CBSE Class 10 Science

Practice Questions with Solutions

Section A: Chemistry

Chapter 1: Chemical Reactions and Equations

Question 1. Balance the following chemical equation and identify the type of reaction:

$Fe + H_2O \rightarrow Fe_3O_4 + H_2$

Solution:

The balanced chemical equation is:

$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

This is a redox reaction because oxidation and reduction occur simultaneously.

- Iron is oxidised as it combines with oxygen.
- Hydrogen in water is reduced as it forms hydrogen gas.

Question 2. What happens when an aqueous solution of sodium sulphate is mixed with barium chloride solution? Write the balanced chemical equation and identify the reaction.

Solution:

When sodium sulphate solution is mixed with barium chloride solution, a white insoluble precipitate of barium sulphate is formed.

Balanced chemical equation:

$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 \downarrow + 2NaCl$

This is a double displacement reaction because the ions of the two compounds exchange places.

It is also a precipitation reaction because an insoluble solid, barium sulphate, is produced.

Question 3. Explain oxidation and reduction with the help of the following reaction:

$CuO + H_2 \rightarrow Cu + H_2O$

Solution:

In this reaction:

- Copper oxide loses oxygen to form copper. Therefore, CuO is reduced.
- Hydrogen gains oxygen to form water. Therefore, H_2 is oxidised.

Hence, this is a redox reaction because oxidation and reduction take place simultaneously.

Hydrogen acts as the reducing agent, while copper oxide acts as the oxidising agent.

Chapter 2: Acids, Bases and Salts

Question 4. Why does dry hydrogen chloride gas not change the colour of dry blue litmus paper, while aqueous hydrochloric acid turns blue litmus red?

Solution:

Hydrogen chloride produces hydrogen ions only when dissolved in water.

In dry conditions, HCl does not release hydrogen ions, so it does not change the colour of dry blue litmus paper.

When HCl dissolves in water, it ionises:

$$HCl + H_2O \rightarrow H_3O^+ + Cl^-$$

The hydronium ions make the solution acidic and turn blue litmus red.

Question 5. A student tests three solutions using pH paper and obtains the following readings:

- Solution A: pH 2
- Solution B: pH 7
- Solution C: pH 11

Identify the acidic, neutral and basic solutions. Which solution has the highest concentration of hydrogen ions?

Solution:

- Solution A (pH 2): Acidic
- Solution B (pH 7): Neutral
- Solution C (pH 11): Basic

Solution A has the highest hydrogen-ion concentration because a lower pH indicates a greater concentration of hydrogen ions.

Question 6. What happens when baking soda reacts with hydrochloric acid? Write the balanced chemical equation and name the gas released.

Solution:

Baking soda is sodium hydrogen carbonate ($NaHCO_3$). When it reacts with hydrochloric acid, sodium chloride, water and carbon dioxide are produced.

Balanced chemical equation:

$$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2 \uparrow$$

The gas released is carbon dioxide.

It can be tested by passing it through limewater. Limewater turns milky due to the formation of calcium carbonate.

Chapter 3: Metals and Non-Metals

Question 7. Why does zinc displace copper from copper sulphate solution? Write the balanced chemical equation.

Solution:

Zinc is more reactive than copper. Therefore, it displaces copper from copper sulphate solution.

Balanced chemical equation:

$$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$$

Observations:

- The blue colour of copper sulphate solution gradually fades.
- A reddish-brown deposit of copper forms on the zinc.

This is a displacement reaction.

Question 8. Explain why ionic compounds have high melting and boiling points.

Solution:

Ionic compounds consist of positively charged and negatively charged ions held together by strong electrostatic forces of attraction.

A large amount of heat energy is required to overcome these forces and separate the ions.

Therefore, ionic compounds generally have high melting and boiling points.

Question 9. Why is sodium stored in kerosene?

Solution:

Sodium is a highly reactive metal. It reacts vigorously with oxygen and moisture in the air and may catch fire.

It is stored under kerosene to prevent contact with air and water.

Chapter 4: Carbon and Its Compounds

Question 10. What is a homologous series? Write two characteristics of a homologous series.

Solution:

A homologous series is a group of organic compounds having the same functional group and general formula, in which successive members differ by a $–CH_2–$ unit.

Characteristics:

- All members have similar chemical properties because they contain the same functional group.
- The molecular mass of successive members differs by 14 u.
- Their physical properties, such as boiling point and melting point, show a gradual change.

Example: Methane (CH_4), ethane (C_2H_6) and propane (C_3H_8) belong to the alkane series.

Question 11. What happens when ethanol reacts with ethanoic acid in the presence of concentrated sulphuric acid? Write the chemical equation and name the reaction.

Solution:

Ethanol reacts with ethanoic acid in the presence of concentrated sulphuric acid to form an ester and water.

Chemical equation:

$$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$$

The ester formed is ethyl ethanoate.

This reaction is called esterification. Esters generally have a pleasant fruity smell.

Question 12. Why does soap form less lather in hard water?

Solution:

Hard water contains calcium and magnesium salts.

When soap is added to hard water, it reacts with calcium and magnesium ions to form insoluble substances called scum.

As a result:

- Soap is wasted in forming scum.
- Less lather is produced.
- Cleaning becomes less effective.

Detergents are generally more effective than ordinary soaps in hard water because they do not form insoluble precipitates with calcium and magnesium ions as readily.

Section B: Biology

Chapter 5: Life Processes

Question 13. Explain the process of photosynthesis. Write its balanced chemical equation.

Solution:

Photosynthesis is the process by which green plants prepare their food using carbon dioxide and water in the presence of sunlight and chlorophyll.

During this process:

- Chlorophyll absorbs sunlight.
- Light energy is converted into chemical energy.
- Water molecules are split, releasing oxygen.
- Carbon dioxide is reduced to form carbohydrates.

Balanced chemical equation:

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$$

Conditions: Sunlight and chlorophyll.

Question 14. Explain how digested food is absorbed in the small intestine.

Solution:

The small intestine is the main site of absorption of digested food.

Its inner lining contains numerous finger-like projections called villi.

The villi:

- Increase the surface area for absorption.
- Contain blood capillaries that absorb glucose and amino acids.
- Contain lymph vessels called lacteals that absorb most digested fats.

The absorbed nutrients are transported to different parts of the body through the circulatory system.

Question 15. Differentiate between aerobic and anaerobic respiration.

Solution:

Aerobic Respiration	Anaerobic Respiration
Takes place in the presence of oxygen.	Takes place without oxygen.
Complete breakdown of glucose occurs.	Incomplete breakdown of glucose occurs.
Releases more energy.	Releases less energy.
Produces carbon dioxide and water.	May produce alcohol and carbon dioxide, or lactic acid.

Aerobic respiration occurs in most human cells under normal conditions. Anaerobic respiration in human muscles may occur during vigorous exercise when oxygen supply is insufficient.

Question 16. Explain the role of xylem and phloem in plants.

Solution:

Xylem and phloem are the two main conducting tissues in plants.

Xylem:

- Transports water and minerals from roots to other parts of the plant.
- Movement is mainly upward.
- Also provides mechanical support.

Phloem:

- Transports food prepared by leaves to other parts of the plant.
- Food can move in both directions depending on the plant’s needs.
- This movement is called translocation.

Question 17. Describe the role of the nephron in the formation of urine.

Solution:

A nephron is the structural and functional unit of the kidney.

Urine formation takes place through three major processes:

- **Filtration:** Blood is filtered under pressure in the glomerulus.
- **Selective reabsorption:** Useful substances such as glucose, amino acids, salts and much of the water are reabsorbed into the blood.
- **Tubular secretion:** Certain additional wastes and excess ions are secreted into the tubule.

The remaining fluid forms urine, which passes into the collecting ducts and then towards the ureter.

Chapter 6: Control and Coordination

Question 18. What is a reflex action? Explain the reflex arc with an example.

Solution:

A reflex action is a quick, automatic and involuntary response to a stimulus.

Example: Pulling your hand away immediately after touching a hot object.

The pathway followed by nerve impulses during a reflex action is called a reflex arc.

The sequence is:

Stimulus → Receptor → Sensory Neuron → Spinal Cord → Motor Neuron → Effector

The spinal cord coordinates the immediate response, helping protect the body from injury.

Question 19. What are plant hormones? Explain the role of auxin in phototropism.

Solution:

Plant hormones are chemical substances that regulate growth and development in plants.

Auxin is a plant hormone that promotes cell elongation.

When light falls on one side of a plant shoot, auxin accumulates more on the shaded side. Cells on that side grow faster, causing the shoot to bend towards the light.

This growth response towards light is called positive phototropism.

Chapter 7: How Do Organisms Reproduce?

Question 20. Differentiate between binary fission and budding with one example each.

Solution:

Binary Fission	Budding
One parent organism divides into two daughter organisms.	A small outgrowth or bud develops on the parent organism.
The nucleus divides, followed by division of the cytoplasm.	The bud grows and eventually separates from the parent.
Example: Amoeba.	Example: Hydra or yeast.

Both are forms of asexual reproduction and generally involve a single parent.

Question 21. Explain the functions of the following parts of a flower: (a) Stamen (b) Pistil (c) Ovary (d) Ovule

Solution:

- **Stamen:** The male reproductive part of a flower. It produces pollen grains.
- **Pistil:** The female reproductive part of a flower. It consists of stigma, style and ovary.
- **Ovary:** Contains ovules and develops into the fruit after fertilisation.
- **Ovule:** Contains the female gamete and develops into a seed after fertilisation.

Question 22. Mention three methods of contraception and explain why contraception is important.

Solution:

Three methods of contraception are:

- **Barrier methods:** Condoms prevent sperm from reaching the egg and also help reduce the risk of sexually transmitted infections.
- **Hormonal methods:** Oral contraceptive pills prevent pregnancy by interfering with ovulation and other reproductive processes.
- **Intrauterine devices (IUDs):** Devices such as copper-T are placed inside the uterus to prevent pregnancy.

Contraception helps prevent unwanted pregnancies, supports family planning and protects reproductive health. Condoms also help reduce the transmission of HIV and other sexually transmitted infections.

Section C: Physics

Chapter 8: Light – Reflection and Refraction

Question 23. An object is placed 30 cm in front of a concave mirror having a focal length of 15 cm. Calculate the position and nature of the image.

Solution:

Given:

- Object distance, u = −30 cm
- Focal length, f = −15 cm

Using the mirror formula:

$$1/f = 1/v + 1/u$$

Substituting the values:

$$1/(-15) = 1/v + 1/(-30)$$

$$1/v = -1/15 + 1/30$$

$$1/v = -1/30$$

Therefore:

$$v = -30 \text{ cm}$$

The image is formed 30 cm in front of the mirror.

Magnification:

$$m = -v/u$$

$$m = -(-30)/(-30) = -1$$

Answer: The image is real, inverted and of the same size as the object.

Question 24. An object is placed 30 cm in front of a convex lens of focal length 20 cm. Calculate the image distance and magnification.

Solution:

Given:

- Object distance, u = −30 cm
- Focal length, f = +20 cm

Using the lens formula:

$1/f = 1/v - 1/u$

Substituting:

$1/20 = 1/v - 1/(-30)$

$1/20 = 1/v + 1/30$

$1/v = 1/20 - 1/30$

$1/v = 1/60$

Therefore:

$v = +60$ cm

Magnification:

$m = v/u$

$m = 60/(-30) = -2$

Answer: The image is formed 60 cm on the other side of the lens. It is real, inverted and twice the size of the object.

Question 25. What is myopia? Explain how it can be corrected.

Solution:

Myopia, or short-sightedness, is a defect of vision in which a person can see nearby objects clearly but cannot see distant objects clearly.

In a myopic eye, the image of a distant object forms in front of the retina instead of on the retina.

Correction: Myopia is corrected using a concave lens of suitable power. The concave lens diverges incoming light rays so that the eye lens forms the image on the retina.

Chapter 9: Electricity

Question 26. A current of 3 A flows through a resistor when a potential difference of 12 V is applied across it. Calculate the resistance.

Solution:

Given:

- Potential difference, V = 12 V
- Current, I = 3 A

According to Ohm's law:

$V = IR$

Therefore:

$R = V/I$

$R = 12/3$

Answer: Resistance = 4 Ω

Question 27. Two resistors of 6 Ω and 3 Ω are connected in parallel across a 12 V battery. Calculate the equivalent resistance and total current.

Solution:

Given:

$R_1 = 6\ \Omega$, $R_2 = 3\ \Omega$

For a parallel combination:

$1/R = 1/R_1 + 1/R_2$

$1/R = 1/6 + 1/3$

$1/R = 1/6 + 2/6$

$1/R = 3/6 = 1/2$

Therefore:

$R = 2\ \Omega$

Using Ohm's law:

$I = V/R$

$I = 12/2$

Answer: Equivalent resistance = 2 Ω; Total current = 6 A

Question 28. An electric heater rated at 1000 W is used for 2 hours. Calculate the electrical energy consumed in kWh and joules.

Solution:

Given:

Power = 1000 W = 1 kW, Time = 2 hours

Electrical energy consumed:

Energy = Power × Time

$= 1 \times 2$

$= 2$ kWh

Since 1 kWh = 3.6×10^6 J,

Energy = $2 \times 3.6 \times 10^6$

Answer: Electrical energy = 2 kWh = 7.2×10^6 J

Chapter 10: Magnetic Effects of Electric Current

Question 29. State the right-hand thumb rule. What does it help us determine?

Solution:

The right-hand thumb rule helps determine the direction of the magnetic field around a straight current-carrying conductor.

According to the rule:

If a straight conductor is held in the right hand such that the thumb points in the direction of conventional current, the curled fingers indicate the direction of the magnetic field lines around the conductor.

The rule is useful for understanding the magnetic field produced by electric current.

Question 30. Why are household electrical appliances connected in parallel rather than in series?

Solution:

Household electrical appliances are connected in parallel for the following reasons:

- Each appliance receives the same potential difference as the mains supply.
- Each appliance can be switched on or off independently.
- If one appliance stops working, the others continue to operate.
- Different appliances can draw the current required for their operation.

Therefore, parallel connections are more suitable for domestic electrical wiring.

Section D: Natural Resources

Question 31. Differentiate between biodegradable and non-biodegradable substances. Give two examples of each.

Solution:

Biodegradable Substances	Non-Biodegradable Substances
Can be broken down by microorganisms into simpler substances.	Cannot be broken down easily by natural biological processes.
Usually do not remain in the environment for very long when properly decomposed.	May remain in the environment for a long time.
Examples: Vegetable peels and paper.	Examples: Plastic and glass.

Question 32. What is ozone depletion? Why is the ozone layer important for living organisms?

Solution:

Ozone depletion refers to the thinning of the ozone layer in the stratosphere due to the action of ozone-depleting substances, such as chlorofluorocarbons (CFCs).

The ozone layer is important because it absorbs much of the harmful ultraviolet (UV) radiation from the Sun.

Excessive exposure to UV radiation can cause:

- Skin cancer.
- Eye damage, including cataracts.
- Harm to plants and aquatic organisms.

Reducing the use and release of ozone-depleting substances helps protect the ozone layer.

Section E: Competency-Based and Case-Based Questions

Case Study 1: Electricity in a Household

A family uses a 1000 W electric heater and a 100 W bulb. Both appliances operate on a 220 V household supply. The appliances are connected in parallel.

Answer the following questions:

(a) Why are the appliances connected in parallel?

Answer: Parallel connection ensures that each appliance receives the same supply voltage and can operate independently.

(b) Calculate the current drawn by the 1000 W heater.

Solution:

P = VI

I = P/V

I = 1000/220

Answer: Approximately 4.55 A.

(c) Calculate the current drawn by the 100 W bulb.

Solution:

I = P/V

I = 100/220

Answer: Approximately 0.45 A.

(d) What is the total current drawn when both appliances operate simultaneously?

Total current = 4.55 + 0.45

Answer: Approximately 5 A.

Case Study 2: Digestion in Humans

A student learns that the human digestive system breaks down complex food substances into simpler substances that can be absorbed by the body. Different digestive organs and enzymes perform specific functions.

Answer the following questions:

(a) Where does the digestion of starch begin?

Answer: Digestion of starch begins in the mouth with the help of salivary amylase.

(b) Which organ produces bile?

Answer: The liver produces bile.

(c) What is the function of bile in digestion?

Answer: Bile helps emulsify fats into smaller droplets, increasing the surface area available for the action of digestive enzymes. It also helps neutralise acidic food entering the small intestine.

(d) Where does the maximum absorption of digested food take place?

Answer: The small intestine, which contains numerous villi for efficient absorption.

Case Study 3: Refraction Through a Lens

A student uses a convex lens to form the image of an object placed at different distances. The student observes that the image changes in size and position depending on the object's distance from the lens.

Answer the following questions:

(a) What happens when an object is placed beyond $2F_1$ of a convex lens?

Answer: A real, inverted and diminished image is formed between F_2 and $2F_2$.

(b) What happens when the object is placed at $2F_1$?

Answer: A real, inverted image of the same size is formed at $2F_2$.

(c) What is the nature of the image when the object is placed between F_1 and the optical centre?

Answer: A virtual, erect and magnified image is formed on the same side of the lens as the object.

(d) Which type of lens is used as a magnifying glass?

Answer: A convex lens.