Solution

BIOLOGY

Class 12 - Biology

Section A

1. Select and write the correct answer:

(i) **(a)** actual remains
Explanation: {
actual remains

(ii) **(a)** Cytokinins
Explanation: {
Cytokinins

(iii) **(a)** Bacillus thuringiensis
Explanation: {
Bacillus thuringiensis

(iv) **(c)** atherosclerosis
Explanation: {
atherosclerosis

(v) **(c)** retina
Explanation: {
retina

(vi) **(b)** humification
Explanation: {
humification

(vii) **(d)** Turgid
Explanation: {
Turgid

(viii) **(a)** Absolute natality
Explanation: {
Absolute natality

(ix) **(b)** Acetobacter aceti
Explanation: {
Acetobacter aceti

(x) **(c)** Sporozoite
Explanation: {
Sporozoite

2. Answer the following:

(i) The cross between F_1 hybrid and its homozygous recessive parent is called as test cross.

(ii) Calcitriol is produced by the kidneys.

(iii) **Microsporogenesis** is a process in which each microspore mother cell divides meiotically to form tetrad of haploid microspores (pollen grains).

OR

The process of formation of microspores from diploid microspore mother cell through meiotic cell division inside the microsporangia or pollen sacs is called microsporogenesis.

(iv) The passive absorption of solutes when mediated by a carrier it is called as facilitated diffusion.

(v) Leaching is a step in the process of decomposition in which water soluble inorganic nutrients percolate into the soil horizon and get precipitated as unavailable salts.

(vi)

Abscission	Pre-mature fall of flowers, fruits and leaves
Mottling	Appearance of green and non- green patches on leaves

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(vii) IVF represents In vitro fertilization.

(viii) Following is the correct sequence of the steps performed during DNA fingerprinting technique:

ii. Isolation of DNA

iv. Restriction digestion

i. Gel electrophoresis

iii. Southern blotting

Section B

3. Answer the following:

(i) In a dissimilar pair of factors, one member of the pair dominates (i.e. dominant) over the other (i.e. recessive). The law of dominance is used to explain the expression of only one of the parental characters of a monohybrid cross in F_1 generation.

(ii) The character which is not expressed in F_1 generation is called recessive character.

4. a. The study of ancient life with the help of fossils is called palaeontology.

b. **The significance of palaeontology:**

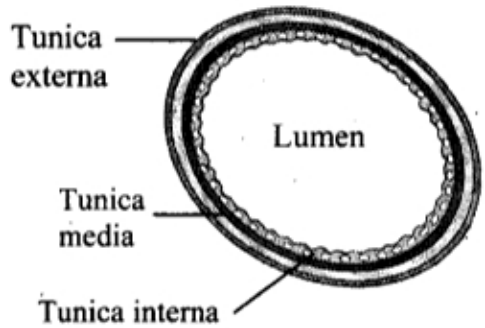
i. It is useful in reconstruction of phylogeny.

ii. It helps in studying various forms and structures of extinct animals.

iii. It provides record of missing link between two groups of organsims.

iv. It helps in the study of habits of extinct organisms. v. Connecting links can be identified by palaeontology which can provide evidence for organic evolution.

5.



T. S. of Vein

6. There are various applications of tissue culture in forestry, agriculture, horticulture, genetic engineering, physiology, etc. The different applications of tissue culture include -

i. Production of disease free plants and haploid plantlets,

ii. Micropropagation,

iii. Production of secondary metabolites,

iv. Protoplast culture,

v. Culture of rare plants,

vi. Somaclonal variations

vii. Production of stress resistant plants, etc.

7. i. Connecting links are fossil forms, transitional or intermediate between two groups of organisms. They show some characters akin to both the groups.

ii. Archaeopteryx lithographica is fossilized crow size, toothed bird found from Jurassic rocks in Germany. It is known as missing link between reptiles and birds because it shows characters of both.

8. Answer the following:

(i) Pollution can be defined as 'an undesirable change in physical, chemical or biological characteristics of our air, water and land that may or will harmfully affect human life and the environment.

(ii) Carbon dioxide (CO_2) is mainly responsible for global warming.

9. i. **Blood proteins:** Erythropoietin; Factors VII, VIII, IX; Tissue plasminogen activator; Urokinase.

ii. **Human Hormones:** Epidermal growth factor; Follicle stimulating hormone; Insulin.

10. Qualitative and quantitative aspects of growth phenomenon:

i. **Quantitative aspect of growth:** Quantitative aspect of growth includes an increase in the length, breadth, size, volume, body mass or dry weight and number of cells. Growth as a quantitative change is a final end product of successful metabolism.

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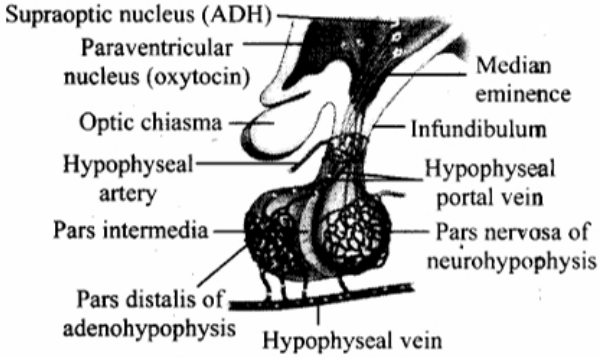
ii. **Qualitative aspect of growth:** Qualitative aspect of growth deals with the change in the nature of growth which includes development that is an ordered change or progress, and differentiation which leads to higher and more complex state.

11. Greenhouse gases are atmospheric gases that trap the reflected heat radiations of the sun. e.g. Carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs), nitrous oxide (N_2O), water vapours [Any two examples]

12.

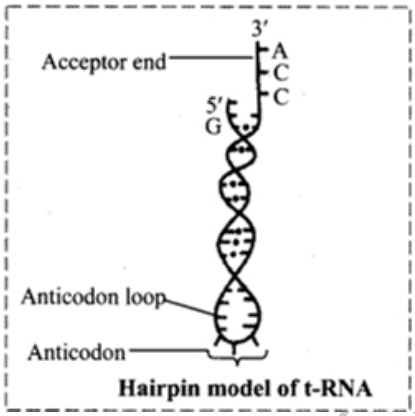


Pituitary gland

13. i. Write limitations of root pressure theory:

a. It is not applicable to plants taller than 20 meters.
b. Ascent of sap can also occur even in the absence of root system.
c. Root pressure value is almost nearly zero in taller gymnosperm trees.
d. In actively transpiring plants, no root pressure is developed.
e. Xylem sap under normal condition is under tension i.e. it shows negative hydrostatic pressure or high osmotic pressure.

14.



Hairpin model of t-RNA

Section C

15. **Following are the characteristics of Neanderthal man:**

i. They were advance prehistoric man.
ii. Their fossils were collected from Neanderthal valley, Germany.
iii. They existed in late Pleistocene epoch about 100000 to 400000 years ago.
iv. Cranial capacity of Neanderthal Man was 1400 cc.
v. These were short and had heavy built.
vi. They had short prominent brow ridges, the skull bones were thick, forehead was low and slanting, the jaw was deeper than that of modern man with no chin. They had outwardly curved thigh bones
vii. They were quite intelligent to use and construct flint tools.
viii. They buried their dead bodies.

16. Answer the following:

(i) Polyembryony is the development of more than one embryo, inside the seed, which consequently results in the emergence of multiple seedlings.

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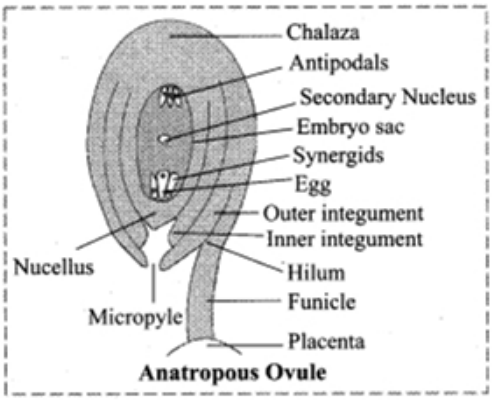
(ii)



Anatropous Ovule

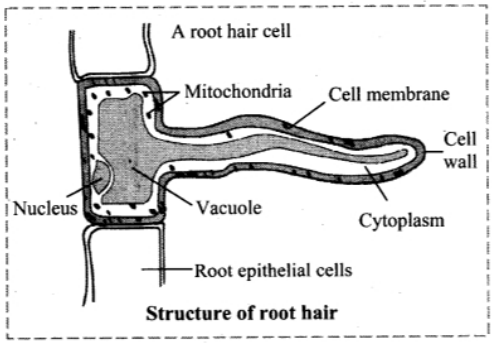
i. Three mitotic divisions are required to produce embryo sac.

ii. The integuments of the fertilized ovule get transformed into the seed coat.

iii. The micropyle provides passage for entry of pollen tube during fertilization.

17. i. Water has high specific heat, high heat of vaporization and high heat of fusion. Due to this, it acts as thermal buffer.

ii.



Structure of root hair

a. Root hair is cytoplasmic extension (prolongation) of epiblema cell.

b. Each root hair may be approximately 1 to 10 mm long and tube like structure.

c. It is colourless, unbranched, short-lived (ephemeral) and very delicate.

d. It has a large central vacuole surrounded by thin film of cytoplasm, plasma membrane and thin cell wall, which is two layered.

e. Outer layer is composed of pectin and inner layer is made up of cellulose.

f. Cell wall of a root hair is freely permeable but plasma membrane is selectively permeable.

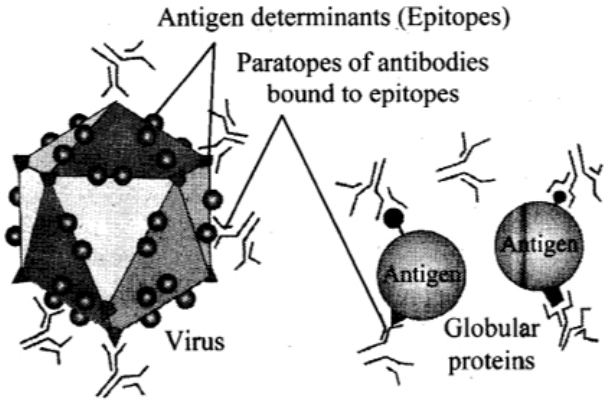
18. i. Each antibody is specific for a particular antigen.

ii. Combining sites of antigen, called antigenic determinants (epitopes) react with the corresponding antigen binding sites of antibodies called paratopes.

iii. The antigen binding sites (paratopes) are located on the variable regions of the antibody.

iv. Small variations in the variable regions make each antibody highly specific for a particular antigen.

v. The variable region enables the antibody to recognize the specific antigen and bind to specific antigen in a lock and key manner forming an antigen-antibody complex.



Formation of antigen- antibody complex

19. Answer the following:

(i) Emigration is the number of individuals of the population who left the habitat during the time period.

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(ii) i. Adaptation is an attribute of the organism (morphological, physiological, and behavioural) that enables the organism to survive and reproduce in its habitat.

ii. a. **Adaptations in Opuntia:** Some desert plants like Opuntia, have their leaves reduced (modified) to spines and the photosynthetic function is taken. over by the flattened stems.

b. **Adaptations in Seal:** Seals have a thick layer of fat (blubber) below their skin acting as an insulator to reduce loss of body heat.

20. **Micropropagation:**

i. Micropropagation is also known as clonal propagation.

ii. Organogenesis via shoots is considered as one of the most widely used commercial method of regeneration of plant.

iii. Micropropagation is the only process adopted by Indian plant biotechnologists in different industries, mainly for the commercial production of plants like Orchids, Chrysanthemum, Eucalyptus, etc. and fruit plants like Banana, Grapes, Citrus, etc.

21. i. Abscisic acid (ABA) is the stress hormone in plants.

ii. **Physiological effects of Abscisic acid:**

a. It promotes abscission of leaves and induces dormancy in many plants.

b. It controls the dormancy in buds and seeds by inhibiting growth processes.

c. It accelerates the senescence of leaves, flowers and fruits.

d. It 'inhibits and delays cell division and cell elongation and suppresses cambium activity by' inhibiting mitosis in vascular cambium.

e. ABA could cause efflux of K^+ ions from the guard cells and result in closure of stomata. So, it is known as an anti-transpirant.

f. It acts as a stress hormone by inducing the plant to bear the adverse environmental conditions.

g. It inhibits flowering' in long day plants but stimulates flowering in short day plants.

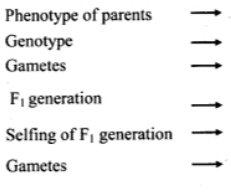
22. A cross between parents differing in two heritable traits is called dihybrid cross.

OR

A cross between two pure (homozygous) parents in which the inheritance pattern of two pairs of contrasting characters is considered simultaneously is called dihybrid cross.

The phenotypic ratio of different types of offsprings (with different combinations) obtained in F_2 generation of dihybrid cross is called dihybrid ratio. It is $9:3:3:1$.

For example, when we cross a yellow round seed pea plant with a green wrinkled seed pea plant, we get 9 yellow round, 3 yellow wrinkled, 3 green round and 1 green wrinkled plants in the F_2 generation.



Yellow Round × Green Wrinkled
YYRR yyrr
YR yr
YyRr
(Yellow round)
YyRr × YyRr
YR Yr yR yr YR Yr yR yr

♀ \ ♂	YR	Yr	yR	yr
YR	YYRR Yellow round	YYRr Yellow round	YyRR Yellow round	YyRr Yellow round
Yr	YYRr Yellow round	YYrr Yellow wrinkled	YyRr Yellow round	Yyrr Yellow wrinkled
yR	YyRR Yellow round	YyRr Yellow round	yyRR Green round	yyRr Green round
yr	YyRr Yellow round	Yyrr Yellow wrinkled	yyRr Green round	yyrr Green wrinkled

Phenotypic ratio: Yellow round $= 9$; Yellow wrinkled $= 3$; Green round $= 3$; Green wrinkled $= 1$ Dihybrid ratio $\rightarrow 9:3:3:1$

Genotypic ratio → YYRR : YYRr : YyRR : YyRr : YYrr : Yyrr : yyRR : yyRr : yyrr
1 : 2 : 2 : 4 : 1 : 2 : 1 : 2 : 1

23.

	Function	Hormone	Gland secreting hormone
i.	Growth of thyroid gland	TSH (Thyroid stimulating hormone)	Pituitary
ii.	Controls tubular absorption of water in kidney	ADH/ Vasopressin	Hypothalamus

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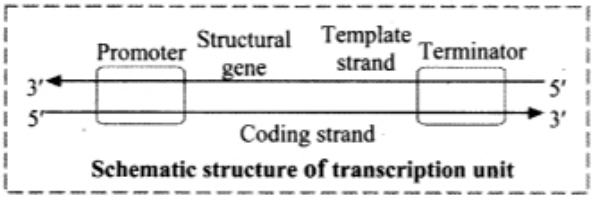
iii.	Stimulates liver and muscles for glycogenesis	Insulin	Pancreas/Islets of Langerhans
iv.	Development of immune system and maturation of T-lymphocyte.	Thymosin	Thymus

24. Answer the following:

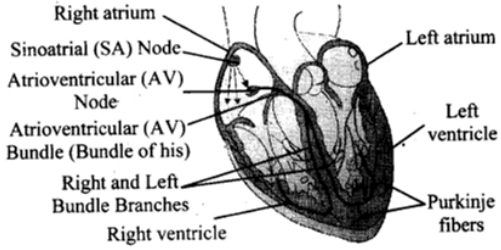
(i) Splicing is the process that removes introns from RNA.

(ii) **Structure of transcription unit:**



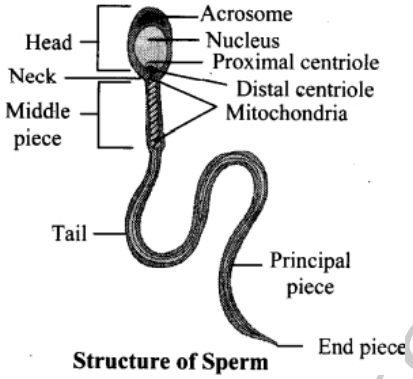
Schematic structure of transcription unit

25.



Conducting system of human heart

26.



Structure of Sperm

For structure of human sperm:

Human sperm:

Sperm is the male gamete. It is a motile, microscopic and elongated cell.

The sperm is divisible into three parts: Head, middle piece and tail.

a. **Head:** The sperm head is oval in shape and contains haploid nucleus.
   Above the nucleus, there is a cap like structure called acrosome which is formed from the Golgi body. Acrosome contains hydrolytic enzymes like hyaluronidase and proteolytic enzymes like zona lysins and corona penetrating enzymes.
b. **Neck:** It is a very short region having two centrioles i.e. proximal centriole and distal centriole.
c. **Middle piece:** It has an axial filament surrounded by 10-14 spiral turns of mitochondria (Nebenkern). It produces energy necessary for the movement of sperm.
d. **Tail:** It is a long, slender and tapering part containing cytoplasm and fine thread i.e. axial filament.
   The axial filament arises from the distal centriole and travels throughout the length of tail. It is partly surrounded by plasma membrane (main piece).
   The part without plasma membrane is called end piece.

Section D

27. Answer the following:

(i) Thymus is a prominent gland at birth but gets gradually atrophied in the adult.

(ii) The hormones released by the neurohypophysis are vasopressin and oxytocin.

i. **ADH: Anti Diuretic Hormone (ADH) or Vasopressin.**
   Functions: It increases reabsorption of water in distal convoluted tubules and collecting ducts of kidney tubules.
   It regulates the balance of body fluids by reducing the output of urine.
   It increases blood pressure by causing vasoconstriction.

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ii. **Oxytocin:**

Functions: It stimulates contraction of uterus during parturition. It stimulates ejection or release of milk thus, it is also known as birth hormone or milk ejecting hormone.

(iii) The blind spot is the region of retina where rods and cones are absent.

28. i. a. Secondary oocyte completes the process of oogenesis and is transformed into a mature ovum (n).
b. The diploid chromosome number is restored in the zygote by the process of syngamy.
c. The ovum lacks the centrioles necessary for further divisions, which are received from the sperm during fertilization.
d. Fertilization involves fusion of male and female gametes from the two parents. It·results in variations which are significant to evolution.

ii. a. **Organs derived from ectoderm:** Skin, hair, nails, sweat glands, salivary glands, mammary glands, lacrimal glands, sebaceous glands, cornea, lens, retina, conjunctiva, nasal epithelium, enamel of teeth, internal and external ear, foregut, hindgut, adrenal medulla, anterior and posterior pituitary, pineal gland, entire nervous system.
b. **Organs derived from mesoderm:** Mesoderm forms all types of muscles (except iris muscles and ciliary muscles of eye which originate from ectoderm), connective tissues, dermis of skin, adrenal cortex, heart, blood, blood vessels, lymphatic vessels, middle ear, dentine of teeth, urinary and reproductive ducts, gonads, kidneys, sclera and choroid of eye.
[Any two organs of each]

29. Answer the following:

(i) Mohsin is suffering from hypertension.
Hypertension or deviation from normal blood pressure value may be due to high or low blood volume, arterial inelasticity or hardening of arteries (arteriosclerosis), deposition of fats like cholesterol in the arteries (artherosclerosis), renal diseases and emotion induced hormonal changes, obesity, etc.

(ii) QRS complex represents ventricular depolarization.

(iii) Respiration converts the energy stored in the body in the form of complex organic compounds (potential energy) into usable form.

30. **Following are the effects of biotechnology with relation to human health:**

i. Allergies
a. GMO crops could potentially have negative effects on human health as well.
b. Consumers have developed unexpected allergic reactions. e.g. Researchers used a gene from the Brazil nut to increase the production of Methionine in soybeans.
c. The insertion of this gene inadvertently caused allergic reactions to the soybean in those with known nut allergies ("Biotech Soybeans").

ii. New proteins
a. Proteins that have never been ingested before by humans are now part of the foods that people consume every day.
b. Their potential effects on the human body are as of yet unknown. E.g. whey protein

iii. Food additives
a. GMOs also present us with possibilities of introducing additional nutrients into foods, as well as antibiotics and vaccines.
b. This availability of technology can provide nutrition and disease resistance to the people of those countries that don't have the means to provide these, otherwise.
c. However, there is possibility of the creation of antibiotic and vaccine-resistant strains of pathogens.
(Explanation of Any two effects)

31. i. Double fertilization: The fusion of one male gamete with egg and that of another male gamete with secondary nucleus is called as double fertilization.
ii. When pollen grain reaches the 'surface of the stigma, it germinates and forms a pollen tube.
iii. Pollen tube penetrates the stigma, style, ovary chamber and then enters ovule.
iv. The growth of pollen tube is guided by the chemicals secreted by the synergids.
v. A pollen tube penetrates embryo sac of ovule through its micropylar end.
vi. The pollen tube carrying >male gametes penetrates in one of the synergids.
vii. Watery contents of synergid are absorbed by pollen tube, due to which it ruptures and release the contents, including the two nonmotile male gametes.
viii. As non-motile male gametes are carried through hollow pollen tube, it is known as siphonogamy that ensures fertilization to take place.
ix. Fertilization mainly involves two processes: Syngamy and Triple fusion.

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a. Syngamy: It is the fusion of haploid male gamete with' haploid female gamete (egg). It results in the formation of diploid zygote which develops to form embryo. Syngamy is a type of generative fertilization.
b. Triple fusion: It is the fusion of second haploid male gamete with diploid secondary nucleus. It results in the formation of Primary Endosperm Nucleus (PEN) which develops into triploid endosperm. Triple" fusion is a type of vegetative fertilization.

x. In this process, both the male gametes participate, due to which fertilization occurs twice in the same embryo sac, hence it is described as double fertilization.

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