

General Instructions

- (i) This question paper contains 50 questions. All questions are compulsory.
- (ii) It comprises 50 single-correct multiple-choice questions.
- (iii) These questions follow the CUET (UG) examination pattern.
- (iv) Each correct answer is awarded +5 marks, with -1 for an incorrect answer.
- (v) The time allotted for this paper is 60 minutes.
- (vi) Attempt every question; detailed solutions are provided in the companion solutions booklet.

1. Water movement from soil into plant roots and subsequently into upper portion of the plant is partly due to phenomenon of

- (A) Edema
- (B) Osmosis
- (C) Reverse Osmosis
- (D) Evaporation

2. Which of the following compound is used as paint remover?

- (A) Methylene chloride
- (B) Iodoform
- (C) Chloroform
- (D) 2,4-dinitrophenylhydrazine

3. 2-Bromopentane reacts with alcoholic KOH to form major product as:

- (A) Pent-1-ene
 - (B) Pent-2-ene
 - (C) Pent-3-ene
 - (D) Pent-1-ene and Pent-2-ene
-

4. Which of the following salts would have the same value of the van't Hoff factor as that of $Al(NO_3)_3$ in aqueous solution?

Assume complete dissociation of electrolytes.

- (A) K_2SO_4
- (B) KCl
- (C) $Al_2(SO_4)_3$
- (D) $K_3[Fe(CN)_6]$

Choose the **correct** answer from the options given below:

- (A) (A) and (B) only
 - (B) (B) and (C) only
 - (C) (D) only
 - (D) (C) and (D) only
-

5. Which of the following statements are **true** for the elevation of boiling point?

- (A) The boiling point of a solution is always higher than the boiling point of the pure solvent in which the solution is prepared.
- (B) The boiling point of a solution is always lower than the boiling point of the pure solvent in which the solution is prepared.
- (C) The elevation of boiling point is directly proportional to the molal concentration of the solute in solution.
- (D) Unit of $K_b = \text{K kg mol}^{-1}$

Choose the *correct* answer from the options given below:

- (A) (A), (B) and (D) only
- (B) (B), (C) and (D) only
- (C) (A), (B), (C) and (D)
- (D) (A), (C) and (D) only

6. Match **List-I** with **List-II**

List-I	List-II
(A) Osmotic pressure	(I) Formation of bubbles of nitrogen in the blood
(B) Anoxia	(II) Pressure applied on the solution side that just stops the flow of solvent
(C) Bends	(III) Impermeable to impurities
(D) Cellulose acetate	(IV) Low blood oxygen causes climbers to become weak

Choose the **correct** answer from the options given below:

- (A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
 (B) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
 (C) (A) - (II), (B) - (IV), (C) - (I), (D) - (III)
 (D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
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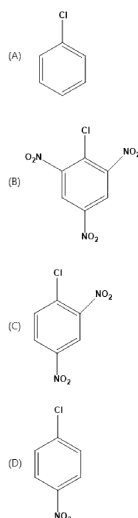
7. Match **List-I** with **List-II**

List-I	List-II
Type of solution	Example
(A) Ideal solution	(I) 95% by volume of ethanol
(B) Positive deviation from Raoult's law	(II) Bromoethane and chloroethane
(C) Negative deviation from Raoult's law	(III) Ethanol and acetone
(D) Azeotrope	(IV) Phenol and aniline

Choose the **correct** answer from the options given below:

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

8. Arrange the following compounds in increasing order towards nucleophilic substitution reaction .



Choose the **correct** answer from the options given below:

- (A) (A),(B),(C),(D)
- (B) (A),(D),(C) ,(B)
- (C) (D),(B),(C),(A)
- (D) (B),(A),(C),(D)

9. Chloroform oxidizes in the presence of light to

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

10. The constant 'k' in a rate law expression of a reaction is

- (A) is dependent on the concentration of reactants.
(B) is dimensionless.
(C) dependent on temperature.
(D) called the Arrhenius constant.
-

11. Match List-I with List -II

List-I (Chemical Reactions)	List-II (Characteristic Feature)
(A) Substitution nucleophilic unimolecular	(I) Anti- Markovnikov's product
(B) Electrophilic addition of HX to unsymmetrical alkene	(II) Inversion
(C) Substitution nucleophilic bimolecular	(III) Racemization
(D) Hydroboration oxidation	(IV) Markovnikov's product

Choose the **correct** answer from the options given below:

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

12. Hydrogenation of ethene represented by ,
 $\text{C}_2\text{H}_4 (\text{g}) + \text{H}_2 (\text{g}) \rightarrow \text{C}_2\text{H}_6 (\text{g})$
is an example of

- (A) Second order reaction.
 - (B) First order reaction.
 - (C) Zero-order reaction.
 - (D) Third Order reaction.
-

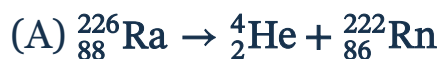
13. Species that are formed in one step of reaction mechanism and used up in another step are called

- (A) catalysts
 - (B) inhibitors
 - (C) intermediates
 - (D) promoters
-

14. Choose the **Incorrect** statement from the following:

- (A) Two series of *f*-block; lanthanoids and actinoids collectively consists of twenty eight elements.
 - (B) All the lanthanoids are hard metals
 - (C) Actinoid contraction is greater from element to element than lanthanoid contraction
 - (D) Actinoids show a greater range of oxidation states than lanthanoids
-

15. Among the following, which are examples of first-order reactions?



Choose **the correct** answer from the options given below:

(A) (A), (B) and (D) only

(B) (A) and (C) only

(C) (B), (C) and (D) only

(D) (A), (C) and (D) only

16. Arrange the following rate expressions (of hypothetical reactions) in the increasing arrangement of their order of reaction:

Assume the concentrations of A and B in all the rate expressions is same.

(A) $\text{Rate} = k [\text{A}]^{1/2} [\text{B}]^{3/2}$

(B) $\text{Rate} = k [\text{A}]^{1/2} [\text{B}]^{1/2}$

(C) $\text{Rate} = k [\text{A}]^{3/2} [\text{B}]^{-1}$

(D) $\text{Rate} = k [\text{A}]^2 [\text{B}]^1$

Choose the **correct** answer from the options given below:

(A) (A), (B), (C), (D)

(B) (C), (B), (A), (D)

(C) (B), (A), (D), (C)

(D) (C), (B), (D), (A)

17. The electronic configuration of Co^{3+} metal ion is.....

- (A) $3d^5 4s^1$
- (B) $3d^6 4s^0$
- (C) $3d^4 4s^2$
- (D) $3d^3 4s^2 4p^1$

18. When Manganese (II) reacts with peroxodisulphate, the respective products obtained are:

- (A) MnO_4^{2-} only
- (B) MnO_4^- and SO_4^{2-}
- (C) MnO_2 and $\text{S}_2\text{O}_4^{2-}$
- (D) MnO_4^{2-} and SO_4^{2-}

19. The most stable oxidation state of titanium is

- (A) Ti^{3+}
 - (B) Ti^{2+}
 - (C) Ti^{4+}
 - (D) Ti^{5+}
-

20. Potassium dichromate ($K_2Cr_2O_7$) is a strong oxidizing agent. Select the **correct** statements from the following:

- (A) It is used for preparation of many azo compounds.
- (B) With the decreasing pH of the solution, dichromates changes into chromates.
- (C) In acidified solution equivalent weight of dichromate is $M/5$
- (D) The bond angle between Cr-O-Cr is 126° .

Choose the **correct** answer from the options given below:

- (A) (A), (B) and (D) only
- (B) (A), (C) and (D) only
- (C) (A) and (D) only
- (D) (B), (C) and (D) only

21. Which of the following is the correct IUPAC name for the $[Pt(NH_3)_2Cl(NO_2)]$ coordination compound?

- (A) Diamminechloridonitrito-N-platinum(II)
- (B) Diamminechloridonitrido-N-platinum(III)
- (C) Diamminechloridonitrito-N-platinate(II)
- (D) Diamminechloridenitrido-N-platinum(II)

22. Which one of the following compounds does not show geometrical isomerism?

- (A) MnO_4^-
- (B) $[\text{Fe}(\text{NH}_3)_2(\text{CN})_4]^-$
- (C) $[\text{CrCl}_2(\text{ox})_2]^{3-}$
- (D) $[\text{CoCl}_2(\text{en})_2]$

23. Which of the following hybridisation is **correct** for $[\text{FeF}_6]^{3-}$?

- (A) sp^3d^2 with 1 unpaired electrons
- (B) sp^3d^2 with 5 unpaired electrons
- (C) d^2sp^3 with 1 unpaired electrons
- (D) d^2sp^3 with 5 unpaired electrons

24. Match **List-I** with **List-II**

List-I	List-II
(A) ion or molecule having two different donor atoms and either of the two ligates in the complex	(I) central atom or ion
(B) In a coordination entity, the atom/ion to which a fixed number of ions/groups are bound in a definite geometrical arrangement	(II) Chelate ligand
(C) ion or molecule using its two or more donor atoms simultaneously to bind a single metal ion	(III) Ambidentate ligand
(D) ion or molecule bound to the central atom/ion through two donor atoms	(IV) Didentate ligand

Choose the **correct** answer from the options given below:

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

25. In nucleophilic addition reaction of HCN to ethanal, the hybridisation of the carbonyl carbon in the final product is

- (A) sp^3
(B) sp^2
(C) sp^2d
(D) spd^2
-

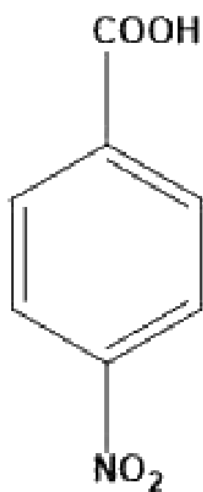
26. Arrange the following complex ions in **increasing** order of their wavelength of light absorbed:

- (A) $[Co(CN)_6]^{3-}$
(B) $[Co(NH_3)_6]^{3+}$
(C) $[Co(F_6)]^{3-}$
(D) $[Co(C_2O_4)]^{3-}$

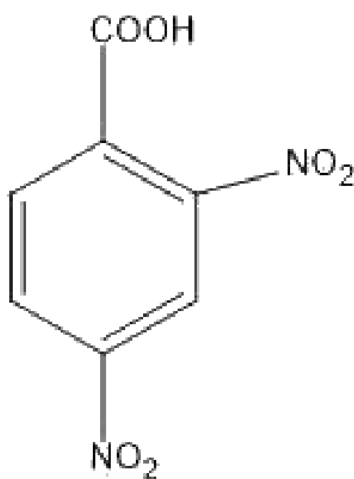
Choose the **correct** answer from the options given below:

- (A) (A), (B), (D), (C)
(B) (A), (D), (B), (C)
(C) (D), (B), (A), (C)
(D) (C), (D), (B), (A)
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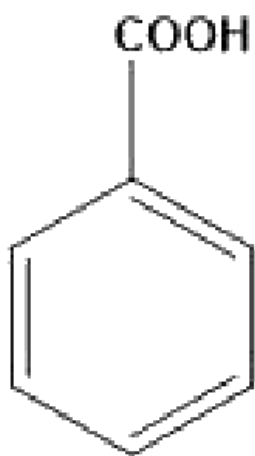
27. The correct increasing order of acidity of the following molecules is
(A)



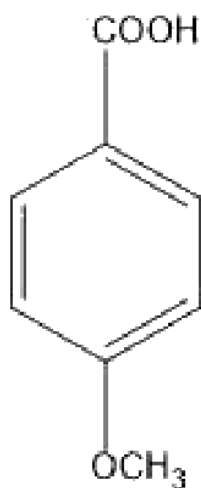
(B)



(C)



(D)



Choose the **correct** answer from the options given below:

- (A) (A), (B), (C), (D)
- (B) (D), (C), (A), (B)
- (C) (B), (A), (D), (C)
- (D) (C), (B), (D), (A)

28. Conversion of carboxylic acid to hydrocarbon is carried out using

- (A) $KMnO_4$
 - (B) $LiAlH_4$ and ether
 - (C) NaOH and CaO
 - (D) B_2H_6 (Diborane)
-

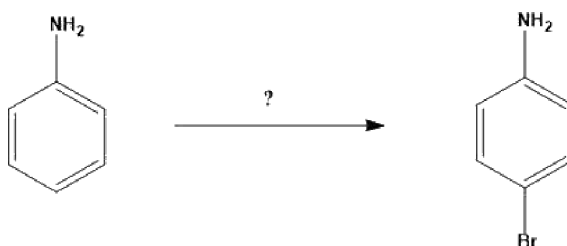
29. Sodium benzoate finds applications in

- (A) Perfumes
 - (B) Nylon 6,6
 - (C) Soaps and detergents
 - (D) Food preservatives
-

30. Iodoform reaction with sodium hypoiodite is used for detection of .

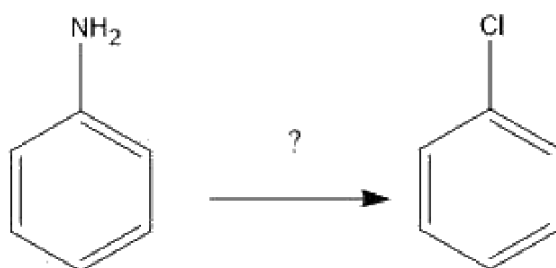
- (A) CH_3CO group
 - (B) CH_3CO and $CH_3CH(OH)$ groups
 - (C) CH_3O group
 - (D) $(CH_3)_3CO$ group
-

31. The first step in conversion of aniline to 4-bromoaniline involves



- (A) Acetylation of amino group
 - (B) Formation of diazonium salt in the presence of NaNO_2 and HCl .
 - (C) Reaction with Bromine water at room temperature.
 - (D) Reaction with Bromine in the presence of NaOH .
-

32. Which of the following reagents will bring out the following transformation ?



- (A) NaNO_2/HCl and Cu/HCl
- (B) $\text{NaNO}_2/\text{NaOH}$ and Cu/HCl
- (C) NaNO_2/HCl and $\text{Cu}_2\text{Cl}_2/\text{HCl}$
- (D) $\text{NaNO}_2/\text{NaOH}$ and $\text{Cu}_2\text{Cl}_2/\text{HCl}$

Choose the **correct** answer from the options given below:

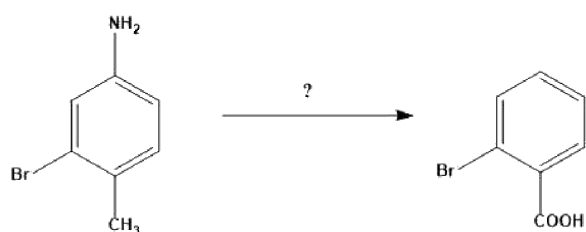
- (A) (A) and (C) only
 - (B) (A), (B) and (D) only
 - (C) (A), (B), (C) and (D)
 - (D) (B), (C) and (D) only
-

33. Amongst the following, the strongest base in the aqueous medium is :

- (A) CH_3NH_2
- (B) NCCH_2NH_2
- (C) $(\text{CH}_3)_2\text{NH}$
- (D) $\text{C}_6\text{H}_5\text{NHCH}_3$



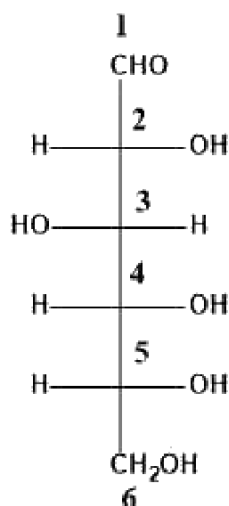
34. Select the correct set of reagents required for conversion of the following chemical reactions



- (A) (i). NaNO_2/HCl , 273-278 K (ii). H_3PO_4 , H_2O (iii). KMnO_4 and KOH
- (B) (i). NaNO_2/HCl (ii). H_3PO_4 (iii). $\text{NaOH}/\text{H}_2\text{O}$
- (C) (i). $\text{HNO}_3/\text{H}_2\text{SO}_4$ (ii). H_3PO_4 (iii). KMnO_4 and KOH
- (D) (i). NaNO_2/HCl (ii). Sn/HCl (iii). KMnO_4 and KOH



35. -OH group at which carbon center of glucose form a pyranose ring structure?



- (A) C₆
 - (B) C₄
 - (C) C₃
 - (D) C₅
-

36. Gabriel phthalimide synthesis of amines produces

- (A) tertiary amines.
 - (B) secondary amines.
 - (C) primary amines.
 - (D) aromatic secondary amines.
-

37. Peptide bond in proteins is structurally represented as

- (A) -CO-NH-
 - (B) -COO-NH-
 - (C) -C-O-C-
 - (D) -C-O-CO-
-

38. Fibrous protein is characterized by the presence of hydrogen and disulfide bonds. Examples of fibrous protein are

- (A) Keratin
- (B) Myosin
- (C) Insulin
- (D) Albumins

Choose the **correct** answer from the options given below:

- (A) (A), (B) and (D) only
 - (B) (A) and (B) only
 - (C) (A), (B), (C) and (D)
 - (D) (C) and (D) only
-

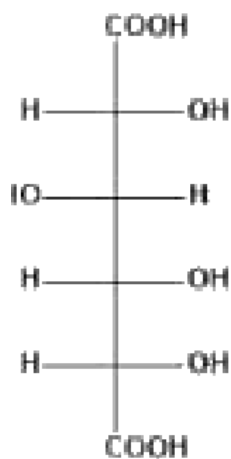
39. Match List-I with List-II

List-I (Name of the Compounds)

List-II (Chemical Structures)

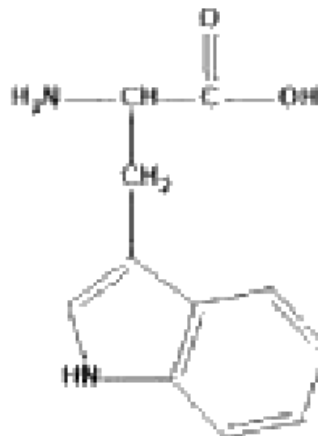
(A) Gluconic acid

(I)



(B) Fructose

(II)

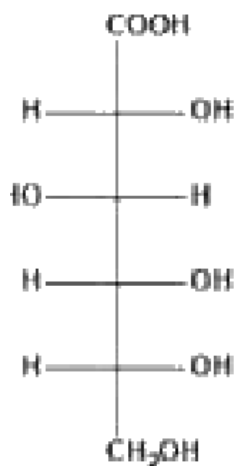


(C) Tryptophan

(III)

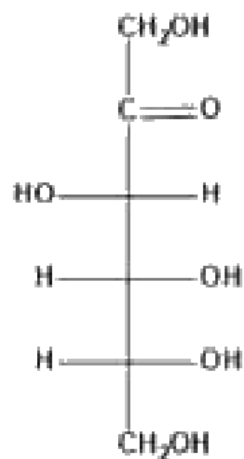
List-I (Name of the Compounds)

List-II (Chemical Structures)



(IV)

(D) Saccharic acid

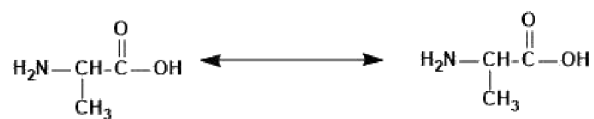


Choose the **correct** answer from the options given below:

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

40. Which of the following gives the correct representation of zwitter ion of the given amino acid ?

(A)



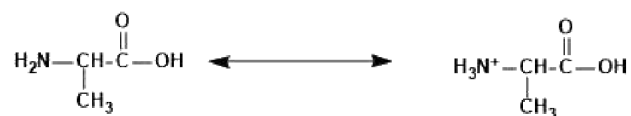
(B)



(C)



(D)



41. Electrochemical cells

We can construct innumerable number of galvanic cells on the pattern of Daniell cell by taking combinations of different half-cells. Each half-cell consists of a metallic electrode dipped into an electrolyte. The two half-cells are connected by a metallic wire through a voltmeter and a switch externally. The electrolytes of the two half-cells are connected internally through a salt bridge. Sometimes, both the electrodes dip in the same electrolyte solution and in such cases we do not require a salt bridge.

For the cell



The cell reaction is $\text{Ni(s)} + 2\text{Ag}^{+}(\text{aq}) \rightarrow \text{Ni}^{2+}(\text{aq}) + 2\text{Ag(s)}$.

Nernst equation relates the emf of the cell with standard emf and the concentration of reduced and oxidized species.

The Nernst equation for the given reaction



$$(A) \quad E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{2F} \ln \frac{[\text{Ni}^{2+}]}{[\text{Ag}^{+}]^2}$$

$$(B) \quad E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{2F} \ln \frac{[\text{Ni}^{2+}]}{[\text{Ag}^{+}]}$$

$$(C) \quad E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{F} \ln \frac{[\text{Ni}^{2+}]}{[\text{Ag}^{+}]}$$

$$(D) \quad E_{\text{cell}} = E_{\text{cell}}^{\circ} + \frac{RT}{F} \ln \frac{[\text{Ni}^{2+}]}{[\text{Ag}^{+}]}$$

42. Electrochemical cells

We can construct innumerable number of galvanic cells on the pattern of Daniell cell by taking combinations of different half-cells. Each half-cell consists of a metallic electrode dipped into an electrolyte. The two half-cells are connected by a metallic wire through a voltmeter and a switch externally. The electrolytes of the two half-cells are connected internally through a salt bridge. Sometimes, both the electrodes dip in the same electrolyte solution and in such cases we do not require a salt bridge.

For the cell



The cell reaction is $\text{Ni(s)} + 2\text{Ag}^{+}(\text{aq}) \rightarrow \text{Ni}^{2+}(\text{aq}) + 2\text{Ag(s)}$.

Nernst equation relates the emf of the cell with standard emf and the concentration of reduced and oxidized species.

The standard electrode potential for the cell



is 0.80 V. The standard Gibbs energy for the reaction is:

- (A) $-154.379 \text{ kJ mol}^{-1}$
- (B) $154.379 \text{ kJ mol}^{-1}$
- (C) $212.2 \text{ kJ mol}^{-1}$
- (D) $-212.2 \text{ kJ mol}^{-1}$

43. Electrochemical cells

We can construct innumerable number of galvanic cells on the pattern of Daniell cell by taking combinations of different half-cells. Each half-cell consists of a metallic electrode dipped into an electrolyte. The two half-cells are connected by a metallic wire through a voltmeter and a switch externally. The electrolytes of the two half-cells are connected internally through a salt bridge. Sometimes, both the electrodes dip in the same electrolyte solution and in such cases we do not require a salt bridge.

For the cell



The cell reaction is $\text{Ni(s)} + 2\text{Ag}^{+}(\text{aq}) \rightarrow \text{Ni}^{2+}(\text{aq}) + 2\text{Ag(s)}$.

Nernst equation relates the emf of the cell with standard emf and the concentration of reduced and oxidized species.

The relationship between the equilibrium constant of the reaction and the standard electrode potential of the cell in which that reaction takes place is given by

$$(A) \quad E_{\text{cell}}^{\circ} = \frac{RT}{2.303 \times nF} \log K_c$$

$$(B) \quad E_{\text{cell}}^{\circ} = \frac{2.303RT}{nF} \log K_c$$

$$(C) \quad E_{\text{cell}}^{\circ} = \frac{2.303RT}{nF} \ln K_c$$

$$(D) \quad E_{\text{cell}}^{\circ} = 2.303RT \ln K_c$$



44. Electrochemical cells

We can construct innumerable number of galvanic cells on the pattern of Daniell cell by taking combinations of different half-cells. Each half-cell consists of a metallic electrode dipped into an electrolyte. The two half-cells are connected by a metallic wire through a voltmeter and a switch externally. The electrolytes of the two half-cells are connected internally through a salt bridge. Sometimes, both the electrodes dip in the same electrolyte solution and in such cases we do not require a salt bridge.

For the cell



The cell reaction is $\text{Ni(s)} + 2\text{Ag}^{+}(\text{aq}) \rightarrow \text{Ni}^{2+}(\text{aq}) + 2\text{Ag(s)}$.

Nernst equation relates the emf of the cell with standard emf and the concentration of reduced and oxidized species.

In the given cell,



which of the given species is the reducing agent?

- (A) $\text{Ni}^{2+}(\text{aq})$
- (B) Ni(s)
- (C) $\text{Ag}^{+}(\text{aq})$
- (D) Ag(s)

45. Electrochemical cells

We can construct innumerable number of galvanic cells on the pattern of Daniell cell by taking combinations of different half-cells. Each half-cell consists of a metallic electrode dipped into an electrolyte. The two half-cells are connected by a metallic wire through a voltmeter and a switch externally. The electrolytes of the two half-cells are connected internally through a salt bridge. Sometimes, both the electrodes dip in the same electrolyte solution and in such cases we do not require a salt bridge.

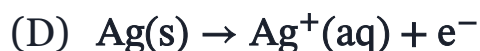
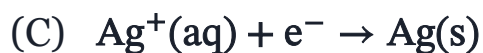
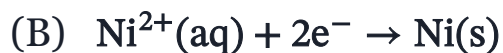
For the cell



The cell reaction is $\text{Ni(s)} + 2\text{Ag}^{+}(\text{aq}) \rightarrow \text{Ni}^{2+}(\text{aq}) + 2\text{Ag(s)}$.

Nernst equation relates the emf of the cell with standard emf and the concentration of reduced and oxidized species.

Which of the following is the anodic half cell reaction?

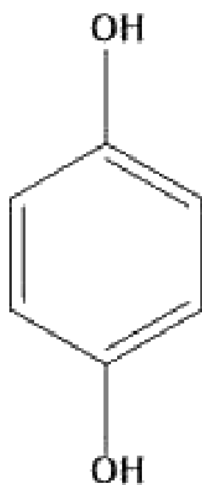


46. Alcohols, Phenols and Ethers

Alcohols and phenols are formed when a hydrogen atom in a hydrocarbon, aliphatic and aromatic respectively, is replaced by -OH group. These classes of compounds find wide applications in industry as well as in day-to-day life. For instance, have you ever noticed that ordinary spirit used for polishing wooden furniture is chiefly a compound containing hydroxyl group, ethanol. The sugar we eat, the cotton used for fabrics, the paper we use for writing, are all made up of compounds containing -OH groups. The common name of an alcohol is derived from the common name of the alkyl group and adding the word alcohol to it. For example, CH_3OH is methyl alcohol. The simplest hydroxy derivative of benzene is phenol. It is its common name and also an accepted IUPAC name. As structure of phenol involves a benzene ring, in its substituted compounds the terms ortho (1,2-disubstituted), meta (1,3-disubstituted) and para (1,4-disubstituted) are often used in the common names.

In ethers, the four electron pairs, i.e., the two bond pairs and two lone pairs of electrons on oxygen are arranged approximately in a tetrahedral arrangement. The bond angle is slightly greater than the tetrahedral angle due to the repulsive interaction between the two bulky (-R) groups.

What is the common name for the following structure given below?



- (A) Resorcinol
- (B) Catechol
- (C) Hydroquinone
- (D) m-cresol

47. Alcohols, Phenols and Ethers

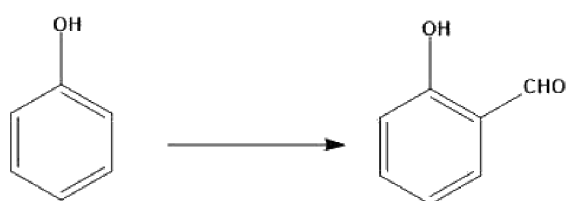
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In ethers, the four electron pairs, i.e., the two bond pairs and two lone pairs of electrons on oxygen are arranged approximately in a tetrahedral arrangement. The bond angle is slightly greater than the tetrahedral angle due to the repulsive interaction between the two bulky (-R) groups.

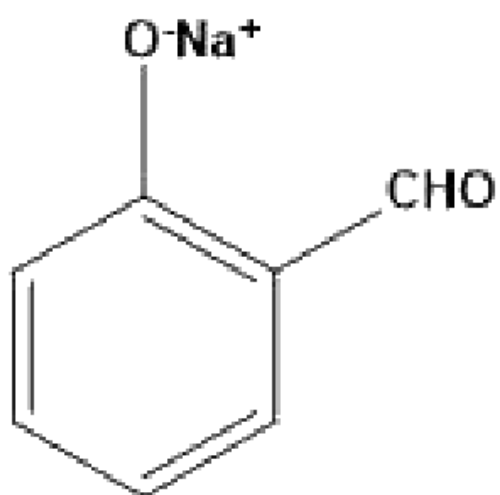
The catalyst involved in the production of methanol through hydrogenation of carbon monoxide is

- (A) $\text{ZnO-Cr}_2\text{O}_3$
- (B) ZnO/Pt
- (C) Anhyd. AlCl_3
- (D) Anhyd. FeCl_3

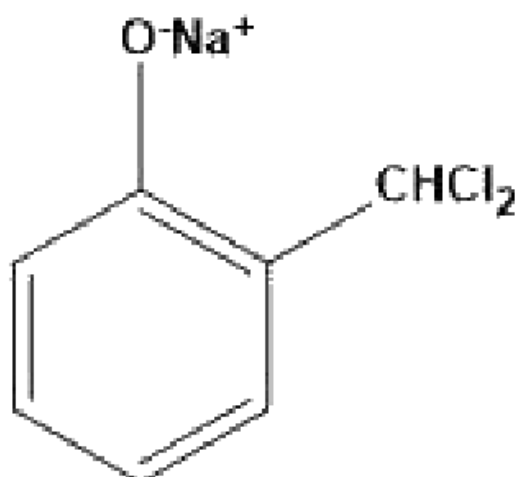
48. Consider the following chemical reaction and identify the intermediate involved in the reaction.



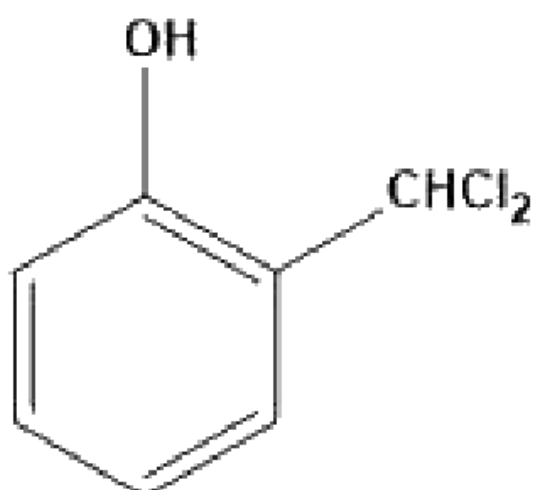
(A)



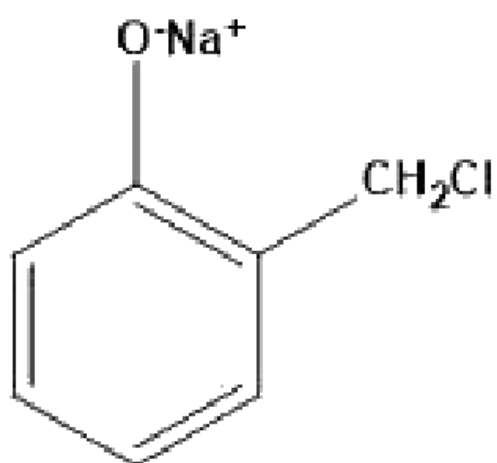
(B)



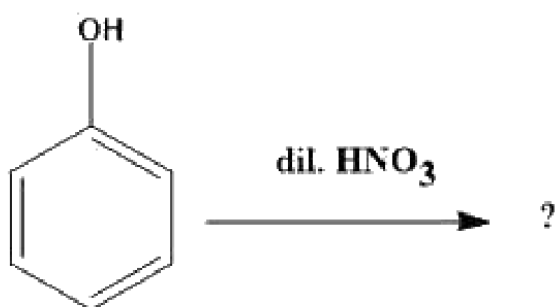
(C)



(D)

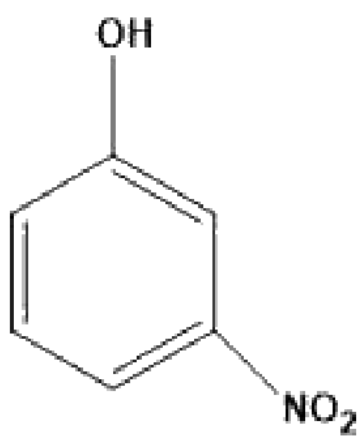


49. Consider the following chemical reaction and identify the final product(s)

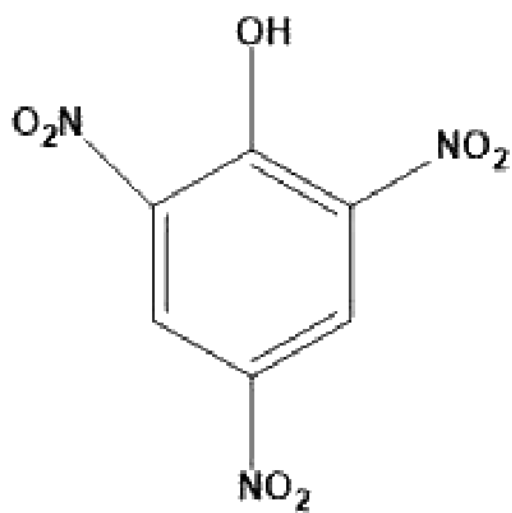


The final product(s) of the above reaction is

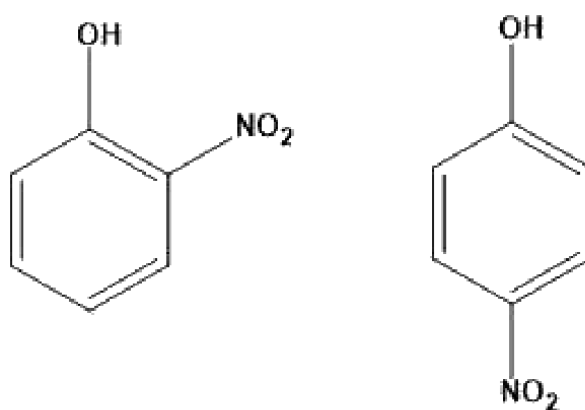
(A)



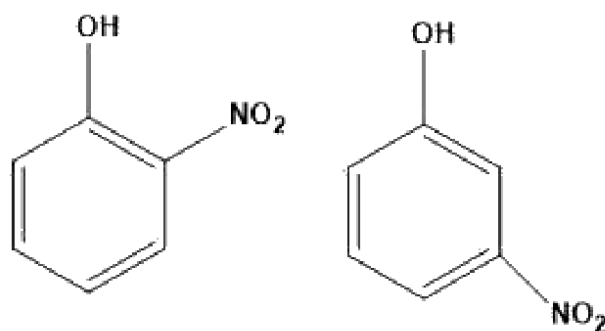
(B)



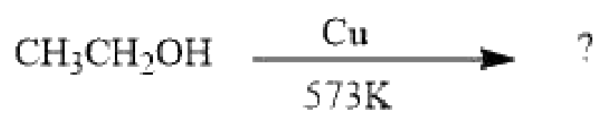
(C)



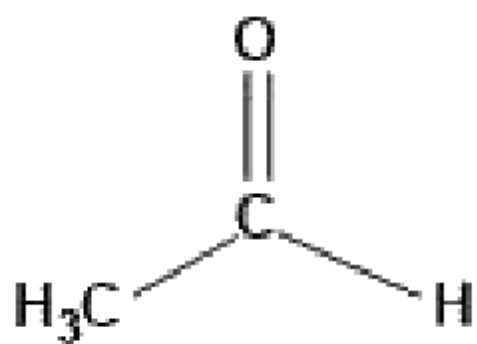
(D)



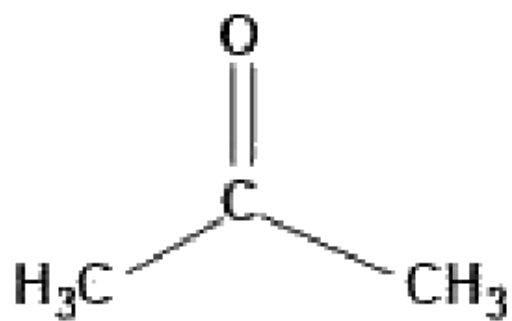
50. The final product for the following reaction is



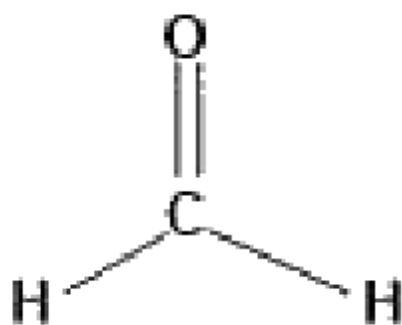
(A)



(B)



(C)



(D)

