Introduction to Chemistry

Exercise

Question 1.
State what is Science and give the basic bifurcation of Science with reasons.
Answer:
Science is the subject which includes the study of various experiments performed by a scientist with all observations recorded and inferences concluded.
Bifurcation : Science is bifurcated into three main branches— Physics, Chemistry and Biology which make study of each branch simple and more focussed.

Question 2.
Give the basic difference between Inorganic Chemistry and Organic Chemistry.
Answer:
(a) Inorganic chemistry includes study of innumerable elements and compounds

Including	Metals	Non metals
• Elements	include	Sulphur, Phosphorus, Sodium, Potassium
• Gases	include	SO_2, CO_2, N
• Acids	include	HCl, H_2SO_4, HNO_3

(b) Organic chemistry includes study of specific carbon compounds built up mainly of carbon and hydrogen.

- Compounds include hydrocarbons e.g., Methane
- Acids include-acetic acid

Question 3.
State the functions of the following basic glass apparatus.

(a) Glass test tube
(b) Hard glass boiling tube
(c) Beaker

(d) Round bottom flask
(e) Retort

Answer:

(a) Glass test tube : It is used for heating chemicals and studying reactions in chemicals solution.
(b) Hard glass, boiling tube : It is resistant to chemicals and used for special purposes. It is made of pyrex.
(c) Beaker : It is used for holding pouring and mixing solutions.
(d) Round bottom flask : In preparation of gases, where heating is required. Since the flask is round bottomed, heat is uniformly distributed throughout on heating.
(e) Retort : For carrying out distillation experiments which include distillation of acids.

Question 4.
State why a round bottom flask is preferred to a flat bottom flask – during preparation of gases in the laboratory.
Answer:
Round bottom flask is preferred to flat bottom flask because in round bottom flask heat is uniformly distributed throughout on heating.

Question 5.
State the function of –

(a) The wooden handle at the end of the test tube holder.
(b) The asbestos fixed at the centre of the wire gauze.
(c) The clamp mounted on the rod of a retort stand.
(d) The air regulator in a Bunsen burner.
(e) The tap at the base of a burette.

Answer:

(a) The wooden handle at the end of test tube being a poor conductor of heat, makes holding the test tube holder easy.
(b) The asbestos fixed at the centre of the wire gauze initiates even distribution of heat to the bottom of the apparatus. It also prevents glass apparatus from cracking.
(c) The clamp mounted on the rod of a retort stand helps in holding the apparatus and adjusting its level upwards or downwards.
(d) The air regulator has holes and is used for regulating the flame.
(e) The tap at the base of the burette helps in removing the measured liquid drop wise.

Question 6.
State the method used for collecting the following gases –

(a) Oxygen – a gas slightly soluble in water.
(b) Ammonia – a gas highly soluble in water and lighter than air.
(c) Sulphur dioxide – a gas highly soluble in water and heavier than air.

Answer:

(a) The method used for collecting oxygen gas is downward displacement of water.
In this method, the gas jar is filled with water and inverted over the beehive shelf, so that the water is displaced downwards and oxygen is collected upwards.
(b) The method used for collecting ammonia gas is downward displacement of air.
This method is used for gases like ammonia which is soluble in water and lighter than air.
(c) The method used for collecting SO_2 is upward displacement of air.
This method is used for gases like SO_2 which is soluble in water and heavier than air.

Question 7.
Explain in brief the importance of Chemistry in agriculture and production of various products.
Answer:
Importance of Chemistry : In agriculture end products and as follow :
1. AGRICULTURE
(a) Fertilizers – A substance to improve fertility and supply of nutrients to plant and is essential for growth.
Example :

1. Ammonium nitrate – widely used as a fertilizer.
2. Urea – an important source of nitrogen [non-explosive and solid in nature]
3. Phosphatic fertilizer – super phosphates.

About 90% of fertilizers are in the solid form. Liquid fertilizers comprise – aqueous solutions of amnionia or ammonium nitrate.

(b) Pesticides

1. Chemicals added to the soil, to kill pests. They include – Herbicides; insecticides; termiticides etc.

2. Pesticides protect the plants from – weeds, fungi and insects.
3. About 30% of crops are destroyed by agricultural pests.

(a) Herbicides – Kill or inhibit growth of – unwanted plants.
(b) Insecticides – Destroy insects, which harm or destroy plants.

Pesticides may come in contact with other living organisms and disrupt the balance of the eco-system.

2. PRODUCTS

Knowledge of Chemistry has initiated production of – different products

1. **Food –** Refined oils, butter, cheese, etc. are obtained through chemical reactions.
2. **Construction –** Mortar, cement, glass, etc. are various chemical compounds.
3. **Clothing –** Natural fabrics such as silk are made through chemical reactions.
4. **Household –** Cooking gas which is liquefied petroleum gas or LPG, food preservatives, specific utensils and electronic items, all involve use of Chemistry.
5. **Daily usage –** Paints, dyes, perfumes, paper, ink etc. involve chemical reactions.
6. **Industrial –** Metals & alloys [mixture of metals] which find application in innumerable machines and metallic structures like automobiles, involve Chemistry.
7. **Petrolium –** Petrol, kerosene & diesel oil are products – obtained from petroleum

Question 8.
'Alchemists are older words for Chemists'. Discuss the statement in brief.
Answer:
Alchemy and alchemists are older words for Chemistry and chemists where – alchemists transformed or created substances through a seemingly – magical process.
An alchemists Nicolas flamel claimed to transform metals into gold.

Question 9.
In the medieval ages – philosopher's stone was connected with all transformations. Explain.
Answer:
In the medievel ages to the 17th Century the so-called philosopher's stone – held priority and alchemists were successful to a certain extent, in the

development of processes, which helped later chemists to extract metals and develop – path-breaking avenues in Chemistry. The scientific process involving modern chemistry started poving paths and chemistry regains its rightful position. The Scientific Process involving Modern Chemistry started paving paths & chemistry regains its rightful position.

Question 10.
State the contributions of

(a) Dimitri Mendeleev
(b) Antoine Lavoisier
(c) John Dalton – towards the development of Chemistry.

Answer:
(a) Dimitri Mendeleev : He formulated the – Periodic Table of elements.

1. He systematically arranged the dozens of known element by atomic weights and could even predict the properties of the still unknown elements.
2. He devised the Periodic Table. He was best known for his discovery of the – Periodic Law.

(b) Antoine Lavoisier :

1. He recognised and named oxygen in 1778 & later – hydrogen in 1783.
2. He also wrote the first extensive list of elements and helped to reform chemical nomenclature.
3. In 1774, he turned his attention to the phenomenon of combustion with his famous experiment, in which he heated pure mercury in a swan necked retort, leading to the discovery of oxygen.

(c) John Dalton :

1. He compiled his theory in 1803 known as Dalton's atomic theory.
2. The main postulates of Dalton's atomic theory are that "Matter consists of particles called atoms, which are indivisible and cannot be created or destroyed."
3. The theory was later contradicted in certain aspects by the Modem atomic theory.

Question 11.
Differentiate between the terms – food preservatives and food processing with appropriate examples.
Answer:

Food preservatives – are substances or chemicals – added to food or beverages to

1. Prevent decomposition by bacteria or microbes.
2. Reduce risk of food borne infections.
3. Preserve nutritional quality of food.

Preservatives :

1. Benzoic acid
2. Nitrates
3. Sulphur compounds

Food items :

1. Jams, pickles, carbonated drinks.
2. Meat products
3. Beverages, wines etc.

Question 12.
Explain the term 'cosmetics' & 'talc'. Name a few main ingredients in cosmetics the role they play.
Answer:
Cosmetics are mixtures of chemical compounds from natural sources or from synthetic sources.
Cosmetics – enhance or alter the appearance or fragrance of an individual. Some sources of compounds used in cosmetics include – modified natural oils and fats, processed minerals e.g. – zinc oxide, iron oxide and talc.
Talc :

1. Talcum powder is made from talc – a mineral made up of – hydrated magnesium silicate, (contains elements – magnesium silicon, oxygen).
2. In its natural form – talc contains asbestos – which is removed from consumer products.
3. Talc – absorbs moisture, cuts down on friction, keeps skin dry and prevents rashes.

Question 13.
Differentiate between – natural fibres & synthetic fibres. State what is – Terylene. State some of its characteristic properties which make it suitable for commercial use.
Answer:
Natural fibres – such as cotton and wool which were directly converted into clothing material.

Synthetic fibres – such as terylene, nylon and rayon are used in expensive clothing ; carpets etc.
Terylene – It is a synthetic polyester fibre or fabric formed generally, by – addition of polyester to natural fibre – cotton. The combination makes the fabric, easy to clean and crease resistant.,

Properties – It is a strong fabric –

(a) elastic in nature, resistant to friction,
(b) suffers little loss in strength,
(c) crease resistant,
(d) easily washable and dries quickly.

Uses –

(a) in fashion garment fabrics
(b) in nonwoven carpets, rain coats, sails
(c) in making of nets, ropes, hoses etc.

Question 14.

Explain how medicines are a boon to mankind. State the positive & negative effects of medicines like aspirin and paracetamol.

Answer:

Medicines are natural or synthetic substances which when taken in a living body, affects its functioning, and treats or prevents a disease.
Aspirin

Positive effect :

1. It is a medicine to treat pain, fever and inflammation.
2. Aspirin given shortly after a heart attack, may decrease risk of death.
3. As long term use it may reduce, blood clots in people who are at a high risk.

Negative effect :

1. It is generally not recommended in children with infections.
2. Its side effects may include upset stomach, stomach ulcers etc.

Paracetamol :

1. It is a medicine to treat mild to moderate pain and fever.
2. It may also be used in low back pain, headaches and for dental use.

Negative effect :

1. It maybe sold in combination with cold medications.
2. It is safe at recommended doses, but too high a dose may result in liver problems.

Question 15.
Give a comparitive difference between – soaps and detergents. Give a reason why detergents have an advantage over soap.

Answer:

Soaps are substances used with water, for cleaning and washing and are made from a compound of vegetable oils or animal fats along, with sodium or potassium hydroxide and generally have perfumes or colourants, added to it.

Whereas

Detergents are synthetic water soluble cleaning agents that unlike soap (which are prepared from vegetable oils or fats) are prepared from petroleum products along with sodium or potassium hydroxide.

Detergents have an advantage over ordinary soap

1. Hard water is one which does not lather with soap, while soft water lathers easily.
2. Ordinary soap when rubbed in hard water is wasted and lather forms only after all the insoluble salts in hard water are removed as scum.
3. Synthetic detergents do not form scum and lather even in hard water.

Question 16.
State what are – 'stain removals'. Name three important stain removers & give their prime functions.

Answer:

Stain removals It is the process of removing a mark or a stain left by one substance on a specific surface fabric. Most stains are removed by dissolving with a solvent.

Examples of stain removers

Substance		Stain
Lemon juice	-	contains citric acid and is used for removing stains from fabrics.
Hydrogen peroxide	-	a mild bleaching agent also effective in removing stains.
Glycerine	-	it softens stains on wool.

Objective Type Questions

Q.1. Select the correct name from the choice A, B or C in each case.

Question 1.
The branch of Science which deals with the different forms of energy e.g. light and sound.
A : Chemistry
B : Physics
C : Biology
Answer:
B : Physics

Question 2.
The branch of Chemistry which includes study of specific carbon compounds – built up of mainly carbon and hydrogen.
A : Inorganic Chemistry
B : Physical Chemistry
C : Organic Chemistry
Answer:
C : Organic Chemistry

Question 3.
The scientist who formulated the Periodic Table.
A : John Dalton
B : Daniel Rutherford
C : Demitri Mendeleev
Answer:
C : Demitri Mendeleev

Question 4.
Predecessors to the modern Chemist who created the Philosoper's stone'.
A : Botanists
B : Alchemists
C : Physicists
Answer:
B : Alchemists

Question 5.
A synthetic fibre used in clothing.
A : Cotton
B : Jute
C : Terylene
Answer:
C : Terylene

Question 6.
A medicine to treat pain, fever & inflammation.
A : Anaesthetic
B : Aspirin
C : Antacid
Answer:
B : Aspirin

Question 7.
A water soluble cleaning agent – not inactivated by hard water.
A : Soap
B : Detergent
C : Cleanser
Answer:
B : Detergent

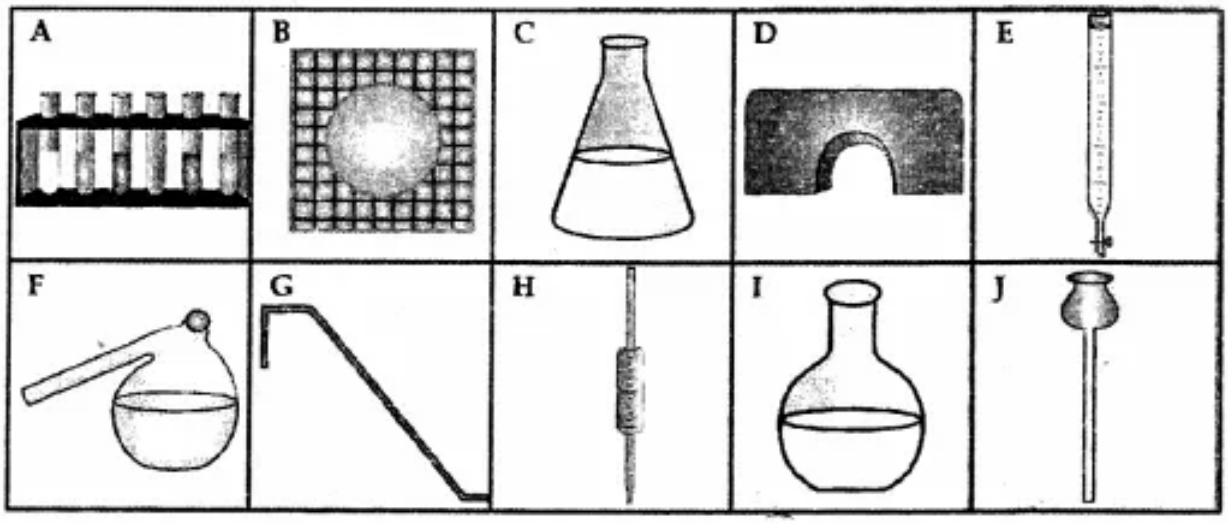
Question 8.
A substance which absorbs moisture and keeps the skin dry and free from rashes.
A : Talc
B : Preservative
C : Emulsifier
Answer:
A : Talc

Question 9.
A chemical used as a preservative for jams, pickles etc.
A : Titanium dioxide

B : Rayon
C : Benzoic acid
Answer:
C : Benzoic acid

Question 10.
A substance which dissolves grease & oil and is preferred as a – drain cleaner.
A : Glycerine
B : Sodium hydroxide
C : Hydrogen peroxide
Answer:
B : Sodium hydroxide

Q.2. Match the apparatus A to J shown below with their correct names 1 to 10 given below :



1. Delivery Tube **2. Pipette**
3. Wire gauze **4. Bee-hive shelf**
5. Thistle funnel **6. Flat bottom flask**
7. Test tube stand **8. Burette**
9. Retort **10. Conical flask**

Answer:

1. Delivery Tube — G	2. Pipette — H
3. Wire gauze — B	4. Bee-hive shelf — D
5. Thistle funnel — J	6. Flat bottom flask — I
7. Test tube stand — A	8. Burette — E
9. Retort — F	10. Conical flask — C

Q.3. Select the correct apparatus from A, B or C for each of the functions of the apparatus given.

Question 1.
For gas preparations where heating is required.

(A) Flat bottom flask
(B) Retort
(C) Round bottom flask

Answer:
(C) Round bottom flask

Question 2.
For holding washed test tubes.

(A) Test tube holder
(B) Test tube stand
(C) Retort stand

Answer:
(B) Test tube stand

Question 3.
A glass apparatus resistant to chemicals, made of pyrex and used for heating specific liquids.

(A) Beaker
(B) Retort
(C) Boiling Tube

Answer:
(C) Boiling Tube

Question 4.
A metallic apparatus which supports the wire gauze.

(A) A Tripod stand
(B) Retort stand
(C) Test tube stand

Answer:
(A) A Tripod stand

Question 5.
A long glass apparatus closed at one end used for collecting gases.

(A) Measuring cylinder
(B) Gas jar
(C) Beehive shelf

Answer:
(B) Gas jar

Question 6.
A glass apparatus which measures liquid by sucking the liquid at one end upto the marked level and later pouring it out.

(A) Burette
(B) Measuring cylinder
(C) Pipette

Answer:
(C) Pipette

Question 7.
A long glass tube with a broad inlet at the top, which allows entry of the reactants into the round bottom flask, during laboratory preparations of gases.

(A) Thistle funnel
(B) Delivery tube
(C) Funnel.

Answer:
(A) Thistle funnel

Question 8.
A clay vessel kept in a trough of water during collection of a gas by downward displacement of water.

(A) Retort
(B) Beehive shelf
(C) Burette

Answer:
(B) Beehive shelf

Question 9.
A modern apparatus with an air regulator, used for heating purposes.

(A) Spirit lamp
(B) Bunsen burner
(C) Electric stove

Answer:
(B) Bunsen burner

Question 10.
A rectangular mesh with an asbestos at its centre, kept for initiating even distribution of heat to the bottom of the apparatus.

(A) Tripod stand
(B) Wire gauze
(C) Retort stand

Answer:
(B) Wire gauze

Q4. Give reasons for the following :

Question 1.
Alchemy was considered a pseudoscience.
Answer:
Towards the end of the 17th Century the scientific processes involving modem Chemistry started paving paths and Alchemy today is considered a pseudoscience and Chemistry regains its rightful position as a serious scientific field.

Question 2.
Preservatives are added to food or beverages.
Answer:
Preservatives are added to food or beverages because of following reasons :

1. Prevent decomposition by bacteria or microbes.

2. Reduce risk of food borne infections.
3. Preserve nutritional quality of food.

Question 3.
Titanium dioxide is an important ingredient in cosmetics.
Answer:
It is a natural pigment powder which provides a base for mineral makeup. It provides mild sun protection and as a pigment gives a white colouration to coloured ingredients.

Question 4.
Aspirin is one of the most widely used medication – globally.
Answer:
Aspirin is one of the most widely used medication – globally because of following reasons :

1. It is a medicine to treat pain, fever & inflammation.
2. Aspirin given shortly after a heart attack, may decrease risk of death.
3. As long term use it may reduce, blood clots in people who are at a high risk.

Question 5.
Ordinary soap is wasted in hard water.
Answer:
Ordinary soap is wasted in hard water because hard water is one which does not lather with soap.

Question 6.
A philosopher's stone is not exactly a stone.
Answer:
Philosopher's stone in a legendary substance, capable of turning inexpensive metals like lead or mercury into – gold.and silver.
(It was not literally a stone, but a powder or potion).

Question 7.
Food processing is an important procedure for obtaining marketable food products.
Answer:
Food processing – involves physical or phemical processes, to transform or change the raw ingredients in food into easy usable forms of food available in

markets. Raw materials – in food to Marketable food products

Food Processing -	processes	
(i) Mincing	Cooking	Pickling
(ii) Preservative addition	Canning	Packaging

Question 8.
Cosmetics may contain preservatives, as one of their ingredients.
Answer:
They extend the shelf life of a cosmetic and may prevent growth of microorganisms.

Question 9.
Polyester is added to natural fibre cotton, to give terylene.
Answer:
Polyester is added to natural fibre cotton, to give terylene because this combination makes the fabric easy to clean and crease resistant.

Question 10.
All medicines must be taken under proper doctors supervision and in the correct dose.
Answer:
All medicines must be taken under proper doctors supervision and in the correct dose because some medicine has side effect as aspirin not taken in proper dose may cause stomach ulcers similarly paracetamol if taken in high dose may cause liver problems.