



<b>Class: XI</b>	<b>DEPARTMENT: SCIENCE 2021 - 22</b> <b>SUBJECT: CHEMISTRY</b>	<b>Date of completion:</b> <b>IV week of October, 2021</b>
<b>Worksheet No: 06</b> <b>with answers</b>	<b>TOPIC: HYDROGEN</b>	<b>Note:</b> <b>A4 FILE FORMAT</b>
<b>NAME OF THE STUDENT</b>	<b>CLASS &amp; SEC:</b>	<b>ROLL NO.</b>

### MULTIPLE CHOICE QUESTIONS

- Which of the following does not contain a neutron?
  - protium
  - deuterium
  - tritium
  - none of these
- Identify an ionic hydride which has significant covalent character.
  - KH
  - BaH<sub>2</sub>
  - RbH
  - LiH
- Choose the correct statement from the following.
  - Solid ionic hydrides on electrolysis liberate hydrogen gas at anode.
  - Solid ionic hydrides on electrolysis liberate hydrogen gas at cathode.
  - Molten ionic hydrides on electrolysis liberate hydrogen gas at anode.
  - Molten ionic hydrides on electrolysis liberate hydrogen gas at cathode.
- ..... Is an electron-deficient hydride which act as a Lewis acid.
  - CH<sub>4</sub>
  - B<sub>2</sub>H<sub>6</sub>
  - NH<sub>3</sub>
  - HF

5. Non-stoichiometric hydrides are formed by .....
- a) s block elements
  - b) p block elements
  - c) many d-block and f-block elements
  - d) all d-block and f-block elements
6. In the gas phase water is a ..... molecule with a bond angle of .....
- a) linear,  $104.5^\circ$
  - b) bent,  $104.5^\circ$
  - c) bent,  $109.5^\circ$
  - d) trigonal planar,  $107^\circ$
7.  $\text{H}_2\text{O}(\text{l}) + \text{H}_2\text{S}(\text{aq}) \rightleftharpoons \text{H}_3\text{O}^+(\text{aq}) + \text{HS}^-(\text{aq})$
- In the above reaction, water acts as .....
- a) a base
  - b) an acid
  - c) oxidising agent
  - d) reducing agent
8. When reacting with fluorine, water is .....
- a) reduced to  $\text{H}_2$
  - b) oxidised to  $\text{H}_2$
  - c) reduced to  $\text{O}_2$
  - d) oxidised to  $\text{O}_2$
9. Identify the salt responsible for temporary hardness of water.
- a)  $\text{CaCl}_2$
  - b)  $\text{MgSO}_4$
  - c)  $\text{NaCl}$
  - d)  $\text{Ca}(\text{HCO}_3)_2$
10. On boiling,  $\text{Mg}(\text{HCO}_3)_2$  present in hard water is precipitated as .....
- a)  $\text{MgO}$
  - b)  $\text{MgCO}_3$
  - c)  $\text{Mg}(\text{OH})_2$
  - d) None of these

**Read the given passage and answer the questions that follow:**

Rain water is almost pure (may contain some dissolved gases from the atmosphere). Being a good solvent, when it flows on the surface of the earth, it dissolves many salts. Presence of calcium and magnesium salts in the form of hydrogencarbonate, chloride and sulphate in water makes water 'hard'. Hard water does not give lather with soap. Water free from soluble salts of calcium and magnesium is called Soft water. It gives lather with soap easily.

11. Write balanced chemical equations for the removal of temporary hardness by Clark's method.
12. Hard water is unsuitable for laundry. Why?
13. Name any two salts responsible for permanent hardness of water.

**Assertion and Reasoning Questions**

14. **Assertion:** Hydrogen has been given a separate position in the modern periodic table.

**Reason:** Protium is an isomer of hydrogen which does not contain any neutron.

- a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
  - b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
  - c) Assertion is correct statement but reason is wrong statement.
  - d) Assertion is wrong statement but reason is correct statement.
15. **Assertion: Ammonia is an electron rich hydride.**

**Reason:** This is due to the presence of lone pair on nitrogen in ammonia.

- a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
- b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- c) Assertion is correct statement but reason is wrong statement.
- d) Assertion is wrong statement but reason is correct statement.

**16. Assertion:** Water is a highly polar molecule.

**Reason:** This is due to the presence of intramolecular hydrogen bonding in water.

- a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
- b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- c) Assertion is correct statement but reason is wrong statement.
- d) Assertion is wrong statement but reason is correct statement.

**Question – Answer Type:**

- 17.** How do you prove the existence of  $H^-$  ions in ionic compounds? **1**
- 18.** Write equation for the self-ionization of water. **1**
- 19.** Write a short note on hydrogen economy. **1**
- 20.** Explain how the temporary hardness of water can be removed by boiling. **2**
- 21.** What are hydrides? How are they classified? **2**
- 22.** Complete the following reactions. **3**
  - a)  $CaC_2 + D_2O \rightarrow$
  - b)  $SO_3 + D_2O \rightarrow$
  - c)  $Al_4C_3 + D_2O \rightarrow$

## ANSWERS

1.	a) protium
2.	d) LiH
3.	c) Molten ionic hydrides on electrolysis liberate hydrogen gas at anode.
4.	b) B <sub>2</sub> H <sub>6</sub>
5.	c) many d-block and f-block elements
6.	b) bent, 104.5°
7.	a) a base
8.	d) oxidised to O <sub>2</sub>
9.	d) Ca(HCO <sub>3</sub> ) <sub>2</sub>
10.	c) Mg(OH) <sub>2</sub>
11.	$\text{Ca(HCO}_3\text{)}_2 + \text{Ca(OH)}_2 \rightarrow 2\text{CaCO}_3 \downarrow + 2\text{H}_2\text{O}$ $\text{Mg(HCO}_3\text{)}_2 + 2\text{Ca(OH)}_2 \rightarrow 2\text{CaCO}_3 \downarrow$ $+ \text{Mg(OH)}_2 \downarrow + 2\text{H}_2\text{O}$
12.	Hard water forms scum/precipitate with soap. Hard water is unsuitable for laundry due to deposition of salts in the form of scale.
13.	Calcium chloride, calcium sulphate, magnesium chloride, magnesium sulphate (Any two)
14.	b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
15.	a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
16.	c) Assertion is correct statement but reason is wrong statement.
17.	On electrolysis, ionic hydrides liberate dihydrogen gas at anode, which confirms the existence of H <sup>-</sup> ion.
18.	$\text{H}_2\text{O(l)} + \text{H}_2\text{O(l)} \rightleftharpoons \text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq})$
19.	The basic principle of hydrogen economy is the transportation and storage of energy in the form of liquid or gaseous dihydrogen. Advantage of hydrogen economy is that energy is transmitted in the form of dihydrogen and not as electric power.
20.	During boiling, the soluble Mg(HCO <sub>3</sub> ) <sub>2</sub> is converted into insoluble Mg(OH) <sub>2</sub> and Ca(HCO <sub>3</sub> ) <sub>2</sub> is changed to insoluble CaCO <sub>3</sub> .

	$\text{Mg}(\text{HCO}_3)_2 \xrightarrow{\text{Heating}} \text{Mg}(\text{OH})_2 \downarrow + 2\text{CO}_2 \uparrow$ $\text{Ca}(\text{HCO}_3)_2 \xrightarrow{\text{Heating}} \text{CaCO}_3 \downarrow + \text{H}_2\text{O} + \text{CO}_2 \uparrow$
21.	<p>Binary compounds of hydrogen with other elements are called hydrides.</p> <p>The hydrides are classified into three categories:</p> <ul style="list-style-type: none"> <li>(i) Ionic or saline or salt like hydrides</li> <li>(ii) Covalent or molecular hydrides</li> <li>(iii) Metallic or non-stoichiometric hydrides.</li> </ul>
22.	<p>a) <math>\text{CaC}_2 + 2\text{D}_2\text{O} \rightarrow \text{C}_2\text{D}_2 + \text{Ca}(\text{OD})_2</math></p> <p>b) <math>\text{SO}_3 + \text{D}_2\text{O} \rightarrow \text{D}_2\text{SO}_4</math></p> <p>c) <math>\text{Al}_4\text{C}_3 + 12\text{D}_2\text{O} \rightarrow 3\text{CD}_4 + 4\text{Al}(\text{OD})_3</math></p>

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