

Solution
PRACTICE Paper 04 (2020-21)
Class 12
Biology

Section A

1. Oogenesis is initiated during the embryonic stage of a female fetus.
Oocyte completes oogenesis when a sperm enters the secondary oocyte.
2. 2^4 (16 gametes can be produced) types.
3. 'Saheli' is a contraceptive pill used by females to space children.
Saheli inhibits ovulation and implantation. It alters the quality of cervical mucus to prevent the entry of sperms into cervix.
4. Tiger population in National parks is calculated on the basis of pugmarks and faecal matter
5. To find the genotype of a pea plant bearing violet flowers a test cross would be carried out.
6. *Drosophila melanogaster*. Linkage and crossing over
7. Two physiological barriers that provide innate immunity are:
 - i. The Acid in the stomach
 - ii. Saliva in the mouth
 - iii. Tears from eyes
8. The cry genes that control cotton bollworm are cry IAc and cry IIAb.
Corn borer is controlled by cry IAb.
9. The enzyme Taq polymerase can withstand high temperature used during PCR, as *Thermus aquaticus* can tolerate high temperature.
10. a) Comensalism
b) Symbiotic
- 11.(b). **Explanation:** As genetic code codes for all the possible 20 amino acids resulting from the combinations of 4 nitrogenous bases, where every codon has 3 nitrogenous bases.

OR

(a) Both assertion and reason are correct.

Explanation: In Snapdragon flower, a cross between true-breeding white and red colored flower produces a pink colored flower in F1 generation. This happens due to incomplete dominance of alleles over the other.

12.(a) Both assertion and reason are correct.

Explanation: The time between infection with the virus and the onset of symptoms of AIDS (the incubation period) ranges from a few months to ten years or more. Infected persons can spread the virus during the incubation period.

13.(a) Both assertion and reason are correct

Explanation: DNA sequencing is the process of determining the precise order of nucleotides within a DNA molecule. It includes any method or technology that is used to determine the order of the four bases- adenine, guanine, cytosine, and thymine- in a strand of DNA.

Genetic map up of an organism or individual lies in the DNA sequence. If two individual differs, then their DNA sequence should also be different.

14.(a) Both assertion and reason are correct.

Explanation: Biodiversity is not uniform throughout the world but varies with latitude and altitude. Favorable environmental conditions favor speciation and make it possible for a larger number of species to exist there, i.e., biodiversity is more in such areas than the others. Latitudinal Gradients Species diversity decreased from the equator towards poles. The tropics harbor more species than temperate and polar regions.

15.i. (c) Mortality

ii. (a) Emigration

iii. (b) deaths

iv. (d) Both (a) and (c)

v. (c) carrying capacity

16.i. (a) Autogamy

- ii (d) Both (a) and (b)
- iii. (a) Non-sticky and light pollen grain
- iv. (c) Grasses
- v. (c) The Assertion is true, and the reason is false

Section B

17. (a) Decline in death rate.

(b) Increase in medical facilities

18. Birds

(i) Female: Autosomes + ZW

Male: Autosomes + ZZ

(ii) Male homogametic, female heterogametic Human beings

Autosomes + XX

Autosomes + X Female homogametic Male heterogametic

19.i. C peptide binds A-chain to its B-chain in proinsulin.

Connecting peptide, has an important role in the synthesis of Insulin.

ii. dsRNA will not allow protein synthesis of the pathogen, thus causing RNA interference, which is associated with the silencing of specific mRNA and is a method of cellular defense in eukaryotes.

20. The first patient to be treated with gene therapy was a four-year-old girl treated at the NIH Clinical Center in 1990. She had a congenital *disease* called Severe Combined Immuno Deficiency (SCID), which is caused by Adenosine deaminase (ADA) deficiency, which severely affects immunity and the ability to fight infections.

For the therapy, her white blood cells were taken from her and inserted with the correct genes for making ADA and then reinjected into her.

This process was performed by Dr.

W. French Anderson from the National Heart, Lung and Blood Institute.

OR

Rosie is the first transgenic cow produced in 1997. It produced human protein-enriched milk at 2.4 grams per litre. This transgenic milk is a more nutritionally balanced product than natural bovine milk and could be

given to babies or the elderly with special nutritional or digestive needs.

Rosie's milk contains the human gene alpha-lactalbumin.

21. DNA ligase facilitates the joining of Okazaki fragments in lagging DNA strands together by catalyzing the formation of phosphodiester bond. It also played a role in repairing single strand breaks in duplex DNA.

22.- By treating bacteria with cold calcium chloride or lysozyme.

- *Escherichia coli*, *Bacillus subtilis*

OR

The separated DNA fragments are stained with ethidium bromide.

i. By the exposure to UV radiation, the separated DNA fragments become visible as orange-colored bands.

ii. These separated bands of DNA are cut out from the agarose gel and DNA is extracted from these gel pieces; *this* process is called elution.

23.i. Species diversity- It refers to the number of different species within a given region as in coral reefs.

ii. Genetic diversity- It refers to the diversity of genes within a species.

24.a. mosses, reptiles, birds, angiosperms, fungi, fishes

b. Decomposition and nutrient cycle would be affected.

25. More solar energy high productivity. More glaciation more niche

Specialisation. It is absolutely true that more solar energy is available in the tropics. Sunlight falls directly at the tropics. Because of straight illumination, the duration of the day is longer at the tropics than at higher latitudes. Due to this, plenty of sunlight is available in the tropics. Better availability of solar energy results in higher productivity which in turn might contribute indirectly to greater diversity.

Section C

26.(a) YYAA and yyaa

(b) Plant with yellow seeds and axial flowers: YyAa

(c) Yellow seeds: Yellow seeds: Green seeds: Green seeds

Axial flower: Terminal flower: Axial flower: Terminal flower

9:3:3:1

27. Advantages of Affordable Genome Sequencing: It can help in settling

disputes which may arise in case of parentage of a child. This can also help in disputes of property inheritance by finding the bonafide beneficiary. The human genome can also help in preparing a database on people with criminal records. It can help in identifying the chances of genetic disorders in a family.

Disadvantages: Genome sequencing can have serious issues of privacy.

Some employers may misuse the data to blackmail their employees. Many private matters may leak into the public domain; creating embarrassment for the affected person.

28. Organ transplant involves a critical issue of tissue rejection. This happens because the immune system always tries to reject any foreign substance. In case of identical twins; most of the tissues would be identical in both the individuals. Hence, chances of tissue rejection would be minimal if donor-acceptor pair is from identical twins. Hence, an identical twin is considered to be an advantage for an organ transplant.

29. a. yes

b. Shaded and unshaded portions refer to exons and introns

c. In prokaryotes arrangement is polycistronic and in eukaryotes it is monocistronic, with the presence of exons and introns.

30. For the diagram refer to N.C.E.R.T Text Book of class XII

Fig 2.8 (c) with every correct labelling carrying $\frac{1}{2}$ mark

OR

a. Egg cell forms zygote and polar nuclei become fusion nucleus

b. Endosperm is filled with reserve food materials and is meant for the nutrition of the developing embryo.

c. Ploidy of tapetal cells $2n$
of endosperm $3n$

Section D

31 i. Oogenesis is markedly different from spermatogenesis in the following aspects-

Spermatogenesis	Oogenesis
It occurs in males, starting from puberty till the complete life cycle.	It starts before birth during embryonic development and occurs till menopause.
A single spermatogonium after second meiotic division forms four haploid spermatids, that mature to form spermatozoa.	A single oogonium after second meiotic division produces one ovum and two non-functional polar bodies.
The process of spermatogenesis, i.e. second meiotic division completes in testes and releases mature sperms.	The second meiotic division of oogenesis completes in Fallopian tube when sperm enters the secondary oocyte.

ii. A diagrammatic sectional view of ovary showing different stages-

Refer to Figure 3.7 of class 12th NCERT Textbook

OR

(a)

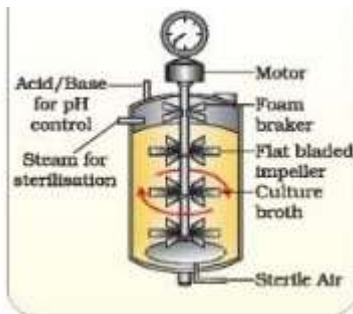
Hormone	13-14th day	21-23rd day
FSH	HIGH	LOW
LH	HIGH	LOW
Progesterone	LOW	HIGH

(b) Luteal

(c) There is no menstruation upon fertilization because the ovum which was to shed gets implanted. Uterine wall and blood vessels maintain the embryo.

32.(a) Temperature, pH, substrates, salts, vitamins and oxygen.

(b) Simple stirred-tank bioreactor



(c) The stirrer facilitates even mixing and oxygen availability throughout simple-stirred tank bioreactor, whereas in case of sparged stirred tank bioreactor, air is bubbled throughout the reactor for proper mixing.

OR

a. 1.A; 2.C 3.T 4.A

b. To get same sticky ends, for the action of enzyme DNA ligase

c. DNA ligase will not be able to function.

d. EcoR I

33.a. Osmoregulation would be affected, water from inside the fish will come out, cells would shrink.

b. Atmosphere is thin, less concentration of oxygen, so to counter it more haemoglobin to pick up more oxygen.

c. As they have large surface area relative to their volume

OR

Sewage through filtration and sedimentation forms supernatant part the primary effluent and all the solids that settle down form the primary sludge.

Secondary treatment or Biological treatment of primary effluent involves different

steps:

- i Primary effluent is passed into large aeration tanks.
- ii It is constantly agitated mechanically, and the air is pumped into it.
- iii This allows vigorous growth of useful aerobic associated with fungal filaments to form mesh like structures).
- iv. The microbes decompose the major part of the organic matter in the effluent.
- v. It reduces the BOD (Biological oxygen demand) of the effluent.
- vi BOD refers to the amount of oxygen that would be consumed if all the organic matter in one liter of water were oxidized by bacteria.
- vii When the BOD of sewage is reduced significantly the effluent is passed into a settling tank where the bacterial flocks are allowed to sediment forming the activated sludge.
- viii. A small part of activated sludge is pumped back into the aeration tank to serve as the inoculum.
- ix. The remaining major part of activated sludge is pumped into large tanks called Anaerobic sludge digesters.
- x. Here, another type of anaerobic bacteria digests the bacteria and fungi in the sludge producing methane, hydrogen sulphide and carbon dioxide i.e., Biogas, can be used as a source of energy as it is inflammable.

