1. Fill in the blanks.

a. The number of molecules of water of crystallization in washing soda is ……..

.

b. The chemical name of baking soda is

…….. .

c. …….. is used in treatment of hyperthyroidism.

d. The chemical name of Teflon is ……..

.

Answer:

a. 10

b. Sodium bicarbonate

c. Iodine -123

d. Polytetra fluoroethylene $(C_2F_4)_n$

Group A	Group B
1. Saturated brine	a. Sodium metal freed
2. Fused salt	b. Basic salt
3. $CaOCl_2$	c. Crystallization of salt
4. $NaHCO_3$	d. Oxidation of colour

a. What is meant by radioactivity?

Answer:

- Elements with a high atomic number such as uranium, thorium, radium have a property of spontaneously emitting invisible, highly penetrating and high energy radiation.
- This property is called radioactivity.
- A substance having this property is called a radioactive substance.

b. When is said to be the nucleus unstable?

Answer:

- It is the balance of protons and neutrons in a nucleus which determines whether a nucleus will be stable or unstable.
- Too many neutrons or protons upset this balance disrupting the binding energy from the strong nuclear forces making the nucleus unstable.

c. Which diseases are caused by artificial food colours?

Answer:

Diseases like ADHD (Attention Deficit Hyperactivity Disorder) can affect children due to excessive consumption of foods with added food colours.

d. Where in the industrial field is radioactivity used?

Answer:

Industrial field Radiography

- Internal cracks and voids in cast iron articles and iron solder can be detected with the help of gamma rays.
- For this purpose, isotopes like cobalt-60, iridium-192 are used in the radiography camera.
- This technique is used for detecting flaws in metal work.

Measurement of thickness, density and level

- It is necessary to maintain the required thickness in the manufacture of aluminium, plastic, iron sheets of differing thickness.
- In the manufacturing process, a radioactive substance is placed on one side and an instrument to measure radiation on the other.
- The radiation read by the measuring instrument varies with the thickness of the sheet.
- Material inside a packing can also be examined by the same technique.

Luminescent paint and radio luminescence:

- The radioactive substances radium, promethium, tritium with some phosphor are used to make certain objects visible in the dark, for example, the hands of a clock, and certain other objects.

e. Write down properties of teflon.

Answer:

Properties of teflon :

- The atmosphere and chemical substances have no effect on Teflon.
- Neither water nor oil will stick to Teflon coated articles.
- High temperatures do not affect Teflon as its melting point is 327 °C.
- Teflon coated articles are easy to clean.

f. What type of colours will you use to celebrate ecofriendly Rang Panchami? Why?
Answer:

- We regularly use artificial colours on Rang Panchami.
- The red colour used on Rang Panchami is very dangerous. It contains a high proportion of mercury in it.
- This poses risks like blindness, skin cancer, asthma, itching of the skin, permanent blocking of sweat pores, etc.
- Therefore, it is necessary to use eco-friendly colours.
- We will prepare colours for Rang Panchami from natural resources such as beet root, flowers of flame of forest, spinach, flame tree (gulmohar) and protect your health by using these.

g. Why has the use of methods like Teflon coating become more common?

Answer:

The use of methods like Teflon coating became more common because of following properties of teflon:

- The atmosphere, rain water and chemical substances have no effect on Teflon.
- Neither water nor oil will stick to Teflon coated articles.
- High temperatures do not affect Teflon as its melting point is 327 °C.
- Teflon coated articles are easy to clean.
- Teflon is a poor conductor of electricity.

4. Give a scientific explanation

a. Bleaching powder has the odour of chlorine.

Answer:

- Bleaching powder undergoes slow decomposition due to the carbon dioxide in air and chlorine gas is released.
- Bleaching powder gets its property because of this release of chorine gas.

$$\underset{\text{Bleaching Powder}}{CaOCl_2} + \underset{\text{Carbon dioxide}}{CO_2} \rightarrow \underset{\text{Calcium Carbonate}}{CaCO_3} + \underset{\text{Chlorine}}{Cl_2\uparrow}$$

b. The hard water of a well becomes soft on adding washing soda to it.

Answer:

- The hard water from a well or a bore-well becomes soft on adding washing soda and we come to know this from the lather formed on it.
- The hardness of water is due to the presence of chlorides and sulphates of calcium and magnesium in it.
- Na_2CO_3 is added to it to soften such water and make it suitable for use.
- The reaction with Na_2CO_3 causes the formation of insoluble carbonate salts of magnesium and calcium.

  $MgCl_{2(aq)} + Na_2CO_{3(s)} \rightarrow MgCO_{3(s)} + 2\ NaCl_{(s)}$

c. Soap forms a precipitate in hard water.
Answer:

- When soap is mixed with hard water, calcium and magnesium salts of fatty acids are formed.
- These being water insoluble, they form a precipitate and that is why lather is not formed.

d. The particles of powder are given an electric charge while spraying them to form the powder coating.
Answer:

- Powder coating is a method of applying a layer harder than paint on the surface of an iron object to prevent rusting.
- In this method, a polymer resin, a pigment and some other ingredients are melt, mixed, cooled and ground into a uniform powder.

- This powder is sprayed on the polished metal surface by electrostatic spray deposition (ESD).
- In this method, the particles of the powder are given an electrostatic charge due to which a uniform layer of the powder sticks to the metal surface.
- Then the object is heated in the oven along with the coating.
- A chemical reaction occurs in the layer, resulting in the formation of long cross-linked polymeric chains.

e. The aluminium article is used as an anode in the anodising process.

Answer:

- A protective layer is formed naturally on the surface of aluminium metal by reaction with oxygen in air.
- In the anodizing process, this layer is made of the desired thickness. Anodizing is done by electrolysis.
- Dilute Sulphuric acid is taken in the electrolytic cell and the aluminium article is dipped in it as the anode.
- When an electric current is passed, hydrogen gas is released at the cathode and oxygen gas at the anode.
- A reaction with oxygen occurs and a layer of hydrated aluminium oxide is formed on the anode. Therefore, aluminium article is used as an anode in the anodizing process.

f. When the radiation coming out from certain radioactive substance is passed through an electric field, marks are found at three places on the photographic plate placed in its path.

Answer:

(i) When the radiation coming out from certain radioactive substance is passed through an electric field, marks are found at three places on the photographic plate placed in its path. This is because the radiation coming out from radioactive substance are of three types Alpha rays, Beta rays and Gamma rays.

g) A certain types of ceramic tiles are fixed on the outer layer of space shuttle.

Ans:

- Ceramic is the heat resistant substance which is formed by kneading an inorganic substance in water and after that shaping it followed by hardening on heating.
- As ceramics are heat resistant hence they can withstand at high temperatures also without decomposition.
- They are brittle, water resistant and also electrical insulators. Because of all these advantageous properties of ceramics certain types of ceramic tiles are fixed on the outer layer of space shuttle.

5. Write answers to the following

a. Write about artificial food colours, the substances used in them and their harmful effects.

Answer:

(a) Artificial food colour and substances in them.

- Food colours are mixed in most soft drinks and foodstuffs available in the market.
- These food colours are in the form of powders, gels and pastes.
- Food colours are used in domestic as well as commercial products.
- Certain colours and essences are added to ice cream, ice candies, sauce, fruit juices, cold drinks, pickles, jams and jelly.
- Food colours are often found to be added to packaged meat (chicken, mutton), chilli powder, turmeric, sweets and other similar substances so as to give them a good colour.
- Tetrazene, sunset yellow are artificial food colours used extensively.

(b) Harmful effects of artificial food colours

1. Food colours added to pickles, jam and sauce contain small quantities of lead and mercury. These can be harmful for those who consume these products on a regular basis.
2. Diseases like ADHD (Attention Deficit Hyperactivity Disorder) can affect children due to excessive consumption of foods with added food colours.

b. What is meant by water of crystallization? Give examples of salts with water of crystallization, and their uses.

Answer:

The exact number of water molecules which are chemically bonded to a molecule of a salt within a hydrated crystalline compound is called as water of crystallization are:

Some substances in our daily use which contain water of crystallization are:

- Alum (Potash alum – $K_2SO_4.Al_2(SO_4)_3.24H_2O$)
- Borax ($Na_2B_4O_7.10H_2O$)
- Epsom salt (Magnesium sulphate $MgSO_4.7H_2O$)
- Barium chloride ($BaCl_2.2H_2O$)
- Sodium sulphate (Glauber's salt $Na_2SO_4.10\ H_2O$)
- Blue vitriol (Copper Sulphate – $CuSO_4.5H_2O$)

Uses of these salts are as given below:

(i) Alum (Potash alum – $K_2SO_4.Al_2(SO_4)_3.24H_2O$)

- Alum is used in the process of water purification.
- Because of the property of coagulation, the solid impurities in water come together, become heavy and settle to the bottom. As a result, the impure water or muddy above becomes clear.
- Alum powder, found in the spice section of many grocery stores, may be used in pickling recipes as a preservative to maintain fruit and vegetable crispness.
- Alum is used as the acidic component of some commercial baking powders.
- Alum has been used as an after shave treatment.

(ii) Borax ($Na_2B_4O_7.10H_2O$)

- Borax today is used for many cleaning purposes.
- It is used to make homemade laundry detergent.
- It is added as a cleaning boost to any other detergent.
- It even keeps ants and other pests away.

(iii) Epsom salt (Magnesium sulphate $MgSO_4.7H_2O$)

- Epsom salt is used as a relaxing magnesium bath soak.
- To grow better vegetables – Add a tablespoon of Epsom salt to the soil below a vegetable plant to boost growth.

(iv) Barium chloride ($BaCl_2.2H_2O$)

- In industry, Barium chloride is mainly used in the purification of brine solution in caustic chlorine plants.
- It is also used in the manufacture of heat treatment salts.
- It is used in hardening of steel.
- It is used in the manufacture of pigments.

(v) Sodium sulphate (Glauber's salt $Na_2SO_4.10H_2O$)

- In the laboratory, anhydrous Sodium sulphate is widely used as an inert drying agent, for removing traces of water from organic solutions.
- Glauber's salt, the decahydrate, is used as a laxative.

(vi) Blue vitriol (Copper sulphate $CuSO_4.5H_2O$)

- Blue vitriol is used in the blood test for diagnosing anaemia.
- Slaked Time is used with blue vitriol in the Bordeaux mixture which is used as a fungicide on fruits like grapes and musk melon.

c. Write briefly about the three methods of electrolysis of sodium chloride.

Answer:

- When an electric current is passed through a saturated solution of sodium chloride (brine) it is electrolysed and hydrogen gas is released at the cathode while chlorine gas is released at the anode.
- This method is used for production of chlorine gas. In this method an important basic compound NaOH is formed in the cell.
- Chemical reaction
  $2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 \uparrow + H_2 \uparrow$
- When salt is heated to a high temperature (about 800 °C), it melts. This is called the fused state of the salt.

6. Write the uses.

a. Anodizing
b. Powder coating
c. Radioactive substances
d. Ceramic

Answer:

(a) Anodizing : Anodizing is done on aluminum cooking utensils like griddles and cookers.

(b) Powder coating : Powder coating is done on iron objects to prevent rusting. Also, on Plastic and Medium density fibre (MDF) board, to make them highly durable, hard and attractive.

(c) Radioactive substances:

(I) Industrial field:

(i) Industrial Radiography : Internal cracks and voids in cast iron articles and iron solder can be. detected with the help of gamma rays. For this purpose, isotopes like cobalt-60, iridium-192 are used in the radiography camera. This technique is used for detecting flaws in metal work.

examined by the same technique.

(iii) Luminescent paint and radioluminescence:

The radioactive substances radium, promethium, tritium with some phosphor are used to make certain objects visible in the dark, for example, the hands of a clock, and certain other objects. Krypton-85 is used in HID (High Intensity Discharge) lamps while promethium-147 is used in portable X-ray units as the source of beta rays.

- Tumour detection : Boron-10, iodine-131, cobalt-60 are used in treatment of brain tumour, while arsenic-74 is used in detection of small tumours in the body.

(d) Ceramic : Pots made by a potter, Mangalore roofing tiles, construction bricks, pottery, terracotta articles are some examples of common ceramic articles that we see around.

7. Write the harmful effects

a. Artificial dye
b. Artificial food colour
c. Radioactive substances
d. Deodorant

Answer:

(a) Artificial dye:

- Dyeing hair can have adverse effects like hair fall, damage to hair texture, burning of skin, adverse effect on eyes, etc.
- Lipstick contains a dye named carmine. It does not affect lips but causes stomach disorders.
- Excessive use of plants for making natural dyes results in deterioration of the environment.

(b) Artificial food colour:

- Food colours added to pickles, jams and sauces contain small quantities of lead and mercury. These can be harmful for those who consume these products on a regular basis.
- Diseases like ADHD (Attention Deficit Hyperactivity Disorder) can affect children due to excessive consumption of foods with added food colours.

(c) Radioactive substances :

- The central nervous system is affected by radioactive radiations.
- Hereditary defects are generated by bombardment of radiation on D.N.A in the body.
- Radioactive radiation can penetrate the skin, and causes diseases like skin cancer, leukemia.
- The radioactive pollutants created due to explosions enter the body through air and it is difficult to control them.
- The radioactive pollutants released in the sea enter the bodies of fishes and through them enter the human body.
- The radioactive paint on the watch can cause cancer.
- The radioactive isotopes strontium-90 can enter the body through plants, fruits, flowers, cereals, milk, etc. and cause diseases like bone cancer, leukemia.

(d) Deodorant:

- Aluminium – Zirconium compounds are the most harmful chemicals in the deodorant. Disorders like headache, asthma, respiratory disorders, heart disease are likely to occur without our knowledge.
- There is a possibility of various skin disorders and also skin cancer due to the aluminium chlorohydrates.

8. Write the chemical formula Bleaching powder, common salt, baking soda, washing soda

Answer:

Common name	Chemical name
Bleaching powder	$CaOCl_2$
Common salt	NaCl
Baking soda	$NaHCO_s$
Washing soda	$Na_2CO_3.10\ H_2O$

9. Explain what you see in the following picture

Powder coating

Answer:

1. This picture shows powder coating of the given object. Powder coating is a method of applying a layer harder than paint on the surface of an iron object to prevent rusting.

2. In this method, a polymer resin, a pigment and some other ingredients are melt mixed, cooled and ground into a uniform powder.
3. This powder is sprayed on the polished metal surface by electrostatic spray deposition (ESD).
4. In this method, the particles of the powder are given an electrostatic charge due to which a uniform layer of the powder sticks to the metal surface.
5. Then the object is heated in the oven along with the coating.
6. A chemical reaction occurs in the layer, resulting in the formation of long cross-linked polymeric chains.
7. This powder coating is highly durable, hard and attractive. Powder coating can be done on plastic and medium density fibre (MDF) board in day to day use as well.