

Grade 10 Science Maharashtra 2022

PART A

Note :-

- (i) All questions are compulsory.
- (ii) Use of a calculator is not allowed.
- (iii) The numbers to the right of the questions indicate full marks.
- (iv) In case of MCQs (Q. No. 1(A)) only the first attempt will be evaluated and will be given credit.
- (v) For each MCQ, the correct alternative (A), (B), (C) or (D) with subquestion number is to be written as an answer.
- (vi) Scientifically correct, labelled diagrams should be drawn wherever necessary.

1. (A) Write the correct alternative :

Q1. Gold plated ornaments is the example of .

- (a) electroplating
- (b) alloying
- (c) anodizing
- (d) galvanising

Solution:

- (a) electroplating

Q2. The functioning of the satellite launch vehicle is based on _____.

- (a) Newton's first law of motion
- (b) Newton's second law of motion
- (c) Newton's third law of motion
- (d) Newton's universal law of gravitation

Solution:

- (b) Newton's third law of motion

Q3. _____ is one of the combustible components of L.P.G.

- (a) Ethane
- (b) Propane
- (c) Methane
- (d) Ethene

Solution:

- (b) Propane

Q4. The power of a convex lens of the focal length 25 cm is _____.

- (a) 4.0 D
- (b) 0.25 D
- (c) -4.0 D
- (d) - 0.4 D

Solution:

- (a) 4.0 D

$$\begin{aligned} \text{Power} &= 1/f; \text{ where } f \text{ is in meters.} \\ &= 1/0.25 \\ &= 4.0\text{D} \end{aligned}$$

Q5. _____ colour is deviated the least in the spectrum of white light obtained with a glass prism.

- (a) Red
- (b) Yellow
- (c) Violet
- (d) Blue

Solution:

Red

(B) Answer the following :

Q1. Find the odd one out:

- (a) INSAT

(b) GSAT

(c) IRS

(d) PSLV

Solution:

(d) PSLV

Q2. Complete the correlation:

Group 1 : Alkali metals : : _____ : Halogens

Solution:

Group 17

Q3. Match the correct pair.

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

Solution:

c) 1.33

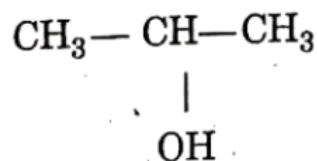
Q4. State True or False:

An electric motor converts mechanical energy into electrical energy.

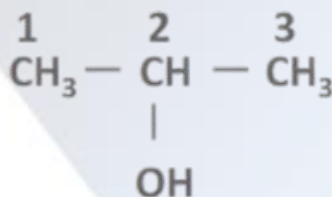
Solution:

False

Q5. Write the IUPAC name of the following structural formula :



Solution:



Nomenclature:

Prefix + Word root + Primary suffix + Secondary suffix

Prop ane 2-ol

-IUPAC name: propan-2-ol

2. A. Give scientific reasons:

Q1. Atomic radius goes on increasing down the group.

Solution:

As we move down a group, the atomic number increases causing the number of electrons and shells to increase. This results in an increase in atomic radius down the group.

Q2. Simple microscope is used for watch repairs.

Solution:

- A simple microscope has a convex lens that has the ability to produce enlarged as well as erect images of an object.
- Simple microscopes are used by watchmakers to see the small parts and screws of the watch while repairing it.

Q3. It is recommended to use airtight container for strong oil for a long time.

Solution:

Oil, when kept aside for a long time, undergoes oxidation. This causes the oil to develop an unpleasant smell and taste. Hence, it is recommended to store oil in air-tight containers to slow down the oxidation reaction.

B. Answer the following: [6]

Q1. An object takes 5 s to reach the ground from a height of 5 m on a planet. What is the value of 'g' on the planet?

Solution:

Given:

$$t = 5 \text{ s}$$

$$s = 5 \text{ m}$$

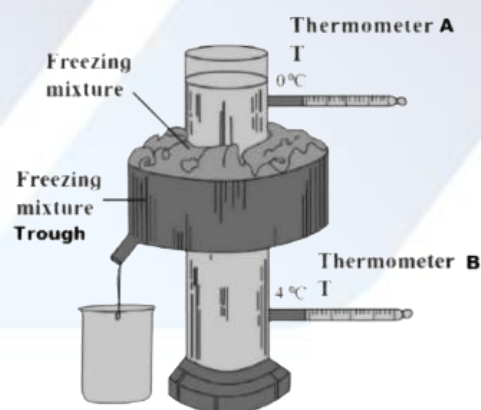
$$u = 0 \text{ m/s}$$

$$\text{Using : } s = ut + \frac{1}{2}at^2$$

$$5 = 0 + \frac{1}{2}g5^2$$

$$\text{Solving } g = 0.4 \text{ m/s}^2$$

Q2. Draw a neat labelled diagram of Hope's Apparatus.



Q3. State the laws of refraction

Solution:

- a) The incident ray, normal and refracted ray all lie in the same plane at the point of incidence.
- b) The ratio of sine of angle of incidence to sine of angle of refraction is constant,

for the light of a given colour and for the given pair of media.

Q4. a) Name the main ore of aluminium.

Solution :

The main ore of aluminium is bauxite ($\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$).

b) What impurities are present in aluminium ore?

Solution:

The ore contains titanium oxide, iron oxide and silicon dioxide as impurities.

Q5. Observe the given figure of Fleming's Left Hand Rule and write the labels of 'A' and 'B'.



Solution:

A: Magnetic Field

B: Current

3. Answer the following: (any five)

[15]

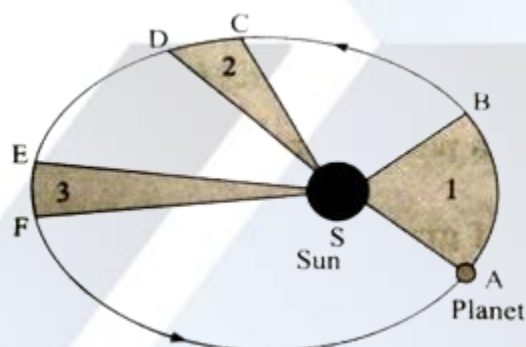
Q1. Write the demerits of Mendeleev's periodic table.

Solution:

Demerits of Mendeleev's Periodic Table

- **Uncertain Position of Hydrogen:** The placement of hydrogen in the periodic table was ambiguous as it resembled both alkali metals and halogens, making its position unclear.
- **Violation of Atomic Mass Order:** In some instances, elements were not arranged strictly in the increasing order of their atomic masses to maintain grouping based on similar chemical properties.
- **Inability to Accommodate Isotopes:** The table could not justify the placement of isotopes, as they have the same chemical properties but different atomic masses.

Q2. State the laws related to the given diagram :



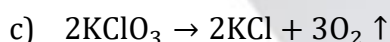
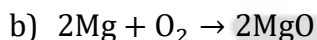
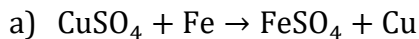
Solution:

The laws related to the given diagram are Kepler's three laws of planetary motion. They can be described as follows:

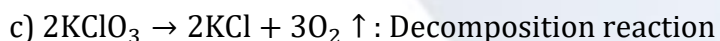
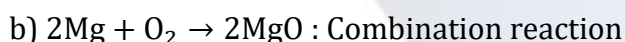
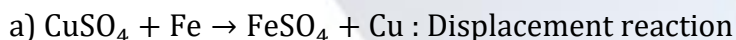
- **The Law of Ellipses:** The path of the planets about the sun is elliptical in shape, with the center of the sun being located at one focus.
- **The Law of Equal Areas:** An imaginary line drawn from the center of the sun to the center of the planet will sweep out equal areas in equal intervals of time.
- **The Law of Harmonies:** The ratio of the squares of the periods of any two planets is equal to the ratio of the cubes of their average distances from the

sun.

Q3. Identify the type of chemical reaction given below:



Solution:



Q4. If the speed of light in a medium is 1.5×10^8 m/s, what is the absolute refractive index of the medium? (Speed of light in vacuum = 3×10^8 m/s)

Solution:

$$\text{Refractive index} = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}} = 2$$

Q5. Read the following paragraph and answer the question based on it:

If heat is exchanged between a hot and cold object, the temperature of the cold object goes on increasing due to the gain of energy and the temperature of the hot object goes on decreasing due to the loss of energy.

The change in temperature continues till the temperature of both objects attains the same value. In this process, the cold object gains heat energy and the hot object loses heat energy. If the system of both objects is isolated from the environment by keeping it inside a heat resistant box, then no energy can flow from the environment by keeping it inside a heat-resistant box, then no energy can flow from inside the box or come into the box.

a) Heat is transferred from where to where?

b) Which principle do we learn about from this process?

c) How will you state the principle briefly?

Solution:

- a) Heat is transferred from a body at a higher temperature to a lower temperature.
- b) We learn the principle of Heat Transfer.
- c) Heat is a form of energy. Heat always flows from a hot body to a cold body.

Q6. Complete the following table for convex lens :

S No.	Position of the object	Position of the image	Nature of the image
1	Beyond $2F_1$		
2		At infinity	
3			Real, inverted & enlarged.

Solution:

S No.	Position of the object	Position of the image	Nature of the image
1	Beyond $2F_1$	Between F_2 & $2F_2$	Real, inverted & diminished.
2	At F_1	At infinity	Real, inverted & highly enlarged.
3	Between F_2 & $2F_2$	Beyond $2F_1$	Real, inverted & enlarged.

Q7. Explain the following terms:

- (a) Metallurgy

Solution:

The different processes involved in the extraction of metals from their ores and refining are known as metallurgy.

(b) Ores

Solution:

The minerals from which the metals can be extracted conveniently and profitably are known as ores.

(c) Gangue

Solution:

The unwanted impurities like soil, sand, earthy particles, limestone, rocky material, mica, etc., present in an ore are known as gangue.

Q8. State the importance of Space Mission.

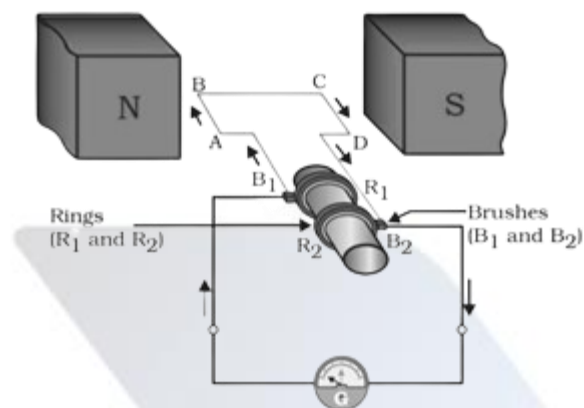
Solution:

Importance of Space Missions:

- **Global Connectivity:** Space missions have made the world more connected by enabling instant communication with people in any part of the world.
- **Access to Information:** The internet, made possible by satellites, provides access to information about global events at our fingertips, enhancing knowledge and awareness.
- **Disaster Management:** Satellites provide early warnings about natural calamities like cyclones, earthquakes, and tsunamis, helping save lives and reduce damage.

4. Answer any one of the following questions: [5]

Q1. Observe the following diagram and answer the questions given below:



a) Identify the above diagram:

Solution:

AC Generator

b) State the principle of an electric generator?

Solution:

Electric generators operate on the principle of electromagnetic induction. In these devices, mechanical energy is converted into electrical energy by rotating a conductor within a magnetic field, thereby generating electricity.

c) Write the working of the above apparatus?

Solution:

- i) A rectangular coil is rotated within a uniform magnetic field, connected to a center-reading meter via metal brushes that make contact with two slip rings (or commutator rings).
- ii) The slip rings and brushes ensure a continuous connection between the rotating coil and the meter.
- iii) As the coil rotates:
 - The pointer on the meter deflects first in one direction, then in the opposite direction, and repeats this cycle.

- This occurs because the coil cuts through magnetic field lines, inducing an EMF and current within the coil.

iv) The pointer deflects alternately in both directions as the current in the circuit continuously changes direction during the coil's rotation.

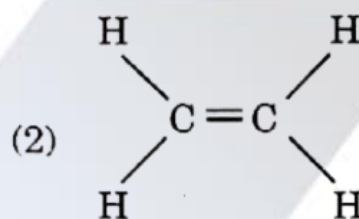
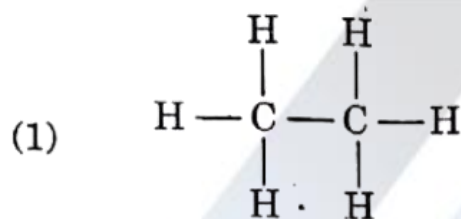
This is due to the repeated change in direction of the induced EMF as the coil spins.

v) The alternating EMF and current persist as long as the coil continues to rotate.

Use of the appliance:

This device functions as an alternating current (AC) generator, which is widely used to produce electricity in power plants and various other applications.

Q2. (a) Identify the saturated and unsaturated hydrocarbon from the given structural formula: [2]



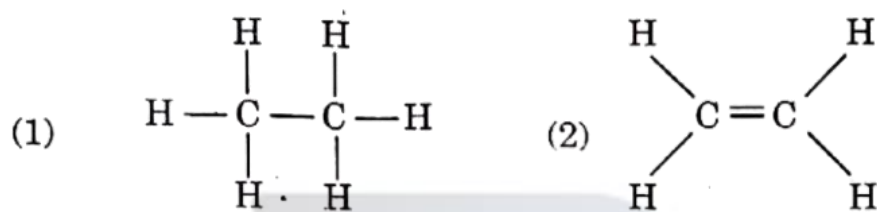
Solution:

Here, the hydrocarbons represented in (1) and (2) are ethane and ethene respectively.

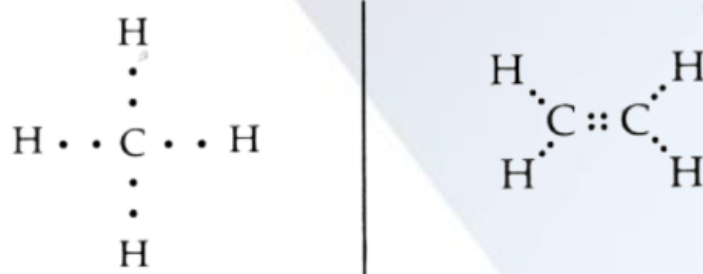
(b) Draw electron dot structure for (1) and (2).

[1]

Solution:



The dot electron structure will be as follows:



(c) Define homologous series.

[1]

Solution:

- A group of organic compounds with similar structures and chemical properties in which the successive compounds differ by $-\text{CH}_2$ group is known as the homologous series.
- For example, methane (CH_4) and ethane (C_2H_6) belong to the same homologous series.

Part B

1. (A) Write the correct alternative.

[5]

Q1. Bones contain _____ amino acids.

(a) Melanin

(b) Haemoglobin

- (c) Ossein
- (d) Insulin

Solution:

- (c) Ossein

Q2. Giant squirrel is an example of a/an _____ threatened species.

- (a) Endangered
- (b) Rare
- (c) Vulnerable
- (d) Indeterminate

Solution:

- (c) Indeterminate

Q3. Human being belongs to _____ class.

- (a) Mammalia
- (b) Amphibia
- (c) Reptilia
- (d) Cyclostomata

Solution:

- (a) Mammalia

Q4. Organs like _____ can be donated after death.

- (a) Skin
- (b) Heart
- (c) Lungs
- (d) Bones

Solution:

- (a) Skin, (b) Heart, (c) Lungs, (d) Bones (All of these are correct)

Q5. Volcano is a _____ disaster.

- (a) Social

- (b) Political
- (c) Biological
- (d) Geological

Solution:

(d) Geological

(B) Answer the following:

[5]

Q1. Find the odd one out:

Earthquake, Flooding, Tsunami, War

Solution:

The odd one out in Earthquake, Flooding, Tsunami, War is **War**.

Q2. State true or false:

Oxidation of proteins is carried out in aerobic respiration.

Solution:

True.

In aerobic respiration, proteins can be oxidized to produce energy.

Q3. Complete the correlation: Western ghat: Asiatic lion:: Sunderban sanctuary:

_____.

Solution:

Western ghat: Asiatic lion:: Sunderban sanctuary: **Tiger**

Western Ghat is associated with the Asiatic lion, just as the Sunderban sanctuary is associated with the tiger.

Q4. Which type of fuel is used in thermal power plant?

Solution:

Fuels such as coal, oil, or natural gas are commonly used in thermal power plants.

Q5. Identify the picture and name it.



Solution:

Laughter club

2. (A) Give scientific reasons: [4 marks]

Q1. Cell division is one of the important properties of cell and organisms.

Solution:

Cell division is a fundamental process in which a parent cell divides to form two or more daughter cells. It plays a crucial role in the growth, development, and maintenance of living organisms.

- In unicellular organisms, cell division is essential for reproduction, leading to the formation of new organisms.
- In asexual reproduction, mitosis ensures the production of genetically identical offspring, while in sexual reproduction, meiosis generates haploid gametes necessary for fertilization.
- It is vital for wound healing, tissue repair, and the production of new blood cells, ensuring the survival and proper functioning of an organism.
- Thus, cell division is a fundamental property of cells and living organisms.

Q2. Cockroach belongs to phylum Arthropoda.

Solution:

- Cockroaches are classified under the phylum Arthropoda because:

- **Exoskeleton:** They have a hard, chitinous exoskeleton that protects their body.
- **Segmented Body:** Their body is divided into distinct segments, typically into the head, thorax, and abdomen. Such segmentation is characteristic of arthropods, allowing for specialization of different body regions.
- **Jointed Appendages:** They possess jointed legs and antennae which aid in movement.
- **Bilateral Symmetry:** Cockroaches, like all arthropods, exhibit bilateral symmetry, meaning their body can be divided into mirror-image halves along a single plane.
- These features are the key characteristics of arthropods.

Q3. Power generation plant based on natural gas is eco-friendly.

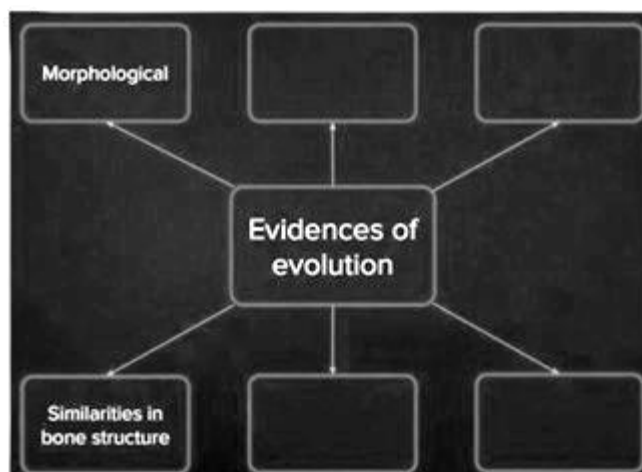
Solution:

Power generation plant based on natural gas is eco-friendly because:

- Natural gas emits 50-60 percent less carbon dioxide in power plants than regular oil or coal power plants.
- It is less polluting as there is no sulphur in natural gas. As a result, burning produces less pollution.
- It also emits greenhouse gases into the atmosphere with a shorter life cycle. As a result, it is comparatively environment friendly.

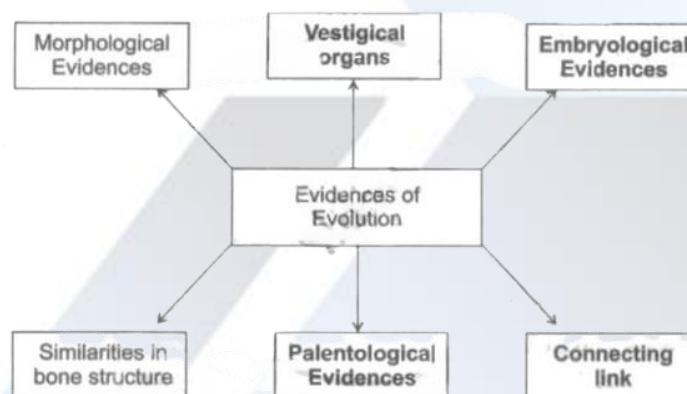
B. Answer the following. (any three)

Q1. Complete the following diagram.



Solution:

Evidences of Biological Evolution



Q2. What do we learn from the story of Jadav Molai Payeng?

Solution:

- i. Mr. Molai successfully transformed a barren land into a thriving forest through his dedication.
- ii. His unwavering determination, love for nature, and relentless efforts led to the plantation of trees across an expanse of over 1360 acres.
- iii. The inspiring story of Jadav Molai Payeng teaches us the importance of making Earth a healthier and more sustainable place for ourselves and future generations.
- iv. His journey demonstrates that while large groups may harm the environment,

a single determined individual can restore it and create a thriving forest, showcasing immense environmental benefits.

v. Furthermore, his efforts highlight that if one person can bring about such a significant change, collective efforts by many individuals can lead to revolutionary advancements in environmental conservation.

Q3. Distinguish between sexual reproduction and asexual reproduction. (two points)

Solution:

	Asexual reproduction	Sexual reproduction
i.	Reproduction that occurs with the help of somatic cells is called as asexual reproduction.	Reproduction that occurs with the help of two germ cells is called sexual reproduction.
ii.	This is uniparental reproduction, thus both male and female parent are not necessary	Male and female parents are necessary for sexual reproduction.
iii.	This reproduction occurs with the help of mitosis only.	This reproduction involves both mitosis and meiosis
iv.	The new individual formed by this method is genetically identical to its parent.	New individual formed by this method is genetically different from parents.

v.	Asexual reproduction occurs in different individuals by various methods like binary fission, multiple fission, budding, fragmentation, regeneration, vegetative propagation, spore formation, etc.	In all individuals, sexual reproduction occurs by gamate formation and fertilization.
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Q4. Define genetically modified crops and give any two examples.

Solution:

Genetically modified crops are plants whose genetic material has been altered using biotechnology to introduce specific traits that are not naturally present. This modification is done by inserting desired genes into the plant's genome.

Importance:

- Increased Crop Yield: GM crops are often more resistant to pests, diseases, and adverse environmental conditions, resulting in improved productivity.
- Reduced Pesticide Use: For example, Bt cotton naturally deters pests, thereby reducing the need for chemical pesticides.
- Enhanced Nutritional Value: Crops like Golden Rice are enriched with essential nutrients, addressing specific dietary deficiencies.

Examples:

- Bt Cotton: Engineered to produce a toxin that protects against certain insect pests.
- Golden Rice: Modified to produce beta-carotene, which helps combat vitamin A deficiency.

Q5. What are vitamins? Write two types of vitamins.

Solution:

Vitamins:

For normal cell functioning, growth and development

	Sources	Deficiency diseases
Vitamin A	Carrot, papaya, leafy Vegetables, etc.	Night blindness
Vitamin B complex	Milk, meat, eggs, cereals, etc.	Beriberi, pellagra, dermatitis, pernicious anaemia
Vitamin C	Amla, lemon, Orange, etc.	Scurvy
Vitamin D	Synthesised by the skin in sunlight, eggs	Rickets
Vitamin E	Meat, milk, vegetable oil, etc.	Sterility
Vitamin K	Leafy vegetables, soyabeans, milk, etc.	Delayed blood coating

Vitamins are a group of heterogeneous compound essential for proper functioning of the body. Vitamins are organic compounds found in natural foods which are required for normal growth and maintenance of the body.

Vitamins are of two types:

- Fat soluble vitamins: Vitamin A, D, E and K are stored in adipose tissues and hence are called fat soluble vitamins.
- Water soluble vitamins: Vitamin B and C must be supplied to our body through regular Diet.

3. Answer the following questions. (any five)

[15]

Q1. Explain the meaning of following symbols:



Solution:



-Recycle: This symbol reminds us to manage our waste responsibly. Garbage should not be discarded carelessly but must be properly sorted and managed.



- Renewable Energy: Using a bicycle represents the use of green energy. Riding a bicycle helps conserve fossil fuels and serves as an eco-friendly, non-polluting mode of transportation.



- Save Water: This symbol conveys the message "Save Water." Sustainable water usage is essential to ensure a better future for all.

Q2. Write any three characteristics of class Reptilia.

Solution:

Characteristics of class Reptilia are:

- These are creeping and burrowing terrestrial animals with scales on their body.

- They are cold-blooded animals found in most of the warmer regions of the world.
- The skin is dry and rough, without any glands.

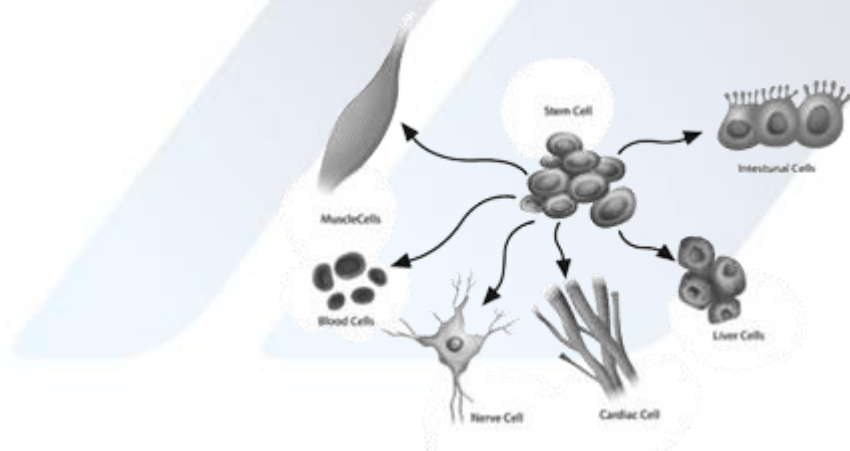
Q3. Answer the following.

1. Which substance is used to produce cheese?
2. Which enzyme was used earlier for cheese production?
3. Which enzyme is used to produce vegetarian cheese?

Solution:

1. Milk is used to produce cheese.
2. The enzyme 'rennet' was used earlier for cheese production.
3. Enzyme protease is obtained from fungi and this enzyme is used to produce vegetarian Cheese.

- Q4. (1) Which process is shown in the given diagram ?
 (2) What is the importance of this process ?
 (3) Which organs can be transplanted by this process ?



Solution:

- (1) The diagram illustrates stem cell therapy.
- (2) Stem cells hold significant promise in medicine due to their remarkable ability to regenerate and repair damaged tissues. They play a vital role, and

some existing treatments, like bone marrow transplants, already utilize their potential for tissue regeneration.

(3) Through this process, specific tissues, such as those from the kidney or skin, can be transplanted effectively.

Q5. What is meant by disaster? Write any two examples of each natural and man-made disaster.

Solution:

A disaster is defined as a disruption on a massive scale, either natural or man-made, occurring in short or long periods. It can lead to human, material, economic or environmental hardships which can be beyond the bearable capacity of the affected Society.

Examples:

- Natural disasters are flood, earthquakes, etc.
- Man-made disasters are forest fires, war, etc.

Q6. Write the objections raised against Darwin's theory of natural selection.

Solution:

Theory of Natural Selection:

Darwinian Theory of Evolution explains that evolution is the result of natural selection, and natural selection is biased by the inherited characteristics of organisms.

Darwin's Proposition:

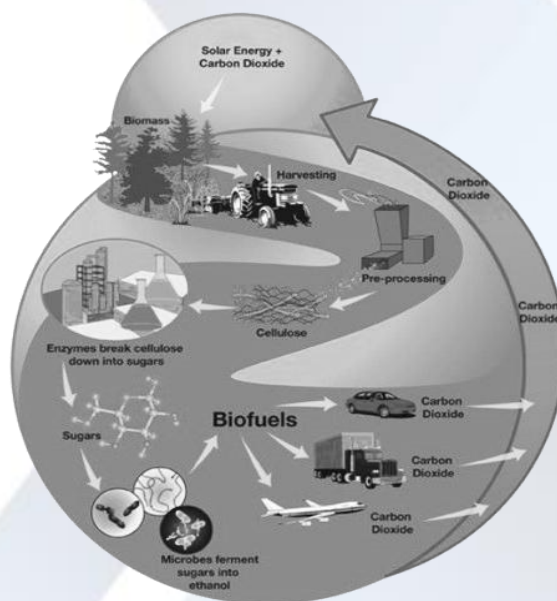
- Prodigality of reproduction
- Food and space are limited
- Struggle for existence
- Survival of the fittest
- Origin of new species

Darwin's theory of natural selection explains how genetic traits of a species may change over time.

Objections to Darwin's theory:

- Apart from natural selection, there are few more factors responsible for evolution.
- Any explanation about useful and useless modifications was not provided by Darwin.
- Causes of slow and abrupt changes was not explained by Darwin.

Q7. (1) Which process is shown in the above given picture?

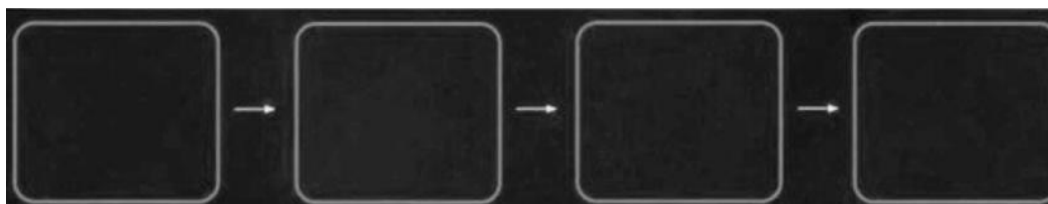


(2) Give two examples for liquid fuels and solid fuels obtained by this process.

Solution:

1. Biofuel process is shown in the above picture.
2. Two examples of liquid fuels are vegetable oil and alcohol, whereas two examples of solid fuels are coal and manure.

Q8. (i) Complete the stages in electric generator using wind energy.



Solution:

(ii) Write limitations in an electric generator using wind energy.

Solution:



Limitations of an electric generator:

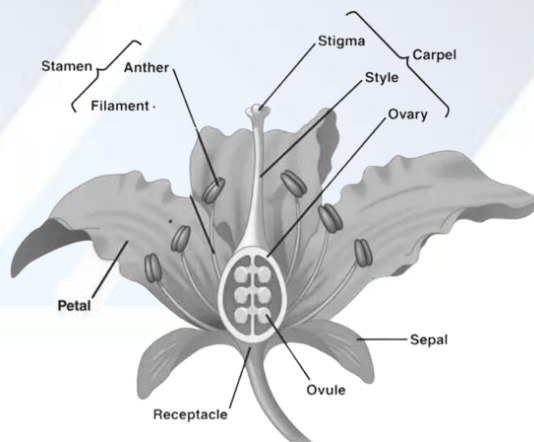
- The wind's speed is not constant and the required wind velocity is not available everywhere.
- It has a limited supply and is uncontrollable.
- Wind power has the limitation of producing no electricity when the wind is not

4. Answer any one of the following:

[5]

Q1. (a) Sketch and label the essential and accessory whorls of flower.

Solution:



(b) What is pollination?

Solution:

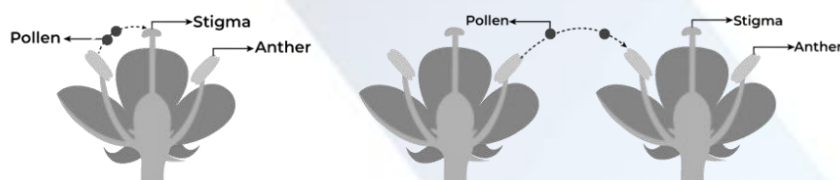
Pollination is a biological process in which the pollen grains are transferred from an anther (male part of a flower) to the stigma (female part of a flower).

It is of two types:

Self-pollination: Transfer of pollen grains from the anther to the stigma of the same flower or another flower of the same plant.

Cross-pollination: Transfer of pollen grains from the anther to the stigma of the flower present on two different plants.

Self-Pollination Vs Cross-Pollination



(c) Give any two examples of agents of pollination.

Solution:

Examples of agents of pollination are:

1. Insect pollination: Bees are the most common and recognised insect pollinators.
2. Bird pollination: Plants are pollinated by some birds, particularly humming birds.

Q2. What will you do ?

(1) You are spending more time on the internet.

Solution:

I will regulate my internet usage by setting a fixed time limit each day.

I will focus on productive activities such as reading, studying, and engaging in hobbies.

(2) Child of your neighbor is addicted to tobacco chewing.

Solution:

I will politely inform the child's parents about the issue and encourage them to seek medical advice or counseling.

I will explain the harmful effects of tobacco chewing on health and suggest alternatives to help the child quit.

(3) Your sister has become incommunicative.

Solution:

I will talk to her with care and patience to understand the reason behind her behavior.

I will also encourage her to share her feelings and, if necessary, involve a trusted adult or counselor to support her.

(4) You have to use free space around your home for a good purpose.

Solution:

I will use the space to plant trees, grow vegetables, or create a small garden to benefit the environment.

Alternatively, I could use it as a space for exercise, community activities, or creating a compost pit.

(5) Your brother studying in XII has developed stress.

Solution:

I will encourage him to take short breaks during study hours and practice relaxation techniques such as yoga or meditation.

I will help him create a study schedule and offer emotional support. If the stress persists, I will suggest consulting a counsellor.