

JEE Main January 2024
Question Paper With Text Solution
30 January | Shift-1

CHEMISTRY



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

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1. The Lassaigne's extract is boiled with dil HNO_3 before testing for halogens because,

- (1) Ag_2S is soluble in HNO_3
- (2) AgCN is soluble in HNO_3
- (3) Na_2S and NaCN are decomposed by HNO_3
- (4) Silver halides are soluble in HNO_3

Question ID : 533543895

Ans. Official Answer NTA (2)

Sol.

2. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : There is a considerable increase in covalent radius from N to P. However from As to Bi only a small increase in covalent radius is observed.

Reason (R) : Covalent and ionic radii in a particular oxidation state increases down the group. In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) (A) is false but (R) is true
- (2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
- (3) (A) is true but (R) is false
- (4) Both (A) and (R) are true and (R) is the correct explanation of (A)

Question ID : 533543891

Ans. Official Answer NTA (2)

Sol.

3. Match List-I with List-II.

List-I

List-II

Molecule

Shape

(A) BrF_5

(I) T-shape

(B) H_2O

(II) See saw

(C) ClF_3

(III) Bent

(D) SF_4

(IV) Square pyramidal

Choose the correct answer from the options given below :

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

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Question ID : 533543888

Ans. Official Answer NTA (3)

Sol.

4. Given below are two statements :

Statement (I) : The gas liberated on warming a salt with dil H_2SO_4 turns a piece of paper dipped in lead acetate into black, it is a confirmatory test for sulphide ion.

Statement (II) : In statement-I the colour of paper turns black because of formation of lead sulphite.

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) Statement I is true but statement II is false
- (4) Both statement I and statement II are false

Question ID : 533543905

Ans. Official Answer NTA (3)

Sol.

5. Sugar which does not give reddish brown precipitate with Fehling's reagent, is :

- (1) Glucose
- (2) Maltose
- (3) Lactose
- (4) Sucrose

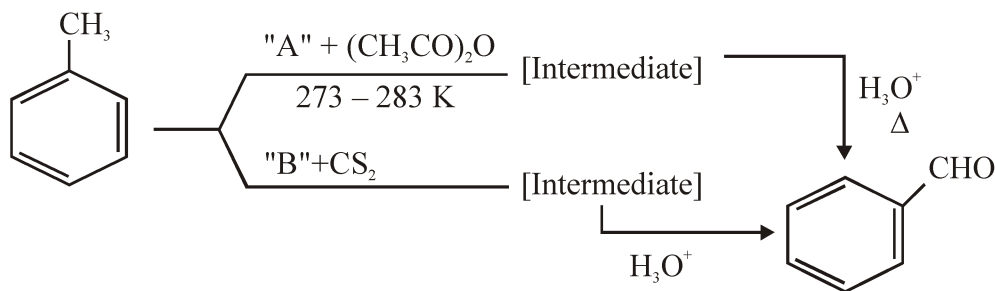
Question ID : 533543904

Ans. Official Answer NTA (4)

Sol.



6. In the given reactions, identify the reagent A and reagent B.

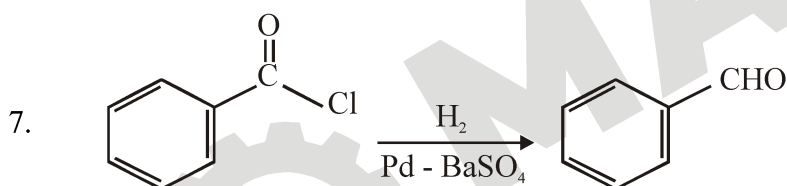


- (1) A-CrO₂Cl₂ B-CrO₃
 (2) A-CrO₃ B-CrO₂Cl₂
 (3) A-CrO₂Cl₂ B-CrO₂Cl₂
 (4) A-CrO₃ B-CrO₃

Question ID : 533543901

Ans. Official Answer NTA (2)

Sol.



This reduction reaction is known as :

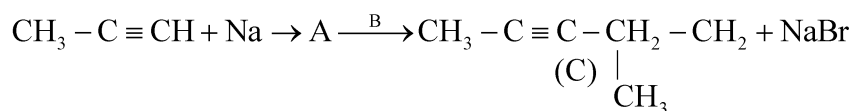
- (1) Etard reduction (2) Rosenmund reduction
 (3) Wolf-Kishner reduction (4) Stephen reduction

Question ID : 533543902

Ans. Official Answer NTA (4)

Sol.

8. Compound A formed in the following reaction reacts with B gives the product C. Find out A and B.

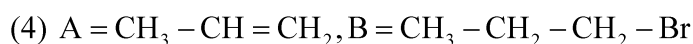


- (1) A = CH₃ - C ≡ C⁻Na⁺, B = CH₃ - CH₂ - CH₃
 (2) A = CH₃ - C ≡ C⁻Na⁺, B = CH₃ - CH₂ - CH₂ - Br

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Question ID : 533543898

Ans. Official Answer NTA (1)

Sol.

9. Aluminium chloride in acidified aqueous solution forms an ion having geometry

(1) Trigonal bipyramidal

(2) Square planar

(3) Tetrahedral

(4) Octahedral

Question ID : 533543890

Ans. Official Answer NTA (2)

Sol.

10. Given below are two statements :

Statement (I) : The orbitals having same energy are called as degenerate orbitals.**Statement (II) :** In hydrogen atom, 3p and 3d orbitals are not degenerate orbitals.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 : 533543887

Ans. Official Answer NTA (3)

Sol.

11. Diamagnetic Lanthanoid ions are :

(1) La^{3+} & Ce^{4+} (2) Nd^{3+} & Ce^{4+} (3) Lu^{3+} & Eu^{3+} (4) Nd^{3+} & Eu^{3+}

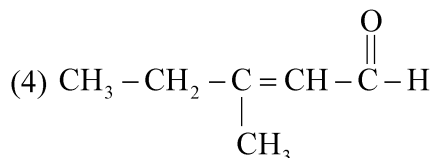
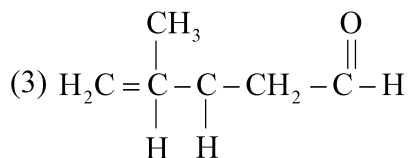
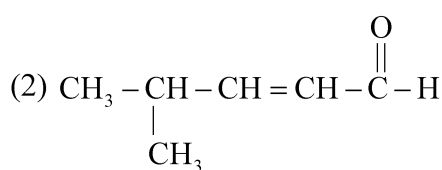
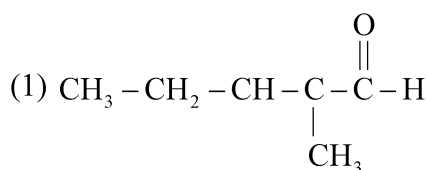
Question ID : 533543893

Ans. Official Answer NTA (2)

Sol.



12. Structure of 4-Methylpent-2-enal is :



Question ID : 533543896

Ans. Official Answer NTA (2)

Sol.

13. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{Cl}$ is an example of allyl halide.

Reason (R) : Allyl halides are the compounds in which the halogen atom is attached to sp^2 hybridised carbon atom

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) (A) is false but (R) is true

(3) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(4) (A) is true but (R) is false

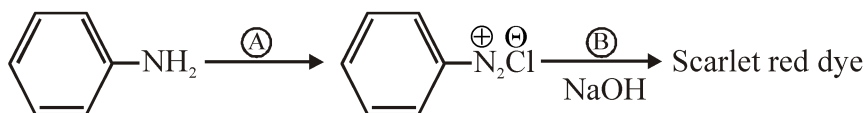
Question ID : 533543900

Ans. Official Answer NTA (3)

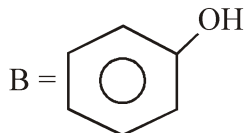
Sol.



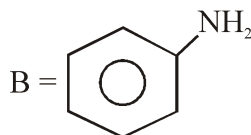
14. Following is a confirmatory test for aromatic primary amines. Identify reagent (A) and (B).



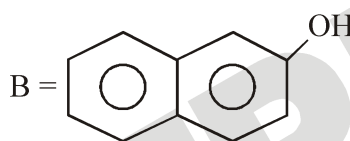
(1) A = $\text{HNO}_3/\text{H}_2\text{SO}_4$



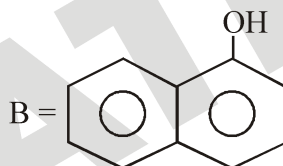
(2) A = $\text{NaNO}_2 + \text{HCl}$, $0 - 5^\circ\text{C}$;



(3) A = $\text{NaNO}_2 + \text{HCl}$, $0 - 5^\circ\text{C}$;



(4) A = $\text{NaNO}_2 + \text{HCl}$, $0 - 5^\circ\text{C}$;



Question ID : 533543906

Ans. Official Answer NTA (1)

Sol.

15. What happens to freezing point of benzene when small quantity of naphthalene is added to benzene ?

- (1) First decreases and then increases
- (2) Remains unchanged
- (3) Increases
- (4) Decreases

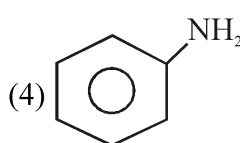
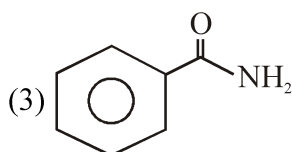
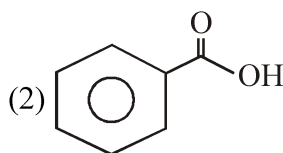
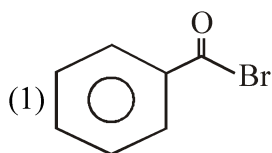
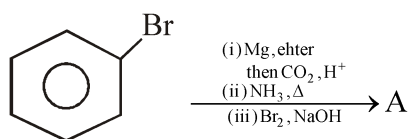
Question ID : 533543889

Ans. Official Answer NTA (2)

Sol.



16. The final product A, formed in the following multistep reaction sequence is :

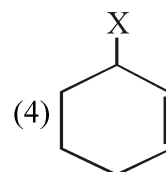
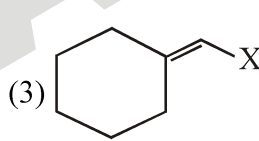
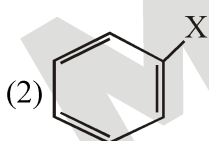
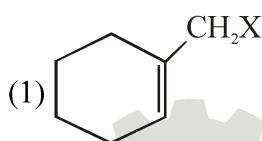


Question ID : 533543903

Ans. Official Answer NTA (4)

Sol.

17. Example of vinylic halide is :

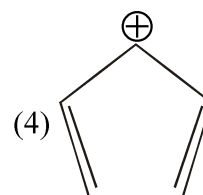
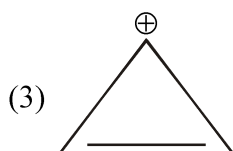
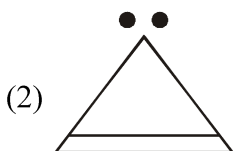
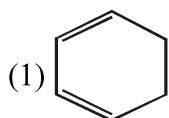


Question ID : 533543899

Ans. Official Answer NTA (3)

Sol.

18. Which of the following molecule/species is most stable ?



Question ID : 533543897

Ans. Official Answer NTA (4)

Sol.



19. Choose the correct statements from the following :

- (A) Ethane-1, 2-diamine is a chelating ligand.
- (B) Metallic aluminium is produced by electrolysis of aluminium oxide in presence of cryolite.
- (C) Cyanide ion is used as ligand for leaching of silver.
- (D) Phosphine acts as a ligand in Wilkinson catalyst.
- (E) The stability constants of Ca^{2+} and Mg^{2+} are similar with EDTA complexes.

Choose the correct answer from the options given below :

- (1) (B), (C), (E) only
- (2) (A), (D), (E) only
- (3) (A), (B), (C) only
- (4) (C), (D), (E) only

Question ID : 533543894

Ans. Official Answer NTA (3)

Sol.

20. Match List-I with List-II.

List-I

Species

(A) Cr^{+2}

(B) Mn^+

(C) Ni^{+2}

(D) V^+

List-II

Electronic distribution

(I) $3d^8$

(II) $3d^34s^1$

(III) $3d^4$

(IV) $3d^54s^1$

Choose the correct answer from the options given below :

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

Question ID : 533543892

Ans. Official Answer NTA (4)

Sol.

21. The total number of molecular orbitals formed from 2s and 2p atomic orbitals of a diatomic molecule is ____.

Question ID : 533543908

Ans. Official Answer NTA (8)

Sol.

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22. 0.05 cm thick coating of silver is deposited on a plate of 0.05 m^2 area. The number of silver atoms deposited on plate are _____ $\times 10^{23}$. (At mass Ag = 108, $d = 7.9 \text{ g cm}^{-3}$)

Question ID : 533543912

Ans. Official Answer NTA (11)

Sol.

23. $2\text{MnO}_4^- + \text{bI}^- + \text{cH}_2\text{O} \rightarrow \text{xI}_2 + \text{yMnO}_2 + \text{zOH}^-$

If the above equation is balanced with integer coefficients, the value of z is _____.

Question ID : 533543911

Ans. Official Answer NTA (8)

Sol.

24. The pH at which $\text{Mg}(\text{OH})_2$ [$K_{\text{sp}} = 1 \times 10^{-11}$] begins to precipitate from a solution containing 0.10 M Mg^{2+} ions is _____.

Question ID : 533543910

Ans. Official Answer NTA (9)

Sol.

25. The rate of first order reaction is $0.04 \text{ mol L}^{-1} \text{ s}^{-1}$ at 10 minutes and $0.03 \text{ mol L}^{-1} \text{ s}^{-1}$ at 20 minutes after initiation. Half life of the reaction is _____ minutes. (Given $\log 2 = 0.3010$, $\log 3 = 0.4771$)

Question ID : 533543913

Ans. Official Answer NTA (24)

Sol.

26. If IUPAC name of an element is "Unununnium" then the element belongs to n^{th} group of Periodic table. The value of n is _____.

Question ID : 533543914

Ans. Official Answer NTA (11)

Sol.

27. The mass of sodium acetate (CH_3COONa) required to prepare 250 mL of 0.35 M aqueous solution is _____ g. (Molar mass of CH_3COONa is 82.02 g mol^{-1})

Question ID : 533543907

Ans. Official Answer NTA (7)

Sol.

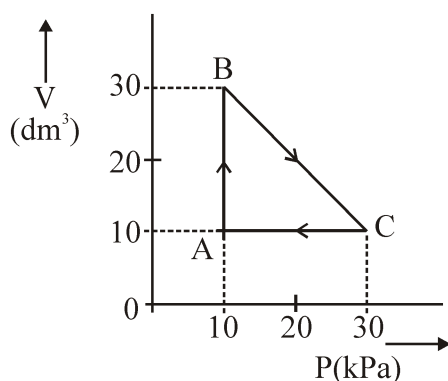
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28.



An ideal gas undergoes a cyclic transformation starting from the point A and coming back to the same point by tracking the path $A \rightarrow B \rightarrow C \rightarrow A$ as shown in the diagram above. The total work done in the process is _____ J.

Question ID : 533543909

Ans. Official Answer NTA (200)

Sol.

29. On a thin layer chromatographic plate, an organic compound moved by 3.5 cm, while the solvent moved by 5 cm. The retardation factor of the organic compound is _____ $\times 10^{-1}$.

Question ID : 533543915

Ans. Official Answer NTA (7)

Sol.

30. The compound formed by the reaction of ethanal with semicarbazide contains _____ number of nitrogen atoms.

Question ID : 533543916

Ans. Official Answer NTA (3)

Sol.