Class XII Session 2026-27
Subject - Biology
Sample Question Paper - 6

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. The chromosome number of a spore mother cell of an angiosperm is 38. What will be chromosome number of its endosperm cell? **[1]**

   a) 38 b) 19

   c) 57 d) 76

2. What would happen if oxygen availability to activated sludge flocs is reduced? **[1]**

   a) Flocs would increase in size as anaerobic bacteria would grow around flocs

   b) Protozoa would grow in large numbers

   c) It will slow down the rate of degradation of organic matter

   d) The center of flocs will become anoxic, which would cause death of bacteria and eventually breakage of flocs

3. Select the statement which explains best parasitism. **[1]**

   a) Both the organisms are benefited b) One organism is benefited, other is affected

   c) One organism is benefited. d) One organism is benefited, other is not affected

4. Which of the following samples of DNA in the table given below will give the desired result during polymerase chain reaction? **[1]**

   a)

Sample	Temperature used for	Enzyme used for

	Denaturation	extension
I	High temp./90°C	Heat stable

b)

Sample	Temperature used for Denaturation	Enzyme used for extension
IV	High temp./90°C	Heat unstable

c)

Sample	Temperature used for Denaturation	Enzyme used for extension
III	Low temp./50°C	Heat resistant

d)

Sample	Temperature used for Denaturation	Enzyme used for extension
II	Low temp./50°C	Heat stable

5. Buffer zone in biosphere reserve is zone for: **[1]**

a) Agriculture b) Tourism and restoration

c) Research and education d) Forestry

6. Which of the following statement is wrong for viroids? **[1]**

a. They lack a protein coat
b. They are smaller than viruses
c. They cause infection
d. Their RNA is of high molecular weight

a) Statement d is wrong. b) Statement b is wrong.

c) Statement c is wrong. d) Statement a is wrong.

7. After some time of ejaculation, semen liquefies due to presence of an enzyme which is found in secretion of: **[1]**

a) Vagina b) Prostate gland

c) Cowpers gland d) Seminal vesicle

8. Radioactive probe can be detected by: **[1]**

a) PCR b) Autoradiography

c) Sequencing d) Centrifugation

9. Which one of the following is the correct sequence in the formation of microspore? **[1]**

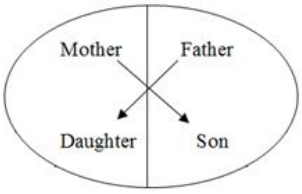
a) Sporogenous tissue, microsporangium, microspore tetrad, microspore

b) Microspore tetrad, microsporangium, sporogenous tissue, microspore

c) Microsporangium, sporogenous tissue, microspore tetrad, microspore

d) Sporogenous tissue, microspore tetrad, microsporangium, microspore

10. Represented below is the inheritance pattern of a certain type of trait in humans. Which one of the following conditions could be an example of this pattern? **[1]**



a) Thalassemia

b) Haemophilia

c) Sickle Cell anemia

d) Phenyl ketonuria

11. The double helix of DNA is made of polynucleotide chains wherein backbone is constituted by sugarphosphate and the bases are projected: **[1]**

a) Inside

b) Bases remain in line of sugar phosphate.

c) One base inside and other outside.

d) Outside

12. An interesting property of restriction enzymes is molecular cutting and pasting. Restriction enzymes typically recognize a symmetrical sequence of DNA. **[1]**



Notice that the top strand is same as the bottom strand, but reads backward. When the enzyme cuts the strand between G and A, it leaves overhanging chains:

a) Both sticky & blunt ends

b) Blunt ends

c) Jointed end

d) Sticky ends

13. **Assertion (A):** '$XX - XY$' type of sex-determination mechanism is an example of male heterogamety. **[1]**

Reason (R): In birds male heterogamety is observed as males produce two different types of gametes.

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

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

14. **Assertion (A):** Under a particular set of selection pressures, organisms evolve towards the most efficient reproductive strategy. **[1]**

Reason (R): Populations evolve to maximise their reproductive fitness in the habitat where they live.

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

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

15. **Assertion (A):** Sequences of bases in one polynucleotide chain of DNA can determine the sequence of bases in the other chain. **[1]**

Reason (R): In a DNA, the amount of adenine equals that of thymine and amount of guanine equals that of cytosine, i.e., A = T and C = G.

a) Both A and R are true and R is the

b) Both A and R are true but R is not

correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** Brown sugar is morphine-derivative. **[1]**
Reason (R): Morphine is the principal opium alkaloid.

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

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

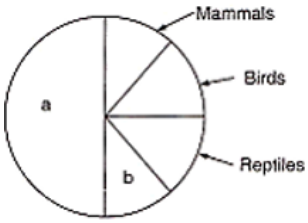
Section B

17. What is the use of aeration tank in the treatment of sewage? **[2]**

OR

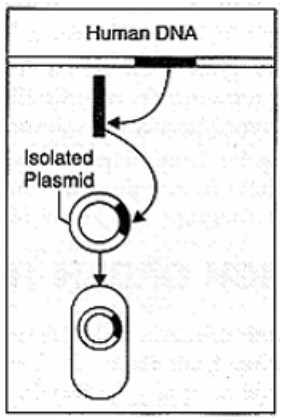
Name the source of statin and state its action on the human body.

18. **[2]**

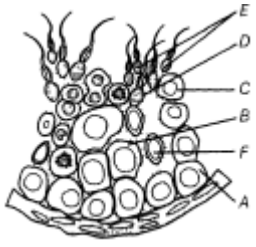


Name the unlabelled areas 'a' and 'b' of the pie chart representing biodiversity of vertebrates showing the proportionate number of species of major taxa.

19. Name the particular technique whose steps are shown in the following figure. Use the figure to summarise the technique in three steps. **[2]**



20. Name the labels A, B, C, D, E and F in the diagram of seminiferous tubule. **[2]**



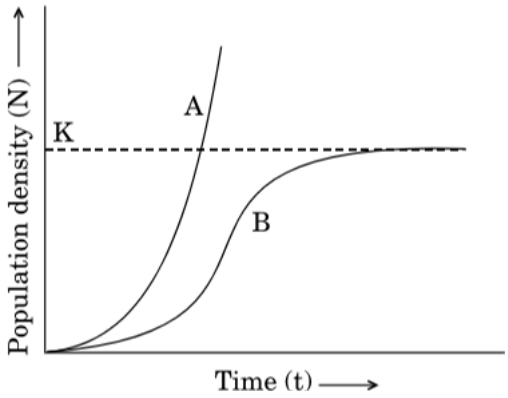
OR

Draw a diagrammatic sectional view of a human seminiferous tubule, and label Sertoli cells, primary spermatocyte, spermatogonium and spermatozoa in it.

21. In a pond, there were 20 Hydrilla plants. Through reproduction 10 new Hydrilla plants were added in a year. Calculate the birth rate of the population. **[2]**

OR

Study the population growth curve given below and answer the questions that follow:



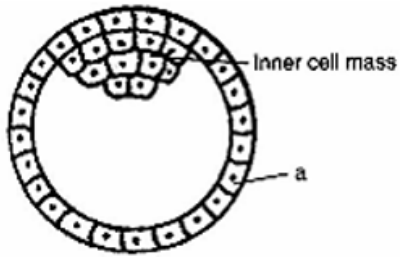
a. Identify **A** and **B** shown in the graph.

b. When and why do such curves occur in a population?

Section C

22. Explain giving reason the action plan followed by organic farmers that support their key belief **biodiversity furthers health of crop lands**. **[3]**

23. Study the below figure and answer the question that follows: **[3]**



i. Identify 'a' and which part of the placenta is formed by 'a'?

ii. Mention the fate of the inner cell mass after implantation in the uterus.

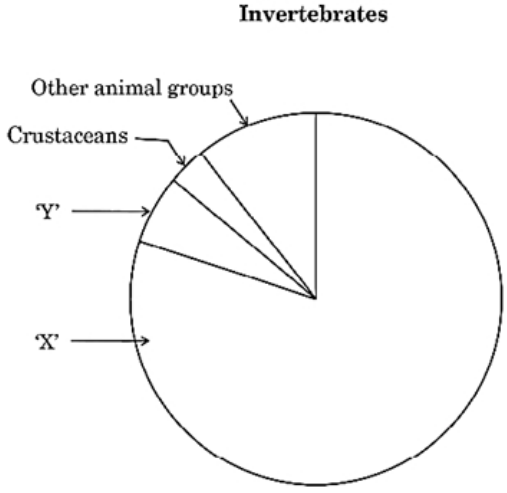
iii. Where are the stem cells located in this embryo?

24. A woman with blood group 'A' marries a man with blood group 'O'. Discuss the possibilities of the inheritance of the blood groups: **[3]**

i. They produce children with blood group 'A' only.

ii. They produce children some with 'O' blood group and some with 'A' blood group.

25. Study the pie chart given below, representing the global diversity: **[3]**
proportionate number of species of major taxa and answer the following questions based on it.



a. Identify **X** and **Y** in the given pie chart.

b. Which one of the two, **X** or **Y**, is the most species-rich taxonomic group and by what percentage?

26. With a neat, labelled diagram, describe the parts of a typical angiosperm ovule. **[3]**

27. Give an account of energy flow in an ecosystem. **[3]**

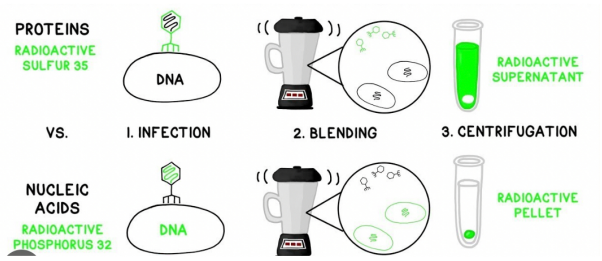
28. i. Differentiate between Intrauterine insemination and Intrauterine transfer. **[3]**

ii. Mention one positive and one negative application of amniocentesis.

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

In 1952, Alfred Hershey and Martha Chase took an effort to find the genetic material in organisms. Their experiments **led to an unequivocal proof to DNA as genetic material**.



Hershey and Chases's experiments:

i. Name the kind of virus they worked with and why? (1)

ii. Why did they use two types of culture media to grow viruses in? Explain. (1)

iii. What was the need for using a blender and later a centrifuge during their experiments? (2)

OR

State the conclusion drawn by them after the experiments. (2)

30. **Read the following text carefully and answer the questions that follow:** **[4]**

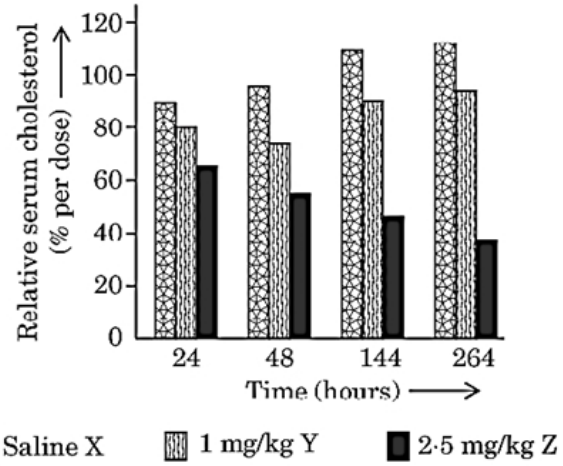
RNA interference (RNAi) holds great potential as a therapeutic agent for the treatment of human diseases and as a bicontrol agent for controlling pests in the field of agriculture.

The graph given below illustrates the use of 'RNAi' for the potential treatment of disorders of cholesterol metabolism. Some people possess genetic mutations with elevated levels of 'ApoB' gene which predisposes them to coronary artery diseases.

Lowering the amount of 'ApoB' can reduce the number of lipoproteins and lower the blood cholesterol.

Tracy Zimmerman and her colleagues used RNAi in 2006 to reduce the level of 'ApoB' in non-human primates Cynomolgus monkeys. One group of monkeys were given RNAi treatment (Small interfering RNAs, SiRNAs) (doses 1 mg/kg SiRNAs), a second group of monkeys were given RNAi treatment (doses 2.5 mg/kg SiRNAs) and a third group of monkeys were injected with saline as control.

The results of the experiments are illustrated in the graph given below:



i. Write your interpretation from the bars **X** and **Z** obtained after 264 hours of treatment of monkeys with saline and 2.5 mg/kg SiRNAs treatment respectively, in comparison to the bars obtained after 24 hours of treatment with saline and 2.5 mg/kg SiRNAs. (1)

ii. A tobacco plant made transgenic using RNA interference is protected from the parasite Meloidogyne incognitia. How is the transgenic tobacco plant able to prevent itself from infestation by the nematode? Explain briefly. (1)

iii. How does the treatment with 2.5 mg/kg brings an effect on cholesterol metabolism when compared from 24 hours and 144 hours. (2)

OR

How is RNAi used in controlling the infection on the roots of tobacco plants by the nematode **Meloidogyne incognitia.** (2)

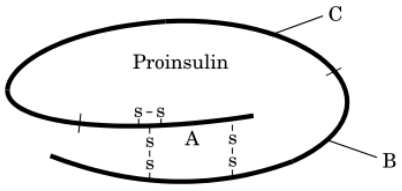
Section E

31. Explain divergent evolution in detail. What is the driving force behind it? **[5]**

OR

State the theory of Biogenesis. How does Miller's experiment support this theory?

32. Insulin in the human body is secreted by the pancreas as prohormone/proinsulin. The schematic polypeptide structure of proinsulin is given below. This proinsulin needs to undergo processing before it becomes functional in the body. Answer the questions that follow: **[5]**



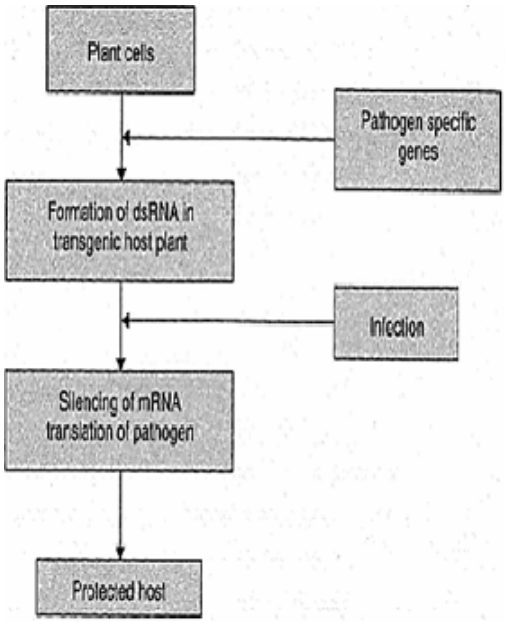
i. State the change the proinsulin undergoes at the time of its processing to become functional.

ii. Name the technique the American company Eli Lilly used for the commercial production of human insulin.

iii. How are the two polypeptides of functional insulin chemically held together?

OR

Study the given flow chart and answer:



i. Name the defence mechanism used.

ii. In which plant it has been done?

iii. Name the pathogen. **OR**

iv. Name the vector used in this technique.

33. What are the methods of cancer detection? Describe the common approaches for the treatment of cancer. **[5]**

OR

Students of class IX had to present a seminar on 'Dengue fever'. They wanted to introduce the disease by starting with

i. the immediate causes of the diseases.

ii. definition of infectious diseases.

iii. the pathogen causing dengue fever.

iv. vector responsible for dengue microbe.

Can you help them to explain the above points? Give details.

Solution

Section A

1.

(c) 57
Explanation:
57

2.

(c) It will slow down the rate of degradation of organic matter
Explanation:
Oxygen is very important for the microorganism to break down and degrade the organic matter which is present in the sewage or the activated sludge. If the oxygen availability of the activated sludge floc is reduced then the degradation rate will slow down.

3.

(b) One organism is benefited, other is affected
Explanation:
Parasitism is a non-mutual relationship between species, where one species, the parasite, benefits at the expense of the other, the host. Traditionally parasite (in biological usage) referred primarily to organisms visible to the naked eye, or macroparasites.

4. **(a)**

Sample	Temperature used for Denaturation	Enzyme used for extension
I	High temp./90°C	Heat stable

Explanation:

Sample	Temperature used for Denaturation	Enzyme used for extension
I	High temp./90°C	Heat stable

5.

(c) Research and education
Explanation:
Buffer zone is managed to accommodate a variety of resources for restoration of degraded ecosystems and habitats, conservation of genetic resources, species and ecosystem, and monitoring of development and conservation programme. It is mainly for research and education.

6. **(a)** Statement d is wrong.
Explanation:
Statement d is wrong.

7.

(b) Prostate gland

Explanation:

The solution Prostate gland is correct because the enzyme responsible for the liquefaction of semen after ejaculation is prostate-specific antigen (PSA), which is secreted by the prostate gland. This enzyme helps to break down the gel-like consistency of semen, allowing sperm to swim freely. The other options do not produce this specific enzyme, making the prostate gland the correct answer.

8.

(b) Autoradiography

Explanation:

Radioactive probes are single stranded DNA or RNA having radioactive components. This probe can be detected in the individual by using autoradiography technique.

9.

(c) Microsporangium, sporogenous tissue, microspore tetrad, microspore

Explanation:

Microspores are male gametes. The formation of microspore takes place inside microsporangium which contains sporogenous tissue. Sporogenous tissue undergoes a reduction division to form tetrad that separates from each other and becomes microspore.

10.

(b) Haemophilia

Explanation:

The inheritance pattern of a certain type of trait in humans shown above is haemophilia.
A son cannot inherit the defective gene from his father. This is a recessive trait and can be passed on if cases are more severe with the carrier. Genetic testing and genetic counselling are recommended for families with haemophilia. The disease is X-linked and the father cannot pass haemophilia through the Y-chromosome.

11. **(a)** Inside

Explanation:

Inside

12.

(d) Sticky ends

Explanation:

Restriction enzymes cut DNA at specific recognition sequences. When the cut is made in a staggered manner (as described in the question, between G and A), it results in single-stranded overhangs at the ends of the DNA fragments. These overhangs are called **sticky ends** because they can easily pair with complementary sequences on other DNA fragments, facilitating the "cutting and pasting" process in molecular cloning.

13.

(c) A is true but R is false.

Explanation:

A is true but R is false.

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

Explanation:

Both statements are correct and the Reason explains the Assertion. Natural selection acts on heritable variation so that traits increasing an individual's reproductive success become more

common in the population; "reproductive strategy" is simply the suite of traits (timing of reproduction, number and size of offspring, parental care) that determines reproductive success. Under particular selection pressures (for example, high juvenile mortality or intense competition for resources), strategies that give higher reproductive fitness in that environment are favoured, so populations evolve toward the strategy that most efficiently converts resources into surviving offspring. Classical r/K-type examples illustrate this: unstable environments favour r-type traits (many small offspring, early reproduction) while stable, crowded environments favour K-type traits (fewer, larger offspring, greater parental care). Thus the statement that populations evolve to maximise reproductive fitness is the mechanism that explains why organisms evolve the most efficient reproductive strategy for their habitat.

15.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Although A = T and C = G, there is no any restriction or sequence of bases in one polynucleotide chain. Since A is always linked to T and C to G as determined from the above evidences, the sequence of bases in one of polynucleotides should determine the sequence of bases in the other polynucleotide of the double helix.

16.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Morphine is a derivative of opium. It is the principal opium alkaloid and a strong analgesic. Diacetyl morphine hydrochloride is brown sugar/ smack and is more powerful analgesic than morphine.

Section B

17. Aeration tank is meant for agitating the liquid effluent from the primary settling tank, where the air is allowed to pass through agitating mixture to make it aerobic.

    The activated sludge process is the most common option in secondary treatment. Aeration in an activated sludge process is based on pumping air into a tank, which promotes the microbial growth in the wastewater. The microbes feed on the organic material, forming flocs which can easily settle out.

    OR

    Source - Monascus purpureus (Yeast)

    Action - Statins are a class of medicines that are frequently used to lower blood cholesterol levels. They do this by blocking the action of a specific chemical in the liver that is necessary for making cholesterol.

    Although cholesterol is necessary for normal cell and body function, very high levels of it can lead to atherosclerosis, a condition where cholesterol-containing plaques build up in arteries and block blood flow.

    By reducing blood cholesterol levels, statins lower the risk of chest pain (angina), heart attack, and stroke.

18. The unlabelled areas are:
    a. Fishes
    b. Amphibians

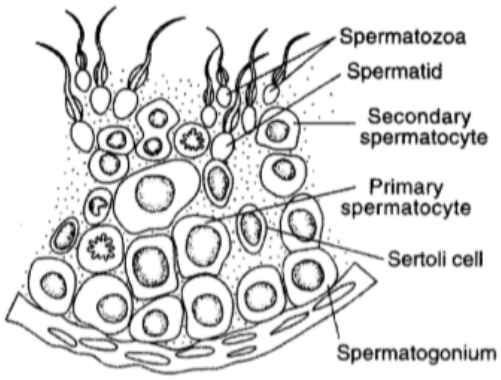
19. Recombinant DNA technology / Genetic engineering

    Three steps are:

    i. Isolation of human DNA with a desirable gene.
    ii. DNA segment is incorporated into the bacterial plasmid to form recombinant DNA.
    iii. Recombinant DNA is introduced in a bacterial cell, which makes protein directed by human DNA.

20. A-Spermatogonium
B-Primary spermatocyte
C-Secondary spermatocyte
D-Spermatid
E-Spermatozoa
F-Sertoli cell

OR



21. Birth rate

$$\frac{\text{Number of individual s added}}{\text{Initial population}}$$

new plants per Hydrilla plant per year

OR

a. Part 'A'- Exponential growth
Part 'B' - Logistic growth

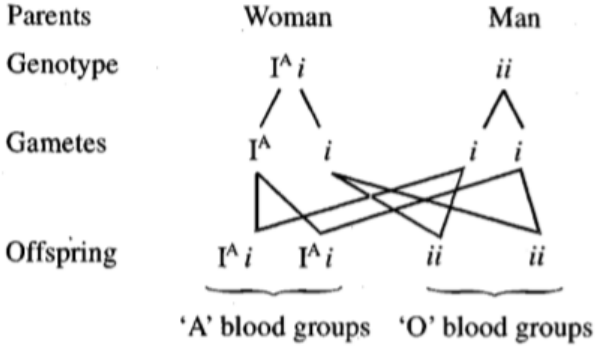
b. 'A'- Exponential growth - when resources (food and space) are not limiting / when resources in the habitat are unlimited, each species has the ability to realise its full potential to grow in number in absence of checks.
'B' - Logistic growth - When resources become limiting / competition between individuals for limited resources occurs, the fittest individuals will survive and reproduce.

Section C

22. Do not eradicate pests but keep them at manageable level by various checks and balances, pests may be food for otherwise beneficiary predators and parasites who would suffer and not survive, more varieties in a landscape more sustainable it is (or any other correct reason).

23. i. 'a' is Trophoblast. It forms chorionic villi and foetal part of the placenta.
ii. It gets differentiated into ectoderm and endoderm.
iii. In the inner cell mass.

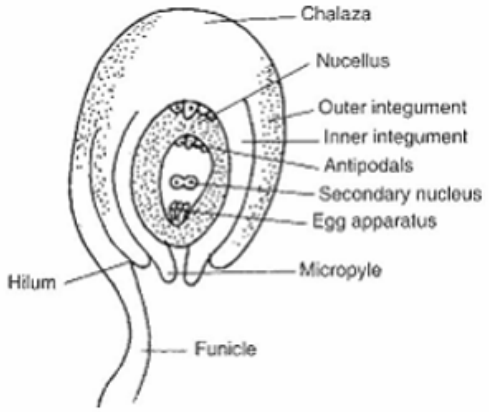
24. i. No, the children with blood group 'A' only, is not correct. If the woman with blood group 'A' is heterozygous (IA,) then there is a possibility of a child with blood group 'O' as each parent may share the recessive gene i. The man with blood group 'O' can contribute only i gene.
ii. Yes, some children with 'O' blood group and some with 'A' blood group is possible.



25. a. X - Insects
Y - Molluscs

b. X - makes most species rich taxonomic group
More than 70% of the total

26.



27. Only 50% of the incident solar radiation is photosynthetically active radiation. Out of this plants capture about 2 to 10% of the energy. This small fraction of energy is what sustains life on the earth. The energy flows from produces (green plants) to consumers or to detritus. The flow of energy follows 10% rule. As per this rule 90% of the energy is spent in metabolic activities by an organism and only 10% is available for the next component of the food chain.
Producers→ Primary consumers →Secondary consumers → Tertiary consumers
Because of this 10% rule a food chain can have limited number of levels. Numerically also the number of organisms in a particular level will be less than that in the previous level

28. i.

Intrauterine insemination	Intrauterine transfer
The semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus of the female.	Embryos with more than 8 blastomeres transferred into the uterus.

ii. Positive application: Amniocentesis used to test for the presence of certain genetic disorders / Down's syndrome / Klinefelter's syndrome / Haemophilia / Sickle-cell anemia.
Negative application: Amniocentesis used to detect sex of the foetus and leads to use of female foeticide

Section D

29. i. They worked with bacteriophage, i.e. viruses that infect bacteria. These viruses were used because during infection they transfer their genetic material into bacteria.
ii. They used two types of culture media, containing ^{35}S and ^{32}P, so as to compare that which one out of DNA and proteins gets transferred from virus to bacteria and act as genetic material.
iii. A blender and centrifuge were used to open up the bacterial cells and viral particles, so, that genetic material could be visualised.
OR
They concluded that DNA is the genetic material that is passed from virus to bacteria.

30. i.
- When monkeys are treated with saline solution, serum cholesterol level increases from 24 hours to 264 hours.
- When monkeys are treated with 2.5mg/kg SiRNAs, level of serum cholesterol decreases from 24 hours to 264 hours.

ii. Using Agrobacterium vectors, nematode specific genes are introduced into the host plant, introduced DNA forms both sense and anti-sense RNA in the host cell, these two RNAs being complementary to each other, form a double stranded RNA, that initiates RNAi and thus silencing the specific mRNA of the nematode, nematode is unable to survive in the transgenic plant.
iii. RNAi treatment has a notable impact in comparison to saline treatment. The Cynomolgus monkeys displayed nearly 60% of relative serum cholesterol throughout the first 24 hours. However, when treated with 2.5mg/Kg siRNAs, this level of serum cholesterol dramatically

dropped by 40% after 144 hours. This indicates that the amount of A po B protein produced is decreased as the mRNA.

OR

The roots of tobacco plants are infected by the nematode Meloidegyne incognitia, which significantly reduces production. This infestation is stopped using an RNA interference (RNAi) technique. In all eukaryotic organisms, RNAi is used as a cellular defence mechanism. Double-stranded RNA (dsRNA) controls the sequence-specific degradation of mRNA throughout this process. Due to a complementary dsRNA molecule, it suppresses (silencing) the translation of a certain mRNA. The steps of RNA interference are as follows:

i. The source of this complementary RNA could be from infection by viruses having RNA genomes or mobile genetic elements (transposons) that replicate via an RNA intermediate.
ii. Using Agrobacterium vectors, nematode-specific genes were introduced into the host plant.
iii. The introduction of DNA was such that it produced both sense and antisense RNA in the host cells.
iv. These two RNAs being complementary to each other formed a doublestranded (dsRNA) that initiated RNAi and thus, silenced the specific mRNA of the nematode.
v. The consequence was that the parasite could not survive in a transgenic host expressing specific interfering RNA.

Section E

31. The accumulation of differences that can lead to formation of new species is called divergent evolution. When two groups of the same species face isolation from each other, group adapts to the changed circumstances in its own way. Natural selection and adaptation result in formation of adaptations in a particular group. These variations accumulate over various generations and finally a new species comes into origin. Homologous organs are results of divergent evolution. We know that organs which are similar in basic design but serve different purposes in different organisms are called homologous organs. Forelimbs of mammals and birds are very good examples of divergent evolution. In most of the mammals, the forelimbs are suited for walking, running and for doing various other chores. In birds, the forelimbs are modified into wings as part of flight adaptations in birds. In both organisms; the forelimbs are composed of humerus, radio-ulna, carpals and metacarpals. But they serve different purposes in mammals and birds. Homology indicates towards common ancestry.

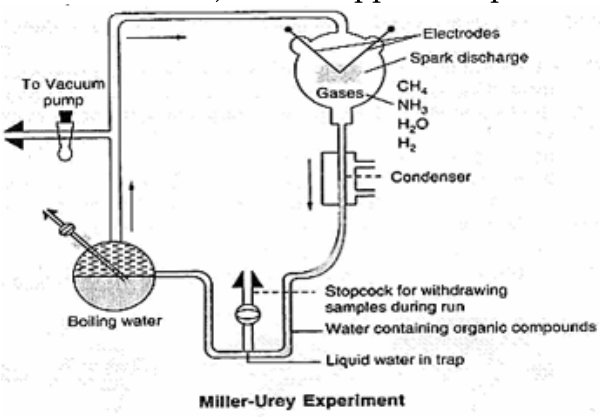
OR

The theory of biogenesis states that life comes from pre-existing life.

Miller's Experiment:

- Stanly Miller and Urey created conditions similar to the primitive atmosphere using glass apparatus and tubes in the laboratory.
- The electric discharge was created by using electrodes in a closed flask containing methane, ammonia, hydrogen and water vapours at 800°C.
- The chamber containing water was heated to provide water vapour.
- He passed the mixture through a condenser. He circulated the gases continuously in this way for one week and then analysed the chemical composition of the liquid inside the apparatus. He observed a large number of simple organic compounds and some amino acids like alanine, glycine and aspartic acid. Miller proved that organic compounds were

the basis of life, which supported opaline's theory.



Miller-Urey Experiment

32. i. Both C-Peptide and mature insulin are biologically active. Cell components and proteins in this image are not to scale. Proinsulin is the prohormone precursor to insulin made in the beta cells of the islets of Langerhans, specialized regions of the pancreas. In humans, proinsulin is encoded by the INS gene.
    ii. Recombinant DNA technology
    iii. The two polypeptides of functional insulin chemically held together by disulphide bond.

OR

    i. RNA interference (RNAi)
    ii. Tobacco plant
    iii. Meloidegyne imcognitia (nematode)
    iv. Agrobacterium tumefacines vector.

33. Following are the methods of cancer detection:

Biopsy: In this process, a small fragment of the suspicious tissue is extracted, cut into thin sections, is stained and examined under a microscope (histopathological studies) by a pathologist. This helps in determining any abnormality in the cells.

Blood Test and Bone Marrow Test: These tests show increased levels of cell count. This helps the doctor to diagnose the problem. Imagery Technique: X-ray, CT scan, and MRI help in diagnosing the cancer of internal organs.

Apart from the above-mentioned techniques; antibodies against cancer-specific antigens and molecular biotechnology are also used in certain cases.

Common approaches to treatment involve surgery, radiotherapy, and immunotherapy:

    i. Surgery: This involves the removal of the tumor through surgery.
    ii. Radiotherapy: In radiotherapy, tumor cells are irradiated lethally, taking proper care of the normal tissues surrounding the tumor mass.
    iii. Immunotherapy: This involves the use of alpha-interferon so that some stubborn cancer cells can be destroyed by chemotherapeutic drugs.

OR

    i. Immediate cause is the main cause of disease through which virus disease has accumulated in the body. Dengue is the immediate cause of Dengue fever.
    ii. Infectious diseases are those diseases in which microbes are immediate cause and spread from one person to another through various means like air, water etc., e.g., chickenpox, cholera, etc.
    iii. Pathogens causing dengue fever are microbes causing dengue fever, i.e., dengue virus.
    iv. Vector responsible for dengue microbe is the female mosquito known as Anopheles. Female mosquitoes require blood as meal as it is necessary for meeting their high protein requirement for laying eggs. When female mosquito stings a person for taking blood during this act, virus is introduced into the blood of healthy person.