



# Grade 10



# SCIENCE



## Quantification of Elements and Compounds—Self Study Pack

Subject : Science

Grade : 10

Term : 2<sup>st</sup> Term

Unit : Quantification of elements and compounds.

Learning outcomes :

- Define atomic mass unit.
- Define relative atomic mass unit.
- Calculate relative atomic mass of a given atom.
- Define relative molecular mass
- Define Avogadro constant.
- Define mole to quantify matter.

Activity: -

### 10.7.1 Examine the units to measure mass in different substances

Mention the unit to measure mass of various packs and substances, at home.

- A loaf of bread
- A tablet of medicine
- Sack of rice
- Brick of cement
- Packet of milk
- Packet of 'Samahan'

For your knowledge

- \* Different units are used to measure different masses of various substances.
- \* Main units among those were kg, g, mg.
- \* Very minute masses cannot be measured by the above units. So in such instances atomic mass unit is used to measure the smaller scale masses.



### 10.7.2 Find the relative mass

Material needed: -

- 1) Pan balance (Can be prepared by using yoghurt cups or any other material.)
- 2) Green gram
- 3) Jill ball

Method: -

- Take the pan balance and put the Jill ball to one side of the balance.
- To balance the indicator, add green gram to the other side of the pan balance.
- Count the numbers of green gram when the indicator gets balanced.
- Use a table balance to measure the mass of the above mass of green gram.
- Calculate the mass of a green gram by dividing the whole mass of green gram by the number of green grams.
- State the mass of the Jill ball relative to the mass of a green gram.

Answer the following questions by the experience you gained through the activity and the knowledge you gain at the school.

- 1) Calculate the mass of the Jill ball relative to a green gram.
- 2) Write a hypothesis you made in this practical.
- 3) Which unit is used to express the mass of the Jill ball relative to a green gram?  
Explain your answer

#### For your knowledge

- \* As atoms, molecules and ions minute masses, masses of those are measured relative to a standard.
- \* Standard, we use today is carbon element. That is relative to  $\frac{1}{12}$  th of  $^{12}_6\text{C}$  atom.  
That can be calculated as follows,

$$\text{Relative atomic mass of an atom} = \frac{\text{Mass of an atom of the element}}{\frac{1}{12} \text{ th } \times \text{ mass of a } ^{12}_6\text{C atom}}$$



- ✚ Relative atomic mass and relative molecular mass do not have units.

Make sure the concept of mole, by the theory you studied at the school, and answer the following questions.

- 1) What is a mole?
- 2) Define mole?
- 3) How many atoms are there in the mole?
- 4) You have to obtain an atomic mole of carbon element. Explain how you do it?
- 5) What is molar mass?
- 6) What is the unit of molar mass?

### For your knowledge

- \* Mole is the internationally recommended unit to measure matter.
  - \* The mole is the amount of a substance that contains as many basic building units. (atoms, molecules, ions) As there are atoms in exactly 12.00g of  $^{12}_6\text{C}$  isotope.
  - \* The number of basic units contained in a mole of any substance is a constant and it is equal to the Avogadro constant or  $6.022 \times 10^{23}$ .
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- ❖ To obtain an atomic mole of any substance we have to take the mass equivalent to relative atomic mass of that element.



## Evaluation

Answer the following questions given below from 2016 - 2020 in GCE O/L examination.

Year	MCQ	Essay Part A	Essay part B
2016	29		(6) (Vii) b, I, II
2017			6 B IL (a)
2018	17		
2019	07		(6) (c) (III)
2020			

### Summary

- ❖ It is difficult to weight small scales by Kg and g. so milligram (mg) and atogramme (ag) and atogramme

$$\begin{array}{l} \text{(ag) are} \\ 1\text{mg} \end{array} = \begin{array}{l} \text{used} \\ \frac{1}{1000} \text{ g} \end{array}$$

$$10\text{g} = \begin{array}{l} \text{used} \\ \frac{1}{100,000,000,000,000,000} \text{ g} \end{array}$$

$$1\text{ag} = 1 \times 10^{-18} \text{ g}$$



- ❖ To measure the mass of an atom, a unit is used. Because of that atomic mass unit (amu) is used to measure the mass of an atom.

$$\text{Relative atomic mass} = \frac{\text{Mass of an atom of the element}}{\frac{1}{12} \times \text{mass of a } \frac{12}{6} \text{ C atom ...}}$$

Relative molecular mass can be calculated by this method too.

$$\text{Relative atomic} = \frac{\text{Mass of a molecule of an element or a compound}}{\frac{1}{12} \times \text{mass of a } \frac{12}{6} \text{ C atom ...}}$$

- ❖ When a mass is taken, equivalent to relative molecular mass of an element or a compound, the particular element or compound consists of  $6.022 \times 10^{23}$  atoms or molecules. That is the Avogadro number.
- ❖ Mole is used to measure matter in standard notation.
- ❖ Any basic unit consists of  $6.022 \times 10^{23}$  amount of matter. That is a mole.