

**CBSE Test Paper 01**  
**Chapter 03 Atoms and Molecules**

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1. A sample of  $\text{CaCO}_3$  contains  $3.01 \times 10^{23}$  ions of  $\text{Ca}^{+2}$  and  $\text{CO}_3^{-2}$ . The mass of the sample is: **(1)**
  - a. 200 g
  - b. 50 g
  - c. 100 g
  - d. 5 g
  
2.  $\text{SO}_3$  is **(1)**
  - a. acidic
  - b. amphoteric
  - c. basic
  - d. neutral
  
3. When dilute sulphuric acid is added to zinc granules, we observe that: **(1)**
  - a. the container remains cool
  - b. the reaction mixture turns yellow
  - c. bubbles start coming from the surface of the zinc granules
  - d. a precipitate is formed
  
4. The number of molecules in  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  bonded by H-bond is **(1)**
  - a. 5
  - b. 3
  - c. 2
  - d. 1
  
5. The maximum number of electrons in L shell is: **(1)**
  - a. 38

- b. 28
- c. 18
- d. 8

6. An element X has valency 3 while the element Y has valency 2. Write the formula of the compound formed by X and Y. **(1)**

- a.  $X_2Y_2$
- b.  $X_3Y_3$
- c. XY
- d.  $X_2Y_3$

7. Define atomic mass unit **(1)**

8. How many atoms are present in a: **(1)**

- a.  $H_2S$  molecule and
- b.  $PO_4^{3-}$  ion?

9. Name the Indian philosopher who proposed the theory of matter. **(1)**

10. Find the ratio by mass of the elements present in the molecule of hydrogen sulphide ( $H_2S$ ). Given that, atomic mass S = 32, H = 1. **(1)**

11. What is the difference between  $H_2$  and  $2H$ ? **(3)**

12. Calculate the number of moles in the following : **(3)**

- i. 28g He
- ii. 46g of Na.
- iii. 60 g of Ca.

Given the gram atomic mass of

- i. He = 4 g
- ii. Na = 23 g
- iii. Ca = 40g.

13. Calculate the molar mass of ethyl alcohol ( $C_2H_5OH$ ). **(3)**
14. Write the chemical formulae of the following. **(5)**
- i. Magnesium chloride
  - ii. Calcium oxide
  - iii. Copper(II) nitrate
  - iv. Aluminium chloride
  - v. Calcium carbonate.
15. Write an experiment to show that cathode rays travel in straight line? **(5)**

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**Answers**

1. b. 50 g

**Explanation:** The mass of one mole of  $\text{CaCO}_3$  is equal to 100 g.  $6.022 \times 10^{23}$  ions are equivalent to one mole. Therefore, mass of  $3.01 \times 10^{23}$  ions will be equivalent to  $(100 / 2)$  g or 50 g.

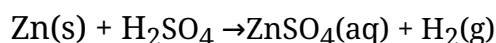
2. a. acidic

**Explanation:** Molecules whose Lewis structures indicate an atom to have an octet as a result of the formation of one or more multiple bonds will often function as Lewis acids. Examples are  $\text{CO}_2$ ,  $\text{SO}_3$ ,  $\text{SO}_2$ .

$\text{SO}_3$  is acidic in nature as it is non-metallic oxide.

3. c. bubbles start coming from the surface of the zinc granules

**Explanation:** Zinc reacts with dil.  $\text{H}_2\text{SO}_4$  to form  $\text{H}_2$  gas and we observe bubbles start coming from the surface of the zinc granules.



This reaction is exothermic and hence heat is evolved in the reaction.

4. d. 1

**Explanation:** One molecule of water is linked by H-bond because only one molecule of water is present outside the coordination sphere.

5. d. 8

**Explanation:** L shell can accommodate a maximum of 8 electrons.

6. d.  $\text{X}_2\text{Y}_3$

**Explanation:** The formula of an ionic compound is formed by interchanging the valencies of the constituent atoms. The formula of the compound having atoms of X and Y is  $\text{X}_2\text{Y}_3$ . The valency (2) of Y forms the subscript of X and the valency (3) of X forms the subscript of Y.

7. Atomic mass unit may be defined as:

The mass of one twelfth (1/12) of the mass of one atom of carbon taken as 12u. It is represented as 1u.

8. i. 2 atoms of hydrogen + 1 atom of sulphur = 3 atoms. Hence 3 atoms are present in an  $H_2S$  molecule.  
ii. 1 atom of phosphorus + 4 atoms of oxygen = 5 atoms. Hence 5 atoms are present in an ion.  $PO_4^{3-}$

9. Kanad proposed the theory of matter around 600 BC.

10. atomic mass of sulphur S = 32 u

atomic mass of hydrogen H = 1u

the ratio by mass of the elements present in the molecule of hydrogen sulphide ( $H_2S$ )

= mass of hydrogen atom present in the compound : the mass of the sulphur atom present compound

$$= 2 \times 1 : 32 = 2 : 32 = 1 : 16$$

11.  $H_2$  represents one molecule of  $H_2$  (hydrogen gas) whereas 2H represents two separate atoms of hydrogen.

12. i. 28 g of He

The no. of moles

$$= \frac{\text{Mass of He in grams}}{\text{Gram atomic mass}} = \frac{m}{M} = \frac{(28g)}{(4g)} = 7 \text{ mol}$$

ii. 46 g of Na

The no. of moles

$$= \frac{\text{Mass of Na in grams}}{\text{Gram atomic mass}} = \frac{m}{M} = \frac{(46g)}{(23g)} = 2 \text{ mol}$$

iii. 60 g of Ca

The no. of moles

$$= \frac{\text{Mass of Ca in grams}}{\text{Gram atomic mass}} = \frac{m}{M} = \frac{(60g)}{(40g)} = 1.5 \text{ mol}$$

13. molar mass of  $C_2H_5OH$

= (2 × Atomic mass of C) + (6 × Atomic mass of H) + (1 × Atomic mass of O)

= {(2 × 12) + (6 × 1) + (1 × 16)} u

= {24 + 6 + 16} u

= 46u

#### 14. **chemical formulae of**

##### a. **Magnesium chloride**

Symbols; Mg Cl

Valencies: 2 1

cross-over valencies

$Mg_1Cl_2$  or  $MgCl_2$

Thus, the formula of magnesium chloride is  $MgCl_2$ .

##### b. **Calcium oxide**

Symbols; Ca O

Valencies: 2 2

cross-over valencies

$Ca_2O_2$  or  $CaO$

**Thus, the formula of Calcium oxide is CaO.**

##### c. **Copper(II) nitrate**

Symbols; Cu  $NO_3$

Valencies: 2 1

cross-over valencies

$Cu_1(NO_3)_2$  or  $Cu(NO_3)_2$

**Thus, the formula of copper nitrate is  $Cu(NO_3)_2$ .**

##### d. **Aluminium chloride**

**Symbols; Al Cl**

**Valencies: 3 1**

cross-over valencies

$Al_1Cl_3$  or  $AlCl_3$

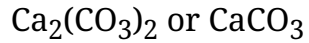
**Thus, the formula of Aluminium chloride is  $AlCl_3$ .**

##### e. **Calcium carbonate.**

Symbols; Ca  $CO_3$

Valencies: 2 2

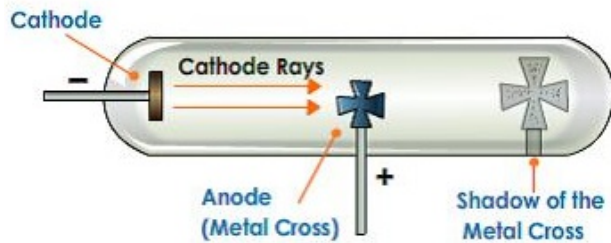
cross-over valencies



**Thus, the formula of Calcium carbonate is  $\text{CaCO}_3$ .**

15. Experiment to show that cathode rays travel in the straight line:-

- Take a discharge tube coated with a fluorescent substance
- Place an opaque object in the path of the cathode rays.
- When cathode rays were made to pass through the discharge tube then discharge the glowed wherever cathode rays fall except in the region of the shadow of the opaque object.
- The above experiment shows that cathode rays travel in the straight line.



**Cathode Rays Cast Shadows of the Objects Placed in their Path**

**CBSE Test Paper 02**  
**Chapter 03 Atoms and Molecules**

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1. What information do we get from the molecular formula?

- (i) It represents one molecule of the substance.
- (ii) It does not tell the name of the substance.
- (iii) It tells about the type of atoms.
- (iv) It represents formula mass unit of the substance.

- a. (ii) and (iii) are correct
- b. All of these
- c. (i) and (ii) are correct
- d. (i), (iii) and (iv) are correct.

2. What is the atomicity of ammonia? **(1)**

- a. 0
- b. 4
- c. 2
- d. 3

3. Match the following with correct response: **(1)**

(1) A dozen of pencil	(A) Mole
(2) Avogadro constant	(B) 12
(3) Unit used for calculation of amount of chemical substances	(C) Carbon-12
(4) Reference atom	(D) $6.022 \times 10^{23}$

- a. 1-D, 2-A, 3-C, 4-B
- b. 1-C, 2-B, 3-D, 4-A
- c. 1-A, 2-C, 3-B, 4-D
- d. 1-B, 2-D, 3-A, 4-C

4. What is the ratio of magnesium and sulphur by mass in magnesium sulphide? **(1)**



- a. 3:4
- b. 23:35.5
- c. 2:1
- d. 5:2

5. A neutron is: **(1)**

- a. Chargeless and has no mass
- b. Has charge and no mass
- c. Charge-less and has mass
- d. Has charge and mass

6. What is the Latin name of Potassium? **(1)**

- a. None of these
- b. Ferrum
- c. Kalium
- d. Natrium

7. What is Dalton? **(1)**

8. What is the valency of calcium in  $\text{CaCO}_3$ ? **(1)**

9. Give an example of a triatomic molecule of an element. **(1)**

10. Formula of the carbonate of a metal M is  $\text{M}_2\text{CO}_3$ . Write the formula of its chloride. **(1)**

11. What are isotopes? Name the isotopes of hydrogen and draw the structure of their atoms? **(3)**

12. Convert into mole. **(3)**

- 1. 12 g of oxygen gas
- 2. 20 g of water
- 3. 22 g of carbon dioxide.

13. If one mole of carbon weighs 12 grams, what is the mass (in gram) of one atom of

carbon? **(3)**

14. Write the molecular formulae for the following compounds: **(5)**

- a. Copper (II) bromide
- b. Aluminium (III) nitrate
- c. Calcium (II) phosphate
- d. Iron (III) sulphide
- e. Mercury (II) chloride
- f. Magnesium (II) acetate

15. 0.44 g of a hydrocarbon on complete combustion with oxygen gave 0.88 g of carbon dioxide and 1.8 g water. Show that the results are in agreement with the law of conservation of mass. **(5)**

**CBSE Test Paper 02**  
**Chapter 03 Atoms and Molecules**

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**Answers**

1. d. (i), (iii) and (iv) are correct.

**Explanation:** The molecular formula of a substance (an element or a compound) is a symbolic representation of the actual number of atoms present in one molecule of that substance. It represents formula mass unit of the substance. It also conveys the name of the substance. Therefore, (a), (c) and (d) are correct.

2. b. 4

**Explanation:** The number of atoms present in one molecule of a substance is called its atomicity.

Atomicity of Ammonia ( $\text{NH}_3$ ) is 4 (1 atom of Nitrogen and 3 atoms of Hydrogen)

3. d. 1-B, 2-D, 3-A, 4-C

**Explanation:**

(1) A dozen of pencil	(B) 12
(2) Avogadro constant	(D) $6.022 \times 10^{23}$
(3) Unit used for calculation of amount of chemical substances	(A) Mole
(4) Reference atom	(C) Carbon-12

4. a. 3:4

**Explanation:** Atomic mass of magnesium is 24. Atomic mass of sulphur is 32. Therefore, the ratio of magnesium and sulphur by mass in magnesium sulphide ( $\text{MgS}$ ) is 24:32 or 3:4

5. c. Charge-less and has mass

**Explanation:** A neutron is a neutral sub-atomic particle and has mass. Mass of neutron is 1.0086654 u or  $1.6749 \times 10^{-27}$  kg.

6. c. Kalium

**Explanation:** Latin name of Potassium element is Kalium from which symbol of Potassium is derived as K.

7. One u (unified mass) is also known as one Dalton.

One atomic mass unit or unified mass (u) =  $1.66 \times 10^{-27} \text{kg}$ .

8. The valency of Ca in  $\text{CaCO}_3$  is 2+ (i.e.  $\text{Ca}^{2+}$ ).

9. Ozone ( $\text{O}_3$ )

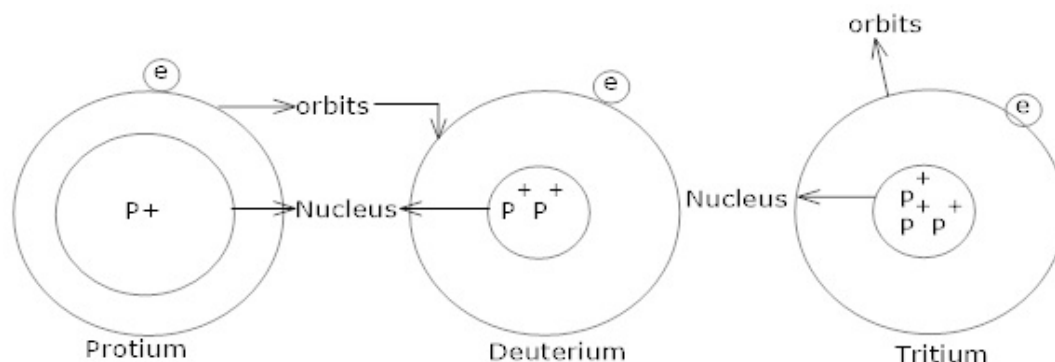
10. The valency of the metal (M) in  $\text{M}_2\text{CO}_3$  is (2+) i.e. metal exists as  $\text{M}^{2+}$ . Therefore, the formula of metal chloride is  $\text{MCl}_2$ .

11. Isotopes are atoms of the same element having the same atomic number and different mass number. Isotopes of an element have the same atomic number because they contain the same no. of protons ( and electrons ). Isotopes of an element have different mass no. because they contain different no. of neutrons.

There are 3 isotopes of hydrogen:-

$\text{p}^+$  = Proton

$\text{e}^-$  = electron.



i. Protium =  ${}^1_1\text{H}$  Protium does not have a special symbol.

ii. Deuterium =  ${}^2_1\text{H}$  .The special symbol of deuterium is D.

iii. Tritium =  ${}^3_1\text{H}$  . The special symbol of tritium is T.

12. a. molecular mass of  $\text{O}_2 = 16 \times 2 = 32\text{u}$

= 32 g (1 mole)

since 32 g of  $O_2=1$  mole then 12 g of  $O_2$   
 $= 1 \times \frac{12}{32}$   
 $=0.375$  mole.

b. molecular mass of  $H_2O = 1 \times 2 + 16 = 18$  u  
 $= 18$  g (1 mole)  
 $20$  g  $H_2O = 1 \times \frac{20}{18} = 1.11$  mole.

c. molecular mass of  $CO_2 = 12 + 16 \times 2 = 12 + 32$   
 $= 44$  u =  $44$  g (1 mole)  
 $22$  g of  $CO_2 = 1 \times \frac{22}{44} = 0.5$  mole.

13. Molar mass of carbon =  $12$  g

Now,  $6.022 \times 10^{23}$  atoms of carbon have mass =  $12$  g

$\therefore$  one atom of carbon has mass =  $(12 \text{ g}) \times \frac{(1 \text{ atom})}{(6.022 \times 10^{23} \text{ atoms})}$

$= 1.99 \times 10^{-23}$ g

14. a. The molecular formulae for the Copper (II) bromide:

Symbols: Cu Br

Valencies: 2 1

Cross over valencies

The molecular formulae for the Copper (II) bromide:  $Cu_1Br_2$  or  $CuBr_2$

b. The molecular formulae for the Aluminium (III) nitrate

Symbols: Al  $NO_3$

Valencies: 3 1

Cross over valencies

The molecular formulae for the Aluminium (III) nitrate is  $Al_1(NO_3)_3$  or  $Al(NO_3)_3$

c. The molecular formulae for the Calcium (II) phosphate

Symbols: Ca  $PO_4$

Valencies: 2 3

Cross over valencies

The molecular formulae for the Calcium (II) phosphate is  $Ca_3(PO_4)_2$ .

d.  $Fe_2S_3$



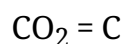
15. Hydrocarbon is a compound of carbon and hydrogen.

The amount of hydrocarbon reacted = 0.44 g.

Let us calculate the amount of carbon and hydrogen which are present in carbon dioxide and water respectively. These are the products.

Calculation of mass of carbon (C)

Mass of carbon dioxide ( $\text{CO}_2$ ) formed = 0.88 g



for  $\text{CO}_2 = (12 + 2 \times 16) = 44 \text{ g}$  and for  $\text{C} = (1 \times 12) = 12 \text{ g}$

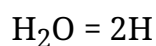
Now, 44.0 g of carbon dioxide ( $\text{CO}_2$ ) contain  $\text{C} = 12.0 \text{ g}$

0.88 g of carbon dioxide ( $\text{CO}_2$ ) contain C

$$= (12.0\text{g}) \times \frac{(0.88\text{g})}{(44.0\text{g})} = 0.24 \text{ g}$$

Calculation of mass of hydrogen (H)

Mass of water ( $\text{H}_2\text{O}$ ) formed = 1.8 g



for  $\text{H}_2\text{O} = (2 \times 1 + 16) = 18 \text{ g}$  and for  $2\text{H} = (2 \times 1) = 2\text{g}$

Now, 18 g of water ( $\text{H}_2\text{O}$ ) contains  $\text{H} = 2.0 \text{ g}$

$$1.8 \text{ g of water } (\text{H}_2\text{O}) \text{ contains H} = (2.0\text{g}) \times \frac{(1.8\text{g})}{(18.0\text{g})} = 0.20 \text{ g}$$

Total mass of C and H in the products =  $(0.24 + 0.20) = 0.44 \text{ g}$

This mass comes out to be the same as the mass of the hydrocarbon. The data is in agreement with the law of conservation of mass.

**CBSE Test Paper 03**  
**Chapter 03 Atoms and Molecules**

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1. Neutron: **(1)**

- a. Has charge but no mass.
- b. Has neither charge nor mass.
- c. Has charge as well as mass.
- d. has mass but no charge.

2. Which is not true about  $H_2SO_4$ ? **(1)**

- (i) It is composed of 2 Hydrogen, 1 Sulphur and 4 Oxygen atoms.
- (ii) Its relative molecular mass is 98.
- (iii) It is composed of one molecule of  $H_2$ , one atom of S and two molecules of  $O_2$
- (iv) Its relative molecular mass is 108.

- a. All of these
- b. (iii) and (iv) are correct
- c. (ii) and (iii) are correct
- d. (i), (ii) and (iii) are correct

3. Argentum is the Latin name of: **(1)**

- a. Tungsten
- b. Silver
- c. Sodium
- d. Antimony

4. Match the following with correct response: **(1)**

(1) Cobalt	(A) Na
(2) Copper	(B) Cu
(3) Sulphur	(C) Co

(4) Sodium	(D) S
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- a. 1-B, 2-D, 3-A, 4-C
- b. 1-D, 2-A, 3-C, 4-B
- c. 1-A, 2-C, 3-B, 4-D
- d. 1-C, 2-B, 3-D, 4-A

5. What is the latin name of sodium? **(1)**

- a. Natrium
- b. None of these
- c. Kalium
- d. Plumbum

6.  $\beta$  -particles are represented as :- **(1)**

- a.  ${}_{-1}^1e$
- b.  ${}_0^1e$
- c.  ${}_{-1}^0e$
- d.  ${}_{+1}^0e$

7. What is an ion? Give one example. **(1)**

8. Write the atomicity of the following molecules: **(1)**

- a.  $\text{H}_2\text{SO}_4$
- b.  $\text{CCl}_4$

9. What is the atomicity of ammonia? **(1)**

10. Define atomicity. **(1)**

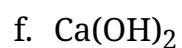
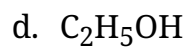
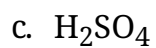
11. What is basic difference between atoms and molecules? **(3)**

12. Calculate the number of moles in  $3.011 \times 10^{23}$  molecules of nitrogen. **(3)**

13. How many moles are present in 4 g of sodium hydroxide? **(3)**



14. Find the ratio of mass of the combining elements in the following compounds: **(5)**



15. Give the names of the elements present in the following compounds. **(5)**

i. Quick lime

ii. Hydrogen bromide

iii. Baking powder

iv. Potassium sulphate

**CBSE Test Paper 03**  
**Chapter 03 Atoms and Molecules**

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**Answers**

1. d. has mass but no charge.

**Explanation:** A neutron has mass but it has no charge.

2. b. (iii) and (iv) are correct.

**Explanation:**  $\text{H}_2\text{SO}_4$  is composed of 2 Hydrogen, 1 Sulphur and 4 Oxygen atoms. Its relative molecular mass is 98.

3. b. Silver

**Explanation:** The Latin name of Silver is Argentum. The symbol of Silver is Ag.

4. d. 1-C, 2-B, 3-D, 4-A

**Explanation:**

(1) Cobalt	(C) Co
(2) Copper	(B) Cu
(3) Sulphur	(D) S
(4) Sodium	(A) Na

Symbol of Copper is derived from Latin **Cuprum**. Symbol of Sodium is derived from Latin Natrium.

5. a. Natrium

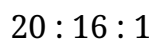
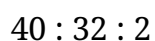
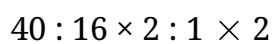
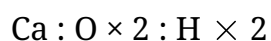
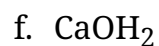
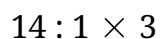
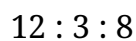
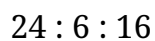
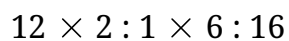
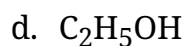
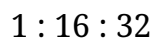
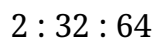
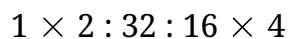
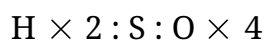
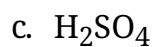
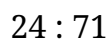
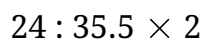
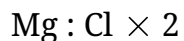
**Explanation:** Latin name of sodium is Natrium. Therefore, the symbol of Sodium is Na.

6. c.  ${}^0_{-1}e$

**Explanation:**  ${}^0_{-1}e$  is the correct representation of a beta particle. A beta particle is denoted by the lower-case Greek letter beta (Symbol  $\beta$ ). It is a high energy, high speed electron or positron emitted in the radioactive decay of a nucleus. It is sometimes called a beta ray. An electron has negligible mass - hence the superscript 0. An electron has a negative charge - hence a subscript

-1.

7. An ion is a positively or negatively charged atom (or group of atoms). For example,.,  
 $PO_4^{3-}$ ,  $H^+$   $Pb^+$
8. Atomicity is the number of atoms present in one molecule of a substance.
- a. In  $H_2SO_4$ , 2 hydrogen atom, 1 sulphur atom & 4 oxygen atoms are present. Hence the atomicity of  $H_2SO_4$  is 7.
- b. In  $CCl_4$ , 1 carbon atom & 4 chlorine atoms are present. Hence the atomicity of  $CCl_4$  is 5.
9. Atomicity of ammonia ( $NH_3$ ) is 4 because one molecule of  $NH_3$  has 1 nitrogen atom and 3 hydrogen atoms.
10. Atomicity is the number of atoms present in one molecule of a substance.
11. Atoms except those of noble or inert gas elements cannot exist of their own. However all molecules can have independent existence.  
Atom consist of only one type of matter while molecules are a combination of two or more atoms.
12. 1 mole of nitrogen contains  $6.022 \times 10^{23}$  molecules  
therefore,  $6.022 \times 10^{23}$  molecules of nitrogen=1 mol  
1 molecule of nitrogen  
Therefore,  $3.011 \times 10^{23}$  molecules of nitrogen
13. 1 mole of atoms = Gram atomic mass  
1 mole of sodium hydroxide = Gram atomic mass  
Gram molar mass of NaOH =23+16+1 =40 g  
40 g of NaOH = 1 mol  
1 g of NaOH =1/40 mol  
4 g of NaOH =1/40  $\times$  4 mol  
= 0.1 mole
14. a.  $CaCO_3$   
Ca : C : O  $\times$  3  
40 : 12 : 16  $\times$  3  
40 : 12 : 48  
10 : 3 : 12
- b.  $MgCl_2$



15.

<b>Compound</b>	<b>formula</b>	<b>Element present</b>
Quick lime	CaO	Calcium and oxygen
Hydrogen bromide	HBr	Hydrogen and bromine
Baking powder	NaHCO <sub>3</sub>	Sodium, hydrogen, carbon and oxygen
Potassium sulphate	K <sub>2</sub> SO <sub>4</sub>	Potassium, sulphur and oxygen