

Solution
BIOLOGY
Class 12 - Biology
Section A

1.
(d) Less in diversity
Explanation:
Crop-fields are main man-made ecosystems which are generally monoculture in nature, with less biodiversity but highly susceptible to ecological and biotic factors.

2.
(c) Better medical facilities
Explanation:
A high increase in the human population is due to the availability of better medical facilities to increase IMR and decrease MMR.

3.
(c) amorphous, colloidal, light coloured substance
Explanation:
amorphous, colloidal, light coloured substance

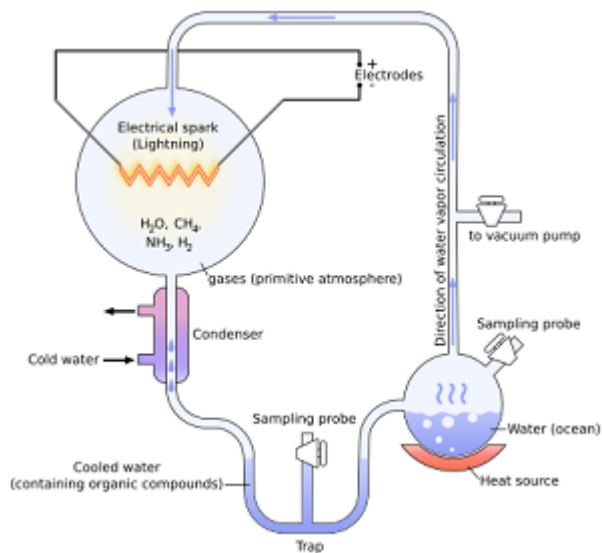
4.
(b) Tubectomy
Explanation:
Tubectomy is not a natural method of birth control. In the tubectomy method, a fallopian tube of the female is cut and tied to prevent ovulation. To abstain, coitus interrupts and the rhythm period is a natural method of birth control.

5.
(c) Invertase
Explanation:
Invertase

6.
(c) Oxygen
Explanation:
Certain bacteria, which grow anaerobically on cellulosic material, produce a large amount of methane along with CO_2 and H_2 . These bacteria are collectively called methanogens.

7.
(c) 100% tall plants
Explanation:
100% tall plants.

8.
(c) A – electrodes, B – ($\text{NH}_3 + \text{H}_2 + \text{H}_2\text{O} + \text{CH}_4$), C – cold water, D – Vacuum, E – U Trap.
Explanation:
In Urey and Miller experiment the set up labelled as A – electrodes, B – ($\text{NH}_3 + \text{H}_2 + \text{H}_2\text{O} + \text{CH}_4$), C – cold water, D – Vacuum, E – U Trap.



9. (c) Dead organic matter
Explanation:
 Dead organic matter
10. (b) The parents are heterozygous
Explanation:
 A diploid organism is heterozygous at a gene locus when its cells contain two different alleles of a gene. Pedigree chart of a family shows that both male and female children carry the traits for free and attached ear lobes. Hence, the parents are heterozygous for the above-given trait.
11. (d) Pseudomonas
Explanation:
 Pseudomonas
12. (a) a - Vector DNA, b - Foreign DNA
Explanation:
 a - Vector DNA, b - Foreign DNA
13. (b) Both A and R are true but R is not the correct explanation of A.
Explanation:
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14. (b) Both A and R are true but R is not the correct explanation of A.
Explanation:
 Bio-fertilizers are organisms that enrich the nutrient quality of the soil. Rhizobium bacteria present in the root nodule of leguminous plants fix atmospheric nitrogen. Organic farming is farming without the use of chemicals.
15. (a) Both A and R are true and R is the correct explanation of A.
Explanation:
 A given organism may occupy more than one trophic level as a sparrow is a primary consumer when it eats seeds and a secondary consumer when it eats insects.

16. (a) Both A and R are true and R is the correct explanation of A.

Explanation:

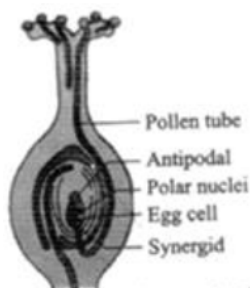
Organic evolution is the events involved in the evolutionary development of a species. It means that all life descended from other life, although features may have changed dramatically along the way.

Charles Robert Darwin collected observations on animal distribution and the relationship between the living and extinct animals. He found that existing living forms share similarities to varying degrees not only among themselves but also with the life forms that existed millions of years ago, some of which have become extinct.

Section B

17. For molecular diagnostics: a single strand DNA or RNA is tagged with a radioactive probe. It is then introduced into the host cell and allowed to hybridize with its complementary DNA in a clone of cells that are formed in vitro. The cloned cells are then observed using radiography. This helps in detecting the problems.

18. i. **Valine:** GUU, **Proline:** CCU
 ii. **Nucleotides of DNA strand:** TAC AAA TAC GGA CAA AGA ATT
 iii. **UAA:** Stop



19. **Longitudinal section of a flower showing growth of pollen tube**

Synergids and egg cell are the components of egg apparatus.

20. A. = Trophoblast - Gets attached to the endometrium and draws nutritive material secreted by uterine endometrium gland.
 B. = Inner cell mass - Differentiates as Embryo.
21. Biochemical oxygen demand (BOD) is a measure of how much organic pollution is in water. The BOD test measures the amount of dissolved oxygen in water that is used up due to the breakdown of organic pollutants, such as sewage, in a certain number of days.
 More the value of BOD, more the water is polluted. Hence sample B is more polluted.

OR

	Primary sewage treatment	Secondary sewage treatment
1.	It is a physical method of treatment	It is a biological method of treatment
2.	It involves in removal of large particles and floating materials such as leaves, papers, rags, solids such as sand, grit and oily substances	It involves the removal of fine suspended and dissolved organic matter.
3.	It makes the used of sedimentation and filtration process	It makes the use of aerobic or anaerobic biological units
4.	It is relatively simple and less time consuming process	It is relatively complex and takes a long time for its completion

Section C

22. i. A - DNA polymerase, B - hnRNA, C - Spliced RNA, D - mRNA
 ii. hnRNA is required to undergo splicing because of the presence of introns in it. These need to be removed and the exons have to be joined in a specific sequence for translation to take place.
23. Cell type of male fruit fly - XY
 Female fowl - ZW
 The sex chromosomes are different, hence, they are called heterogametic.
 While female fruit fly has XX and male fowl has ZZ. The sex of chromosomes are similar hence homogametic.
24. - Sigmoid curve
 - In nature a given habitat has enough resources to support a maximum possible number of population, beyond which no further growth of the population is possible. This limit is called as nature's carrying capacity (K) for that species in that habitat.

25. ELISA-Enzyme Linked Immunosorbent Assay.

ELISA is based on antigen-antibody interaction.

The two ways to detect the presence of infection or disease by ELISA are as follows:

- i. The presence of antigens (proteins, glycoproteins, etc) is detected.
 - ii. Antibodies produced against the pathogens are detected.
26. No, it is impossible to maintain constant productivity and natural community over a time period of 100 years because with time the population size increases resulting in the depletion of the availability of resources. It is also a cause of competition among species. Moreover, an environmental condition also changes with time.

OR

In situ conservation - conservation and protection of whole ecosystem and its biodiversity at all levels in their natural habitat. Whereas **Ex situ conservation** involves taking out the threatened animals and plants from their natural habitat and placed in special settings where they can be protected and given special care.

27. a. Study of fossil fuel indicate the following

They are evidence of evolution and they represent extinct. The life forms varied over time and certain life forms were restricted to certain geological time spans.

b. Rhynia ⇒ Arborescent Lycopods ⇒ Conifers ⇒ Dicotyledon

28. In modern times, many children are kept under a protective environment at an early age. They are not exposed to the external environment. This lowers the immunity against the hazards of the environment and is the main cause of allergic reactions in those children. Due to this, many children in the metropolitan cities of India suffer from allergy/asthma.

Some symptoms of allergic reactions are; coughing, sneezing, breathlessness, etc.

Section D

29. i. When the zygote moves through the isthmus of the oviduct, the mitotic division is initiated and is called the cleavage towards the uterus to form 2,4,8,16 daughter cells called blastomeres. It is an embryo containing 8 to 16 blastomeres from the morula. It continues to transform and divide into blastocysts as it further approaches the uterus.

ii. The endocrine function of corpus luteum is to secrete progesterone which is essential for the maintenance of endometrium layer of uterus. Thickened endometrium is necessary for the implantation of fertilised ovum and other events of pregnancy.

iii. Fertilization may take place but the zygote may develop in the tube instead of the uterus.

OR

The trophoblast layer of the human blastocyst gets attached to the endometrium and the inner cell mass gets differentiated into an embryo. After attachment, the uterine cells divide rapidly and cover the blastocyst.

30. a. Macrophages, virus replication (RNA genome)

b. Enzyme-linked immuno-sorbent assay (ELISA)/Polymerase Chain Reaction (PCR)

Treatment available - Antiviral drugs that are only partially effective as they only prolong the life of the patient.

c. Making blood HIV safe in blood banks, use of only disposable needles and syringes in hospitals, free distribution of condoms, controlling drug abuse, advocating safe sex, regular check-ups for HIV susceptible population.

OR

A patient suffering from AIDS does not die of this disease but from some other infection because of drastic reduction of helper T-lymphocytes that are responsible to fight infections, person become immune-deficient, unable to protect oneself from other bacterial or viral or fungal or parasitic infection

Section E

31. **Polyembryony** - It is the occurrence of more than one embryo in a seed. It was discovered by Leeuwenhoek in 1719 in orange.

Polyembryony can be three types:

1. **Cleavage polyembryony**: When a single fertilized egg produces more than one embryos, it is the case of cleavage polyembryony.
2. **Simple polyembryony**: When the production of more than one embryos in single seed is the result of fertilization of multiple archegonia, then it is known as simple polyembryony.
3. **Rosette polyembryony**: In some of the gymnosperms, the rosette cells produce additional embryos and this is known as rosette polyembryony.

Polyembryony can also be classified as true and false polyembryony:

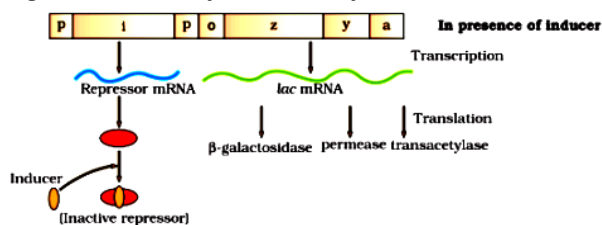
1. **True polyembryony**: It is the production of embryos from cleavage of the zygote or from synergids and antipodal cells.
2. **False polyembryony**: It is the production of multiple embryos from the formation of multiple embryo sac in an ovule.

OR

Microsporogenesis comprises the events which lead to the formation of the haploid unicellular microspores. During microsporogenesis, the diploid sporogenous cells differentiate as microsporocytes (pollen mother cells or meiocytes) which divide by meiosis to form four haploid microspores. Each diploid meiocyte gives rise to a tetrad of four haploid microspores and microsporogenesis is complete with the formation of distinct single-celled haploid microspores.

Microgametogenesis comprises events which lead to the progressive development of the unicellular microspores into mature microgametophytes containing the gametes. This phase begins with the expansion of the microspore which is commonly associated with the formation of a single large vacuole. Vacuolation is accompanied by the displacement of the microspore nucleus to an eccentric position against the microspore wall. In this position, the nucleus undergoes first pollen mitosis (pollen mitosis I) which results in the formation of two unequal cells, a large vegetative cell and a small generative cell each containing a haploid nucleus. The generative cell subsequently detaches from the pollen grain wall and is engulfed by the vegetative cell forming a unique 'cell within a cell' structure. The engulfed generative cell divides once more by mitosis (pollen mitosis II) to form the two sperm cells completely enclosed within the vegetative cell cytoplasm either before pollen is shed (tricellular pollen) or within the pollen tube (bicellular pollen).

32. The regulator gene produces repressor, inactivated in the presence of inducer, that is lactose, RNA polymerase then gets access to the promoter gene and transcription proceeds
 z gene codes for beta-galactosidase (β -gal), responsible for the hydrolysis of the disaccharide lactose into galactose and glucose
 y gene codes for permease, which increases permeability of the cell to β galactosides / lactose
 a gene encodes enzyme transacetylase.

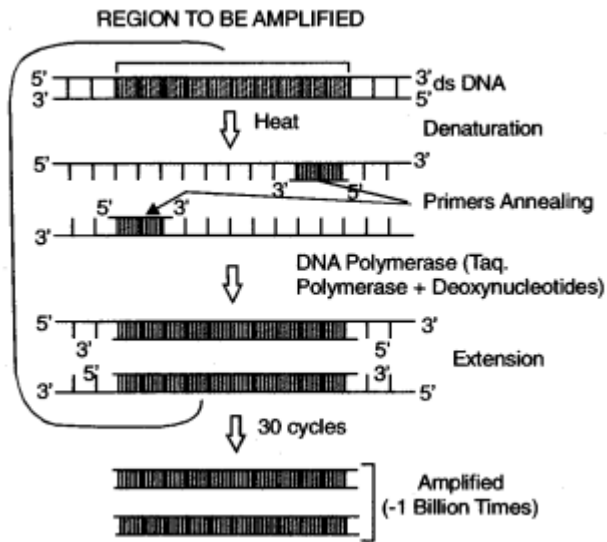


OR

- In the first phase itself, amino acids are activated in the presence of ATP and linked to their cognate tRNA—a process commonly called as charging of tRNA or aminoacylation of tRNA to be more specific. If two such charged tRNAs are brought close enough, the formation of a peptide bond between them would be favored energetically.
 - Small subunit of ribosome binds to mRNA at start codon (AUG) at 5' end, in the two sites of large subunits of ribosome, the charged tRNA with the amino acid corresponding to the codon on mRNA align, formation of peptide bond between the two closely placed amino acids in the two sites occur, with the help of ribozyme in the ribosome, peptide chain elongation continues till the stop codon (UAG, UGA, UAA) on the mRNA reach the big unit of ribosome.
 - Due to transcription error, ATG codon of DNA is transcribed into UAG in mRNA which translates a non-functional polypeptide chain in the ribosome. This means that due to transcription error i.e. presence of G in place of C there will be a synthesis of incorrect protein. Since the codon, UAG stops codon and it will cause termination of the polypeptide chain synthesis.
33. Restriction Enzymes and DNA: Restriction enzymes are those enzymes which cleave/cut the DNA at the particular sequence of the bases. More than 900 restriction enzymes have been isolated from over 230 strains of bacteria, each of which recognises different recognition sequences. Restriction enzymes belong to a larger class of enzymes called nucleases. They may be
- Exonucleases—remove nucleotides from the ends of DNA
 - Endonucleases - make cuts at specific positions within the DNA. Each restriction endonuclease recognises specific palindromic nucleotide sequences in the DNA. It functions by inspecting the length of DNA sequence, identify specific recognition sequence, bind to DNA and cut the two strands at specific points in the sugar-phosphate backbones.

OR

PCR (Polymerase Chain Reaction): In this reaction, multiple copies of the desired gene (DNA) is synthesised in vitro using two sets of primers (small artificially synthesised oligonucleotides that are complementary to the region of DNA) and the enzyme DNA polymerase. The enzyme extends the primers using the nucleotides provided in the reaction and genomic DNA as a template.



A schematic representation of the three steps performed during PCR. Note that the two primers used are complementary to the 3' end sequences of DNA segment to be amplified.

The process of DNA replication can be repeated many times and the segment of DNA can be amplified to approximately billion times. It is achieved by the use of thermostable DNA polymerase isolated from bacterium *Thermus aquaticus*.

The amplified segment can also be used to ligate with a vector for further cloning.

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