BCECE 2026 May 30 (Chemistry)

Question Paper (Memory-Based) With Solutions PDF

Conducted by Bihar Combined Entrance Competitive Examination Board (BCECEB)

General Instructions

(i) The question paper will consist of 100 Multiple Choice Questions (MCQs).

(ii) The duration of the Agriculture examination will be 1 hour 30 minutes (90 minutes).

(iii) The examination will be conducted in offline (pen-and-paper/OMR-based) mode.

(iv) For every correct answer, 4 marks will be awarded and for every incorrect answer, 1 mark will be deducted as negative marking.

1. Biuret test is not positive for:

(A) Protein
(B) Alanine
(C) Peptides
(D) Polypeptides

Correct Answer: (B) Alanine

Solution:

Step 1: Understanding the Concept:

The Biuret test is a chemical test used to detect the presence of peptide bonds in a given sample.

A positive result is indicated by a color change from blue to violet or purple.

Step 2: Key Formula or Approach:

For a compound to give a positive Biuret test, it must contain at least two peptide bonds (i.e.,

it must be a tripeptide or larger molecule).
The peptide bonds form a coordination complex with Cu^{2+} ions in an alkaline solution, which produces the characteristic violet color.

Step 3: Detailed Explanation:
Proteins, peptides, and polypeptides are polymer chains made of amino acids linked by multiple peptide bonds.
Therefore, they all give a positive Biuret test.
Alanine is a single, free amino acid.
Since it does not contain any peptide bonds, it cannot form the required coordination complex.
Thus, alanine gives a negative result (the solution remains blue).

Step 4: Final Answer:
The Biuret test is not positive for Alanine.

Quick Tip: The Biuret test requires a minimum of two peptide bonds to show a positive violet color. Individual amino acids (except histidine under certain conditions) always give a negative result.

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2. This sulphide is not black:

(A) PbS
(B) NiS
(C) MnS
(D) CoS

Correct Answer: (C) MnS

Solution:
Step 1: Understanding the Concept:
In qualitative inorganic analysis, metal cations are precipitated as their sulfides to separate

and identify them.
Different metal sulfides exhibit characteristic colors that help in their identification.

Step 2: Key Formula or Approach:
Identify the standard colors of the precipitates of the given metal sulfides:
Lead sulfide (PbS), Nickel sulfide (NiS), and Cobalt sulfide (CoS) are well-known black precipitates.
Manganese sulfide (MnS) has a distinctly different color.

Step 3: Detailed Explanation:
Let us look at the characteristic colors of the options provided:
Lead sulfide (PbS) $\rightarrow$ Black precipitate.
Nickel sulfide (NiS) $\rightarrow$ Black precipitate.
Cobalt sulfide (CoS) $\rightarrow$ Black precipitate.
Manganese sulfide (MnS) $\rightarrow$ Flesh-colored or buff/pink precipitate.
Therefore, among the given options, MnS is the sulfide that is not black.

Step 4: Final Answer:
The sulfide that is not black is MnS.

Quick Tip: Manganese sulfide (MnS) is highly unique in qualitative analysis due to its distinct flesh-pink color, making it easy to differentiate from the common black transition metal sulfides.

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3. The colour of $Mg(NH_4)PO_4 \cdot 6H_2O$ is:

(A) White
(B) Green
(C) Black
(D) Yellow

Correct Answer: (A) White

Solution:

Step 1: Understanding the Concept:

Magnesium ammonium phosphate hexahydrate, $Mg(NH_4)PO_4 \cdot 6H_2O$ (commonly known as struvite), is formed during the qualitative estimation and identification of magnesium or phosphate ions.

Step 2: Key Formula or Approach:

When a magnesium salt solution is treated with ammonium chloride, ammonium hydroxide, and disodium hydrogen phosphate, a characteristic crystalline precipitate is formed.
The physical appearance and color of this precipitate serve as a confirmatory test.

Step 3: Detailed Explanation:

The reaction for the formation of the precipitate can be written as:

$$Mg^{2+} + NH_4^+ + HPO_4^{2-} + 6H_2O \rightarrow Mg(NH_4)PO_4 \cdot 6H_2O \downarrow + H^+$$

This precipitate forms as distinct, white, distinctively shaped (often described as star-shaped or coffin-lid-shaped) crystals.
Thus, the color of the compound is white.

Step 4: Final Answer:

The color of $Mg(NH_4)PO_4 \cdot 6H_2O$ is White.

Quick Tip: The formation of a white crystalline precipitate of $Mg(NH_4)PO_4 \cdot 6H_2O$ is a classic confirmatory test for magnesium ions (Mg^{2+}) in group analysis.

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4. Heating $Ba(NO_3)_2$ produces:

(A) N_2

(B) $BaO + NO_2 + O_2$

(C) N_2O

(D) NO_2

Correct Answer: (B) $BaO + NO_2 + O_2$

Solution:

Step 1: Understanding the Concept:

The thermal decomposition of metal nitrates depends on the position of the metal in the electrochemical series and its polarizing power.

Most group 2 (alkaline earth metal) nitrates decompose upon heating to yield the corresponding metal oxide, nitrogen dioxide gas, and oxygen gas.

Step 2: Key Formula or Approach:

The general chemical equation for the thermal decomposition of an alkaline earth metal nitrate is:

$$2M(NO_3)_2 \xrightarrow{\Delta} 2MO + 4NO_2 + O_2$$

where M represents a group 2 element such as Beryllium, Magnesium, Calcium, Strontium, or Barium.

Step 3: Detailed Explanation:

Barium (Ba) belongs to group 2 of the periodic table.

When barium nitrate, $Ba(NO_3)_2$, is strongly heated, it undergoes thermal decomposition.

The balanced chemical equation for this reaction is:

$$2Ba(NO_3)_2 \xrightarrow{\Delta} 2BaO + 4NO_2 \uparrow + O_2 \uparrow$$

The products formed are Barium oxide (BaO), Nitrogen dioxide (NO_2, a brown gas), and Oxygen (O_2, a colorless gas).

Therefore, heating barium nitrate produces $BaO + NO_2 + O_2$.

Step 4: Final Answer:

Heating $Ba(NO_3)_2$ produces $BaO + NO_2 + O_2$.

Quick Tip: All alkaline earth metal nitrates decompose on heating to give a metal oxide, brown fumes of NO_2, and O_2. In contrast, alkali metal nitrates (except $LiNO_3$) decompose to give metal nitrites and oxygen gas.

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5. The pyrimidine bases present in DNA are:

(A) Cytosine and Uracil

(B) Cytosine and Thymine

(C) Cytosine and Guanine

(D) Cytosine and Adenine

Correct Answer: (B) Cytosine and Thymine

Solution:

Step 1: Understanding the Concept:

Nucleic acids like DNA and RNA contain nitrogenous bases, which are broadly classified into two categories based on their chemical ring structures: purines and pyrimidines.

Step 2: Key Formula or Approach:

Purines possess a double-ring structure and include Adenine (A) and Guanine (G).

Pyrimidines possess a single six-membered heterocyclic ring structure and include Cytosine (C), Thymine (T), and Uracil (U).

Step 3: Detailed Explanation:

The distribution of these nitrogenous bases varies between DNA and RNA:

In DNA, the purines are Adenine and Guanine, while the pyrimidines are Cytosine and Thymine.

In RNA, Thymine is replaced by Uracil, meaning its pyrimidines are Cytosine and Uracil. The question explicitly asks for the pyrimidine bases present in DNA, which are Cytosine and Thymine.

Step 4: Final Answer:

The pyrimidine bases present in DNA are Cytosine and Thymine.

Quick Tip: To remember the classification easily, use the mnemonic: "CUT the PY" → Cytosine, Uracil, and Thymine are PYrimidines. Remember that Thymine is unique to DNA, and Uracil is unique to RNA.

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6. Tomato is a natural source of ___ acid.

(A) Acetic acid

(B) Citric acid

(C) Tartaric acid

(D) Oxalic acid

Correct Answer: (D) Oxalic acid

Solution:

Step 1: Understanding the Concept:

Many naturally occurring fruits and vegetables contain organic acids that contribute to their unique taste, metabolic processes, and nutritional profile.

Step 2: Key Formula or Approach:

Match the primary natural organic acids with their common dietary sources:

- Acetic acid is found in vinegar.
- Citric acid is prevalent in citrus fruits like lemons and oranges.
- Tartaric acid is found in tamarind and grapes.
- Oxalic acid is found in high concentrations in tomatoes and spinach.

Step 3: Detailed Explanation:

Tomatoes contain multiple organic acids, including citric acid, malic acid, and oxalic acid. However, in standard academic curricula and chemistry assessments, tomatoes are primarily recognized and highlighted as a classic natural source of oxalic acid ($HOOC-COOH$). Therefore, option (D) is the most appropriate choice.

Step 4: Final Answer:

Tomato is a natural source of Oxalic acid.

Quick Tip: While tomatoes contain small amounts of citric and malic acids, they are uniquely notable for their high content of Oxalic acid. Individuals prone to kidney stones (calcium oxalate) are often advised to regulate their intake of tomato seeds and spinach because of this.

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7. Which product will be formed during Etard's reaction?

(A) Benzoic acid

(B) Benzyl alcohol

(C) Benzaldehyde

(D) Benzene

Correct Answer: (C) Benzaldehyde

Solution:

Step 1: Understanding the Concept:

Etard's reaction is a named organic oxidation reaction used to convert an aromatic methyl group directly into an aldehyde functional group.

Step 2: Key Formula or Approach:

The reaction involves the partial oxidation of toluene (or substituted toluenes) using a mild oxidizing agent, chromyl chloride (CrO_2Cl_2), in the presence of a non-polar solvent like carbon

tetrachloride (CCl_4) or carbon disulfide (CS_2).

Step 3: Detailed Explanation:

When toluene reacts with chromyl chloride, it forms a brown chromium complex as an intermediate.

The chemical reaction occurs as follows:

$$C_6H_5CH_3 + 2CrO_2Cl_2 \rightarrow C_6H_5CH(OCr(OH)Cl_2)_2$$

Subsequent acid hydrolysis of this brown complex cleaves it to yield the corresponding aromatic aldehyde, which is benzaldehyde.

$$C_6H_5CH(OCr(OH)Cl_2)_2 \xrightarrow{H_3O^+} C_6H_5CHO$$

Since the oxidation stops at the aldehyde stage and does not proceed further to a carboxylic acid, the main product formed is benzaldehyde.

Step 4: Final Answer:

The product formed during Etard's reaction is Benzaldehyde.

Quick Tip: Etard's reaction is highly selective. Chromyl chloride (CrO_2Cl_2) acts as a controlled oxidizing agent that arrests the oxidation at the aldehyde stage (C_6H_5CHO), preventing further oxidation into benzoic acid.

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8. Angular shape of ozone molecule consist of:

(A) 1 sigma and 2 pi-bonds

(B) 2 sigma and 2 pi-bonds

(C) 1 sigma and 1 pi-bonds

(D) 2 sigma and 1 pi-bonds

Correct Answer: (D) 2 sigma and 1 pi-bonds

Solution:

Step 1: Understanding the Concept:

The ozone molecule (O_3) consists of three oxygen atoms.

To understand its bonding scheme and geometry, we look at its chemical structure and localized resonance forms.

Step 2: Key Formula or Approach:

An ozone molecule has a central oxygen atom bonded to two terminal oxygen atoms.

The molecule has a bent or angular geometry due to the presence of a lone pair on the central oxygen atom.

Step 3: Detailed Explanation:

In the basic Lewis structure of ozone, the central oxygen atom forms a single covalent bond with one terminal oxygen atom and a double covalent bond with the other terminal oxygen atom.

- A single bond contains exactly 1 σ (sigma) bond.
- A double bond contains exactly 1 σ (sigma) bond and 1 π (pi) bond.

Summing up the localized bonds in the framework:

$$\text{Total } \sigma \text{ bonds} = 1 + 1 = 2$$

$$\text{Total } \pi \text{ bonds} = 1$$

Thus, the angular skeletal structure of ozone is composed of 2 sigma (σ) and 1 pi (π) bonds.

Step 4: Final Answer:

The angular shape of an ozone molecule consists of 2 sigma and 1 pi-bonds.

Quick Tip: Even though the true structure of ozone is a resonance hybrid where both O-O bond lengths are equal, the total count of localized σ and π bonds in its valid Lewis representations remains 2 σ bonds and 1 π bond.

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9. The number of atoms in 0.1 mole of a triatomic gas will be ($N_A = 6.02 \times 10^{23}$):

(A) 1.800×10^{22}

(B) 6.026×10^{23}

(C) 1.806×10^{23}

(D) 3.600×10^{23}

Correct Answer: (C) 1.806×10^{23}

Solution:

Step 1: Understanding the Concept:

A mole of any substance contains Avogadro's number (N_A) of constituent particles (molecules or atoms).

For a gas, the total number of atoms depends on both the number of moles of the gas molecules and its atomicity.

Step 2: Key Formula or Approach:

The formula to compute the total number of individual atoms is given by:

$$\text{Total number of atoms} = \text{Number of moles} \times N_A \times \text{Atomicity}$$

where atomicity is the total number of atoms present inside a single molecule of the gas.

Step 3: Detailed Explanation:

Given parameters:

- Number of moles of gas = 0.1 mole
- Gas type = Triatomic (which explicitly means Atomicity = 3, such as O_3 or CO_2)

- Avogadro's number (N_A) $= 6.02 \times 10^{23}$ molecules/mole

First, let us calculate the total number of molecules present in 0.1 mole:

$$\text{Number of molecules} = 0.1 \times 6.02 \times 10^{23} = 6.02 \times 10^{22} \text{ molecules}$$

Next, since every molecule contains 3 constituent atoms, we multiply the total molecules by the atomicity:

$$\text{Total number of atoms} = 3 \times (6.02 \times 10^{22})$$

$$\text{Total number of atoms} = 18.06 \times 10^{22}$$

Converting this value into scientific standard notation:

$$\text{Total number of atoms} = 1.806 \times 10^{23}$$

Step 4: Final Answer:
The total number of atoms is 1.806×10^{23}.

Quick Tip: Always read carefully whether the question asks for the total number of molecules or atoms. Multiplying by the atomicity (3 for triatomic, 2 for diatomic) is essential to get the correct atom count.

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10. Which of the following compounds contains the -COOH (carboxylic) group?

(A) Acetic acid

(B) Ethanol

(C) Diethyl ether

(D) Formaldehyde

Correct Answer: (A) Acetic acid

Solution:

Step 1: Understanding the Concept:

Organic compounds are classified into various families based on their specific functional groups.

The carboxylic acid family is characterized by the presence of the carboxyl group, which is written as —COOH.

Step 2: Key Formula or Approach:

Analyze the chemical structure and functional group of each option to find the one that possesses the —COOH group:

- Carboxylic acids have the suffix "-ic acid" or "-oic acid" and contain —COOH.
- Alcohols contain the hydroxyl group (—OH).
- Ethers contain an oxygen bridge between two alkyl groups (—O—).
- Aldehydes contain the formyl group (—CHO).

Step 3: Detailed Explanation:

Let us look closely at the chemical formulas and functional groups of all the choices:

- Acetic acid: The formula is CH_3COOH. It explicitly contains the functional group —COOH.
- Ethanol: The formula is CH_3CH_2OH. It belongs to the alcohol family and contains the —OH group.
- Diethyl ether: The formula is $CH_3CH_2OCH_2CH_3$. It belongs to the ether family and contains the —O— linkage.
- Formaldehyde: The formula is HCHO. It belongs to the aldehyde family and contains the —CHO group.

Therefore, only acetic acid contains the —COOH functional group.

Step 4: Final Answer:

The compound that contains the -COOH group is Acetic acid.

Quick Tip: The carboxyl group (—COOH) is a combination of a carbonyl group (> C = O) and a hydroxyl group (—OH) attached to the same carbon atom. Its name "carboxyl" is derived from carbonyl and hydroxyl.
