CHEMISTRY

BOOKS - ICSE

HYDROGEN

Check Your Progress Answer These Questions

1. What is the most abundant element in the universe?

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2. Who named the gas hydrogen?

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3. What happens when steam is passed over magnesium?

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4. What is an electrode connected to the negative terminal of a voltage source called?

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5. Which metal is preferred for preparation of hydrogen from acid ?

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6. What happens when a burning splinter is brought near the mouth of a gas jar containing hydrogen gas?

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7. Which raw materials are used to produce hydrogen by Bosch's process?

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Exercise Tick The Most Appropriate Answer

1. Which of the following metals reacts with steam or acids to release hydrogen?

A. zinc

B. platinum

C. silver

D. gold

Answer:

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2. Which of the following metals reacts explosively with dilute hydrochloric acid to liberate hydrogen?

A. aluminium

B. magnesium

C. zinc

D. potassium

Answer:

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3. Which of the following is formed along with hydrogen when zinc reacts with steam?

A. ZnO_2

B. ZnO

C. Zn

D. none of these

Answer:

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4. What is the electrode connected to the positive terminal of an electrolytic cell called?

A. anode

B. electrolyte

C. cathode

D. none of these

Answer:

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5. In electrolysis of water, which gas is produced at the anode?

A. hydrogen

B. oxygen

C. carbon dioxide

D. nitrogen

Answer:

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6. Which of the following is water gas?

A. $CO_2 + H_2O$

B. $CO + H_2O$

C. $CO_2 + H_2$

D. $CO + H_2$

Answer:

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7. What is the chemical process that involves the addition of oxygen or the removal of hydrogen called?

A. reduction

B. oxidation

C. displacement

D. synthesis

Answer:

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Exercise Fill In The Blanks

1. Active metals react with cold water to liberate hydrogen gas and form the corresponding metal _____

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2. Magnesium reacts with steam to form _____ and hydrogen gas

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3. An ____ cell is a device in which electrical energy is converted into chemical energy and vice versa.

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4. Hydrogen combines with nitrogen to form _____ in the presence of iron as a catalyst at a high pressure and temperature

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5. The _____ flame is used for cutting and welding of metals.

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6. A _____ reaction is a reaction in which both oxidation and reduction take place simultaneously.

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Exercise Match The Columns

1. Match the columns.

1. Converting liquid vegetable oils into solid ghee	a. ammonia
2. Haber process	b. hydrogenation
3. Bosch's process	c. addition of oxygen
4. Oxidation	d. water gas
5. The gas formed when hydrogen reacts with chlorine in diffused sunlight	e. electrolysis
6. Producing hydrogen by passing electric current through water	f. hydrogen chloride
	g. hydrocarbons

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Exercise Write True Or False Correct The False Statements

1. Electrolytes conduct electricity in their aqueous solution or molten state to undergo decomposition into ions.

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2. Steam is passed over hot coke at $1000^{\circ}C$ in a converter to produce hydrogen gas.

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3. Hydrogen changes the colour of litmus. This statement is.....

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4. The only product of combustion of hydrogen in air is water. (T/F)

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5. A mixture of hydrogen and chlorine reacts normally with each other in direct sunlight.

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6. Hydrogen reacts with metal oxides to give the corresponding metals.

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7. True or False: A substance that brings about reduction or reduces another substance is called a reducing agent.

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Exercise Complete And Balance The Following Equations

1. $Ca + H_2O \rightarrow$

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2. Complete and balance the following reactions.

$Fe + HCl \rightarrow$ _____ + _____

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3. Complete and balance the following reactions.

$Al + KOH + H_2O \rightarrow$ _____ + _____

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4.

Complete and balance the equations:

$Pb + NaOH \rightarrow$ ____+ ____

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5. $Zn + H_2SO_4 \rightarrow$

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6. Complete the reaction : $CO + H_2 + H_2O \rightarrow$

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Exercise Answer The Following In Short

1. What is an electrolytic cell?

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2. Differentiate between a cathode and an anode.

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3. What is the action of hydrogen on litmus paper?

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4. A mixture of hydrogen and chlorine reacts normally with each other in direct sunlight.

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5. Oxidation and Reduction

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6. What is the hydrogenation of vegetable oils?

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Exercise Answer The Following In Detail

1. Write about the preparation of hydrogen by the action of cold water, hot water and steam on metals.

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2. Describe the action of alkalis on metals with the help of reactions.

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3. Describe the industrial preparation of hydrogen by the electrolysis of water.

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4. Write about the preparation of hydrogen by Bosch's process.

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5. Mention some important uses of di hydrogen.

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Think And Answer

1. Give reasons :

Hydrogen is collected by downward displacement of water.

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2. Give reasons : Apparatus for laboratory preparation of Hydrogen should be air-tight and away from a naked flame.

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3. Give reason for the following:

The end of the thistle funnel should be dipped under acid.

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Exercise

1. State how hydrogen occurs in the free state. Name three compounds containing hydrogen in the combined state.

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2. Starting from zinc how would you obtain hydrogen using - a. Steam b. A dilute acid c. An alkali give balanced equations for each & name the product formed in eahc case other than hydrogen] Name metal which will not react with the reactants above to give hydrogen.

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3. State the following pertaining to the physical properties of hydrogen.

a. colour & odour b. solubility in water c.Effect on moist blue litmus paper.

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4. Draw neat labeled diagrams for two different experiments to prove that hydrogen is lighter than air.

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5. Starting from hydrogen gas how would you obtaind a.A neutral liquid b. A basic gas c. A metal by reduction of its heated oxide. [the metal formed is above iron in the activity series]

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6. Using a burning candle and a jar of hydrogen- how would you prove experimentally that a. Hydrogen is a combustible gas b. Hydrogen does not support combustion.

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7. State a reason why when hydrogen is passed over heated copper oxide, the resultant product fromed, differs incolour from the original reactant.

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8. With reference to the uses of hydrogen, give reasons for the following:

a. Hydrogen is not used in air balloons b. A mixture for hydrogen &

oxygen on burning, find application inwelding & cutting metals c. Reaction of hydrogen with nitrogen under specific conditions finds industrial utility.

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9. Give a test to differentiate between two gas jars.

One containing pure hydrogen and the other hydrogen air mixture.

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10. With reference to oxidation & reduction reactions - complete the statement given by filling in the blanks with only the words a. Addition b. Removal

Oxidation is a chemical reaction involving _____ of oxygen to a substance or _____of hydrogen from a substance. Reduction on

the other hand involves _____ of hydrogen to a substnace or _____of oxygen from a substance.

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11. With reference to the equation $Cl_2 + H_2S \rightarrow 2HCl + S$ pertaining to a redox reaction - select the correct answer in each case a. Chlorine is oxidised/reduced to HCl. B. Hydrogen sulphide is oxidised /reduced to sulphur since the reaction involves addition/ removal of hydrogen. c. Chlorine acts as an oxidising / reducing agent.

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Objective Type Questions

1. Give balanced equations for the following conversions

Zinc to sodium zincate - using an alkali.

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2. Give balanced equations for the following conversions

Acidified water to hydrogen-by electrolysis.

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3. Give balanced equations for the following conversions

Water gas to hydrogen- industrially.

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4. Give balanced equations for the following conversions

Iron [III] oxide to iron- using hydrogen.

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5. Give balanced equations for the following conversions

Nitrogen to a basic gas-using hydrogen.

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6. Assertion $(A): Cu$ liberates $H_2(g)$ from a dilute solution of HCl.

Reason (R): Hydrogen is below Cu in the electrochemical series.

(a)If both (A) and (R) are correct, and (R) is the correct explanation of (A).

(b)If both (A) and (R) are correct, but (R) is not the correct

explanation of (A).

(c)If (A) is correct, but (R) is incorrect.

(d)If both (A) and (R) are incorrect.

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7. Give reason for the following:

In the preparation of hydrogen by electrolysis of water - the distilled water used is acidified.

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8. Give reason for the following:

In the laboratory preparation of hydroge from zinc and dilute hydrochloric acid- the zinc used is granulated zinc.

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9. Give reason for the following:

In Bosch process- the final gaseous products are passed through caustic potash [KOH] soln.

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10. Give reason for the following:

The reaction of chlorine with hydrogen sulphide is deemed a redox reaction.

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11. Select the correct answer from A,B,C,D or E for each statement give below:

A. Nickel B: Sodium C: Iron D: Iron [III] oxide E: Magnesium oxide.

A metal which reacts with water to a give a metallic hydroxide & liberate hydrgen.

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12. Select the correct answer from A,B,C,D or E for each statement give below:

A. Nickel B: Sodium C: Iron D: Iron [III] oxide E: Magnesium oxide.

The metallic compound used as a catalyst in Bosch process.

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13. Select the correct answer from A,B,C,D or E for each statement give below:

A. Nickel B: Sodium C: Iron D: Iron [III] oxide E: Magnesium oxide.

The metal used as a catalyst in hydrogenation of oils.

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14. Select the correct answer from A,B,C,D or E for each statement give below:

A. Nickel B: Sodium C: Iron D: Iron [III] oxide E: Magnesium oxide.

The metal which reacts with steam liberating hydrogen & the reaction is reversible.

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15. Select the correct answer from A,B,C,D or E for each statement give below:

A. Nickel B: Sodium C: Iron D: Iron [III] oxide E: Magnesium oxide.

The metallic compound formed when a metal above aluminium in the activity series reacts with steam.

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16. Select the correct answer from the choice in bracket to complete each sentence:

The acid_____$[dil.\ H_2SO_4, dil.\ HNO_3, dilHCl]$ is not used in the laboratory preparation of hydrogen, using zinc and an acid.

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17. Select the correct answer from the choice in bracket to complete each sentence:

In Bosch process the catalytic reduction of steam to hydrogen is carried out by _____$[CO_2CO, C]$.

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18. Select the correct answer from the choice in bracket to complete each sentence:

A foul smelling gas formed when hydrogen reacts with a molten non-metal, is _____[hydrogen chloride, hydrogen sulpide, ammonia].

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19. Select the correct answer from the choice in bracket to complete each sentence:

The product formed on combustion of hydrogen in air is _____[water gas, water, producer gas].

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20. Select the correct answer from the choice in bracket to complete each sentence:

The gas which has now replaced hydrogen in air balloons is _____[argon, helium, neon].

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21. Match the statements in List I the appropriate answer in List II.

List I	List II
1. An atom of hydrogen	A: Chromic oxide
2. A strong oxidising agent	B: Ammonia
3. A promoter used in Bosch process	C: Iron
4. A chemical used in the manufacture of fertilizers	D: One electron
5. The catalyst used in production of a basic gas from nitrogen	E: Dilute nitric acid

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Test Yourself 1

1. Match the following

1. Positively charged ions	*a*. Electroysis
2. Negatively charged ions	*b*. Cations
3. Passing electric current to split a solution	*c*. Anions
4. A metal through which electric current can pass	*d*. Hydrogen
5. Atomic number is 1	*e*. Electrode

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Test Yourself 2 Fill In The Blanks

1. ..... And .... are used as reactants in the laboratory preparation of hydrogen

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2. In Bosch process, when steam is passed over coke at high temperature ..... is formed.

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3. ..... is used as a catalyst in Bosch process.

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4. ..... acid is a strong oxidizing agent and so it is not used in preparation of hydrogen.

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Test Yourself 3

1. Calculate the entropy change for the following reaction

$H_2(g) + CI_2(g) \rightarrow 2HCI(g) at 298K$

Given $S^{\Theta} H_2 = 131 JK^{-1} mol^{-1}$, $S^{\Theta} CI_2 = 233 JK^{-1} mol^{-1}$, and $S^{\Theta} HCI = 187 JK^{-1} mol^{-1}$

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2. $CuO + H_2 \rightarrow Cu + H_2O$ (reference to copper)

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3. $4Fe + 3O_2 \rightarrow 2Fe_2O_3$ (reference to iron)

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4. $Fe_2O_3 + 3H_2 \rightarrow 2Fe + 3H_2O$ (reference to iron)

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Exercises A Multiple Choice Questions

1. What is true for cations?

A. negatively charged ions

B. move towards anode

C. positively charged ions

D. present in oxygen

Answer: C

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2. In preparation of hydrogen, zinc granules are preferred over pure zinc because they

A. are easily available

B. reduce hydrogen

C. contain copper as impurity

D. act with HCI

Answer: C

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3. Which of the following is a property of hydrogen?

A. colourless and pungent

B. acidic gas

C. supports combustion

D. reducing agent

Answer: D

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4. Oxidation is a process that involves the following

A. removal of hydrogen

B. addition of hydrogen

C. removal of oxygen

D. formation of monoxide

Answer: A

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5. The reaction in which oxidation and reduction occurs simultaneously is called

A. electrolysis

B. redox

C. oxidation

D. ionisation

Answer: B

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Exercises B True Or False

1. Hydrogen is the lightest element known so far.

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2. Pure water is used for electrolysis of water to get hydrogen.

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3. A weak electrolyte like water dissociates completely into ions.

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4. Nitric acid being a strong oxidizing agent is used in the preparation of hydrogen.

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5. Hydrogen reacts with strong metals to form metal hydrides.

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Exercises C Fill In The Blanks

1. ..... is connected to the negative terminal of battery.

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2. Bubbles of hydrogen in electrolysis collect at the ..... while oxygen collects at.....

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3. When water gas is mixed with steam in the presence of iron chromate as catalyst ..... is produced.

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4. Hydrogen is used in the manufacturing of ..... which is used to prepare fertilisers.

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5. If hydrogen is added in a reaction, it is called ..... reaction.

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Exercises D Match The Following

1. Match the following

1. Reaction of hydrogen sulphide with chlorine (a) Reduction

2. Splitting of water into hydrogen and oxygen (b) Oxidation

3. Reaction of copper oxide with carbon (c) Electrolysis

4. Formation of hydrogen from water and coke (carbon) (d) Bosch process

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Exercises E Name The Following

1. Agent that removes hydrogen.

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2. An electrode that is connected to the positive terminal.

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3. Acid used in the laboratory for preparation of hydrogen.

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4. An industrial process used for the production of hydrogen gas on a large scale.

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5. Compound formed when hydrogen reacts with oxygen.

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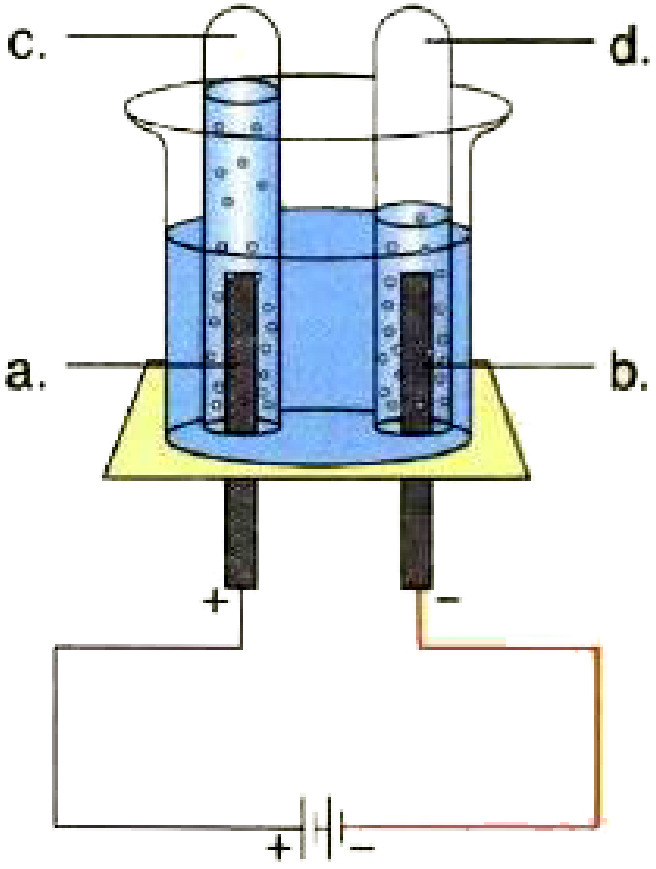
Exercises F Diagram Based Questions Br Study The Figure Given And Answer The Questions Based On It

1. Name the process shown in the figure.



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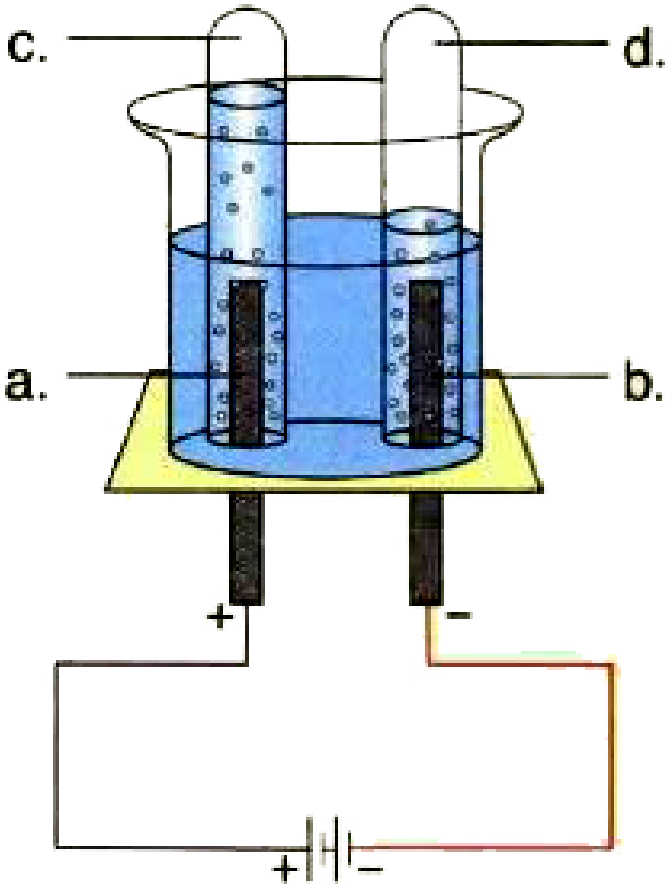
2. Label parts a, b, c and d.



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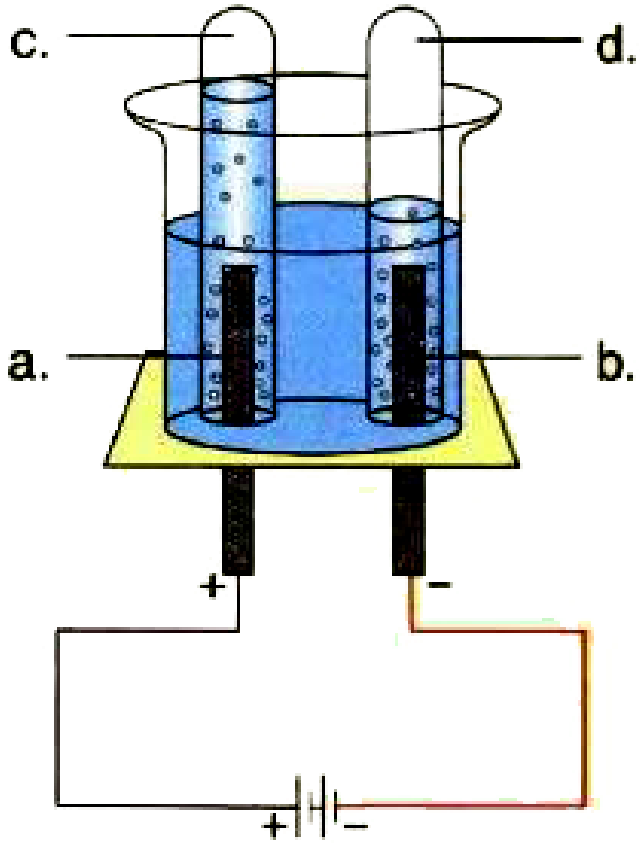
3. Name the electrolyte used in this process.



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Exercises G Give Reasons For The Following

1. Hydrogen is collected over water.

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2. In preparation of hydrogen, zinc granules are preferred over pure zinc because they

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3. Dil. HCl is used in laboratory preparation of hydrogen and not HNO_3.

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4. Hydrogen is used as a reducing agent.

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5. Hydrogen may be considered as the fuel of future.

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Exercises H Differentiate Between The Following

1. Define Weak and strong electrolyte

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2. Differentiate between cations and anions

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3. Differentiate between a cathode and an anode.

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4. Differentiate between Reducing and oxidizing agents

Watch Video Solution

5. Differentiate between Reduction and oxidation reactions

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Exercises I Short Answer Questions

1. Name the most abundant compound of hydrogen present on earth.

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2. Name the cation formed during electrolysis of water.

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3. Give two physical properties of water.

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4. What is the action of hydrogen on litmus paper?

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5. What happens when hydrogen combines with chlorine in diffused light?

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6. Hydrogen combines with nitrogen to form _____ in the presence of iron as a catalyst at a high pressure and temperature

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7. In a reaction between copper oxide and hydrogen, specify the reduction and oxidation taking place in the reaction.

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8. Which type of reactions are called oxidation reactions?

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9. A reducing agent is a substance which can

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10. What are redox reactions?

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