

**VIKAAS PRE UNIVERSITY COLLEGE**  
**BIOLOGY – II PUC MARCH 2019 ANSWER KEY**

**Part A**

**Answer the following questions in one word or one sentence each**

**10×1=10**

1. Oestrous cycle
2. Myometrium
3. Y chromosome
4. Sporozoites
5. Mule
6. *Aspergillus niger*
7. cry gene (*cryIAc, cryIIAb, cryIAb*)
8. Ti-plasmid
9. Main aim of the Montreal Protocol to control the emission of ozone depleting substances
10. Grazing Food Chain (GFC)

**Part B**

**Answer any five of the following questions in 3 to 5 sentences each, wherever applicable**

**5×2=10**

11. Embryogenesis is the process of development of embryo from the zygote  
The two important events that occur during embryogenesis  
a) Cell division                      b) Cell differentiation
12. Point Mutation: Mutation that arise due to change in a single base pair of a DNA  
Example: Sickle Cell Anaemia
13. Conclusions drawn by T.H.Morgan from crossing experiments in *Drosophila*:  
When the genes are loosely linked show higher recombination and when the genes are tightly linked show low recombination
14. The exaggerated response of the immune system to certain antigens present in the environment is called allergy  
Histamine and Serotonin are the two chemicals secreted by the mast cells during allergy
15. The four traits for which plant breeding is done:  
a) Increased tolerance to environmental stresses (Salinity, extreme temperature, drought)  
b) Resistance to pathogens (viruses, fungi, bacteria)  
c) Increased tolerance to insect pests  
d) Increased crop yield and improved quality
16. Convention for naming restriction endonucleases scientifically  
Eg: EcoRI comes from *Escherichia coli* RY13  
First letter of the name comes from the genus *Escherichia* and the second letter from the species of the prokaryotic cell from which they were isolated **coli**

In EcoRI, the letter 'R' is derived from the name of the strain Escherichia coli RY13 . Roman number following the names indicates the order in which the enzymes were isolated from that strain of bacteria.

17. i) Some species of insects and frogs are cryptically coloured (Camouflaged) to avoid being detected easily by the predator  
ii) Monarch Butterfly is highly distasteful to its predator (bird) because of special chemical present in its body
18. The human body compensates low oxygen availability at higher altitude by increasing red blood cell production, decreasing the binding affinity of haemoglobin and by increasing breathing rate.

### Part C

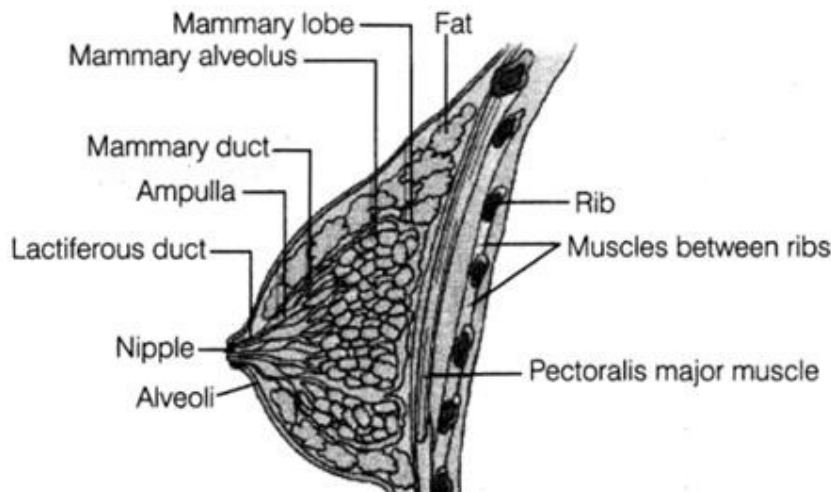
**Answer any five of the following questions in about 40 to 80 words each, wherever applicable**

**5×3=15**

19. Seeds offer several advantages to angiosperms

- Seeds have better adaptive strategies for dispersal to new habitats and help the plant species grow in a new area.
- As the seeds have sufficient reserve food the young seedlings are nourished until they are capable of photosynthesis on their own.
- The hard seed coat provides protection to the embryo.
- As they are the products of sexual reproduction they contribute new genetic combinations to new generations that leads to variations which is the necessary tools for evolution

- 20.



**A diagrammatic sectional view of mammary gland**

21. DNA is better genetic material than RNA because

- Presence of thymine at the place of uracil confers additional stability to DNA
- It provides the scope for slow changes (mutation) because RNA being unstable mutates at a faster rate.
- The 2'-OH group present at every nucleotide in RNA is reactive and makes RNA labile and degradable. But DNA is less reactive and structurally more stable.

22. **Convergent Evolution:** It creates analogous structures that evolve for same function and hence having similarities

Eg: Sweet potato (root modification) and Potato (Stem modification)

**Divergent Evolution:** The same structure developed along different direction due to adaptations to different need. This is divergent evolution and these structures are homologous

Eg: Thorns and tendrils of *Bougainvillea* and *Cucurbita*

23. The agents which causes cancer are called carcinogens

i)Physical carcinogens- Ionising radiations, X-rays

ii)Chemical carcinogens- Tobacco Smoke

iii)Biological Carcinogens-Oncogenic viruses (any two)

24. a)Tools required for recombinant DNA technology

Restriction enzymes, cloning vector, competent host, polymerase enzymes, ligases (any four)

b)The separated bands of DNA are cut out from the agarose gel and extracted from the gel piece is called elution.

25. Limitations of ecological pyramids

- It does not take into account the same species belonging to two or more trophic levels
- It assumes a simple food chain, it never exists in nature
- It does not accommodate food web
- Saprophytes are not given place in ecological pyramids (any 3)

26. Factors which affect decomposition:

- In a particular climatic condition, decomposition rate is slower if detritus is rich in lignin and chitin and quicker, if detritus is rich in nitrogen and water soluble substances like sugars.
- Temperature and soil moisture are the most important climatic factors that regulate decomposition through their effects on the activities of soil microbes.
- Warm and moist environment favour decomposition whereas low temperature and anaerobiosis inhibit decomposition resulting in build up of organic materials

## Part D

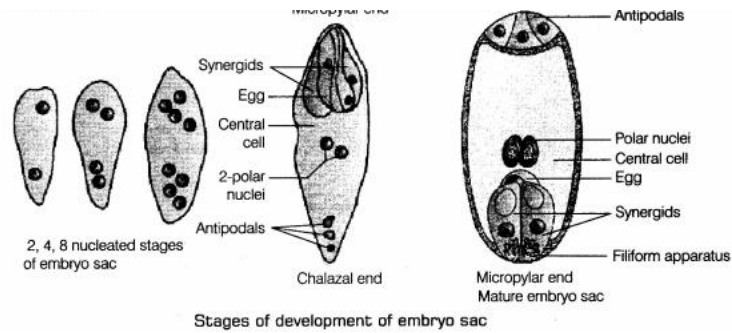
### Section-I

**Answer any four of the following questions in about 200 to 250 words each, wherever applicable**

**4×5=20**

27. The process of formation of megaspores from the megaspore mother cell is called megasporogenesis  
Development of eight nucleate embryosac in flowering plants:

- The nucleus of the functional megaspore divides mitotically to form two nuclei, which moves to the opposite poles, forming the 2-nucleate embryo sac
- Two more sequential mitotic nuclear divisions result in the formation of the 4-nucleate and later the 8-nucleate stage of the embryo sac.
- These divisions are strictly free nuclear i.e, nuclear divisions are not followed immediately by cell wall formation
- After the 8-nucleate stage cell walls are laid down leading to the organisation of the typical female gametophyte or embryo sac



28. Contraceptives are the devices which prevents unwanted pregnancy

Non surgical Contraceptive Methods

1)Barrier Method: Ovum and sperm are prevented from physically meeting with the help of barriers such methods are available for both males and females

2)Intra Uterine devices (IUD's): These are inserted into the uterus through vagina. Types are:Non-Medicated (Lippes Loop), Cu releasing IUDs (Cu T, Cu7), Hormonal IUDs(LNG-20). They increase the phagocytosis of the sperm within uterus and Cu ions released suppress sperm motility and fertilising capacity of the sperms. The hormone releasing IUDs in addition make the uterus unsuitable for implantation and the cervix hostile to the sperms

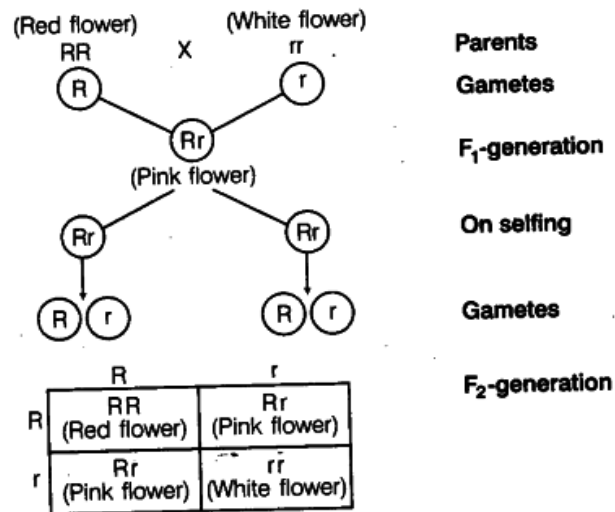
3)Implants: Progestogens or progestogen-estrogen combination can be used by females as injections or implants under the skin

4)Oral contraceptive pills: Oral administration of small doses of either progestogen or progestogen-estrogen combinations in the form of pills. They inhibit ovulation and implantation

29. In heterozygous condition both the alleles fails to dominate each other and exhibit intermediate characters in F1 generation it is called as incomplete dominance

This kind of inheritance is found in flower colour in Dog flower

It is cross between true breeding red flower (RR) and true breeding white flower (rr), the F1 (Rr was pink). When F1 was self pollinated the F2 resulted in the following ratio 1(RR)Red:2 (Rr)Pink:1(rr)White



Phenotypic ratio Red : Pink : White

1 : 2 : 1

Genotypic ratio

RR : Rr : rr

1 : 2 : 1

30. a) Role of organisms as biocontrol agents

- the ladybird and dragonflies are useful to get rid of aphids and mosquitoes
- *Bacillus thuringiensis* used to control butterflies caterpillars. Dried spores are mixed with water and sprayed on to plants such as *Brassicas* and fruit trees where these are eaten by the insect larvae. In the gut of the larvae the toxin is released and the larvae gets killed.
- *Trichoderma*- a free living fungus used to control several plant pathogens.

b) Significance of BOD:

BOD is the measure of organic matters present in the water. Greater the BOD of waste water more is its polluting potential

c) Glomus

31. Benefits of creating transgenic animals

i) study of normal physiology and development:

- Useful to study gene regulation, their effect on the normal functions of the body and its development
- For example, study of complex growth factors like insulin-like growth factors

ii) Study of disease:

- Study of genes which are responsible for diseases in human and their treatment
- Transgenic models have been developed for many human diseases like cancer, cystic fibrosis, rheumatoid arthritis and Alzheimer's disease

iii) Biological products

- Useful biological products can be produced by introducing into transgenic animals the portion of DNA (or genes) which codes for a particular product
- For example, human protein ( $\alpha$ -1-antitrypsin) is used to treat emphysema
- In 1997, the first transgenic cow, Rosie produced human protein-enriched milk (2.4g/L)
- The milk contained the human alpha-lactalbumin and was more nutritionally balanced for human babies than natural cow milk

iv) Vaccine safety:

- Transgenic mice are developed to test safety of vaccines before being used on humans. Eg: polio vaccine

v) Chemical safety testing:

- Transgenic animals are made to carry genes which make them more sensitive to the toxic substances than non-transgenic animals

32. a) Tropical region has greater biodiversity than temperate region because

i) Unlike temperate regions subjected to frequent glaciation in the past, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification

ii) Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable, promotes niche specialisation and lead to greater species diversity

iii) There is more solar energy available in the tropics, which contribute to higher productivity

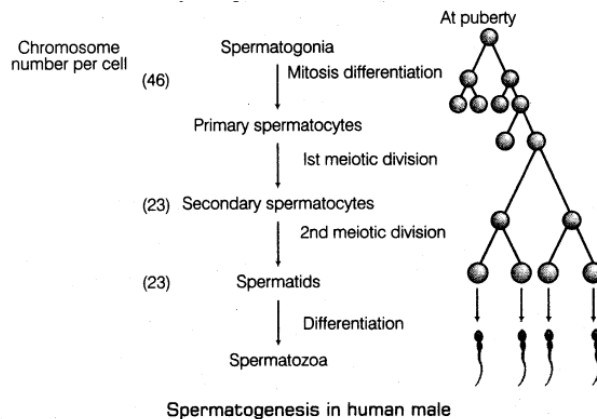
b) Use of CNG is better than petrol or diesel because CNG burns most efficiently, unlike petrol or diesel, in the automobiles and very little of it is left unburnt. CNG is cheaper than petrol or diesel. It cannot be siphoned off by thieves and adulterated like petrol or diesel.

## Section II

Answer any three of the following questions in about 200 to 250 words each, wherever applicable

3×5=15

33. a)

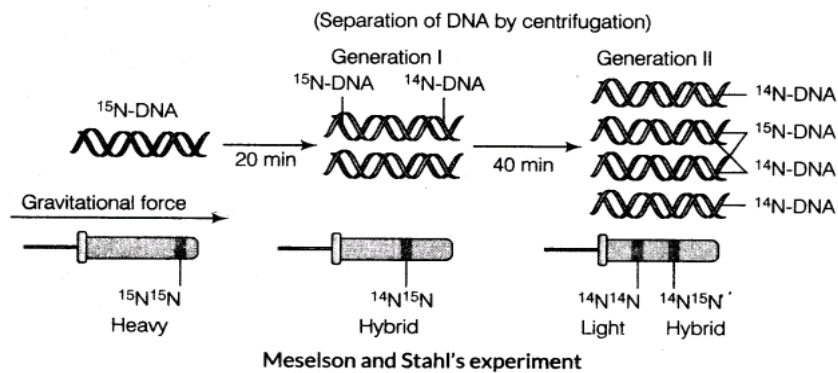


b) During follicular phase, the primary follicles in the ovary grow to become a fully mature graafian follicle under the stimulation of FSH and LH. In the uterus endometrium regenerates through proliferation under the stimulation of estrogen hormone.

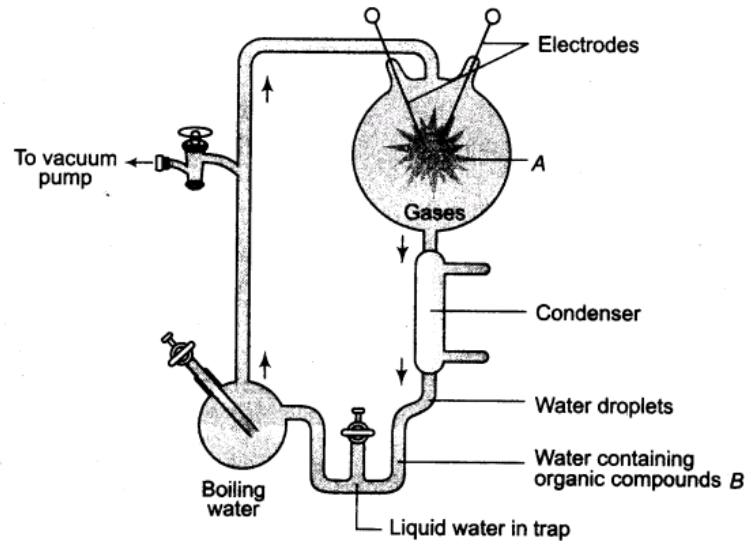
34. During DNA replication in daughter DNA molecules one strand is parental and another is newly synthesised. Hence DNA replication is called semi conservative

Semiconservative method was shown by Messelson and Stahl (1958) in *Escherichia coli*

- They grew *E. coli* in a medium containing  $^{15}\text{NH}_4\text{Cl}$  ( $^{15}\text{N}$  is the heavy isotope of nitrogen) as the only nitrogen source for many generations. The result was that  $^{15}\text{N}$  was incorporated into newly synthesised DNA. This heavy DNA molecule could be distinguished from the normal DNA by centrifugation in a Cesium chloride (CsCl) density gradient
- Then they transferred the cells into a medium with normal  $^{14}\text{NH}_4\text{Cl}$  and took samples at various definite time intervals as the cells multiplied, and extracted the DNA that remained as double-stranded helices. The various samples were separated independently in CsCl gradients to measure the densities of DNA
- Thus, the DNA that was extracted from the culture one generation after the transfer from  $^{15}\text{N}$  to  $^{14}\text{N}$  medium had a hybrid or intermediate density. DNA extracted from the culture after another generation was composed of equal amounts of this hybrid DNA and of light DNA.



35. a) Diagram of Miller's experiment



b) Assumption of Oparin and Haldane

- First form of life could have come from pre-existing non living organic molecules (eg: RNA, protein)
- Formation of life was preceded by chemical evolution i.e., formation of diverse organic molecules from inorganic constituents

36. Multiple Ovulation Embryo Transfer Technology (MOET): It is one of the programmes for increasing the herd size.

- It is used to improve chances of successful production of hybrids
- Cow is administered hormones with FSH like activity induces follicular maturation and production of many numbers of ova called Super ovulation.
- Production of 6-8 eggs instead of 1 egg per oestrous cycle
- The female is either mated with an elite bull or artificially inseminated
- Non-surgical recovery of fertilised eggs at 8-32 celled stage
- Each one transferred to the surrogate mother. The genetic mother is available for another round of super ovulation

37. a) Four 'Evil Quartet' which causes depletion of biodiversity are

- i) Habitat loss and fragmentation
- ii) Over Exploitation
- iii) Alien species invasion
- iv) Co-extinction

b) i) Hibernation (winter sleep): It is a suppressed metabolic state of an organism to avoid winter season  
Eg: Bears going into hibernation in winter.

ii) Aestivation (summer sleep): Hibernation during the summer season is called aestivation Eg: Fishes avoid summer related problems like heat and desiccation.

iii) Diapause: It is the delay in the development during adverse environmental condition

Eg: Many zooplanktons undergoes a stage of suspended development in unfavourable conditions

c) Fishes