

## Chapter 2: Acids, Bases and Salts

### Question 1:

Consider this situation:

You are given three test tubes. The three test tubes contain distilled water, acidic solution and basic solution respectively. There is only red litmus paper available in order to identify what is there in each test tube. How will you find out what is in each of the test tubes?

### Solution:

Using the red litmus paper, we can identify the content in each of the test tube. This can be done by noticing the color change of the red litmus paper.

- If the red litmus paper changes to blue color it means that, the solution is a basic solution.
- If we put the changed litmus paper into another solution to see if it changes to red again. If it does change that means that solution will be an acidic solution.
- The solution that has no change in any of the litmus paper will be the neutral solution therefore that will be the distilled water.

### Question 2:

What is the reason behind curd or any other sour substance not to be kept in copper or brass vessels?

### Solution:

Curd and sour food substances contain acids; these acidic substances have a possibility of reacting with the metal. If this reaction takes place then it can cause food poisoning and damage people's health.

### Question 3:

When acids react with metal, which gas is liberated?

### Solution:

If an acid reacts with any metal, a salt and hydrogen gas will be formed.

Metal + Acid → Salt + Hydrogen gas

### Question 4:

The reaction of metal A and dilute hydrochloric acid produces a fizz. This gas that is a product of the reaction can extinguish candles. Explain the reaction.

**Solution:**

The gas that can extinguish a burning candle is carbon dioxide is formed by the reaction of dilute hydrochloric acid reaction with metal carbonate. When a metal compound 'A' reacts with dilute hydrochloric acid, it produces some fizz or effervescence. The compounds formed in this reaction is calcium chloride and it shows that the metal is calcium carbonate. By this, we can state that the compound A is calcium carbonate. Calcium carbonate reacts with the dilute hydrochloric acid to form calcium + carbon dioxide + water. Therefore this product that is formed can extinguish a burning candle.

**Question 5:**

HCl, HNO<sub>3</sub> are compounds that show acidic character in aqueous solutions and on the other hand compounds such as alcohol/glucose don't show any acidic character. Why is that?

**Solution:**

Acids are substances that can dissociate on the dissolving of water, which results in production of hydrogen ions. Some acids show acidic character as they dissociate in the aqueous solution which results in the production of hydrogen ions (acids like HCl, HNO<sub>3</sub>).

Compounds similar to glucose or alcohol also do contain hydrogen element but they do not show signs of acidic nature. This is due to the fact that the hydrogen in them will not separate as like the hydrogen in the acids. They will not separate to become hydrogen ions, on dissolving in the water.

**Question 6:**

What is the reason to an acid aqueous solution conducting electricity?

**Solution:**

Due to charged particles, there is electricity that is conducted in aqueous solutions. The charged particles are called ions and they help conduct electricity.

**Question 7:**

Why does dry litmus paper not change color in presence of dry HCl?

**Solution:**

Because, HCl does not have hydrogen ions present. Therefore does not show any acidic behavior.

**Question 8:**

When diluting acid, why is it important to add acid in the water and not water in the acid?

**Solution:**

- Diluting is a process that involves adding concentrated acid to the water. The concentrated water will be added gradually by stirring.
- There is heat that is evolved slowly and gradually so that concentrated acid is added because diluting acid easily absorbs large quantity of water.
- If it happens in the other way by adding water to diluted acid the amount of heat evolved is all don't at once and not gradually. This may cause a splash and could end up in acid burn.

**Question 9:**

When an acid is diluted, how does it affect the concentration of the hydronium ions  $H_3O^+$ ?

**Solution:**

When dilution happens and the concentrated solution is mixed with water, it results in the decrease of hydronium ions per unit volume.

**Question 10:**

How does excess base dissolved in the water affect the concentration of the hydroxide ions?

**Solution:**

The solution of base is diluted when mixed with more water, therefore the concentration of hydroxide ions will decrease per unit volume.

**Question 11:**

You are given two solutions called E, J their pH is 6 and 8 respectively.

Answer the following:

1. Which of the two solutions have more hydrogen ion concentration?
2. Which is acidic and which is basic?

**Solution:**

In order to find the hydrogen ion concentration we can use the rule that states, "The pH of any solution is inversely proportional to the hydrogen ion concentration". Therefore, it means that

the solution that has lower pH number will have the higher hydrogen ion concentration. So it means solution E will have the higher hydrogen ion concentration. In addition, solution J will be basic and E will be acidic.

**Question 12:**

What is the effect of concentration of the hydrogen ions have on the nature of a solution?

**Solution:**

When acids are added to water, they produce hydrogen ions in water therefore the concentration of the hydrogen ions will increase in water. Since the solution will have more hydrogen ions, it will definitely be acidic in nature.

**Question 13:**

Does basic solutions have hydrogen ions? If they do then why are they basic in nature?

**Solution:**

Basic solutions do not have hydrogen ions. Since the solution has excess of hydroxide ions, the basic solution does not have hydrogen ions.

**Question 14:**

In what condition does a farmer need to treat the soil on his field with quick lime or slaked lime or chalk?

**Solution:**

If the soil that is on the field were too acidic then he would have to treat the soil with quicklime. If the soil is, too acidic it means that it will be having a low pH. Therefore the farmer would need to add lime or even slaked lime so that his soil is not too acidic.

**Question 15:**

Write down the common name for the compound  $\text{CaOCl}_2$ :

**Solution:**

It is called bleaching powder.

**Question 16:**

Give names of substances after the treatment with chlorine will give bleaching powder:

**Solution:**

Calcium hydroxide

**Question 17:**

What is the name of the sodium compound that is used to softening hard water?

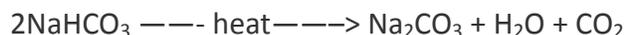
**Solution:**

Sodium carbonate

**Question 18:**

Write the reaction for the heating of sodium hydro carbonate

**Solution:**



**Question 20:**

Why rainwater conducts electricity and distilled water doesn't?

**Solution:**

- Distilled water does not contain any ionic compounds in it.
- Whereas rainwater has a lot, more compounds.
- Rainwater has dissolved acidic gas such as carbon dioxide from the air and that forms carbonic acid. This means that it has hydrogen ions and carbonate ions. Therefore, with the presence of acids, rainwater can conduct electricity.

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**Question 21:**

Why is that acids don't have their acidic behavior in the absence of water?

**Solution:**

The acidic behavior from acids are because of the presence of hydrogen ions. Hydrogen ions can only be produced in the presence of water and therefore water is definitely needed if acids are to show their acidic behavior.

**Question 22:**

Find out which solution is which with respect to their pH and arrange them in an increasing order of hydrogen ion concentration:

Solution	pH
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Neutral – A	7
Strongly alkaline – B	11
Strongly acidic – C	1
Weekly acidic – D	4
Weekly alkaline – E	9

**Solution:**

In increasing order of hydrogen ion concentration:

pH 11(B) -> pH 9(E) -> pH 7(A) -> pH 4(D) -> pH 1 (C)

**Question 23:**

There are two test tubes A and B. In test tube, A HCl is added and in test tube, B is added. In both the test tubes, magnesium ribbons are kept in both the test tubes. So, find out and explain in which test tube there will be more fizzing give reasons.

**Solution:**

HCl is a strong acid where acetic is a weaker acid. The reason why fizzing occurs is because of the evolution of the hydrogen gas by reacting with the acid on the magnesium ribbon. Since HCl is a very strong acid there is a lot of liberation of hydrogen gas from test tube A. therefore, more fizzing take place in test tube A.

**Question 24:**

Fresh milk from cows have pH of 6. So how does the pH change when this milk is turned to curd?

**Solution:**

The formation of lactic acid is what turns the milk to curd therefore it will result in the pH changing below 6.

**Question 25:**

Why should plaster of paris be stored in moisture proof container?

**Solution:**

Moisture can affect it by slowing the setting of the plaster because of hydration. Which will end up making it useless.

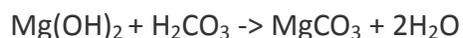
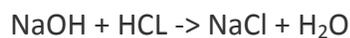
**Question 26:**

What is meaning of neutralization reaction? Give examples:

**Solution:**

The reaction of acid + base gives a product of salt + water, which is considered a neutralization reaction.

Examples:

**Question 27:**

What are two important purposes of washing soda and baking soda?

**Solution:**

<b>Washing soda</b>	<b>Baking soda</b>
1. It is used as an electrolyte	1. It can be used to test the garden soil for acidity. If bubbles are developed then the soil is too acidic
2. It can be used domestically as water softener for laundry.	2. If used on washing car then it will remove dead bug bodies without damaging the color or the paint on the car.