

Class XII BIOLOGY (Theory)

CBSE Board, Set -2

General Instructions:

- (i) There are total of 26 questions and five sections in the questions paper.
- (ii) Section A contains questions number 1 to 5, Very Short Answer type questions of one marks each.
- (iii) Section B contains questions number 6 to 10, Short Answer type questions of two marks each.
- (iv) Section C contains questions number 11 to 22, Short Answer type II questions of three marks each.
- (v) Section D contains questions number 23, Value Based Questions of four marks.
- (vi) Section E contains questions number 24 to 26, Long Answer type questions of five marks each.
- (vii) There is no overall choice in the questions paper, however, an internal choice is provided in one question of two marks, one question of three marks and all three questions of five marks. AN examinee is to attempt any one of the questions out of the two given in the questions paper with the same question number.

Section-A

Q1. What is Biopiracy?

Sol.1 **Biopiracy** is a situation where native knowledge of nature, originating with native peoples, is used by others for profit, without any permission.

Q2. State a reason for the increased population of dark colored moths coinciding with the loss of lichens (on tree barks) during industrialization period in England.

Sol.2 The industrial revolution resulted in large scale smoke which deposited on tree trunks turning them black. This led to loss of gray moths & the black forms flourished.

Q3. Indiscriminate diagnostic practice using X-rays etc., should be avoided. Give one reason.

Sol.3 Indiscriminate use of X-ray causes mutation in the DNA which can led to cancer.

Q4. Name the transcriptionally active region of chromatin in nucleus.

Sol.4 Transcriptionally active region of a chromatin is euchromatin.

Q5. A geneticist interested in studying variation and patterns of inheritance in living beings prefer to choose organism for experiments with shorter life cycle. Provide a reason.

Sol.5 A geneticist interested in studying variations & patterns of inheritance in living beings prefers to choose organism for experiments with shorter life span because they have small growing season & their progenies can be cultivated in lesser time for observation.

Section-B

Q6. Many fresh water animals cannot survive in marine environment. Explain.

Sol.6 Fresh water animals & marine animals live in different environment. Animal which can live in both fresh water & marine water condition are known as euryhaline.

A cell is present in normal condition in dilute water while it shrinks in case of hypertonic water, same phenomena occur with some animals if they are brought to marine condition from normal water condition.

Most fishes are stenohaline. They will die if exposed to wrong environment

OR

Q6. How are productivity, gross productivity, net primary productivity and secondary productivity interrelated?

Sol.6 **Productivity:-**

Productivity of the ecosystem refers to the rate of biomass production i.e. the amount of organic matter accumulated per unit area per unit time.

It is generally expressed in $g^{-2} yr^{-1}$ or $(kcal m^{-2})yr^{-1}$.

There are two types of productivity present primary and secondary:

Primary Productivity:-

Primary productivity is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis.

Primary productivity can be divided into- gross primary productivity (GPP) and net primary Productivity (NPP).

Secondary productivity:-

Secondary productivity is the rate of formation of new organic matter by consumers.

- Q7.** Name any two common Indian millet crops, state one characteristic of millets that has been improved as a result of hybrid breeding so as to produce high yielding millet crops.
- Sol.7** common millet crops are finger millet, pearl millet & proso millet. The improved millet variety in India are CSH1, CSH2; CHS3 etc
- Height of millet has been improved as a result of hybrid breeding.
- Q8.** Mention a product of Human welfare obtained with the help of each one of the following microbes:
- (a) LAB
- (b) *Saccharomyces sharmanii*
- (c) *Propionibacterium sharmanii*
- (d) *Aspergillus niger*
- Sol.8** (a) LAB or lactic acid bacteria or *Lactobacillus* are gram positive bacteria which is used in curd production or curd making.
- (b) *Saccharomyces cerevisiae* is a species of yeast which is used in wine making, brewing & baking.
- (c) *Propionibacterium sharmanii* is used in cheese-making where it produces CO₂ bubbles in cheese.
- (d) *Aspergillus niger* is used in industries for production of citric acid & gluconic acid.
- Q9.** Explain mechanism of sex determination in birds.
- Sol.9** In birds, there's ZW-ZZ type of sex determination. Female is heterogametic i.e. it produces two types of gametes (ZW) & male is homogametic i.e. produces one type of gamete (ZZ).
- Q10.** After a brief medical examination a healthy couple came to know that both of them are unable to produce functional gametes and should look for an 'ART' (Assistant Reproductive Technique). Name the 'ART' and the procedure involved that you can suggest to them to help them bear a child.
- Sol.10** Assisted reproductive technology (ART) includes all fertility treatment in which both sperms & eggs are handled. It involves surgically removing eggs from a mother's ovaries, combining them with sperms in the laboratory & returning them to the woman's body or donating them to another woman.

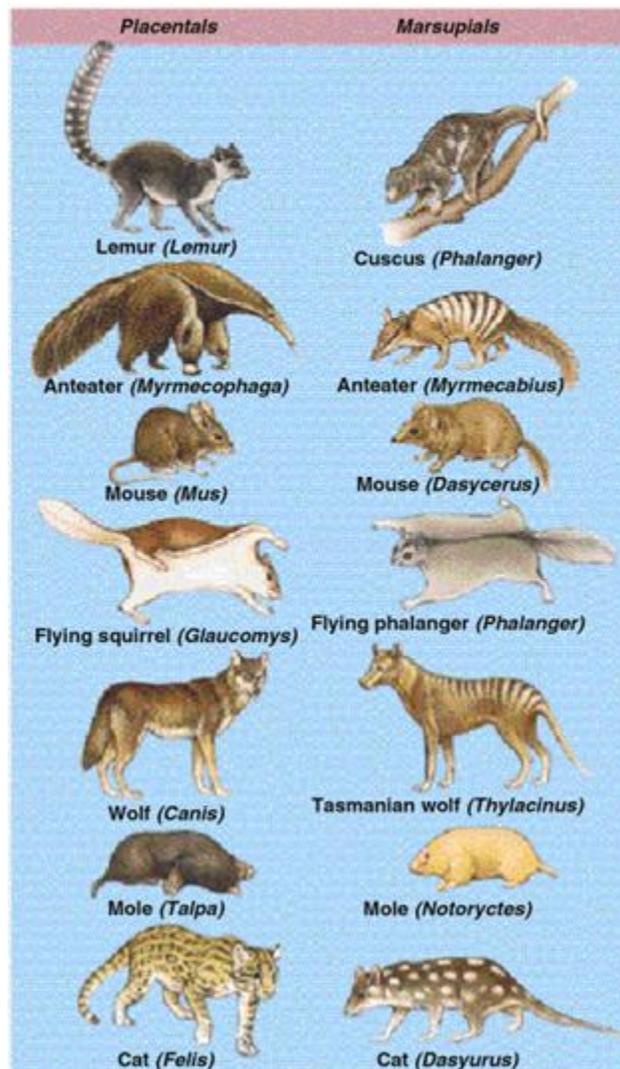
The main ART- techniques include:

- (i) Zygote intra fallopian transfer (ZIFT)
- (ii) Gamete intra fallopian transfer (GIFT)

Q11. What is adaptive radiation? When can adaptive radiation be referred to as convergent evolution? Give an example.

Sol.11 Species which have diverged after origin from common ancestor giving rise to new species adapter to new habitats & ways of life is called adaptive radiation.

Development of similar adaptive functional structures in undulated groups of organism is called divergent evolution. E.g. some of marsupials of Australia resemble equivalent placenta mammals that live in similar habitats of other continents. When adaptive convergence is found in closely related species it is called parallel evolution.



Q12. A teacher wants his/her students to find the genotype of pea plants bearing purple coloured flowers in their school garden. Name and explain the cross that will make it possible.

Sol.12 Student will do the test cross to find the genotype of plant.

In test cross F_1 progeny is crossed with recessive parent.

1. $Ww \times ww$

	W	w
w	Ww (purple)	ww (white)
w	Ww (purple)	ww (white)

If the progeny obtained consist of 50% purple & 50% white means that the purple flower is heterozygous for dominant allele.

2. $WW \times ww$

	W	W
w	Ww (purple)	Ww (purple)
w	Ww (purple)	Ww (purple)

If flowers (100%) obtained are purple, it is homozygous for dominant allele.

Q13. (a) A DNA segment has a total of 1,500 nucleotides out of which 410 are guanine containing nucleotides, how many pyrimidine bases this segment possesses.

(b) Draw a diagrammatic sketch of a portion of DNA segment to support your answer.

Sol.13 (a) Purine includes adenine & guanine. Pyrimidine include cytosine & thymine.

Amount of $A = T$ & $C = G$

Now, as 1410 nucleotides are guanine, so number of cytosine nucleotides = 410 we also know that, as total 1500 nucleotides are present so amount of

$$\begin{aligned} A + T &= 1500 - (C + G) \\ &= 1500 - (410 + 410) \\ &= 1500 - 820 \\ &= 680 \end{aligned}$$

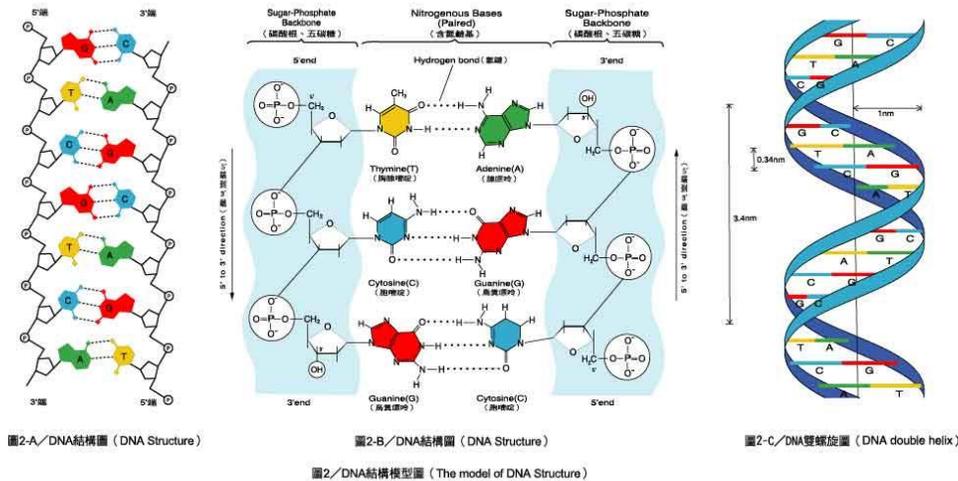
$$\text{As we know } A = T \frac{680}{2} = 340$$

Now, total no. of pyrimidine nucleotides

$$= C + T = 410 + 340$$

= 750

(b)



Q14. Name the stage of human embryo in which it gets implanted. Explain the process of implantation.

Sol.14 The process of fusion of a sperm with an ovum to form a diploid cell is called fertilization. It normally occurs when sperm and egg interact in the upper part of the oviduct (ampule) The haploid nucleus of the sperm and that of the ovum fuse together to form a diploid zygote. Cleavage is the mitotic division of the zygote unit moving through the isthmus of the oviduct towards the uterus and forms 2, 4, 8, 16 daughter cells called blastomeres. Cleavage occurs more readily in the active cytoplasm. Cleavage in human is equal holoblastic. Morula is a solid ball of 32 cell stage without a cavity which is formed after 5th cleavage and 31 cell division. Morula looks like a little mulberry. Morula changes to blastula due to rearrangements of blastomeres. Blastula formation is called blastulation. Mammalian blastula with a large blastocoel is called blastocyst (in humans). Blastocyst has 3 parts- trophoblast, inner cell mass and blastocoel. The blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called the inner cell mass. The trophoblast layer then gets attached to the endometrium and the inner cell mass gets differentiated as the embryo. After attachment, the uterine cells divide rapidly and cover the blastocyst. As a result, the blastocyst becomes embedded in the endometrium of the uterus. This is called implantation and it leads to pregnancy. Implantation occurs generally between 6th to 9th day after fertilization.

Q15. A non -biology person is quite shocked to know that apple is false fruit, mango is true fruit and banana is a seedless fruit. As a biology student how would you satisfy this person.

Sol.15 Fruit in general develop from ovary & they are called true fruit but in some species the thalamus conglobates in fruit for that matter it is called false or Pseudo fruit.

Mango is a true fruit since it's derived from only ovary & its content, since banana is developed by parthenocarpy; it is seedless fruit & also known as virgin fruit.

Q16. Enlist the steps involved in inbreeding of cattle. Suggest two disadvantages of this practice.

Sol.16 Inbreeding is the production of organism from breeding of genetically related organism.

Disadvantage: - (i) It may result in homozygosis & can enhance the chances of offspring being affected from resistive or harmful characters.

(ii) It can cause inbreeding depression in which the ability of offspring to service & reproduces; decreases.

Q17. Choose any microbes, from the following which are suited for organic farming which is in great demand these days for various reasons. Mention one application of each one chosen.

Mycorrhiza; Monascus; Anabaena; Rhizobium; Methenobacterium; Trichoderma.

Sol.17 *Anabaena:* - They form heterocyst which helps in nitrogen fixation.

Rhizobium:- It plays a very important role in agriculture by in during nitrogen – fixing modules on the roots of legumes such as peas, beans, cloves, alfalfa.

Mycorrhiza:- It can be used to suppress several problematic agricultural weeds.

Q18. Draw a labeled sketch of sparged-stirred-tank bioreactor. Write its applications.

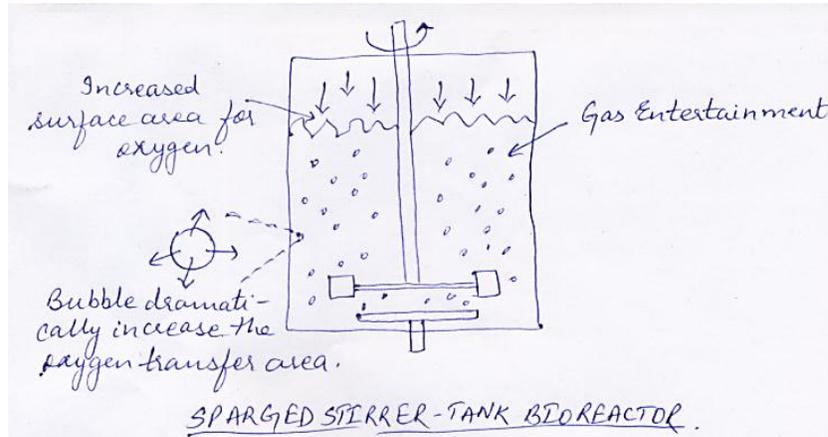
Sol.18

Applications-

Larger quantity of culture can be processed.

Raw materials are biologically converted into specific products.

It provides optimal conditions for achieving the desired products by providing optimum growth conditions.



Q19. Following the collision of two trains a large number of passengers are killed. A majority of them are beyond recognition. Authorities want to hand over the dead to their relatives. Name a modern scientific method and write the procedure that would help in the identification of kinship.

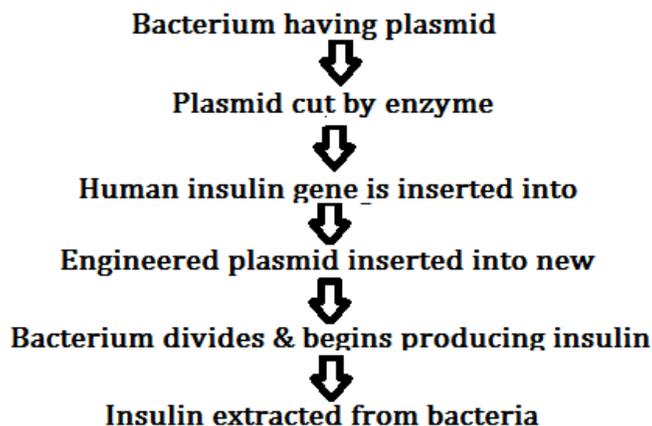
Sol.19 DNA fingerprinting would help in the identification of Kinship.

Procedure:-

1. Blood sample are taken from the killed passengers.
2. DNA is extracted from blood cells.
3. DNA is cut into fragments by restriction enzymes.
4. The DNA fragments are separated into bands during electrophoresis on agarose gel.
5. The DNA band pattern in the gel is transferred to a nylon membrane by a technique known as southern blotting.
6. The radioactive DNA probe is prepared.
7. The DNA probe binds to specific DNA sequences on the membrane.

8. Excess DNA probe is washed.
 9. At this stage, the radioactive probe is bound to the DNA pattern on the membrane.
 10. X -ray film is placed next to the membrane to detect the radioactive pattern.
 11. The X -ray file is developed to make visible the pattern of bands which is known as a DNA fingerprint.
- Q20.** Recombinant DNA-technology is of great importance in the field of medicine. With the help of flow chart, shows how this technology has been used in preparing genetically engineered human insulin.

Sol.20



- Q21.** Many plant and animal species are on the verge of their extinction because of loss of forest land by indiscriminate use by the humans. As a biology student what method would you suggest along with its advantage that can protect such threatened species from getting extinct?

Sol.21 By *In-situ* conservation, many threatened species can be protected from getting extinct. It is protection & management of important components of biological diversity through a network of protected areas. In *In-situ* conservations the endangered species are protected in their natural habitat so that the entire ecosystem is protected.

Advantages

1. These areas are ecological areas where biological diversity along with natural & cultural resources are protected, maintained & managed through legal or other effective measures.
2. Cultivation, grazing, forestry & habitat manipulation are not allowed in these areas.

OR

Q21. “Determine of Biological Oxygen Demand (BOD) can help in suggesting the quality of a water body.” Explain.

Sol.21 BOD is the amount of oxygen in milligrams required by microorganisms for five days to metabolize waste present in the liter of water at 20°C. The degree of water pollution is directly proportional to BOD.

B.O.D. \propto Input of organic wastes.

The more we put organic wastes in the water body, more will be the amount of oxygen required by microorganisms to decompose the waste present in water.

Q22. A team of students are preparing to participate in the interschool sports meet. During a practice session you find some vials with labels of certain cannabinoids.

(a) Will you report to the authorities? Why?

(b) Name a plant from which such chemicals are obtained.

(c) Write the effect of these chemical on human body.

Sol.22 (a) Of course we will tell the authority about the presence of vials. As cannabinoids is a type of drug whose intake is illegal.

(b) It is obtained from cannabis plant.

(c) Cannabinoids possess certain neuro-transmitter which give relieve during headache, nausea & pain.

Q23. Since October 02, 2014 “Swachh Bharat Abhiyan” has been launched in our country.

(a) Write your views on this initiative giving justification.

(b) As a biologist two problems that you may face while implementing the programme in your locality.

(c) Suggest two remedial methods to overcome these problems.

Sol.23 (a) Swachh Bharat Abhiyan aims to make this country a clean country. This campaign involves the construction of latrines, promoting sanitation programmes in the rural areas , cleaning streets , roads etc. The aim of the mission is to include all the rural to urban areas of the country, The mission has also targeted aims like eliminating open defecation, converting insanitary toilets into pour flush toilets, eradicating manual scavenging, complete disposal of solid to liquid wastes, bringing behavioral changes to people & motivate health practices, spreading cleanliness awareness among people, strengthening the cleanliness systems in urban & rural areas as well as creating user friendly environment for all private sector interested for investing in India.

(b)1. Partial involvement of the people

2. Open defecation.

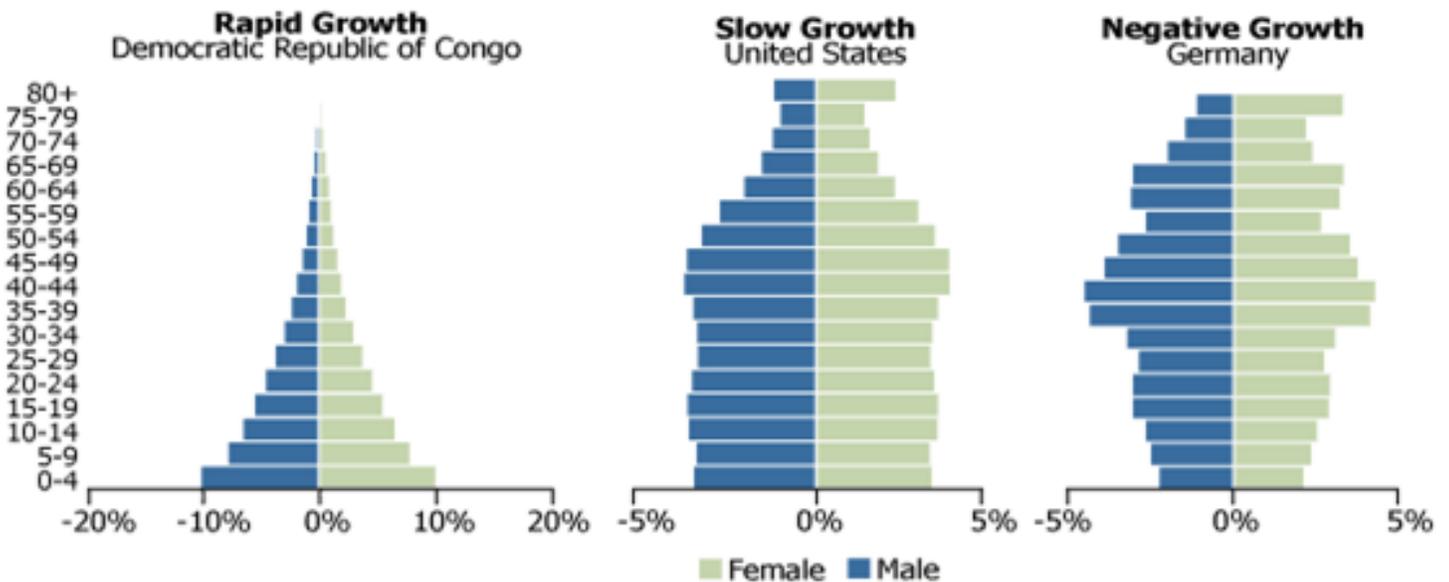
(c) Partial involvement can be overcome by awareness and education.

2. Toilets should be built at mega speed and to persuade households to actually use them.

Q24. “Analysis of age-pyramids for human population can provide important inputs for long-term planning strategies.” Explain.

Sol.24 Age distribution: Various age groups in a population determine its reproductive status. The three ages referred to as ecological ages in a population are – pre – reproductive, where young members grow rapidly, while the declining populations have a large proportion of older individuals.

And also the age-sex structure of a human population can be studied through population pyramids. The overall shape of the pyramid indicates the potential for the future growth. The four representations of population age-sex structure indicate an overall example of what a pyramid for different levels of population growth would appear like rapid growth, slow growth, zero growth, and negative growth. The horizontal bars represent the percentage (or in some cases the actual numbers) of males and females in each age group.



OR

Q24. Describe the advantages for keeping the ecosystems healthy.

Sol.24 Advantages for keeping the ecosystems healthy:

1. Large scale biodiversity is very much useful to maintain ecosystem healthy.
2. It maintains buoyancy between food web & food chain.
3. It satisfies human needs.
4. The evolution in the gene pool of species through number of generation has produced substances that offer us significant health & other benefits.
5. By maintaining ecosystem, our future remains secured.

Q25. A flower of brinjal plant following the process of sexual reproduction produce 360 viable seeds.

- (a) How many ovules are minimally involved?
- (b) How many megaspore mother cells are involved?
- (c) What is the minimum number of pollen grains that must lands on stigma for pollination?
- (d) How many male gametes are involved in the above case?
- (e) How many microspore mother cells must have undergone reduction division prior to dehiscence of anther in the above case?

Sol.25 (a) No. of ovules minimally involved = 360

No. of ovules are equal to the number of viable seeds, because after fertilization ovules develop into seeds.

(b) No. of megaspore mother cells are involved = 360. During gametogenesis, one megaspore mother cell undergoes meiosis, to produce 4 haploid megaspores. Out of these 4 megaspores, only one megaspore becomes functional & the other 3 degenerate.

(c) Minimum no. of pollen grains that must land on pistil for fertilization=360

Pollen grains consist of 2 male gametes, one fuses with polar nuclei to form the endosperm while the other fuses with egg cell to form the zygote that develops into seeds. Therefore, to obtain 360 seeds no. of pollen grains needed would be 360.

(d) No. of male gametes involved in seed production = 360.

Because only one nuclei of pollen grain fuses with the egg cell which eventually develops into seeds.

(e) No. of microspore cell = 90.

1 microspore mother cell produces 4 microspores after meiosis which eventually develop into 4 pollen grains.

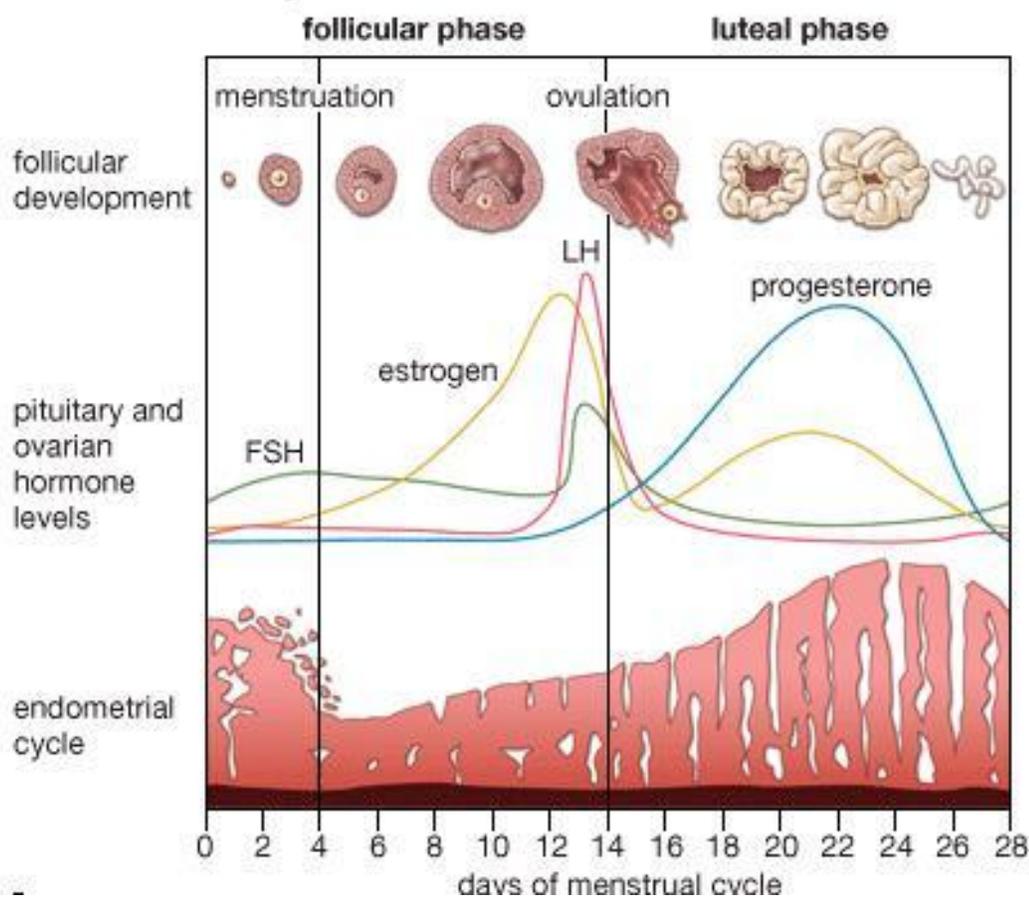
Hence,

4 pollen grains are produced by = 1 (microspore mother cell)

$$360 \dots\dots\dots = \frac{1}{4} \times 360$$

$$= 90 \text{ MMC.}$$

The menstrual cycle



OR

Q25. Describe the changes that occur in ovaries and uterus in human female during the reproductive cycle.

Sol.25 Phases of Menstrual Cycle:-

Menstrual cycle is divided into four phases-follicular,ovulatory, luteal and menstrual.

Follicular (Proliferative) 'phase or Post-menstrual or 'Pre-ovulatory phase:

Under the stimulation of FSH-RF of hypothalamus, there is increased secretion of FSH from anterior pituitary.

- (a) FSH stimulates the change of a primary follicle of the ovary into a Graafian follicle.
- (b) Follicular cells of Graafian follicle secrete estrogens.
- (c) Proliferative phase consists of growth of endometrium, fallopian tube and vagina.

The follicular phase ends with ovulation.

Ovulatory phase or fertility phase:

It involves the ovulation from the Graafian follicle of ovary.

Ovulation is controlled by the increased level of LH in the blood. Egg at that time is in the secondary oocyte state. LH also starts the change of empty Graafian follicle into corpus luteum and secretion of progesterone from corpus luteum.

During ovulation, the secondary oocytes remain surrounded by its zona pellucida and corona radiata. There is no much change in uterine endometrium during ovulatory phase.

Luteal or presentational or pre-menstrual or secretory or post – ovulatory phase:

It is characterized by following changes – Corpus luteum (yellow body) is formed from empty Graafian follicle so is called luteal phase. The endometrium prepares for the implantation of an embryo & the corpus luteum is active. Corpus luteum begins to secrete hormone called progesterone. The latter reaches its peak about 22nd day after the beginning of cycle.

Menstrual Phase or Bleeding Phase

When the ovum remains unfertilized, then the corpus luteum starts degenerating. The level of progesterone in the blood declines. The uterine tissues fail to be maintained. Then the unfertilized ovum along with ruptured uterine epithelium, about 50 - 100 ml of blood and some mucus is discharged out through the vaginal orifice and is called menstrual flow or menstruation.

Decrease in the level of progesterone and estrogens in the blood stimulates the hypothalamus and anterior pituitary to release FSH-RF and FSH respectively (positive feedback). FSH starts the follicular phase of next menstrual cycle.

Q26. Explain the genetic basis of blood grouping in human population.

Sol.26 Blood grouping in human is a type of codominance name in which both the genes are expressed for a particular character in F1 hybrid progeny.

There is no blending of characters.

ABO blood groups are determined by allele I^A , allele I^B & allele I^O

I^A = dominant

I^B = dominant

I^O = recessive.

Possible phenotype - A, B, AB, O.

Blood group	Antigen(s) present on the red blood cells	Antibodies present in the serum	Genotype(s)
A	A antigen	Anti-B	AA or AO
B	B antigen	Anti-A	BB or BO
AB	A antigen and B antigen	None	AB
O	None	Anti-A and Anti-B	OO

Possible genotype no. = $\frac{3(3+1)}{2} = 6$ genotype

OR

Q26. How did Hershey and Chase established that DNA is transferred from virus to bacteria?

Sol.26 Hershey and Chase (1952) discovered that DNA is the genetic material of bacteriophage.

They conducted their experiment on T_2 bacteriophage, which attacks on E.coli bacterium.

The phage particles were prepared by using radioisotopes of S^{35} and p^{32} in the following steps-

Few bacteriophages were grown in bacteria containing ^{35}S which was incorporated into the cysteine and methionine amino acids of proteins and thus these amino acids with ^{35}S formed the proteins of phage.

Some other bacteriophages were grown in bacteria having ^{32}P , which was restricted to DNA of phage particles.

These two radioactive phage preparations (one with radioactive proteins and another with radioactive DNA) were allowed to infect the culture of E.coli. The protein coats were separated from the bacterial cell walls by shaking, and centrifugation.

The heavier infected bacterial cells during centrifugation pelleted to bottom. The supernatant had the lighter phage particles and other components that failed to infect bacteria. It was observed that bacteriophages with radioactive DNA gave rise to radioactive pellets with ^{32}P in DNA. However in the phage particles with radioactive protein (with ^{35}S) the bacterial pellets have almost nil radioactivity indicating that proteins have failed to migrate into bacterial cell. So, it can be safely concluded that during infection by bacteriophage T2' it was DNA, which entered the bacteria. It was followed by an eclipse period during which phage DNA replicates numerous times within the bacterial cell. Towards the end of eclipse period phage DNA directs the production of protein coats assembly of newly formed phage particles.

The above experiment clearly suggests that it is phage DNA and not protein, which contains the genetic information for the production of new bacteriophages. However, in some plant viruses (like TMV), RNA acts as hereditary material (being DNA absent).

