ST. XAVIER'S SENIOR SECONDARY SCHOOL, DELHI – 110 054

Class 12 Time: 3 hrs.

23-9-2023 MID TERM EXAMINATION - **BIOLOGY** Max. Marks : 70

General Instructions:-

i) All questions are compulsory.
ii) The question paper has five sections and 33 questions. All questions are compulsory.
iii) 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.
iv) 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.
v) Wherever necessary, neat and properly labeled diagrams should be drawn.

Section – A

1. Choose the correct statement from the following: 1
   a) Cleistogamous flowers always exhibit autogamy.
   b) Chasmogamous flowers always exhibit geitonogamy.
   c) Cleistogamous flowers exhibit both autogamy and geitonogamy.
   d) Chasmogamous flowers never exhibit autogamy.

2. Domestic wheat, which has 42 chromosomes, is probably hexaploid (6n), whereas the haploid number in the ancestral ones was 7. Find out the right reason as to how are such plants produced? 1
   a) Due to failure of segregation of chromatids during cell division cycle.
   b) Due to the gain of extra copy of chromosome.
   c) Due to failure of cytokinesis after telophase stage of cell division.
   d) Due to the loss of extra copy of chromosome.

3. Evolution of life shows that life forms has a trend of moving from 1
   a) land to water b) dryland to wet land
   c) fresh water to sea water d) water to land

4. Enlisted are some events during fruit formation. 1
   i) The egg cell is fertilized by a male gamete.
   ii) The thalamus withers away.
   iii) The ovules form seeds.
   iv) The ovary develops into the fleshy fruit.
   Which of these events is/are not true for an apple fruit?
   a) Only i) b) Only ii)
   c) Only ii) and iv) d) Only ii), iii) and iv)

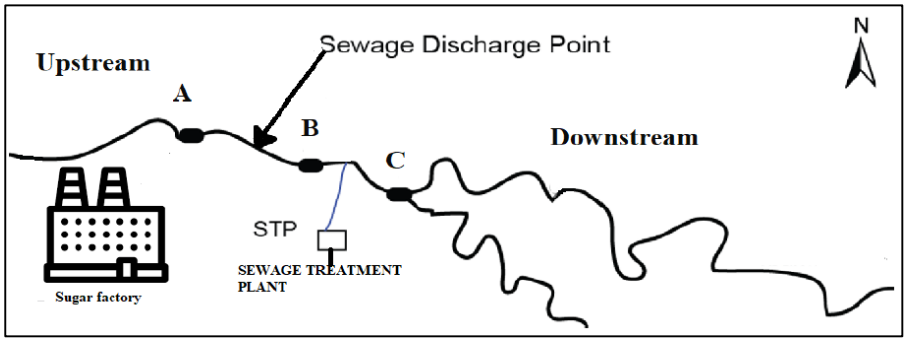
5. If dark skin color is controlled by dominant genes MNO and its recessive allele is mno, what can be definitely said about the offspring that are dark-skinned? 1
   a) They all have two copies of the dominant alleles.
   b) They have at least one copy of the dominant allele.
   c) They all have very high exposure to sunlight.
   d) They do not have any exposure to sunlight.

6. Extrusion of second polar body from egg nucleus occurs at what stage? 1
   a) Before fertilization. b) At the time of ovulation.
   c) After entry of sperm but during fertilization.
   d) After entry of sperm but before fertilization.

7. Which of the following amino acid residues will constitute the histone core? 1
   a) Lysine and Arginine b) Asparagine and Arginine
   c) Glutamine and Lysine d) Asparagine and Glutamine

8. Which of the following are true in respect of chorionic villi in humans? 1
   i. It appears after implantation of human embryo in the uterus.
   ii. It becomes interdigitated with cervical tissue of the female reproductive tract.
   iii. It increases the surface area for exchange of materials.
   iv. It develops from the inner cell mass of the blastocyst.
   Choose the correct option:
   a) i and ii b) ii and iii c) i and iv d) i and iii

9. Water samples were collected at points A, B and C in a segment of a river near a sugar factory and tested for BOD level. The BOD levels of samples A, B and C were 400 mg/L, 480 mg/L and 8 mg/L respectively. What is this indicative of? 1



   a) At collection points A and B, water is treated in STP.
   b) At collection points A and B, the BOD level is high due to high organic pollution caused by sugar factory and sewage discharge.
   c) At collection points A and B, the BOD level is high due to low organic pollution caused by sugar factory and sewage discharge.
   d) Both options (a) and (b).

10. Evolutionary convergence is development of a 1
   a) common set of functions in groups of different ancestry.
   b) dissimilar set of functions in closely related groups.
   c) common set of structures in closely related groups.
   d) dissimilar set of functions in unrelated groups.

11. Which of the following statements is/are correct about ZIFT and GIFT as methods of helping conception in cases of infertility? 1
   P) ZIFT can help where the female is unable to form a viable ovum.
   Q) ZIFT uses methods of in vitro fertilisation.
   R) GIFT involves the injection of one's own ovum into the body.
   S) GIFT uses in vivo fertilisation method.

   a) only P b) only P and R
   c) only Q, R and S d) all - P, Q, R and S

12. Cystic fibrosis is an autosomal recessive disorder. Consider a cross between two carrier parents, each with genotype Ff. What will be the genotype of the affected offspring in the F_1 generation? 1
   a) Ff b) ff c) X^fY d) FF and Ff

Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

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

13. Assertion (A): Biogas is produced by anaerobic digestion of biomass by methanogenic bacteria.
Reason (R): Biogas is made up of methane entirely and is the most ecofriendly fuel. 1

14. Assertion (A): When white eyed, yellow bodied Drosophila females were hybridized with red eyed, brown-bodied males; and F1 progeny was intercrossed, F2 ratio deviated from 9 : 3 : 3 : 1.
Reason (R): When two genes in a dihybrid are on the same chromosome, the proportion of parental gene combinations is much higher than the non-parental type. 1

15. Assertion (A): Micro-organisms such as *Lactobacillus* grow in milk and convert it to curd.
Reason (R): During growth, the bacteria produce acids that coagulate and partially digest the milk proteins. 1

16. Assertion (A): If the codon UAU coding for an amino acid at the 25^{th} position of a polypeptide of 50 amino acids is mutated to UAA, a polypeptide of 24 amino acids will be formed.
Reason (R): UAA will prevent further translation. 1

Section – B

17. Give reasons: 2
i) Zona pellucida layer block the entry of additional sperms.
ii) All copulations do not lead to fertilization and pregnancy.

18. State Hardy-Weinberg principle of genetic equilibrium. Knowing that genetic drift disturbs this equilibrium, mention what does this disturbance in genetic equilibrium leads to? 2

19. Protein synthesis machinery revolves around RNA but in the course of evolution it was replaced by DNA. Justify. 2

20. a) Mature seeds of legumes are non-albuminous. Then, can it be assumed that double fertilization does not occur in legumes? Explain your answer.
b) List the difference between the embryos of dicot and monocot seed. 2

21. A colourblind child is born to a normal couple. Work out a cross to show how it is possible. Mention the sex of this child.

(OR)

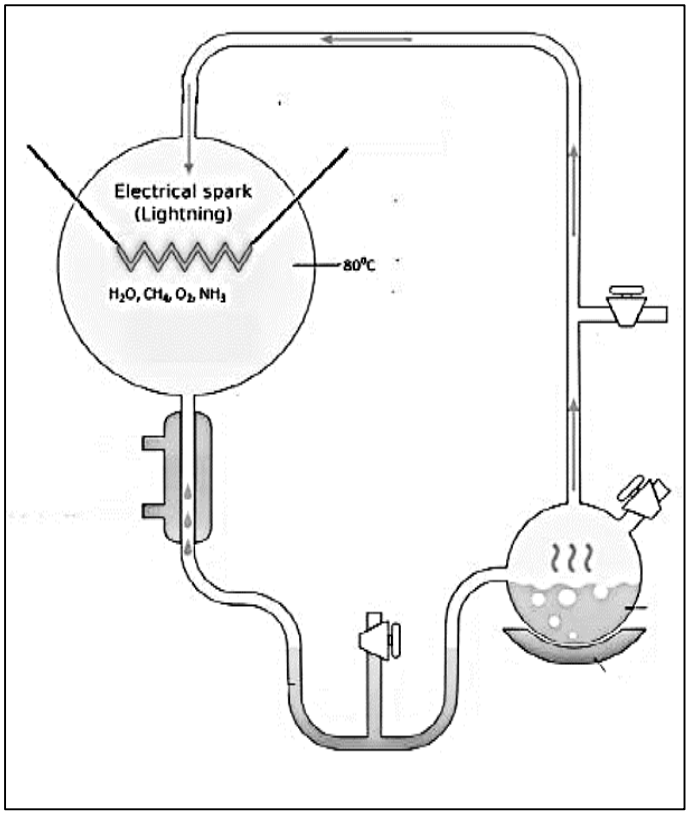
Rajesh and Mahesh have defective hemoglobin due to genetic disorders. Rajesh has too few globin molecules while Mahesh has incorrectly functioning globin molecules. Identify the disorders they are suffering from. 2

Section – C

22. A flower of brinjal plant following the process of sexual reproduction produces 360 viable seeds. Answer the following questions giving reasons:
a) How many megaspore mother cells are involved?
b) How many male gametes are involved in the above case?
c) How many microspore mother cells must have undergone reduction division prior to dehiscence of another in the above case? 3

23. When Snapdragon plant bearing pink colour flower was selfed, it was found that; 69 plants were having red coloured flowers. What would be the number of plants bearing pink flower and white flower? Show with the help of Punnett square. Identify the principle of inheritance involved in this experiment. 3

24. A student was simulating Urey and Millers experiment to prove the origin of life. The set up used by the student is given – 3



a) Find out the reasons why he could not get desired results.

b) What conclusion was drawn by Urey and Miller through this experiment?

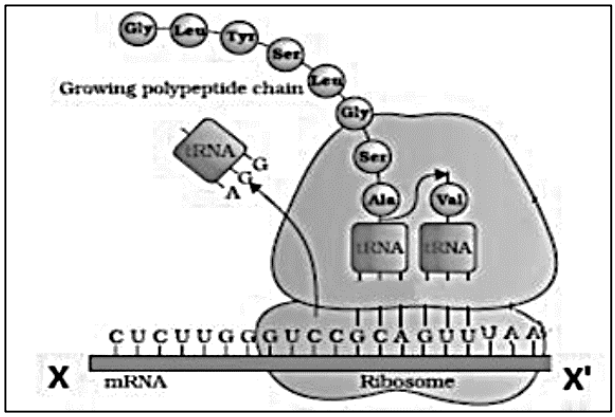
c) Compare the conclusion drawn with the theory of spontaneous generation.

25. a) What is the count of chromosomes after the first and second meiotic divisions in the formation of sperms? Give a reason to support your answer. 3

b) In an individual with low testosterone levels –
   i) which process in spermatogenesis is likely to not happen?
   ii) if the semen sample of such an individual is collected, what is likely to be observed?

26. A woman has certain queries as listed below, before starting with contraceptive pills. Answer them. 3
   a) What do contraceptive pills contain and how do they act as contraceptives?
   b) Why "Saheli" is a preferred contraceptive by women?

27. a) Identify the polarity of x to x' in the diagram below and mention how many more amino acids are expected to be added to this polypeptide chain.



b) Mention the codon and anticodon for alanine.

c) Why are some untranslated sequences of bases seen in mRNA coding for a polypeptide? Where exactly are they present on mRNA?

(OR)

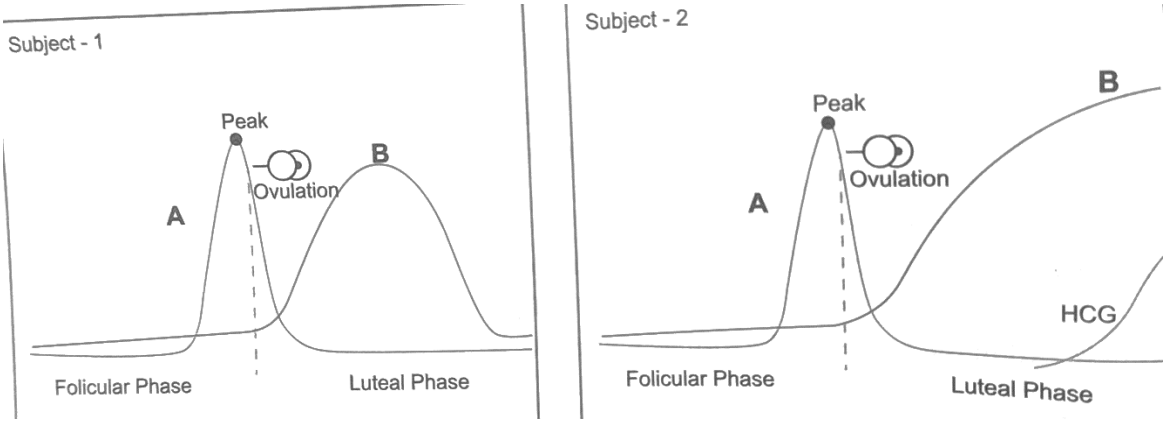
a) How many types of RNA polymerases are there in a eukaryotic cell? Mention which one of them transcribes hnRNA.

b) Write the changes that hnRNA undergoes before it leaves the nucleus as mRNA. 3

28. State the medicinal value and bioactive molecules produced by *Streptococcus*, *Monascus* and *Trichoderma.* 3

Section – D

29. To answer the questions, study the graphs below for subject 1 and 2 showing different levels of certain hormones. 4



i) Which hormone is responsible for the peak observed in subject 1 and 2? Mention its source.

ii) Name the hormone B of subject 2. Which structure in the ovary will remain functional in subject 2?

iii) What will you observe for hormone B, if the peak of hormone A does not appear in the study for Subject 1?

(OR)

What will you observe for subject 2, it is pregnant or not? Also mention the reason.

30. Darwin found the varieties of finches that travelled to Galapagos Islands and observed variations in them. 4

i) What role does an individual organism play as per Darwin's theory of natural selection?

ii) How did Darwin explain the existence of different varieties of finches on Galapagos Islands?

(OR)

Branching descent and natural selection are the two key concepts of Darwinian theory of evolution. Explain each concept with the help of a suitable example.

iii) What is "fitness of an individual" according to Darwin?

Section – E

31. a) Draw a diagram of a fertilized embryo sac of a dicot flower. Label all its cellular components.

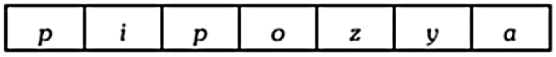
b) If you squeeze a seed of orange you might observe many embryos of different sizes. How is it possible? Explain.

(OR)

a) Describe in sequence the process of microsporogenesis in angiosperms.

b) Draw a labelled diagram of a two celled final structure formed. 5

32. Study the schematic representation of the genes involved in the lac operon given below and answer the questions that follow:



a) The active site of enzyme permease present in the cell membrane of a bacterium has been blocked by an inhibitor, how will it affect the lac operon?
b) The protein produced by the i gene has become abnormal due to unknown reasons. Explain its impact on lactose metabolism stating the reason.
c) If the nutrient medium for the bacteria contains only galactose; will operon be expressed? Justify your answer.

(OR)

With respect to Messelson and Stahl's Experiment, answer the following questions:
a) Identify the method used to distinguish between heavy and light isotopes of nitrogen.
b) With the help of diagrams, compare the results for the DNA isolated after 20 minutes of experiment with the DNA which was isolated after 40 minutes.
c) What was the inference drawn from the experiment? 5

33. i) The alarming population growth is leading to scarcity of basic requirements. Suggest any two population control measures other than contraception to address the situation. Also state the reason.
ii) How RCH programme of the government helped to improve the reproductive health of the people?
iii) Indiscriminate diagnostic practices, using X-rays, etc., should be avoided. Give one reason.

(OR)

A large number of married couples the world over are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.
a) Why in your opinion the female partner is often blamed for such situations in India?
b) State any two reasons responsible for the cause of infertility.
c) Suggest a technique that can help the couple to have a child where the problem is with the male partner. 5

-x-x-x-x-x-x-x-x-