SCIENCE
WORKSHEET_230425
CHAPTER 02 ACIDS, BASES AND SALTS
(ANSWERS)

SUBJECT: SCIENCE **MAX. MARKS : 40**

CLASS : X **DURATION : 1½ hrs**

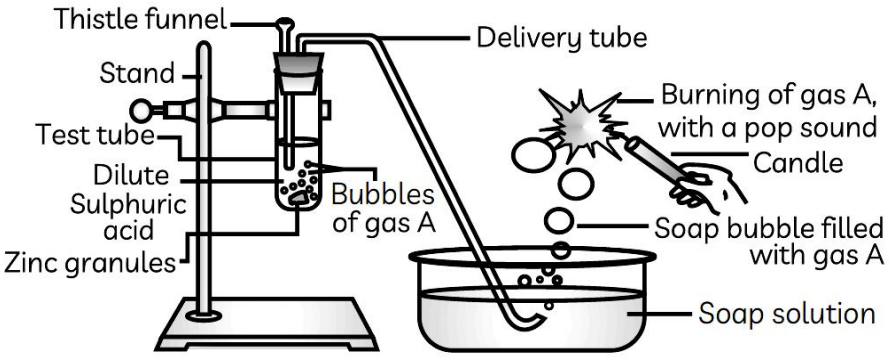
General Instructions:

(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. Identify gas A in the following experiment.



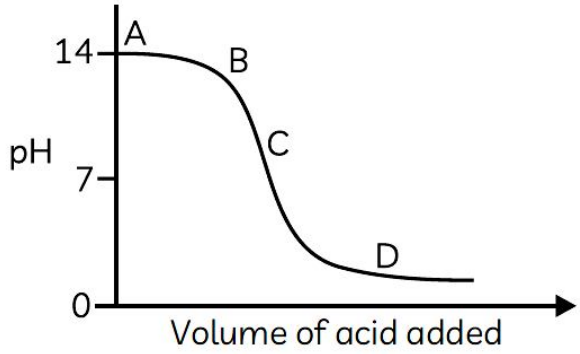
(a) Nitrogen (b) Hydrogen (c) Oxygen (d) Carbon dioxide

Ans: (b) Hydrogen

Hydrogen gas is evolved when dilute sulphuric acid is added to zinc granules. The type of reaction taking place is single displacement reaction.

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

2. The graph given below depicts a neutralization reaction (acid + alkali → salt + water). The pH of a solution changes as we add excess of acid to an alkali.



Which letter denotes the area of the graph where both acid and salt are present?

(a) A (b) B (c) C (d) D

Ans: (d) D

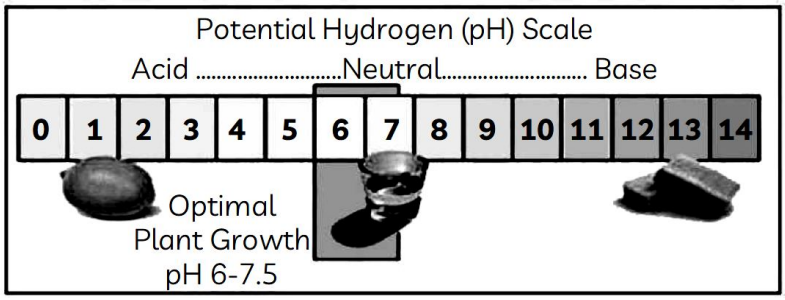
Neutralization reaction is the reaction between an acid (pH < 7) and a base (pH > 7) to form a salt and water.

When excess of acid is added to an alkali, the solution changes from basic to acidic. In the graph, the areas marked A, B and C have pH > 7 and therefore, depict basic medium. Whereas, the region marked D has pH < 7 and therefore, shows acidic medium.

3. When we smile, our teeth become visible. So, we should ensure that we have a beautiful set of teeth as it makes our smile even more beautiful. Tooth enamel is the thin outer covering of the tooth. This tough shell is the hardest tissue in the human body. Enamel covers the crown which is a part of tooth that's visible outside of the gums.

What is the nature of the salt present in the tooth enamel?
(a) Basic (b) Acidic (c) Neutral (d) Amphoteric.
Ans: (a) Basic
Calcium phosphate [$Ca_3(PO_4)_2$] is a basic salt, as it is formed by the combination of a weak acid (phosphoric acid) and a slightly stronger base (calcium hydroxide).

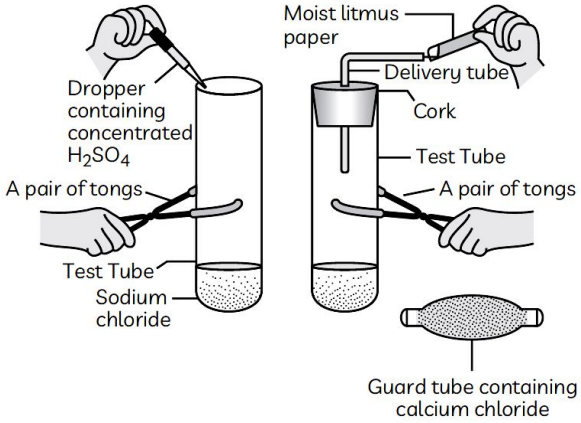
4. The sample of soil from a particular place was tested for its pH value. It came out to be 5.



Which one of the following should be added to the soil to make it suitable for plant growth?
(I) Calcium chloride (II) Calcium Hydroxide (III) Calcium sulphate (IV) Calcium oxide
Options:
(a) Both (I) and (II) (b) Both (II) and (IV)
(c) Both (II) and (III) (d) Only (III)
Ans. (b) Both (II) and (IV)
The pH value of salt sample was found to be 5. It means the soil is acidic, so the soil should be treated with chemicals like calcium hydroxide (slaked lime) or calcium oxide (quick lime). These materials are bases and react with excess acid present in the soil and reduce its acidity. Calcium chloride and calcium sulphate are neutral salts.

5. A solution of a base with pH 12.1 is given. Which of the following can be done to decrease its pH?
(I) Add distilled water to it.
(II) Add a solution of a different base with pH 8.7.
(III) Add few drops of an acid with an unknown pH.
(a) Only (I) (b) Only (III)
(c) Only (I) and (II) (d) Any of (I), (II) and (III)
Ans. (b) Only (III)
First we have to know that how much pH value we want to decrease from the solution. If we want to neutralize a solution which have pH value around 12.1 then we should add acid whose pH value is 2.

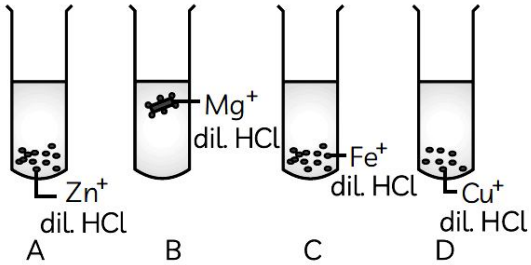
6. The change in colour of the moist litmus paper in the given set up is due to:



(I) presence of acid
(II) presence of base
(III) presence of H(aq) in the solution
(IV) presence of litmus which acts as an indicator
Options:
(a) (I) and (II) (b) Only (II) (c) Only (III) (d) Only (IV)
Ans: (c) Only (III)
The colour of litmus paper changes only in the presence of ions like hydrogen (H^+) or hydronium (H_3O^+) ions. H_2SO_4 can produce these ions only in an aqueous solution. Hence, dry H_2SO_4 gas does not change the colour of dry litmus paper.

7. Which of the following is/are true when HCl(g) is passed through water?
(I) It does not ionize in the solution as it is a covalent compound.
(II) It ionizes in the solution.
(III) It gives both hydrogen and hydroxyl ions in the solution.
(IV) It forms hydronium ion in the solution due to the combination of hydrogen ion with water molecule.
Select the correct option:
(a) Only (I) (b) Only (III) (c) (II) and (IV) (d) (III) and (IV)
Ans. (c) (II) and (IV)
Explanation: HCl, being a polar covalent compound, easily ionizes in water to form hydronium (H_3O^+) and chloride ions (Cl^-). HCl (a strong acid) ionizes completely in water to produce H^+ and Cl^- ions. H^+ ions combine with water molecules to produce hydronium ions.

8. The diagram shows the reaction between metal and dil. acid.



What is the reason for different behaviour of Mg in test tube B?
(a) Mg is lighter element than dil. HCl.
(b) Mg reacts with dil. HCl to produce H_2 gas which helps in floating.
(c) Mg reacts with dil. HCl to produce N_2 gas which helps in floating.
(d) Mg reacts with dil. HCl to produce CO_2 gas which helps in floating.
Ans. (b) Mg reacts with dil. HCl to produce H_2 gas which helps in floating.
When Mg reacts with dil HCl, it forms $MgCl_2$ and H_2 gas. The bubbles of hydrogen gas formed stick to the surface of Mg due to which Mg floats.

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(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 but 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.

9. Assertion (A): Sodium hydrogencarbonate is used as an ingredient in antacids.
Reason (R): $NaHCO_3$ is a mild noncorrosive basic salt.
Ans: (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
Sodium hydrogencarbonate (Baking soda) is a mild base and is used as an antacid which reacts with excess acid in the stomach and neutralizes it.

10. Assertion (A): HCl gas does not change the colour of dry blue litmus paper.
Reason (R): Acids always produce hydrogen ions.
Ans: (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
HCl gas does not change the colour of dry litmus paper but changes colour of moist litmus paper as acids produce hydrogen ions only in solution.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Identify the acid and the base from which sodium chloride is obtained. Which type of salt is it? When is it called rock salt? How is rock salt formed?
Ans: Sodium chloride or NaCl is obtained by the reaction between sodium hydroxide solution and hydrochloric acid.

$$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$$

Sodium chloride is a neutral salt as it is formed by the reaction between a strong acid and a strong base.
It is called rock salt when found in the form of large crystals which are often brown due to impurities.

12. Write balanced chemical equation for the reaction that occurs when:
(a) Blue coloured copper sulphate crystals are heated and
(b) Sodium hydrogen carbonate is heated during cooking.
Ans: (a) On strong heating, blue copper sulphate crystals turn white.
$CuSO_4.\ 5H_2O \xrightarrow{heat} CuSO_4 + 5H_2O$
(b) As sodium hydrogen carbonate is heated, sodium carbonate and water are formed, and carbon dioxide gas is also released.
The reaction is as follow:
$2NaHCO_3(s) \xrightarrow{heat} Na_2CO_3(s) + H_2O(l) + CO_2(\uparrow)$

13. On adding a few drops of universal indicator in three colourless solutions X, Y and Z taken separately in three test tubes, a student observed the changes in colour as green in X, red in Y and blue in Z.
(a) Arrange X, Y and Z in increasing order of their pH values.
(b) Which one of the three, X, Y and Z, will change the colour of phenolphthalein? Why?
Ans. (a) Y < X < Z
(b) Z, because it is basic in nature and the bases turn phenolphthalein pink.

14. Out of HCl and CH_3COOH, which one is a weak acid and why? Explain with the help of an example.

Ans. • Acetic acid (CH_3COOH) is a weak acid because it has less concentration of hydronium ion (H_3O^+/H^+).
• e.g., Zinc granules react with dil. HCl very vigorously and liberate hydrogen gas but in case of acetic acid, it reacts slowly to liberate hydrogen gas.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. (a) Write the name given to bases that are highly soluble in water. Give an example.
(b) How is tooth decay related to pH ? How can it be prevented?
(c) Why does bee sting cause pain and irritation ? Rubbing of baking soda on the sting area gives relief. How?
Ans: (a) Alkali e.g. NaOH (Sodium hydroxide)
(b) Lower the pH, more will be tooth decay. Acid reacts with $Ca_3(PO_4)_2$ and cause tooth decay. It can be prevented by brushing our teeth after every meal.
(c) It is due to formic acid. Sodium hydrogencarbonate (Baking soda) neutralises formic acid giving relief.

16. "Sodium hydrogencarbonate is a basic salt". Justify the statement. How is it converted into washing soda ? Explain.
Ans: Sodium hydrogencarbonate is a salt of sodium hydroxide (strong base) and carbonic acid (weak acid).
∴ It is basic salt. It is converted into washing soda by heating followed by crystallization.
$2NaHCO_3 \xrightarrow{heat} Na_2CO_3 + CO_2 + H_2O$

17. Name the products formed in each case when
(a) hydrochloric acid reacts with caustic soda.
(b) granulated zinc reacts with caustic soda.
(c) carbon dioxide is passed into lime water.
Ans:
(a) Sodium chloride and water are formed.

$$\underset{\text{Sodium hydroxide}}{NaOH(aq)} + \underset{\text{Hydrochloric acid}}{HCl(aq)} \longrightarrow \underset{\text{Sodium chloride}}{NaCl(aq)} + \underset{\text{Water}}{H_2O(l)}$$

(b) Sodium zincate and H_2(g) are formed.

$$\underset{\text{Zinc}}{Zn(s)} + \underset{\text{Sodium hydroxide}}{2NaOH(aq)} \longrightarrow \underset{\text{Sodium zincate}}{Na_2ZnO_2(aq)} + \underset{\text{Hydrogen gas}}{H_2(g)}$$

(c) Calcium carbonate and water are formed.

$$\underset{\text{Lime water}}{Ca(OH)_2(aq)} + \underset{\text{Carbon dioxide}}{CO_2(g)} \longrightarrow \underset{\text{(white ppt) Calcium carbonate}}{CaCO_3(s)} + \underset{\text{Water}}{H_2O(l)}$$

SECTION – D

Questions 18 carry 5 marks.

18. State reason for the following statements:
(a) Tap water conducts electricity whereas distilled water does not.
(b) Dry hydrogen chloride gas does not turn blue litmus red whereas dilute hydrochloric acid does.
(c) During summer season, a milk man usually adds a very small amount of baking soda to fresh milk.
(d) For a dilution of acid, acid is added into water and not water into acid.
(e) Ammonia is a base but does not contain hydroxyl group.
Ans: (a) Tap water contains ions which conduct electricity, distilled water does not contain ions.
(b) Dry HCl does not form ions but HCl gives H^+ and Cl^-.

(c) Baking soda does not allow milk to change to lactic acid which makes milk sour.
(d) Adding water to acid is highly exothermic. Therefore, water is added to acid very slowly with cooling.
(e) Ammonia dissolves in water forms OH^-. Therefore, it is basic.
$NH_3 + H_2O \rightarrow NH^{4+} + OH^-$

OR

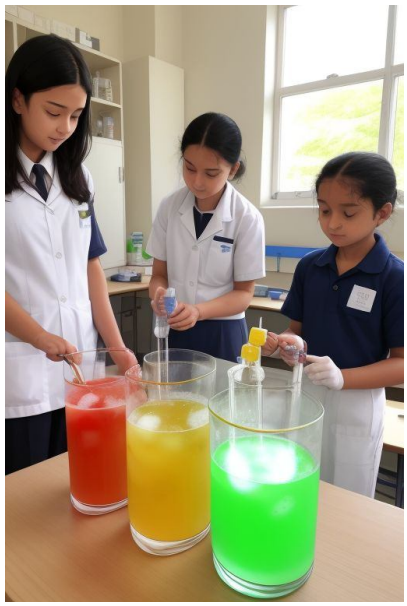
(a) Explain why is hydrochloric acid a strong acid and acetic acid, a weak acid. How can it be verified?
(b) Explain why aqueous solution of an acid conducts electricity.
(c) You have four solutions A, B, C and D. The pH of solution A is 6, B is 9, C is 12 and D is 7,
(i) Identify the most acidic and most basic solutions.
(ii) Arrange the above four solutions in the increasing order of H+ ion concentration.
(iii) State the change in colour of pH paper on dipping in solution C and D.
Ans: (a) HCl is completely ionised in aqueous solution, whereas acetic acid is partially ionised in aqueous solution. HCl gives dark red colour with pH paper whereas CH_3COOH gives orange colour.
(b) It is because acid ionises in aqueous solution.
(c) (i) 'A' is most acidic and 'C' is most basic.
(ii) C (10–12) < B (10–9) < D (10–7) < A (10–6)
(iii) pH paper will become blue in 'C' and green in 'D'.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Read the given passage and answer the questions based on passage and related studied concepts.

The teacher was conducting practicals in laboratory divided the students in three groups and gave them various solutions to find 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.



(a) For the solution provided, which group is/are likely to have pH value (i) < 7 (ii) > 7.
(b) List two ways of determining pH of a solution.
(c) Explain, why the sour substances such as lemon juice are effective in cleaning the tarnished copper vessels.
OR
(c) "pH has great importance in our daily life." Justify this statement giving two examples.
Ans: (a) (i) Group A and B will have pH < 7.
(ii) Group C will have pH 7 and > 7.

(b) (i) Add universal indicator (2 drops) in solution of given substance. Observe the colour change and match with colour chart to find pH.
(ii) Add few drops of solution of given substance on pH paper. Observe the change in colour and match with colour chart to find pH.
(c) Copper vessels get tarnished due to formation of basic copper carbonate [$Cu(OH)_2$. $CuCO_3$] which can be removed by lemon juice containing acid (citric acid and ascorbic acid).
OR
(c) (i) Our stomach produces HCl which helps in digestion of food without harming the stomach. Change in pH leads to indigestion and hyper acidity.
(ii) pH change causes tooth decay in our mouth if it is less than 5.5. Tooth enamel made up of basic calcium phosphate gets corroded in acidic pH.

20. Crystalline salts have water of crystallisation. The number of water molecules associated with crystals depends upon size of cation. The colour and physical state may be different for crystalline and amorphous salt. Crystalline salts have well defined geometrical shape, sharp melting point. Amorphous compounds do not have well defined shape.

(a) What is colour of hydrated copper sulphate?
(b) What is formula of washing soda?
(c) What happens when hydrated copper sulphate is heated? Write chemical equation.
OR
(c) What happens when water is added to anhydrous copper sulphate? Write chemical equation involved.
Ans: (a) Blue
(b) $Na_2CO_3.10H_2O$
(c) $CuSO_4.5H_2O \xrightarrow{heat} CuSO_4 + 5H_2O$
(Blue) (dirty white)
It becomes dirty white after losing water of crystalisation.

OR

(c) The salt will become blue again.
$CuSO_4(s) + 5H_2O \rightarrow CuSO_4.5H_2O$