 - butene
 (3) A : 2 - Pentyne B : Cis -2 - butene
 (4) A : n-Pentane B : Cis -2 - butene

13. The number of radial node/s for $3p$ orbital is:

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

14. Match List - I with List - II.

List – I

Compound

- (A) Carbon tetrachloride
(B) Methylene chloride
(C) DDT
(D) Freons

List – II

Use

- (I) Paint remover
(II) Refrigerators and air conditioners
(III) Fire extinguisher
(IV) Non Biodegradable insecticide

Choose the correct answer from the options given below :

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

15. The functional group that shows negative resonance effect is:

- (1) $-\text{NH}_2$ (2) $-\text{OH}$ (3) $-\text{COOH}$ (4) $-\text{OR}$

16. $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$ are respectively known as:

- (1) Spin free Complex, Spin paired Complex
(2) Spin paired Complex, Spin free Complex
(3) Outer orbital Complex, Inner orbital Complex
(4) Inner orbital Complex, Spin paired Complex

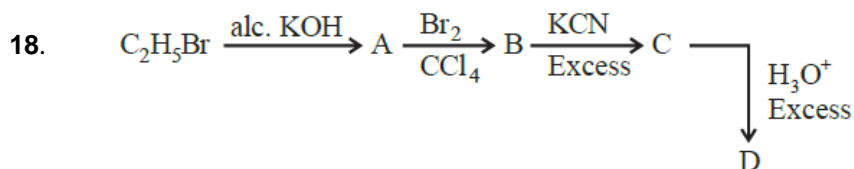
17. Given below are two statements :

Statement (I) : SiO_2 and GeO_2 are acidic while SnO and PbO are amphoteric in nature.

Statement (II) : Allotropic forms of carbon are due to property of catenation and $p\pi - d\pi$ bond formation.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Both Statement I and Statement II are false
(2) Both Statement I and Statement II are true
(3) Statement I is true but Statement II is false
(4) Statement I is false but Statement II is true



Acid D formed in above reaction is :

- (1) Gluconic acid (2) Succinic acid
(3) Oxalic acid (4) Malonic acid

19. Solubility of calcium phosphate (molecular mass, M) in water is W_g per 100 mL at 25°C . Its solubility product at 25°C will be approximately.

- (1) $10^7 \left(\frac{W}{M}\right)^3$ (2) $10^7 \left(\frac{W}{M}\right)^5$
 (3) $10^3 \left(\frac{W}{M}\right)^5$ (4) $10^5 \left(\frac{W}{M}\right)^5$

20. Given below are two statements :

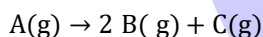
Statement (I) : Dimethyl glyoxime forms a sixmembered covalent chelate when treated with NiCl_2 solution in presence of NH_4OH .

Statement (II) : Prussian blue precipitate contains iron both in (+2) and (+3) oxidation states. In the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Statement I is false but Statement II is true
 (2) Both Statement I and Statement II are true
 (3) Both Statement I and Statement II are false
 (4) Statement I is true but Statement II is false

SECTION-B

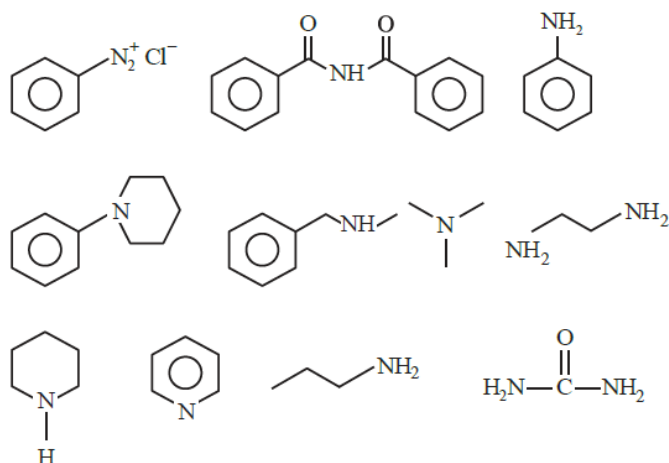
21. Total number of isomeric compounds (including stereoisomers) formed by monochlorination of 2-methylbutane is
22. The following data were obtained during the first order thermal decomposition of a gas A at constant volume:



S.No	Time/s	Total pressure/(atm)
1.	0	0.1
2.	115	0.28

The rate constant of the reaction is _____ $\times 10^{-2} \text{ s}^{-1}$ (nearest integer)

23. The number of tripeptides formed by three different amino acids using each amino acid once is
24. Number of compounds which give reaction with Hinsberg's reagent is



25. Mass of ethylene glycol (antifreeze) to be added to 18.6 kg of water to protect the freezing point at -24°C is _____ kg (Molar mass in gmol^{-1} for ethylene glycol 62, K_f of water = $1.86 \text{ K kg mol}^{-1}$)
26. Following Kjeldahl's method, 1 g of organic compound released ammonia, that neutralised 10 mL of $2\text{M H}_2\text{SO}_4$. The percentage of nitrogen in the compound is _____ %.
27. The amount of electricity in Coulomb required for the oxidation of 1 mol of H_2O to O_2 is $\times 10^5 \text{C}$.
28. For a certain reaction at 300 K, $K = 10$, then ΔG° for the same reaction is $\times 10^{-1} \text{ kJ mol}^{-1}$.
(Given $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)
29. Consider the following redox reaction :
 $\text{MnO}_4^- + \text{H}^+ + \text{H}_2\text{C}_2\text{O}_4 \rightleftharpoons \text{Mn}^{2+} + \text{H}_2\text{O} + \text{CO}_2$
 The standard reduction potentials are given as below (E_{red}°)
 $E_{\text{MnO}_4^-/\text{Mn}^{2+}}^{\circ} = +1.51 \text{ V}$
 $E_{\text{CO}_2/\text{H}_2\text{C}_2\text{O}_4}^{\circ} = -0.49 \text{ V}$
 If the equilibrium constant of the above reaction is given as $K_{\text{eq}} = 10^x$, then the value of $x =$
 (Nearest integer)
30. 10 mL of gaseous hydrocarbon on combustion gives 40 mL of CO_2 (g) and 50 mL of water vapour. Total number of carbon and hydrogen atoms in the hydrocarbon is

NTA ANSWERS

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|-----|--------------|-----|-----|-----|------|-----|------|-----|------|-----|-----|-----|------|
| 1. | (2) | 2. | (3) | 3. | (1) | 4. | (3) | 5. | (2) | 6. | (3) | 7. | (1) |
| 8. | (3) | 9. | (4) | 10. | (4) | 11. | (2) | 12. | (1) | 13. | (1) | 14. | (2) |
| 15. | (3) | 16. | (2) | 17. | (3) | 18. | (2) | 19. | (2) | 20. | (1) | 21. | (6) |
| 22. | (2) | 23. | (6) | 24. | (5) | 25. | (15) | 26. | (56) | 27. | (2) | 28. | (57) |
| 29. | (338 OR 339) | | | 30. | (14) | | | | | | | | |