JEE Main January 2024

Question Paper With Text Solution

29 January | Shift-1

CHEMISTRY

1. Appearance of blood red colour, on treatment of the sodium fusion extract of an organic compound with $FeSO_4$ in presence of concentrated H_2SO_4 indicates the presence of element/s

    (1) N and S   (2) Br   (3) S   (4) N

Question ID: 405859905

Ans.   Official Answer NTA (1)

Sol.

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

    Assertion A : The first ionisation enthalpy decreases across a period.

    Reason R : The increasing nuclear charge outweighs the shielding across the period.

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

    (1) A is false but R is true

    (2) A is true but R is false

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

    (4) Both A and R are true and R is the correct explanation of A

Question ID: 405859898

Ans.   Official Answer NTA (1)

Sol.

3. In alkaline medium, MnO_4^- oxidises I^- to

    (1) I_2 (2) IO^- (3) IO_3^- (4) IO_4^-

Question ID: 405859902

Ans.   Official Answer NTA (3)

Sol.

4. Chlorine undergoes disproportionation in alkaline medium as shown below :

    a $Cl_2(g)$ + b $OH^-_{(aq)}$ → c $ClO^-_{(aq)}$ + d $Cl^-_{(aq)}$ + e $H_2O(1)$

    The values of a, b, c and d in a balanced redox reaction are respectively :

    (1) 3, 4, 4 and 2

    (2) 2, 2, 1 and 3

    (3) 2, 4, 1 and 3

    (4) 1, 2, l and 1

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Question ID: 405859897

Ans.   Official Answer NTA (4)

Sol.

5.   Identify product A and product B :
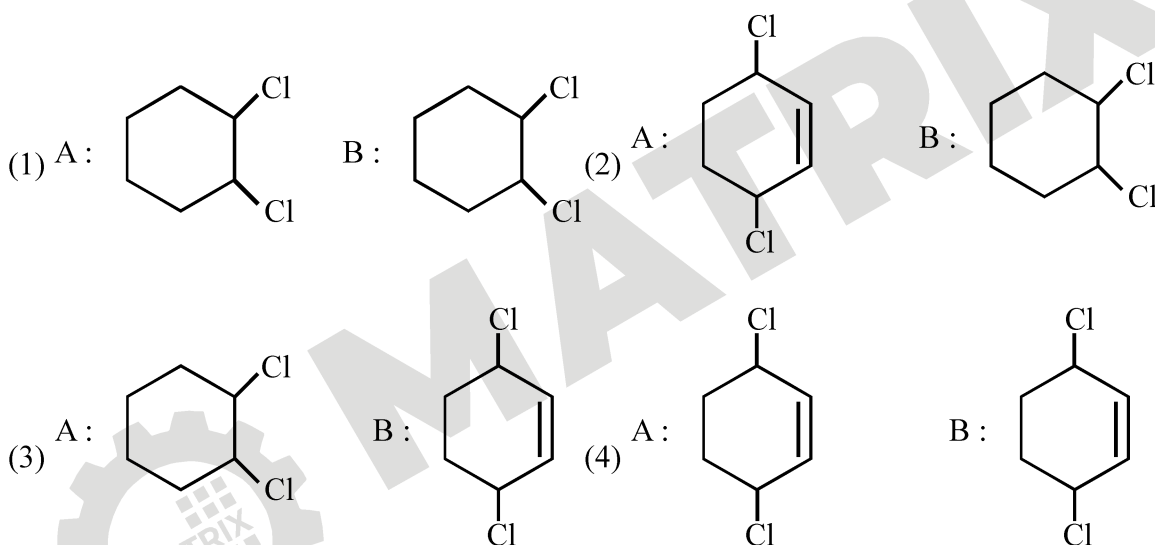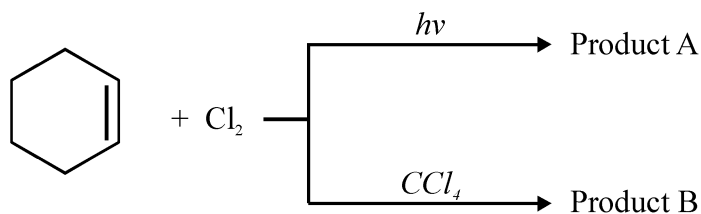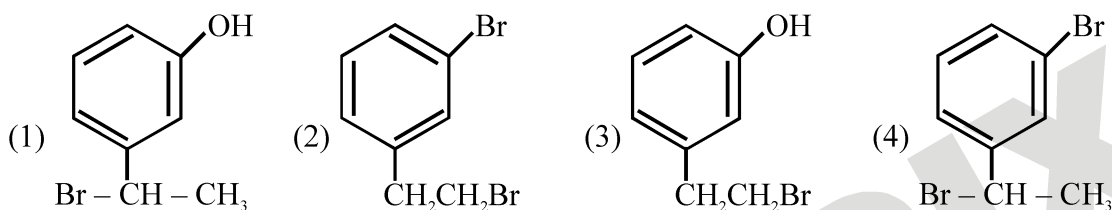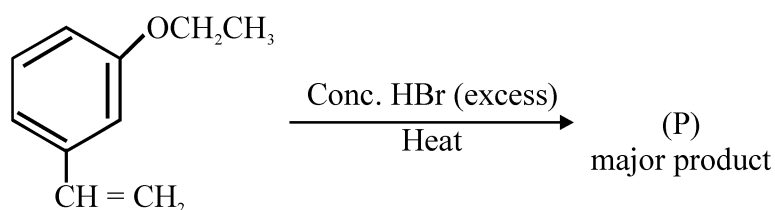

Question ID: 405859908

Ans.   Official Answer NTA (2)

Sol.

6. The major product (P) in the following reaction is

$\xrightarrow[\text{Heat}]{\text{Conc. HBr (excess)}}$ (P) major product

(1) [phenol with Br–CH–CH₃ substituent]

(2) [bromobenzene with CH₂CH₂Br substituent]

(3) [phenol with CH₂CH₂Br substituent]

(4) [bromobenzene with Br–CH–CH₃ substituent]

Question ID: 405859911

Ans.   Official Answer NTA (1)

Sol.

7. The arenium ion which is not involved in the bromination of Aniline is _____.
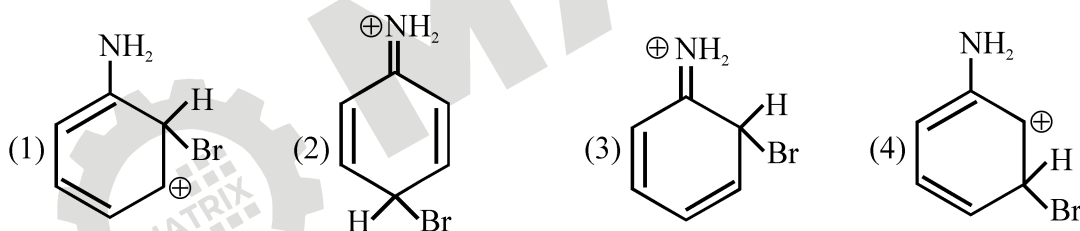
(1)   (2)   (3)   (4)

Question ID: 405859914

Ans.   Official Answer NTA (4)

Sol.

8. Type of amino acids obtained by hydrolysis of proteins is

(1) α   (2) δ   (3) β   (4) γ

Question ID: 405859912
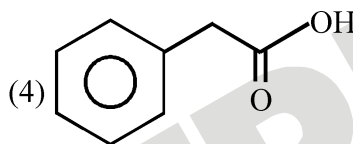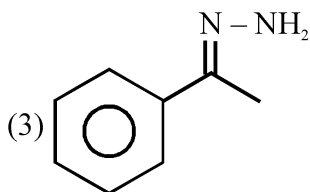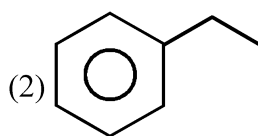
Ans.   Official Answer NTA (1)

Sol.

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9. The final product A formed in the following multistep reaction sequence is

(i) H_2O, $H^\oplus$
(ii) CrO_3
(iii) $H_2N - NH_2$, KOH Heating
$\longrightarrow$ A

(1)

(2)

(3)

(4)
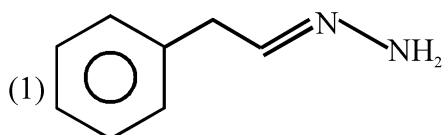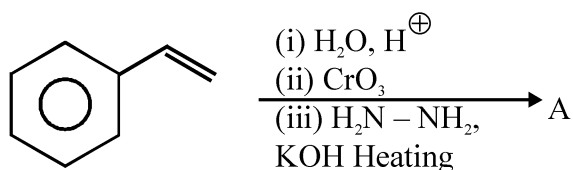
Question ID: 405859910

Ans. Official Answer NTA (2)

Sol.

10. The correct set of four quantum numbers for the valence electron of rubidium atom (Z = 37) is :

(1) $5, 0, 1, +\dfrac{1}{2}$

(2) $5, 0, 0, +\dfrac{1}{2}$

(3) $5, 1, 0 +\dfrac{1}{2}$

(4) $5, 1, 1, +\dfrac{1}{2}$

Question ID: 405859895

Ans. Official Answer NTA (2)

Sol.

11. Which of the following is not correct?

(1) ΔG is negative for a spontaneous reaction

(2) ΔG is positive for a non-spontaneous reaction

(3) ΔG is zero for a reversible reaction

(4) ΔG is positive for a spontaneous reaction

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Question ID: 405859896

Ans.   Official Answer NTA (4)

Sol.

12.   In chromyl chloride test for confirmation of Cl^- ion, a yellow solution is obtained. Acidification of the solution and addition of amyl alcohol and 10 % H_2O_2 turns organic layer blue indicating formation of chromium pentoxide. The oxidation state of chromium in that is

(1) + 10

(2) + 6

(3) + 3

(4) + 5

Question ID: 405859913

Ans.   Official Answer NTA (2)

Sol.

13.   The difference in energy between the actual structure and the lowest energy resonance structure for the given compound is

(1) resonance energy

(2) hyperconjugation energy

(3) ionization energy

(4) electromeric energy

Question ID: 405859907

Ans.   Official Answer NTA (1)

Sol.

14. $KMnO_4$ decomposes on heating at 513K to form O_2 along with

(1) K_2MnO_4 & Mn

(2) K_2MnO_4 & MnO_2

(3) Mn & KO_2

(4) MnO_2 & K_2O_2

Question ID: 405859901

Ans.   Official Answer NTA (2)

Sol.

15. The interaction between π bond and lone pair of electrons present on an adjacent atom is responsible for

    (1) Inductive effect

    (2) Electromeric effect

    (3) Hyperconjugation

    (4) Resonance effect

Question ID: 405859906

Ans.   Official Answer NTA (4)

Sol.

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

    Assertion A : Aryl halides cannot be prepared by replacement of hydroxyl group of phenol by halogen atom.

    Reason R : Phenols react with halo gen acids violently.

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

    (1) Both A and R are true but R is NOT the correct explanation of A

    (2) A is false but R is true

    (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: 405859909

Ans.   Official Answer NTA (3)

Sol.

17. In which one of the following metal carbonyls, CO forms a bridge between metal atoms?

    (1) $[Ru_3(CO)_{12}]$

    (2) $[Co_2(CO)_8]$

    (3) $[Mn_2(CO)_{10}]$

    (4) $[Os_3(CO)_{12}]$

Question ID: 405859903

Ans.   Official Answer NTA (2)

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Sol.

18.   Given below are two statements :

Statement I : The electronegativity of group 14 elements from Si to Pb, gradually decreases.

Statement II : Group 14 contains non-metallic, metallic, as well as metalloid elements.

In the light of the above statements, choose the most appropriate 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: 405859900

Ans.   Official Answer NTA (2)

Sol.

19.   Identify the incorrect pair from the following :

(1) Fluoroapatite – $3\ Ca_3(PO_4)_2.CaF_2$

(2) Cryolite – Na_3AlF_6

(3) Carnallite – $KCl.MgCl_2.6H_2O$

(4) Fluorspar – BF_3

Question ID: 405859899

Ans.   Official Answer NTA (4)

Sol.

20.   Match List I with List II

LIST I (Substances)	LIST II (Element Present)
A. Ziegler catalyst	I. Rhodium
B. Blood Pigment	II. Cobalt
C. Wilkinson catalyst	III. Iron
D. Vitamin B_{12}	IV. Titanium

Choose the correct answer from the options given below:

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

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

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

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

Question ID: 405859904

Ans.   Official Answer NTA (4)

Sol.

21.   For the reaction $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$, $K_p = 0.492$ atm at 300 K. K_c for the reaction at same temperature is

_____ $\times 10^{-2}$. (Given : R = 0.082 L atm mol^{-1} K^{-1})

Question ID: 405859919
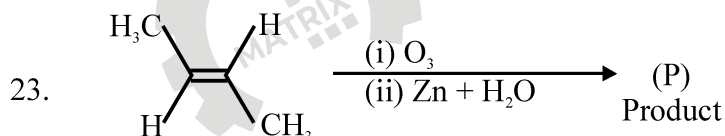
Ans.   Official Answer NTA (2)

Sol.

22.   The number of species from the following which are paramagnetic and with bond order equal to one is _____.

H_2, He_2^+, O_2^+, N_2^{2-}, O_2^{2-}, F_2, Ne_2^+, B_2

Question ID: 405859916

Ans.   Official Answer NTA (1)

Sol.

23.

Consider the given reaction. The total number of oxygen atom/s peresent per molecule of the product (P) is

_____.

Question ID: 405859923

Ans.   Official Answer NTA (1)

Sol.

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24. For a reaction taking place in three steps at same temperature, overall rate constant $K = \dfrac{K_1 K_2}{K_3}$. If Ea_1, Ea_2 and Ea_3 are 40, 50 and 60 kJ/mol respectively, the overall Ea is _____ kJ/mol.

Question ID: 405859921

Ans.   Official Answer NTA (30)

Sol.

25. From the compounds given below, number of compounds which give positive Fehling's test is _____.
Benzaldehyde, Acetaldehyde, Acetone, Acetophenone, Methanal, 4-nitrobenzaldehyde, cyclohexane carbaldehyde.

Question ID: 405859924

Ans.   Official Answer NTA (3)

Sol.

26. Number of compounds among the following which contain sulphur as heteroatom is _____.
Furan, Thiophene, Pyridine, Pyrrole, Cysteine, Tyrosine

Question ID: 405859922

Ans.   Official Answer NTA (2)

Sol.

27. The mass of zinc produced by the electrolysis of zinc sulphate solution with a steady current of 0.015 A for 15 minutes is _____ $\times 10^{-4}$ g.
(Atomic mass of zinc = 65.4 amu)

Question ID: 405859920

Ans.   Official Answer NTA (46)

Answer by Matrix is (45.75), But As per Information bulletine issued by NTA for Jee Main 2024 report your answer as nearest integer.

Sol.

28. The osmotic pressing of a dilute solution is 7×10^5 Pa at 273K. Osmotic pressure of the same solution at 283K is _____ $\times 10^4$ Nm^{-2}.

Question ID: 405859918

Ans.   Official Answer NTA (73)

Answer by Matrix is (72.56), But As per Information bulletine issued by NTA for Jee Main 2024 report your

answer as nearest integer.

Sol.

29.   Number of compounds with one lone pair of electrons on central atom amongst following is _____ .

O_3, H_2O, SF_4, ClF_3, NH_3, BrF_5, XeF_4

Question ID: 405859917

Ans.   Official Answer NTA (4)

Sol.

30.   A solution of H_2SO_4 is 31.4% H_2SO_4 by mass and has a density of 1.25g/mL. The molarity of the H_2SO_4

solution is _____ M (nearest integer)

[Given molar mass of H_2SO_4 = 98g mol^{-1}]

Question ID: 405859915

Ans.   Official Answer NTA (4)

Sol.