

Grade 10 Science Maharashtra 2024

PART - A

General Instructions:

1. All questions are compulsory.
2. Use of a calculator is not allowed.
3. The numbers to the right of the questions indicate full marks.
4. In case of MCQs [Q. No. 1(A)] only the first attempt will be evaluated and will be given credit.
5. Scientifically correct, labelled diagrams should be drawn wherever necessary.

PART - A

Q1. (A) Write the correct alternative:

[5]

(i). The SI unit of heat is _____.

- (A) Calorie
- (B) Joule
- (C) Kcal/kg °C
- (D) Cal/g °C

Solution:

(B) Joule

The SI unit of heat is **Joule (J)** because heat is a form of energy, and in the International System of Units (SI), energy is measured in joules.

(ii) We can see the sun even when it is little below the horizon because of _____.

- (A) Reflection of light
- (B) Refraction of light

- (C) Dispersion of light
- (D) Absorption of light

Solution:

- (B) Refraction of light

Refraction of light bends the sun's rays as they travel through Earth's atmosphere. This causes the sun to appear above the horizon even when it is actually below it.

(iii) _____ is the functional group of carboxylic acid.

- (A) -COOH
- (B) -CO-
- (C) -CHO-
- (D) -OH

Solution:

- (A) -COOH

-COOH is the functional group of carboxylic acid. It consists of a carbon atom double-bonded to an oxygen atom (C=O) and bonded to a hydroxyl group (-OH). This combination gives carboxylic acids their acidic properties.

(iv) In simple microscope lens is used.

- (A) Concave
- (B) Plano concave
- (C) Plano convex
- (D) Convex

Solution:

- (D) Convex

A simple microscope uses a **convex lens** to magnify objects. A convex lens is thicker in the middle than at the edges, which causes light rays to converge. This lens helps in creating a magnified image of the object, making it appear larger when viewed through the microscope.

(v) In process a layer of molten tin is deposited on metals.

- (A) Anodization
- (B) Tinning
- (C) Galvanizing
- (D) Alloying

Solution:

(B) Tinning

Tinning involves coating metals with a layer of molten tin. This process, also called 'kalhaae,' prevents damage caused by a greenish, poisonous layer that forms on copper or brass vessels. Such a layer can spoil food like buttermilk or curry placed in the vessel. Tinning protects the surface and keeps the food safe.

(B) Answer the following:

[5]

(i) Write the name of the atom having the smallest size.

Solution:

The atom with the smallest size is **helium (He)**. It has the smallest atomic radius because it has only two electrons, this pulls the electrons closer to the nucleus, making its atomic size very small.

(ii) Write the molecular formula of calcium carbonate.

Solution:

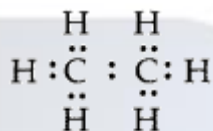
The molecular formula of calcium carbonate is CaCO_3 . Calcium carbonate is a common compound found in rocks such as limestone.

(iii) Write the use of 'Calorimeter'.

Solution:

Calorimeter is used to measure specific heat of an object.

(iv) Identify the hydrocarbon from the given electron-dot structure:



Solution:

The hydrocarbon from the given electron-dot structure is ethane.

(v) Match the columns:

Column 'A'	Column 'B'
Refractive index of water	(a) 1.31
	(b) 1.36
	(c) 1.33

Solution:

Column 'A'	Column 'B'
Refractive index of water	(c) 1.33

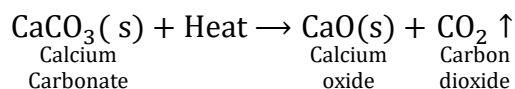
Q2. (A) Give scientific reasons (any two):

[4]

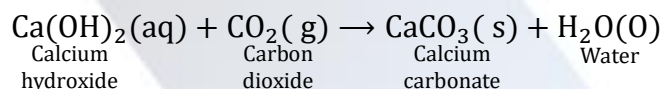
(i) When the gas formed on heating limestone, is passed through freshly prepared lime water, the lime water turns milky.

Solution:

When limestone is heated, calcium oxide and carbon dioxide gas are formed.



When carbon dioxide is passed through freshly prepared lime water, it turns milky because insoluble calcium carbonate forms in the solution.



(ii) Tungsten metal is used to make a solenoid type coil in an electric bulb.

Solution:

Tungsten is a strong metal with a very high melting point of 3380°C. When a bulb glows, it generates a lot of heat and reaches a high temperature. Tungsten is used because it can withstand the intense heat and high temperatures without melting.

(iii) On exposure to air, silver articles turn blackish after some time.

Solution:

Silver articles turn black over time when exposed to air. This happens because silver reacts with hydrogen sulfide in the air, forming a layer of silver sulfide (Ag_2S). This layer causes the blackish appearance on silver items.

(B) Answer the following (any three):

[6]

(i) State Dobereiner's law of triad. Give one example of it.

Solution:

Dobereiner's law of triads: In 1817, the German scientist Dobereiner suggested a link between the properties of elements and their atomic masses. He categorized elements into groups of three, known as triads, based on their similar chemical behavior.

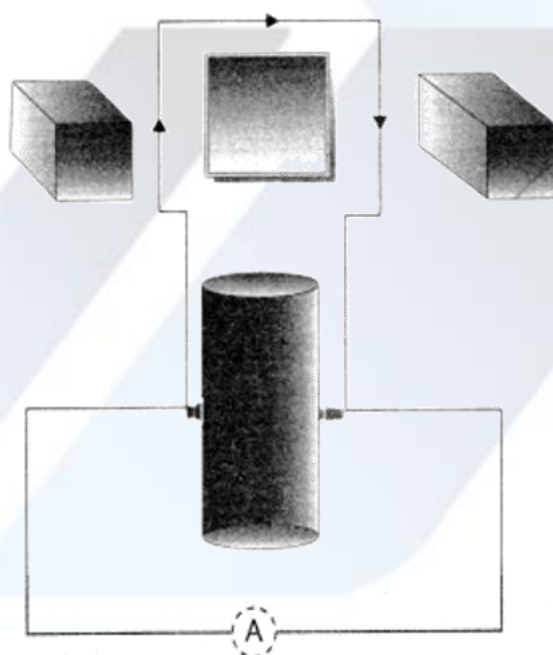
Dobereiner organized the elements within each triad in ascending order of atomic mass and noticed that the atomic mass of the middle element was roughly the average of the atomic masses of the first and third elements.

Elements like Lithium (Li), Sodium (Na), and Potassium (K) exhibit similar chemical properties and are organized in ascending order based on their atomic masses, which are 6.9, 23.0, and 39.1 g/mol, respectively. According to the law of triads, the atomic mass of Sodium (Na) should approximately equal the average of the atomic masses of Lithium (Li) and Potassium (K).

$$\text{Molecular mass of Sodium (Na)} = \frac{\text{Molecular mass of Lithium (Li)} + \text{Molecular mass of Potassium (K)}}{2}$$

$$\text{Atomic mass of sodium (Na)} = \frac{6.9 + 39.1}{2} = 23$$

(ii) Identify the figure and explain its use:



Solution:

The figure given is of a DC generator.

Use of D.C. generator:

- A DC generator transforms mechanical energy into electrical energy, producing it as direct current.
- DC generator is used in stable current generator, booster and arc lamps for lighting

purposes.

(c) DC generators are also used to reimburse the voltage drop within feeders.

(iii) What is meant by satellite launch vehicle? Name any one Indian satellite launch vehicle.

Solution:

A satellite launch vehicle is a type of rocket built to deploy satellites into specific orbits. One example of an Indian satellite launch vehicle is the **Polar Satellite Launch Vehicle (PSLV)**, developed by ISRO. The satellite intended for deployment is mounted on the uppermost section of the rocket's fourth stage.

(iv) What is free fall? When is it possible?

Solution:

Free fall refers to the movement of an object solely under the influence of gravity, with no interference from air resistance. This phenomenon is possible only in a vacuum or in the absence of air resistance. For instance, when a ball and a feather are dropped from the same height, the feather falls slower because of air resistance. However, in a vacuum, both the ball and the feather will descend at the same rate and hit the ground at the same time.

(v) The focal length of a convex lens is 20 cm. What is its power?

Solution:

Given: focal length = 20 cm

To find:

Power

Formula : $P = \frac{1}{f}$

Calculation: 1 m = 100 cm

Focal length = 0.2 m

$P = \frac{1}{0.2}$

$P = 5D$

Thus, the power of convex lens is +5D.

Q3. Answer the following (any five): [15]

(i) Select the appropriate options and complete the following paragraph:
(Metals, non-metals, metalloids, four, seven, s-block, p-block, d-block,/-block).

On the basis of electronic configuration, elements in the modern periodic table are classified into _____ blocks. Groups 1 and 2 elements are included in ____ and all these elements are metals, (except, Hydrogen). Group 13 to 18 elements are included in _____. This block contains metals, non-metals and metalloids. Group 3 to 12 elements are included in _____ and all the elements are _____ elements shown at the bottom of the periodic table i.e. Lanthanides and Actinides constitute _____ and all these elements are metals.

Solution:

On the basis of electronic configuration, elements in the modern periodic table are classified into **four** blocks. Group 1 and 2 elements are included in **s-block** and all these elements are metals. Group 13 to 18 elements are included in **p-block**. This block contains metals, non-metals and metalloids. Group 3 to 12 elements are included in **d-block** and all the elements are **metals** elements shown at the bottom of the periodic table i.e. Lanthanides and Actinides constitute **f-block** and all these elements are metals.

(ii) (a) What are the factors affecting the rate of chemical reaction?

(b) Explain any one factor.

Solution:

(a) Factors that affects the rate of chemical reaction are:

- Nature of reactant.
- Size of the particles of reactants.
- Concentration of the reactants.
- Temperature of the reaction.

- Catalyst.

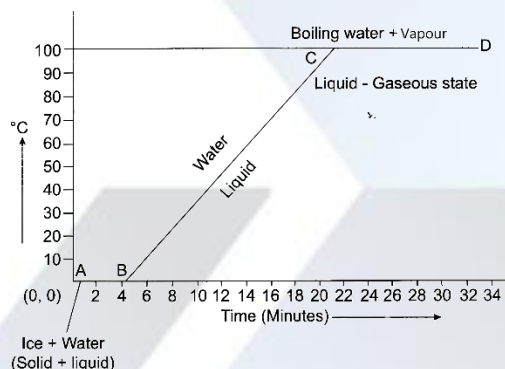
(b) Catalyst: “The substance in whose presence the rate of a chemical reaction increases, without causing any chemical change to it, is called a catalyst.”

For example, potassium chlorate (KClO_3) decomposes slowly when heated.



Reducing the particle size or raising the reaction temperature has minimal impact on accelerating the reaction. However, when manganese dioxide (MnO_2) is introduced, potassium chlorate (KClO_3) decomposes quickly, releasing oxygen gas. MnO_2 remains chemically unchanged throughout the process, functioning purely as a catalyst.

(iii) Observe the following graph and answer the following questions:



- What does the graph represent?
- What does the line AB represent?
- What does the line BC represent?

Solution:

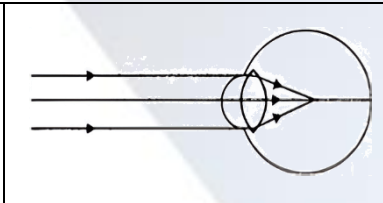
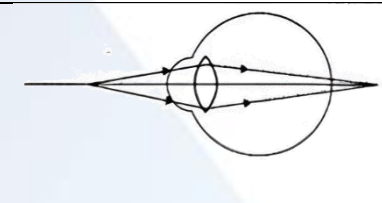
- The graph represents latent heat of phase transformation.
- Line AB represents the conversion of ice into water at constant temperature.
- Line BC represents rise in temperature of water from 0°C to 100°C

(iv) Complete the following table by observing the given figures:

Figure →		
Points ↓		

(a) Name the defect		
(b) Position of the image		
(c) Lens used to correct the defect		

Solution:

Figure→		
Points ↓		
(a) Name the defect	Nearsightedness/myopia	Farsightedness/Hypermetropia
(b) Position of the image	In the front of the retina	Behind the retina
(c) Lens used to correct the defect	Concave lens is used to correct the defect	Convex lens is used to correct the defect

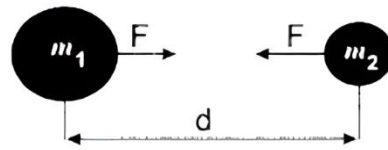
(v) Write any three general properties of ionic compounds.

Solution:

General properties of ionic compounds:

- i. Ionic compounds are solid and hard due to the strong attraction between their positively and negatively charged ions.
- ii. They are brittle and tend to break into smaller fragments when subjected to pressure.
- iii. These compounds dissolve well in water.
- iv. Their high melting and boiling points result from the strong forces holding their ions together.

(vi) Observe the figure and answer the questions:



- (a) State Newton’s universal law of gravitation.
- (b) If the distance between the two bodies is tripled, how will the gravitational force between them change?
- (c) What will happen to gravitational force, if mass of one of the object is doubled?

Solution:

(a) Newton’s universal law of gravitation states that every object in the universe exerts an attractive force on every other object. This force is proportional to the product of their masses and inversely proportional to the square of the distance separating them.

$$F \propto m_1m_2 \dots\dots\dots(i)$$

$$F \propto 1/d^2 \dots\dots (ii)$$

by (i) and (ii)

$$F \propto m_1m_2 / d^2$$

$$F = Gm_1m_2 / d^2$$

Where, G = universal gravitational constant.

(b) When the distance between two objects is tripled, the gravitational force decreases by a factor of 9.

(c) If the mass of one object is doubled, the gravitational force will also double, as gravitational force is directly proportional to the mass of the objects.

(vii) The orbit of a satellite is exactly 35780 km above the earth’s surface and its tangential velocity is 3.08 km/s.

How much time the satellite will take to complete one revolution around the earth?

(Radius of earth = 6400 km.)

Solution:

Given: Height of the satellite above the earth’s surface = 35780 km

Tangential velocity of the satellite = 3.08 km/sec.

If the satellite completes one full orbit around the Earth in T seconds, the distance it travels in that time is equivalent to the circumference of its circular orbit.

If r is the radius of the orbit, the satellite will travel a distance of $2\pi r$ during one revolution.

Thus, the time required for one revolution can be obtained as follows:

$$v = \text{Distance} / \text{Time} = \text{Circumference} / \text{Time}$$

$$v = 2\pi x / T \quad [\because x = (r + h)]$$

$$T = 2\pi(r+h)/v$$

$$= [2 \times 3.14 \times (6400 + 35780)] / 3.08$$

$$= 86003.38 \text{ sec.}$$

$$= 23.89 \text{ hours}$$

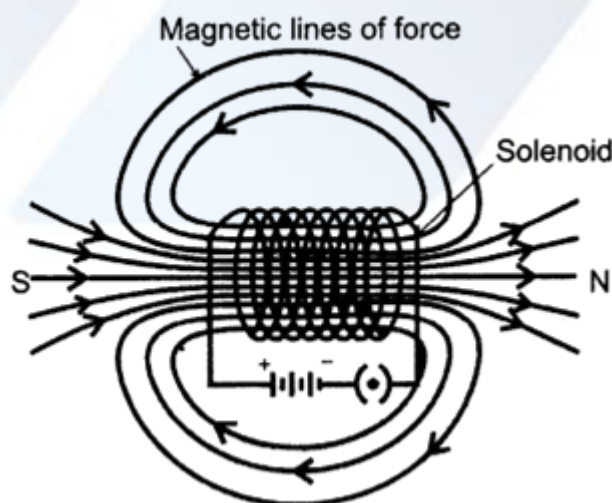
$$= 23 \text{ hours } 54 \text{ minutes}$$

Thus, satellite takes 23 hours and 54 minutes to complete one revolution around the earth.

(viii) What is a solenoid? Draw a neat diagram and name its various components.

Solution:

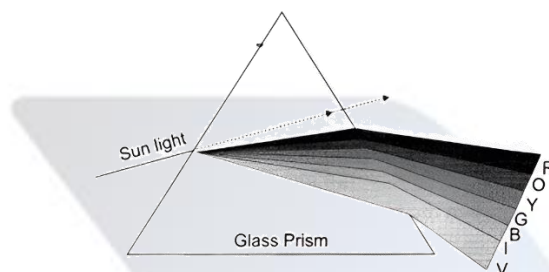
A solenoid is created by coiling a copper wire, typically coated with a resistive layer, into multiple loops. As an electric current passes through the solenoid, it generates a magnetic field with specific lines of force. The magnetic field generated by the solenoid resembles that of a bar magnet, with one end acting as the north pole and the other as the south pole.



Q4. Answer the following questions (any one):

[5]

(i) Observe the following diagram and answer the questions:

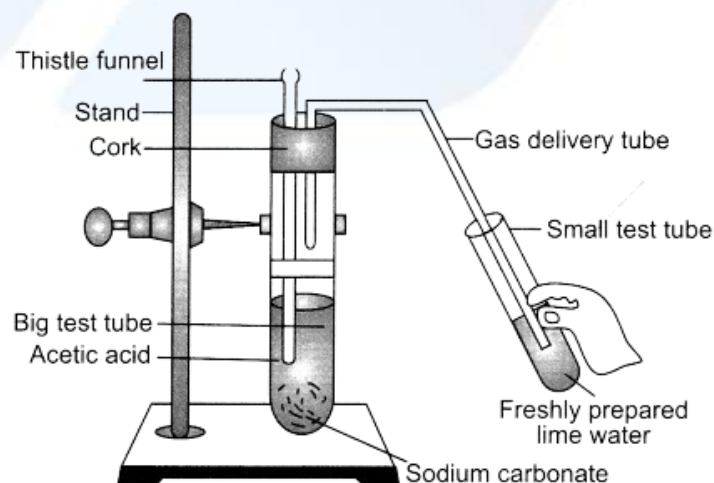


- Name the process shown in the figure.
- Name the colour that deviates the most.
- Name the colour that deviates the least.
- Name any one phenomenon in the nature which is based on the above process.
- Define 'spectrum'.

Solution:

- The process shown in figure is Dispersion of light
- Violet colour deviates the most
- Red colour deviates the least
- Rainbow is the phenomenon in nature which is based on above process.
- The band of coloured components of a light beam is called as spectrum.

(ii) Observe the diagram given below and answer the questions:



- (a) Name the reactants in this reaction.
- (b) Which gas comes out as effervescence in the bigger test tube?
- (c) What is the colour change in the lime water?
- (d) In the above experiment instead of sodium carbonate which chemical can be used to get same products?
- (e) Write the use of acetic acid.

Solution:

- (a) Acetic acid (CH_3COOH) and sodium carbonate (Na_2CO_3) are the reactants in given reaction.
- (b) Carbon dioxide (CO_2) comes out as effervescence in the bigger test tube.
- (c) Carbon dioxide gas is passed through lime water, it turns lime water milky or cloudy due to formation of calcium carbonate.
- (d) Sodium bicarbonate is used instead of sodium carbonate to get same products.
- (e) Acetic acid is used as vinegar and is helpful in cooking.
It is used to produce dyes, perfumes, esters, etc.

PART - B

Q1. (A) Choose and write correct option number as answer: [5]

- (i) Regeneration occurs in _____.
- (A) amoeba
- (B) paramoecium
- (C) euglena
- (D) planaria

Solution:

(D) planaria
Regeneration occurs in planaria. Planaria are flatworms capable of regenerating their body parts. If a planaria is cut into pieces, each piece can grow into a complete organism.

- (ii) Lactobacillus brevis gives us the beverage _____.

- (A) cocoa
- (B) coffee
- (C) wine
- (D) cider

Solution:

- (B) coffee

Lactobacillus brevis helps in coffee production by breaking down the sticky pulp around the beans. This process helps separate the seeds from the fruit, an important step before roasting.

(ii) A minor change occurs due to change in position of any nucleotide is termed as _____.

- (A) transcription
- (B) translocation
- (C) mutation
- (D) translation

Solution:

- (C) mutation

A minor change occurs due to change in position of any nucleotide is termed as mutation. A mutation is a change in the DNA sequence of an organism.

(iv) Atomic power plant in Maharashtra is _____.

- (A) Chandrapur
- (B) Koyana
- (C) Tarapur
- (D) Anjanwel

Solution:

- (C) Tarapur

Atomic power plant in Maharashtra is in Tarapur.

(v) Example of phylum Arthropoda is _____.

- (A) scorpion
- (B) starfish
- (C) earthworm
- (D) hydra

Solution:

(A) scorpion

Example of phylum Arthropoda is a scorpion. These animals have jointed appendages. Hence, they are called arthropods.

(B) Solve the following:

[5]

(i) Pick the odd man out:

duckbill platypus, pomfret, lungfish, peripatus.

Solution:

Odd one: Pomfret.

Pomfret is the only one that is a typical marine fish and does not have any unique evolutionary adaptations like the others.

(ii) Write co-relation :

Skin : Melanin :: Pancreas : _____

Solution:

Skin: Melanin :: Pancreas: **Insulin**

Insulin is a hormone produced by the beta cells of the pancreas. It regulates blood sugar levels by facilitating the uptake of glucose into cells.

(iii) State true or false :

Production of various useful aquatic organisms with the help of water is called blue revolution.

Solution:

True. **Blue Revolution** refers to the significant increase in the production of aquatic organisms (such as fish, shellfish, and other seafood) through aquaculture and the sustainable management of water resources.

(iv) Write full form of WHO.

Solution:

The full form of WHO is World Health Organization. It is a specialized agency of the United Nations responsible for international public health. Established on April 7, 1948.

(ii) Match the pair:

'A'	'B'
(1) Male	(a) 44 + XX
	(b) 44 + XY
	(c) 44 + YY

Solution:

(1) Male: (b) 44 + XY

In humans, males typically have a chromosomal composition of **44 + XY**.

Q2. (A) Give scientific reasons (any two): [4]

(i) Though tortoise lives on land as well as in water, it cannot be included in class-Amphibia.

Solution:

Tortoises breathe using lungs and deposit hard-shelled eggs on land, whereas amphibians rely on their moist skin for respiration and lay eggs coated in a jelly-like substance in aquatic environments.

(ii) Hydroelectric energy, solar energy and wind energy are called renewable energies.

Solution:

Hydroelectric power, solar power, and wind power come from sources that renew themselves naturally and won't run out, unlike fossil fuels.

(iii) We feel tired after exercise.

Solution:

When you exercise, your muscles produce lactic acid because of anaerobic respiration, which can cause tiredness.

(B) Answer any three of the following:

[6]

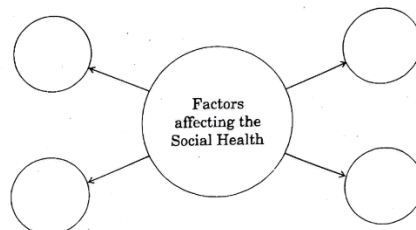
(i) Write four adverse effects of radiations on human body.

Solution:

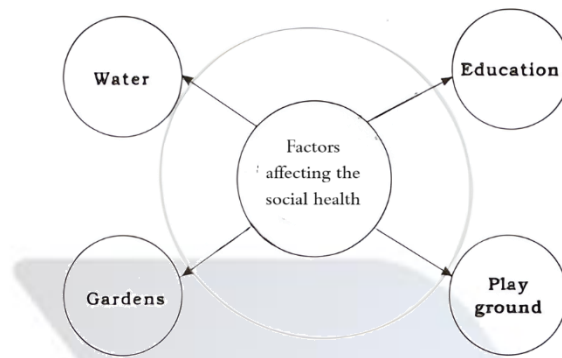
Four harmful effects of radiation on the human body:

1. Damage to DNA
2. Higher chances of developing cancer
3. Reduced ability to have children
4. Skin burns and related skin problems

(ii) Redraw and complete the given chart.



Solution:



(iii) Write any four important facts which must be thought over while considering the scope of disaster.

Solution:

Disaster management can be broken down into four main stages:

- i. Pre-Disaster Phase: This stage is about getting ready. It includes identifying risks, planning how to use resources, and preparing evacuation strategies.
- ii. Warning Phase: During this stage, potential threats are monitored, and alerts are sent out to ensure people are prepared.
- iii. Emergency Phase: This is when immediate action is taken, such as rescuing people, providing medical help, and evacuating affected areas while evaluating the disaster's impact.
- iv. Transitional Phase: The focus here is on recovery. Efforts are made to restore basic services, offer financial support, and help victims rebuild their lives by creating livelihood opportunities.

(iv) Name two fuels obtained by microbial processes. Why is it necessary to increase the use of such fuels?

Solution:

Two fuels produced through microbial processes are:

1. Ethanol: Made by *Saccharomyces* during the fermentation of molasses. It is a smokeless fuel often blended with petrol to lower emissions.
2. Methane: Created when microbes break down waste in the absence of oxygen.

Why use them more?

These fuels are renewable, eco-friendly, and cause less pollution compared to fossil fuels, making them better for the environment and a sustainable energy option.

(v) What is DNA fingerprinting? Where is it mainly useful?

Solution:

Each person's DNA sequence is as unique as their fingerprints. Because of this, a person's identity can be determined using their DNA. This process is known as DNA fingerprinting. It is used for paternity tests, forensic analysis, and identifying genetic connections between individuals.

Q3. Answer any five :

[15]

- i. (a) What are vitamins?
- (b) Classify them according to their solubility.
- (c) Give one example of each type as per above classification.

Solution:

(a) Vitamins are essential organic nutrients needed in small quantities for healthy growth and proper body function.

(b) Types of vitamins:

1. Water-soluble vitamins: These cannot be stored in the body and need to be consumed regularly. Any extra amount is removed through urine.
2. Fat-soluble vitamins: These are absorbed along with fats and stored in the body's fatty tissues and liver.

(c) Example of water-soluble vitamin: Vitamin C

Example of fat-soluble vitamin: Vitamin A

(ii) Explain the following terms:

- (a) Stem cells
- (b) Cloning
- (c) Genetically modified crops.

Solution:

- (a) **Stem Cells:** Stem cells are special cells found in multicellular organisms that have the ability to transform into different types of cells. During early development, a zygote gives rise to a group of identical cells called stem cells, which act as the building blocks for all other cells in the body.
- (b) **Cloning:** Cloning is the process of creating organisms that are genetically identical to each other.
- (c) **Genetically Modified Crops:** These are plants that have been altered through genetic engineering to exhibit specific characteristics, such as resistance to pests.
- (iii) Complete the given paragraph by filling the blank spaces from the options given in the bracket.

{oxygen, pyridines, mechanical, CO₂, petroleum, fatal, polyester, norcadia}

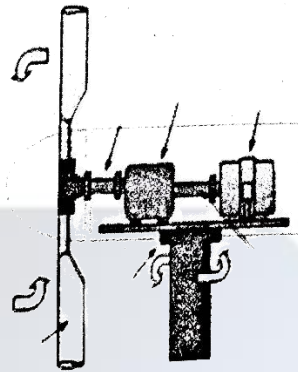
Spilling of _____ oil occurs in ocean due to various reasons. This oil may prove _____ and toxic to aquatic organisms. It is not easy to remove the oil layer from surface of water by _____ method.

However, bacteria like *Pseudomonas* spp. and *Alcanovorax borkumensis* have to ability to destroy the _____ and other chemicals. Hence, these bacteria are used to clear the oil spills. These are called as hydrocarbonoclastic bacteria (HCB). HCB decompose the hydrocartons and bring about the reaction of carbon with _____. _____ and water is formed in this process.

Solution:

Spilling of **petroleum** oil occurs in oceans due to various reasons. This oil may prove **fatal** and toxic to aquatic organisms. It is not easy to remove the oil layer from the surface of water by **mechanical** methods. However, bacteria like *Pseudomonas* spp. and *Alcanovorax borkumensis* have the ability to destroy **pyridines** and other chemicals. Hence, these bacteria are used to clear oil spills. These are called hydrocarbonoclastic bacteria (HCB). HCB decompose hydrocarbons and bring about the reaction of carbon with **oxygen**. CO₂ and water is formed in this process.

(iv) Observe the given picture and answer the questions.



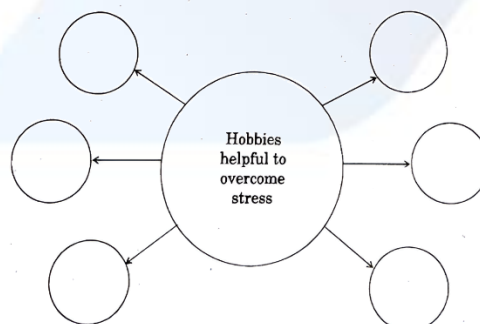
Questions:

- (a) Identify the given diagram.
- (b) What is the source of energy in this project?
- (c) Why is this source supposed to be ecofriendly?

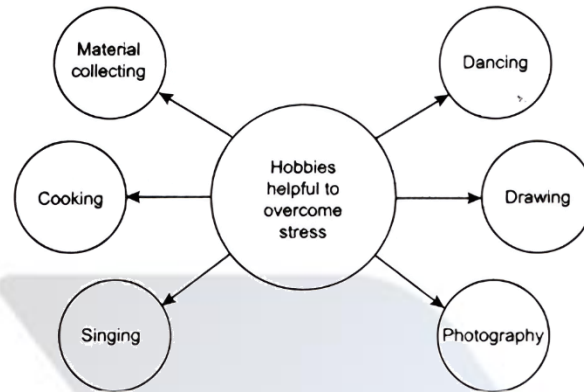
Solution:

- (a) The diagram shows the parts of a windmill, including the blades, shaft, gearbox, generator, bearings, and the tower that supports it.
- (b) Wind powers this system. The blades capture the wind's energy, turning it into mechanical energy as they spin the shaft connected to the gearbox and generator.
- (c) Wind energy is clean and sustainable because it is renewable and produces electricity without releasing pollutants or harmful waste.

(v) Complete the following chart:



Solution:



(vi) Write name of any six materials which are to be in the first aid box.

Solution:

Materials in first-aid box are:

- (a) Hand gloves
- (b) Antiseptic
- (c) Scissor
- (d) Bandages
- (e) Band aids
- (f) Medicated cotton

(vii) (a) Define vestigial organs.

(b) Write names of any two vestigial organs in the human body.

(c) Write name of those animals in which these vestigial organs are functional.

Solution:

(a) Vestigial organs are underdeveloped or non-functional structures in organisms that have lost their original purpose.

(b) Examples of vestigial organs in humans include:

1. Appendix
2. Wisdom teeth
3. Ear pinna
4. Tailbone

(c) Examples of functionality in other animals:

1. The appendix aids in cellulose digestion in ruminants.

2. The ear pinna is functional in animals like rabbits, cows, and horses, helping to enhance hearing.

(viii) Read the statements and answer accordingly:

(a) Calcareous spines are present on the body. Tube feet are used for locomotion and capturing prey also.

- Identify the phylum and give one example.

(b) I live in your small intestine. Pseudocoelom is present in my thread like body.

- Identify the phylum and give one example.

(c) My body is spindle shaped. I respire with the help of gills.

- Identify my class and give one example.

Solution:

(a) Phylum: Echinodermata

Example: Starfish, sea cucumber, sea urchin, brittle star, and similar marine animals.

(b) Phylum: Aschelminthes

Example: Organisms such as Ascaris, Loa-loa, and Filarial worm.

(c) Class: Pisces

Example: Species like shark, rohu, pomfret, stingray, among others.

Q4. Answer any one:

[5]

i. Answer the following questions based on human male reproductive system:

(a) In which organ sperms are formed?

(b) What is the length of a sperm?

(c) What is the work of vas deferens?

(d) By which type of cell division, sperms are formed?

(e) Name any two unpaired organs of male reproductive system.

Solution:

(a) Sperms are formed in the testes.

(b) The length of a sperm is approximately 0.05 mm.

(c) The vas deferens transports sperm from the epididymis to the urethra for ejaculation.

(d) Sperms are formed by meiotic cell division.

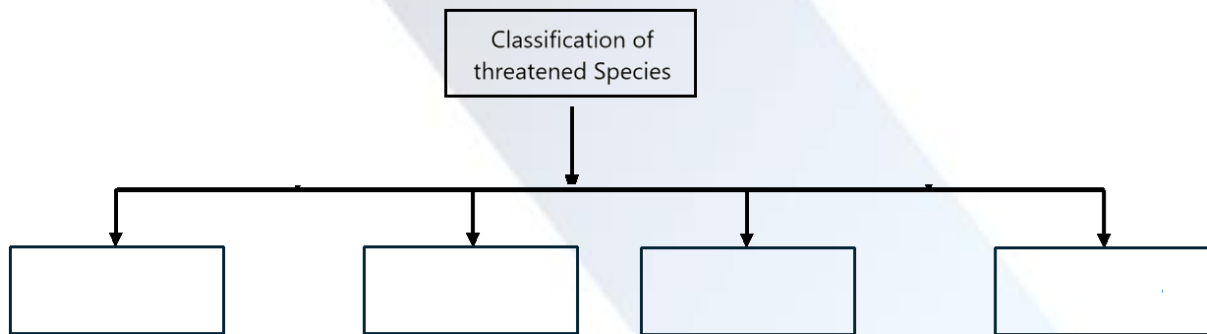
(e) Two unpaired organs of the male reproductive system are:

- Prostate gland
- Urethra

ii. Answer the following questions based on environmental conservation and biodiversity :

(a) Complete the flow chart:

[2]



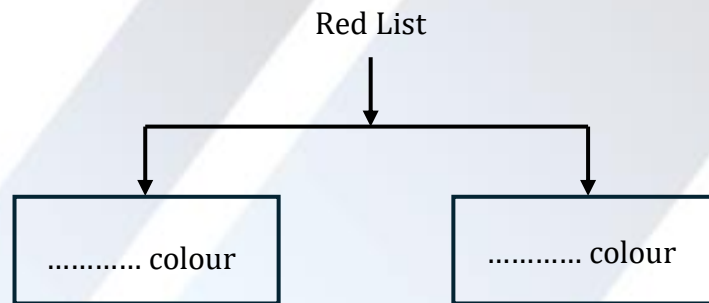
(b) How can biodiversity be conserved? Give any four points.

[2]

(c) Complete the flow chart:

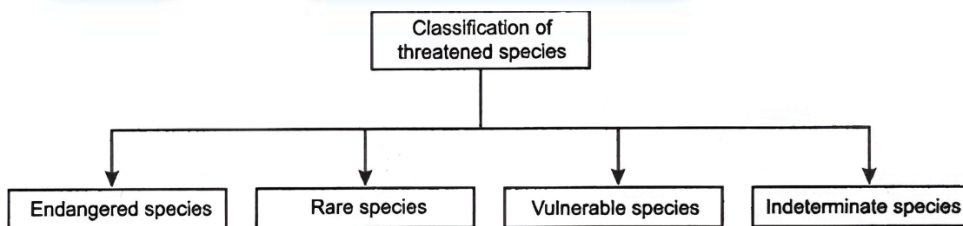
[1]

Colour of the pages in Red List of Endangered Species.



Solution:

(a)



(b)

Biodiversity can be conserved by:

1. Safeguarding rare species of living beings.
2. Creating national parks and wildlife sanctuaries.
3. Designating certain areas as **bioreserves**.
4. Implementing programs to protect specific species.
5. Preserving all types of plants and animals.
6. Following conservation laws and guidelines.

(c)

