

1. Introduction to Chemistry

Worksheet

A. State whether the following statements are true or false.

1. Chemistry helps us understand the world in a better way and answer questions about how things work.
2. Alchemists were the first ones to learn the process of isolating iron and phosphorus.
3. John Dalton is credited for proposing the periodic table.
4. Benzene hexachloride is an insecticide.
5. Cosmetics are combination of various chemical ingredients.

B. Choose the correct answer.

1. Which of the following is not a contribution of J.J. Thomson?
 - (a) Discovery of electron
 - (b) Proposed plum pudding model
 - (c) Electrons are embedded in a cloud of protons
 - (d) Protons and neutrons lie in the nucleus
2. Which of the following is an emollient?
 - (a) Skin softener
 - (b) Hair gel
 - (c) Lipsticks
 - (d) Shampoo
3. Which preservative is used for dairy products?
 - (a) Sodium benzoate
 - (b) Ethylene oxide
 - (c) Sorbic acid and its sodium and potassium salts
 - (d) Benzoic acid
4. What was the contribution of C.N.R. Rao in the field of chemistry?
 - (a) Founded India's first pharmaceutical company
 - (b) Contributed mainly in solid-state and structural chemistry
 - (c) Structure and function of ribosomes
 - (d) Development of mercury compounds
5. Who discovered the role of oxygen in combustion?
 - (a) Dmitri Ivanovich Mendeleev
 - (b) Joseph Priestley
 - (c) Daniel Rutherford
 - (d) Antoine-Laurent de Lavoisier

C. Match the columns.

Column A

1. Discovery of nitrogen
2. Henry Cavendish
3. Discovery of oxygen
4. Discovery of radium
5. P. C. Ray

Column B

- (a) Founded India's first pharmaceutical company
- (b) Marie Curie
- (c) Discovery of hydrogen
- (d) Joseph Priestley
- (e) Daniel Rutherford

D. Fill in the blanks.

1. The two branches of science are further divided into _____, _____ and _____.
2. Alchemy was an early _____ and _____ field of study that integrated chemistry with metalwork.
3. Mendeleev used the table to predict the _____ and _____ of new chemical elements.
4. Niels Henrik David Bohr proposed that energy levels of _____ are discrete and electrons revolve in orbits around the _____ of an atom.
5. _____ discovered the concept of radioactive half-life.

E. Answer the following questions.

1. How has chemistry helped to produce disease-free crops and increase crop yield?
2. Discuss the contributions of the following scientists in the field of chemistry.
(a) Antoine-Laurent de Lavoisier (b) Dmitri Ivanovich Mendeleev
(c) J.J. Thomson (d) Ernest Rutherford
(e) Niels Henrik David Bohr
3. Define preservatives. Enlist a few of them with their usage.
4. Chemistry in the textile industry involves the knowledge of both natural and synthetic fibres. Comment.
5. Chemistry has contributed to the development of different industries thus resulting in increased efficiency of various industrial processes. Justify the statement with the help of a few examples.

Answers to Worksheet

- A. 1. True 2. False 3. False 4. True 5. True
- B. 1. (d) 2. (a) 3. (c) 4. (b) 5. (d)
- C. 1. (e) 2. (c) 3. (d) 4. (b) 5. (a)
- D. 1. physics, chemistry, biology
2. philosophical, spiritual
3. existence, properties
4. electrons, nucleus
5. Ernest Rutherford
- E. 1. Increase in population has led to increased demand for food. This has been taken care of with the help of chemistry. Development and application of new techniques has increased crop yield and provided ways to produce disease-free crop.
- Fertilisers: They are chemicals which provide nutrients required by crops for a proper growth. The use of fertilisers also increases the yield. Urea, sodium nitrate, potassium and ammonium phosphate are some examples of fertilisers.
 - Pesticides: They are used by farmers to kill pests affecting crop production and growth of fruits. Aldrin, malathion and parathion are some major pesticides used on crops and fruits against pests.
 - Insecticides: They are the chemicals used to kill insects that affect the growth of crops. Some examples of insecticides are benzene hexachloride (BHC), dichlorodiphenyltrichloroethane (DDT) and carbaryl.
 - Fungicides: They are chemicals that prevent crops from being affected by fungi. Sulphur, calcium polysulphide and ethylene oxide are some examples of fungicides.
 - Preservatives: They are chemicals used to preserve food and control its wastage.
 - Sodium benzoate is used to preserve food items such as fruit products, beverages and salads.
 - Sugar, salt and vinegar are often used as preservatives. Sugar and salt help in preventing the growth of bacteria in food items.
 - Sorbic acid, and its sodium and potassium salts are used for preservation of food items such as dairy products, fish and seafood, fruit and vegetable products, fat-based products, baked foods and cookies.
 - Some other food preservatives used are sodium metabisulphite, salicylic acid, benzoic acid and propionic acid.
2. (a) Antoine-Laurent de Lavoisier (also Antoine Lavoisier) is considered the 'Father of Modern Chemistry'. Lavoisier is credited for discovering the role of oxygen in combustion. He also gave the 'Law of Conservation of Mass' that states that mass is neither created nor destroyed in a chemical reaction. Lavoisier also named oxygen and hydrogen.
- (b) Dmitri Ivanovich Mendeleev was the first scientist who formulated the 'Modern Periodic Table of Elements'. Mendeleev used the table to predict the existence and properties of new chemical elements.

- (c) J.J. Thomson discovered the electron and proposed the 'Plum Pudding Model', according to which electrons are embedded in a cloud of protons. The model represents that electrons are surrounded by positive charges in order to balance negative charges. Thomson helped us to have a better understanding of the atom and its structure.
- (d) Ernest Rutherford performed the famous 'gold foil experiment'. He proposed that protons and neutrons lie at the centre of an atom in the nucleus, and are surrounded by electrons. He also discovered the concept of radioactive half-life.
- (e) Niels Henrik David Bohr developed the 'Bohr model of an atom' or 'Bohr atomic model'. He proposed that energy levels of electrons are discrete and electrons revolve in orbits around the nucleus of an atom.
3. Preservatives are the chemicals used to preserve food and control its wastage.
- Sodium benzoate is used to preserve food items such as fruit products, beverages and salads.
 - Sugar, salt and vinegar are often used as preservatives. Sugar and salt help in preventing the growth of bacteria in food items.
 - Sorbic acid, and its sodium and potassium salts are used for preservation of food items such as dairy products, fish and seafood, fruit and vegetable products, fat-based products, baked foods and cookies.
 - Some other food preservatives used are sodium metabisulphite, salicylic acid, benzoic acid and propionic acid.
4. Chemistry in the textile industry involves the knowledge of both natural and synthetic fibres. Cotton, jute, wool and silk are some natural fibres that were used earlier to produce various types of dresses, sarees, bags, shawls, pullovers and other items. With the development in this field, synthetic fibres such as nylon and terylene were also used to manufacture clothes. These fibres are strong, wrinkle-resistant and they dry quickly. These fibres are used to make dress materials, bed sheets, carpets, bags, blankets, towels, curtains and many other items.
5. Chemistry has contributed to the development of different industries thus resulting in increased efficiency of various industrial processes. This in turn has led to the production of many useful materials such as plastics, alloys, synthetic rubber, synthetic fibres and textiles.

Chemicals are used to make different products in various industries thus playing an important role in our daily lives. Industries manufacture various products such as dyes, plastics, fertilisers, detergents, drugs, paints, textiles, stain removals, paper, and glass, cleansing agents – soaps and detergents, and synthetic fibres. These products have various beneficial uses. Preparation of common salt from sea water, extraction of sugar from cane sugar juice, extraction of metals, preparation of alloys and development of drugs is possible because of the application of various chemical processes. The chemical industry is the most important industry and is very diverse; it produces a huge variety of products that are used by other industries.

2. Elements, Compounds and Mixtures

Worksheet

A. Fill in the blanks.

1. We can classify matter on the basis of some _____ and _____ in their composition.
2. _____ substances are of two types—elements and compounds.
3. There are 118 known _____.
4. Xenon is a non-metal in _____ state.
5. A symbol represents _____ atom of an element.

B. State whether the following statements are true or false.

1. Water and oil are both liquids but they differ from each other.
2. An atom of sodium can exist freely but an atom of hydrogen cannot exist independently.
3. Elements combine to form compounds.
4. Majority of known elements are non-metals.
5. Arsenic conducts heat and electricity better than sulphur but not as well as zinc.

C. Complete the following table.

Element	Latin name (if any)	Symbol	Metal/non-metal/metalloid
Sodium	_____	_____	Metal
_____	Kalium	K	_____
Silicon	-	_____	Non-metal
_____	Aurum	_____	_____
_____	-	S	_____

D. Choose the correct answer.

1. Which of the following is mainly found in the crust, atmosphere and oceans of the earth?
(a) Phosphorus (b) Argon
(c) Aluminium (d) Calcium
2. Which of the following is not true for N_2 ?
(a) The atoms are held by chemical bonds.
(b) The atoms are combined in a fixed whole ratio.
(c) The properties of N atom are different from N_2 .
(d) N_2 is a molecule.
3. Which of the following combines in a fixed ration of 1:2?
(a) Magnesium oxide (b) Calcium chloride
(c) Water (d) Ammonia

Answers to Worksheet

- A.
1. similarities and dissimilarities
 2. Pure
 3. elements
 4. gaseous
 5. one

- B.
1. True
 2. True
 3. True
 4. False
 5. True

C.

Element	Latin name (if any)	Symbol	Metal/non-metal/metalloid
Sodium	Natrium	Na	Metal
Potassium	Kalium	K	Metal
Silicon	-	Si	Non-metal
Gold	Aurum	Au	Metal
Sulphur	-	S	Non-metal

- D.
1. (a)
 2. (c)
 3. (b)
 4. (d)
 5. (a)

E.

1. Element is a pure substance as it has atoms of only one kind.
2. (a) Sieving: A sieve consists of a mesh placed over a frame. Sieving helps to separate components of a mixture that differ in size. While sieving, the fine particles pass through the sieve whereas the coarse particles are left behind on the sieve. Depending on the size and type of the components to be separated, sieves with different size of holes are used. For example, the sieve used at a construction site has larger holes in the mesh because it is used to separate stones and pebbles from sand.
(b) Filtration: This method is used to separate an insoluble solid and a liquid. In this process, the mixture to be separated is passed through a filter paper. The filter paper has tiny pores that allow only the liquid to pass through it and the insoluble solid particles remain on the filter paper. The insoluble solid left behind on the filter paper is called residue and the clear liquid that passes through the filter paper is called filtrate.

- (c) **Evaporation:** Evaporation is a process by which a liquid is converted into its vapour state. This method is employed to separate a soluble solid component from a liquid. In this method, the mixture is heated. As a result, the liquid component evaporates, leaving the solid component behind. This method is used to separate homogeneous solid-liquid mixtures like extracting salt from sea water. Sea water is collected in shallow beds and is allowed to evaporate under the heat of the sun. In a few days, the water gets evaporated and salt is left behind which is purified before use.
- (d) **Magnetic separation:** Magnetic separation is used when one of the components of a mixture is a magnetic substance, i.e., it can be attracted by a magnet. In a mixture of iron and sulphur, iron is separated by rolling a magnet over the mixture. In this way iron gets attracted towards the magnet and is separated from the mixture.
- (e) **Sedimentation and decantation:** When a mixture of insoluble substance and water is kept undisturbed for some time, then the suspended insoluble particles settle down at the bottom under the influence of gravity. This process is called sedimentation. The insoluble solid substance that settles down is called sediment and the clear liquid over the sediment is called supernatant liquid. The clear liquid is then poured into another beaker, leaving the sediments undisturbed. This process is called decantation. Sedimentation and decantation are used to separate a mixture of a solid and a liquid where the solid component is heavier than the liquid component, and is insoluble, for example, a mixture of sand and water.

3. Characteristics of an atom are as follows.

- The atoms are very reactive and therefore exist in combination with the atoms of same element or other elements. For example, hydrogen atoms are found in combination with atoms of hydrogen or other elements. Noble gases, on the other hand, exist independently.
- The atoms of an element are identical and exhibit same properties.
- The atoms of an element differ from those of other elements.
- The properties of an atom are maintained through all physical and chemical changes. For example, a piece of iron when broken down into smaller pieces will retain its property of being attracted towards a magnet.

Characteristics of a molecule are as follows.

- The atoms of same element or different elements combine to form molecules. When two or more atoms of the same element combine they form the molecule of an element. When atoms of two or more elements combine they form the molecule of a compound.
- The atoms of different elements are combined in a fixed whole number ratio in a molecule.
- The atoms in a molecule are held together by chemical bonds. A chemical bond refers to the force of attraction between atoms that enables the formation of chemical compounds.

4.

Mixtures	Compounds
A mixture is an impure substance.	A compound is a pure substance.
In case of mixtures, the constituents can be present in any ratio.	In case of compounds, the constituents are present in a fixed ratio.
There is no change in energy during the formation of a mixture.	The energy is absorbed or released during the formation of a compound.
The components of a mixture can be separated by physical methods.	The components of a compound can be separated by chemical processes.
The constituents of a mixture retain their properties.	The properties of a compound are entirely different from its constituents.
A mixture does not have a fixed melting or boiling point.	A compound has fixed melting and boiling points.

5.

Water	Air
Water has a homogeneous composition, i.e., the components of water—hydrogen and oxygen are combined in a fixed ratio of 1:8 by mass.	Air contains a number of gases like nitrogen, oxygen, carbon dioxide, water vapour, etc. which retain their individual properties.
The chemical composition of water remains the same, irrespective of the source from where it is obtained.	The composition of air varies from place to place. At high altitudes, the amount of oxygen is less. Near industrial complexes, the concentration of carbon monoxide is high.
The properties of water are totally different from the properties of its constituent elements, i.e., oxygen and hydrogen.	The constituents of air retain their individual properties.
Energy change takes place during the formation of water.	There is no change in energy when constituents of air are mixed together.

D. Name the following.

1. Intermingling of particles of different substances on their own _____
2. intermolecular forces between molecules of the same substance. _____
3. Zig-zag movement of small particles _____
4. Two substances that sublime _____
5. A chemical change _____

E. Answer the following questions.

1. Are mass and weight same? Justify.
2. With the help of an activity, show that liquids contract on cooling.
3. How does a solid change into gas?
4. How does the state of matter change?
5. Define the following terms.
 - (a) Melting
 - (b) Freezing
 - (c) Boiling

