# Amines JEE Main PYQ - 3

**Total Time:** 1 Hour : 15 Minute **Total Marks:** 120

## Instructions

## Instructions

1. Test will auto submit when the Time is up.
2. The Test comprises of multiple choice questions (MCQ) with one or more correct answers.
3. The clock in the top right corner will display the remaining time available for you to complete the examination.

### Navigating & Answering a Question

1. The answer will be saved automatically upon clicking on an option amongst the given choices of answer.
2. To deselect your chosen answer, click on the clear response button.
3. The marking scheme will be displayed for each question on the top right corner of the test window.

# Amines

**1.** A primary aliphatic amine on reaction with nitrous acid in cold (273 K) and there after raising temperature of reaction mixture to room temperature (298 K), gives **(+4, -1)**

**a.** nitrile

**b.** alcohol

**c.** diazonium salt

**d.** secondary amine

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**2.** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R). **(+4, -1)**

Assertion (A): Experimental reaction of $CH_3Cl$ with aniline and anhydrous $AlCl_3$ does not give o and p-methylaniline.

Reason (R): The $-NH_2$ group of aniline becomes deactivating because of salt formation with anhydrous $AlCl_3$ and hence yields m-methyl aniline as the product.

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

**a.** Both (A) and (R) are true and (R) is the correct explanation of (A).

**b.** Both (A) and (R) are true but (R) is not the correct explanation of (A).

**c.** (A) is true, but (R) is false.

**d.** (A) is false, but (R) is true.

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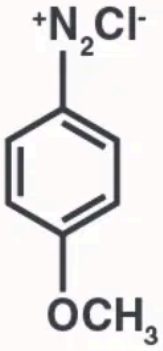
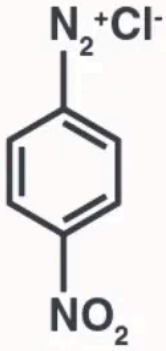
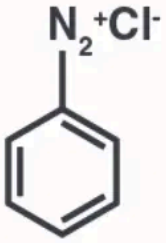
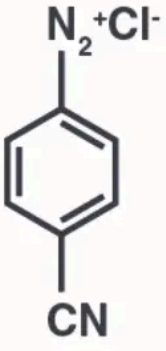
**3.** The correct stability order of the following diazonium salt is **(+4, -1)**

(A) 


(B) 


(C) 


(D) 


**a.** (A) > (B) > (C) > (D)

**b.** (A) > (C) > (D) > (B)

**c.** (C) > (A) > (D) > (B)

**d.** (C) > (D) > (B) > (A)

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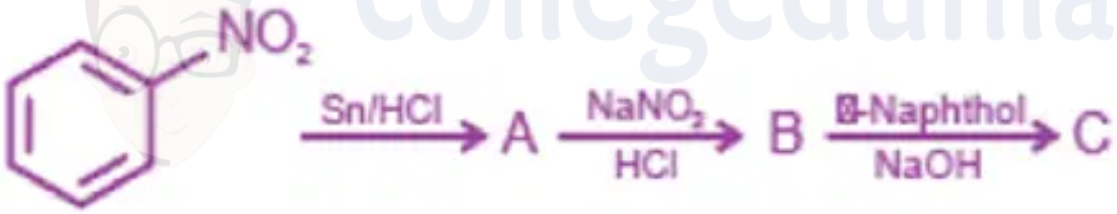
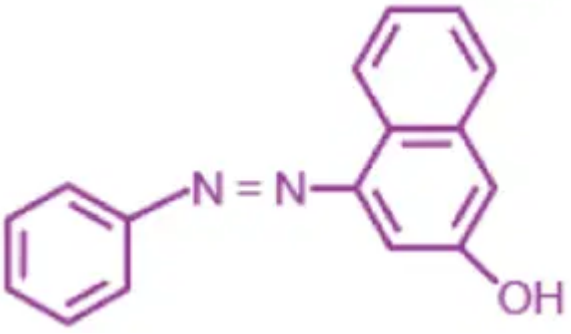
**4.** The final product 'C' in the following series of reactions **(+4, -1)**




**a.** 

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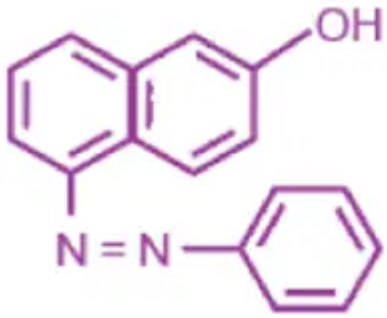
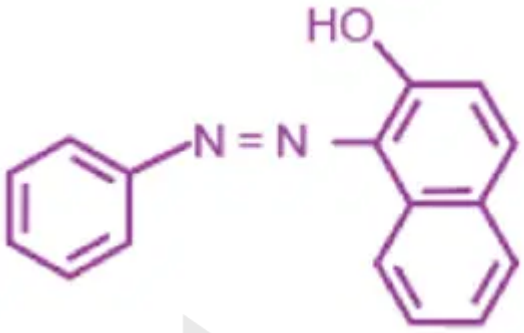



c.

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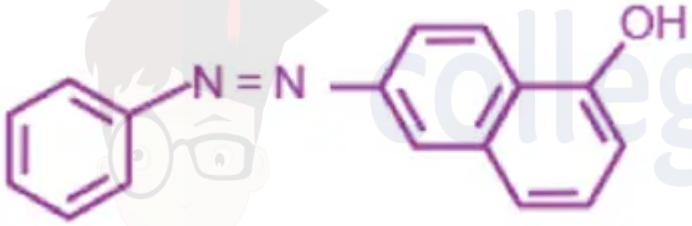


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**5.** Which statement is NOT correct for p-toluenesulphonyl chloride? **(+4, -1)**

**a.** It is known as Hinsberg's reagent

**b.** It is used to distinguish primary and secondary amines

**c.** On treatment with secondary amine, it leads to a product, that is soluble in alkali

**d.** It doesn't react with tertiary amines

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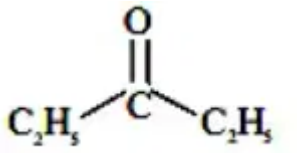
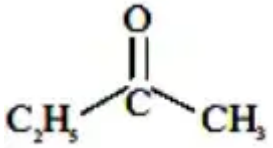
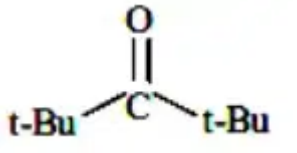
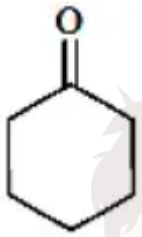
**6.** Which of the following ketone will NOT give enamine on treatment with secondary amines? [where t-Bu is $-C(CH_3)_3$] **(+4, -1)**

a. 

b. 

c. 

d. 



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**7.** The correct stability order of the following diazonium salt is **(+4, -1)**

**a.** (A) > (B) > (C) > (D)

**b.** (A) > (C) > (D) > (B)

**c.** (C) > (A) > (D) > (B)

**d.** (C) > (D) > (B) > (A)

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**8.** Which of the following contains maximum number of lone pairs of electrons on the central atom? **(+4, -1)**

**a.** (A) $ClO3^-$

**b.** (B) XeF4

**c.** (C) $I3^-$

**d.** (D) SF4

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**9.** Of the metals: Be, Mg, Ca and Sr of group 2 in the periodic table, the least ionic chloride will be formed by: **(+4, -1)**

**a.** (A) Be

**b.** (B) Ca

**c.** (C) Mg

**d.** (D) Sr

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**10.** Which of the following statements regarding eutrophication are correct?(i) Eutrophication is the natural ageing of a lake by nutrient enrichment of its water.(ii) Pollutants from human activities like effluents from the industries and homes can radically accelerate the aging process of a lake. This phenomenon is called as cultural or accelerated eutrophication.(iii) The plant nutrients responsible for eutrophication are nitrates and phosphates. (iv) These phosphates and nitrates accelerate the growth of algae, which utilise oxygen and may deoxygenate the water to kill the fish and other aquatic animals. **(+4, -1)**

**a.** (A) (i) and (ii)

**b.** (B) (iii) and (iv)

**c.** (C) (i), (ii) and (iii)

**d.** (D) (i), (ii), (iii) and (iv)

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**11.** Hydrogen ion concentration of an aqueous solution is $1 \times 10^{-4}$ M. The solution is diluted with equal volume of water. Hydroxyl ion concentration of the resultant solution in terms of $p \times 10^{-10}$ mol $dm^{-3}$ . What is the value of p? **(+4, -1)**

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**12.** **Statement-1:** Methyl orange is a weak acid **(+4, -1)**
**Statement-2:** Benzenoid form of methyl orange is deeply coloured than

quinonoid form
Check out which of the above statement is true?

**a.** Statement-1 is correct and Statement-2 is wrong

**b.** Both the Statements-1 and Statement-2 are correct

**c.** Statement-1 is wrong and Statement-2 is correct

**d.** None of them

---

**13.** Match the terms in Column-I with their description in Column-II and choose the correct option: **(+4, -1)**

| | **Amino Acid** | | **Letter Code** |
|---|---|---|---|
| (A). | Alanine | (P). | N |
| (B). | Asparagine | (Q). | A |
| (C). | Aspartic acid | (R). | R |
| (D). | Arginine | (S). | D |

**a.** 1-Q; 2-S; 3-P; 4-R

**b.** 1-Q; 2-S; 3-R; 4-P

**c.** 1-S; 2-P; 3-R; 4-Q

**d.** 1-S; 2-P; 3-P; 4-R

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**14.** **Group–13 elements react with $O_2$ in amorphous form to form oxides of type $M_2O_3$ (M = element). Which among the following is the most basic oxide?** **(+4, -1)**

**a.** $Tl_2O_3$

**b.** $Tl_2O_2$

**c.** $Cr_2O_3$

**d.** $B_2O_3$

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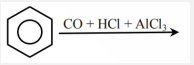
**15.** Match the following with the correct name of reaction **(+4, -1)**

| Reaction | | Name of reaction | |
|---|---|---|---|
| (I) | $CH_3-COOH \xrightarrow{Red\text{-}P + Br_2}$ | (P) | Gattermann Koch reaction |
| (II) | $CH_3-\underset{\underset{O}{\|}}{C}-CH_3 \xrightarrow{NaOI}$ | (Q) | Hell Volhard Zelinsky |
| (III) |  | (R) | Iodoform reaction |

**a.** (I) → (Q), (II) → (R), (III) → (P)

**b.** (I) → (R), (II) → (Q), (III) → (P)

**c.** (I) → (Q), (II) → (P), (III) → (R)

**d.** (I) → (P), (II) → (Q), (III) → (R)

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**16.** Match List I with List II **(+4, -1)**

| LIST I (Amines) | | LIST II (*pKb*) | |
|---|---|---|---|
| A | Aniline | I | 3.25 |
| B | Ethanamine | II | 3.00 |
| C | N-Ethylethanamine | III | 9.38 |
| D | N, N-Diethylethanamine | IV | 3.29 |

Choose the correct answer from the options given below:

**a.** A-III, B-IV, C-II, D-I

**b.** A-III, B-II, C-IV, D-I

**c.** A-I, B-IV, C-II, D-III

**d.** A-III, B-II, C-I, D-IV

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**17.** Given below are two statements: **(+4, -1)**

**Statement I** : Pure Aniline and other arylamines are usually colourless.

**Statement II** : Arylamines get coloured on storage due to atmospheric reduction.

Choose the correct answer

**a.** Both Statement I and Statement II are correct

**b.** Statement I is incorrect but Statement II is correct

**c.** Both Statement I and Statement II are incorrect

**d.** Statement I is correct but Statement II is incorrect

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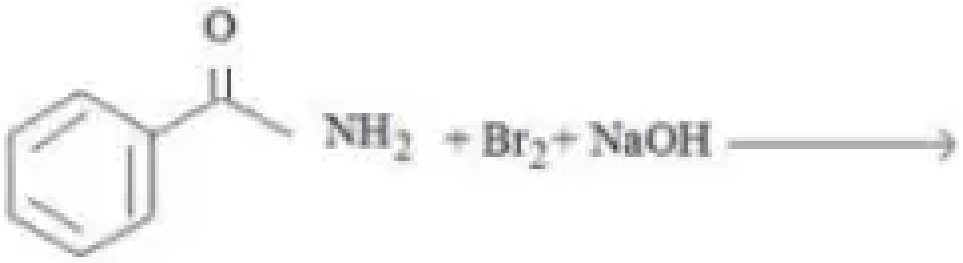
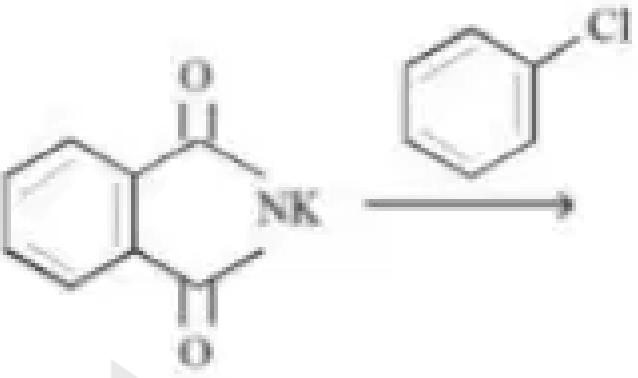
**18. How many of the transformations given below would result in aromatic amines?** **(+4, -1)**

1) 


2) 


3) 


4) 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**19.** The correct order in aqueous medium of basic strength in case of methyl substituted amines is : **(+4, -1)**

**a.** $NH_3 > Me_3N > MeNH_2 > Me_2NH$

**b.** $Me_2NH > Me_3N > MeNH_2 > NH_3$

**c.** $Me_2NH > MeNH_2 > Me_3N > NH_3$

**d.** $Me_3N > Me_2NH > MeNH_2 > NH_3$

---

**20.** The correct order in aqueous medium of basic strength in case of methyl substituted amines is : **(+4, -1)**

**a.** $NH_3 > Me_3N > MeNH_2 > Me_2NH$

**b.** $Me_2NH > Me_3N > MeNH_2 > NH_3$

**c.** $Me_2NH > MeNH_2 > Me_3N > NH_3$

**d.** $Me_3N > Me_2NH > MeNH_2 > NH_3$

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**21.** Match List I with List II **(+4, -1)**

| List I Test | | List II Functional group / Class of Compound | |
|---|---|---|---|
| A | Molisch's Test | I | Peptide |
| B | Biuret Test | II | Carbohydrate |
| C | Carbylamine Test | III | Primary amine |
| D | Schiff's Test | IV | Aldehyde |

Choose the correct answer from the options given below:

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

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

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

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

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**22.** 2 g of a base whose equivalent weight is 40 reacts with 3 of an acid. The equivalent weight of the acid is: **(+4, -1)**

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**23.** Resistance of a conductivity cell filled with 0.1 mol $L^{-1}$ KCl solution is 100Ω. If the resistance of the same cell when filled with 0.02 mol $L^{-1}$ KCl solution is 520Ω, calculate the conductivity and molar conductivity of 0.02 mol $L^{-1}$ KCl solution. The conductivity of 0.1 mol $L^{-1}$ KCl solution is 1.29 S / m. (Answer _____ $\times 10^{-4} Sm^2\ mol^{-1}$) **(+4, -1)**

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**24.** Select the IUPAC name for $Fe(\ -C_5H_5)_2$: **(+4, -1)**

**a.** (A) bis ( $^6$-cyclopentadienyl) iron(II)

**b.** (B) bis ( $^5$-cyclopentadienyl) ferrate(II)

**c.** (C) bis ( $^5$-cyclopentadienyl) iron(0)

**d.** (D) bis ( $^5$-cyclopentadienyl) iron(II)

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**25.** The functional group, which is found in an amino acid is: **(+4, -1)**

**a.** (A) -COOH group

**b.** (B) $NH_2$ group

**c.** (C) $-CH_3$ group

**d.** (D) both COOH and $NH_2$

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**26.** Which of the following is a set of essential amino acids? **(+4, -1)**

**a.** Glycine, Alanine, Tyrosine, Glutamic acid

**b.** Glycine, Alanine, Threonine, Lysine

**c.** Tyrosine, Glutamic acid, Valine, Leucine

**d.** Leucine, Threonine, Alanine, Tyrosine

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**27.** Lower amines can be prepared from amines through _____. **(+4, -1)**

**a.** (A) Wurtz reaction

**b.** (B) Schmidt reaction

**c.** (C) Hofmann bromamide reaction

**d.** (D) Mannich reaction

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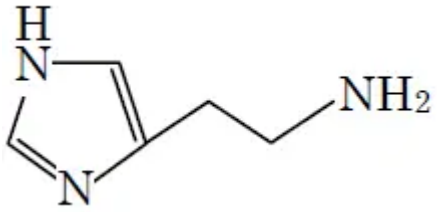
**28.** The predominant form of histamine present in human blood is $(pK_a$ Histidine $= 6.0)$ **(+4, -1)**

**a.**



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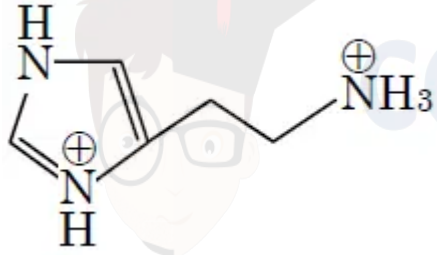
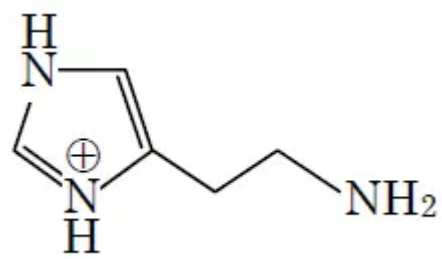
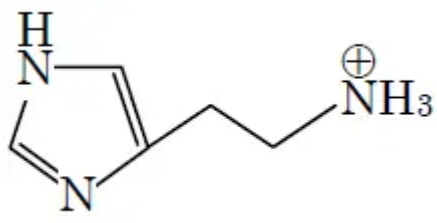


**c.**



**d.**



**29.** Hinsberg's reagent is : **(+4, -1)**

**a.** $C6H5SO2Cl$

**b.** $C6H5COCl$

**c.** $SOCl2$

**d.** $(COCl)2$

**30.** Ethylamine $(C2H5NH2)$ can be obtained from N-ethylphthalimide on treatment with : **(+4, -1)**

**a.** $NaBH_4$

**b.** $CaH_2$

**c.** $H_2O$

**d.** $NH_2NH_2$

# Answers

1. **Answer: b**

## Explanation:

The correct answer is (B) : alcohol


Fig. Alcohol

## Concepts:

### 1. Amines - Chemical Properties:

There are many chemical properties of amines.

The primary and secondary amines, including several amine derivatives, have a direct impact on their properties due to the presence of hydrogen bonding. The compounds containing phosphorus have a lower boiling point and the compounds containing amines and alcohol have a higher boiling point. The structure of alkanols is immensely similar to that of amine except the presence of the hydroxyl group. In such a case, oxygen has a higher electronegativity than that of nitrogen, so alkanol compounds are more acidic in nature in comparison to the amines.

On account of the ability to form hydrogen bonds, the amines have tendencies of high solubility in water. The amine molecules such as Ethyl, diethyl, triethyl, and Methyl are gaseous in nature. Whereas, higher weight amines have a solid structure and alkyl amines have a liquid structure. There is an ammonia smell to gaseous amines and a fishy smell to liquid amines. The solubility of amines entirely depends upon the number of carbon atoms in the molecule.

---

2. **Answer: c**

## Explanation:

Aniline does not undergo Friedel Craft reaction because the reagent $AlCl_3$ being electron deficient acts as a Lewis acid.

So, the correct option is (C): (A) is true, but (R) is false.

## Concepts:

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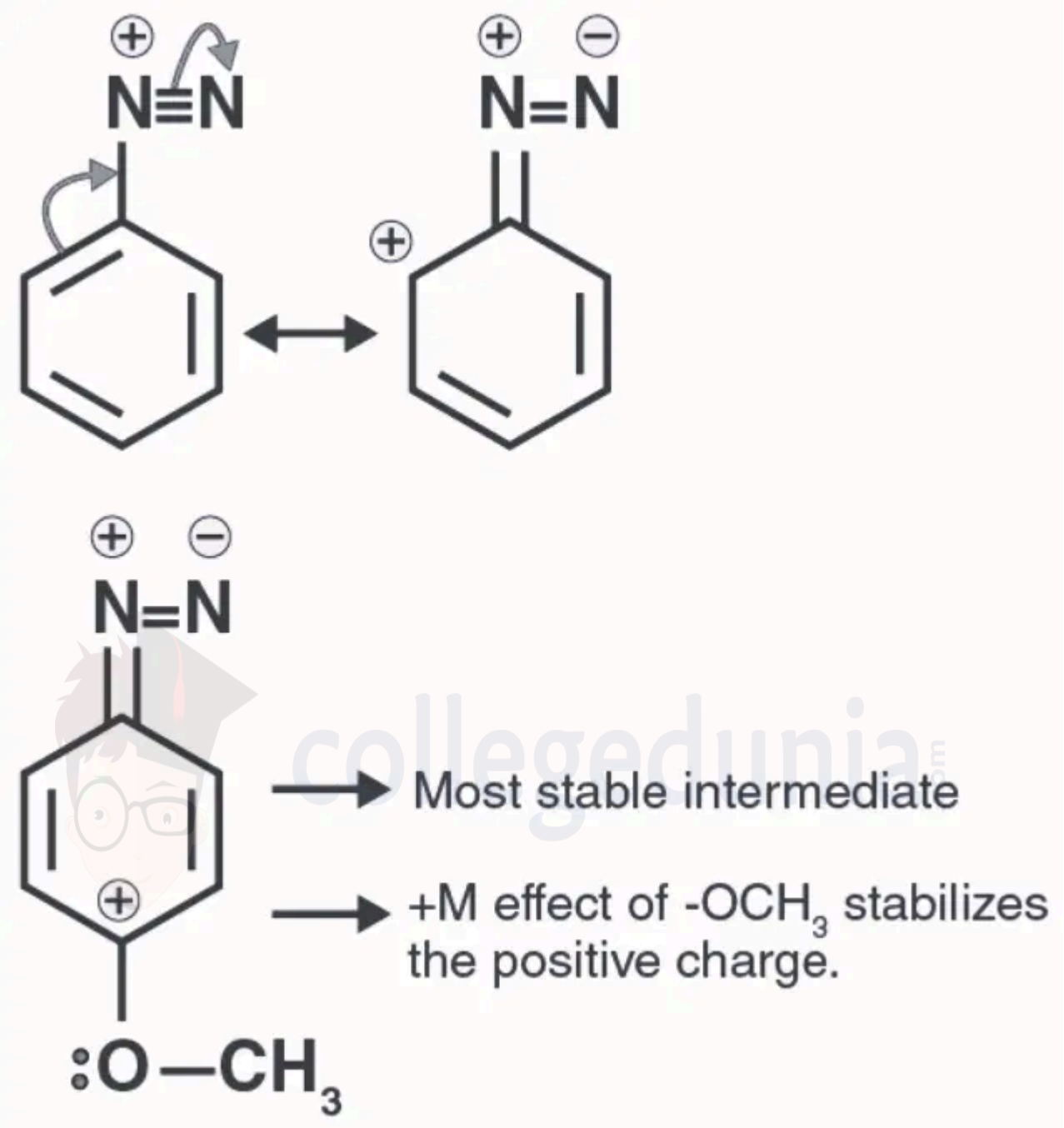
## 3. Answer: b

## Explanation:

Diazonium salt containing aryl group directly linked to electron donating group is the most stable due to resonance. The +M effect stabilizes the intermediate, whereas Electron withdrawing group on benzene destabilizes the intermediate at the para position.
Order will be A > C > D > B.




So, the correct option is (B): (A) > (C) > (D) > (B).

## Concepts:

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The primary and secondary amines, including several amine derivatives, have a direct impact on their properties due to the presence of hydrogen bonding. The compounds containing phosphorus have a lower boiling point and the compounds

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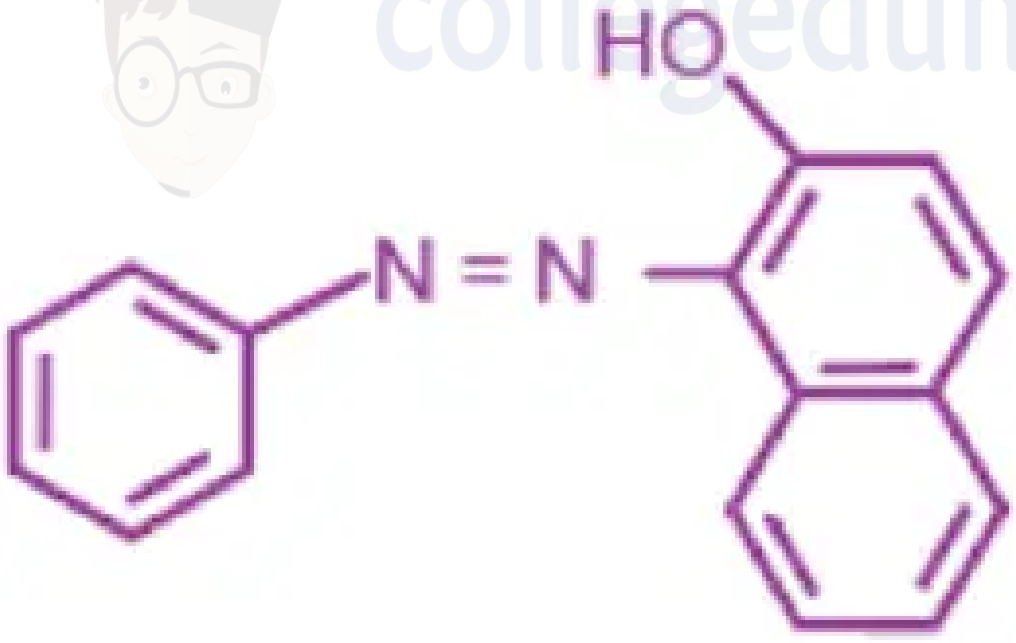
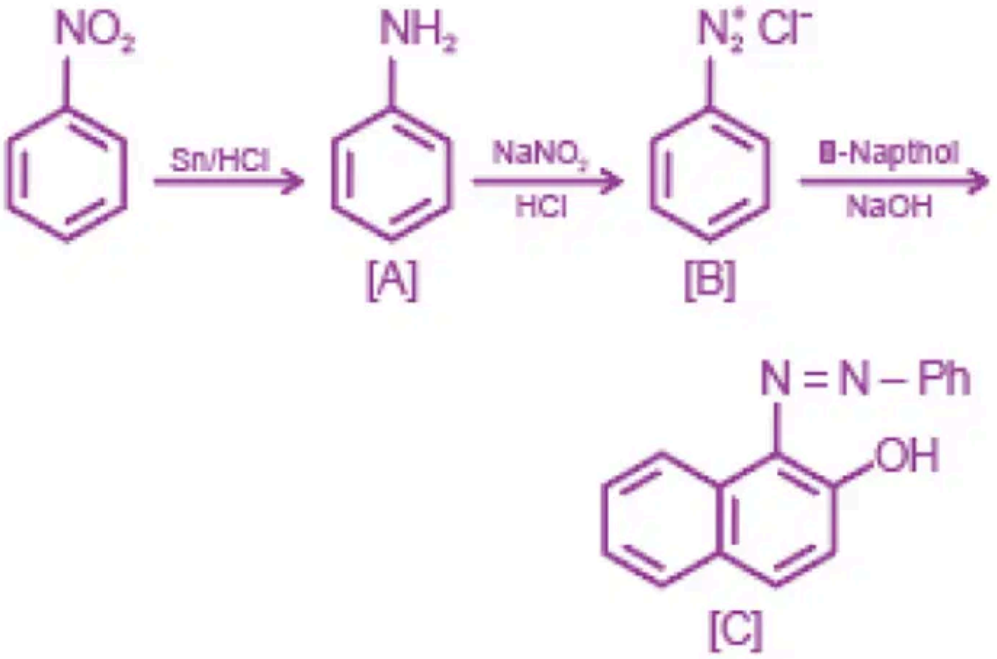
4. **Answer: c**

**Explanation:**

The correct answer is (C) :






## Concepts:

### 1. Amines:

Amine is a type of compound which is derived from ammonia ($NH_3$). According to Organic chemistry, they are basically classified as the functional groups of the organic nitrogen compounds that contain nitrogen atoms with a lone pair.

## Amine - Types

### Primary Amines:

It is formed when one hydrogen atom in ammonia is substituted by an alkyl or aromatic group. Amino acids and methyl amine are the best examples that why aromatic amines include aniline.

### Secondary Amines:

Amines that have two organic substitutes either alkyl or aryl ones or both and are bound to the nitrogen together with one hydrogen are termed as secondary amines. For Example, Dimethylamine.

### Tertiary Amines:

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

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5. **Answer: c**

### Explanation:

The correct answer is (C) : On treatment with secondary amine, it leads to a product, that is soluble in alkali

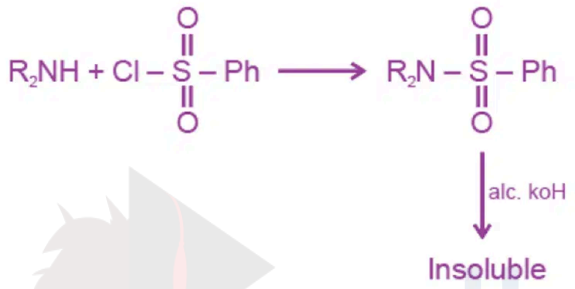


Fig. Chemical Reaction

### Concepts:

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### Tertiary Amines:

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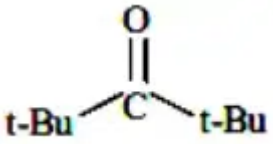
---

6. **Answer: a**

## Explanation:

In order to form enamine from the reaction of carbonyl compound with 2° amine, the carbonyl compound must have α-hydrogen.




In above figure, there  is no α-hydrogen is present.
Along with this, due to steric crowding by t-Bu group, it is difficult for 2° amine to attack on this compound.

So, the correct option is (C).

## Concepts:

### 1. Amines - Chemical Properties:

There are many chemical properties of amines.

The primary and secondary amines, including several amine derivatives, have a direct impact on their properties due to the presence of hydrogen bonding. The compounds containing phosphorus have a lower boiling point and the compounds containing amines and alcohol have a higher boiling point. The structure of alkanols is immensely similar to that of amine except the presence of the hydroxyl group. In such a case, oxygen has a higher electronegativity than that of nitrogen, so alkanol compounds are more acidic in nature in comparison to the amines.

On account of the ability to form hydrogen bonds, the amines have tendencies of high solubility in water. The amine molecules such as Ethyl, diethyl, triethyl, and Methyl are gaseous in nature. Whereas, higher weight amines have a solid structure and alkyl amines have a liquid structure. There is an ammonia smell to gaseous

amines and a fishy smell to liquid amines. The solubility of amines entirely depends upon the number of carbon atoms in the molecule.

---

7. **Answer: b**

### Explanation:

The correct option is (B): (A) > (C) > (D) > (B).

### Concepts:

#### 1. Amines:

Amine is a type of compound which is derived from ammonia ($NH_3$). According to Organic chemistry, they are basically classified as the functional groups of the organic nitrogen compounds that contain nitrogen atoms with a lone pair.

## Amine - Types

### Primary Amines:

It is formed when one hydrogen atom in ammonia is substituted by an alkyl or aromatic group. Amino acids and methyl amine are the best examples that why aromatic amines include aniline.

### Secondary Amines:

Amines that have two organic substitutes either alkyl or aryl ones or both and are bound to the nitrogen together with one hydrogen are termed as secondary amines. For Example, Dimethylamine.

### Tertiary Amines:

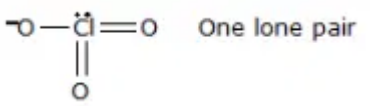
Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

---

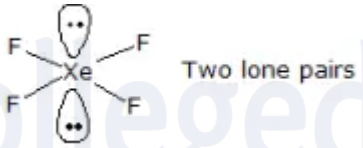
8. **Answer: c**

## Explanation:

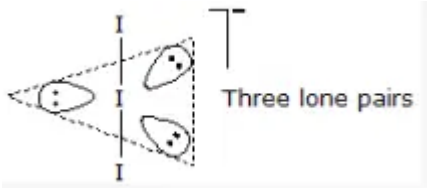
Explanation:
The species containing a maximum number of lone pairs of electrons on the central atom can be found out by using VSEPR theory.The number of lone pairs of electrons on the central atom of the given species is as follows:A. In $ClO3^-$, Cl contains 7 valence electrons. Out of these 4 electrons are utilised in making 2 double bonds with 2 of the oxygen atoms, 1 electron with a singly bonded O atom and a lone pair of electrons is left behind.



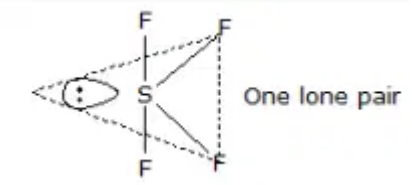

B. In XeF4, Xe contains eight electrons in the valence shell. Four electrons are utilised in making four single bonds with F atoms leaving behind two lone pairs of electrons on the Xe atom.




C. In $I3^-$, central I atom contains eight electrons (7 valence electrons + 1 electron of the negative charge = 8). Two are utilised in forming two single bonds with I atoms leaving three lone pairs of electrons.




D. In SF4 , the central S atom contains six electrons. Four are utilised in forming single bonds with 4 F atoms leaving behind a lone pair of electrons.




Thus, $I3^-$ contains the maximum number of lone pairs of electrons, i.e. 3.Hence, the correct option is (C).

9. **Answer: a**

**Explanation:**

Explanation:
Beryllium halides are covalent in nature. This is due to the small size and high charge density of $Be^{2+}$ ion i.e., it has high polarising power. However, the halides of the other alkaline earth metals (fluorides, chlorides, bromides, and iodides) are ionic solids.Hence, the correct option is (A).

---

10. **Answer: d**

**Explanation:**

Explanation:
Eutrophication is when a body of water becomes overly enriched with minerals and nutrients that induce excessive growth of plants and algae. This process may result in oxygen depletion of the water body. One example is the "bloom" or great increase of phytoplankton in a water body as a response to increased levels of nutrients. Eutrophication is almost always induced by the discharge of nitrate or phosphate containing detergents, fertilizers, or sewage into an aquatic system. Cultural eutrophication is the process that speeds up natural eutrophication because of human activity. Due to clearing of land and building of towns and cities, land runoff is accelerated and more nutrients such as phosphates and nitrate are supplied to lakes and rivers, and then to coastal estuaries and bays. Extra nutrients are also supplied by treatment plants, golf courses, and agricultural practices through the use of fertilizers. Human activities, including the ones previously listed, can be responsible for an increase in nutrients, therefore, cultural eutrophication is more pronounced in non-polar ecosystems which have higher levels of human activity.Hence, the correct option is (D).

---

11. **Answer: 2 - 2**

**Explanation:**

Explanation:

Given:Concentration of $H^+$ ions, $[H^+] = 1 \times 10^{-4}$ MThe solution is diluted with an equal volume of water.Hydroxyl ion solution in the resulting solution = $p \times 10^{-10}$ mol $dm^{-3}$We have to find the value of p.Since, the solution is diluted with an equal volume of water, the concentration of H+ will become one-half of that of the original value. Concentration of [H+] ions = $\frac{1 \times 10^{-4}}{2} = 0.5 \times 10^{-4}$ MWhen temperature is 25°C, the ionic product of water , Kw is given as:Kw = $[H^+]\ [OH^-] = 1 \times 10^{-14}$ ..... (i)Substituting the value of $[H^+]$ in equation (i), we get$[0.5 \times 10^{-4}]\ [OH^-] = 1 \times 10^{-14}[OH^-] = \frac{1 \times 10^{-14}}{0.5 \times 10^{-4}} = \frac{1 \times 10^{-10}}{0.5} = 2 \times 10^{-10}$ M or $2 \times 10^{-10}$ mol $dm^{-3}$Therefore, the value of p = 2.Hence, the correct answer is 2.00.

---

12. **Answer: a**

**Explanation:**

## Analysis of Statements on Methyl Orange:

### Statement I:

Methyl orange is not a weak acid; it is an acid-base indicator that exists in different structural forms depending on the pH of the solution:

- In acidic solutions, methyl orange exists in its protonated form.
- In basic solutions, it undergoes deprotonation to form a conjugate base.

**Conclusion:** Since methyl orange is not classified as a weak acid, **Statement I is incorrect.**

### Statement II:

The color intensity of methyl orange depends on its structural form:

- The **quinonoid form** of methyl orange is more intensely or deeply colored and is responsible for the orange/red coloration in acidic media.
- The **benzenoid form** is less intensely colored and contributes to the yellow coloration in basic media.

Since the statement incorrectly claims that the benzenoid form is more intensely colored, **Statement II is also incorrect.**

### Final Conclusion:

Since both Statement I and Statement II are incorrect, the correct answer is **option (1).**

## Concepts:

### 1. Amines:

Amine is a type of compound which is derived from ammonia ($NH_3$). According to Organic chemistry, they are basically classified as the functional groups of the organic nitrogen compounds that contain nitrogen atoms with a lone pair.

## Amine - Types

### Primary Amines:

It is formed when one hydrogen atom in ammonia is substituted by an alkyl or aromatic group. Amino acids and methyl amine are the best examples that why aromatic amines include aniline.

### Secondary Amines:

Amines that have two organic substitutes either alkyl or aryl ones or both and are bound to the nitrogen together with one hydrogen are termed as secondary amines. For Example, Dimethylamine.

### Tertiary Amines:

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

---

13. **Answer: a**

### Explanation:

The correct option is (A): 1-Q; 2-S; 3-P; 4-R
This is because the letter code for asparagine is Q, for arginine is S, for alanine is P, and for aspartic acid is R.
**Answer.** A.

### Concepts:

#### 1. Amines:

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## Amine - Types

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### Tertiary Amines:

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---

## 14. Answer: b

### Explanation:

The correct option is (B): $Tl_2O_2$
Tl+ oxide is more basic than $Tl_3$ + $Cr_2O_3$ is amphoteric.

## Concepts:

### 1. Amines - Chemical Properties:

There are many chemical properties of amines.

The primary and secondary amines, including several amine derivatives, have a direct impact on their properties due to the presence of hydrogen bonding. The compounds containing phosphorus have a lower boiling point and the compounds containing amines and alcohol have a higher boiling point. The structure of alkanols is immensely similar to that of amine except the presence of the hydroxyl group. In such a case, oxygen has a higher electronegativity than that of nitrogen, so alkanol compounds are more acidic in nature in comparison to the amines.

On account of the ability to form hydrogen bonds, the amines have tendencies of high solubility in water. The amine molecules such as Ethyl, diethyl, triethyl, and Methyl are gaseous in nature. Whereas, higher weight amines have a solid structure and alkyl amines have a liquid structure. There is an ammonia smell to gaseous amines and a fishy smell to liquid amines. The solubility of amines entirely depends upon the number of carbon atoms in the molecule.

---

## 15. Answer: a

## Explanation:

(I) $CH_3$-COOH + $Br_2$ (Red P) **Hell Volhard Zelinsky Reaction (Q)**

- This reaction involves the bromination of carboxylic acids at the alpha carbon position.
- It requires the presence of phosphorus (P).

(II) $CH_3$-C=O-$CH_3$ + NaOI **Iodoform Reaction (R)**

- The iodoform reaction identifies compounds with a methyl ketone group (-CO-$CH_3$).
- It produces a yellow precipitate of iodoform ($CHI_3$).

(III) Benzene + CO + HCl + $AlCl_3$ **Gattermann Koch Reaction (P)**

- This reaction involves the formylation of benzene to form benzaldehyde.
- It requires carbon monoxide (CO), hydrogen chloride (HCl), and $AlCl_3$ as catalysts.

## Correct Matches:

- (I) → **Q**
- (II) → **R**
- (III) → **P**

### Concepts:

#### 1. Amines:

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## Amine - Types

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### Tertiary Amines:

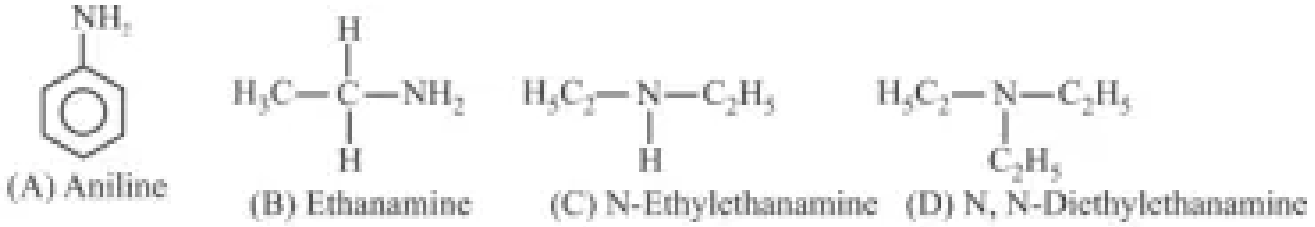
Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

---

16. **Answer: a**

## Explanation:

The correct answer is (A) : A-III, B-IV, C-II, D-I




$$\text{Basic Strength } \alpha \frac{1}{pK_b}$$

$$\text{Order for } pK_b: \ A > B > D > C$$

Amines are organic compounds that contain a nitrogen atom bonded to one or more alkyl or aryl groups. They are weak bases and react with acids to form salts. The strength of a base is measured by its pKb value, which is the negative logarithm of its base dissociation constant (Kb). The higher the pKb value, the weaker the base.

List I contains the names of different amines, while List II contains their respective pKb values.

To match the amines with their correct pKb values, we need to compare their structures and the effects of the different alkyl or aryl groups attached to the nitrogen atom on their basicity.

## Concepts:

### 1. Amines:

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# Amine - Types

### Primary Amines:

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### Tertiary Amines:

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

---

17. **Answer: d**

### Explanation:

**Statement I:** Pure aniline and other arylamines are indeed colourless liquids.
**Statement II:** Aniline becomes coloured on storage, not due to reduction, but due to oxidation by air and light, forming brown-coloured quinonoid compounds. Hence, Statement II is incorrect.

### Concepts:

#### 1. Amines:

Amine is a type of compound which is derived from ammonia ($NH_3$). According to Organic chemistry, they are basically classified as the functional groups of the organic nitrogen compounds that contain nitrogen atoms with a lone pair.

## Amine - Types

### Primary Amines:

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### Tertiary Amines:

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

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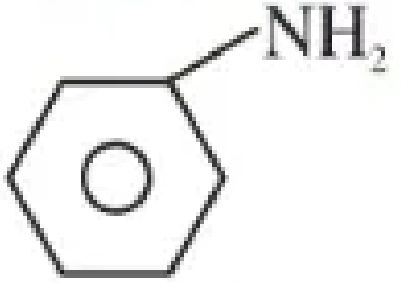
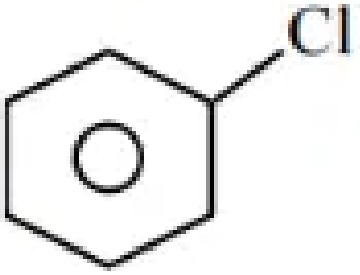
18. **Answer: 3 - 3**

### Explanation:

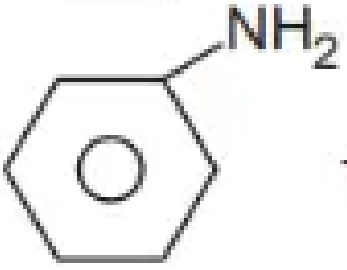
The correct answer is 3.

Product in the given reactions are as follow-

1. 

2. No reactions will be observed as in Gabriel phthalimide synthesis  is poor substrate for $SN^2$

3. 

4.  $+ CH_3COOH$

Aromatic amines will he formed in 1, 3 & 4

## Concepts:

### 1. Amines - Chemical Properties:

There are many chemical properties of amines.

The primary and secondary amines, including several amine derivatives, have a direct impact on their properties due to the presence of hydrogen bonding. The

compounds containing phosphorus have a lower boiling point and the compounds containing amines and alcohol have a higher boiling point. The structure of alkanols is immensely similar to that of amine except the presence of the hydroxyl group. In such a case, oxygen has a higher electronegativity than that of nitrogen, so alkanol compounds are more acidic in nature in comparison to the amines.

On account of the ability to form hydrogen bonds, the amines have tendencies of high solubility in water. The amine molecules such as Ethyl, diethyl, triethyl, and Methyl are gaseous in nature. Whereas, higher weight amines have a solid structure and alkyl amines have a liquid structure. There is an ammonia smell to gaseous amines and a fishy smell to liquid amines. The solubility of amines entirely depends upon the number of carbon atoms in the molecule.

---

19. **Answer: c**

## Explanation:

In aqueous medium, the basic strength of amines depends on:
1. Electron density on the nitrogen atom (due to inductive effect of methyl groups).
2. Solvation effect, which stabilizes the conjugate acid after accepting a proton.

- **Dimethylamine ($Me_2NH$):** The best combination of inductive effect and solvation, making it the most basic.
- **Methylamine ($MeNH_2$):** Slightly less basic due to less inductive effect but better solvation.
- **Trimethylamine ($Me_3N$):** Weaker basicity because bulky groups hinder solvation.
- **Ammonia ($NH_3$):** Lowest basicity due to the absence of inductive effect.

Thus, the basic strength order is $Me_2NH > MeNH_2 > Me_3N > NH_3$. Basicity in aqueous medium is influenced by both inductive effects and solvation. Dimethylamine balances these effects best, while trimethylamine suffers from steric hindrance.

## Concepts:

### 1. Amines:

Amine is a type of compound which is derived from ammonia ($NH_3$). According to Organic chemistry, they are basically classified as the functional groups of the

organic nitrogen compounds that contain nitrogen atoms with a lone pair.

## Amine - Types

### Primary Amines:

It is formed when one hydrogen atom in ammonia is substituted by an alkyl or aromatic group. Amino acids and methyl amine are the best examples that why aromatic amines include aniline.

### Secondary Amines:

Amines that have two organic substitutes either alkyl or aryl ones or both and are bound to the nitrogen together with one hydrogen are termed as secondary amines. For Example, Dimethylamine.

### Tertiary Amines:

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

---

**20. Answer: c**

### Explanation:

In aqueous medium basic strength is dependent on electron density on nitrogen as well as solvation of cation formed after accepting $H^+$. After considering all these factors overall basic strength order is
$Me_2NH > MeNH_2 > Me_3N > NH_3$

### Concepts:

#### 1. Amines:

Amine is a type of compound which is derived from ammonia ($NH_3$). According to Organic chemistry, they are basically classified as the functional groups of the organic nitrogen compounds that contain nitrogen atoms with a lone pair.

## Amine - Types

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### Tertiary Amines:

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

---

21. **Answer: b**

### Explanation:

- **Molisch's Test:** Used for the detection of carbohydrates. So, **(A) – II.**
- **Biuret Test:** Used for detecting peptide bonds, thus identifying proteins. So, **(B) – I.**
- **Carbylamine Test:** Used for detecting primary amines. So, **(C) – III.**
- **Schiff's Test:** Used to detect aldehydes. So, **(D) – IV.**

### Concepts:

#### 1. Amines:

Amine is a type of compound which is derived from ammonia ($NH_3$). According to Organic chemistry, they are basically classified as the functional groups of the organic nitrogen compounds that contain nitrogen atoms with a lone pair.

## Amine - Types

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### Tertiary Amines:

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

---

## 22. Answer: 60 - 60

### Explanation:

Explanation:
Given:Mass of base $= 2$ The equivalent weight of base $= 40$Mass of acid $= 3$ We have to find the equivalent weight of acid.2 g of a base reacts with 3 g of acid.Let the equivalent weight of acid be E.Gram-equivalent is given by:Gram-equivalent $= \frac{\text{Mass}}{\text{Equivalent Mass}}$Now since equivalents of all the reactants and products are equal.Gram-equivalent of base = Gram-equivalent of acidor, $\frac{\text{Mass of base}}{\text{Equivalent mass of base}} = \frac{\text{Mass of acid}}{\text{Equivalent mass of acid}}$Substituting all the values in equation (i), we get $\frac{2}{40} = \frac{3}{}$ $= \frac{3 \times 40}{2} = 60$Therefore, equivalent weight of acid is $60$. Hence, the correct answer is 60.

---

## 23. Answer: 124 - 124

### Explanation:

Explanation:
Given that:Concentration of the KCl solution $= 0.1$ mol $L^{-1}$ Resistance of cell filled with

0.1 mol $L^{-1}$ KCl solution = 100ΩThe cell constant is given by the equation:Cell constant = = conductivity × resistance = 1.29 S / m × 100Ω = 129 $m^{-5}$ = 1.29 $cm^{-1}$ Conductivity of 0.02 mol $L^{-1}$ KCl solution = $\frac{\text{cell constant}}{\text{resistance}}$ = — = $\frac{129\ m^{-1}}{520\Omega}$ = 0.248 S $m^{-1}$ Concentration = 0.02 mol $L^{-1}$ = 1000 × 0.02 mol $m^{-3}$ = 20 mol $m^{-3}$ Molar conductivity = Λ = – = $\frac{248 \times 10^{-3}\ S\ m^{-1}}{20\ mol\ m^{-3}}$ = $124 \times 10^{-4}$ S $m^2$ $mol^{-1}$ Hence, the molar conductivity of 0.02 mol $L^{-1}$ KCl solution is $124 \times 10^{-4}$ $Sm^2$ $mol^{-1}$.

---

## 24. Answer: d

### Explanation:

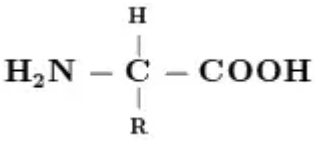
Explanation:
The IUPAC name for Fe( $-C_5H_5)_2$ is bis ( $^5$ -cyclopentadienyl) iron(II).The oxidation state of iron is +2 and is written in parenthesis in roman numerals. Two cyclopentadienyl ligands are coordinated to Fe. The prefix bis indicate 2 $n^5$ indicates that the cyclopentadienyl ligands are pentacoordinate.Hence, the correct option is (D).

---

## 25. Answer: d

### Explanation:

Explanation:
The functional group which is found in an amino acid are COOH and $NH_3$ (amine group). So every amino acid has a central carbon with a H, R group (varies for each amino acid), a carboxylic group and an amine group. These groups are joined to a single (aliphatic) carbon. The carbon directly attached to a carboxyl group is the alpha position, so the amino acids in proteins are all alpha-amino acids.



Hence, the correct option is (D).

---

## 26. Answer: a

### Explanation:

Humans can produce 10 of the 20 amino acids. The others must be supplied with food. Failure to obtain enough of even 1 of the 10 essential amino acids, those that we cannot make, results in degradation of the body's proteins muscle and so forth to obtain the one amino acid that is needed. Unlike fat and starch, the human body does not store excess amino acids for later use. The amino acids must be in the food every day. The 10 amino acids that we can produce are alanine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine, and tyrosine. Tyrosine is produced from phenylalanine, so if the diet is deficient in phenylalanine, tyrosine will be required as well.

Hence, the correct option is (A): Glycine, Alanine, Tyrosine, Glutamic acid.

---

## 27. Answer: c

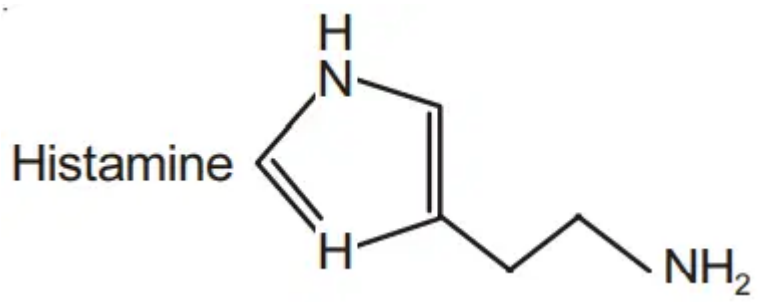
### Explanation:

Explanation:
Hofmann bromamide reaction is the one in which an amide is treated with bromine and a base to prepare amines from lower amines.The Hofmann reaction is an organic reaction used to convert a primary amide to a primary amine.In the Hofmann reaction, an amide is treated with bromine and base (usually NaOH or KOH).Upon heating, an intermediate isocyanate is formed, which is not isolated.In the presence of water, the isocyanate loses carbon dioxide to give an amine. Hence, the correct option is (C).

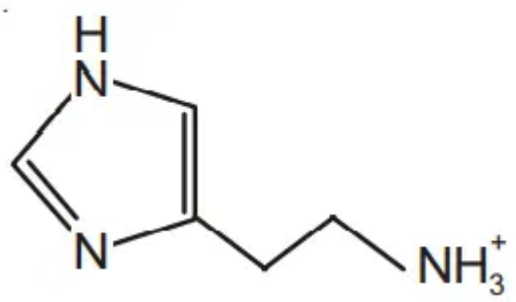
---

## 28. Answer: d

### Explanation:




At $pH\ (7.4)$ major form of histamine is protonated at primary amine.




## Concepts:

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# Amine - Types

### Primary Amines:

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### Secondary Amines:

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### Tertiary Amines:

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

---

29. **Answer: a**

**Explanation:**

[Benzene Sulphonyl chloride]

**Concepts:**

1. **Amines:**

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## Amine - Types

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Amines that have two organic substitutes either alkyl or aryl ones or both and are bound to the nitrogen together with one hydrogen are termed as secondary amines. For Example, Dimethylamine.

**Tertiary Amines:**

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.

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30. **Answer: d**

### Explanation:

reagent is $NH_2 - NH_2$ byproduct will be

### Concepts:

#### 1. Amines:

Amine is a type of compound which is derived from ammonia ($NH_3$). According to Organic chemistry, they are basically classified as the functional groups of the organic nitrogen compounds that contain nitrogen atoms with a lone pair.

## Amine - Types

### Primary Amines:

It is formed when one hydrogen atom in ammonia is substituted by an alkyl or aromatic group. Amino acids and methyl amine are the best examples that why aromatic amines include aniline.

### Secondary Amines:

Amines that have two organic substitutes either alkyl or aryl ones or both and are bound to the nitrogen together with one hydrogen are termed as secondary amines. For Example, Dimethylamine.

### Tertiary Amines:

Tertiary Amines are the amines where the nitrogen consists of three organic substitutes. For example, Trimethylamine and EDTA.