Chemistry, Class 8

A. Name the following.

1. The most abundant element in the universe

Hydrogen

2. The arrangement of metals in a series in the descending order on the basis of their reactivity

Metal activity series

3. Compounds formed when hydrogen combines with carbon

Hydrocarbons

4. Compounds formed when hydrogen combines with very active metals

Metal hydrides

5. The process of adding oxygen to an element or a compound, or removing hydrogen from an element or a compound

Oxidation

6. Scientist who coined the name "hydrogen"

Antoine Lavoisier

7. The lightest known element till now

Hydrogen

8. Gas liberated when zinc reacts with dilute hydrochloric acid

Hydrogen

9. The process of manufacturing ammonia gas by the reaction of hydrogen with nitrogen gas

Haber process

10. The process of converting vegetable oil into vegetable ghee with the help of nickel as the catalyst

Hydrogenation

B. Choose the correct option.

1. Zinc and iron react with steam to release which gas?

a. Oxygen b. Water vapour c. Hydrogen d. Nitrogen

c. Hydrogen

2. Hydrogen combines with chlorine gas in the presence of diffused (scattered) sunlight and forms _____ gas.

a. chlorine b. oxygen c. nitrogen d. hydrogen chloride

d. hydrogen chloride

3. Hydrogen combines with carbon and forms methane, which belongs to the category of

a. hydrocarbons b. hydrides c. carbides d. hydrates

a. hydrocarbons

4. The reaction in which oxidation and reduction takes place simultaneously is known as the _____

a. oxidation b. reduction c. hydrogenation d. redox reaction

d. redox reaction

5. The mixture of hydrogen and oxygen can produce temperature up to _____

a. 2800^{o}C b. 800^{o}C c. 280^{o}C d. 2000^{o}C

a. 2800^{o}C

6. A colourless, odourless and highly inflammable gas which burns with a ‘pop’ sound

a. Hydrogen b. Bromine c. Iodine d. Oxygen

a. Hydrogen

7. Hydrogen combines with molten sulphur and forms

a. hydrogen sulphate b. hydrogen sulphide

c. ammonia d. sulphuric acid

b. hydrogen sulphide

8. Hydrogen combines with which of the following gas under high pressure and temperature to form ammonia gas?

a. Hydrogen b. Nitrogen c. Oxygen d. Sulphur

b. Nitrogen

9. A highly water soluble gas that fumes in moist air.

a. Ammonia b. Carbon dioxide

c. Hydrogen chloride d. hydrogen

c. Hydrogen chloride

10. Hydrogen combines with carbon and forms hydrocarbons such as

a. carbon dioxide b. water c. alcohol d. methane

d. methane

C. Write T for True and F for False. Correct the False statements.

1. Hydrogen is the most abundant element in the universe.

T

2. Hydrogen is the lightest gas.

T

3. Hydrogen gas combines with molten sulphur and forms hydrogen chloride gas, which smells like a rotten egg.

F. Hydrogen gas combines with molten sulphur and forms hydrogen sulphide gas, which smells like a rotten egg.

4. Hydrogen is used to manufacture methane gas through the Haber–Bosch process.

F. Hydrogen is used to manufacture ammonia gas through the Haber-Bosch process.

5. Hydrogen is used to extract metals from their oxides.

T

6. Hydrogen is soluble in water.

F. Hydrogen is insoluble in water.

7. Hydrogen burns in oxygen with a blue flame.

T

8. Hydrogen chloride gas is highly insoluble in water.

F. Hydrogen chloride combines with water to form hydrochloric acid.

9. The process of adding oxygen to an element or a compound, or removing hydrogen from an element or a compound is known as reduction.

F. The process of adding oxygen to an element or a compound, or removing hydrogen from an element or a compound, is known as oxidation.

10. Substances that bring about reduction are known as oxidizing agents.

F. Substances that bring about reduction are known as reducing agents.

11. The reaction between lead oxide and hydrogen is a redox reaction.

T

12. In Greek, *hydro* means "water" and *genes* means "generator".

T

13. The reactivity of a metal can be determined by the metal activity series.

T

14. Hydrogen is an acidic gas.

F. Hydrogen is a neutral gas.

15. Oxygen burns with a pop sound.

F. Hydrogen burns with a pop sound

16. Hydrogen is a strong reducing agent

T

D. Choose the correct option to fill in the blank.

1. Hydrogen is a very reactive _____ (non-metal/metal).

non-metal

2. The mass number of hydrogen is _____ (1/2).

1

3. Hydrogen _____ (burns/melts) with a pop sound.

burns

4. Sodium reacts with _____ (cold/boiling) water and releases hydrogen.

cold

5. Zinc reacts with _____ (ice/steam) and releases hydrogen.

steam

6. Hydrogen is _____ (soluble/insoluble) in water.

insoluble

7. Hydrogen is _____ (heaviest/lightest) gas.

lightest

8. Hydrogen burns in oxygen with a _____ (blue/pink) flame.

blue

9. Hydrogen chloride gas forms fumes in _____ (moist/dry) air.

moist

10. In the reaction between lead oxide and hydrogen, lead oxide is the _____ (reducing/oxidizing) agent.

oxidizing

11. Hydrogen exists in _____ (diatomic/triatomic) state with molecular formula H_2.

diatomic

12. Hydrogen is collected in the gas jar by the _____ (upward/downward) displacement of water.

downward

13. Metals undergo _____ (combination/displacement) reaction with water, acids, or alkalis to release hydrogen.

displacement

14. The most reactive metals are placed at the _____ (top/bottom) and the least reactive metals are placed at the _____ (top/ bottom) of the metal activity series.

top; bottom

15. Hydrogen burns in _____ (nitrogen/oxygen) with a blue flame and forms steam.

oxygen

E. Circle the odd one.

1. Diatomic, Combined, Triatomic, Free (Hint: Hydrogen is found in these states; circle the one which is not a state of hydrogen.)

Triatomic

2. Sodium, Potassium, Calcium, Iron (Hint: React with cold water)

Iron

3. Light, Poisonous, Tasteless, Colourless (Hint: Physical properties of hydrogen)

Poisonous

4. Oxidizing agent, Reducing agent, Hydrogenation, Redox (Hint: Related to oxidation and reduction)

Hydrogenation

5. Sodium, Potassium, Calcium, Copper (Hint: Metals above hydrogen in the metal reactivity series)

Copper

6. Copper, Platinum, Gold, Aluminium (Hint: Metals below hydrogen in the metal reactivity series)

Aluminium

7. Sodium hydroxide, Calcium sulphate, Water, Hydrochloric acid (Hint: React with metals to produce hydrogen)

Calcium sulphate

8. Burns with pop sound, Neutral to litmus, Insoluble in water, Burns with green flame (Hint: Properties of hydrogen gas)

Burns with green flame

F. Complete and balance the reaction.

1. 1. $H_2 + S \rightarrow$
   2. $2H_2 + C \rightarrow$
   3. $H_2 + 2Na \rightarrow$
   4. $H_2 + Ca \rightarrow$
   5. $3H_2 + N_2 \rightleftharpoons$

1. $H_2 + S \rightarrow H_2S\uparrow$
2. $2H_2 + C \rightarrow CH_4$
3. $H_2 + 2Na \rightarrow 2NaH$
4. $H_2 + Ca \rightarrow CaH_2$
5. $3H_2 + N_2 \rightleftharpoons 2NH_3\uparrow$

G. Give reasons for the following.

1. Hydrogen is collected by the downward displacement of water.

As hydrogen is insoluble in water and lighter than air and water, so it is collected by the downward displacement of water.

2. Hydrogen is used as a reducing agent.

Hydrogen is used as a reducing agent because it removes oxygen from compounds and forms water.

3. Hydrogen is used by the meteorological department.

As hydrogen is the lightest gas, it is filled in the meteorological balloons to study weather parameters such as air pressure, wind speed, and temperature.

4. Diffused sunlight is used for the preparation of hydrogen chloride gas.

Under the bright sunlight, the reaction between hydrogen and chlorine gas to produce hydrogen chloride gas becomes explosive and exothermic. Hence, diffused sunlight is used for the preparation of hydrogen chloride gas.

5. Hydrogen is used for the welding and cutting of metals.

The mixture of hydrogen and oxygen can produce a temperature of up to 2800°C. Hence, this mixture is used for the welding and cutting of metals.

6. Hydrogen has no effect on litmus paper.

Hydrogen has no effect on litmus paper because hydrogen is a neutral gas.

7. Hydrogen is the reducing agent in the reaction between lead oxide and hydrogen.

Hydrogen is the reducing agent in the reaction between lead oxide and hydrogen because hydrogen removes oxygen from lead oxide and gets oxidized to form water.

8. Hydrogen is considered as an alternative source of energy for future.

Hydrogen is considered as an alternative source of energy for future because unlike non-renewable resources, hydrogen can be produced on demand.

H. Explain the following terms.

1.**Hydrogenation:**

Hydrogenation is a process of converting vegetable oil into vegetable ghee with the help of nickel as the catalyst.

2.**Catalyst:**

A catalyst is the substance that alters the rate of the reaction without getting itself chemically involved.

3.**Redox reaction:**

The reaction in which oxidation and reduction takes place simultaneously is called a redox reaction.

4. Oxidizing agents

Oxidizing agents: Substances that bring about oxidation by removing hydrogen or giving oxygen are known as oxidizing agents.

5. Reducing agents

Reducing agents: Substances that bring about reduction by removing oxygen or giving hydrogen are known as reducing agents.

6. Redox reaction

Redox reaction: The reaction in which oxidation and reduction takes place simultaneously is known as the redox reaction.

7. Displacement reaction

Displacement reaction: A type of reaction in which an element displaces another element from a compound is called displacement reaction.

8. Metal activity series

Metal activity series: The arrangement of metals in a series in the descending order on the basis of their reactivity is known as metal activity series.

I. Distinguish between the following.

1. Displacement reaction and metal activity series

Displacement reaction	Metal activity series
It is a type of reaction in which an element displaces another element from a compound.	The arrangement of metals in a series in the descending order on the basis of their reactivity is known as the metal activity series.

2. Catalyst and rocket propellant

Catalyst	Rocket propellant
It is a chemical substance that alters the speed of a reaction, without getting itself chemically involved.	It is a mixture of a fuel and an oxidizing agent used in rockets and other space vehicles.
For example, nickel is a catalyst in hydrogenation reaction.	For example, the mixture of liquid hydrogen and liquid oxygen is used as a rocket propellant.

3. Oxidation and reduction

Oxidation	Reduction
The process of adding oxygen to an element or a compound, or removing hydrogen from an element or a compound is known as oxidation.	The process of removing oxygen from an element or a compound, or adding hydrogen to an element or a compound is known as reduction.

4. Oxidizing agent and reducing agent

Oxidizing agent	Reducing agent
Substances that bring about oxidation by removing hydrogen or giving oxygen are known as oxidizing agents.	Substances that bring about reduction by removing oxygen or giving hydrogen are known as reducing agents.

5. Oxidation and reduction

Oxidation	Reduction
Adding oxygen to an element or a compound	Removing oxygen from an element or a compound
Removing hydrogen from an element or a compound	Adding hydrogen to an element or a compound

6. Reaction of hydrogen and chlorine gas in diffused sunlight, and direct sunlight

Hydrogen combines with chlorine gas in the presence of diffused (scattered) sunlight and forms hydrogen chloride gas. However, under the bright sunlight, the reaction is explosive and hence exothermic.

7. Hydrogenation and Haber process

The process of manufacturing ammonia gas by the reaction of hydrogen with nitrogen gas is known as the Haber process.

$$3H_2 + N_2 \xrightarrow{\text{Iron as catalyst}} 2NH_3\uparrow$$

Hydrogen Nitrogen Ammonia

Hydrogenation is a process of converting vegetable oil into vegetable ghee with the help of nickel as the catalyst.

J. Short answer questions.

1. Name some scientists who had a contribution in the discovery of hydrogen.

Henry Cavendish identified the hydrogen gas. Antoine Lavoisier coined the name “hydrogen” for this gas.

2. Write a short note on the occurrence of hydrogen.

Hydrogen is rarely found in monatomic state on the Earth. It exists in the diatomic state with molecular formula H_2 . Also, it is the most abundant element in the universe. Hydrogen is mostly found in the combined state with other elements in many compounds such as water, acids, carbohydrates, proteins, fats, vitamins, hormones, chlorophyll, and haemoglobin. A small percentage of hydrogen is also found in the free state as a gas in the Earth’s atmosphere.

3. What do you understand by a displacement reaction?

A displacement reaction is a type of reaction in which an element displaces another element from a compound. Metals undergo displacement reactions with water, acids, or alkalis to release hydrogen.

4. What is a metal reactivity series? Where are most reactive and the least reactive metals placed in this series?

The arrangement of metals in a series in the descending order of their reactivity is known as the metal reactivity series. The most reactive metals are placed on the top and the least reactive metals are placed at the bottom of the series.

5. Name the metals that react with cold water to release hydrogen.

Potassium, sodium, and calcium react with cold water to release hydrogen gas.

6. List the physical properties of hydrogen.

Hydrogen has the following physical properties:
• It is a colourless, odourless, non-poisonous, and tasteless gas.
• It is insoluble in water.
• It is the lightest gas.

7. Name the property used for the hydrogen gas test.

Hydrogen gas is highly flammable and burns with a pop sound. This property is specifically used for the hydrogen gas test.

8. What is a redox reaction? Give an example.

The reaction in which oxidation and reduction takes place simultaneously is known as the redox reaction. For example, the reaction between lead oxide and hydrogen is a redox reaction.

PbO	+	H_2	→	Pb	+	H_2O
Lead oxide		Hydrogen		Lead		Water

In this reaction, hydrogen is the reducing agent, and lead oxide is the oxidizing agent. Lead oxide is reduced to lead and hydrogen is oxidized to form water.

9. List any three uses of hydrogen.

Three uses of hydrogen gas are:
• Hydrogen is filled in the meteorological balloons to study weather parameters such as air pressure, wind speed, temperature, etc.
• Hydrogen is used as a reducing agent.
• Hydrogen is used to manufacture ammonia gas through the Haber process.

10. Why is hydrogen considered as an environment-friendly fuel?

On burning, hydrogen leaves almost no harmful by-products. Thus, it is considered as an environment-friendly fuel.

11. Name the metal and the acid used in the lab preparation of hydrogen.

Zinc granules and hydrochloric acid are used in the lab preparation of hydrogen.

12. What property of hydrogen gas is used to test for the element?

Hydrogen gas is highly inflammable and burns with a 'pop' sound. This property is used to test for hydrogen.

13. State three physical properties of hydrogen gas.

Hydrogen has the following physical properties:
• Hydrogen gas is a colourless, odourless, non-poisonous, and tasteless gas.
• It is insoluble in water.
• It is the lightest gas.

14. What happens when hydrogen reacts with oxygen?

Hydrogen burns in oxygen with a blue flame and forms steam, which on condensation forms water.

$2H_2 + O_2 \rightarrow 2H_2O + \text{Heat}$

Hydrogen Oxygen Water

15. What is a catalyst?

A catalyst is a substance that alters the rate of a reaction without getting itself chemically involved. For example, iron is a catalyst in the manufacture of ammonia by Haber process.

16. What happens when hydrogen gas is passed through molten sulphur?

Hydrogen gas combines with molten sulphur and forms hydrogen sulphide gas, which smells like a rotten egg.

$H_2 + S \rightarrow H_2S\uparrow.$

K. Long answer questions.

1. Write equations for the following

a. Hydrogen with sodium

b. Aluminium with sodium hydroxide

c. Zinc with sodium hydroxide

d. Iron with steam

e. Magnesium with dilute sulphuric acid

f. Calcium with sulphuric acid

g. Potassium with cold water

a. H_2 + 2Na → 2NaH
Hydrogen Sodium Sodium hydride

b. 2Al + 2NaOH + $2H_2O$ → $2NaAlO_2$ + $3H_2$
Aluminium Sodium hydroxide Water Sodium aluminate Hydrogen

c. Zn + 2NaOH → Na_2ZnO_2 + H_2
Zinc Sodium hydroxide Sodium zincate Hydrogen

d. 3Fe + $4H_2O$ → Fe_3O_4 + $4H_2$
Iron Steam Iron oxide Hydrogen

e. Mg + H_2SO_4 → $MgSO_4$ + H_2
Magnesium Dil. Sulphuric acid Magnesium sulphate Hydrogen

f. Ca + H_2SO_4 → $CaSO_4$ + H_2
Calcium Dil. Sulphuric acid Calcium sulphate Hydrogen

g. 2K + $2H_2O$ → 2KOH + H_2
Potassium Cold water Potassium hydroxide Hydrogen

2. Answer the questions on the basis of the equation given below.

$$\mathbf{PbO + H_2 \rightarrow Pb + H_2O}$$

a. Name the oxidizing agent.

b. Name the reducing agent.

c. What happens to lead oxide?

d. What happens to hydrogen?

e. Name the process of conversion of lead oxide to lead.

f. Name the process of conversion of hydrogen to water.

a. Lead oxide

b. Hydrogen

c. Lead oxide is reduced to lead.

d. Hydrogen is oxidized to form water.

e. Reduction

f. Oxidation

3. Write a short note on metal activity series.

The production of hydrogen depends on the reactivity of the metal with water, acid, or alkali. The reactivity of a metal can be determined by the metal activity series.
The arrangement of metals in a series in the descending order on the basis of their reactivity is known as the metal activity series. The most reactive metals are placed at the top and the least reactive metals are placed at the bottom of the series.
Potassium > Calcium > Sodium > Magnesium > Aluminium > Zinc. iron > Tin > Lead > **Hydrogen** > Copper > Silver > Gold > Platinum.

4. Explain redox reaction with an example.

The reaction in which oxidation and reduction takes place simultaneously is known as redox reaction. For example, reaction between lead oxide and hydrogen is a redox reaction.

PbO	+	H_2	→	Pb	+	H_2O
Lead oxide		Hydrogen		Lead		Water

In this reaction, hydrogen is the reducing agent, and lead oxide is the oxidizing agent. Lead oxide is reduced to lead and hydrogen is oxidized to water. Hence the reaction is a redox reaction.

5. How is hydrogen gas useful to us?

Some of the uses of hydrogen gas are as follows:
• Hydrogen is filled in the meteorological balloons to study weather parameters such as air pressure, wind speed, and temperature.

• Hydrogen is used as a reducing agent.

• Hydrogen is used to manufacture ammonia gas through the Haber process.

• Hydrogen is used to convert vegetable oil to vegetable ghee through hydrogenation in the presence of catalyst nickel.