Biology

Academic Year: 2013-2014 Marks: 70
Date: March 2014

Question 1: Select and write the most appropriate Answer from the given alternatives for each sub-question: **[7]**

Question 1.A.i: The biological scissor is ----------. **[1]**

Restriction endonuclease
Gyrase
DNA ligase
helicase
Solution: The biological scissor is **Restriction endonuclease.**

Question 1.A.ii: Dead and dried cell mass of microbes having nutritive value is also known as ---------- **[1]**

BGA (blue green algae).
SCP (Single-cell protein).
STP (sewage treatment plant).
VAM (vesicular arbuscular mycorrhizae)

Solution: Dead and dried cell mass of microbes having nutritive value is also known as **SCP (Single cell protein).**

Question 1.A.iii: From the visible spectrum of light, which component is reflected by the given leaves? **[1]**

Blue
Red
Green
Orange

Solution: Green

Question 1.A.iv: For the formation of 50 seeds, how many minimum meiotic divisions are necessary? **[1]**

25
50
75
63

Solution: 63

Question 1.A.v: In bisexual flowers, maturation of gynoecium before androecium is known as ---------- **[1]**

protandry
protogyny
gynandry
diciliny

Solution: In bisexual flowers, maturation of gynoecium before androecium is known as **protogyny.**

Question 1.A.vi: The permanent removal of forests and woodlands is called ---------- **[1]**

Reforestation
afforestation
deforestation
agroforestry

Solution: The permanent removal of forests and woodlands is called **deforestation.**

Question 1.A.vii: The abundance of phosphate, causing algal overgrowth resulting in depletion of oxygen and killing other aquatic life is known as ----------. **[1]**
Ecological succession
eutrophication
guano deposit
green house effect

Solution: The abundance of phosphate, causing algal overgrowth resulting in depletion of oxygen and killing other aquatic life is known a **eutrophication.**

Question 2.A: Answer in 'one' sentence each: [6]

Question 2.A.i: What is 'jumping genes'? **[1]**

Solution: The sequences of DNA that can move or transpose themselves to new positions within the genome of a single cell are known as 'jumping genes.

Question 2.A.ii: Give the importance of heterocyst in cyanobateria. **[1]**

Solution: In cyanobacteria, heterocyst is specialized and colourless cells and are the site for nitrogen fixation.

Question 2.A.iii: From which microbial sources can pectinase be obtained? **[1]**

Solution: Sclerotiana libertine is the microbial source.

Question 2.A.iv: Which is the ultimate pathway for fixing carbon dioxide (CO2) into glucose? **[1]**

Solution: C3 pathway (Calvin cycle) is the ultimate pathway for fixing carbon dioxide (CO2) into glucose.

Question 2.A.v: Name the process of respiration which does not involve intake of oxygen (O2). **[1]**

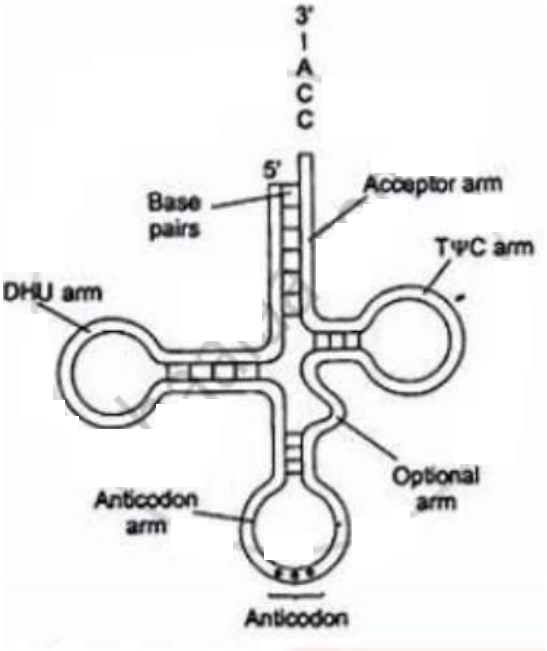
Solution: Lactic acid fermentation is the process of anaerobic respiration which does not involve intake of oxygen (O2) and release of carbon dioxide (CO2).

Question 2.A.vi: What is 'bio magnification'? **[1]**

Solution: Increasing concentration of non-biodegradable pesticides in top members of the food chain is called bio magnification. It is also called as bio concentration.

Question 2.B: Sketch and label the 'clover leaf model' of t-RNA. **[1]**

Solution:



CLOVER LEAF MODEL OF t-RNA

Question 2.C: Attempt any TWO of the following: [4]

Question 2.C.i: 'There is a whole in the ozone layer'. What do you understand by this? **[2]**

Solution: The depletion of the Ozone layer takes place due to two reactions between Ozone and chlorofluorocarbons which are released from an aerosol spray can air conditioners and refrigerator. The depletion is particularly marked over the Antarctic region. This has resulted in the formation of a large area of thinned ozone layer called the Ozone hole.

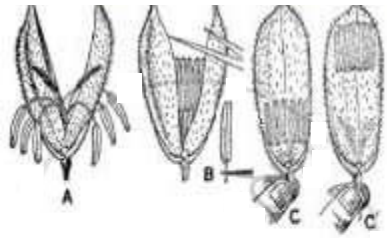
Question 2.C.ii: Name any 'two' edible varieties of mushrooms. Give nutritional values of these. **[2]**

Solution:

1. White button Mushroom. (AgaricusBisporus)
2. Paddy Straw Mushroom. (Volvariellavolvacea)

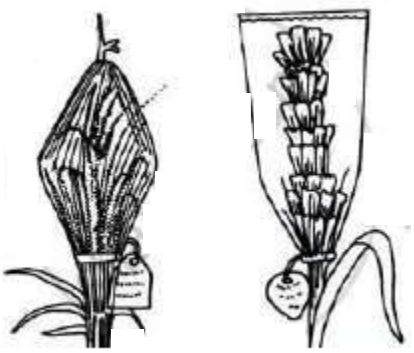
Question 2.C.iii: With the help of diagrams, describe emasculation and bagging. **[2]**

Solution: If the female plant bears bisexual flowers removal of anthers from the flower but before the Answer basis using a pair of forceps is necessary this is referred to as emasculation.



EMASCULATION

Emasculation flowers have to be covered with a bag of suitable size generally made up of butter paper to prevent contamination of its stigma with unwanted Fallen this process is called bagging.



BAGGING

Question 2.C.iv: What is 'biopatent'? Give any two examples. **[2]**

Solution: A Bio patent is a patent granted by government investor for biological to the investor for biological entities and from products obtained from them. For example basmati rice and turmeric.

Question 3.A: Attempt any TWO of the following: [6]

Question 3.A.i: Describe any 'two' applications of tissue culture technique. **[3]**

Solution: Tissue culture is the cultivation of plant parts under the aseptic conditions and suitable nutrient medium. The essential nutrients include inorganic salt, carbon, and energy source and a growth regulator. Applications of tissue culture:

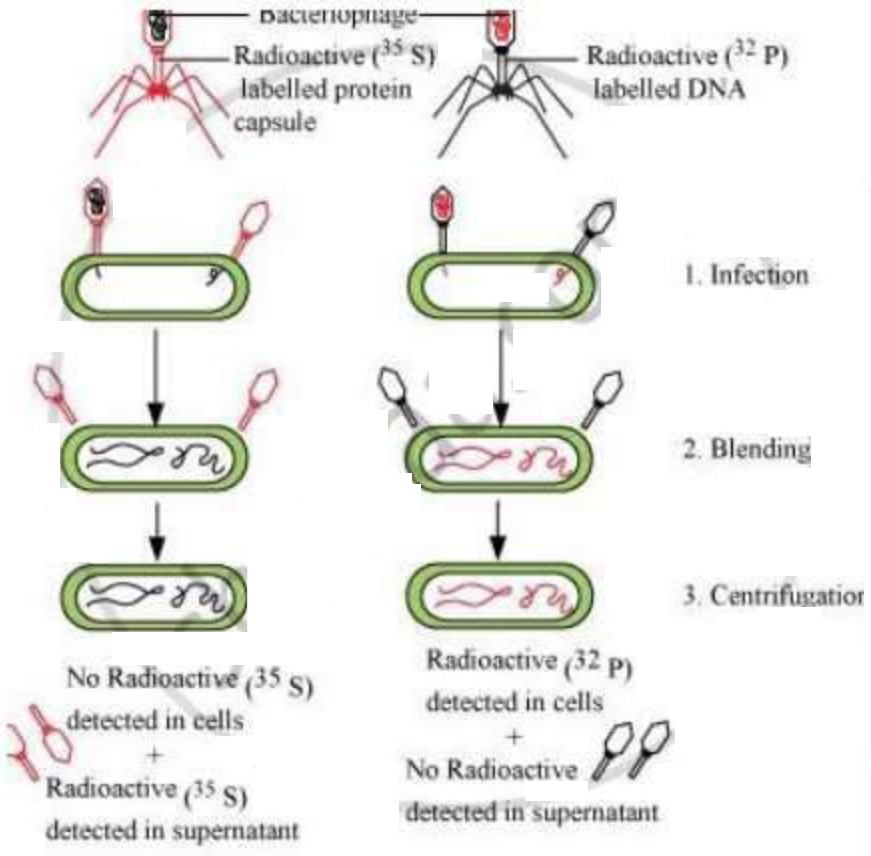
(a) Genetically identical plants are produced from a single cell or a group of cells in a short interval of time by micropropagation. A large number of progeny are produced from a single cell or a group of cells.

(b) It is possible to raise a large number of plants and disease-resistant plants using tissue culture techniques. This method has been used to raise tobacco plants resistant to Wildfire caused by a bacteria pathogen pseudomonas tabaci.

Question 3.A.ii: What is 'photorespiration'? Explain it with diagrammatic representation. **[3]**

Solution: The process of uptake of oxygen and production of carbon dioxide in lights bye photosynthesis tissue who is called photorespiration. It takes place in the C3 pathway. It occurs in chloroplast, peroxisomes, and mitochondria. End products of photorespiration are CO2 and Phosphoglyceric acid.

Question 3.A.iii: Describe the experiment of Hershey and Chase to prove that DNA is the genetic material. **[3]**



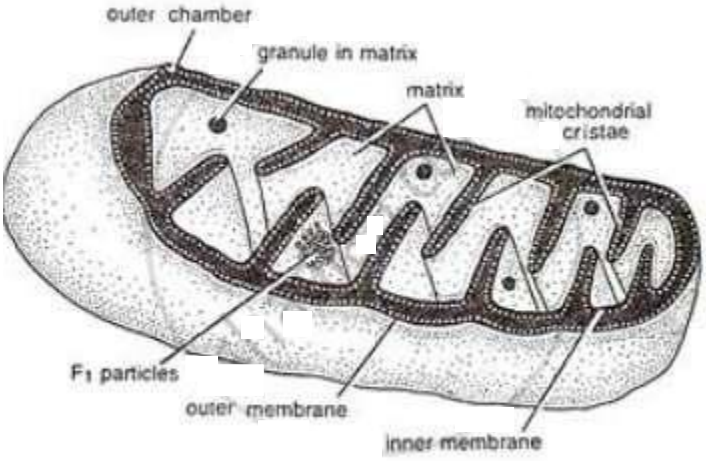
HARSHEY AND CHASE EXPERIMENT

Solution: Hershey and Chase developed two strains of viruses one with labelled proteins and other with labelled DNA. All protein contains Sulphur and atom not found in DNA where is all DNA molecules contain Phosphorus which is not found in protein. The bacteriophages parasitizing bacteria grown in the presence of radioactive sulphur(35S) labelled proteins and bacteriophages parasitizing bacteria grown in the presence of radioactive phosphorus(32P) level DNA. After developing these two strains Hershey and chase combined each strain with on-radioactive bacteria and allowed bacteriophages to attack and inject their genetic material. Soon after infection, the bacterial cell was gently agitated in a blender to loosened the adhering phage particles.

It was observed that only the active Radioactive 32P was found associated with bacteria cell and S was only in the surrounding medium and not in a bacterial cell. When phage progeny was studied it was found that it carries label only with 32P and not with 35S. It can be concluded that it is viral DNA and not protein that carries the g information for the production of more viral particle and as such DNA is the genetic material. Hershey and Chase proved that the DNA is the genetic material.

Question 3.B: Sketch and label 'ultrastructure of mitochondrion'. **[3]**

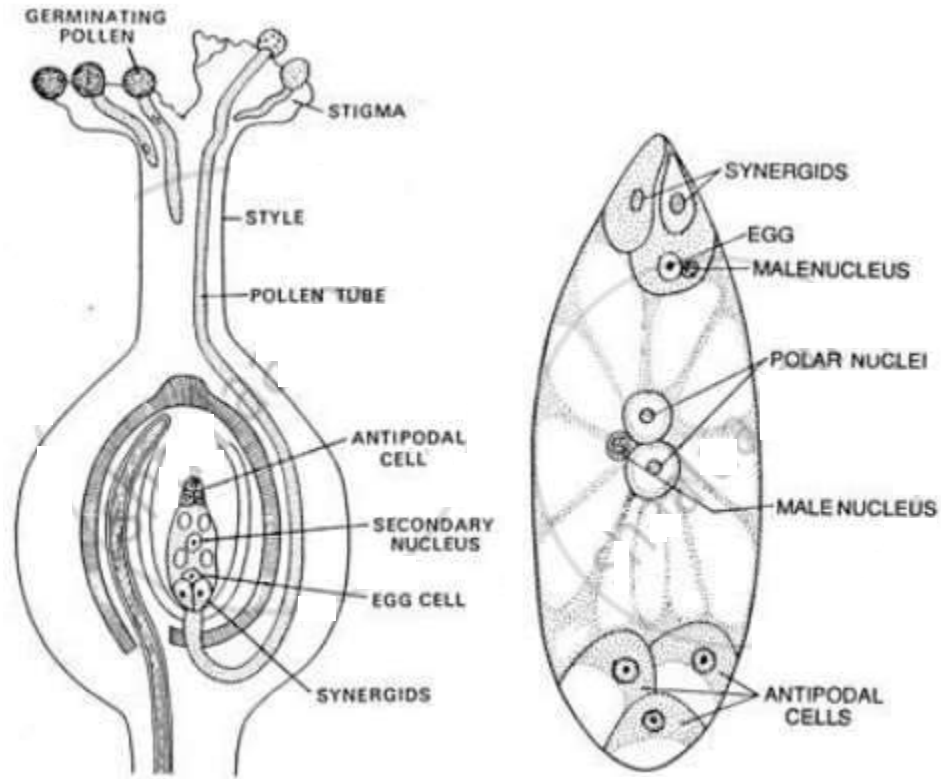
Solution:



Ultrastructure OF MITOCHONDRIA

Question 4.A: What is 'double fertilization'? Describe it with the help of a neat and well-labeled diagram. Give its importance. **[7]**

Solution: DOUBLE FERTILIZATION



The process in which fusion of male gamete with eggs and another male gamete with the nucleus takes place in an embryo sac is termed as double fertilization. In the

flowering plants after entering one of the synergids the Pollen tube releases the two male gametes into the cytoplasm of synergids. One of the male gametes moves toward the Egg cell and fuses with its nucleus just completing the syngamy. This results in the formation of a diploid cell called the zygote. The other moves toward the two polar nuclei located in the central cell and fuses with them to produce triploid primary endosperm nucleus As this involve the fusion of three haploid nuclei it is termed as triple fusion. Syngamy and triple fusion both take place at the same time during the process of fertilization so it is called double fertilization.

Importance of double fertilization: Due to the formation of a zygote, the diploid condition is restored. As male and female gametes fuse, there is the recombination of maternal and paternal characters, this results in variation. Double fertilization triggers embryonic development, which leads to the formation of seed and fruit. Viable seeds with a high percentage of germination are produced.

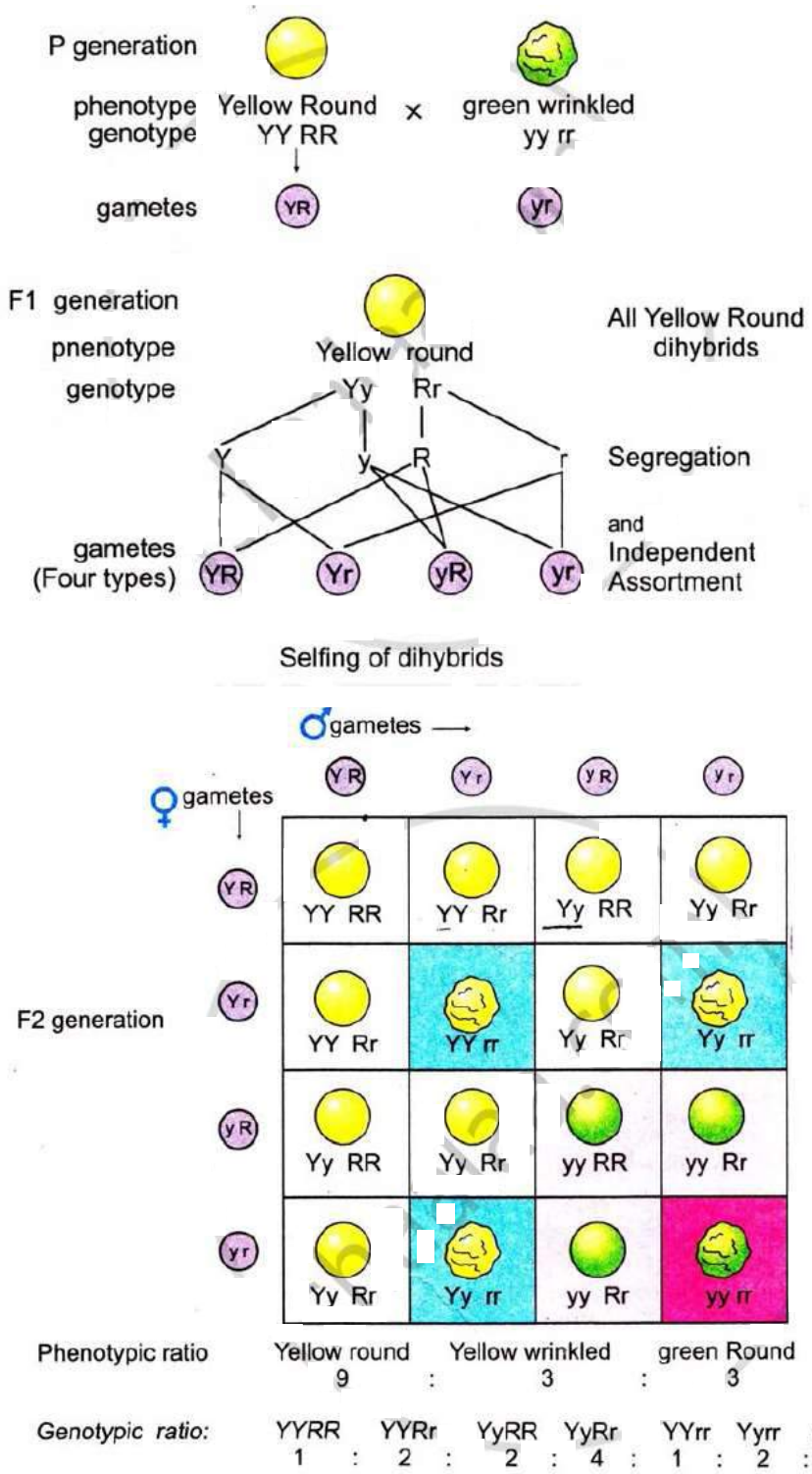
Question 4.B: Explain the law of independent assortment with a suitable example. **[7]**

Solution: When the two homozygous parents differing in two pairs of contrasting traits are crossed, the inheritance of one pair is independent of the other.

In other words, when a dihybrid (or poly hybrid) form gametes, assortment (distribution) of alleles of different traits is independent of their original combinations in the parents.

This law of independent assortment can be explained with the help of dihybrid cross and dihybrid ratio. The appearance of new combinations in F2 generation proves the law.

Carry out dihybrid cross for any two characters till F2 generation with the phenotypic and genotypic ratio



Graphic representation of a dihybrid cross.

Explanation:

A gamete that receives 'Y' for colour may receive 'R' for shape or 'r' for shape. This would result in the formation of YR and Yr types of gametes. Similarly, a gamete that receives 'y' for colour may receive 'R' or 'r' for shape. This would result in the formation of yR and yr types of gametes (Independent assortment).

SECTION – II ZOOLOGY

Question 5.A: Select and write the most Appropriate Answer from the given alternatives for each sub-question: [7]

Question 5.A.i: The most common types of fossils are ----------. **[1]**

moulds
casts
Actual remains
models

Solution: The most common types of fossils are **Actual remains.**

Question 5.A.ii: Which of the following traits is never observed in a human female? **[1]**

Hypertrichosis
Haemophilia
Colour blindness
Myopia

Solution: Hypertrichosis

Question 5.A.iii: Safety of polio vaccine is tested in transgenic ---------- **[1]**

Pig
rabbit
fish
mice

Solution: Safety of polio vaccine is tested in transgenic **mice.**

Question 5.A.iv: Mucous membrane trapping the microbes acts as a ---------- **[1]**

physiological barrier
physical barrier

Solution: Mucous membrane trapping the microbes acts as a **physical barrier.**

Question 5.A.v: Conversion of ammonia into uric acid occurs through ----------**[1]**

ornithine cycle

guanine cycle
Ionosinic pathway
Kreb's cycle

Solution: Conversion of ammonia into uric acid occurs through **Ionosinic pathway.**

Question 5.A.vi: Spinal cord and sympathetic ganglion of autonomous nervous system are connected by ------ **[1]**

ramus ventralis
ramus communicans
ramus dorsalis
connective

Solution: Spinal cord and sympathetic ganglion of the autonomous nervous system are connected by **ramus communicans.**

Question 5.A.vii: Pregnancy in second trimester is maintained by ---------- **[1]**

LH (luteinizing hormone)
progesterone
estrogen
HCG (human chorionic gonadotropin)

Solution: Pregnancy in second trimester is maintained by **progesterone** .

Question 6.A: Answer the following in 'one' sentence each: [6]

Question 6.A.i: What is 'gene flow'? **[1]**

Solution: Gene flow is the introduction of genetic material from one population of its species to another by interbreeding. It brings a change in the composition of the gene pool of the receiving population. The introduction of new alleles through a gene pool for increased variability within the population.

Question 6.A.ii: What is 'restriction digestion'? **[1]**

Solution: Restriction endonuclease cut DNA at specific locations making many pieces of DNA having a variable length, this process is called 'restriction digestion'.

Question 6.A.iii: What is 'restriction digestion'? **[1]**

Solution: Restriction endonuclease cut DNA at specific locations making many pieces of DNA having a variable length, this process is called 'restriction digestion'.

Question 6.A.iv: What is the use of tissue plasminogen activator? **[1]**

Solution: Tissue plasminogen activator is an enzyme that dissolves clot. It has an affinity for fibrin that is produced naturally in the blood vessels lining. It is used in genetic engineering form to prevent damage of heart muscles following Heart Attack and reduce neurological damage.

Question 6.A.v: Name the type of animal breeding carried out to produce amule. **[1]**

Solution: Cross breeding is a type of animal breeding to produces a mule. Mule is formed when horse mates with donkey.

Question 6.A.vi: Why is zona pellucid retained around the egg till it reaches the uterus? **[1]**

Solution: Zona pellucida prevents the implantation of the blastocyst at an abnormal site such as a fallopian tube and it keeps trophoblast cells unexposed till it reaches the uterus. Hence, zona pellucida is retained around the egg until it reaches the uterus.

Question 6.C: Attempt any TWO of the following: [4]

Question 6.C.i: Write a note on desert adaptations. **[2]**

Solution: Desert adaptations are adaptations for survival in the Desert. These adaptations can be explained with the example of a camel. n camel, minimum water is lost through urine. Water is stored in the muscles, water cells of the stomach and connective tissues of the hump. They have Nephrons with a longer loop of Henle for more reabsorption of water.

Question 6.C.ii: Give the economic importance of fisheries. **[2]**

Solution: The economic importance of fisheries is the following.
a. It is a source of employment for many people.
b. It provides nutrient food, as fishes are rich in proteins, vitamins (A, D & E), carbohydrates, fats, and minerals.

c. It is flourishing as an agro-based business as well as an industry.

d. It promotes allied businesses like the manufacturing of crafts and gears and also provides raw material to other industries.

e. It helps in biological control as fishes feed on insect larvae and micro-organisms

f. Oil extracted from the body of fishes has medicinal as well as commercial value. e.g. Shark liver oil, cod liver oil (medicinal value) and the oil extracted from sardine and mackerel (commercial value).

Question 6.C.iii: Distinguish between X and Y chromosomes. **[2]**

Solution:

X chromosome	**Y chromosome**
It is found in both male and female	It is found in males only.
It is responsible for X linked characters.	It is responsible for Y linked character.
Chromosome appear X shaped as they are metacentric	Chromosome appear Y shaped as they are acrocentric
Non-homologous parts show less genes.	Non-homologous parts show more genes.

Question 6.C.iv: Give applications of a vaccine. **[2]**

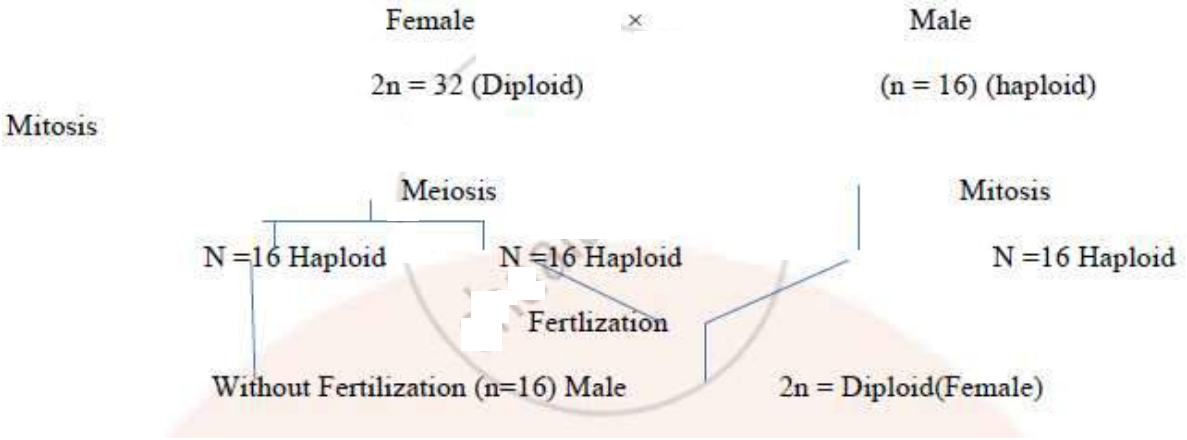
Solution: A vaccine is an antigenic preparation used to stimulate the production of antibodies. Vaccines induce immunity against several diseases. Vaccines stimulate the immune system to act against genuine toxins. Vaccines or vaccination program is used to eradicate a particular disease. Ex. smallpox disease has been totally eradicated by vaccination programs.

Question 7.A: Attempt any TWO of the following : [6]

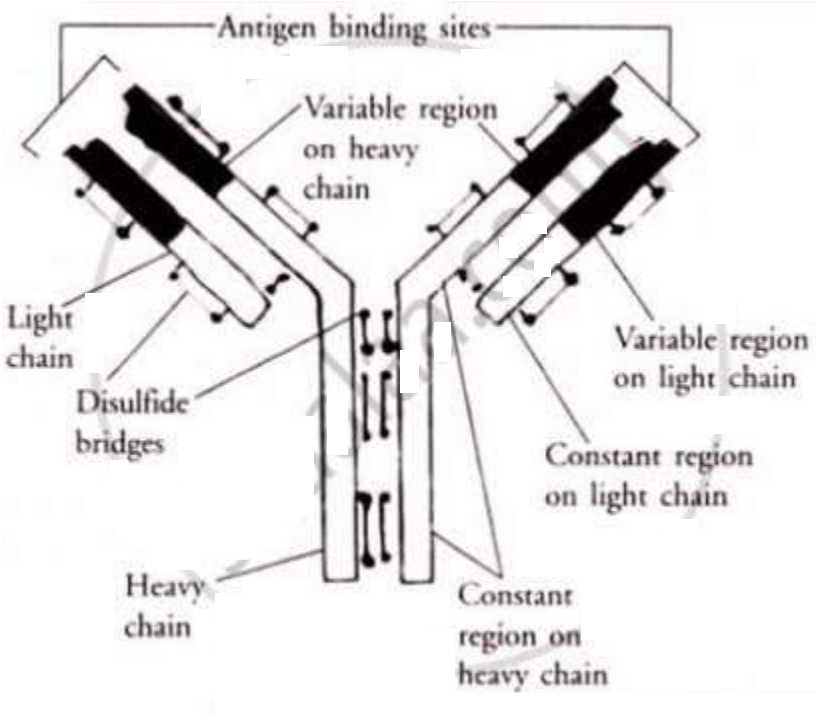
Question 7.A.i: With the help of a chart, explain the method of sex determination in honeybees. **[3]**

Solution: In the honeybee, the haplodiploid sex-determination system determines the sex of the offspring. In this system, sex is determined by the number of sets of chromosomes an individual receives. An offspring developed from fertilized egg develops as a female and unfertilized egg develops in males.

A female offspring shows diploid (2n = 32) number of chromosomes. Males (drones) produced by means of parthenogenesis have haploid (n = 16) number of chromosomes



Question 7.A.ii: Describe the structure of an antibody. **[3]**



Solution: Antibodies are specific glycoproteins synthesized by the host in response to an antigen. All antibody molecules are immunoglobins and are released from plasma cells. Immunoglobins are of five types, IgM. IgD and IgE. All these types consist of monomeric units is comprising two light and two heavy chains which are joint by

disulfide bonds as well as by non-covalent bonds .each immunoglobin is specific in its function.

Question 7.A.iii: Distinguish between the following: (Give at least one point of distinction for each pair) [3]

Question 7.A.iii.a: Natality and Mortality **[1]**

Solution:

Natality	Mortality
Natality is defined as the number of birth of organisms in a population of a specific area with the passage of time.	Mortality is defined as the number of deaths of organisms in a population of a specific area with the passage of time.
Natality is an inherent ability of a population to increase	Mortality decreases population size.

Question 7.A.iii.b: Competition and Mutualism. **[1]**

Solution:

Competition	Mutualism
Competition is a rivalry between two individuals which required a source that is in short supply.	Mutualism is an interaction between two species in which both are benefited
One is benefited and other is harm	Both are benefited
Example -competition of food between carnivores	Example-Lichens

Question 7.A.iii.b: Competition and Mutualism. **[1]**

Solution:

Competition	Mutualism
Competition is a rivalry between two individuals which required a source that is in short supply.	Mutualism is an interaction between two species in which both are benefited
One is benefited and other is harm	Both are benefited
Example -competition of food between carnivores	Example-Lichens

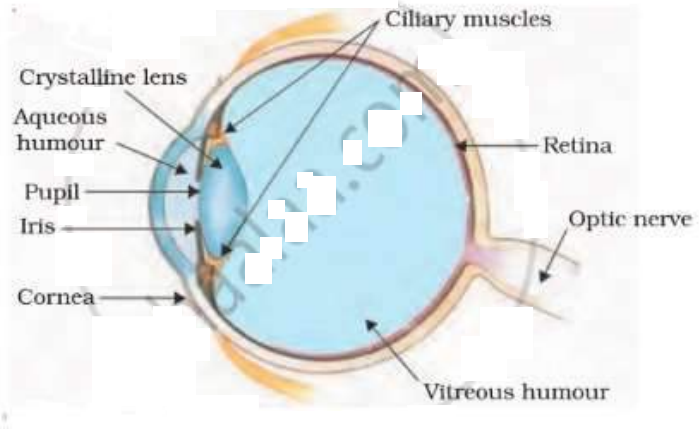
Question 7.A.iii.c: Agricultural water pollution and Shipping water pollution. **[1]**

Solution:

Agricultural Wastes pollution	Shipping water pollution
Agricultural water pollution includes sediments, fertilizers, and farm animal wastes.	Shipping water pollution includes oil, human sewage, and other wastes
Agricultural water pollution is caused due to water run-off from agricultural lands.	It is caused due to spills from ships, offshore drilling rigs, and cleaning operations on ships.

Question 7.B: Sketch and label V.S. of a human eye. **[3]**

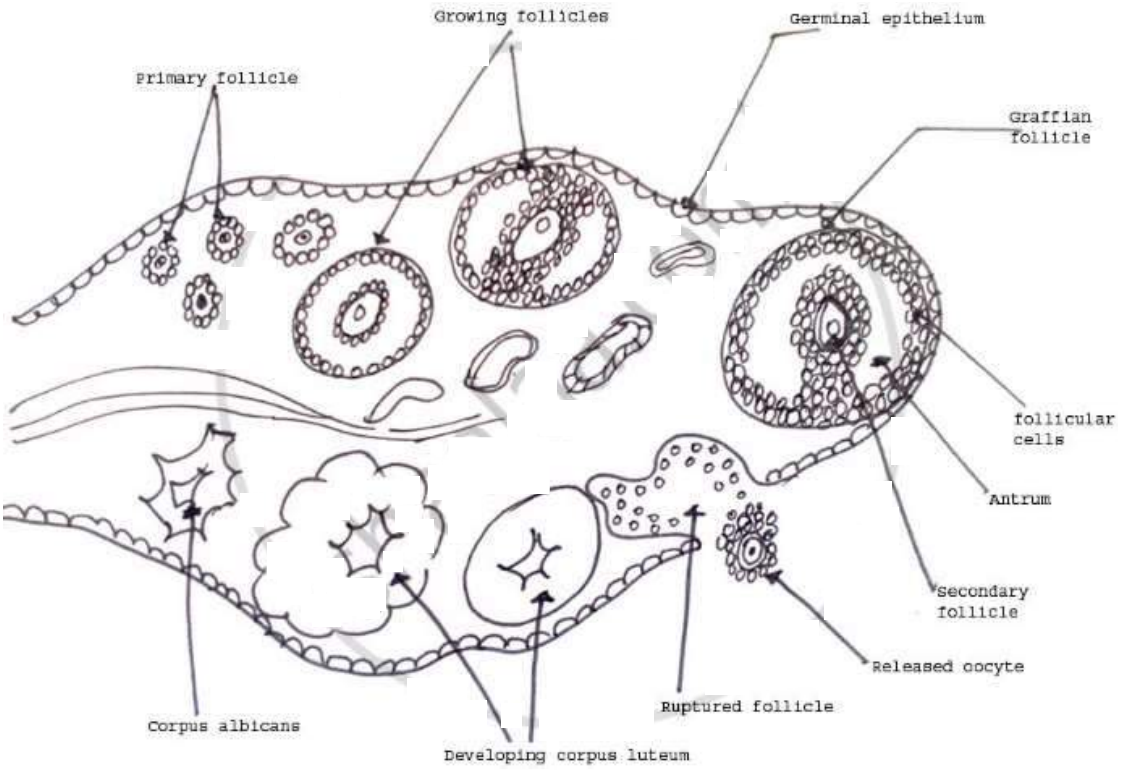
Solution:



HUMAN EYE

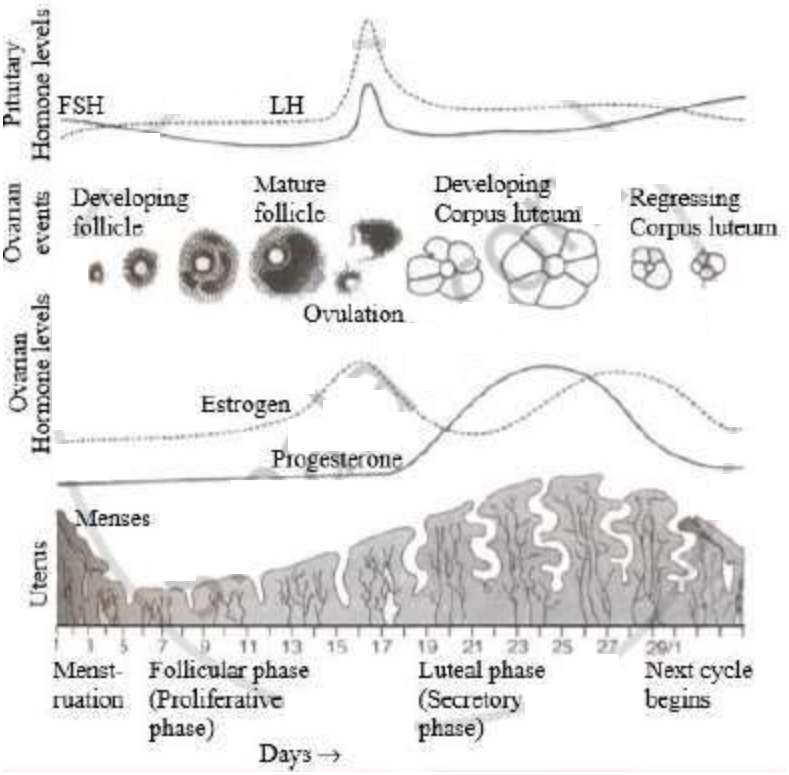
Question 8.A: Draw a neat and well-labeled diagram showing T.S. of the ovary and describe the menstrual cycle in human females. **[7]**

Solution:



T.S. Ovary

In Human females, at the start of the puberty period, the menstruation is repeated at an average interval of about 28 / 29 days and the cycle of events starting from one mensuration till the next one is called mensuration cycle. It is a monthly flow of blood from the uterus it lasts about 25 days.



PHASES OF MENSTRUATION CYCLE

Changes during the menstrual cycle can be divided into four phases. Menstrual phase b. Proliferative phase c. Ovulatory phase d. Post ovulatory or secretory phase or luteal phase

a. Menstrual Phase (bleeding or destructive phase):
This phase extends from the 1st to the 4th day of the menstrual cycle. Menstruation occurs in the absence of fertilization. During this phase, bleeding occurs as the endometrium of the uterus is sloughed off. The menstrual flow consists of the secretion of endometrial glands, cell debris, and unfertilized ovum along with 35 to 45 ml of blood.

b. Proliferative phase: This phase extends from the 5th to the 13th day of the menstrual cycle.
Changes in the ovary: During this phase, the primordial follicle of the ovary develops into the Graafian follicle. Theca internal cells of the follicle secrete female sex hormone estrogen. Only one follicle develops in one cycle.

Changes in the uterus: Oestrogen secreted by follicular cells of ovary stimulate endometrial glands. This causes the repair of the endometrium. The endometrial cells proliferate and the thickness of endometrium grows to about 3mm to 5mm.

c. Ovulatory phase: During this phase, ovulation takes place. It usually occurs on the 14th day of the cycle. Due to LH secreted by the pituitary, the Graafian follicle bursts

and releases the ovum in the abdominal cavity. It passes through the fallopian tube. On its way, if it happens to meet sperms, it is fertilized. If it remains unfertilized then ovum degenerates.

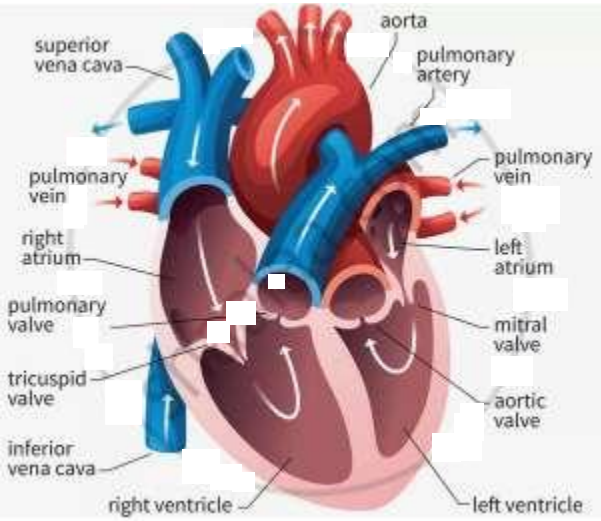
d. Secretory phase/Luteal phase: This phase extends from the 15th to the 28th day of the menstrual cycle. Changes in the ovary: After ovulation, the ruptured follicle develops into a yellow body called corpus luteum. Corpus luteum remains active till the placenta starts the secretion of HCG (Human chorionic gonadotropin). If the ovum is not fertilized, corpus luteum degenerates and transforms into a whitish scar called corpus Albicans.

Changes in Uterus: Corpus luteum formed in ovary secretes progesterone. It causes further growth of endometrial glands. If fertilization occurs, the embryo is implanted in thickened endometrium.

OR

Question 8.B: The help of a well-labeled diagram describes the internal structure of the human heart. **[7]**

Solution:



The human heart situated between two lungs and behind the sternum .it is a hollow conical organ which is a narrow apex directed downwards to the left. It rests on the diaphragm near the middle of the thoracic cavity in the mediastinum. The heart remains surrounded by a conical Three-layered sac called pericardium A pericardial fluid is present between the two membranes which reduce the friction between the heart wall and the surrounding tissues. Three layers that form the ball of the heart are epicardium,

myocardium, and endocardium. The endocardium is a thin layer of endothelium overlying a thin layer of connective tissue. The human heart consists of four chambers two auricles and two ventricles. Theatre are thin-walled structures and act primarily as a receiver. The right atrium receives the oxygenated blood from the general circulation of the body while the left atrium receives oxygenated blood from the lungs. In between the two arteria lies the interatrial septum which forms the common wall between the two arteriae. The ventricles are thickly muscular structures and they have a powerful force of contraction the left ventricular wall is at least three times bigger than the wall of the right ventricle. The right ventricle receives deoxygenated blood from the Right Atrium and the left ventricle oxygenated blood from the Left Atrium. The two ventricles remain separated from each other by an interventricular septum and the ventricle of the same side is also separated by a fibrous tissue called the artrio-ventricular septum. Each of these chapters provided with an opening through which two chambers of the same side are connected.