BIOLOGY

SOLUTION

SECTION-A

Q.	1	2	3	4	5	6	7	8	9	10
A.	A	D	B	D	C	C	C	C	B	D
Q.	11	12	13	14	15	16				
A.	D	B	A	B	B	A				

SECTION-B

17. **(a)** **Myometrium :** Middle layer of the uterus, contractions of the uterus during delivery/child birth/parturition.

(b) **Endometrium :** Inner layer of the uterus, cyclic changes during menstruation/implantation of embryo. **[1+1=2]**

18. (a) This representation (HbA peptide) indicates a normal human, because the glutamic acid in the sixth position is not substituted by Valine.

(b) The suffere's RBCs become elongated and sickle shaped as compared to the normal biconcave RBCs. **[1+1=2]**

19. **[1+1=2]**

	Host	Site of occurrence
(a) Formation of gametocytes	Human	Red blood cells
(b) Fusion of gametocytes	Female *Anopheles* mosquito	Intestine

20. (a) To take up the (hydrophilic) DNA from the external medium.

Divalent calcium ions increase the efficiency of DNA entering the cell through pores in the cell wall.

(b) Biolistic gun helps to introduce alien DNA into the plant cell by bombarding with high velocity micro-particles (gold or tungsten) coated with DNA. **[1+1=2]**

21. Given ecological pyramid represents the inverted pyramid of biomass and pyramid of number

Example pyramid of biomass :- Pond ecosystem.

Example pyramid of number :- Tree ecosystem. **[1+½ + ½ =2]**

SECTION-C

22. (a) In the given graph, 1 and 2 are FSH and LH respectively.

(b) The given graph A and B are estrogen and progesterone respectively.

(c) In the given figure, represents A is the endometrium B-myometrium C-perimetrium and A is the endometrium that break during menstruation. **[1+1+1=3]**

23. (a) Down syndrome is caused by trisomy 21 — the person has three copies of chromosome 21, instead of the usual two copies, in all cells. This is caused by abnormal cell division during the development of the sperm cell or the egg cell.

(b) Down syndrome could be caused due to presence of an additional copy of the chromosome number 21 (trisomy of 21). The affected individual is short statured with small round head, furrowed tongue and partially open mouth. Palm is broad with characteristic palm crease physical, psychomotor and mental development is retarded. So, the pregnent women is advised to undergo MTP and not to complete the full term of her pregnancy. **[1+2=3]**

24. (a) Contraceptive pills contain progestogen or progestogen-estrogen combination.
They act by either of the following way :

(i) Inhibiting ovulation

(ii) Inhibiting implantation

(iii) Altering the quality of the cervical mucus to prevent or retard the entry of sperms.

(b) Contraceptive pills should be taken daily for a period of 21 days starting within first five days of menstrual cycle (to be repeated after a gap of 7 days). **[2+1=3]**

25. (a) **Adaptive radiation :** The process of evolution of different species in a given geographical area starting from a point and radiating to other areas of geography (habitats).

(b) **Convergent evolution (Adaptive convergence):** formation of functionally similar structures independently by unrelated organisms.

(c) Wolf is a placental mammal whereas Tasmanian wolf is a marsupial mammal. **[1+1+1=3]**

26. (a) A farmer relies on biofertilisers then chemical fertilisers because

- Chemical fertilisers significantly increase the soil pollution and reduce quality of soil, cause water pollution, when it drains into nearby water bodies, after rain.
- Overuse of chemical fertiliser makes the soil unfit for raising any crop.

(b) Anabaena fixes atmospheric nitrogen, thus enriching the nitrogen content of the soil, as well as the organic matter.
In Mycorrhizae, the fungal symbiont absorbs phosphorus from the soil and passes it to the plant and provides resistance to root-borne diseases, since, they fulfill the nitrogen and phosphorus requirement they act as biofertilizers. $[1\frac{1}{2} + 1\frac{1}{2} = 3]$

27. (a) Biopiracy

(b) (i) here should be equal sharing of the benefits of bioresources by developed and developing countries.

(ii) Laws should be made to avoid unauthorized usage of the bioresources. **[1+2=3]**

OR

- Specific Bt toxin genes isolated from *Bacillus Thuringiensis* are incorporated into cotton. *CryIAc* and *CryIIAb* control the bollworm.
- Bt gene forms protein crystals that contain a toxin insecticidal protein.
- It is in an inactive state.
- The inactive toxin is converted into active form due to the alkaline pH of the gut of ballworm which solubilizes the crystal.
- Activated Bt-toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis. It finally leads to the death of the insect. **[1+2=3]**

28. (a) Yes, India has greater ecosystem diversity than Norway. It is because India lies primarily in the tropical and sub-tropical zone while Norway lies near the Artic region this exposes India to greater amounts of sunlight and thus greater level of ecosystem diversity.

(b) (i) **Genetic diversity :-** A single species might show high diversity at the genetic level over its distributional range. The genetic variation shown by the medicinal plant *Rauwolfia vomitoria* growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical (reserpine) that the plant produces. India has more than 50,000 genetically different strains of rice, and 1,000 varieties of mango.

(ii) **Species diversity:-** The diversity at the species level, for example, the Western Ghats have a greater amphibian species diversity than the Eastern Ghats. **[1+2=3]**

SECTION-D

29. (a) DNA is basically a hydrophilic molecule and cell membrane is hydrophobic in nature. Hence, the DNA cannot pass through cell membrane.

OR

In the micro-injection method, the recombinant DNA is injected directly into animal's nucleus.

(b) Competent cells are those that allow the foreign DNA to incorporate into the host by a slight alteration in the cell walls. "Competent" means the ability of a cell to intake foreign DNA.

(c) The microinjection technique is usually carried out in animal cell to inject alien DNA directly into the nucleus. **[1+2+1=4]**

30. (a) Initial number of Hydrilla = 20

New Born Hydrilla = 10

Time period = 1 year

$$\text{Birth rate} = \frac{\text{Number of Individual born}}{\text{Total Number of Individual}} = \frac{10}{20} = 0.5 \text{ per year}$$

(b) A=Mortality B=Natality

(c) Birth rate or Natality is expressed as the number of births per 1,000 individuals of a population per year

Example : If in a pond there were 20 lotus plants last year and through reproduction 8 new plants are added, taking the current population to 28. We calculate the birth rate as 8/20 = 0.4 offspring per lotus per year.

OR

Death rate or Mortality is expressed as the number of deaths of individual of a population per year.

Example : If 4 individuals in a laboratory population of 40 fruitflies died during a specified time interval, say a week, the death rate in the population during that period is 4/40 0.1 individuals per fruitfly per week. **[1+1+2=4]**

SECTION-E

31. (a) In India the female partner is often blamed for the couple being childless because our society is a male dominating society so nobody blames the male.
Being a biology student below are the values that i will promote :
(i) We must provide proper biological / sex eduction at such, a basic stand which can be clear to very individual.
(ii) General health awareness programme must be scheduled to persons for their health related queries.

(b) Causes of infertility could be -
- Many physical congenital disease.
- Some physiological problems in females/males, so gametes (sperm/ova) are not produced.

(c) IVF (In Vitro Fertilisation) and Artificial Insemination (Al) can be done if the sperm count of male is low. **[2+2+1=5]**

OR

(a) (i) Incentives should be given to couples with small families.
(ii) Media Publicity, Posters of happy couples with two children.
(iii) Motivate families to use contraceptive measures.

(b) To understand the problem faced by the family and the nation due to increasing population, simultaneously the benefits of having a small family.

(c) (i) Public awareness through mass media
(ii) Education at all levels
(iii) Family planning
(iv) Increasing marriageable age (18 for girls, 21 for boys) **[2+1+2=5]**

32. (a) • Contact inhibition is the of normal cells in which contact with other cells inhibits their uncontrolled growth.
• Metastasis is the property in which tumor cells reach distant sites in the body, through blood.

(b) Proto oncogenes or Cellular oncogenes.
These genes when activated under certain condition could lead to oncogenic transformation of the cells.

(c) Biopsy/radiography/CT/MRI

(d) α-interferon activates immune system and destroys the tumour. **[2+1+1+1=5]**

OR

(a) Yes, so that it does not become a habit by repeated use. Consumption of drugs may cause harmful effects.

(b) (Any Two)

Drugs	Source	Danger
Cocaine	*Erythroxylum coca*	Affects central nervous system and interferes with transport of dopamine.
Opioids/ Heroin/ Smack	Latex of *Papaver somniferum*	Slow down body functions
Cannobinoids	*Cannabis sativa*	Affect cardiovascular System

(c) Awareness can be promoted by organising poster making competitions, street plays, talks by experts and interviews of experts. **[1+3+1=5]**

33. (a)

S.N.	Mendel	Sutton And Bovery
1	Factors occur in pairs	Chromosomes occur in pairs
2	Factors segregate at the time of gamete formation such that only one of each pair is transmitted to a gamete	Chromosomes segregate at gamete formation stage and only one of each pair is transmitted to a gamete
3	Independent pairs of factors segregate independently of each other	One pair of chromosomes segregate independently of another pair

(b) There are following reasons behind unrecognization of Mendel work.

(i) The communication was not easy in those days and his work could not be widely publicised.

(ii) His concept of genes or factor as stable and discrete unit that controlled the expression of traits and, of the pair of alleles which did not blend with each other, was not accepted by his contemporaries as an explanation for the apparently continuous variations seen in nature.

(iii) Mendel's approach of using mathematics to explain biological phenomena was totally new and unacceptable to many of the biologists of his time.

(iv) Finally, though Mendel's work suggested that factors (genes) were discrete units, he could not provide any physical proof for the existence of factor. **[3+2=5]**

OR

Operon is a group of controller & structural genes which controls the catabolism of the cell genetically eg lactose operon / lac operon.

(i) **When inducer or lactose is absent :-**

The lac regulator gene synthesize a repressor protein by transcription & translation. This repressor protein binds with operator site of lac operon & blocks RNA polymerase. Thus, RNA polymerase unable to transcribe mRNA & structural gene unable to translate enzyme β-galactosidase.

(ii) **When inducer or lactose is present :-**

The lac regulator gene transcribe mRNA & synthesise active lac repressor protein & at the same time lactose is converted into isomer allolactose. Allolactose binds to active lac repressor due to which it is converted to inactive repressor. This inactive repressor is released from operator site of lac operon & RNA polymerase binds to promoter & starts to transcribe mRNA & forms β-galactosidase are which converts lactose into glucose & galactose.

Thus, presence of lactose determines whether or not lac. Repressor is bound to operator & genes are expressed on not. **[2+3=5]**