

JEE Main January 2024
Question Paper With Text Solution
01 February | Shift-2

CHEMISTRY

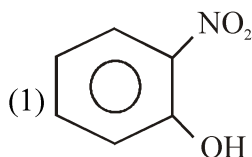


JEE Main & Advanced | XI-XII Foundation | VI-X Pre-Foundation

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1. Select the compound from the following that will show intramolecular hydrogen bonding.



(2) H₂O

(3) NH₃

(4) C₂H₅OH

Question ID: 9561771278

Ans. Official Answer NTA (1)

Sol.

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

(1) 1

(2) 2

(3) 3

(4) 4

Question ID: 9561771276

Ans. Official Answer NTA (1)

Sol.

3. 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)-(IV), (B)-(III), (C)-(II), (D)-(I)

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

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

Question ID: 9561771291

Ans. Official Answer NTA (4)

Sol.

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

Question ID: 9561771277

Ans. Official Answer NTA(2)

Sol.

5. 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 statements, 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

Question ID: 9561771284

Ans. Official Answer NTA(1)

Sol.

6. Match List - I with List - II.

List - I

List - II

Reactants

Product

- | | |
|---------------------------------|---------------------|
| (A) Phenol, Zn / Δ | (I) Salicylaldehyde |
| (B) Phenol, $CHCl_3, NaOH, HCl$ | (II) Salicylic acid |
| (C) Phenol, $CO_2, NaOH, HCl$ | (III) Benzene |
| (D) Phenol, Conc. HNO_3 | (IV) Picric acid |

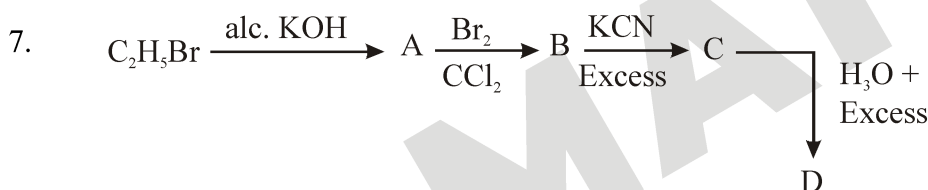
Choose the correct answer from the options given below :

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

Question ID: 9561771292

Ans. Official Answer NTA(1)

Sol.



Acid D formed in above reaction is :

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

Question ID: 9561771293

Ans. Official Answer NTA(1)

Sol.

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

- (1) $-OH$
- (2) $-OR$
- (3) $-COOH$
- (4) $-NH_2$

Question ID: 9561771288

Ans. Official Answer NTA (3)

Sol.

9. The strongest reducing agent among the following is :

- (1) SbH_3
- (2) PH_3
- (3) NH_3
- (4) BiH_3

Question ID: 9561771281

Ans. Official Answer NTA (4)

Sol.

10. The set of meta directing functional groups from the following sets is :

- (1) $-\text{CN}$, $-\text{CHO}$, $-\text{NHCOCH}_3$, $-\text{COOR}$
- (2) $-\text{CN}$, $-\text{NH}_2$, $-\text{NHR}$, $-\text{OCH}_3$
- (3) $-\text{NO}_2$, $-\text{CHO}$, $-\text{SO}_3\text{H}$, $-\text{COR}$
- (4) $-\text{NO}_2$, $-\text{NH}_2$, $-\text{COOH}$, $-\text{COOR}$

Question ID: 9561771289

Ans. Official Answer NTA (3)

Sol.

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

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

Question ID: 9561771285

Ans. Official Answer NTA (2)

Sol.

12. Given below are two statements :

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Statement (I): Dimethyl glyoxime forms a six-membered 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 true but Statement II is false
- (2) Statement I is false but Statement II is true
- (3) Both Statement I and Statement II are true
- (4) Both Statement I and Statement II are false

Question ID: 9561771295

Ans. Official Answer NTA (2)

Sol.

13. Given below are two statements :

Statement (I) : Both metals and non-metals 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 options given below :

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

Question ID: 9561771280

Ans. Official Answer NTA (4)

Sol.

14. The transition metal having highest 3rd ionisation enthalpy is :

- (1) V
- (2) Fe
- (3) Mn
- (4) Cr

Question ID: 9561771283



Ans. Official Answer NTA (3)

Sol.

15. Which among the following has highest boiling point?

- (1) $\text{H}_5\text{C}_2 - \text{O} - \text{C}_2\text{H}_5$
- (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) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

Question ID: 9561771294

Ans. Official Answer NTA (2)

Sol.

16. 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,

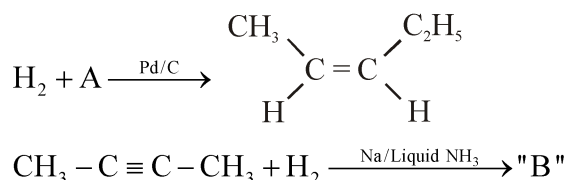
- (1) $10^3 \left(\frac{W}{M}\right)^5$
- (2) $10^7 \left(\frac{W}{M}\right)^5$
- (3) $10^5 \left(\frac{W}{M}\right)^5$
- (4) $10^7 \left(\frac{W}{M}\right)^3$

Question ID: 9561771279

Ans. Official Answer NTA (2)

Sol.

17. In the given reactions identify A and B





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

Question ID: 9561771290

Ans. Official Answer NTA (3)

Sol.

18. Lassaigne's test is used for detection of :

- (1) Nitrogen, Sulphur and Phosphorous only
(2) Nitrogen and Sulphur only
(3) Nitrogen, Sulphur, phosphorous and halogens
(4) Phosphorous and halogens only

Question ID: 9561771287

Ans. Official Answer NTA (3)

Sol.

19. Which of the following compounds show colour due to d-d transition?

- (1) $K_2Cr_2O_7$
(2) $CuSO_4 \cdot 5H_2O$
(3) K_2CrO_4
(4) $KMnO_4$

Question ID: 9561771286

Ans. Official Answer NTA (2)

Sol.

20. 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 :

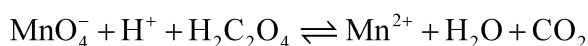
- (1) Statement I is false but Statement II is true
- (2) Statement I is true but Statement II is false
- (3) Both Statement I and Statement II are false
- (4) Both Statement I and Statement II are true

Question ID: 9561771282

Ans. Official Answer NTA (2)

Sol.

21. Consider the following redox reaction :



The standard reduction potentials are given as below

$$(E_{\text{red}}^\circ) : E_{\text{MnO}_4^-/\text{Mn}^{2+}}^\circ = +1.51 \text{ V}$$

$$E_{\text{CO}_2/\text{H}_2\text{C}_2\text{O}_4}^\circ = -0.49 \text{ V}$$

If the equilibrium constant of the above reaction is given as $K_{\text{eq}} = 10^x$, then the value of $x =$ (nearest integer)

Question ID: 9561771300

Ans. Official Answer NTA (338)

Sol.

22. Following Kjeldahl's method, 1g of organic compound released ammonia, that neutralised 10 mL of 2 M H_2SO_4 . The percentage of nitrogen in the compound is _____ %.

Question ID: 9561771302

Ans. Official Answer NTA (56)

Sol.

23. 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 $= 1.86 \text{ K kg mol}^{-1}$)

Question ID: 9561771298



Ans. Official Answer NTA (15)

Sol.

24. Total number of isomeric compounds (including stereoisomers) formed by monochlorination of 2-methylbutane is

Question ID: 9561771303

Ans. Official Answer NTA (6)

Sol.

25. The amount of electricity in Coulomb required for the oxidation of 1 mol of H_2O to O_2 is _____ $\times 10^5\text{C}$.

Question ID: 9561771299

Ans. Official Answer NTA (2)

Sol.

26. 10 mL of gaseous hydrocarbon on combustion gives 40 mL of $\text{CO}_2(\text{g})$ and 50 mL of water vapour. Total number of carbon and hydrogen atoms in the hydrocarbon is

Question ID: 9561771296

Ans. Official Answer NTA (14)

Sol.

27. For a certain reaction at 300 K, $K = 10$, then ΔG° for the same reaction is - _____ $\times 10^{-1} \text{ kJ mol}^{-1}$.
(Given $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)

Question ID: 9561771297

Ans. Official Answer NTA (57)

Sol.

28. 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)

Question ID: 9561771301

Ans. Official Answer NTA (2)

Sol.

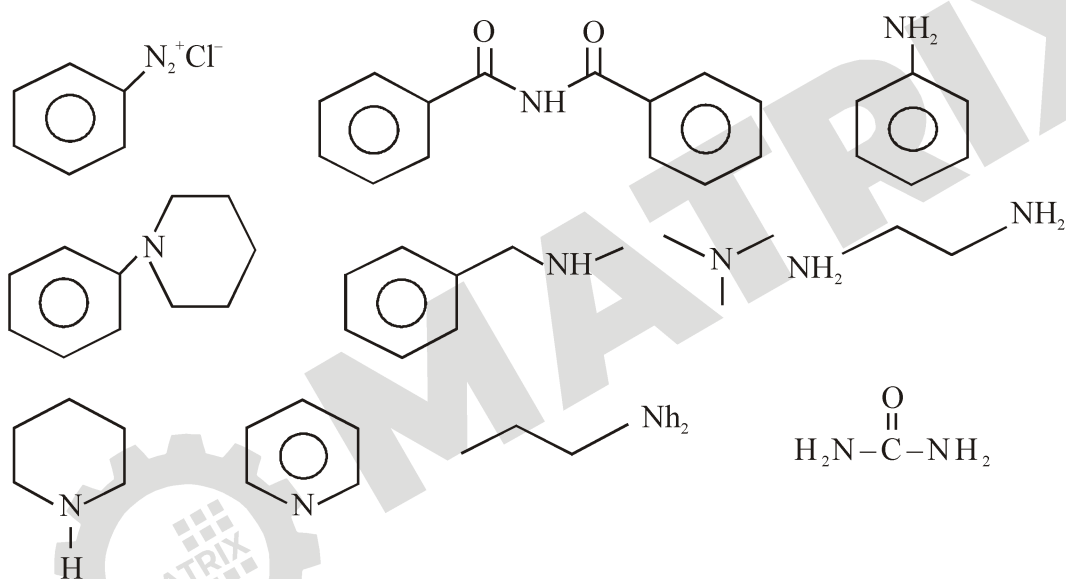
29. The number of tripeptides formed by three different amino acids using each amino acid once is

Question ID: 9561771305

Ans. Official Answer NTA (6)

Sol.

30. Number of compounds which give reaction with Hinsberg's reagent is



Question ID: 9561771304

Ans. Official Answer NTA (5)