

LESSON PLAN
SUBJECT - SCIENCE
CLASS - 9

CONSOLIDATED PLAN

Chapter Number and Title of Chapter	Chapter No. - 3 Title of the Chapter - Atoms And Molecules
No. of Periods	Total: 4 periods (approx. 40 min each)
Learning Objectives	1. Students will be able to describe Laws of chemical combination . 2. Students will be able to describe Dalton's Atomic Theory 3. Students will be able to define the term atom. 4. Students will be able to state Symbols of atoms of different elements. 5. Students will be able to define Atomic mass. 6. Students will be able to define molecule. 7. Students will be able to define the term ions. 8. Students will be able to describe the nature of colloid and its types. 9. Students will be able to formulate the formulae of chemical compounds. 10. Students will be able to define describe mole concept and to calculate molar mass. 11. Students will be able to define formula unit mass
Teaching Aids / Resources	Teaching Video Explanation Video Experiential Learning Video PPT Concept Map

Previous Knowledge/ Curiosity Questions	Q1. Name the metal which is used in thermometers? Ans- Mercury. Q 2. Name the elements which are the constituents of water? Ans- The constituents of water are Hydrogen and Oxygen. Q3. The mass of Hydrogen is 1 u and the mass of Oxygen is 16, What will be the ratio of their masses? Ans- The ratio of masses is 1:8. Q4. What will be the effect on mass of water, if it is heated? Ans- Mass of water remains same.
Announcement of topic	On finding that the students were unable to answer last two questions, the teacher would announce that the students have already studied basic concept of pure substance and element in previous classes. Today, we will begin with the Chapter -Atoms And Molecules , in which the Concepts related to atoms, molecules, ions, Atomic mass, molecular mass and mole concept will be done.

Teaching Methodology/ Strategy	Transaction would proceed in the following manner- Suggestive Methodologies: 1. Brain Storming / Curiosity Questioning-Short Answer Type Questions Q 1. 4 grams of hydrogen reacts with some oxygen to make 36 grams of water. Figure out how much oxygen must have been used by applying the law of conservation of mass? Ans. Mass of oxygen required =32g Q2. In a chemical reaction 150 g Baking soda mixture containing sodium bicarbonate and vinegar on heating gives 87 g of carbon dioxide gas. What mass of solid residue will left in food? Ans. $150-87=63\text{g}$ Q3. Which of the following are triatomic and tetra-atomic molecules? CH_3Cl, CaCl_2, NH_3, PCl_3, P_2O_5, H_2O, $\text{C}_2\text{H}_5\text{OH}$. Answer: (i) Triatomic molecules - CaCl_2, H_2O. (ii) Tetra-atomic molecules - NH_3, PCl_3. 2. Active learning- Explanation of the Content will be started with real life examples of elements and compounds followed by power point Presentation. Students will easily grasp the concept of atoms and molecules. 3. Group learning- It fosters discussion which is essential for understanding in science. Students will perform experiments collaboratively to understand the law of conservation of mass and atomic mass which develops critical thinking. 4. Guided practice followed by Independent Practice- NCERT questions to be discussed in the classroom.
Content Obligatory Vocabulary (Keywords)	Chemical combination, atoms,molecules, element, compound, atomicity, atomic mass, molecular mass, mole, molar mass, Avogadro number.

Learning Concepts/ Teaching Points	1. Laws of chemical combination 2. Dalton's Atomic Theory 3. Atoms 4. Symbols of atoms of different elements 5. Atomic mass 6. Molecule 7. Ions 8. Chemical formulae 9. Molecular mass 10. Mole concept 11. Formula unit mass
Hard Spots/ Focus Spots	Students find difficult to understand the difference in molecular mass and molar mass. Reason: Students may get confused between the mass of a molecule and mass of a mole.
Experiential Content	Activity 1.- To illustrate law of conservation of mass. Activity 2. -To understand the concept of atomic mass unit.
Subject Enrichment Activities for Internal Assessment	1. To make a list symbols of elements . 2. To practice writing formulas of chemical compounds.
Recapitulation :	Q1. Name the element which is used as the reference for atomic mass? Q2. Define the term polyatomic ion? Q3. What is the difference in Avogadro constant and Avogadro Number? Q4. Define the atomic mass unit. Q5. What is an ion? Give one example.

Assignment: LOTS	Q1.Name the element which is used as the reference for atomic mass? Q2. Define the term polyatomic ion? Q3. What is the difference in Avogadro constant and Avogadro Number? Q4. Define the atomic mass unit. Q5. What is an ion? Give one example.
Assignment: HOTS	SAQ Q1. State law of conservation of mass? Q2. State law of definite proportions? Q3. Which of the following are triatomic and tetra-atomic molecules? CH_3Cl, CaCl_2, NH_3, PCl_3, P_2O_5, H_2O, $\text{C}_2\text{H}_5\text{OH}$ Q4. What is the mass of 5 mole of Sodium atoms ? Atomic mass of Sodium = 23u. LAQ Q1. Describe postulates of Dalton Atomic Theory? Q 2. How many moles are present in 8g of sodium hydroxide? Q3. Write down the formula of : (i) Sodium oxide (ii) Aluminium chloride (iii) Sodium sulphide (iv) Magnesium hydroxide (v).Quick lime (vi).Baking Soda. (vii) Hydrogen bromide Q4. Write the chemical names of the following formulas: (a) K_2SO_4 (b) $\text{Mg}_3(\text{PO}_4)_2$ (c) NH_4Cl (d) ZnS (e) Na_3N (f) AgBr

PERIOD - ONE

Chapter Number and Title of Chapter	Chapter No. - 3 Title of the Chapter - Atoms And Molecules
Period Number	One (approx. 40 min each)
Learning Objectives	1. Laws of chemical combination 2. Dalton's Atomic Theory 3. Atoms
Teaching Aids / Resources	Explanation Video Experiential Learning Video PPT
Previous Knowledge/ Curiosity Questions	Q1. Name the metal which is used in thermometers? Ans- Mercury. Q 2. Name the elements which are the constituents of water? Ans- The constituents of water are Hydrogen and Oxygen. Q3. The mass of Hydrogen is 1 u and the mass of Oxygen is 16, What will be the ratio of their masses? Ans- The ratio of masses is 1:8. Q4. What will be the effect on mass of water, if it is heated? Ans- Mass of water remains same.
Announcement of topic	On finding that the students were unable to answer last two questions, the teacher would announce that the students have already studied basic concept of pure substance and element in previous classes. Today, we will begin with the Chapter -Atoms And Molecules , in which the Concepts related to atoms, molecules, ions, Atomic mass, molecular mass and mole concept will be done.

Teaching Methodology/ Strategy	Transaction would proceed in the following manner- Suggestive Methodologies: 1. Brain Storming / Curiosity Questioning- Q 1. 4 grams of hydrogen reacts with some oxygen to make 36 grams of water. Figure out how much oxygen must have been used by applying the law of conservation of mass? Ans. Mass of oxygen required =32g Q2. In a chemical reaction 150 g Baking soda mixture containing sodium bicarbonate and vinegar on heating gives 87 g of carbon dioxide gas. What mass of solid residue will left in food? Ans. 150-87=63g Q3. What is the ratio of mass of H and O in water? Ans.In water the ratio of mass of hydrogen to the mass of oxygen is always 1: 8 2. Active learning- Students get engaged in learning process, increasing understanding and memory. Explanation of the Content will be started with real life examples of elements and compounds followed by power point Presentation.Students will easily grasp the concept of laws of chemical combination And Dalton's atomic theory . 3. Group learning- It fosters discussion which is essential for understanding in science. Students will perform experiments to understand the law of conservation of mass. It develops collaboration, critical thinking and creativity skills in students. 4.Guided practice followed by Independent Practice- NCERT questions to be discussed in the classroom.
Content Obligatory Vocabulary (Keywords)	Element,compound, metal, semi metal, nonmetal atoms, molecules, conservation, chemical combination.

Learning Concepts/ Teaching Points	Laws of chemical combination. Lavoisier and Joseph L. Proust proposed laws of chemical combination 1. Law of conservation of mass. Law of conservation of mass states that mass can neither be created nor be destroyed in a chemical reaction. It states that mass of reactants is always equal to mass of products in a chemical reaction. 2. Law of constant proportions. Law of constant or definite proportions state that in a chemical substance the elements are always present in definite proportions by mass. Eg. In water the ratio of mass of hydrogen to the mass of oxygen is always 1: 8 Activity to illustrate law of conservation of mass of mass. 1. Prepare 5% solution of barium chloride and 5% solution of sodium Sulphate in water. 2. Take little amount of sodium Sulphate in a conical flask and some solution of barium chloride in an ignition tube 3. Hang the ignition tube in the flask so that the solutions does not get mixed and put a cork. 4. Weigh the flask with its contents 5. Now tilt and shake the flask to mix the contents and weigh again 6. The mass of the contents remains same before and after the mixing. This proves that mass of reactants is always equal to mass of products in a chemical reaction.
Learning Concepts/ Teaching Points	Dalton's Atomic Theory The postulates of this theory are as follows 1. Matter is made of very tiny particles called atoms. 2. Atoms are indivisible particles which can not be created or destroyed in a chemical reaction. 3. Atoms of a given element are identical in mass and chemical Properties. 4. Atoms of different elements are different in mass and chemical properties. 5. Atoms combine in whole No ratio to form compounds. 6. The ratio of number and types of atoms are fixed in a given compound. Atom. Atom is a building block of matter. It is an indivisible particle of an element.

Experiential Content	1. To illustrate law of conservation of mass.
Subject Enrichment Activities for Internal Assessment	1.To make a list of metal, nonmetal , five each?
Recapitulation :	1. State law of conservation of mass? 2. State law of definite proportions? 3. Explain the activity to illustrate law of conservation of mass?

Assignment:

1. State law of conservation of mass?

Ans. Law of conservation of mass states that mass can neither be created nor be destroyed in a chemical reaction.

2. State law of definite proportions?

Ans. Law of constant or definite proportions state that in a chemical substance the elements are always present in definite proportions by mass.

Eg. In water the ratio of mass of hydrogen to the mass of oxygen is always 1: 8.

3. Explain the activity to illustrate law of conservation of mass?

Ans.

1. Prepare 5% solution of barium chloride and 5% solution of sodium Sulphate in water.

3. Take little amount of sodium Sulphate in a conical flask and some solution of barium chloride in an ignition tube

4. Hang the ignition tube in the flask so that the solutions does not get mixed and put a cork.

5. Weigh the flask with its contents

6. Now tilt and shake the flask to mix the contents and weigh again

7. The mass of the contents remains same before and after the mixing. This proves that mass of reactants is always equal to mass of products in a chemical reaction.

4. Describe Dalton's atomic theory?

Ans. The postulates of this theory are as follows

1. Matter is made of very tiny particles called atoms.

2. Atoms are indivisible particles which can not be created or destroyed in a chemical reaction.

3. Atoms of a given element are identical in mass and chemical Properties.

4. Atoms of different elements are different in mass and chemical properties.

5. Atoms combine in whole No ratio to form compounds.

6. The ratio of number and types of atoms are fixed in a given compound.

PERIOD- TWO

Chapter Number and Title of Chapter	Chapter No. - 3 Title of the Chapter - Atoms And Molecules
Period Number	TWO (approx. 40 min each)
Learning Objectives	1. Symbols of atoms of different elements 2. Atomic mass 3. Molecule 4. Ions
Teaching Aids / Resources	Explanation Video Experiential Learning Video PPT
Previous Knowledge/ Curiosity Questions	1. State law of conservation of mass? Ans. Law of conservation of mass states that mass can neither be created nor be destroyed in a chemical reaction. 2. State law of definite proportions? Ans. Law of constant or definite proportions state that in a chemical substance the elements are always present in definite proportions by mass. Eg. In water the ratio of mass of hydrogen to the mass of oxygen is always 1: 8. 3. Explain the activity to illustrate law of conservation of mass? Ans. 1. Prepare 5% solution of barium chloride and 5% solution of sodium Sulphate in water. 2. Take little amount of sodium Sulphate in a conical flask and some solution of barium chloride in an ignition tube 3. Hang the ignition tube in the flask so that the solutions does not get mixed and put a cork. 4. Weigh the flask with its contents 5. Now tilt and shake the flask to mix the contents and weigh again 6. The mass of the contents remains same before and after the mixing. This proves that mass of reactants is always equal to mass of products in a chemical reaction. Q4. What is the atomic mass of carbon? Ans. 12 u.

Announcement of topic	On finding that the students were unable to answer last question, the teacher would announce that the students have already studied basic concept of law of chemical combinations in previous classes. Today, we will begin with the topic symbols of elements, atomic mass, molecule and ion.
Teaching Methodology/ Strategy	Transaction would proceed in the following manner- Suggestive Methodologies: 1. Brain Storming / Curiosity Questioning- It allows students generate a large number of ideas. Q1. What are symbols of Hydrogen, Sodium, Potassium? Q2. What is meant by the term molecule? Q3. What are cations? Give examples ? Q4. What are anions? Give examples? 2. Active learning- Students get engaged in learning process, increasing understanding and memory. Explanation of the Content will be started with symbols of simple elements, examples of simple molecules that fosters discussion which is essential for understanding in science. 3. Guided practice followed by Independent Practice- NCERT questions to be discussed in the classroom.
Content Obligatory Vocabulary (Keywords)	Symbols, atomic mass, molecules, atomicity, ion, polyatomic ion.

**Learning Concepts/
Teaching Points**

Symbols of atoms of different elements.

Facts-

1. Dalton was the first scientist who used symbols for elements
2. Berzelius suggested that symbols of elements should be made from one or two letters of the name of element.
3. IUPAC(International Union Of Pure And Applied Chemistry) approves the Names of the elements.
4. The first letter of a symbol is always written as upper case and second letter as lower case.

Aluminium(Al), Argon(Ar),
Barium(Ba), Boron(B),
Bromine(Br), Calcium(Ca),
Carbon(C), Chlorine(Cl) ,
Cobalt(Co), Copper(Cu),
Fluorine(Fl), Gold(Au),
Hydrogen(H), Iodine(I),
Iron(Fe),Lead(Pb),
Magnesium (Mg), Neon(Ne),
Nitrogen(N), Oxygen(O),
Potassium (K), Silicon(Si),
Silver(Ag), Sodium(Na),
Sulphur (S), Uranium(U),
Zinc(Zn).

**Learning Concepts/
Teaching Points**

Atomic Mass

One atomic mass unit is the mass which is exactly equal to $1/12$ mass of one atom of carbon-12.

Earlier the atomic mass unit was written as anu but according to IUPAC recommendations, now it is written as u(unified mass)

Activity to illustrate atomic mass-

1. A fruit seller takes a watermelon and cuts it into 12 equal pieces.
2. He finds the mass of each fruit (he is selling) relative to the mass of one piece of water melon.
3. He sells his fruits by relative fruit mass units.

Atomic masses of elements

Atomic mass of H- 1u

Atomic mass of C-12u

Atomic mass of N- 14u

Atomic mass of O- 16u

Atomic mass of Na-23u

Atomic mass of Mg- 24u

Atomic mass of S-32u

Atomic mass of C-35.5u

Atomic mass of Ca-40u

Molecule

1. A molecule is a group of two or more atoms that are chemically bonded together I.e tightly held together by attractive forces.
2. A molecule is defined as the smallest particle of an element or a compound that can exist independently and shows all the properties of substance.

	Atomicity Atomicity is the number of atoms present in one molecule . Eg. Monoatomic- Ar, He Diatomic- O₂ , H₂, N₂, Cl₂ Tetra atomicity- P₄ Polyatomic- S₂, S₈ Ion An ion is a charged particle and can be negatively or positively charged. A negatively charged ion is called an anion. A positively charged ion is called a cation. Eg. Sodium chloride(NaCl) is made up of one Na⁺ and one Cl⁻ ions. Polyatomic ions A group of atoms carrying a charge is known as a polyatomic ion Eg. OH⁻ , NH₄⁺ Valency Valency is the combining capacity of an element
Subject Enrichment Activities for Internal Assessment	To make a list of symbols of elements and atomicity of molecules?
Recapitulation :	Q. What is the atomic mass of following elements? H, C, N, O, Na, Mg, S, Cl, Ca. Ans. Atomic mass of H- 1u Atomic mass of C-12u Atomic mass of N- 14u Atomic mass of O- 16u Atomic mass of Na-23u Atomic mass of Mg- 24u Atomic mass of S-32u Atomic mass of Cl -35.5u Atomic mass of Ca-40u •

Assignment:	Q1. What is an ion? Give one example. Answer: The negatively and positively charged particles are called ions. For example: Cl^-, Br^-, SO_4^{2-} Q2. Define the term atomic mass unit? Ans. One atomic mass unit is the mass which is exactly equal to $1/12$ mass of one atom of carbon-12. Q3. What is meant by the term atomicity? Ans. Atomicity is the number of atoms present in one molecule . Q4. Which of the following are triatomic and tetra-atomic molecules? CH_3Cl, CaCl_2, NH_3, PCl_3, P_2O_5, H_2O, $\text{C}_2\text{H}_5\text{OH}$ Answer: (i) Triatomic molecules - CaCl_2, H_2O. (ii) Tetra-atomic molecules - NH_3, PCl_3.
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PERIOD- THREE

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Chapter Number and Title of Chapter	Chapter No. - 3 Title of the Chapter - Atoms And Molecules
Period Number	THREE (approx. 40 min each)
Learning Objectives	1. Chemical formulae 2. Molecular mass 3. Mole concept 4. Formula unit mass
Teaching Aids / Resources	Explanation Video Experiential Learning Video PPT

Previous Knowledge/ Curiosity Questions	Q1. What is an ion? Give one example. Answer: The negatively and positively charged particles are called ions. For example: Cl^-, Br^-, SO_4^{2-} Q2. Define the term atomic mass unit? Ans. One atomic mass unit is the mass which is exactly equal to $1/12$ mass of one atom of carbon-12. Q3. What is meant by the term atomicity? Ans. Atomicity is the number of atoms present in one molecule . Q4. Which of the following are triatomic and tetra-atomic molecules? CH_3Cl, CaCl_2, NH_3, PCl_3, P_2O_5, H_2O, $\text{C}_2\text{H}_5\text{OH}$ Answer: (i) Triatomic molecules - CaCl_2, H_2O. (ii) Tetra-atomic molecules - NH_3, PCl_3.
Announcement of topic	On finding that the students were unable to answer last question, the teacher would announce that the students have already studied basic concept of symbols of elements and molecules in previous classes. Today, we will begin with the topic related to molecular formula, molecular mass and mole concept.

Teaching Methodology / Strategy	Transaction would proceed in the following manner- Suggestive Methodologies: 1. Brain Storming / Curiosity Questioning- Q. Write down the formula of : (i) Sodium oxide (ii) Aluminium chloride (iii) Sodium sulphide (iv) Magnesium hydroxide (v) Quick lime (vi) Baking Soda. (vii) Hydrogen bromide Ans. (i) Sodium oxide - Na_2O (ii) Aluminium chloride - AlCl_3 (iii) Sodium sulphide - Na_2S (iv) Magnesium hydroxide - $\text{Mg}(\text{OH})_2$ v) Quick lime - CaO (vi) Baking Soda. - NaHCO_3 (vii) Hydrogen bromide - HBr 2. Active learning- Students get engaged in learning process, increasing understanding and memory. Explanation of the Content will be started with the molecular formulas of common chemical compounds followed by power point Presentation. Students will easily grasp the molecular formula, molecular mass and mole concept. 3. Group learning- It fosters discussion which is essential for understanding in science. Students will be asked to calculate moles, molar mass of given substances in collaboration. 4. Guided practice followed by Independent Practice- NCERT questions to be discussed in the classroom.
Content Obligatory Vocabulary (Keywords)	Valence, molecular formula, mole, molar mass, Avogadro number.

Learning Concepts/ Teaching Points Continues.	Rules for Writing chemical formulae 1. The Valencies or charges on the ion must be balanced 2. When a compound consists of a metal and a non metal, the symbol of the metal is written first Eg. Calcium, Sodium, Iron, Copper etc. Non metals are written on the right Eg. Oxygen, Chlorine, Sulphur etc. 3. In the compounds having poly atomic ions, the ion is enclosed in a bracket before writing the no indicating its ratio Molecular mass Molecular mass of a substance is the sum of the atomic masses of all the atoms in a molecule of the substance It is the relative mass of a molecule expressed in atomic mass unit(u). Formula unit mass Formula unit mass of a substance is the sum of the atomic masses of all the atoms in a formula unit of the substance It is the relative mass of a formula unit expressed in atomic mass unit(u). Mole Concept One mole of atoms = 6.022×10^{23} atoms = atomic mass in g. One mole of molecules = 6.022×10^{23} molecules = molecular mass in g. 6.022×10^{23} particles constitute one mole. 6.022×10^{23} is called the avogadro constant or avogadro number(N_0).
Subject Enrichment Activities for Internal Assessment	Students will be asked to solve numericals.

Recapitulation :	Q 1. How many moles are present in 8g of sodium hydroxide? Answer: Gram molar mass of NaOH = 23 + 16 + 1 = 40 g 40 g of NaOH = 1 mole 1 g „ „ „ =. 1/40 8g. „ „ „ =. 1X 8/40. = 1/5. = 0.2 mole. Q2. Write down the formula of : (i) Sodium oxide (ii) Aluminium chloride (iii) Sodium sulphide (iv) Magnesium hydroxide (v).Quick lime (vi).Baking Soda. (vii) Hydrogen bromide Ans. (i) Sodium oxide - Na₂ O (ii) Aluminium chloride - Al Cl₃ (iii) Sodium sulphide - Na₂ S (iv) Magnesium hydroxide - Mg (OH)₂ v).Quick lime - CaO (vi).Baking Soda. - Na HCO₃ (vii) Hydrogen bromide - HBr Q3. Write the chemical names of the following formulas: (a) K₂SO₄ (b) Mg₃(PO₄)₂ (c) NH₄.Cl (d) ZnS (e) Na₃ N (f) Ag Br Ans. (a) Potassium sulphate (b) Magnesium phosphate, (c) Ammonium chloride, (d) Zinc sulphide, (e) Sodium nitride. (f) Silver bromide.
Assignment:	Solve the NCERT intext numericals to calculate moles and molar masses in different substances?

FOCUS SPOT

CHAPTER	Chapter No. - 3 Title of the Chapter - Atoms And Molecules
TOPIC/CONCEPT	Mole concept.
FOCUS SPOT	Molecular mass and molar mass
WHY	Students find difficult to understand the difference in molecular mass and molar mass.
IMPACT	1.Students will not be able to calculate the numericals of molar mass with the help of molecular mass. 2.Students may get confused between the mass of a molecule and mass of a mole.

EXPERIENTIAL LEARNING ACTIVITY- 1

CHAPTER	Chapter No. - 3 Title of the Chapter - Atoms And Molecules.
TOPIC/CONCEPT	Activity to illustrate law of conservation of mass of mass.
NAME OF THE ACTIVITY	Reaction between Barium Chloride and Sodium Sulphate.
TYPE OF ACTIVITY	Group Activity
LEARNING OUTCOME	Mass can neither be created nor be destroyed in a chemical reaction.
PROCEDURE/ METHODOLOGY	1. Prepare 5% solution of barium chloride and 5% solution of sodium Sulphate in water. 2. Take little amount of sodium Sulphate in a conical flask and some solution of barium chloride in an ignition tube 3. Hang the ignition tube in the flask so that the solutions does not get mixed and put a cork. 4. Weigh the flask with its contents 5. Now tilt and shake the flask to mix the contents and weigh again 6. The mass of the contents remains same before and after the mixing. This proves that mass of reactants is always equal to mass of products in a chemical reaction.
QUESTIONS	State law of conservation of mass?
SOLUTIONS/ HINTS	Mass can neither be created nor be destroyed in a chemical reaction.

EXPERIENTIAL LEARNING ACTIVITY- 2

CHAPTER	Chapter No. - 3 Title of the Chapter - Atoms And Molecules
TOPIC/CONCEPT	Activity to illustrate atomic mass.
NAME OF THE ACTIVITY	Watermelon Activity.
TYPE OF ACTIVITY	Group Activity
LEARNING OUTCOME	One atomic mass unit is the mass which is exactly equal to $1/12$ mass of one atom of carbon-12.
PROCEDURE/ METHODOLOGY	1. A fruit seller takes a watermelon and cuts it into 12 equal pieces. 2. He finds the mass of each fruit (he is selling) relative to the mass of one piece of water melon. 3. He sells his fruits by relative fruit mass units.
QUESTIONS	Define the term Atomic mass unit?
SOLUTIONS/ HINTS	One atomic mass unit is the mass which is exactly equal to $1/12$ mass of one atom of carbon-12.

