5. Elements and Compounds Around us

Evaluation

1. Question

Water is made up of two elements, hydrogen and oxygen. Water is a liquid, whereas hydrogen and oxygen are gases. Hydrogen catches fire easily. Oxygen helps in burning. Water is used to put off the fire.

From the above information, answer the following questions.

a) What are the elements present in water?

b) In which state do these elements exist?

c) Write the property of hydrogen.

d) Write the property of oxygen.

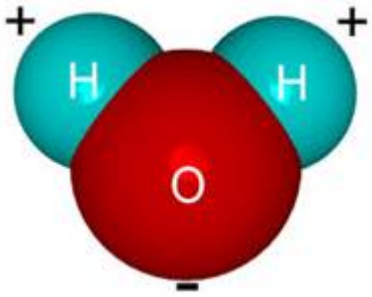
e) Do the properties of water differ from hydrogen and oxygen?

Answer

a) Water is made up of two elements i.e. hydrogen & oxygen.

Water is a compound of two hydrogen atoms and one oxygen atom in the ratio 2:1 by volume.

$2H_2 + O_2 \rightarrow 2H_2O$

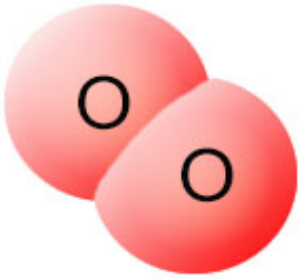


b) Hydrogen & oxygen exists in gases state.

Hydrogen & oxygen exists in gases state at standard temperature and pressure. This is because the intermolecular forces of attraction between the particles are weak.

c) Hydrogen is colourless, odourless gas and it is lighter than air. It is highly flammable it readily catches fire.

d) Oxygen is colourless, odourless & tasteless gas. Oxygen is not flammable; it makes other things ignite at low temperature. But oxygen itself does not catch fire.

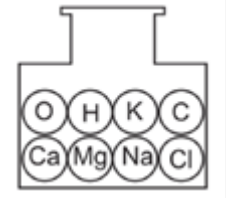


e) Yes, the properties of water are different from its constituent particles, i.e. hydrogen & oxygen.

Water is made up of two elements hydrogen & oxygen and is called a compound. Usually the properties of compounds are different from the properties of their constituent elements. Water exists in a liquid state & it acts as a fire extinguisher whereas hydrogen is highly inflammable gas and oxygen supports combustion.

2. Question

Using the elements enclosed in the bottle, frame formulae for some compounds.



Answer

1. Components= Hydrogen & Oxygen

Formulae= H_2O

Explanation: Water is a compound of two hydrogen atoms and one oxygen atom in the ratio 2:1 by volume.

$2H_2 + O_2 \rightarrow 2H_2O$

2. Components = Sodium & chlorine

Formulae = NaCl

Explanation: One sodium atom combines with one chlorine atom to form sodium chloride.

$Na + Cl \rightarrow NaCl$

3. Components = Carbon, hydrogen & oxygen

Formulae = $C_{12}H_{22}O_{11}$

Explanation: Sugar is a compound which is made up of 12 carbon atoms, 22 hydrogen atoms & 11 oxygen atoms.

4. Components = Sodium, carbon, hydrogen & oxygen

Formulae = $NaHCO_3$

Explanation: Baking soda is sodium hydrogen carbonate

$Na_2CO_3 + CO_2 + H_2O \rightarrow 2NaHCO_3$

5. Components = Calcium, oxygen & chlorine

Formulae = $CaOCl_2$

Explanation: Bleaching powder is formed by passing chlorine gas over slaked lime

$Ca(OH)2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

6. Components = Calcium & oxygen

Formulae = CaO

Explanation: Calcium oxide is formed by thermal decomposition of calcium carbonate.

$CaCO_3 \rightarrow CaO + CO_2$

7. Components = Calcium, oxygen & hydrogen

Formulae = $Ca(OH)_2$

Explanation: It is obtained by combining calcium oxide with water.

$CaO + H_2O \rightarrow Ca(OH)_2$

8. Components = Calcium, carbon & oxygen

Formulae = $CaCO_3$

Explanation: Calcium carbonate is formed by passing carbon dioxide into a solution of calcium hydroxide.

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

9. Components = Magnesium & chlorine

Formulae = $MgCl_2$

Explanation: It indicates two atoms of chlorine chemically combined with magnesium to form magnesium chloride.

$Mg + Cl_2 \rightarrow MgCl_2$

10. Components = Magnesium & oxygen

Formulae = MgO

Explanation: It indicates one oxygen molecule chemically combined with magnesium to form magnesium oxide.

$2Mg + O_2 \rightarrow MgO$

11. Components = Potassium & chlorine

Formulae = KCl

Explanation: One potassium atom combines with one chlorine atom to form potassium chloride.

$K + Cl \rightarrow KCl$

12. Components = Hydrogen & chlorine

Formulae = HCl

Explanation: One hydrogen atom combines with one chlorine atom to form hydrogen chloride.

$H + Cl \rightarrow HCl$

13. Components = Calcium & Chlorine

Formulae = $CaCl_2$

Explanation: One calcium atom combines with two chlorine atom to form calcium chloride.

$Ca + Cl_2 \rightarrow CaCl_2$

3. Question

Find the valency of the underlined element in the given formulae.

i) H_2O ii) KCl iii) Al_2O_3 iv) Fe_2O_3 v) CH_4

Answer

i) H_2O

Valency of oxygen is 2

Let the valency of oxygen is x

We know that,

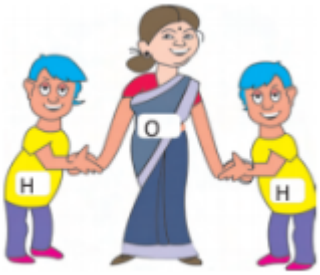
Charge on hydrogen is +1

Therefore, $2 \times 1 + x = 0$

$2+x=0$

$x= -2$

As the picture shows,



Valency of oxygen is 2

ii) KCl

Valency of potassium is 1

Let the valency of potassium is x

We know that,

Charge on chlorine is -1

Therefore, $x + (-1) = 0$

$x - 1 = 0$

$x= 1$

As the picture shows,

iii) $\underline{Al}_2O_3$

Valency of aluminium is 3

Let the valency of aluminium is x

We know that,

Charge on oxygen is -2

Therefore, $2 \times x + 3 \times (-2) = 0$

$2x - 6 = 0$

$2x = 6$

$x = \frac{6}{2}$

$x = 3$

iv) $\underline{Fe}_2O_3$

Valency of iron is 3

Let the valency of iron is x

We know that,

Charge on oxygen is -2

Therefore, $2 \times x + 3 \times (-2) = 0$

$2x - 6 = 0$

$2x = 6$

$x = \frac{6}{2}$

$x = 3$

v) $\underline{C}H_4$

Valency of carbon is 4

Let the valency of carbon is x

We know that,

Charge on hydrogen is +1

Therefore, $x+4\times1 = 0$

$x+4=0$

$x= -4$

4. Question

Write the chemical name of the given formulae.

i) MgO ii) HCl iii) NH_3 iv) ZnO v) NaCl

Answer

i) MgO

Magnesium oxide

Magnesium combines with oxygen molecule to form magnesium oxide.

$2Mg + O_2 \rightarrow 2MgO$

Magnesium + Oxygen → Magnesium oxide

ii) HCl

Hydrochloric Acid

Hydrogen combines with chlorine to form hydrochloric acid.

$H + Cl \rightarrow HCl$

Hydrogen + Chlorine → Hydrochloric Acid

iii) NH_3

Ammonia

One nitrogen molecule combines with three hydrogen molecules to form ammonia.

$N_2 + 3H_2 \rightarrow NH_3$

Nitrogen + Hydrogen → Ammonia

iv) ZnO

Zinc oxide

Zinc combines with oxygen to form zinc oxide.

$2Zn + O_2 \rightarrow 2ZnO$

Zinc + Oxygen → Zinc oxide

v) NaCl

Sodium chloride

Sodium combines with chlorine to form Sodium chloride.

Na + Cl → NaCl

Sodium + Chlorine → Sodium chloride

5. Question

Write the names of the planets (Greek God) after which these elements are named.

a) Plutonium b) Neptunium c) Uranium

Answer

Name	Symbol	Name derived from
Uranium	U	Uranus
Explanation: Atomic number of uranium is 92. Because at that time uranium is the furthest known element & Uranus is the furthest known planet.		
Neptunium	Np	Neptune
Explanation: Atomic number of neptunium is 93. Neptunium is the element after uranium & is named for Neptune, the next planet to Uranus.		
Plutonium	Pu	Pluto
Explanation: Atomic number of plutonium is 94. Plutonium is the element after neptunium & is named for Pluto, the next planet to Neptune.		

The following diagram shows the solar system: