Practice Questions - Term I

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Subject: Chemistry

Topic : Acids, Bases and Salts Class: X

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1. A solution of _____ when reacts with crushed egg-shells, gives a gas that turns lime-water milky.

   ✗ **A.** $NaCl$

   ✓ **B.** HCl

   ✗ **C.** $LiCl$

   ✗ **D.** KCl

   Egg shells are composed of calcium carbonate $(CaCO_3)$.
   Acids react with metal carbonates to produce salt, water and carbon dioxide gas. The gas produced turns lime water milky.
   Among the given options only HCl is an acid which reacts with egg shells (a metal carbonate) to release CO_2 gas.
   Hence, b option is correct.

2. When dissolved in water, Arrhenius base is a compound that:

   ✗ **A.** Increases the concentration of H^+

   ✓ **B.** Increases the concentration of OH^-

   ✗ **C.** Decreases the concentration of OH^-

   ✗ **D.** Does not change the concentration of OH^-

   An Arrhenius base is a compound that increases the concentration of OH^- ions that are present when added to water. For eg: when NaOH is dissolved in water, then it dissociates as shown below:

   $NaOH(aq) \rightarrow Na^+(aq) + OH^-(aq)$

3. Which of the following are the products formed on heating $CuSO_4.5H_2O\ (s)$?

- ✗ **A.** $CuSO_4.3H_2O\ (s)\ and\ 2CO_2\ (g)$
- ✗ **B.** $CuSO_4.10H_2O\ (s)\ and\ 5H_2O\ (g)$
- ✓ **C.** $CuSO_4\ (s)\ and\ 5H_2O\ (g)$
- ✗ **D.** $CuSO_4.5H_2O\ (s)\ and\ 5H_2O\ (g)$

Copper sulphate crystals contain water of crystallisation. When we heat the crystals, this water is removed and the salt turns white.
The reaction involved is:
$CuSO_4.5H_2O\ (s) \rightarrow CuSO_4\ (s) + 5H_2O\ (g)$

4. Which of the following is basic in nature?

- ✗ **A.** Lemon
- ✗ **B.** Apple
- ✗ **C.** Curd
- ✓ **D.** Caustic soda

The substances containing bases are basic in nature. Whereas, the substances containing acids are acidic in nature.
Lemon contains citric acid, curd contains lactic acid, apple contains malic acid and caustic soda contains sodium hydroxide (a base). Hence, among the given options caustic soda is basic in nature.

5. Choose the correct statement from the following options.

A. Citric acid will turn red litmus to blue.

B. Acetic acid will turn red litmus to blue.

C. Sodium hydroxide will turn red litmus to blue.

D. Potassium hydroxide will turn blue litmus to red.

Litmus is a very popular natural indicator which is often used to distinguish between an acid and a base. Acids turn blue litmus to red and bases turn red litmus to blue. The change in colour of litmus in the presence of the given substances are mentioned in the table given below.

Substance	Nature	Change in colour of litmus
Citric acid	Acidic	Blue to red
Acetic acid	Acidic	Blue to red
Sodium hydroxide	Basic	Red to blue
Potassium hydroxide	Basic	Red to blue

Hence, sodium hydroxide will turn red litmus to blue.

6. Which of the following will behave as a strong acid in aqueous solution?

A. C_2H_5COOH

B. H_2SO_4

C. $HCOOH$

D. CH_3COOH

A strong acid produces a large amount of $H^+(aq)$ ions in the aqueous solution.
H_2SO_4 is a strong acid because it easily gives $H^+(aq)$ ions in water.

C_2H_5COOH, $HCOOH$ and CH_3COOH partially dissociate in water, i.e., release less amount of $H^+(aq)$ ions. Therefore, they are weak acids.

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7. A solution X has a pH value of 2 and another solution Y has a pH value of 1. What can be inferred regarding the difference in hydrogen ion concentration between them?

   ✗ **A.** Solution X has more hydrogen ion concentration than solution Y

   ✓ **B.** Solution Y has more hydrogen ion concentration

   ✗ **C.** Both the solutions X and Y have equal hydrogen ion concentration

   ✗ **D.** Hydrogen ion concentration does not depend on pH

   pH is a measure of hydrogen ion concentration in a solution. Higher the hydrogen ion concentration, lower is the pH. Acids which give rise to more hydrogen ions are more acidic than the acids which give less hydrogen ions. Thus, lower the pH, higher is the acidic nature of the solution.
   Thus, Y has more hydrogen ion concentration than X.

8. **Assertion**:- Curd is not stored in copper or brass vessels.
   Reason:- Curd contains acid which reacts with copper or brass vessels and forms toxic substances.

   ✓ **A.** Both assertion and reason are true and the reason is the correct explanation of assertion.

   ✗ **B.** Both assertion and reason are true but the reason is not the correct explanation of assertion.

   ✗ **C.** Only assertion is correct.

   ✗ **D.** Only reason is correct.

   Metals react with acids to form salts and hydrogen gas.

   Lactic acid ($C_3H_6O_3$) is present in curd. This acid reacts with metal like copper and brass to form harmful salts and hydrogen gas.

   Hence, curd should not be placed in metal vessels.

9. Which of the following is a naturally occuring indicator?

A. Methyl orange

B. Turmeric

C. Phenolphthalein

D. Methyl red

Methyl red, phenolphthalein and methyl orange are indicators obtained using chemicals whereas turmeric is a natural indicator obtained from the roots of turmeric plant.

10. Dilute hydrochloric acid (HCl) reacts with metals to evolve _____ gas along with the formation of corresponding metal salt.

A. oxygen

B. hydrogen

C. nitrogen

D. chlorine

Acids react with metals to produce the respective metal salt along with hydrogen gas. The general form of the reaction is given below:

$$\mathrm{Acid\ (aq) + Metal\ (s) \rightarrow Salt\ (aq) + Hydrogen\ (g)}$$

For example:
When hydrochloric acid reacts with zinc, it produces zinc chloride along with the evolution of hydrogen gas.

The chemical reaction is given below:

$$\mathrm{2HCl\ (aq) + Zn\ (s) \rightarrow ZnCl_2\ (aq) + H_2\ (g)}$$

11. Identify X in the following reaction:

$$Ca(OH)_2\ (aq) + \ 2X \rightarrow CaCl_2\ (aq) + \ 2H_2O\ (l)$$

- A. H_2SO_4
- B. HNO_3
- C. HCl ✓
- D. H_2CO_3

Calcium hydroxide is a base which on reaction with 'X' produces calcium chloride salt and water.

Since salt and water are the only products formed when the base reacts with 'X', it will be acidic in nature. This type of reaction in which an acid reacts with base to give salt and water is called a neutralisation reaction.

In a neutralisation reaction, the salt formed gets its anion (Cl^-) from the acid and cation (Ca^{2+}) from the base. Thus, the acid (X) is hydrochloric acid (HCl).

So the complete reaction is:
$Ca(OH)_2\ (aq) + 2HCl\ (aq) \rightarrow CaCl_2\ (aq) + 2H_2O\ (l)$

12. Identify the Arrhenius acids among the following:

1. NaCl 2. HCl 3. $Cu(OH)_2$ **4. NaOH**

5. H_2SO_4 **6.** HNO_3 **7. KOH**

- ✗ **A.** 1,2 and 5 are acids
- ✗ **B.** 2,3 and 5 are acids
- ✗ **C.** 4,6 and 7 are acids
- ✓ **D.** 2,5 and 6 are acids

Arrhenius acids releases H^+ whereas Arrhenius bases releases OH^- ions when dissolved in water.

Among the given chemicals, HCl, H_2SO_4 and HNO_3 are Arrhenius acids. $Cu(OH)_2, NaOH, KOH$ are Arrhenius bases and $NaCl$ is a salt.
Hence, correct answer is option d.

13. Choose the products that are formed when magnesium oxide reacts with hydrochloric acid.

- ✗ **A.** Magnesium hydroxide and oxygen
- ✗ **B.** Magnesium chloride and carbon dioxide
- ✓ **C.** Magnesium chloride and water
- ✗ **D.** Magnesium hydroxide and water

Metal oxides react with acids to form salt and water. So, magnesium oxide (MgO) reacts with hydrochloric acid (HCl) to form magnesium chloride ($\mathrm{MgCl_2}$) and water ($\mathrm{H_2O}$).

$$\mathrm{MgO(aq) + 2\,HCl(aq) \rightarrow MgCl_2(aq) + H_2O(aq)}$$

14. $CaOCl_2$ is the product of the reaction between calcium hydroxide and ___ and is commonly called as ___.

- ✔ **A.** Chlorine and bleaching powder.
- ✘ **B.** Fluorine and talcum powder
- ✘ **C.** Hydrogen and gunpowder
- ✘ **D.** Nitrogen and lime powder

Chlorine gas is used to react with calcium hydroxide to get the main ingredient of the bleaching powder ($CaOCl_2$)

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

15. Plaster of Paris is obtained by:

- ✘ **A.** adding water to calcium sulphate.
- ✘ **B.** adding sulphuric acid to calcium hydroxide.
- ✘ **C.** heating gypsum to a very low temperature.
- ✔ **D.** heating gypsum to $120^{\circ}C$.

The chemical name of plaster of Paris is calcium sulphate hemihydrate ($\mathrm{CaSO_4.\frac{1}{2}H_2O}$). It is obtained by heating gypsum at 120° C. The reaction involved is:

$$\underset{\text{Gypsum}}{\mathrm{CaSO_4.2H_2O(s)}} \xrightarrow{120^{\circ}\mathrm{C}} \underset{\text{Plaster of paris}}{\mathrm{CaSO_4.\frac{1}{2}H_2O(s)}} + \mathrm{\frac{3}{2}H_2O(l)}$$

16. **Assertion**: Metal oxides are basic in nature.

Reason: Metal oxides neutralise the effect of acids and release water, similar to the reaction of a base with an acid.

- ✔ **A.** Both assertion and reason are true and the reason is the correct explanation of assertion.
- ✘ **B.** Both assertion and reason are true but the reason is not the correct explanation of assertion.
- ✘ **C.** Only assertion is correct.
- ✘ **D.** Only reason is correct.

Metal oxides react with acids to form salt and water, similar to the reaction of a base with an acid. Hence, metal oxides are basic in nature.
For example:
$MgO + 2HCl \rightarrow MgCl_2 + H_2O$

17. In a manufacturing unit of hydrochloric acid situated near a lake, an accident occurs resulting in spillage and leakage of the storage tanks containing hydrochloric acid. The spillage spreads all over an iron structure and also into the lake. The specialists are called for an inspection, who observe fizzing on the surface of the iron structure.

i) The specialists want to know about the spillage into the lake using litmus paper. Which of the following observations will be true.

- ✘ **A.** Red litmus turns blue and blue turns red
- ✔ **B.** Red litmus remains red and blue turns red
- ✘ **C.** Red litmus turns blue and blue remains blue
- ✘ **D.** No change in the colour of litmus paper

Litmus paper is an acid-base indicator where red litmus turns blue and blue remains blue in case of basic solution. While blue litmus turns red and red remains red in case of acidic solution.

Since there is an acid spillage in the lake, the water would have been acidic. Therefore, when the specialist will use red litmus paper to check the acid spillage, it will remain red while blue litmus will change to red.

18. In a manufacturing unit of hydrochloric acid situated near a lake, an accident occurs resulting in spillage and leakage of the storage tanks containing hydrochloric acid. The spillage spreads all over an iron structure and also into the lake. The specialists are called for an inspection, who observe fizzing on the surface of the iron structure.

ii) Evolution of _____ gas resulted in fizzing on the surface of iron structure.

- ✔ **A.** hydrogen
- ✘ **B.** nitrogen
- ✘ **C.** oxygen
- ✘ **D.** chlorine

Generally, metals react with acids to form metal salt along with hydrogen gas.
In this case, spilling of hydrochloric acid has taken place over iron metal structure. This iron reacts with HCl to form hydrogen gas resulting in fizzing on the surface.

19. In a manufacturing unit of hydrochloric acid situated near a lake, an accident occurs resulting in spillage and leakage of the storage tanks containing hydrochloric acid. The spillage spreads all over an iron structure and also into the lake. The specialists are called for an inspection, who observe fizzing on the surface of the iron structure.

iii) The specialists took a sample of water from the lake. Which of the following can be used to neutralise its acidity?

- ✘ **A.** Formic acid
- ✘ **B.** Acetic acid
- ✔ **C.** Limewater
- ✘ **D.** Sodium chloride

Due to spillage of HCl in the lake, the water has became acidic in nature. To neutralise it, the specialists need to add a base.
Among all the given options, only limewater $Ca(OH)_2$ is a base.
Formic acid, acetic acid are acids and sodium chloride is a salt.
Hence, correct answer is option c.

20. In a manufacturing unit of hydrochloric acid situated near a lake, an accident occurs resulting in spillage and leakage of the storage tanks containing hydrochloric acid. The spillage spreads all over an iron structure and also into the lake. The specialists are called for an inspection, who observe fizzing on the surface of the iron structure.

iv) Hydrochloric acid is a _____ acid and dissociates _____ in water.

- **A.** weak, completely
- **B.** strong, partially
- **C.** weak, partially
- **D.** strong, completely

On the basis of strength, acids can be categorised as strong and weak.

Strong acids are the acids which ionise/dissociate completely in water and gives more H^+ ions. Examples - Sulphuric acid, hydrocholoric acid, etc. Weak acids, on the other hand, ionise/dissociate partially in water and gives less H^+ ions. Examples - Acetic acid, oxalic acid, etc.

HCl is a strong acid and dissociates completely in water. Hence, the correct answer is d.