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**2013**

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Part: I

Question: 1 ii - v

Part II

Section: A

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Section: B

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## Part I

Answer all questions.

### Question: 1

a. Give one significant difference between each of the following:

[5]

i. Implantation and Parturition.

#### Answer:

Implantation	Parturition
Attachment of blastocyst with the wall of uterus is called implantation	The process of giving birth to child is called parturition

ii. Active absorption and passive absorption.

#### Answer:

Active absorption	Passive absorption
It is the process of absorption which occurs at the expense of energy in the form of ATP as it occurs in the presence of roots only.	It is the process of absorption which do not require energy as it occurs even in the absence of roots.

iii. Haemodialysis and Peritoneal dialysis.

#### Answer:

Hemodialysis		Peritoneal dialysis
Advantages	It is most often done by trained health professionals who can watch for any problems. It allows you to be in contact with other people having dialysis, which may give you emotional support. You don't have to do it yourself, as you do with peritoneal dialysis. You do it for a shorter amount of time and on fewer days each week than peritoneal dialysis	It gives you more freedom than hemodialysis. It can be done at home or in any clean place. You can do it when you travel. You may be able to do it while you sleep. You can do it by yourself.  It doesn't require as many food and fluid restrictions as hemodialysis, and it does not use needles.
Disadvantages	It causes you to feel tired on the day of the treatments. It can cause problems such as low blood pressure and blood clots in the dialysis access. It increases your risk of blood stream infections.	The procedure may be hard for some people to do. It increases your risk for an infection of the lining of the belly, called peritonitis.

iv. Simple fruit and Aggregate fruit.



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**Answer:**

Simple fruit	Aggregate fruit
A simple fruit develops from the single simple or compound ovary of a flower.	An aggregate fruit is a group of simple fruitlets that develop from the free ovaries of a single flower.

v. Auricles and Ventricles.

**Answer:**

Auricles refer to the upper chambers of the heart (2 in number) that receive the impure blood from the veins to send it to the ventricles. On the other hand, ventricles are small cavities or chambers that are present within an organ, usually the left chamber of the heart that accepts blood from the arteries (left atrium) and then contracts to force into the aorta.

- b. Explain what would happen if: [5]  
i. Excess fertilizers are added to soil.

**Answer:**

Excess fertilizers are added to soil: In this case the soil solution becomes hypertonic and concentration of sap inside the root cells is comparatively less. As a result of which, the contents from root cells moves towards the soil solution. Hence, root cells get plasmolysed.

- ii. Blood clots in the coronary artery.

**Answer:**

Muscle suddenly becomes blocked and the heart can't get oxygen. Most heart attacks occur as a result of coronary heart disease.

- iii. Beta cells in the islets of Langerhans are damaged.

**Answer:**

Human islets have a unique architecture allowing all endocrine cells to be adjacent to blood vessels and favoring heterologous contacts between  $\beta$ - and  $\alpha$ -cells, while permitting homologous contacts between  $\beta$ -cells. Islets of Langerhans are micro-organs located in the pancreas and composed of at least four types of endocrine cells. The  $\alpha$ - and  $\beta$ -cells are the most abundant and also the most important in that they secrete hormones (glucagon and insulin, respectively) crucial for glucose homeostasis.

- iv. Silicon emulsion is applied over the surface of leaves.

**Answer:**

Silicon emulsion is applied over the surface of leaves: Silicon emulsion acts as an inhibitor for the presentation of sunlight by masking the exposure area of leaf. If proper amount of sunlight do not enter into leaf, the photosynthesis drastically declines.

- v. Magnesium element is deficient in the soil.

**Answer:**

Magnesium elements is deficient in the soil: Dificiency of magnesium causes marginal curling, interveinal chlorosis with purple anthocyanin pigmentation appearing first in older leaves, veins green, chlorotic areas may turn necrotic, premature leaf abscission, reduced growth, underdeveloped phloem and pith.

- c. Each of the following questions/statements have four suggested answer. Rewrite the correct answer in each case: [3]



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i. The cell division in the tunica region of shoot apex is:

- A. Periclinal
- B. Horizontal
- C. Anticlinal
- D. Radial

**Answer:**

Anticlinal.

ii. The dark coloured dead wood present in the central region of old trees is:

- A. Spring wood
- B. Heart Wood
- C. Sap wood
- D. Combium

**Answer:**

Heart wood.

iii. Dwarfism accompanied with mental retardation is due to hypo-secretion of:

- A. Growth hormone
- B. Thyroxine hormone
- C. Parathormone
- D. Adrenalin hormone

**Answer:**

Growth hormone.

iv. Oxygen is released in photosynthesis by:

- A. Photophosphorylation
- B. Photolysis of water
- C. Photorespiration
- D. Photons

**Answer:**

Photolysis of water.

v. The spinal nerve is:

- A. A mixed nerve
- B. A sensory nerve
- C. A motor nerve
- D. A cranial nerve

**Answer:**

A sensory nerve.

vi. The cells of the areolar tissue which produce heparin are:

- A. Fibrocytes
- B. Mast cells
- C. Macrophages
- D. Chondriocytes

**Answer:**

Mast cells



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d. Mention the most significant function of the following:

[3]

i. Semicircular canals

**Answer:**

The membranous semicircular duct can be thought of as a fluid-filled tube with a partition (the cupula) in the middle. Because the utricles are located medially, compared with the horizontal canals, on each side of the head, the hair cells of the complementary left and right semicircular canals are oppositely polarized.

ii. Bowman's capsule

**Answer:**

The Bowman's capsule performs the first step in the filtration of blood to form urine. It allows liquids and small particles of solid to pass through but prevents larger structures (e.g. blood cells) from passing through.

iii. Parenchyma

**Answer:**

Parenchyma: The parenchymatous tissue is especially meant for storage of food, slow conduction of various substances and for providing turgidity to softer parts of the plant.

iv. Leg haemoglobin

**Answer:**

Leg haemoglobin: It acts as an oxygen scavenger, protects the enzyme nitrogenase from oxygen.

v. Guard cells

**Answer:**

These cells help in stomatal transpiration and gaseous exchange. The guard cells expand and contract in response to their turgidity and ultimately open or close the stomatal aperture.

vi. Alveoli

**Answer:**

Alveoli are tiny sacs of air located in your lungs. There are millions of them in your lungs, and they fill up with oxygen when you inhale. They greatly increase the surface area of the lungs so that more oxygen can enter your bloodstream.

e. State the best known contribution of:

i. Munch

**Answer:**

Munch: Mass Flow or Pressure Flow Hypothesis was put forward by him.

ii. Ronald Ross

**Answer:**

Ronald Ross: He discovered malaria and established that malarial parasite is transmitted by the bite of a female *Anopheles* mosquito.



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iii. Marshal Hall

**Answer:**

Marshal Hall: He contributed in field of Circulatory Physiology, also known as “Father of Modern Neurology”.

iv. Huxley

**Answer:**

Huxley: He made a scientific attempt to the problem of man’s origin in his book “Man’s Place in Nature”. Also suggested that “Birds are glorified reptile”.

f. Expand the following:

i. ABA

**Answer:**

ABA- Abscissic Acid.

ii. FSH

**Answer:**

FSH- Follicle Stimulating Hormone.

iii. AIDS

**Answer:**

AIDS- Acquired Immuno Deficiency Syndrome.

iv. DDT

**Answer:**

DDT- Diethyl Diphenyl Trichloroethane.

**Part II**

**Section A (Answer any three questions)**

**Question: 2**

a. Give four difference between root apex and shoot apex. \*\* [4]

b. Explain the development of the different types of endosperms in angiosperms [3]

**Answer:**

Development of the different types of endosperms in angiosperms:

Depending upon the mode of its formation, angiospermic endosperm is of three types:

i. Nuclear Endosperm: The primary endosperm nucleus divides repeatedly without wall formation to produce a large number of free nuclei. Meanwhile central vacuole appears in the central cell and pushes the cytoplasm containing the nuclei to the periphery. The cytoplasm thickens and undergoes cleavage and gives rise to a multicellular tissue e.g., Maize, Wheat, Rice etc.



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ii. Cellular Endosperm: Every division of primary endosperm nucleus is followed by cytokinesis. Therefore, endosperm becomes cellular from the very beginning eg. Balsam, Petunia and Datura etc.

iii. Helobial endosperm: The endosperm is of intermediate type between cellular and nuclear types. The first division of primary endosperm nucleus is followed by transverse cytokinesis to form two unequal cells, large micropylar and smaller chalazal cells. Micropylar cells grow faster than the chalazal end eg. Asphodelus.

c. Explain briefly:

i. Capillary Water.

**Answer:**

It is the water present in soil narrow spaces or micropores of soil having a diameter of 20  $\mu\text{m}$  or below. The amount of capillary water which can be present in a soil depends upon the abundance of micropores. Capillary water is held in the soil by capillary forces. It, therefore, does not fall down to water table by gravity. Only capillary water is available to plant roots for absorption.

ii. Osmosis

**Answer:**

It is the movement of water from the region of higher chemical potential (found in pure state or dilute solution) to its lower chemical potential (found in solution or stronger solution) without allowing the diffusion of solute by means of a semipermeable membrane is called osmosis.

iii. Aeroponics

**Answer:**

Aeroponics: It is the technique of growing plants in above-ground strands provided with the fine mist of normal solution.

**Question: 3**

a. Explain the  $\text{C}_4$  cycle of photosynthesis.

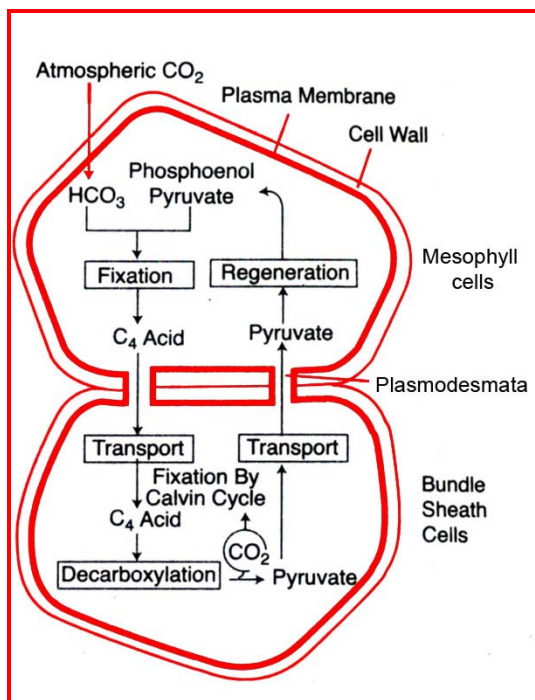
[4]

**Answer:**

It was worked out by Hatch and Slack in number of tropical plants. These plants are called as  $\text{C}_4$  plants because of the first stable photosynthetic product being a 4-carbon compound. These plants show Kranz anatomy as mesophyll is undifferentiated and its cells occur in concentric layers around vascular bundles. Vascular bundles are surrounded by large sized bundle sheath cells which are arranged in a wreath-like manner in one to several layers. Mesophyll and bundle sheath are connected by plasmodesmata or cytoplasmic bridges.

Initial Fixation: In  $\text{C}_4$  plants, initial fixation of carbon dioxide occurs in mesophyll cells. Primary acceptor of  $\text{CO}_2$  is phosphoenol pyruvate or PEP in the presence of enzyme PEP carboxylase or PEP case to form oxalo-acetic acid or oxaloacetate.





$$\text{PEP} + \text{CO}_2 + \text{H}_2\text{O} \xrightarrow{\text{PEP Carboxylase}} \text{Oxalo-acetic acid (OAA)} + \text{H}_3\text{PO}_4$$
 OAA is reduced to malic acid or transaminated to form aspartic acid.
 
$$\text{OAA} + \text{NADPH} \xrightarrow{\text{Dehydrogenase}} \text{Malic acid} + \text{NADP}^+$$

$$\text{OAA} + \text{Alanine} \xrightarrow{\text{Transaminase}} \text{Aspartic acid} + \text{Pyruvic acid}.$$

Transport: Malic acid or Aspartic acid is translocated to bundle sheath cells through plasmodesmata. Inside bundle sheath cells they are decarboxylated to form pyruvate and CO<sub>2</sub>. Malic acid + NADP<sup>+</sup>

$$\xrightarrow{\text{Malic enzyme}} \text{Pyruvic acid} + \text{CO}_2 + \text{NADPH}$$

$$\text{Aspartic acid} + \text{Pyruvic acid} \xrightarrow{\text{Transaminase}} \text{Alanine}$$

$$+ \text{Oxaloacetic acid} \xrightarrow{\text{Decarboxylase}} \text{PEP} + \text{CO}_2 + \text{H}_2\text{O}$$

CO<sub>2</sub> released in bundle sheath cells is fixed through Calvin cycle. RuBP of Calvin cycle is called final or secondary acceptor of CO<sub>2</sub> in C<sub>4</sub> plants.

Regeneration of PEP: Pyruvate and PEP formed in bundle sheath cells are sent back to mesophyll cells. Here pyruvate is changed to phosphoenol pyruvate. Energy is provided in the form of ATP.

$$\text{Pyruvate} + \text{ATP} + \text{H}_3\text{PO}_4 \xrightarrow[\text{dikinase}]{\text{Phosphopyruvate}} \text{PEP} + \text{AMP} + \text{PPi}$$

b. State three advantages and three disadvantages of vegetative reproduction.

[3]

**Answer:**

**Advantages of Vegetative Reproduction:**

- It is the only method of multiplication in seedless plants e.g., Sugar cane, Banana, Seedless Grape etc.
- Plants produced through this method are identical, hence maintain genetic uniformity.





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**Disadvantages of Vegetative Reproduction:**

- i. Vegetative propagules get easily decayed and are prone to viral, bacterial and fungal diseases.
- ii. There is no variation. Therefore, the plants may show degeneration and in such plants there is a less adaptability to changed environment.
- iii. No dispersal of Vegetative propagules. Therefore, it causes over crowding.

c. Mention one role and one deficiency symptom of the following elements in plant nutrition:\*\*

- i. Phosphorus
- ii. Iron
- iii. Chlorine

**Question: 4.\*\***

- a. What are tropic hormones? Describe the feedback control of tropic hormones with an example. [4]
- b. Explain the conduction of nerve impulse through a nerve fibre. [3]
- c. Draw a labeled diagram of the T.S. of bone [3]

**Question: 5.**

- a. Explain the role of pancreas in digestion of various food materials.\*\* [4]
- b. Briefly describe the stages in clotting of blood.\*\* [3]
- c. Define: [3]
  - i. Reparative regeneration\*\*
  - ii. Capacitation

**Answer:**

Capacitation: Changes in a mammalian sperm which prepares it to fertilize ovum is called capacitation

- iii. Menarchy.

**Answer:**

Menarchy: Initiation or onset of menstruation in girls at the age of puberty i.e., 12-14 years of age.

**Question: 6.**

- a. State four differences between transpiration and guttation. [4]



**Answer:**

Transpiration	Guttation
<ol style="list-style-type: none"><li>1. It is the loss of water by a plant in the form of vapours.</li><li>2. The transpired water is pure water.</li><li>3. Transpiration occurs through the general surface of the leaves and young stems.</li><li>4. It does not leave anything on the surface of the plant.</li><li>5. Most of the transpiration occurs during the hotter periods of the day. It is negligible during night.</li><li>6. Transpiration occurs through stomata, lenticels and epidermal cells.</li><li>7. Stomata can be opened or closed</li><li>8. Transpiration causes the development of a negative pressure in the xylem of the plant.</li><li>9. It occurs during dry periods.</li><li>10. Transpiration continues even when the plant is under water stress.</li><li>11. Excessive transpiration produces wilting.</li></ol>	<ol style="list-style-type: none"><li>1. Guttation is the loss of liquid droplets from the plant.</li><li>2. Guttated water is a dilute solution of inorganic and organic substances.</li><li>3. Guttation commonly occurs at the margins and the tips of the leaves.</li><li>4. An incrustation of salts is formed on the surface after the guttated liquid evaporates.</li><li>5. Guttation mostly occurs during night and early hours of the morning.</li><li>6. Guttation occurs only through water pores.</li><li>7. The water pore is always kept open</li><li>8. Guttation is produced only when the xylem shows a positive pressure.</li><li>9. Guttation takes place during humid periods,</li><li>10. It does not occur under conditions of water deficiency.</li><li>11. Excessive guttation does not cause loss of turgidity.</li></ol>

b. Give an account of the secretory phase of menstrual cycle.

[3]

**Answer:**

Secretory phase of Menstrual Cycle: This phase usually includes cycle days 15 to 28 in a 28 days cycle. The leutinizing hormone (LH) is secreted by anterior lobe of pituitary gland. LH causes ovulation. Remaining cells of the ovarian follicles are stimulated by the LH to develop corpus luteum. The corpus luteum secretes large amount of progesterone. Progesterone stimulates uterine there is also similar increase in the secretion of watery mucus. During phase, glands and by glands of fallopian tubes, Progesterone is also essential for maintenance of endothelium. Such an endothelium is necessary for implantation of fertilized ovum and other events of pregnancy. In the absence of fertilization, corpus luteum degenerates. This causes disintegration of endothelium leading to menstruation making a new cycle. Thus increase production of progesterone causes secretory phase.

c. Define:

[3]

i. Radial vascular bundle

**Answer:**

Xylem and phloem occur in the form of separate bundles called xylem bundles and phloem bundles. The two types of bundles usually alternate with each other. They occur on different radii. These are characteristic of roots.

ii. Rigor mortis

**Answer:**

A few hours after a person or animal dies, the joints of the body stiffen and become locked in place. This stiffening is called rigor mortis.

iii. Root pressure



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**Answer:**

It is pressure exerted by the cortical cells of the root upon their liquid contents, under fully turgid condition, forcing a quantity of them into the xylem vessels and through them upward into the stem.

**Section B**

Answer any two questions.

**Question: 7**

a. Differentiate between apes and man with respect to the following characteristics:

[4]

- i. Posture
- ii. Cranium
- iii. Brow ridges
- iv. Locomotion

**Answer:**

Differentiate between apes and man

Ape	Man
<ul style="list-style-type: none"><li>i. Posture Less erect posture</li><li>ii. Cranium:<ul style="list-style-type: none"><li>1. Brain box (cranium) is of small size.</li><li>2. Cranial capacity is under 450 cc.</li></ul></li><li>iii. Brow ridges Brow ridges are very prominent.</li><li>iv. Locomotion Locomotion is quadrupedal</li></ul>	<ul style="list-style-type: none"><li>Fully erect posture</li><li><ul style="list-style-type: none"><li>1. Brain box is of large size.</li><li>2. Cranial capacity (average) is about 450 cc.</li></ul></li><li>Brow ridges are not so prominent</li><li>Locomotion is bipedal</li></ul>

b. Define:

[3]

- i. Vestigial organs

**Answer:**

The organs which are present in reduced form and do not perform any function in the body but correspond to the fully developed functional organs of related animals are called vestigial organs. They were believed to be remnants of organs which were complete and functional in their ancestors.

- ii. Variations

**Answer:**

Variations: These are morphological, physiological, cytological and behaviouristic differences amongst the individuals of the same species and the offspring of the same parents. They are found in all the characters and in every conceivable direction.

- iii. Neo-Darwinism

**Answer:**

According to it only genetic variations (mutations) are inherited and not all variations as held by Darwin.

c. Give three differences between Natural Selection and Artificial Selection.

[3]



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**Answer:**

Artificial Selection	Natural Selection
1. It is an artificial process. 2. It is conducted by man. 3. Traits selected are of human interest 4. Results are achieved in a shorter period	1. It is a natural process. 2. It is conducted by nature. 3. Traits selected are beneficial to the species 4. Results are achieved over a long period of time.

**Question: 8**

a. State four characteristics of the Cromagnon man.

[4]

**Answer:**

Four characteristics of Cromagnon man:

- i. The Cro-magnon man had, like us, about 1.8 metres tall, well built body.
- ii. Its face was perfectly orthognathous (Jaws do not protrude forward) with an arrow, elevated nose, broad and arched forehead, moderate brow ridges, strong jaws with man like dentition and a well developed chin.
- iii. Its cranial capacity was about 1650 cc.
- iv. It could walk and run faster and lived in families in caves.

b. Explain the basic postulates of Darwinism

[3]

**Answer:**

The main features of the theory are as follows:

- i. Over Production: All organisms possess enormous fertility. They multiply in geometric ratio
  - ii. Limited food and space: Despite of rapid multiplication of all types of species, food and space and other resources remain limited. They are not liable to increase.
  - iii. Struggle for Existence: The struggle for existence can be of three types:
    - a. Intraspecific Struggle: It occurs between the individuals of same species.
    - b. Interspecific Struggle: It occurs between the members of different species
    - c. Environmental Struggle: It is the struggle between organisms and the environmental factors.
  - iv. Variations: The changes which makes two individuals different from each other are called variations. They are gradual and continuous.
  - v. Natural Selection or Survival of the Fittest: The organism, which are provided with favourable variations would survive because they are fittest to face their surroundings, while unfit are destroyed.
  - vi. Formation of New species: Variations, if accumulated over generations, becomes so distinct that they form a new species.
- c. Archaeopteryx is connecting link between reptiles and birds. Justify the statement by giving two characteristics of each group.

[3]

**Answer:**

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It is a connecting link between reptiles and birds due to presence of characters of both groups which are as follows:

i. Reptile characters of Archeopteryx:

1. The body axis is more or less lizards like.
2. A long tail is present and free caudal vertebrae like lizards are found.

ii. Avian characters of Archaeopteryx:

1. Presence of feathers on the body.
2. Jaws are modified into beaks

**Question: 9**

Person suffering from G6PD deficiency are resistant to malaria. Explain.

[4]

**Answer:**

Glucose 6-Phosphate Dehydrogenase deficiency occurs as an inborn error of metabolism in some persons. It is also called favism because beans cause haemolysis in the patients. Antimalarial drugs like primaquin causes haemolysis in such persons. The haemolysis is due to production of  $H_2O_2$  which is not removed because of Glucose-6PD deficiency and the result is lack of  $NADPH_2$ . Malaria parasite can not complete schizogony in Glucose 6PD deficiency patient due to immature death of RBCs.

b. Define:

[4]

i. Genetic Erosion

**Answer:**

A permanent reduction in richness or evenness of common localized alleles or loss of combination of alleles over times in a defined area.

This definition recognizes that diversity has two distinct components in:

- a. Number of different entities
- b. Their relative frequencies.
- i. Bioinsecticides: Bioinsecticides are those biological agents that are used to control harmful insects. They include predators, parasites and pathogens and natural insecticides etc.
- ii. Antigen: Antigens are substances which, when introduced into the body, stimulate the production of antibodies.
- iii. Psychosis: It is the most severe type of mental illness in which the victim forgets everything and remains no longer in touch with the realities of life. Such persons are usually called mad.

c. Define Biofortification.

[2]

**Answer:**

Breeding of crops with higher levels of vitamins and minerals or higher protein and healthier fats is called biofortification. This is the most practical aspect to improve health of people.

**Question: 10.**

a. List the activities of community Health Services.\*\*



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b. Give three early diagnostic symptoms of cancer.

[3]

**Answer:**

Three early diagnostic symptoms of cancer:

- i. Presence of persistent lump or thickening which can be felt with touch as at the tip of tongue or breast.
- ii. Any wound that does not heal.
- iii. Any irregular bleeding or blood coloured discharge.

c. Define:

[3]

- i. Carrying capacity

**Answer:**

Carrying capacity: Total capacity of an environment for a given population at a given time is called its carrying capacity. It refers to the limit of individuals in an ecosystem at a time.

- ii. Implant

**Answer:**

Implant: It is a tissue or organ inserted surgically into the body to replace a defective part. They are used for replacing joints, arteries, heart valves etc. They are non-toxic and biocompatible.

- iii. Carcinoma

**Answer:**

Carcinoma: Cancer which is mainly derived from epithelial cells. It includes cervical cancer, breast cancer, skin cancer, brain cancer, lung cancer, stomach cancer etc. About 80% of all tumours are carcinomas.

*\*\* Out of syllabus. Answer will be provided up on request*

