Answer in 30 Words

1. What is meant by the rate of a chemical reaction? What is its unit?
The rate of a chemical reaction is the speed at which reactants are converted into products. Its unit is moles per liter per second (mol/L/s).

2. What are alloys? Write the composition of Brass and Bronze.
Alloys are mixtures of two or more metals. Brass is composed of copper and zinc, while bronze is composed of copper and tin.

3. Define chemical equilibrium and equilibrium constant.
Chemical equilibrium is the state where the forward and reverse reactions occur at equal rates. The equilibrium constant (K) quantifies the ratio of product and reactant concentrations at equilibrium.

4. Define the relation between focal length and radius of curvature.
The focal length (f) of a lens or mirror is half the radius of curvature (R). The relation is given by $f = \frac{R}{2}$.

5. What are the factors influencing specific resistance?
Specific resistance depends on the material's nature, temperature, and physical state (solid, liquid, or gas).

6. Write the applications of PN junction diode.
PN junction diodes are used in rectification, signal modulation, voltage regulation, and switching circuits.

7. What are the functions of blood in the human body?
Blood transports oxygen, nutrients, hormones, and waste products; regulates body temperature; and protects against infections.

8. How are minerals transported in plants?
Minerals are transported in plants through the xylem, primarily via passive and active transport mechanisms, including diffusion and transpiration pull.

Part-2

1. Find the Highest Common Factor (HCF) of 9/10, 12/25, 18/35, and 21/40.
To find the HCF of fractions, HCF = $\frac{HCF \text{ of numerators}}{LCM \text{ of denominators}}$. The HCF is $\frac{3}{200}$.

2. If $\frac{b}{a} = 0.25$, then find the value of $\frac{2a-b}{2a+b} + \frac{2}{9}$.
$\frac{b}{a} = 0.25$, so $b = 0.25a$. The expression simplifies to $\frac{7}{9}$.

3. Find the probability of drawing 5 white balls from a basket having 3 red, 7 white, and 2 blue balls.

The total number of balls is 12. The probability of drawing 5 white balls is $\frac{7}{792}$.

4. A can do a work in 4 days, B in 5 days, and C in 10 days. Find the time taken by A, B, and C to do the work together.
The combined work rate is $\frac{1}{4} + \frac{1}{5} + \frac{1}{10}$. The time taken is approximately 1.82 days.

5. Solve 98 × 96 using Vedic Mathematics Sutra – Nikhilam and check the answer by Bijank.
Using Nikhilam Sutra:
98 × 96 = 9408.
Verification by Bijank gives the same answer.

Part-3

1. What is RAM in computers?
RAM (Random Access Memory) is a type of volatile memory that stores data temporarily for quick access by the CPU during processing.

2. Write the names of any four fields of communication in which computers are used.
Computers are used in telecommunications, broadcasting, internet services, and satellite communication.

3. What do you understand by information technology?
Information technology (IT) refers to the use of computers, networks, and software to manage, store, and communicate information.

4. What are the reactions due to which energy is released in nuclear reactors? Write name only.
The reactions are nuclear fission and nuclear fusion.

5. Define in-situ and ex-situ conservation.
In-situ conservation protects species in their natural habitats. Ex-situ conservation involves the preservation of species outside their natural habitats, such as in zoos or seed banks.

6. Write the names of any four bio-geographical regions of India.
Himalayan, Western Ghats, Indo-Gangetic Plains, and Deccan Plateau.

7. Write the names of a bacterial and a protozoan disease caused due to water pollution. Also, write the names of their causal organisms.
Bacterial disease: Cholera (Vibrio cholerae).
Protozoan disease: Amoebiasis (Entamoeba histolytica).

8. Write the names of any four important hot spots of biodiversity in India.
Western Ghats, Eastern Himalayas, Indo-Burma region, and Sundaland.

For the remaining sections and more complex calculations or descriptions, please let me know which parts you'd like to focus on or if you need further details!

Section-2

Answer 60 Words Each

Part-1

8. What are synthetic detergents? Give one example each on cationic and anionic detergents. Why are detergents considered better than soaps?

Synthetic detergents are cleansing agents that work in both hard and soft water. Anionic detergents include sodium lauryl sulfate, while cationic detergents include cetyl trimethyl ammonium bromide. Detergents are better than soaps because they do not form scum with hard water, ensuring better cleaning efficiency.

9. What are the major components of the human digestive system?

The human digestive system includes the mouth, esophagus, stomach, small intestine, large intestine, rectum, and anus. Accessory organs like the liver, pancreas, and gallbladder aid digestion by secreting enzymes and bile that break down food into nutrients for absorption.

12. What is photosynthesis? What are the main steps of this process?

Photosynthesis is the process by which green plants convert light energy into chemical energy. The main steps include light-dependent reactions, where sunlight is absorbed to produce ATP and NADPH, and the Calvin cycle, where carbon dioxide is fixed into glucose using ATP and NADPH.

13. What do you understand by Artificial Vegetative Reproduction? Write down the various techniques of Artificial Vegetative Reproduction.

Artificial vegetative reproduction involves human intervention to propagate plants asexually. Techniques include grafting (joining two plants), cutting (planting a piece of the parent plant), layering (encouraging a plant stem to take root while still attached), and tissue culture (growing plants from cells in a nutrient medium).

Part-2

7. A can print 30 pages of a document in 2 hours, and B takes 5 minutes to print a page. How many pages will B print in the time A prints 60 pages?

A prints 60 pages in 4 hours. Since B prints a page in 5 minutes, B will print 48 pages in 4 hours (4 hours = 240 minutes, $240/5 = 48$).

8. Bhavya rows a distance of 2 km downstream in 25 minutes and takes 35 minutes to cover the same distance upstream. Find the speed of the stream.

Let the speed of the stream be x km/h. Speed downstream = $\frac{2}{\frac{25}{60}}$ km/h and speed upstream = $\frac{2}{\frac{35}{60}}$ km/h. The speed of the stream x = $\frac{7}{24}$ km/h or approximately 0.29 km/h.

Part-3

What is ROM in computers? What type of memory does it contain? What is its importance?
ROM (Read-Only Memory) is a type of non-volatile memory that permanently stores essential data and instructions needed for the computer to boot up. It contains firmware, which is critical for the initial startup process and system functions, ensuring the computer can initialize hardware and load the operating system.

Write the names of four electricity-generating nuclear power plants of India.
1. Tarapur Atomic Power Station (Maharashtra)
2. Kudankulam Nuclear Power Plant (Tamil Nadu)
3. Narora Atomic Power Station (Uttar Pradesh)
4. Kakrapar Atomic Power Station (Gujarat)

What do you mean by hot spots of biodiversity? What are the two criteria for any area to be a hot spot of biodiversity?
Hotspots of biodiversity are regions with high species richness and endemism that face significant threats. To qualify as a hotspot, an area must have at least 1,500 species of vascular plants as endemics and have lost at least 70% of its original habitat.

Write the differences between National Park and Sanctuary.
National Parks are areas for conserving wildlife and habitats with stricter regulations; human activities like grazing and timber harvesting are prohibited. Sanctuaries are also protected areas, but they allow regulated human activities, such as grazing and forest resource collection, to coexist with wildlife conservation.

What is CNG? Explain its importance.
CNG (Compressed Natural Gas) is a clean fuel alternative to petrol and diesel. It is composed primarily of methane. CNG is important because it produces fewer pollutants, reduces greenhouse gas emissions, and is more cost-effective, making it an environmentally friendly and economical fuel option.

Section-3

Answer in 130 Words Each

What are alcohols? Write chemical reactions for the preparation of primary, secondary, and tertiary alcohols using Grignard's reagent, C2H5MgBr.
Alcohols are organic compounds with one or more hydroxyl (-OH) groups attached to a carbon atom. Primary alcohols can be prepared by reacting Grignard reagent (C2H5MgBr) with formaldehyde, secondary alcohols by reacting it with acetaldehyde, and tertiary alcohols by reacting it with ketones. The general reactions are as follows:
- Primary alcohol: $C2H5MgBr + HCHO \rightarrow C2H5CH2OH + MgBrOH$
- Secondary alcohol: $C2H5MgBr + CH3CHO \rightarrow C2H5CH(OH)CH3 + MgBrOH$
- Tertiary alcohol: $C2H5MgBr + (CH3)2CO \rightarrow (CH3)2C(OH)C2H5 + MgBrOH$
These reactions illustrate how Grignard reagents are versatile for synthesizing different types of alcohols.

How is the photoelectric effect the basis for the working of Solar Cells? Explain. Draw the structure of a Solar Cell.

The photoelectric effect occurs when light strikes a material, causing it to emit electrons. In solar cells, photons from sunlight hit a semiconductor material (typically silicon), knocking electrons free and creating an electric current. This current can then be harnessed for electrical power. The structure of a solar cell includes layers of N-type and P-type semiconductors, with a junction between them. When light hits the cell, it generates a flow of electrons, creating electricity. The efficiency of this process is central to the effectiveness of solar panels.

![Solar Cell Structure](https://upload.wikimedia.org/wikipedia/commons/1/19/Solar_cell_structure.png)

Draw the structure of the spinal cord of the human body and label its major components. How is the human nervous system related to the spinal cord?

The spinal cord is a cylindrical structure composed of nerve tissues extending from the brainstem down the vertebral column. It is protected by the vertebrae and surrounded by cerebrospinal fluid. The major components include the white matter (containing nerve fibers), gray matter (containing nerve cell bodies), dorsal and ventral roots, and the central canal. The spinal cord is a critical component of the central nervous system (CNS), serving as a conduit for transmitting nerve impulses between the brain and the body, coordinating reflexes, and enabling motor and sensory functions.

![Spinal Cord Structure](https://upload.wikimedia.org/wikipedia/commons/thumb/5/57/Gray694.png/200px-Gray694.png)

Section-3

Answer in 130 Words Each

Minakshi started a business investing ₹ 45,000. After 3 months, Anil joined her with a capital of ₹ 60,000, and after another 6 months, Sunil joined them with a capital of ₹ 90,000. At the end of the year, they made a profit of ₹ 16,500. Find the share of each.

The profit-sharing ratio is determined by the product of the capital invested and the time period for which it was invested.

- Minakshi's share: $45,000 \times 12 = 540,000$
- Anil's share: $60,000 \times 9 = 540,000$
- Sunil's share: $90,000 \times 3 = 270,000$

Total = $540,000 + 540,000 + 270,000 = 1,350,000$

Profit share of each:
- Minakshi: $\frac{540,000}{1,350,000} \times 16,500 = ₹ 6,600$
- Anil: $\frac{540,000}{1,350,000} \times 16,500 = ₹ 6,600$

- Sunil: $\frac{270,000}{1,350,000} \times 16,500 = ₹ 3,300$

A fast train takes 3 hours less than a slow train for a journey of 600 km. If the speed of the slow train is 10 km/hr less than that of the fast train, find the speeds of the two trains.

Let the speed of the fast train be x km/h. Then, the speed of the slow train is $x - 10$ km/h. The time taken by the fast train is $\frac{600}{x}$ hours, and the time taken by the slow train is $\frac{600}{x - 10}$ hours.

According to the problem:
$$\frac{600}{x - 10} - \frac{600}{x} = 3$$

Solving the equation:
$$600x - 600(x - 10) = 3x(x - 10)$$
$$6000 = 3x^2 - 30x$$
$$x^2 - 10x - 2000 = 0$$

Using the quadratic formula:
$$x = \frac{-(-10) \pm \sqrt{(-10)^2 + 4(1)(2000)}}{2(1)}$$

This gives the speeds of the fast and slow trains as approximately 50 km/h and 40 km/h, respectively.

Section-4

Answer in 150 Words Each

What is the sum of the number of girls in School C, the number of girls in School E, and the number of boys in School D together?

To solve this problem, the exact numbers for the respective schools must be provided. Assuming hypothetical values:
- Number of girls in School C: 200
- Number of girls in School E: 150
- Number of boys in School D: 180

The sum of these values would be:
$$200 + 150 + 180 = 530$$

What is the ratio of the number of boys in School C, the number of girls in School B, and the total number of students in School E?

Assume the following numbers:
- Boys in School C: 120
- Girls in School B: 160

- Total students in School E: 300

The ratio is calculated as:
$$ 120 : 160 : 300 = 3 : 4 : 10 $$

What is the difference between the total number of students in School F and the number of boys in School E?

Assuming:
- Total students in School F: 500
- Number of boys in School E: 150

The difference is:
$$ 500 - 150 = 350 $$

In which school is the total number of students equal to the number of girls in School E?

Assuming:
- Total number of students in School X: 150
- Number of girls in School E: 150

The total number of students in School X equals the number of girls in School E.

Section-5

Answer in 200 Words

Define the Law of Reflection. How is reflection from a curved surface different from a plane surface? Which type of mirror will be used in the following situations? Support your answer with reasons: (a) Solar furnace, (b) Rear-view mirror of a vehicle, (c) Headlight of a car.

The Law of Reflection states that the angle of incidence is equal to the angle of reflection, and both angles lie in the same plane. In the case of a plane surface, light reflects uniformly, with all reflected rays being parallel if the incident rays are parallel. In curved surfaces, like concave or convex mirrors, the reflected rays either converge (concave) or diverge (convex) depending on the curvature.

- (a) Solar Furnace: A concave mirror is used because it converges sunlight at a focal point, creating a high-intensity spot ideal for generating heat.
- (b) Rear-view Mirror of a Vehicle: A convex mirror is used as it provides a wider field of view, allowing the driver to see more area behind the vehicle.
- (c) Headlight of a Car: A concave mirror is used because it focuses light into a parallel beam, which enhances the intensity and range of the headlights.

Discuss Halogen Elements with Reference to the Following: (a) Position in Periodic Table, (b) Physical State of Elements, (c) Electron Gain Enthalpy, (d) Electronegativity, (e) Formation of Interhalogen Compounds.

- (a) Position in Periodic Table: Halogens are found in Group 17 of the periodic table and include fluorine, chlorine, bromine, iodine, and astatine.
- (b) Physical State of Elements: Halogens exhibit all three physical states at room temperature: fluorine and chlorine are gases, bromine is a liquid, and iodine and astatine are solids.
- (c) Electron Gain Enthalpy: Halogens have high electron gain enthalpy because they need only one electron to complete their valence shell, with fluorine having the highest.
- (d) Electronegativity: Halogens are highly electronegative, with fluorine being the most electronegative element in the periodic table.
- (e) Formation of Interhalogen Compounds: Halogens form interhalogen compounds like ClF3 and ICl, where a halogen atom is covalently bonded to another halogen atom, typically with higher oxidation states.

In How Many Categories are Threatened Species Classified in the Red List of IUCN? Write the Name of Each Category and Explain Them.

The IUCN Red List classifies threatened species into three categories:
- Critically Endangered (CR): Species facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered (EN): Species facing a very high risk of extinction in the near future.
- Vulnerable (VU): Species facing a high risk of extinction in the medium term.

These classifications help in prioritizing conservation efforts for species that are most at risk of disappearing from the wild.

What is Solid Waste Management? Describe the Object and Functional Elements of Solid Waste Management.

Solid waste management refers to the systematic control of the generation, storage, collection, transport, processing, and disposal of solid waste. Its objective is to minimize the adverse effects of waste on human health and the environment.

The functional elements of solid waste management include:
- Waste Generation: Activities that identify materials as no longer valuable.
- Storage and Collection: Temporary storage and systematic collection of waste from various sources.
- Transportation: Moving waste to disposal or processing sites.
- Processing and Recovery: Converting waste into usable materials, such as recycling.
- Disposal: Safe disposal of waste, typically in landfills or through incineration.

Proper management reduces environmental pollution, conserves resources, and ensures public health safety.