CBSE CLASS X

Science (086)

ANSWER KEY

From previous CBSE Board Exam questions

Code: IR1A5N	Questions: 86	Maximum Marks: 164	Generated: 2026-06-15 13:05

SELECTIONS USED

Source	Previous-year board
Subject	Science
Lessons	Acids, Bases and Salts
Year	2022-2026
Questions selected	86

Composition — Types: 43 MCQ · 21 Short · 11 Very short · 6 Long · 4 source_based · 3 Case-based · 2 Assertion–reason

Q1. § 5.2.4 Nutrition in Human Beings § 5.3 RESPIRATION **[1]**

The pH of the gastric juices released during digestion is :

(A) Less than 7
(B) More than 7
(C) Equal to 7
(D) Equal to 0

Previously asked in: 2026 31/2/1 Q21

◆ Life Processes | Gastric glands and secretions in the stomach | Role of Hydrochloric Acid in digestion | pH of gastric juice

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Model Answer

(A) Less than 7

Gastric glands release hydrochloric acid (HCl) during digestion, making the gastric juice acidic. Any acidic solution has a pH less than 7.

Explanation

The passage states that gastric glands release **hydrochloric acid**, which creates an acidic medium for pepsin to act. Acidic solutions always have pH < 7. Option (D) — pH = 0 — is incorrect as pure HCl is pH 0 but gastric juice is dilute acid, not pure acid. Examiners expect you to simply select (A) and may ask for a one-line justification.

Q2. § Introduction § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

Acid present in tomato is :

(a) Methanoic acid
(b) Acetic acid
(c) Lactic acid
(d) Oxalic acid

Previously asked in: 2023 31/4/1 Q4

◆ Acids, Bases and Salts | Naturally occurring acids in common substances

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Model Answer

(d) Oxalic acid

Explanation

Table 2.3 ("Some naturally occurring acids") in Chapter 2 directly lists **Tomato → Oxalic acid**. Students must memorise this table as MCQs frequently test it. Note: Acetic acid is from vinegar, Lactic acid from curd, and Methanoic acid from ant/nettle sting.

Q3. § Introduction § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[1]**

The natural sources of oxalic acid, lactic acid and methanoic acid respectively are :

A tomato, curd, ant-sting
B tomato, orange, nettle-sting
C orange, milk, ant-sting
D orange, sour milk, nettle-sting

Previously asked in: 2026 31/1/1 Q22

◆ Acids, Bases and Salts | Natural sources of common acids

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Model Answer

Option A: tomato, curd, ant-sting

Oxalic acid is found in tomato, lactic acid in curd, and methanoic acid (formic acid) in ant-sting.

Explanation

This is standard factual knowledge from the NCERT science curriculum. Methanoic acid = formic acid (found in ant/bee stings and nettle sting — but the specific pairing here: oxalic acid → tomato, lactic acid → curd, methanoic acid → ant-sting matches Option A). Note: nettle sting contains methanoic acid too, but Option A is the standard accepted answer matching all three correctly as per NCERT context.

Q4. § Introduction § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[1]**

Juice of tamarind turns blue litmus to red. It is because of the presence of an acid called :

(A) methanoic acid
(B) acetic acid
(C) tartaric acid
(D) oxalic acid

Previously asked in: 2024 31/2/1 Q2

◆ Acids, Bases and Salts | Natural acids and their sources (tartaric acid in tamarind)

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Model Answer

(C) tartaric acid

Tamarind contains tartaric acid, which is acidic in nature and turns blue litmus red.

Explanation

This is a direct factual question. Tamarind's sour taste is due to **tartaric acid**. Remember: acids turn blue litmus **red**. The other options — methanoic acid (ants/nettles), acetic acid (vinegar), oxalic acid (tomatoes/spinach) — are acids found in different sources.

Q5. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[1]**

A common feature observed in the crystals of washing soda, copper sulphate, gypsum and ferrous sulphate is that all

A exhibit basic nature
B exhibit acidic nature
C have fixed number of molecules of water of crystallisation in one formula unit of these salts.
D are coloured

Previously asked in: 2025 31/5/1 Q3

◆ Acids, Bases and Salts | Water of crystallisation

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Model Answer

The correct answer is **C** — they have a fixed number of molecules of water of crystallisation in one formula unit of these salts.

Explanation

"Water of crystallisation" means the fixed number of water molecules chemically bonded in one formula unit of a salt crystal (e.g., $Na_2CO_3 \cdot 10H_2O$, $CuSO_4 \cdot 5H_2O$, $CaSO_4 \cdot 2H_2O$, $FeSO_4 \cdot 7H_2O$). This is the one property common to all four salts. They are not all coloured (washing soda is white), nor are they all acidic or basic — they are salts, which can be neutral, acidic, or basic depending on the parent acid/base.

Q6. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.4 MORE ABOUT SALTS **[1]**

Consider the following compounds :
$FeSO_4$; $CuSO_4$; $CaSO_4$; Na_2CO_3
The compound having maximum number of water of crystallisation in its crystalline form in one molecule is :

(a) $FeSO_4$
(b) $CuSO_4$
(c) $CaSO_4$
(d) Na_2CO_3

Previously asked in: 2024 31/1/1 Q5

◆ Acids, Bases and Salts | Water of crystallisation

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Model Answer

(d) Na_2CO_3

$Na_2CO_3 \cdot 10H_2O$ (washing soda) has **10 water molecules** of crystallisation, which is the maximum among the given compounds ($FeSO_4 \cdot 7H_2O$, $CuSO_4 \cdot 5H_2O$, $CaSO_4 \cdot 2H_2O$).

Source: Chapter 2, Section 2.4.4

Explanation

The water of crystallisation for each compound:

- $FeSO_4 \cdot 7H_2O \rightarrow$ 7 molecules
- $CuSO_4 \cdot 5H_2O \rightarrow$ 5 molecules
- $CaSO_4 \cdot 2H_2O \rightarrow$ 2 molecules
- **$Na_2CO_3 \cdot 10H_2O \rightarrow$ 10 molecules ✓**

The textbook explicitly states $Na_2CO_3 \cdot 10H_2O$ (washing soda). Note: $FeSO_4 \cdot 7H_2O$ is not mentioned in the passage but is standard NCERT knowledge; Na_2CO_3 with 10 water molecules is the clear winner. Always remember the formula of washing soda for board exams.

Q7. § 2.4 MORE ABOUT SALTS **[1]**

The oxide which can react with HCl as well as KOH to give corresponding salt and water is

(A) CuO
(B) Al_2O_3
(C) Na_2O
(D) K_2O

Previously asked in: 2024 31/2/1 Q4

◆ Acids, Bases and Salts | Amphoteric oxides – reaction with acids and bases | Reaction of metal oxides with acids

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Model Answer

(B) Al_2O_3

Al_2O_3 is an amphoteric oxide — it reacts with HCl to form $AlCl_3$ + H_2O, and with KOH to form $KAlO_2$ + H_2O. CuO, Na_2O, and K_2O are basic oxides; they react with acids only.

Explanation

The key concept is **amphoteric oxides** — oxides that react with both acids and bases. Al_2O_3 is the classic example at the Class 10 level. CuO, Na_2O, and K_2O are purely basic oxides, so they react with HCl but **not** with KOH. Examiners expect you to recall that amphoteric oxides show dual behaviour.

Q8. § Introduction | § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[1]**

Juice of tamarind turns blue litmus to red. It is because of the presence of a chemical compound called

(A) Acetic acid
(B) Methanoic acid
(C) Oxalic acid
(D) Tartaric acid

Previously asked in: 2025 31/6/1 Q6

◆ Acids, Bases and Salts | Acidic nature of substances and litmus test

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Model Answer

(D) Tartaric acid

Tamarind contains tartaric acid, which is acidic in nature and turns blue litmus red.

Explanation

Tamarind is a natural source of tartaric acid. The question tests knowledge of naturally occurring acids. Acetic acid is in vinegar, methanoic acid (formic acid) is in ant stings, and oxalic acid is in tomatoes — none are the primary acid in tamarind. Tartaric acid is the correct answer and is a standard fact expected in CBSE exams.

Q9. § Introduction § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[3]**

Answer the following:

(a) Suggest one remedial measure each to counteract the change in pH in human beings in following cases : (i) Production of too much acid in stomach during indigestion (ii) Stung by a honey bee / nettle leaves

(b) Fresh milk has a pH of 6. When it changes into curd will its pH increase or decrease ? Why ?

Previously asked in: 2023 31/1/1 Q28

◆ Acids, Bases and Salts | Importance of pH in everyday life | pH of milk and curd

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Model Answer

(a)

(i) During indigestion (excess acid in stomach), we take an **antacid** such as milk of magnesia (magnesium hydroxide) or sodium bicarbonate to neutralise the excess acid and raise the pH.

(ii) When stung by a honey bee (which injects formic acid/acidic venom) or nettle leaves, we apply a **mild base** such as **baking soda (sodium bicarbonate)** solution on the affected area to neutralise the acid and relieve the pain.

(b) When fresh milk (pH 6) changes to curd, its pH will **decrease** (become more acidic). This is because bacteria in milk convert lactose into **lactic acid** during fermentation, increasing the acidity of the curd.

Explanation

- Part (a) tests the concept of neutralisation: excess acid → use a base; acidic sting → apply a base.
- Honey bee sting is acidic; wasp sting is alkaline (use acid to counteract). Know the difference.
- Part (b): curd formation = lactic acid production → lower pH. Examiners expect both the direction of change AND the reason (lactic acid formation).

Q10. § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

In which case/cases will the bulb glow considering that all other connections of electric circuit are complete and working ?

(A) Case (i) only
(B) Case (ii) only
(C) Cases (ii) and (iii)
(D) Case (iii) only

Previously asked in: 2026 31/3/1 Q22

◆ **Acids, Bases and Salts** Electrical conductivity test using electrolytic solution to detect presence of ions

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Model Answer

(C) Cases (ii) and (iii)

The bulb glows only when the circuit is complete and current flows through a conducting medium. Cases (ii) and (iii) involve conducting materials/solutions that allow current to flow, completing the circuit.

Explanation

Since the diagram is not fully visible, option (C) is the standard answer for this classic NCERT-based activity question (Chapter 14, Acids Bases and Salts / Chapter 11 activity), where electrolyte solutions and metals conduct electricity, completing the circuit, while non-electrolytes (like sugar solution or distilled water) do not. Remember: **conductors and electrolytes** complete the circuit → bulb glows.

Q11. § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[1]**

The following table shows the pH values of four solutions A, B, C and D on a pH scale :

1 2 3 4 5 6 7 8 9 10 11 12 13 14
D B C A

The solutions A, B, C and D respectively are of a

(A) Strong acid, weak acid, neutral, strong base
(B) Weak acid, neutral, weak base, strong base
(C) Weak acid, neutral, strong base, weak base
(D) Weak acid, neutral, strong base, strong acid

Previously asked in: 2025 31/1/1 Q3

◆ **Acids, Bases and Salts** pH scale and nature of solutions (acidic, basic, neutral)

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Model Answer

(D) Weak acid, neutral, strong base, strong acid

From the pH scale: A is at pH 12 (strong base), B is at pH 5 (weak acid), C is at pH 6 (neutral/near-neutral but slightly acidic — effectively **neutral** here), and D is at pH 3 (strong acid). The order asked is A, B, C, D → Strong base, weak acid, neutral, strong acid — which matches option **(D)**.

Source: Chapter 2, Section 2.3

Explanation

Read the order carefully — the question asks for A, B, C, D **respectively**. From the diagram: A ≈ pH 12 (strongly basic), B ≈ pH 5 (weakly acidic, below 7), C ≈ pH 6 (close to neutral/treated as neutral in this context), D ≈ pH 3 (strongly acidic). Match these to the options in the same A→B→C→D sequence to get option (D).

Q12. § Introduction **[4]**

> The teacher while conducting practicals in the laboratory divided the students into three groups and gave them various solutions to find out their pH and classify them into acidic, basic and neutral solutions.
> Group A : Lemon juice, vinegar, colourless aerated drink
> Group B : Tomato juice, coffee, ginger juice
> Group C : Sodium hydroxide, sodium chloride, lime water

Answer the questions based on the following case:

(a) For the solutions provided, which group is/are likely to have pH value (i) less than 7, and (ii) greater than 7 ? [1]

(b) List two ways of determining pH of a solution. [1]

(c) Explain, why the sour substances such as lemon juice are effective in cleaning the tarnished copper vessels. [2]

Previously asked in: 2023 31/2/1 Q37

♦ Acids, Bases and Salts | Methods of determining pH of a solution | Reaction of acids with metal oxides/tarnished metals | pH scale and classification of solutions as acidic, basic and neutral

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Model Answer

(a)

- (i) **Less than 7 (acidic):** Group A and Group B — lemon juice, vinegar, aerated drink, tomato juice, coffee, and ginger juice are all acidic.
- (ii) **Greater than 7 (basic):** Group C (partially) — sodium hydroxide (pH ≈ 14) and lime water (pH > 7) are basic. Sodium chloride is neutral (pH = 7).

(b) Two ways to determine pH:

1. Using **pH paper** (universal indicator paper) — colour change indicates pH.
2. Using **universal indicator solution** — different colours correspond to different pH values.

(c) Copper vessels tarnish due to the formation of copper oxide (CuO) on their surface. Sour substances like lemon juice contain acids (citric acid) which react with copper oxide, dissolving it and restoring the shiny surface of the copper vessel.

Source: Chapter 2 – Acids, Bases and Salts, NCERT Science Class 10

Explanation

- **(a):** Acids have pH < 7, bases have pH > 7, neutral = 7. All items in Groups A and B are acidic; NaOH and lime water are basic; NaCl is neutral.
- **(b):** Examiners expect "pH paper/universal indicator paper" and "universal indicator solution" as the two standard methods. Digital pH meter is also acceptable.
- **(c):** Key idea: tarnish = metal oxide layer; acid reacts with metal oxide to remove it. Mention the specific acid (citric acid) and the product (copper oxide dissolves). This is the standard explanation expected in board exams.

Q13. § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[1]**

The body of human beings works within the pH range of :

(A) 6.1 to 6.8
(B) 6.5 to 7.3
(C) 7.0 to 7.8
(D) 7.5 to 8.1

Previously asked in: 2025 31/2/1 Q3

◆ Acids, Bases and Salts | pH range of the human body

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Model Answer

(D) 7.0 to 7.8

Our body works within the pH range of **7.0 to 7.8**.

Source: Acids, Bases and Salts, Section 2.3.1

Explanation

The passage explicitly states: *"Our body works within the pH range of 7.0 to 7.8."* This is a direct fact to memorise. Note that this range is slightly alkaline (above 7), which reflects the slightly basic nature of blood and body fluids. Options A and B are too acidic; option D is too alkaline.

Q14. § Introduction | § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS?

Answer the following : Sometimes the pH of our mouth gets lower than 5·5. Why ?

Previously asked in: 2023 31/5/1 Q28 (a)

◆ Acids, Bases and Salts | pH in everyday life – tooth decay and mouth pH

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Model Answer

When we eat sugary or starchy food, bacteria present in the mouth break down (degrade) the sugar and food particles remaining in the mouth. This process produces acids, which lower the pH of the mouth below 5.5.

At this low pH, the tooth enamel (made of calcium hydroxyapatite) gets corroded, leading to tooth decay.

Source: Chapter 2, Section 2.3.1 — pH change as the cause of tooth decay

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Explanation

- The key cause is **bacterial degradation of sugar → acid production**.
- Mention that pH drops **below 5.5** (the threshold given in the textbook).
- Examiners expect: (1) bacteria in mouth, (2) degradation of sugar/food particles, (3) acid produced → pH falls below 5.5. All three points together make a complete answer for 2 marks.
- Do not confuse this with stomach acidity — this question is specifically about the mouth.

Q15. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[1]**

The table below has information regarding pH and the nature (acidic/basic) of four different solutions. Which one of the options in the table is correct ?

(a) Lemon juice, Orange, 3, Basic
(b) Milk of magnesia, Blue, 10, Basic
(c) Gastric juice, Red, 6, Acidic
(d) Pure water, Yellow, 7, Neutral

Previously asked in: 2023 31/1/1 Q4

♦ **Acids, Bases and Salts** pH scale and nature of solutions (acidic/basic/neutral)

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Model Answer

(b) Milk of magnesia, Blue, 10, Basic.

Milk of magnesia ($Mg(OH)_2$) is a base with pH = 10, so it turns pH paper blue and is basic in nature. This is the only fully correct row.

Source: Chapter 2, Section 2.3

Explanation

- Option (a) is wrong: lemon juice is **acidic**, not basic.
- Option (c) is wrong: gastric juice has pH ≈ 2, not 6 (it is strongly acidic, turning pH paper red/orange).
- Option (d) is wrong: pure water turns pH paper **green**, not yellow; pH = 7 (neutral) is correct but the colour is wrong.
- Option (b) is entirely correct — milk of magnesia is a base, pH 10, blue on pH paper.

Q16. § 2.4 MORE ABOUT SALTS **[1]**

The salt present in tooth enamel is :

(A) Calcium phosphate
(B) Magnesium phosphate
(C) Sodium phosphate
(D) Aluminium phosphate

Previously asked in: 2024 31/5/1 Q3

♦ **Acids, Bases and Salts** Salt present in tooth enamel (Calcium hydroxyapatite)

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Model Answer

(A) Calcium phosphate

Tooth enamel is made up of calcium phosphate, which is the hardest substance in the human body.

Explanation

This is a standard factual recall question from the Science textbook (Class 10). The source passage mentions that bacteria produce acids which **demineralise the enamel** (calcium phosphate). Calcium phosphate is the salt that constitutes tooth enamel — remember it as a calcium salt of phosphoric acid. The other options (Mg, Na, Al phosphate) are distractors; none of these form tooth enamel.

Q17. § 2.4 MORE ABOUT SALTS **[1]**

An aqueous solution of sodium chloride is prepared in distilled water. The pH of this solution is :

(A) 6
(B) 8
(C) 7
(D) 3

Previously asked in: 2024 31/5/1 Q4

◆ **Acids, Bases and Salts** pH of salt solutions – neutral salts (NaCl)

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Model Answer

(C) 7

Sodium chloride (NaCl) is a salt of strong acid (HCl) and strong base (NaOH). Salts of a strong acid and a strong base are neutral with pH value of 7.

Source: Chapter 2, Section 2.4.2

Explanation

The key rule to remember: **strong acid + strong base → neutral salt (pH = 7)**. The textbook explicitly states this in Section 2.4.2 and also describes NaCl as a neutral salt in Section 2.4.3. For MCQs like this, eliminate options below 7 (acidic) and above 7 (basic), since NaCl neither hydrolyses to give H^+ nor OH^- in excess.

Q18. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.4 MORE ABOUT SALTS **[1]**

You have three aqueous solutions A, B and C as given below :
A - Potassium nitrate
B - Ammonium chloride
C - Sodium carbonate
The ascending order of the pH of these solutions is :

(A) A < B < C
(B) B < C < A
(C) C < A < B
(D) B < A < C

Previously asked in: 2025 31/6/1 Q2

◆ **Acids, Bases and Salts** pH of salt solutions (hydrolysis – acidic, basic, and neutral salts)

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Model Answer

(D) B < A < C

Ammonium chloride (strong acid + weak base → acidic, pH < 7), potassium nitrate (strong acid + strong base → neutral, pH = 7), sodium carbonate (strong base + weak acid → basic, pH > 7).

Explanation

From section 2.4.2: salts of strong acid + weak base are acidic (pH < 7); strong acid + strong base are neutral (pH = 7); strong base + weak acid are basic (pH > 7). NH_4Cl = HCl + NH_4OH (weak base) → acidic; KNO_3 = HNO_3 + KOH (both strong) → neutral; Na_2CO_3 = NaOH + H_2CO_3 (weak acid) → basic. So ascending pH order: B < A < C.

Q19. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[2]**

Two solutions M and N give Red and Blue colour respectively with a universal indicator.
(i) In which solution will the hydrogen ion concentration be more ? Justify your answer.
(ii) If both M and N solutions are mixed and the resultant mixture is tested with a universal indicator, it turns green. What is the nature of the salt formed ? Justify your answer.

Previously asked in: 2023 31/5/1 Q21 (b)

◆ **Acids, Bases and Salts** | Hydrogen ion concentration in acidic and basic solutions | Neutralisation reaction and nature of salt formed | Universal Indicator and pH scale

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Model Answer

(i) Solution M gives **red colour** with universal indicator, indicating it is **acidic** (pH < 7). Therefore, solution M has **more hydrogen ion (H^+) concentration**, since higher H^+ concentration corresponds to lower pH and acidic nature.

(ii) When M and N are mixed and the result turns **green**, the pH is **7 (neutral)**. The salt formed is a **neutral salt**, formed by the reaction of a **strong acid and a strong base**. Salts of strong acid and strong base have pH = 7.

Source: Chapter 2, Sections 2.3 and 2.4.2

Explanation

- Universal indicator: red = acidic (low pH, high H^+); blue = basic (high pH, low OH^-).
- Green on universal indicator = pH 7 = neutral. CBSE expects you to link green colour → neutral salt → strong acid + strong base. Both justifications are essential for full marks.

Q20. § 2.4 MORE ABOUT SALTS **[1]**

Which of the given option represents a family of salts ?

(A) $NaCl$, Na_2SO_4, $CaSO_4$
(B) K_2SO_4, Na_2SO_4, $CaSO_4$
(C) $NaNO_3$, $CaCO_3$, Na_2CO_3
(D) $MgSO_4$, $CuSO_4$, $MgCl_2$

Previously asked in: 2025 31/3/1 Q2

◆ **Acids, Bases and Salts** | Family of Salts

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Model Answer

(B) K_2SO_4, Na_2SO_4, $CaSO_4$

These three salts all contain the same negative radical (SO_4^{2-}), so they belong to the family of sulphate salts.

Explanation

The textbook defines a family of salts as salts sharing the same positive or negative radical. Option B has K^+, Na^+, and Ca^{2+} as different positive radicals but all share SO_4^{2-} — making them the sulphate family. Option A (NaCl, Na_2SO_4, $CaSO_4$) mixes chloride and sulphate anions, so it is not a single family. Always check that ALL salts in the option share one common radical.

Q21. § 2.4 MORE ABOUT SALTS **[3]**

Common salt is an important raw material for various chemicals of daily use. State in brief the method of preparation of (i) Sodium hydroxide, and (ii) Sodium hydrogen carbonate from common salt. Write balanced chemical equations of the reactions that occur.

Previously asked in: 2025 31/3/1 Q28(a)

◆ **Acids, Bases and Salts** | Chemicals from Common Salt – Sodium Hydrogen Carbonate (Solvay/Ammonia process) | Chemicals from Common Salt – Sodium Hydroxide (Chlor-alkali process)

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Model Answer

(i) Sodium Hydroxide:

An aqueous solution of sodium chloride (brine) is electrolysed. This is called the **chlor-alkali process**. NaOH is formed near the cathode, Cl_2 at the anode, and H_2 at the cathode.

$$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$$

(ii) Sodium Hydrogen Carbonate:

NaCl solution is treated with water, CO_2, and NH_3. The less soluble $NaHCO_3$ is precipitated.

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$$

Source: Acids, Bases and Salts, Section 2.4.3

Explanation

- Examiners expect the **name of the process** (chlor-alkali) for NaOH — this is a common 1-mark component.
- Both balanced equations must be written correctly; missing state symbols may cost half a mark.
- For $NaHCO_3$, mention all four reactants (NaCl, H_2O, CO_2, NH_3) — students often forget NH_3.
- Keep descriptions brief; the equation carries most of the marks.

Q22. § 2.4 MORE ABOUT SALTS **[4]**

> Salts play a very important role in our daily life. Sodium chloride which is known as common salt is used almost in every kitchen. Baking soda is also a salt used in faster cooking as well as in baking industry. The family of salts is classified on the basis of cations and anions present in them.

Read the source and answer the sub-parts that follow.

(a) Identify the acid and base from which Sodium chloride is formed. [1]

(b) Find the cation and the anion present in Calcium sulphate. [1]

(c) "Sodium chloride and washing soda both belong to the same family of salts." Justify this statement. [2]

Previously asked in: 2024 31/2/1 Q37

♦ **Acids, Bases and Salts** | Cations and anions in salts | Family of Salts | Formation of salts from acids and bases

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Model Answer

(a) Sodium chloride (NaCl) is formed from:

- **Acid:** Hydrochloric acid (HCl)
- **Base:** Sodium hydroxide (NaOH)

(b) In Calcium sulphate ($CaSO_4$):

- **Cation:** Ca^{2+} (Calcium ion)
- **Anion:** SO_4^{2-} (Sulphate ion)

(c) Salts are classified into families based on the cations and anions present in them. Sodium chloride (NaCl) contains the Na^+ cation and Cl^- anion. Washing soda (Na_2CO_3) also contains the Na^+ cation. Since both salts share the same cation (Na^+), they belong to the **sodium family** of salts. Hence, the statement is justified.

Source: Chapter 2 – Acids, Bases and Salts

Explanation

- **(a):** Always identify the parent acid (provides anion) and parent base (provides cation) of a salt. NaCl → HCl + NaOH.
- **(b):** Dissociate the formula: $CaSO_4 \rightarrow Ca^{2+} + SO_4^{2-}$. Cation is the positive ion, anion is the negative ion.
- **(c):** The key phrase from the passage is *"family of salts is classified on the basis of cations and anions."* Use this directly to justify: both NaCl and Na_2CO_3 share Na^+, so same family. 2-mark justification needs both the rule AND its application.

Q23. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

A chemical compound used in glass, soap and paper industries is

A Washing Soda
B Baking Soda
C Bleaching Powder
D Common Salt

Previously asked in: 2024 31/3/1 Q3

◆ Acids, Bases and Salts | Uses of Sodium Carbonate (Washing Soda)

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Model Answer

Answer: A — Washing Soda

Washing Soda ($Na_2CO_3 \cdot 10H_2O$) is used in the glass, soap, and paper industries, as well as for softening hard water.

Explanation

This is from the Acids, Bases and Salts chapter (Chapter 2). Examiners expect you to recall the **uses of washing soda** specifically — glass, soap, paper industries, and water softening. Do not confuse it with **Baking Soda** ($NaHCO_3$), which is used in cooking and as an antacid. The source passages provided are from Chapter 4 and do not cover this topic, but the correct answer is firmly from the CBSE syllabus Chapter 2.

Q24. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[1]**

An aqueous solution of a salt turns blue litmus to red. The salt could be the one obtained by the reaction of :

A HNO_3 and NaOH
B H_2SO_4 and KOH
C CH_3COOH and NaOH
D HCl and NH_4OH

Previously asked in: 2024 31/4/1 Q2

◆ Acids, Bases and Salts | Acidic Salts and pH of Salt Solutions | Salts of Strong Acid and Weak Base

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Model Answer

Answer: D

HCl (strong acid) + NH_4OH (weak base) → NH_4Cl (acidic salt, pH < 7), which turns blue litmus red.

Source: Acids, Bases and Salts, Section 2.4.2

Explanation

- A salt turns blue litmus red only if it is **acidic** (pH < 7).
- Salts of **strong acid + weak base** are acidic.
- Option D: HCl (strong acid) + NH_4OH (weak base) → NH_4Cl — acidic salt ✓
- Options A & B: strong acid + strong base → neutral salt (no litmus change).
- Option C: CH_3COOH (weak acid) + NaOH (strong base) → basic salt (turns red litmus blue, not the other way).

Q25. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? § 2.4 MORE ABOUT SALTS **[5]**

Answer the following:

(i) Five solutions A, B, C, D and E when tested with pH paper showed pH as 4, 1, 13, 7 and 10 respectively. Which solution is : (1) Strongly acidic (2) Strongly alkaline (3) Weakly acidic (4) Neutral and (5) Weakly alkaline ? Arrange the solutions in increasing order of H^+ ion concentration.

(ii) Write the name and formula of (1) an acidic salt and (2) a basic salt giving the name of the parent acid and parent base used to form the salt in each case.

Previously asked in: 2024 31/3/1 Q34(a)

◆ **Acids, Bases and Salts** Acidic salts and basic salts – names, formulas, parent acid and parent base
pH scale and classification of solutions (strongly acidic, strongly alkaline, weakly acidic, neutral, weakly alkaline)

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Model Answer

(i)

Solution	pH	Type
B	1	(1) Strongly acidic
C	13	(2) Strongly alkaline
A	4	(3) Weakly acidic
D	7	(4) Neutral
E	10	(5) Weakly alkaline

Increasing order of H^+ ion concentration (lower pH → higher H^+):

$$C < E < D < A < B$$

(pH 13 < 10 < 7 < 4 < 1)

(ii)

(1) Acidic Salt:
Name: Sodium bisulphate (Sodium hydrogen sulphate)
Formula: $NaHSO_4$
Parent acid: Sulphuric acid (H_2SO_4) — strong acid, partially neutralised
Parent base: Sodium hydroxide (NaOH)

(2) Basic Salt:
Name: Basic copper chloride (Copper hydroxychloride)
Formula: Cu(OH)Cl
Parent acid: Hydrochloric acid (HCl)
Parent base: Copper hydroxide [$Cu(OH)_2$] — strong base, partially neutralised

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Explanation

- For (i), remember: **lower pH = more acidic = higher H^+ concentration**. pH 7 is neutral; below 7 is acidic; above 7 is alkaline. "Strongly" means close to 1 or 14; "weakly" means closer to 7.
- For the increasing H^+ order, arrange from highest pH to lowest pH (C→E→D→A→B).

- For (ii), an **acidic salt** is formed when a strong acid partially replaces H^+ with a metal — it still has replaceable hydrogen. A **basic salt** is formed when a strong base is only partially neutralised — it still contains OH^- groups. Examiners expect the formula, name, and parent acid/base for each.

Q26. § Introduction § Group Activity **[1]**

Select washing soda from the following :

(a) $NaHCO_3$
(b) $Na_2CO_3.5H_2O$
(c) $Na_2CO_3.10H_2O$
(d) NaOH

Previously asked in: 2023 31/1/1 Q6

◆ **Acids, Bases and Salts** Washing Soda (Sodium Carbonate - $Na_2CO_3·10H_2O$) - Identification and Common Salt Derivatives

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Model Answer

(c) $Na_2CO_3.10H_2O$

Washing soda is sodium carbonate decahydrate with the formula $Na_2CO_3.10H_2O$.

Explanation

Washing soda = $Na_2CO_3.10H_2O$. $NaHCO_3$ is baking soda, NaOH is caustic soda, and $Na_2CO_3.5H_2O$ is not the correct hydrated form. Examiners expect you to know the exact formula including the water of crystallisation ($10H_2O$).

Q27. § 2.4 MORE ABOUT SALTS **[3]**

Attempt either option (A) or (B). Option (B):

(i) Write all the reactions involved in the extraction of Zn from ZnS. [2]

(ii) Hydrogen gas is not evolved when most of the metals react with nitric acid. Give reason. [1]

Previously asked in: 2026 31/4/1 Q27 (B)

◆ **Acids, Bases and Salts** | Sodium Carbonate and Sodium Hydrogencarbonate

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Model Answer

(i) Extraction of Zn from ZnS:

Step 1 – Roasting (ZnS converted to ZnO):

$$2ZnS + 3O_2 \xrightarrow{\Delta} 2ZnO + 2SO_2$$

Step 2 – Reduction (ZnO reduced by coke):

$$2ZnO + C \xrightarrow{\Delta} 2Zn + CO_2$$

(ii) Nitric acid is a strong oxidising agent. It oxidises the hydrogen gas produced during the reaction to water (H_2O). Therefore, hydrogen gas is not evolved; instead, oxides of nitrogen (like NO, NO_2) are released.

Explanation

- For (i), the two-step process — roasting followed by reduction — must be shown as separate balanced equations. Both steps carry marks; missing either loses a mark.
- For (ii), the key phrase is **oxidising agent**: HNO_3 oxidises H_2 to H_2O before it can escape, so NO/NO_2 is evolved instead. Always mention this in one clear sentence.

Q28. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[5]**

Attempt either option (A) or (B). Option (B):

(i) How would you name the following : I. $CH_3 - CH_2 - C == O \mid H$ II. $CH_3 - C \equiv CH$ [2]

(ii) When ethanol reacts with ethanoic acid in the presence of conc. H_2SO_4, a substance with sweet smell is produced. Answer the following : I. State the class of compounds to which the sweet smelling compounds belong. II. Write the chemical equation for the reaction. [2]

(iii) Why soaps do not produce foam with hard water ? [1]

Previously asked in: 2026 31/4/1 Q29 (B)

◆ **Acids, Bases and Salts** Sodium Carbonate and Sodium Hydrogencarbonate

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Model Answer

(i)

I. $CH_3–CH_2–C(=O)–H$

The compound has 3 carbon atoms with an aldehyde (–CHO) functional group.
Name: **Propanal**

II. $CH_3–C\equiv CH$

The compound has 3 carbon atoms with a triple bond (alkyne).
Name: **Propyne**

(ii)

I. The sweet-smelling compounds produced belong to the class **Esters**.

II. The reaction is called **Esterification**. The chemical equation is:

$$CH_3COOH + C_2H_5OH \xrightarrow{\text{conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$$

(Ethanoic acid + Ethanol → Ethyl ethanoate + Water)

(iii)

Soap does not lather with hard water because hard water contains dissolved salts of calcium and magnesium. The soap reacts with these salts to form an insoluble precipitate called **scum** (calcium or magnesium salt of the fatty acid), which reduces the soap available for cleaning and prevents foam formation.

Source: Carbon and its Compounds, 4.2.5 Nomenclature of Carbon Compounds

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Explanation

- **(i):** Count the carbon atoms → assign the parent chain name. Aldehyde suffix = *-al*; triple bond suffix = *-yne*. Common errors: writing "propanaldehyde" or "methylacetylene" — CBSE expects IUPAC names.
- **(ii):** Always write the full balanced equation with the acid catalyst shown above the arrow. State the class name clearly as "Esters."
- **(iii):** The key word examiners look for is **scum** and the explanation that Ca^{2+}/Mg^{2+} ions react with soap to form insoluble salts, consuming the soap. One mark — keep it to 2–3 lines.

Q29. § 2.4 MORE ABOUT SALTS **[4]**

> Common salt is a very important chemical compound for our daily life. It's chemical name is sodium chloride and it is used as a raw material in the manufacture of caustic soda, washing soda, baking soda etc. It is also used in the preservation of pickles, butter, meat etc.

Read the source and answer the questions that follow.

(i) Name the acid and the base from which common salt can be obtained. [1]

(ii) State the nature (acidic/basic/neutral) of sodium chloride. Give reason for the justification for your answer. [1]

(iii) What happens when electric current is passed through an aqueous solution of sodium chloride (called brine)? Name the products obtained along with the corresponding places in the electrolytic cell where each of these products is obtained. [2]

Previously asked in: 2025 31/4/1 Q37

◆ Acids, Bases and Salts | Common Salt (Sodium Chloride) – source acid and base | Electrolysis of brine – chlor-alkali process | Nature of salts – acidic, basic, or neutral

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Model Answer

(i) Common salt (NaCl) is obtained from **hydrochloric acid (HCl)** (strong acid) and **sodium hydroxide, NaOH** (strong base).

(ii) Sodium chloride is **neutral** in nature. It is formed by the neutralisation of a strong acid (HCl) and a strong base (NaOH), so its aqueous solution has pH = 7.

(iii) When electric current is passed through brine (aqueous NaCl), the process is called **chlor-alkali process**. The products obtained are:

Product	Place of collection
Chlorine gas (Cl_2)	Anode
Hydrogen gas (H_2)	Cathode
Sodium hydroxide (NaOH)	Near cathode (in solution)

Source: Acids, Bases and Salts, Chapter 2 (NCERT Class 10 Science)

Explanation

- **(i)** Examiners expect both the name and formula of the acid and base.
- **(ii)** The key reasoning is "strong acid + strong base → neutral salt." Always state pH = 7.
- **(iii)** This is a standard 2-mark factual question. Naming all three products AND their correct positions (anode/cathode) is essential to score full marks. Missing the location loses a mark.

Q30. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[1]**

Few drops of aqueous solution of ammonium chloride are put on a universal indicator paper. The paper turns pink. Study the following table and choose the correct option.

(a) acidic | weak acid and strong base | less than 7
(b) basic | weak acid and strong base | more than 7
(c) acidic | strong acid and weak base | less than 7
(d) basic | strong acid and strong base | 7

Previously asked in: 2023 31/6/1 Q2

◆ Acids, Bases and Salts | Nature of Salt Solutions (Acidic, Basic, Neutral) | pH and Universal Indicator

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Model Answer

(c) acidic | strong acid and weak base | less than 7

Ammonium chloride is a salt of HCl (strong acid) and NH_4OH (weak base). Its solution is acidic, turning universal indicator pink, with pH less than 7.

Source: Chapter 2, Section 2.3

Explanation

- Ammonium chloride (NH_4Cl) is formed from HCl (strong acid) + NH_4OH (weak base) → acidic salt.
- Salts of strong acid + weak base give acidic solutions (pH < 7).
- Pink colour on universal indicator confirms acidic nature (pH slightly below 7).
- Option (a) is wrong because it pairs weak acid + strong base (that gives basic salt). Options (b) and (d) are eliminated as they suggest basic/neutral nature. Only option (c) is correct.

Q31. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[1]**

Two salts 'X' and 'Y' are dissolved in water separately. When phenolphthalein is added to these two solutions, the solution 'X' turns pink and the solution 'Y' does not show any change in colour, therefore 'X' and 'Y' are

(a) (X) Na_2CO_3, (Y) NH_4Cl
(b) (X) Na_2SO_4, (Y) $NaHCO_3$
(c) (X) NH_4Cl, (Y) Na_2SO_4
(d) (X) $NaNO_3$, (Y) Na_2SO_4

Previously asked in: 2023 31/6/1 Q4

◆ **Acids, Bases and Salts** pH and indicator behaviour of salt solutions (hydrolysis of salts)

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Model Answer

(a) X = Na_2CO_3, Y = NH_4Cl

Phenolphthalein turns pink in basic solutions. Na_2CO_3 is a salt of strong base and weak acid, so its solution is basic (turns pink). NH_4Cl is a salt of strong acid and weak base, so its solution is acidic/neutral (no colour change).

Source: Chapter 2, Section 2.1.1

Explanation

Phenolphthalein is colourless in acidic/neutral solutions and turns pink in basic solutions. Na_2CO_3 undergoes hydrolysis to give a basic solution; NH_4Cl gives an acidic solution. Options (b), (c), (d) are wrong because Na_2SO_4 and $NaNO_3$ give neutral solutions, and $NaHCO_3$ also gives a mildly basic solution — but the only pair where X is clearly basic (turns pink) and Y is acidic/neutral (no change) is option (a). Examiners expect you to recall the nature of salt solutions based on the strength of parent acid and base.

Q32. § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

In the given experimental set-up, if the experiment is carried out separately with each of the following solutions the cases in which the bulb will glow is/are :

(a) (i) only
(b) (ii) only
(c) (i) and (ii)
(d) (ii), (iii) and (iv)

(i) Dilute hydrochloric acid

(ii) Dilute sulphuric acid

(iii) Glucose solution

(iv) Alcohol

Previously asked in: 2023 31/2/1 Q2

◆ **Acids, Bases and Salts** | Electrical conductivity of acids, bases, and salts in solution

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Model Answer

(d) (ii), (iii) and (iv)

Wait — correct answer is **(c) (i) and (ii)**.

The bulb glows only with dilute HCl (i) and dilute H_2SO_4 (ii), as acids produce ions in solution that conduct electricity. Glucose and alcohol do not ionise, so the bulb does not glow with them.

Source: Chapter 2, Activity 2.8

Explanation

- Examiners expect you to recall that **only acids and bases produce ions** in aqueous solution, enabling electrical conduction.
- Glucose and alcohol contain hydrogen but **do not ionise** in water, so they cannot conduct electricity.
- The key concept tested: electrical conductivity requires free ions — acids provide H^+ and anions; non-electrolytes like glucose/alcohol do not.
- Option **(c)** is correct because both HCl and H_2SO_4 are strong acids that fully dissociate into ions.

Q33. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § Group Activity **[1]**

The water of crystallization is present in
(i) Bleaching Powder
(ii) Plaster of Paris
(iii) Washing Soda
(iv) Baking Soda

(A) (ii) and (iv)
(B) (ii) and (iii)
(C) (i) and (iii)
(D) (i) and (iv)

Previously asked in: 2025 31/6/1 Q7

◆ **Acids, Bases and Salts** Water of Crystallization

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Model Answer

(B) (ii) and (iii)

Washing soda ($Na_2CO_3 \cdot 10H_2O$) and Plaster of Paris ($CaSO_4 \cdot \frac{1}{2}H_2O$) both contain water of crystallisation. Bleaching powder and baking soda do not contain water of crystallisation.

Explanation

- **Water of crystallisation** = fixed number of water molecules in one formula unit of a salt.
- Washing soda: $Na_2CO_3 \cdot \mathbf{10H_2O}$ ✓
- Plaster of Paris: $CaSO_4 \cdot \mathbf{\frac{1}{2}H_2O}$ ✓
- Baking soda ($NaHCO_3$) and Bleaching powder ($CaOCl_2$) have **no** water of crystallisation.
- Examiners expect you to recall the chemical formulae of these common compounds to answer such questions correctly.

Q34. § 2.4 MORE ABOUT SALTS **[3]**

Write chemical equations to show what happens when an acid reacts with a
(i) metal
(ii) base and
(iii) carbonate
Write the name of the main product formed in each case.

Previously asked in: 2025 31/6/1 Q28(b)

◆ **Acids, Bases and Salts** | Reaction of acids with bases (neutralisation reaction) | Reaction of acids with carbonates | Reaction of acids with metals

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Model Answer

(i) Acid + Metal → Salt + Hydrogen gas

$$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2 \uparrow$$

Main product: Salt (zinc sulphate)

(ii) Acid + Base → Salt + Water (Neutralisation reaction)

$$NaOH + HCl \rightarrow NaCl + H_2O$$

Main product: Salt (sodium chloride)

(iii) Acid + Carbonate → Salt + Carbon dioxide + Water

$$Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 \uparrow + H_2O$$

Main product: Salt (sodium chloride)

Source: Chapter 2, Acids, Bases and Salts

Explanation

- Each sub-part carries 1 mark: **½ mark for the balanced equation + ½ mark for naming the main product** is the typical examiner split.
- The **common product in all three reactions is a salt** — examiners expect you to state this explicitly.
- Use a standard example (Zn/H_2SO_4, NaOH/HCl, Na_2CO_3/HCl) — these are directly from the textbook and are safe choices.
- Ensure arrows for gas evolution (↑) are shown where relevant; it demonstrates awareness of physical states.

Q35. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

Sodium hydroxide is termed an alkali while Ferric hydroxide is not because :

(a) Sodium hydroxide is a strong base, while Ferric hydroxide is a weak base.
(b) Sodium hydroxide is a base which is soluble in water while Ferric hydroxide is also a base but it is not soluble in water.
(c) Sodium hydroxide is a strong base while Ferric hydroxide is a strong acid.
(d) Sodium hydroxide and Ferric hydroxide both are strong base but the solubility of Sodium hydroxide in water is comparatively higher than that of Ferric hydroxide.

Previously asked in: 2023 31/4/1 Q5

◆ Acids, Bases and Salts | Distinction between alkalis and bases – solubility in water

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Model Answer

(b) Sodium hydroxide is a base which is soluble in water while Ferric hydroxide is also a base but it is not soluble in water.

Explanation

The textbook (Chapter 2, Section 2.2.1) explicitly states: **"Bases which are soluble in water are called alkalis."** So the defining criterion for an alkali is water-solubility, not strength. NaOH dissolves in water → alkali; $Fe(OH)_3$ does not dissolve in water → base but not an alkali. Option (a) is partially correct but solubility, not strength, is the textbook definition. Option (d) is wrong in reasoning — "comparatively higher solubility" misses the point.

Q36. § 2.4 MORE ABOUT SALTS **[1]**

The name of the salt used to remove permanent hardness of water is :

(a) Sodium hydrogen carbonate ($NaHCO_3$)
(b) Sodium chloride (NaCl)
(c) Sodium carbonate decahydrate ($Na_2CO_3.10H_2O$)
(d) Calcium sulphate hemihydrate ($CaSO_4.½H_2O$)

Previously asked in: 2023 31/4/1 Q6

◆ Acids, Bases and Salts | Hardness of Water – Removal of Permanent Hardness using Washing Soda (Sodium Carbonate)

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Model Answer

(c) Sodium carbonate decahydrate ($Na_2CO_3.10H_2O$)

Explanation

The textbook (Section 2.4.3) explicitly states that one of the **uses of washing soda** ($Na_2CO_3.10H_2O$) is **"for removing permanent hardness of water."** It reacts with soluble calcium and magnesium salts causing hardness, converting them into insoluble carbonates. The other options are incorrect: $NaHCO_3$ is baking soda (antacid/fire extinguisher), NaCl is common salt, and $CaSO_4.½H_2O$ is Plaster of Paris.

Source: Chapter 2, Section 2.4.3

Q37. § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS § Group Activity **[2]**

(B) The industrial process used for the manufacture of caustic soda involves electrolysis of an aqueous solution of compound 'X'. In this process, two gases 'Y' and 'Z' are liberated. 'Y' is liberated at cathode and 'Z', which is liberated at anode, on treatment with dry slaked lime forms a compound 'B'. Name X, Y, Z and B.

Previously asked in: 2023 31/4/1 Q21 (B)

◆ Acids, Bases and Salts | Electrolysis of brine (chlor-alkali process) – manufacture of caustic soda, chlorine and hydrogen

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Model Answer

- **X** = Sodium chloride (NaCl) / brine (aqueous solution)
- **Y** = Hydrogen (H_2) — liberated at cathode
- **Z** = Chlorine (Cl_2) — liberated at anode
- **B** = Bleaching powder — formed when Cl_2 reacts with dry slaked lime $Ca(OH)_2$

$$2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{electrolysis}} 2NaOH + H_2 \uparrow + Cl_2 \uparrow$$

Explanation

This question tests the **chlor-alkali process**. Remember the key facts: electrolysis of **brine** (NaCl solution) gives **NaOH** (caustic soda) as the main product, **H_2** at cathode, and **Cl_2** at anode. Cl_2 + dry slaked lime [$Ca(OH)_2$] → **bleaching powder**. Examiners expect all four names correctly identified. Writing the equation adds value even in a 2-mark answer.

Q38. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.4 MORE ABOUT SALTS **[1]**

Answer the following : Categorise the following based on their nature : ZnO, Na_2O, CO_2

Previously asked in: 2026 31/1/1 Q25 (b)

◆ Acids, Bases and Salts | Classification of oxides (amphoteric, basic, acidic)

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Model Answer

ZnO — amphoteric oxide; Na_2O — basic oxide; CO_2 — acidic oxide.

Explanation

Examiners expect all three categorised correctly in one line. ZnO reacts with both acids and bases (amphoteric); Na_2O is a metal oxide (basic); CO_2 is a non-metal oxide (acidic). No explanation needed for 1 mark.

Q39. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[1]**

The warning sign shown in the given figure must invariably be displayed/pasted on the containers which contain hydroxide of :

(A) Aluminium
(B) Calcium
(C) Sodium
(D) Magnesium

Previously asked in: 2025 31/2/1 Q2

◆ Acids, Bases and Salts | Corrosive nature of strong bases (alkalis) and warning signs on containers

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Model Answer

(C) Sodium

The corrosive warning sign is displayed on containers of **sodium hydroxide (NaOH)** pellets, as it is a strongly corrosive alkali.

Source: Chapter 2, Section 2.2.1 (Fig. 2.5)

Explanation

The textbook explicitly mentions the corrosive warning sign (Fig. 2.5) in the context of **concentrated sulphuric acid** and **sodium hydroxide pellets**. Among the four options, only **sodium** hydroxide (NaOH) is referenced with this warning sign. $Ca(OH)_2$, $Mg(OH)_2$, and $Al(OH)_3$ are either insoluble, weak, or amphoteric — not strongly corrosive alkalis that require this label.

Q40. § 2.4 MORE ABOUT SALTS

Answer the following: Name the salt formed when sulphuric acid is added to sodium hydroxide and write its pH.

Previously asked in: 2023 31/4/1 Q28 (ii)

◆ Acids, Bases and Salts | Neutralisation reaction – acid + base forming salt | pH of salt solution (sodium sulphate – neutral salt, pH = 7)

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Model Answer

When sulphuric acid (H_2SO_4) reacts with sodium hydroxide (NaOH), the salt formed is **sodium sulphate (Na_2SO_4)**.

$$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$$

Since sulphuric acid is a strong acid and sodium hydroxide is a strong base, sodium sulphate is a neutral salt with **pH = 7**.

Source: Chapter 2, Section 2.4.2

Explanation

- Examiners expect: name of salt, chemical equation (balanced), and the pH value with reasoning.
- Key rule to remember: **Strong acid + Strong base → Neutral salt, pH = 7**.
- Always justify the pH by stating the nature of the acid and base used — this earns the reasoning mark.
- Writing the balanced equation is important; note that 2 moles of NaOH are needed for H_2SO_4.

Q41. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON?

Answer the following: Dry HCl gas does not change the colour of dry blue litmus paper. Why ?

Previously asked in: 2023 31/4/1 Q28 (iii)

◆ **Acids, Bases and Salts** Role of water in ionisation of acids (HCl does not ionise without water, hence no H^+ ions to change litmus colour)

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Model Answer

Dry HCl gas does not ionise in the absence of water and hence does not produce H^+ ions. Since no H^+ (hydronium) ions are formed, it shows no acidic character and cannot change the colour of dry blue litmus paper.

$$HCl + H_2O \rightarrow H_3O^+ + Cl^-$$

H^+ ions are produced only in the presence of water. Without water, HCl remains as molecules and cannot act as an acid.

Source: Chapter 2, Section 2.2.1

Explanation

- The key concept is that **acids show acidic properties only in aqueous solution** — they must ionise to release H^+ ions.
- Dry litmus paper has no moisture, so HCl gas cannot ionise → no H_3O^+ → no colour change.
- Always mention: (1) no ionisation without water, (2) no H^+ ions produced, (3) therefore no acidic behaviour. Writing the equation earns a mark in most marking schemes.

Q42. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[3]**

Explain chlor-alkali process with chemical equation. Name the products formed at anode and cathode.

Previously asked in: 2026 31/1/1 Q27(a)

◆ **Acids, Bases and Salts** Chlor-alkali process (electrolysis of brine)

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Model Answer

Chlor-Alkali Process:

When electricity is passed through an aqueous solution of sodium chloride (brine), it decomposes to give sodium hydroxide, chlorine, and hydrogen. This is called the chlor-alkali process.

$$2\text{NaCl}(aq) + 2\text{H}_2\text{O}(l) \xrightarrow{\text{electricity}} 2\text{NaOH}(aq) + \text{Cl}_2(g) + \text{H}_2(g)$$

- **At Anode:** Chlorine gas (Cl_2) is produced.
- **At Cathode:** Hydrogen gas (H_2) is produced; sodium hydroxide (NaOH) is formed near the cathode.

Source: Acids, Bases and Salts, Chapter 2

Explanation

- The name "chlor-alkali" comes from the two main products: **chlorine** (chlor) and **alkali** (NaOH).
- Examiners expect: (1) a clear definition/description of the process, (2) the balanced chemical equation with state symbols, and (3) specific products named at each electrode.
- Remember: Cl_2 → anode; H_2 → cathode; NaOH forms near cathode. All three products must be mentioned for full marks.

Q43. § Introduction § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[3]**

Answer the following :

(i) The pH of a sample of tomato juice is 4.6. How is this juice likely to be in taste ? Give reason to justify your answer. [1]

(ii) How do we differentiate between a strong acid and a weak base in terms of ion-formation in aqueous solutions ? [1]

(iii) The acid rain can make the survival of aquatic animals difficult. How ? [1]

Previously asked in: 2024 31/1/1 Q28

◆ **Acids, Bases and Salts** | Acid rain – effects on aquatic life | Strong acid vs weak base – ion formation in aqueous solutions | pH scale and taste of acidic/basic solutions

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Model Answer

(i) The tomato juice with pH 4.6 will taste **sour**. Since its pH is less than 7, it is acidic in nature, and acids taste sour.

(ii) A **strong acid** completely dissociates (ionises) in aqueous solution to produce a large number of H^+ ions. A **weak base** partially dissociates in aqueous solution, producing a small number of OH^- ions.

(iii) Acid rain lowers the pH of river/lake water. Aquatic animals are adapted to survive within a specific pH range. When pH falls below this range due to acid rain, their survival becomes difficult and they may die.

Explanation

- **(i)** Any pH < 7 = acidic = sour taste. Direct and simple — state it clearly.
- **(ii)** Key contrast: "complete ionisation" (strong acid) vs "partial ionisation" (weak base). Mention the ions produced (H^+ and OH^- respectively).
- **(iii)** The logic chain is: acid rain → lower pH of water → outside tolerable range for aquatic life → difficult survival. Follow this chain for full marks.

Q44. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[1]**

Hydronium ions are formed by the reaction between :

(a) Sodium hydroxide and water
(b) Calcium chloride and water
(c) Hydrogen chloride gas and water
(d) Ethanol and water

Previously asked in: 2023 31/5/1 Q6

◆ **Acids, Bases and Salts** Formation of Hydronium Ions

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Model Answer

(c) Hydrogen chloride gas and water

When HCl gas dissolves in water, it ionises to form H^+ ions, which combine with water molecules to form hydronium ions: $HCl + H_2O \rightarrow H_3O^+ + Cl^-$.

Explanation

Hydronium ion (H_3O^+) is formed when H^+ (from an acid) combines with a water molecule. HCl is an acid that dissociates in water to release H^+, which then bonds with H_2O to give H_3O^+. NaOH gives OH^- (not H_3O^+), $CaCl_2$ is a salt with no such reaction, and ethanol does not ionise in water.

Q45. § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[4]**

> Acid-base indicators can be used to distinguish between an acid and a base. Universal indicator, a mixture of several indicators, shows different colours at different concentrations of acids and bases, thereby indicating their pH on the pH scale of 0 – 14. The pH of a solution is measured by pH paper, which is a paper impregnated with a universal indicator.

Read the case carefully and answer the questions that follow.

(a) Solution P is a strong acid while solution Q is a strong base. On the pH scale, where would you place the solutions P and Q ? [1]

(b) A solution has a pH of 7. Name a compound you would use to (i) increase its pH, and (ii) decrease its pH. [1]

(c) (i) When the pH of a solution is decreased from 4 to 2, what effect does it produce on its hydronium ion concentration ? State the colour change shown by the pH paper. [2]

Previously asked in: 2025 31/2/1 Q37

♦ Acids, Bases and Salts | Acid-base indicators | Hydronium ion concentration and pH relationship | Universal indicator and pH paper | pH scale and pH of acids and bases

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Model Answer

(a) Solution P (strong acid) would be placed near **pH 0–3** (towards the left/acidic end), and Solution Q (strong base) would be placed near **pH 11–14** (towards the right/basic end) of the pH scale.

(b)
(i) To **increase** the pH (make it more basic): **NaOH** (sodium hydroxide)
(ii) To **decrease** the pH (make it more acidic): **HCl** (hydrochloric acid)

(c)(i) When pH decreases from 4 to 2, the hydronium ion (H_3O^+) concentration **increases 100 times** (increases by a factor of 100).
Colour change on pH paper: from **orange** (pH 4) to **red** (pH 2).

Source: Chapter 2 – Acids, Bases and Salts; pH Scale section

Explanation

- **(a)** Strong acids have very low pH (0–3); strong bases have very high pH (11–14). Place them at opposite ends of the scale.
- **(b)** Any valid strong base/acid is acceptable. NaOH and HCl are the most common NCERT examples.
- **(c)** pH is a logarithmic scale — a drop of 2 units means H^+ concentration increases **100-fold** ($10^2 = 100$). Examiners expect "100 times" specifically. Colour change from orange → red is read directly from the pH scale figure: pH 4 ≈ orange, pH 2 ≈ red.

Q46. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[2]**

Answer the following :

(a) Write the formula of the ions which (i) acids, and (ii) bases generate in water solutions. [1]

(b) Dry HCl gas does not change the colour of dry litmus paper. Why ? [1]

Previously asked in: 2025 31/3/1 Q22

◆ **Acids, Bases and Salts** | Ions generated by acids and bases in water (H^+/H_3O^+ and OH^- ions) | Role of water in ionisation of acids – dry HCl and litmus paper

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Model Answer

(a)

(i) Acids generate **H^+ (hydrogen ions / hydronium ions, H_3O^+)** in water.

(ii) Bases generate **OH^- (hydroxide ions)** in water.

(b)

Dry HCl gas does not ionise in the absence of water and thus produces no H^+ ions. Since litmus changes colour only in the presence of H^+ ions (in solution), dry HCl cannot affect dry litmus paper.

Explanation

- For (a), examiners expect the correct ionic formulae: H^+/H_3O^+ for acids and OH^- for bases. Either H^+ or H_3O^+ is accepted.
- For (b), the key concept is that **ionisation requires water as a medium**. Without water, HCl remains molecular and cannot produce H^+ ions, so no colour change occurs. Always link the absence of water → no ions → no effect on litmus.

Q47. § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[3]**

Design an experimental set-up to demonstrate that "Alcohol and glucose contain hydrogen but are not categorised as acids". Also give the reason to justify this fact.

Previously asked in: 2025 31/3/1 Q28(b)

◆ **Acids, Bases and Salts** | Acids require ionizable hydrogen ions (H^+) – distinguishing acids from non-acids containing hydrogen | Electrical conductivity test using electrolytic solution to detect presence of ions

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Model Answer

Experimental Set-up (Activity 2.8):

- Take solutions of glucose, alcohol, HCl, and H_2SO_4 separately.
- Fix two nails on a cork placed in a beaker. Connect nails to a 6V battery through a bulb and switch.
- Pour each solution into the beaker and switch on the current.

Observation: The bulb glows with HCl and H_2SO_4 solutions but **does not glow** with glucose and alcohol solutions.

Reason: Acids produce $H^+(aq)$ ions in water, which conduct electricity. Glucose and alcohol do not ionise in water — they do not produce H^+ ions — and hence are not classified as acids, even though they contain hydrogen.

Source: Chapter 2, Section 2.2

Explanation

- Examiners expect: (1) the experimental setup description, (2) observation (bulb glows/doesn't glow), and (3) the reason linking ion formation to acidic character.
- Key point: containing hydrogen ≠ being an acid. Only compounds that release $H^+(aq)$ ions in solution are acids.
- Avoid writing unnecessary details about glucose/alcohol chemical formulas — focus on ion formation.

Q48. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § Group Activity **[1]**

Select a pair of natural indicator from the following :

A Litmus and methyl orange
B Turmeric and Litmus
C Phenolphthalein and methyl orange
D Methyl orange and Turmeric

Previously asked in: 2024 31/3/1 Q2

◆ Acids, Bases and Salts | Natural Indicators of Acids and Bases

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Model Answer

Option B — Turmeric and Litmus

Turmeric and litmus are natural indicators as both are obtained from natural sources (turmeric plant and lichen respectively), unlike methyl orange and phenolphthalein, which are synthetic indicators.

Explanation

The key distinction is **natural vs. synthetic** indicators. Litmus (from lichen) and turmeric (from the turmeric plant) are natural indicators. Methyl orange and phenolphthalein are synthetic (man-made) indicators. The textbook (Ch. 2) lists litmus as a natural indicator and uses turmeric as an example of a natural substance that can indicate acids/bases. Eliminate options containing only synthetic indicators.

Q49. § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

Four solutions, namely glucose, alcohol, hydrochloric acid and sulphuric acid filled in four separate beakers are connected one by one in an electric circuit with a bulb. The solutions in which the bulb will glow when current is passed are :

A Glucose and alcohol
B Alcohol and hydrochloric acid
C Glucose and sulphuric acid
D Hydrochloric acid and sulphuric acid

Previously asked in: 2024 31/4/1 Q3

◆ Acids, Bases and Salts | Electrolytes and Non-electrolytes – Conductivity of Acids, Bases and Salts in Solution

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Model Answer

Option D: Hydrochloric acid and sulphuric acid.

Acids produce $H^+(aq)$ ions in solution, which carry electric current and make the bulb glow. Glucose and alcohol do not ionise, so they do not conduct electricity.

Source: Chapter 2, Section 2.2 (Activity 2.8)

Explanation

The key concept is **ionic conduction**: only solutions containing ions can conduct electricity. HCl and H_2SO_4 are strong acids that fully dissociate into ions in water. Glucose and alcohol contain hydrogen but do not produce H^+ ions in solution, so they are non-electrolytes. Examiners expect you to link "glowing bulb = ions present = acid/base" directly.

Q50. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.4 MORE ABOUT SALTS **[1]**

Study the following table and select the correct option :

(A) NaCl, HCl, NaOH, Basic
(B) Na_2CO_3, H_2CO_3, NaOH, Neutral
(C) Na_2SO_4, H_2SO_4, NaOH, Acidic
(D) CH_3COONa, CH_3COOH, NaOH, Basic

Previously asked in: 2026 31/5/1 Q20

◆ **Acids, Bases and Salts** Nature of salts – acidic, basic, or neutral Neutralisation reaction and nature of salt formed pH of salt solutions (hydrolysis – acidic, basic, and neutral salts)

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Model Answer

(D) CH_3COONa, CH_3COOH, NaOH, Basic — CH_3COONa is formed from weak acid (CH_3COOH) and strong base (NaOH), so its nature is basic. This is the only correct row.

Explanation

- **NaCl** (Option A): formed from strong acid + strong base → **neutral**, not basic.
- **Na_2CO_3** (Option B): formed from weak acid (H_2CO_3) + strong base (NaOH) → **basic**, not neutral.
- **Na_2SO_4** (Option C): formed from strong acid + strong base → **neutral**, not acidic.
- **CH_3COONa** (Option D): weak acid + strong base → **basic** ✓ — this is the only entry where all four columns are correct.

Key rule: Salt of weak acid + strong base = basic; strong acid + strong base = neutral; weak base + strong acid = acidic.

Q51. § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

Four solutions, namely fructose, ethanol, hydrochloric acid and sodium hydroxide filled in four separate beakers are connected one by one in an electric circuit with a bulb. The solutions in which the bulb will glow when current is passed are :

(A) ethanol and hydrochloric acid
(B) fructose and ethanol
(C) fructose and sodium hydroxide
(D) hydrochloric acid and sodium hydroxide

Previously asked in: 2026 31/5/1 Q22

◆ **Acids, Bases and Salts** Electrolytes vs Non-electrolytes Electrolytic conductivity of acids, bases, and salts

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Model Answer

(D) hydrochloric acid and sodium hydroxide

HCl and NaOH ionize in water to produce H^+ and OH^- ions respectively, allowing current to flow and the bulb to glow. Fructose and ethanol do not ionize, so they do not conduct electricity.

Source: Chapter 2, Section 2.2

Explanation

The key concept is ionic conduction: only solutions that produce free ions conduct electricity. Acids produce $H^+(aq)$ and bases produce $OH^-(aq)$ — both allow current flow. Non-electrolytes like fructose (sugar) and ethanol have no ions in solution, so the bulb stays off. Examiners expect you to identify the two ionic solutions correctly.

Q52. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES **[1]**

An aqueous solution turns red litmus blue. Excess addition of which of the following solution would reverse the change ?

(A) Sodium hydroxide
(B) Hydrochloric acid
(C) Baking soda
(D) Slaked lime

Previously asked in: 2026 31/4/1 Q19

◆ **Acids, Bases and Salts** | Acids, Bases and Indicators (Litmus Test, Neutralisation)

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Model Answer

(B) Hydrochloric acid

The solution is basic (turns red litmus blue). Adding excess HCl (acid) will neutralise the base, making it acidic, turning blue litmus red again — reversing the change.

Explanation

- A solution that turns red litmus blue is **basic/alkaline**.
- To reverse this (make it acidic again), an **acid** must be added in excess.
- Options A, C, and D (NaOH, baking soda, slaked lime) are all basic — they would not reverse the change.
- Only **HCl (option B)** is an acid that can neutralise the base and make the solution acidic, turning blue litmus back to red.

Q53. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

In the experimental setup given below, it is observed that on passing the gas produced in the reaction in the solution 'X' the solution 'X' first turns milky and then colourless. The option that justifies the above stated observation is that 'X' is aqueous calcium hydroxide and

(a) it turns milky due to carbon dioxide gas liberated in the reaction and after sometime it becomes colourless due to formation of calcium carbonate.
(b) it turns milky due to formation of calcium carbonate and on passing excess of carbon dioxide it becomes colourless due to formation of calcium hydrogen carbonate which is soluble in water.
(c) it turns milky due to passing of carbon dioxide through it. It turns colourless as on further passing carbon dioxide, sodium hydrogen carbonate is formed which is soluble in water.
(d) the carbon dioxide liberated during the reaction turns lime water milky due to formation of calcium hydrogen carbonate and after some time it turns colourless due to formation of calcium carbonate which is soluble in water.

Previously asked in: 2023 31/1/1 Q1

◆ **Acids, Bases and Salts** | CO_2 gas turning lime water milky then colourless (excess CO_2 forming soluble calcium bicarbonate) | Reaction of $Ca(OH)_2$ solution with CO_2 – lime water test | Reaction of acids with carbonates

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Model Answer

(b) It turns milky due to formation of calcium carbonate and on passing excess of carbon dioxide it becomes colourless due to formation of calcium hydrogen carbonate which is soluble in water.

Explanation

The reactions are: $Ca(OH)_2 + CO_2 \rightarrow CaCO_3\downarrow$ (white/milky) + H_2O; then $CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$ (soluble, so colourless). Option (b) correctly identifies $CaCO_3$ as the cause of milkiness and soluble $Ca(HCO_3)_2$ as the reason for turning colourless. Options (c) and (d) wrongly mention sodium hydrogen carbonate or reverse the products.

Q54. § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[4]**

> The pH plays an important role in our daily life. Strength of acids and bases depends on the number of H^+ ions and OH^- ions produced by these respectively. pH scale helps in predicting the strength of acids and bases by measuring hydrogen ion concentration in a solution.

The pH plays an important role in our daily life. Strength of acids and bases depends on the number of H^+ ions and OH^- ions produced by these respectively. pH scale helps in predicting the strength of acids and bases by measuring hydrogen ion concentration in a solution.
Answer the following :

(a) What type of indicator is used to predict how strong an acid or base is ? [1]

(b) Three solutions A, B and C showed pH as 3, 5 and 7. Which solution has the highest concentration of H^+ ions ? [1]

(c) What are strong acids and weak acids ? [2]

Previously asked in: 2026 31/4/1 Q28

◆ Acids, Bases and Salts | Acids, Bases and Indicators (Litmus Test, Neutralisation) | pH Scale and its Importance in Everyday Life

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Model Answer

(a) Universal indicator is used to predict how strong an acid or base is. It shows different colours at different pH values, allowing us to determine the strength of an acid or base.

(b) Solution **A** (pH = 3) has the highest concentration of H^+ ions, as lower pH indicates higher hydrogen ion concentration.

(c) Strong acids are acids that completely dissociate in water to produce a large number of H^+ ions. Example: HCl, H_2SO_4.

Weak acids are acids that partially dissociate in water, producing fewer H^+ ions. Example: acetic acid (CH_3COOH), carbonic acid.

Source: Chapter 2 – Acids, Bases and Salts

Explanation

- **(a)** Universal indicator is the standard answer; examiners also accept "pH paper."
- **(b)** Remember: **lower pH = higher H^+ concentration**. This is a direct 1-mark factual point — state the solution and the reason.
- **(c)** For 2 marks, you need both definitions with at least one example each. The key distinction is **complete vs. partial dissociation**. Do not write long paragraphs — two crisp definitions suffice.

Q55. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[5]**

Attempt either option (A) or (B). Option (A):

(i) Carbon cannot form C^{4+} cation and C^{4-} anion. Explain. [2]

(ii) Define homologous series of carbon compounds. Why are the melting and boiling points of C_4H_{10} higher than C_3H_8 or C_2H_6 ? [2]

(iii) What happens when ethanol is heated with acidified potassium dichromate ? [1]

Previously asked in: 2026 31/4/1 Q29 (A)

◆ **Acids, Bases and Salts** Acids, Bases and Indicators (Litmus Test, Neutralisation)

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Model Answer

(i) Carbon cannot form C^{4+} or C^{4-}:

To form C^{4+}, carbon would need to remove 4 electrons, requiring a very large amount of energy, which is not energetically feasible. To form C^{4-}, it would need to gain 4 electrons; placing 4 extra electrons on a small carbon nucleus would be very difficult as the nucleus cannot hold so many electrons with stability. Therefore, carbon shares electrons and forms covalent bonds instead.

(ii) Homologous Series:

A homologous series is a group of organic compounds having the same general formula and similar chemical properties, differing from each other by a $-CH_2-$ unit.

C_4H_{10} has more carbon atoms and hence greater molecular mass than C_3H_8 or C_2H_6. Greater molecular mass means stronger intermolecular forces (van der Waals forces), so more energy is needed to overcome them, resulting in higher melting and boiling points.

(iii) Oxidation of Ethanol:

When ethanol is heated with acidified potassium dichromate, it gets oxidised to ethanoic acid (acetic acid). The orange colour of potassium dichromate changes to green.

$$CH_3CH_2OH \xrightarrow{\text{acidified } K_2Cr_2O_7} CH_3COOH$$

Explanation

- **(i)** Examiners want both reasons — energy cost of losing $4e^-$ AND instability of gaining $4e^-$. Missing either loses a mark.
- **(ii)** Definition must include: same general formula, differ by $-CH_2-$, similar chemical properties. For boiling/melting point, link molecular mass → intermolecular forces → energy required.
- **(iii)** 1-mark answer needs: product (ethanoic acid) + colour change of dichromate (orange → green), or the equation. Keep it to one or two lines.

Q56. § 2.4 MORE ABOUT SALTS **[2]**

Answer the following:

(i) A compound 'X' which is prepared from gypsum has the property of hardening when mixed with proper quantity of water. Identify 'X' and write its chemical formula.

(ii) State the difference in chemical composition between baking soda and baking powder.

Previously asked in: 2023 31/1/1 Q21(a)

◆ **Acids, Bases and Salts** | Baking soda vs. baking powder – difference in chemical composition | Plaster of Paris – preparation from gypsum, chemical formula, and property of hardening

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Model Answer

(i) Compound X is **Plaster of Paris**.
Chemical formula: $CaSO_4 \cdot \frac{1}{2}H_2O$

(ii) Baking soda contains only **sodium hydrogen carbonate** ($NaHCO_3$), whereas baking powder contains sodium hydrogen carbonate **along with a mild edible acid** (such as tartaric acid).

Explanation

- For (i), Plaster of Paris is made from gypsum ($CaSO_4 \cdot 2H_2O$) by heating; its formula with the ½ water of crystallisation must be written correctly.
- For (ii), the key distinction is that baking powder = baking soda + mild acid (+ starch). Examiners expect you to name the extra component; just saying "it has more ingredients" is insufficient.

Q57. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[4]**

> In the given diagram, when electricity is passed through an aqueous solution of a common salt, a substance 'Z' is produced, along with the evolution of gases 'X' and 'Y'. When a burning matchstick is brought near the gas 'Y', it burns with a pop sound, whereas 'X' is used for disinfecting drinking water. When 'X' is passed through slaked lime, an insoluble substance 'A' is produced.

Read the following passage and answer the questions that follow :

(a) Write the names of the gases 'X' and 'Y'. [1]

(b) Write the balanced chemical equation for the formation of substance 'Z'. [1]

(c) Answer (i) or (ii): [2]

Previously asked in: 2026 31/2/1 Q28

◆ **Acids, Bases and Salts** | Chlor-alkali process and uses of its products | Electrolysis of brine (aqueous NaCl solution)

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Model Answer

(a) Gas X = **Chlorine (Cl_2)**; Gas Y = **Hydrogen (H_2)**

(b) Electrolysis of brine (aqueous NaCl) produces sodium hydroxide (Z):

$$2NaCl + 2H_2O \xrightarrow{\text{electricity}} 2NaOH + Cl_2 + H_2$$

(c) *(i) or (ii) — answered as (i): Name substance 'A' and write its chemical equation.*

When chlorine gas (X) is passed through slaked lime [$Ca(OH)_2$], **bleaching powder** is formed as substance 'A'.

$$2Ca(OH)_2 + 2Cl_2 \rightarrow Ca(OCl)_2 + CaCl_2 + 2H_2O$$

(ii) Uses of substance 'Z' (NaOH): It is used in making soap, paper, and as a drain cleaner.

Source: Chapter 2 — Acids, Bases and Salts; Electrolysis of Brine / Chemicals from Common Salt

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Explanation

- **X = Chlorine** because it disinfects water and reacts with slaked lime. **Y = Hydrogen** because it burns with a pop sound — classic test for H_2.
- The balanced equation for (b) is the standard electrolysis of brine equation — examiners award the mark only if it is balanced with correct formulae.
- For (c), bleaching powder is Ca(OCl)Cl (calcium oxychloride); examiners accept either formula. If the sub-question asked for uses of NaOH instead, soap/paper/drain cleaner are the three accepted uses from the textbook.
- Always write chemical names alongside formulae to avoid losing marks for ambiguity.

Q58. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON?

Give reasons for the following : The path of a beam of light passing through a colloidal solution is visible.

Previously asked in: 2023 31/1/1 Q31 (c)

◆ **Acids, Bases and Salts** Tyndall Effect in Colloidal Solutions

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Model Answer

The path of a beam of light passing through a colloidal solution is visible due to the **Tyndall effect**. The colloidal particles are relatively larger in size than the particles of a true solution. When light strikes these colloidal particles, they scatter light in all directions. This scattered light reaches our eyes, making the path of the beam visible. This phenomenon is called the Tyndall effect.

Source: Chapter 10, Section 10.6 – Scattering of Light / 10.6.1 Tyndall Effect

Explanation

- The key term examiners look for is **Tyndall effect** — always name it.
- The core reason is **scattering of light by colloidal particles** (which are larger than particles in a true solution).
- Contrast with a true solution (path not visible) to strengthen the answer — it shows conceptual clarity.
- This is typically a 2–3 mark question; the answer above covers all required points concisely.

Q59. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[5]**

When the acid present in tamarind is mixed with a base, a mixture is produced. When the base is mixed into kneaded flour and heated, cakes become soft and spongy. The base is prepared with common salt and is also used for faster cooking.

(i) Write the common name and chemical formula of X, Y and Z, and also the chemical formula of Y. [2]

(ii) How is Y prepared and how does it help in making cakes soft and spongy ? Illustrate the reaction with suitable chemical equation. [2]

(iii) Write the name and chemical formula of a mild base other than Y that is used as an antacid. [1]

Previously asked in: 2024 31/5/1 Q34 (b)

◆ **Acids, Bases and Salts** | Mild bases used as antacids – Magnesium Hydroxide $Mg(OH)_2$ | Preparation and uses of Baking Soda ($NaHCO_3$) | Salts and their common names – Baking Soda ($NaHCO_3$), Washing Soda (Na_2CO_3), Common Salt (NaCl)

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Model Answer

The clues identify:

- **X** = Tartaric acid (acid in tamarind) — Chemical formula: **$C_4H_6O_6$**
- **Y** = Baking soda (base mixed into flour) — Common name: Baking soda; Chemical formula: **$NaHCO_3$**
- **Z** = Washing soda (prepared from common salt, used for faster cooking) — Common name: Washing soda; Chemical formula: **Na_2CO_3**

(i) X = Tartaric acid, $C_4H_6O_6$; Y = Baking soda, $NaHCO_3$; Z = Washing soda, Na_2CO_3

(ii) Baking soda ($NaHCO_3$) is prepared by treating a solution of sodium chloride (brine) with ammonia and CO_2 (Solvay process), or from washing soda and CO_2:

$$Na_2CO_3 + H_2O + CO_2 \rightarrow 2NaHCO_3$$

On heating, $NaHCO_3$ releases CO_2 gas:

$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2 \uparrow$$

The CO_2 produced gets trapped in the dough, making the cake soft and spongy.

(iii) Milk of magnesia — $Mg(OH)_2$ — is a mild base used as an antacid.

Source: Chapter 2, Salts and their uses

Explanation

- The question is a disguised identification puzzle: tamarind acid = tartaric acid (X), the base added to flour = baking soda (Y), prepared from common salt and used for faster cooking = washing soda (Z).
- Examiners expect all three names + formulae in (i); don't skip any.
- For (ii), the key points are: how $NaHCO_3$ is made **and** the decomposition equation showing CO_2 release — both are required for full marks.
- For (iii), $Mg(OH)_2$ (milk of magnesia) is the standard NCERT answer for a mild base antacid. Do not write NaOH (it is a strong base).

Q60. § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

Assertion (A) : It is advised that while diluting an acid one should add water to acid and not acid to water keeping the solution continuously stirred.
Reason (R) : The process of dissolving an acid into water is highly exothermic.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Previously asked in: 2023 31/6/1 Q17

◆ **Acids, Bases and Salts** Dilution of acids – exothermic nature and safe practice (add acid to water)

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Model Answer

(d) Assertion (A) is false, but Reason (R) is true.

The correct practice is to **add acid to water** (not water to acid). So Assertion (A) is false. The Reason (R) is true — dissolving acid in water is highly exothermic.

Explanation

The textbook (Chapter 2, Activity 2.10) clearly states: *"The acid must always be added slowly to water with constant stirring."* The Assertion incorrectly reverses this — it says "add water to acid," which is the dangerous practice. The Reason is correctly stated (the process is highly exothermic). Hence, A is false but R is true → option **(d)**.

Q61. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[3]**

Give reasons :

(i) For dilution of an acid, acid is added into water and not water into acid. [1]

(ii) Dry HCl gas does not turn blue litmus red whereas dilute hydrochloric acid does. [1]

(iii) Blue colour of Copper(II) sulphate crystals turns white on heating. [1]

Previously asked in: 2026 31/3/1 Q27 (a)

◆ **Acids, Bases and Salts** | Dilution of acids – acid added to water (not water to acid) | Role of water (H^+/H_3O^+ ions) in acidic behaviour – dry HCl vs dilute HCl | Water of crystallisation – copper sulphate crystals turning white on heating

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Model Answer

(i) When concentrated acid is mixed with water, a large amount of heat is released. If water is added to acid, the heat generated can cause the mixture to splash and cause burns. Adding acid to water ensures the heat is absorbed by the large volume of water gradually, making it safe.

(ii) Acids produce H^+ (or H_3O^+) ions only in the presence of water. Dry HCl gas has no water, so it cannot produce H^+ ions and does not show acidic properties. Dilute HCl is dissolved in water, producing H^+ ions, which turn blue litmus red.

(iii) Copper sulphate crystals ($CuSO_4 \cdot 5H_2O$) contain water of crystallisation. On heating, this water is lost, converting the blue hydrated salt into white anhydrous copper sulphate ($CuSO_4$).

Explanation

- These are standard reasons from the Acids, Bases and Salts chapter (Chapter 2, Science Class 10).
- For (i), the key word is **safety** and heat absorption by water.
- For (ii), the key concept is **ionisation requires water** — no water = no H^+ ions = no acidic effect.
- For (iii), the key term is **water of crystallisation** — its removal causes the colour change. Always name both forms of the compound.
- Note: The source passages provided were unrelated to this question; the answers are grounded in standard NCERT Class 10 Chemistry content.

Q62. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[3]**

A substance 'X' is used as a building material and is insoluble in water. When it reacts with dil. HCl, it produces a gas which turns lime water milky.

(i) Write the chemical name and formula of 'X'.

(ii) Write chemical equations for the chemical reactions involved in the above statements.

Previously asked in: 2023 31/6/1 Q28(a)

◆ **Acids, Bases and Salts** | CO_2 turning lime water milky (reaction with $Ca(OH)_2$) | Salts used as building materials – Calcium Carbonate ($CaCO_3$) and its reaction with dilute HCl

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Model Answer

(i) Substance 'X' is **Calcium Carbonate**.
Chemical formula: **$CaCO_3$**

(ii)

Reaction 1 – $CaCO_3$ is insoluble in water (no equation needed, it is a physical property).

Reaction 2 – $CaCO_3$ reacts with dilute HCl to produce CO_2 gas:

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

Reaction 3 – CO_2 turns lime water milky:

$$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$$

(White precipitate of $CaCO_3$ makes lime water milky.)

Source: Chapter 2, Acids, Bases and Salts; Chapter 1, Section 1.2.1

Explanation

- The clues — building material, insoluble in water, reacts with acid to give CO_2 — all point to **$CaCO_3$** (limestone/marble/chalk, all used in construction).
- Examiners expect **both** equations: the acid–carbonate reaction AND the lime water reaction. Missing either loses marks.
- Write state symbols — (s), (aq), (g), (l) — as CBSE awards a mark for balanced equations with correct states.
- The lime-water reaction is the same as equation 1.14 from the textbook (reverse context), so knowing it from Chapter 1 is helpful here.

Q63. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.4 MORE ABOUT SALTS **[1]**

Consider the following reactions :
(i) Dilute hydrochloric acid reacts with sodium hydroxide.
(ii) Magnesium oxide reacts with dilute hydrochloric acid.
(iii) Carbon dioxide reacts with sodium hydroxide.
It is found that in each case :

(A) Salt and water is formed.
(B) Neutral salts are formed.
(C) Hydrogen gas is formed.
(D) Acidic salts are formed.

Previously asked in: 2025 31/1/1 Q4

◆ **Acids, Bases and Salts** Neutralisation reactions involving acids, bases and salts

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Model Answer

(A) Salt and water is formed.

- $HCl + NaOH \rightarrow NaCl + H_2O$ (neutralisation)
- $MgO + 2HCl \rightarrow MgCl_2 + H_2O$ (metal oxide + acid)
- $CO_2 + 2NaOH \rightarrow Na_2CO_3 + H_2O$ (non-metallic oxide + base)

In each case, a salt and water are produced.

Explanation

The key concept tested is that acid-base reactions, metal oxide + acid reactions, and non-metallic oxide + base reactions all yield **salt + water**. Option B is wrong because Na_2CO_3 is not a neutral salt. Option C is wrong — no hydrogen gas is released in any of these three reactions. Option D is incorrect as acidic salts are not necessarily formed here.

Q64. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[1]**

When Sodium bicarbonate reacts with dilute hydrochloric acid, the gas evolved is :

(a) Hydrogen; it gives pop sound with burning match stick.
(b) Hydrogen; it turns lime water milky.
(c) Carbon dioxide; it turns lime water milky.
(d) Carbon dioxide; it blows off a burning match stick with a pop sound.

Previously asked in: 2023 31/4/1 Q1

◆ **Acids, Bases and Salts** Reaction of sodium bicarbonate with dilute hydrochloric acid

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Model Answer

(c) Carbon dioxide; it turns lime water milky.

$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$. CO_2 is evolved, which turns lime water milky.

Explanation

When an acid reacts with a metal hydrogencarbonate (bicarbonate), it produces CO_2 gas (not hydrogen). CO_2 turns lime water milky — this is its standard test. Option (d) is wrong because CO_2 does **not** cause a pop sound; that test is for hydrogen gas.

Q65. § 2.4 MORE ABOUT SALTS **[4]**

> Seawater contains many salts dissolved in it. Common salt is separated from these salts. Deposits of solid salt are also found in several parts of the world. These large crystals are often brown due to impurities. This is called rock salt and is mined like coal. The common salt is an important raw material for chemicals of daily use.

Read the passage carefully and answer the questions that follow.

(a) Write balanced chemical equations to show the products formed during electrolysis of brine. [1]

(b) List two uses of any one product obtained during electrolysis of brine. [1]

(c) Answer the following : [2]

Previously asked in: 2025 31/1/1 Q37

♦ **Acids, Bases and Salts** | Chlor-alkali process – uses of products (NaOH, Cl_2, H_2) | Common salt as a raw material and its sources (rock salt, seawater) | Electrolysis of brine – products and chemical equations

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Model Answer

(a) Electrolysis of brine (aqueous NaCl solution):

$$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$$

(b) Uses of **Chlorine (Cl_2)**:

1. Used as a disinfectant for purification of drinking water.
2. Used in the manufacture of PVC and disinfectants.

(Or uses of NaOH: used in making soap; used in paper industry.)

(c) Brine is a concentrated aqueous solution of common salt (NaCl). When electricity is passed through brine, it undergoes electrolysis to produce three important chemicals — sodium hydroxide (NaOH), chlorine gas, and hydrogen gas. This process is called the **chlor-alkali process**. These products are widely used in industries such as soap-making, textile, and water treatment.

Explanation

- **(a)** Examiners expect a fully balanced equation with state symbols — don't skip those.
- **(b)** Name ONE product clearly and give TWO distinct uses. Chlorine or NaOH are the safest choices as their uses are explicitly in the textbook.
- **(c)** Sub-question (c) appears to be cut off in the original, so the answer covers the chlor-alkali process — the most likely intended topic given the passage. In the exam, answer whatever the actual question asks. Key terms: *chlor-alkali process*, *brine*, *electrolysis* — examiners look for these.

Q66. § Introduction § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § Group Activity

Answer the following: Suggest a safe procedure of diluting a strong concentrated acid.

Previously asked in: 2023 31/4/1 Q28 (i)

◆ Acids, Bases and Salts | Dilution of Strong Concentrated Acids – Safe Procedure

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Model Answer

To safely dilute a strong concentrated acid, the **acid must always be added slowly to water** with constant stirring, and never the other way round.

Reason: Dissolving an acid in water is a highly exothermic process. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating.

Source: Chapter 2, Section 2.2.1

Explanation

Examiners expect two things: (1) the correct procedure — acid added to water, not water to acid — and (2) the reason involving the exothermic nature of the process and the danger of splashing/burns. Both are needed for full marks. This is a standard 2-mark question from the in-text questions of Section 2.2.1.

Q67. § Introduction § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[1]**

Fresh milk has a pH of 6. To delay its curdling, a chemical substance is added to it, which is :

(a) Sodium carbonate
(b) Baking powder
(c) Sodium hydroxide (Caustic soda)
(d) Baking soda (Sodium hydrogen carbonate)

Previously asked in: 2023 31/5/1 Q4

◆ Acids, Bases and Salts | pH of milk and use of bases to delay curdling

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Model Answer

(d) Baking soda (Sodium hydrogen carbonate)

Fresh milk has pH 6 (slightly acidic). Adding baking soda raises the pH to slightly alkaline, which delays the formation of lactic acid (curdling). As it is a mild base, it neutralises the developing acidity.

Source: Acids, Bases and Salts, Section 2.3.1 / Exercise Q.12

Explanation

The question is directly based on Exercise Q.12 of Chapter 2. The key logic is:

- Curdling occurs when bacteria produce **lactic acid**, lowering pH further.
- Adding a **mild base** (baking soda / $NaHCO_3$) shifts pH to slightly alkaline, slowing acid build-up and delaying curdling.
- Sodium carbonate (Na_2CO_3) and NaOH are **too strongly basic** and would spoil the milk; baking powder is a mixture, not a pure base. Only **baking soda** is the appropriate mild base used for this purpose.

Q68. **[2]**

When X is heated at 373 K, it loses water molecules and gets converted to Y. Y is used to keep things dry.
(i) Identify X and Y.
(ii) How can X be reobtained from Y ?

Previously asked in: 2023 31/5/1 Q21 (a)

◆ **Acids, Bases and Salts** | Plaster of Paris and Gypsum – interconversion and uses

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Model Answer

(i) X is **Gypsum** ($CaSO_4 \cdot 2H_2O$) and Y is **Plaster of Paris** ($CaSO_4 \cdot \frac{1}{2}H_2O$).

Reaction: $CaSO_4 \cdot 2H_2O \xrightarrow{373\ K} CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$

(ii) X (Gypsum) can be reobtained from Y (Plaster of Paris) by **adding water** to it. Plaster of Paris absorbs water and sets into a hard solid mass, converting back to gypsum.

$CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O \rightarrow CaSO_4 \cdot 2H_2O$

Explanation

- Examiners expect you to correctly name both X and Y with their chemical formulae.
- The key fact is that heating gypsum at 373 K removes ¾ of the water of crystallisation to form Plaster of Paris (not complete dehydration).
- For part (ii), the reverse reaction — Plaster of Paris absorbing water to reform gypsum — is the key concept. Writing the chemical equation earns full marks.
- Since no source passage directly covers this topic, this answer is based on standard CBSE Class 10 Science Chapter 2 (Acids, Bases and Salts) content.

Q69. § 2.4 MORE ABOUT SALTS **[3]**

Answer the following:

(a) Give the chemical name and formula of Plaster of Paris.

(b) Write the chemical equation of its preparation.

(c) Give any two uses of it.

Previously asked in: 2026 31/5/1 Q27 ((A))

◆ **Acids, Bases and Salts** Plaster of Paris – chemical name, formula, preparation, and uses

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Model Answer

(a) Plaster of Paris is **calcium sulphate hemihydrate**.
Formula: $\mathrm{CaSO_4 \cdot \frac{1}{2}H_2O}$

(b) It is prepared by heating gypsum ($\mathrm{CaSO_4 \cdot 2H_2O}$) at 373 K:

$$\mathrm{CaSO_4 \cdot 2H_2O \xrightarrow{373\ K} CaSO_4 \cdot \frac{1}{2}H_2O + \frac{3}{2}H_2O}$$

(c) Two uses of Plaster of Paris:

1. Used by doctors for setting fractured bones.
2. Used for making toys, decorative materials, and smooth surfaces in construction.

Explanation

- **(a)** Always write both the name and formula; the formula with ½ water of crystallisation is essential.
- **(b)** The key detail is the temperature **373 K** (not boiling point). Writing gypsum's formula correctly on the left earns marks.
- **(c)** Any two valid uses are accepted. Medical (bone-setting) and decorative/construction are the standard NCERT examples to memorise.

Q70. § Introduction § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[3]**

Answer the following:

(a) Name the acid present in ant's sting.

(b) Give reason : (i) While diluting an acid, it is recommended that the acid should be added to water. (ii) Baking soda is used as an antacid.

Previously asked in: 2026 31/5/1 Q27 ((B))

◆ **Acids, Bases and Salts** | Acid present in ant's sting (Methanoic/Formic acid) | Baking soda ($NaHCO_3$) as an antacid | Dilution of acids – adding acid to water

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Model Answer

(a) The acid present in ant's sting is **methanoic acid (formic acid)**, $HCOOH$.

(b)

(i) Dissolving acid in water is highly exothermic. If water is added to acid, the heat generated is so intense that it may cause the mixture to splash and cause burns. Adding acid to water ensures the heat is absorbed by the large volume of water, making the process safer.

(ii) Baking soda ($NaHCO_3$) is a mild base. When excess acid is produced in the stomach causing acidity, baking soda neutralises it:

$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$

Thus it acts as an effective antacid.

Explanation

- **(a)** is a direct 1-mark recall fact — just naming the acid is enough.
- **(b)(i)** Examiners want the key phrase "exothermic reaction" and the safety reason (splashing/burns). Mentioning that water absorbs the heat is key.
- **(b)(ii)** Must state that $NaHCO_3$ is a mild base and show/mention the neutralisation reaction. Avoid saying it is a strong base — that would be wrong.

Q71. **[1]**

In order to prepare dry hydrogen chloride gas in humid atmosphere the gas produced is passed through a guard tube (drying tube) which contains :

(a) Calcium chloride
(b) Calcium oxide
(c) Calcium hydroxide
(d) Calcium carbonate

Previously asked in: 2025 31/4/1 Q2

◆ Acids, Bases and Salts | Preparation and drying of hydrogen chloride (HCl) gas

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Model Answer

(a) Calcium chloride

Calcium chloride is used as a drying agent to absorb moisture and prepare dry HCl gas, as it does not react with HCl.

Explanation

The other options (CaO, $Ca(OH)_2$, $CaCO_3$) are basic substances that would **react with** acidic HCl gas, not just dry it. Only anhydrous $CaCl_2$ acts as a neutral drying agent suitable for HCl. Note: The source passages do not cover this topic; the answer is based on standard Class 10 Chemistry knowledge of drying agents.

Q72. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[2]**

Answer the following:

(a) 1 gram of solid sodium chloride was taken in a clean and dry test tube and concentrated sulphuric acid was added to it. (i) Name the gas evolved in the reaction. (ii) What will be observed when this gas is tested with (I) dry, and (II) wet blue litmus paper ? Write your conclusion about the nature (acidic/basic) of this gas. [2]

Previously asked in: 2024 31/4/1 Q21

◆ **Acids, Bases and Salts** | Acidic nature of HCl gas – dry vs wet litmus paper test | Reaction of NaCl with concentrated H_2SO_4 – evolution of HCl gas

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Model Answer

(a)

(i) The gas evolved is **hydrogen chloride (HCl)** gas.

(ii)

- **(I) Dry blue litmus paper:** No change in colour observed.
- **(II) Wet blue litmus paper:** Turns **red**.

Conclusion: HCl gas is **acidic in nature**. It shows acidic character only in the presence of water (moisture), as it dissolves in water to form hydrochloric acid (H^+ ions). In dry state, it does not ionise and hence shows no acidic behaviour.

Explanation

The key concept here is that HCl is a **covalent compound** and shows acidic nature only when dissolved in water — it ionises to give H^+ ions only in the presence of moisture. Dry litmus test vs. wet litmus test distinguishes this beautifully. Examiners expect you to state both observations clearly and draw a conclusion about the role of water in acidic behaviour. This is a standard practical-based question from the Acids, Bases and Salts chapter (Chapter 2).

Q73. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.4 MORE ABOUT SALTS **[3]**

Write the common name and the chemical name of the compound $CaSO_4 \cdot \frac{1}{2}H_2O$. Write the method of its preparation. Give chemical equation for the reaction, when water reacts with $CaSO_4 \cdot \frac{1}{2}H_2O$.

Previously asked in: 2024 31/4/1 Q27

◆ **Acids, Bases and Salts** Plaster of Paris – common name, chemical name, preparation, and reaction with water

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Model Answer

Common name: Plaster of Paris
Chemical name: Calcium sulphate hemihydrate

Preparation: Plaster of Paris is prepared by heating gypsum ($CaSO_4 \cdot 2H_2O$) at 373 K (100°C).

$$CaSO_4 \cdot 2H_2O \xrightarrow{373\ K} CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$$

Reaction with water:

When water is added to Plaster of Paris, it sets into a hard solid mass — gypsum.

$$CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O \rightarrow CaSO_4 \cdot 2H_2O$$

Explanation

- Examiners expect **all three parts**: name, preparation with equation, and the reverse reaction equation.
- Note that Plaster of Paris **sets** by recombining with water to reform gypsum — this is the reverse of its preparation, so knowing both equations together is essential.
- The formula **$CaSO_4 \cdot \frac{1}{2}H_2O$** (or $CaSO_4 \cdot \frac{1}{4}H_2O$ in some books) — NCERT Class 10 Science uses the $\frac{1}{2}H_2O$ form; always match your textbook edition.
- The temperature **373 K** is a key detail examiners look for.

Q74. § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

How will you protect yourself from the heat generated while diluting a concentrated acid ?

(A) By adding acid to water with constant stirring.
(B) By adding water to acid with constant stirring.
(C) By adding water to acid followed by base.
(D) By adding base to acid with constant stirring.

Previously asked in: 2026 31/4/1 Q23

◆ Acids, Bases and Salts | Dilution of Acids and Bases (Exothermic Process)

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Model Answer

(A) By adding acid to water with constant stirring.

When acid is added to water slowly with constant stirring, the heat generated is absorbed by the large volume of water, preventing splashing or burns.

Explanation

The source passage (Chapter 2, Section 2.2.1) explicitly states: "The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns." This is a standard safety rule — remember the mnemonic: **"Do as you oughta, add acid to water."** Option (B) is the dangerous reverse procedure; options (C) and (D) are irrelevant to dilution safety.

Q75. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? **[1]**

Assertion (A) : Concentrated nitric acid is diluted by adding water slowly to acid with constant stirring.
Reason (R) : Concentrated nitric acid is easily soluble in water.

(a) Both, Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).
(b) Both, Assertion (A) and Reason (R) are true, and Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Previously asked in: 2025 31/4/1 Q18

◆ Acids, Bases and Salts | Dilution of concentrated acids – adding acid to water

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Model Answer

(d) Assertion (A) is false, but Reason (R) is true.

The correct procedure is to add acid slowly to water (not water to acid) with constant stirring, as dissolving acid in water is highly exothermic. Thus, Assertion (A) is false. Concentrated nitric acid is indeed soluble in water, so Reason (R) is true.

Source: Chapter 2, Section 2.2.1

Explanation

The key fact from the textbook is: **"The acid must always be added slowly to water with constant stirring"** — never water to acid. So the Assertion reverses this and is **false**. The Reason states nitric acid is soluble in water, which is **true** (all common mineral acids are water-soluble). Since A is false but R is true, the answer is **(d)**. Watch out — examiners frequently test this dilution rule as it is a safety precaution explicitly highlighted in the textbook.

Q76. § Introduction § 2.4 MORE ABOUT SALTS **[1]**

Baking powder is a mixture of :

(A) Sodium carbonate + Acetic acid
(B) Sodium carbonate + Tartaric acid
(C) Sodium hydrogen carbonate + Tartaric acid
(D) Sodium hydrogen carbonate + Acetic acid

Previously asked in: 2026 31/2/1 Q22

◆ Acids, Bases and Salts | Baking Powder and Baking Soda

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Model Answer

(C) Sodium hydrogen carbonate + Tartaric acid

Explanation

Baking powder is a mixture of sodium hydrogen carbonate ($NaHCO_3$) and a mild edible acid like tartaric acid. When heated or mixed with water, the acid reacts with $NaHCO_3$ to release CO_2, which makes the baked goods rise. Options with sodium carbonate or acetic acid are incorrect.

Q77. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[5]**

A few crystals of ferrous sulphate were taken in a dry boiling tube and heated. Tiny water droplets were observed in the tube after some time.

(i) From where did these water droplets appear ? Explain. [1]

(ii) What colour change will be observed during heating ? [1]

(iii) How many molecules of water are attached per molecule of $FeSO_4$ crystal ? Write the molecular formula of crystalline forms of (I) Copper sulphate, and (II) Sodium carbonate. [2]

(iv) State how is Plaster of Paris obtained from gypsum. Write two uses of Plaster of Paris. [1]

Previously asked in: 2024 31/5/1 Q34 (a)

◆ **Acids, Bases and Salts** | Colour change of ferrous sulphate on heating | Plaster of Paris — preparation from gypsum and uses | Water of crystallisation

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Model Answer

(i) $FeSO_4$ crystals exist as hydrated salt — $FeSO_4 \cdot 7H_2O$. On heating, the water of crystallisation is driven off, which condenses as tiny droplets on the cooler upper walls of the boiling tube.

(ii) The green colour of ferrous sulphate crystals changes to reddish-brown, as $FeSO_4$ decomposes to form ferric oxide (Fe_2O_3).

$$2FeSO_4 \xrightarrow{\Delta} Fe_2O_3 + SO_2 + SO_3$$

(iii) 7 molecules of water are attached per molecule of $FeSO_4$.

- (I) Copper sulphate: **$CuSO_4 \cdot 5H_2O$**
- (II) Sodium carbonate: **$Na_2CO_3 \cdot 10H_2O$**

(iv) Plaster of Paris is obtained by heating gypsum ($CaSO_4 \cdot 2H_2O$) at 373 K:

$$CaSO_4 \cdot 2H_2O \xrightarrow{373\ K} CaSO_4 \cdot \frac{1}{2}H_2O + \frac{3}{2}H_2O$$

Uses: (1) Making casts for fractured bones. (2) Making statues and decorative materials.

Source: Chapter 1, Section 1.2.2; Chapter 2 (Acids, Bases and Salts)

Explanation

- **(i)** Key phrase: "water of crystallisation" — examiners expect this term.
- **(ii)** The colour change (green → reddish-brown) is due to formation of Fe_2O_3; mention both colours.
- **(iii)** The 7 water molecules must be stated clearly. Both crystal formulae carry 1 mark — memorise them accurately ($CuSO_4 \cdot 5H_2O$ and $Na_2CO_3 \cdot 10H_2O$).
- **(iv)** This sub-question is from the Acids, Bases and Salts chapter (Ch. 2). State the temperature (373 K), write the equation, and give two distinct uses for full marks.

Q78. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES | § 2.4 MORE ABOUT SALTS | § Group Activity **[3]**

Write chemical formula of washing soda. How is it obtained from baking soda? List two uses of washing soda.

Previously asked in: 2025 31/5/1 Q27

◆ Acids, Bases and Salts | Uses of Washing Soda | Washing Soda – Chemical Formula and Preparation from Baking Soda

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Model Answer

Chemical formula of washing soda: $Na_2CO_3.10H_2O$

Preparation from baking soda:

Baking soda ($NaHCO_3$) is heated to obtain sodium carbonate (Na_2CO_3). Recrystallisation of sodium carbonate gives washing soda.

$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$$

$$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$$

Two uses of washing soda:

1. It is used in glass, soap and paper industries.
2. It is used for removing permanent hardness of water.

Source: Chapter 2, Section 2.4.3

Explanation

- The examiner expects the formula with water of crystallisation ($10H_2O$) — writing just Na_2CO_3 loses a mark.
- Both steps must be shown: heating $NaHCO_3 \rightarrow Na_2CO_3$, then recrystallisation → washing soda. Equations add scoring value.
- For uses, pick any two from the textbook list. "Cleaning agent" and "removing hardness of water" are the most commonly expected answers.

Q79. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.4 MORE ABOUT SALTS **[3]**

Write the preparation of the following compounds with balanced chemical equation :

(i) NaOH by chlor-alkali process [1]

(ii) Baking Soda [1]

(iii) Plaster of Paris [1]

Previously asked in: 2026 31/3/1 Q27 (b)

◆ Acids, Bases and Salts | Chlor-alkali process – preparation of NaOH | Preparation of Baking Soda ($NaHCO_3$) | Preparation of Plaster of Paris ($CaSO_4 \cdot \frac{1}{2}H_2O$)

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Model Answer

(i) NaOH by Chlor-Alkali Process:

When electricity is passed through aqueous NaCl solution (brine), it decomposes to give NaOH, chlorine gas, and hydrogen gas:

$$2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{electricity}} 2NaOH(aq) + Cl_2(g) + H_2(g)$$

(ii) Baking Soda ($NaHCO_3$):

Baking soda is prepared by passing CO_2 through a concentrated solution of sodium chloride saturated with ammonia (Solvay process):

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$$

(iii) Plaster of Paris ($CaSO_4 \cdot \frac{1}{2}H_2O$):

It is prepared by heating gypsum ($CaSO_4 \cdot 2H_2O$) at 373 K:

$$CaSO_4 \cdot 2H_2O \xrightarrow{373\ K} CaSO_4 \cdot \frac{1}{2}H_2O + \frac{3}{2}H_2O$$

Explanation

- These three equations are directly from the CBSE Class 10 Chapter on Acids, Bases and Salts.
- **Chlor-alkali process** is so named because products are chlorine (chlor) and alkali (NaOH). The electrolysis equation must be balanced and include water as a reactant.
- **Baking soda**: The Solvay process equation is standard; $NaHCO_3$ precipitates out as it is less soluble.
- **Plaster of Paris**: Remember it is heated at exactly **373 K** (not higher), and the formula **$CaSO_4 \cdot \frac{1}{2}H_2O$** (hemihydrate) must be written correctly — examiners check this.

Q8o. § Introduction § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.4 MORE ABOUT SALTS **[3]**

State the chemical property in each case on which the following uses of baking soda are based upon :
(i) as an anti-acids
(ii) as a constituent in making baking powder
(iii) in soda-acid fire-extinguishers

Previously asked in: 2025 31/6/1 Q28(a)

◆ **Acids, Bases and Salts** | Baking Powder – Release of CO_2 on Heating | Baking Soda ($NaHCO_3$) – Chemical Properties and Uses | Baking Soda as Antacid – Reaction with Acid | Soda-Acid Fire Extinguisher – Reaction of $NaHCO_3$ with H_2SO_4 to Produce CO_2

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Model Answer

(i) As an antacid:
Baking soda ($NaHCO_3$) is a mild base (alkaline in nature). It neutralises excess hydrochloric acid present in the stomach, relieving indigestion.

$$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$$

(ii) As a constituent of baking powder:
On heating, $NaHCO_3$ decomposes to release CO_2 gas, which makes the dough soft and fluffy (acts as a leavening agent).

$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2 \uparrow$$

(iii) In soda-acid fire extinguishers:
When $NaHCO_3$ reacts with sulphuric acid, CO_2 is produced in large quantities. CO_2 being heavier than air cuts off the oxygen supply and extinguishes the fire.

$$2NaHCO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O + 2CO_2 \uparrow$$

Source: Chapter 2, Acids, Bases and Salts

Explanation

- Each part carries 1 mark. Examiner looks for: the **chemical property** (basic/alkaline nature → neutralisation; decomposition on heating; reaction with acid to give CO_2) AND the **reason** it is useful.
- Including balanced equations earns full marks and demonstrates the property clearly — always write them if you remember them.
- Key terms to use: *neutralisation*, *decomposition*, *CO_2 released*, *alkaline nature*.

Q81. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.2 WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON? § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[1]**

Which one of the following can be used as an acid-base indicator by a visually impaired (blind) student ?

A Turmeric
B Vanilla essence
C Methyl orange
D Litmus

Previously asked in: 2026 31/1/1 Q18

◆ **Acids, Bases and Salts** Olfactory (smelling) indicators

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Model Answer

Answer: B — Vanilla essence

Vanilla essence is an **olfactory indicator** — its odour changes in acidic/basic media, making it suitable for visually impaired students who cannot detect colour changes.

Explanation

- Visually impaired students cannot observe **colour changes**, so visual indicators (turmeric, methyl orange, litmus) are not useful for them.
- **Olfactory indicators** work by change in smell, not colour. The textbook (Activity 2.2) identifies vanilla essence as one such olfactory indicator — its characteristic odour is lost in a basic (NaOH) solution but retained in an acidic one.
- Onion and clove oil are also olfactory indicators mentioned in the chapter, but vanilla essence is the one given in the options.

Q82. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES | § 2.4 MORE ABOUT SALTS | § Group Activity **[3]**

Write the preparation of following compounds with balanced chemical equation :
(i) Baking soda
(ii) Bleaching powder
(iii) Plaster of Paris

Previously asked in: 2026 31/1/1 Q27(b)

◆ Acids, Bases and Salts | Preparation of Plaster of Paris | Preparation of bleaching powder | Preparation of sodium hydrogen carbonate (baking soda)

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Model Answer

(i) Baking Soda ($NaHCO_3$):
Baking soda is prepared by passing excess CO_2 through a saturated solution of sodium chloride (brine) in the presence of ammonia:

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NaHCO_3 + NH_4Cl$$

(ii) Bleaching Powder ($CaOCl_2$):
Bleaching powder is prepared by passing chlorine gas over dry slaked lime [$Ca(OH)_2$]:

$$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$$

(iii) Plaster of Paris ($CaSO_4 \cdot \frac{1}{2}H_2O$):
Plaster of Paris is prepared by heating gypsum ($CaSO_4 \cdot 2H_2O$) at 373 K:

$$CaSO_4 \cdot 2H_2O \xrightarrow{373\ K} CaSO_4 \cdot \frac{1}{2}H_2O + \frac{3}{2}H_2O$$

Source: Acids, Bases and Salts, Chapter 2

Explanation

- All three are standard CBSE questions from Chapter 2 (Acids, Bases and Salts). Each preparation must include the **correct equation** — examiners award marks for the balanced equation specifically.
- For baking soda, name the process (Solvay-type) and mention CO_2 + NH_3 + brine.
- For bleaching powder, remember it is Cl_2 over **dry** slaked lime.
- For Plaster of Paris, the temperature **373 K** (100°C) is important — higher temperature gives anhydrite (dead burnt plaster), so mention it.
- Writing $\frac{1}{2}H_2O$ in the formula of Plaster of Paris is acceptable; some write it as $CaSO_4 \cdot \frac{1}{2}H_2O$.

Q83. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § Group Activity **[1]**

Select a pair of olfactory indicators from the following :

(a) Clove oil and vanilla essence
(b) Onion and turmeric
(c) Clove oil and litmus solution
(d) Vanilla and methyl orange

Previously asked in: 2023 31/5/1 Q1

◆ Acids, Bases and Salts | Olfactory Indicators

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Model Answer

(a) Clove oil and vanilla essence

Olfactory indicators change their smell in acidic or basic media. Clove oil and vanilla essence both show a change in odour with acids and bases, making them olfactory indicators.

Explanation

The textbook (Activity 2.2, Chapter 2) states that onion, vanilla essence, and clove oil are tested as olfactory indicators. However, **onion** is also confirmed as one, but turmeric is a colour-based indicator. Litmus and methyl orange are synthetic colour indicators — not olfactory. The **pair** that consists of only olfactory indicators is clove oil and vanilla essence (option a). Students often confuse turmeric and onion — remember turmeric is a colour indicator, not olfactory.

Q84. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? § Group Activity **[1]**

Define the following terms :
(i) Olfactory indicator
(ii) Water of crystallization Olfactory indicator

Previously asked in: 2026 31/5/1 Q25 (i)

◆ Acids, Bases and Salts | Olfactory Indicators | Water of Crystallization

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Model Answer

(i) Olfactory indicator: A substance whose odour changes in acidic or basic media, e.g., onion, vanilla essence, clove oil.

(ii) Water of crystallisation: The fixed number of water molecules chemically bonded in the crystalline structure of a salt, e.g., $CuSO_4 \cdot 5H_2O$.

Source: Chapter 2, Section 2.1.1

Explanation

The question asks for two definitions but is worth 1 mark total — keep each definition to one short phrase. Olfactory indicator is directly defined in the passage. Water of crystallisation is a standard textbook definition from Chapter 2 (not in the given passages, but is a core term from the same chapter). Examiners expect the definition plus one example for each.

Q85. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.3 HOW STRONG ARE ACID OR BASE SOLUTIONS? **[1]**

Define the following terms :
(i) Olfactory indicator
(ii) Water of crystallization Water of crystallization

Previously asked in: 2026 31/5/1 Q25 (ii)

◆ Acids, Bases and Salts | Olfactory Indicators | Water of Crystallization

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Model Answer

(i) Olfactory indicator: Substances whose odour changes in acidic or basic media are called olfactory indicators. Examples: onion, vanilla essence, clove oil.

(ii) Water of crystallisation: The fixed number of water molecules present in one formula unit of a salt is called water of crystallisation. Example: $CuSO_4 \cdot 5H_2O$.

Source: Acids, Bases and Salts, sections 2.1.1 and "What you have learnt"

Explanation

For **olfactory indicators**, the key phrase from the textbook is "substances whose odour changes in acidic or basic media." Always give an example.

For **water of crystallisation**, copy the textbook definition exactly — "fixed number of water molecules present in one formula unit of a salt." An example (like blue vitriol) earns full marks. Since this is a 1-mark question split into two parts, each definition needs just one concise line.

Q86. § 2.1 UNDERSTANDING THE CHEMICAL PROPERTIES OF ACIDS AND BASES § 2.4 MORE ABOUT SALTS **[5]**

Name and state in brief the process which is used to prepare sodium hydroxide from sodium chloride. In this process along with the main product two gases 'X' and 'Y' are also given off at the two electrodes. Name 'X' and 'Y' specifying the name of their respective electrode at which each gas is obtained. One of these gases when reacts with dry calcium hydroxide produces a compound 'Z' which is widely used in water treatment plants and textile industries. Name Z and write chemical equation for the reaction involved in its formation.

Previously asked in: 2024 31/3/1 Q34(b)

◆ **Acids, Bases and Salts** | Bleaching powder (compound Z) – formation and uses | Chlor-alkali process (electrolysis of brine) | Products of chlor-alkali process: hydrogen (cathode) and chlorine (anode)

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Model Answer

Process: Chlor-Alkali Process

When electricity is passed through an aqueous solution of sodium chloride (brine), it decomposes to give sodium hydroxide. This process is called the **chlor-alkali process**.

$$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$$

Gas X — Chlorine (Cl_2): obtained at the **anode**.

Gas Y — Hydrogen (H_2): obtained at the **cathode**.

Compound Z — Bleaching Powder [$Ca(ClO)_2$]

Chlorine gas (X) reacts with dry slaked lime [$Ca(OH)_2$] to produce bleaching powder. It is widely used in water treatment plants (to kill germs) and in the textile industry (for bleaching).

Chemical equation:

$$2Ca(OH)_2 + 2Cl_2 \rightarrow Ca(ClO)_2 + CaCl_2 + 2H_2O$$

Source: Chapter 2, Section 2.4.3

Explanation

- The examiner expects the **name and brief definition** of the chlor-alkali process, the **balanced equation**, correct identification of both gases with their **respective electrodes**, the name of compound Z (bleaching powder), its two uses, and its **formation equation** — all five elements map to the 5 marks.
- A common mistake is reversing the electrodes: **Cl_2 → anode**, **H_2 → cathode**.
- Write the bleaching powder equation exactly as given in the textbook; the examiner checks it carefully.
- "Dry calcium hydroxide" = dry slaked lime = $Ca(OH)_2$ — use this term in your answer.

Q87. **[1]**

Answer the following : Write chemical formula of Plaster of Paris. At what temperature gypsum is heated to obtain Plaster of Paris ?

Previously asked in: 2026 31/4/1 Q25 (b)

◆ Acids, Bases and Salts | Plaster of Paris

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Model Answer

The chemical formula of Plaster of Paris is **$CaSO_4 \cdot \frac{1}{2}H_2O$**. Gypsum ($CaSO_4 \cdot 2H_2O$) is heated at **373 K (100°C)** to obtain Plaster of Paris.

Explanation

Examiners expect both the chemical formula and the exact temperature. The formula is sometimes written as $CaSO_4 \cdot \frac{1}{2}H_2O$ or $(CaSO_4)_2 \cdot H_2O$ — both are accepted. The temperature 373 K is the key fact; writing only "100°C" is also acceptable. Since this is 1 mark, one concise line covering both parts is sufficient.

Q88. § Group Activity **[1]**

Answer the following : A compound 'A' is used in soda-lime fire-extinguisher and decomposes on heating to form compound 'B'. Compound 'B' is used for removing permanent hardness of water. Identify 'A' and 'B'.

Previously asked in: 2026 31/4/1 Q25 (a)

◆ Acids, Bases and Salts | Sodium Carbonate and Sodium Hydrogencarbonate | Thermal Decomposition Reaction

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Model Answer

A = Sodium bicarbonate ($NaHCO_3$) — used in soda-lime fire extinguishers.
B = Sodium carbonate (Na_2CO_3) — formed on heating A; used to remove permanent hardness of water.

$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$$

Explanation

The key clues are: (1) used in soda-acid fire extinguisher → $NaHCO_3$; (2) decomposes on heating → Na_2CO_3 (washing soda); (3) washing soda removes permanent hardness by precipitating Ca^{2+}/Mg^{2+} ions. Examiners expect both compounds identified with correct formula.

Q89. § 2.4 MORE ABOUT SALTS **[1]**

A metal carbonate reacts with a solution X which forms a salt, water and a gas Y. What are X and Y ?

(A) X – Sodium hydroxide, Y – Carbon dioxide
(B) X – Sodium hydroxide, Y – Hydrogen
(C) X – Hydrochloric acid, Y – Carbon dioxide
(D) X – Hydrochloric acid, Y – Hydrogen

Previously asked in: 2026 31/2/1 Q18

◆ Acids, Bases and Salts | Reaction of acids with carbonates | Reaction of metal carbonates with acids

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Model Answer

(C) X – Hydrochloric acid, Y – Carbon dioxide

When a metal carbonate reacts with an acid (HCl), it produces a salt, water, and CO_2 gas. Example: $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

Explanation

- Metal carbonates react with **acids**, not bases like NaOH — this eliminates options A and B.
- The gas released is always **CO_2** (not H_2) when a carbonate reacts with an acid — this eliminates option D.
- Remember the pattern: Carbonate + Acid → Salt + Water + CO_2↑

Q90. § 3.2 CHEMICAL PROPERTIES OF METALS | § 3.3 HOW DO METALS AND NON-METALS REACT? **[1]**

Which gas is evolved when magnesium metal reacts with very dilute HNO_3 ?

(A) Oxygen
(B) Nitrogen
(C) Hydrogen
(D) Nitrogen Dioxide

Previously asked in: 2026 31/5/1 Q23

◆ Metals and Non-metals | Reaction of metals with dilute nitric acid (evolution of H_2 gas) | Reaction of metals with nitric acid – no hydrogen gas evolution

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Model Answer

(C) Hydrogen

Magnesium (Mg) reacts with very dilute HNO_3 to evolve H_2 gas, unlike other metals where HNO_3 (a strong oxidising agent) oxidises H_2 to water.

Explanation

The textbook explicitly states: *"But magnesium (Mg) and manganese (Mn) react with very dilute HNO_3 to evolve H_2 gas."* This is an exception to the general rule that metals do not produce hydrogen with nitric acid. Examiners expect students to recall this specific exception.

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