ALLEN OVERSEAS

CLASSROOM CONTACT PROGRAMME

(Academic Session : 2022 - 2023)

Board Pattern

MAJOR

27-01-2023

PRE-MEDICAL : ENTHUSIAST COURSE (MEA,B,C,D,P,Q,F,R,S,G,H,I,J,MTS & MEPRO)

BIOLOGY

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;

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 labelled diagrams should be drawn.

Biology		Total Q. : 33 and Total Marks : 70			
Type of Que.	Section	No. of Que.	Q. Numbering	Marks	Total Marks
MCQ	A	12	1 to 12	1	12
Assertion & Reason		4	13 to 16	1	4
Short Answer Type Questions I	B	5	17 to 21	2	10
Short Answer Type Questions II	C	7	22 to 28	3	21
Case Based Questions	D	2	29 to 30	4	8
Long Answer Type Questions	E	3	31 to 33	5	15

(SECTION – A)

1. Which of the following are true with 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 material.

(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)

2. Which of the following statements are correct with respect to hormones secreted by placenta? **[1]**

(i) Placenta secretes relaxin during later stage of pregnancy.

(ii) Placenta secretes high amount of FSH during pregnancy.

(iii) Placenta secretes relaxin during initial stage of pregnancy.

(iv) Placenta secretes hCG and hPL during pregnancy.

(A) (i) and (iv) (B) (i), (ii) and (iv) (C) (iii) and (iv) (D) (ii), (iii) and (iv)

3. The promoter site and the terminator site for transcription are located at **[1]**

(A) 3' (downstream) end and 5' (upstream) end, respectively of the coding strand

(B) 5' (upstream) end and 3' (downstream) end, respectively of the coding strand

(C) the 5' (upstream) end of the coding strand

(D) the 3' (downstream) end of the coding strand

4. Oswald Avery, Colin MacLeod and Maclyn McCarty used enzymes to purify biochemicals such as proteins, DNA and RNA from the heat-killed S cells to see which ones could transform live R cells into S cells in Griffith's experiment. They observed that **[1]**

(A) Proteases and RNases affected transformation.

(B) DNase inhibited transformation.

(C) Proteases and Lipases affected transformation.

(D) RNases inhibited transformation.

5. Which of the following statements is incorrect regarding AIDS? **[1]**

(A) It is caused by HIV, a retrovirus.

(B) Retroviruses have RNA genome, which replicates via DNA intermediate.

(C) HIV selectively infects and kills B-lymphocytes.

(D) It causes immunodeficiency and thereby makes a person susceptible to many other infections.

6. Which of the following is a characteristic of acquired immunity? **[1]**

(A) It is pathogen-specific

(B) It has memory of the previous encounter with a pathogen.

(C) It can differentiate between 'self' and 'non-self' cells/molecules.

(D) All of the above

7. Read the following statements (i-iv) and select the option containing the incorrect statements. **[1]**

(i) Primary treatment of sewage involves the physical removal of large and small particles through filtration and sedimentation.

(ii) Secondary treatment of sewage is only a mechanical process.

(iii) Activated sludge sediment after secondary treatment of sewage is rich in aerobic microbes.

(iv) Biogas, also known as gobar gas, is pure methane.

Choose the correct option.

(A) (i) and (ii) (B) (i) and (iii) (C) (ii) and (iii) (D) (ii) and (iv)

8. Plasmid pBR322 has Pst I restriction enzyme site within the gene amp^R that confers resistance to antibiotic, penicillin. If this site is used for ligating an rDNA molecule and the plasmid is into an *E.coli* cell **[1]**

(A) it will not be able to confer ampicillin resistance to the host.

(B) the transformed cell will show resistance to ampicillin.

(C) it will be able to produce a novel protein.

(D) it will lead to the lysis of host cell.

9. Gause's competitive exclusion principle states that **[1]**

(A) competition for the same resources excludes species having different food habits.

(B) no two species can occupy the same niche indefinitely for the same limiting resources.

(C) larger organisms exclude the smaller ones through competition.

(D) more abundant species will exclude the less abundant species through competition.

10. In an expanding or growing population of a country **[1]**

(A) pre-reproductive individuals are more than the reproductive individuals.

(B) reproductive individuals are less than the post- reproductive individuals.

(C) pre-reproductive individuals are less than the reproductive individuals.

(D) reproductive and pre-reproductive individuals are equal in number.

11. Mark the odd one in each of the following groups and select the correct option. **[1]**

(i) Bacteria, Fungi, Flagellates, Lichens

(ii) Fragmentation, Stratification, Leaching, Catabolism

(iii) Phytoplankton, Oak, Cow , Teak

(iv) Goat, Lion, Zooplankton, snail

(A) (i) - Lichens, (ii) - Fragmentation, (iii) - Teak, (iv) - Snail

(B) (i) - Bacteria, (ii) - Fragmentation, (iii) - Goat, (iv) - Lion

(C) (i) - Lichens, (ii) - Stratification, (iii) - Cow, (iv) - Lion

(D) (i) - Lichens, (ii) - Stratification, (iii)- Phytoplankton, (iv) - Lion

12. Identify the type of argument for biodiversity conservation for each of the following statements and select the correct option. **[1]**

(i) Ecosystem services provided by nature such as aesthetic value, pollination of crops, etc.

(ii) Direct economic benefits derived from nature such as food, fibre, firewood, etc.

(iii) Every species has an intrinsic value, even if it is not of any economic use to humans.

(A) (i) Ethical, (ii) Broadly utilitarian, (iii) Narrowly utilitarian

(B) (i) Broadly utilitarian, (ii) Narrowly utilitarian, (iii) Ethical

(C) (i) Broadly utilitarian, (ii) Ethical, (iii) Narrowly utilitarian

(D) (i) Narrowly utilitarian, (ii) Broadly utilitarian, (iii) Ethical

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) :** 'Saheli' is considered as an improved form of contraceptive for human females. **[1]**

Reason (R) : It is a non-steroidal preparation and is once a week pill.

14. **Assertion (A) :** When white eyed, yellow bodies *Drosophila* females were hybridized with red eyed, brown-bodied males, and F_1 progeny was inter crossed, F_2 ratio deviated from 9:3:3:1. **[1]**

Reason (R) : When two genes in a dihybrid are on the same chromosome, the proportion of parental gene combinations in much higher than the non- parental type.

15. **Assertion (A) :** The first restriction enzyme was Hind III. **[1]**

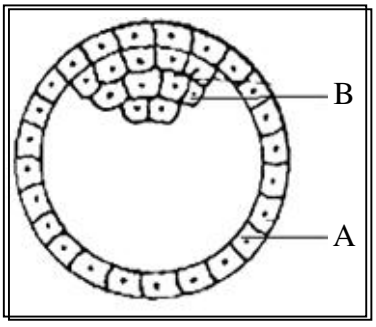
Reason (R) : The recognition sequence of the first isolated restriction enzyme was six base pair long.

16. **Assertion (A) :** A community with more species is more stable than that with less species. **[1]**

Reason (R) : More the number of species, lesser the variation in the total biomass production year after year.

(SECTION – B)

17. Study the figure given below and answer the questions that follow ? **[2]**



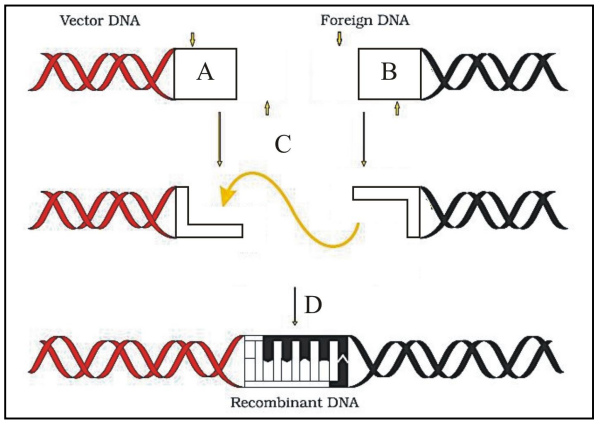
(a) Name the stage of human embryo the figure represent.

(b) Identify (A) in the figure and mention its function.

18. About 8% male the human population are colourblind whereas only 0.4% of females are colour - blind. Write an explanation to show how it is possible. **[2]**

19. Name two drugs obtained from poppy plant. There drugs are medically useful, but are often abused. Taking the mentioned examples, justify by giving reasons. **[2]**

20. The structure of formation of recombinant DNA by action of a restriction endonuclease enzyme given below. Study it and answer the question that follow.



(a) What are A, B, C & D in the given structure ?

(b) How can A & B are helpful for formation of recombinant DNA ? **[2]**

21. (a) Name an ideal pyramid existing in an ecosystem. Construct it up to there trophic levels, along with their names.

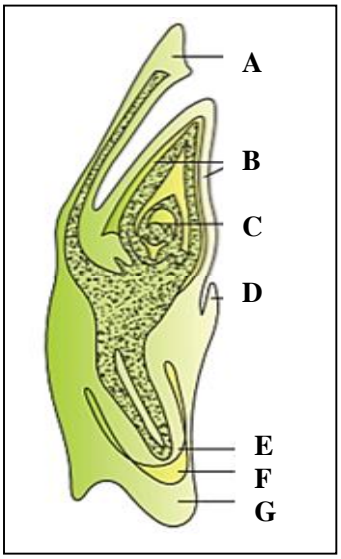
(b) The sun provides 1,000,000 J of sunlight (Solar energy) in an ecosystem .Write the amount of energy that is available to the first and third trophic levels, respectively. **[2]**

OR

Can you work out at how many trophic levels human beings functions in a food chain?

(SECTION – C)

22. Study the diagram of a monocot (Grass) embryo given below and answer the questions that follow? **[3]**



(a) Identify and name the
(i) Single functional cotyledon
(ii) Second rudimentary cotyledon
(b) What technical term is given to the embryonal axis below the level of attachment of cotyledon(s)? What does it terminate into, at its lower end?
(c) Identify and name the two parts that are not found in a dicot embryo and explain them.

23. (a) Draw the mature female gametophyte of a flowering plant and label the following :

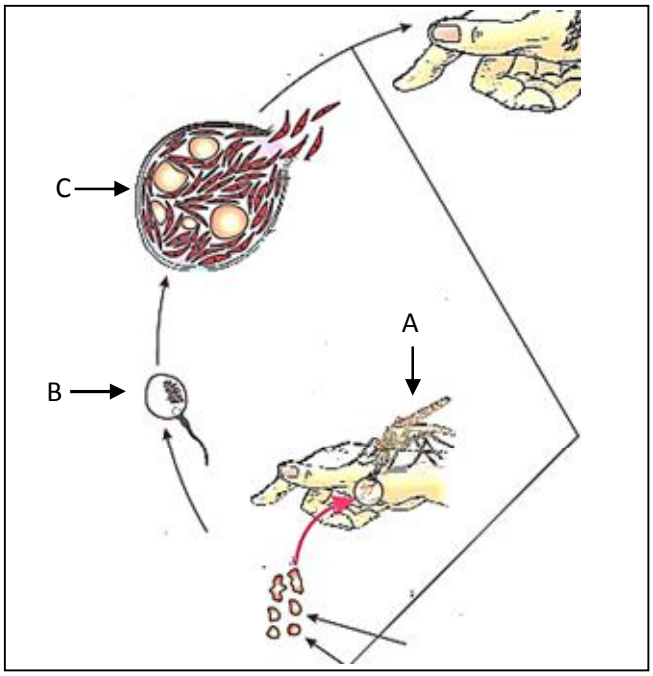
(i) Antipodals (ii) Polar nuclei
(iii) Central cell (iv) Egg
(v) Synergids (vi) Filliform apparatus

(b) How many meiosis and mitosis division takes for formation of mature female gametophyte from a megaspore mother cell.
(c) There are how many cells and nucleus in the mature female gametophyte of flowering plants. **[3]**

24. (a) Why both the strands are not copied during transcription? Give two reason. **[3]**
(b) All the reference point while defining a transcription unit is made from.

25. According to Darwinian theory of natural selection the rate of appearance of new forms is linked to the life-cycle or the life-span of an organism. Explain with the help of an example. **[3]**

26. Study a part of the life cycle of malarial parasite given below. Answer the questions that follows : **[3]**

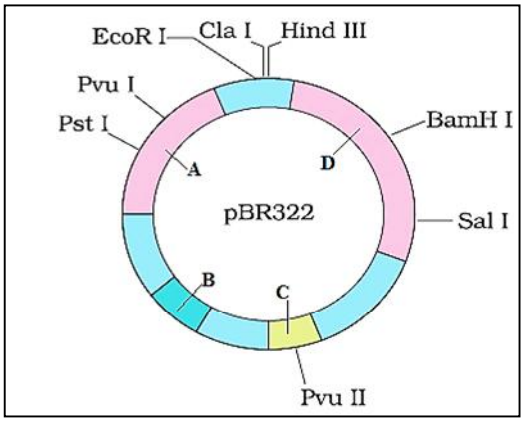


(a) Mention the roles of 'A' in the life cycle of the malarial parasites.
(b) Name the events 'B' and the organ where this event occurs.
(c) Identify the organ 'C' and name the cells being released from it.

OR

(a) How do normal cells get transformed into cancerous neoplastic cells. **[3]**
(b) Mention the difference between viral oncogenes and cellular oncogenes.

27. Study the figure of vector pBR322 given below. Answer the questions that follows : **[3]**



(a) Identify the A, B, C and D in the given diagram.

(b) A foreign DNA have palindrome sequence as follow:

5' GAATTC 3'

3' CTTAAG 5'

If we want to joins this DNA with given plasmid than which of the restriction enzyme should be used.

(c) Mention the role of 'C' in the replication of plasmid.

28. Since the origin of life on Earth there were five episodes of mass extinction of species?

(a) How is the 'Sixth Extinction', presently in progress, different from the previous episodes?

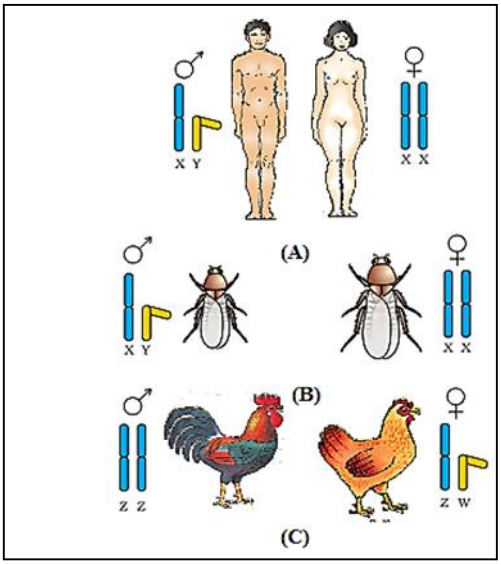
(b) Who is mainly responsible for the 'Sixth Extinction'?

(c) List any four points that can help to overcome this disaster. **[3]**

(SECTION – D)

Q.no 29 and 30 are case based questions. Each question has subparts with internal choice in one subpart.

29. The given below is the figure of sex determination in some animals. Observe it and give the answer of question that follow.



(a) What is male heterogamety ? Explain using given example.

(b) How is the sex-determination mechanism different in the birds? Is the sperm or the egg responsible for the sex of the chicks ?

(c) In our society the women are often blamed for giving birth to daughters. Can you explain why this is not correct ?

OR

(c) It is evident that the genetic makeup of sperms determines the sex of the child. How ? **[4]**

30. Read the following passage and answer the given questions.

Your batchmate 'X' is the daughter of a HIV positive mother and she tests positive too. Most of the your classmates do not mingle with her at all and their parents want the school to send 'X' out. But the principal arranges for a lecture by a qualified doctors, now that the parents are convinced, 'X' continues to study in the same school.

(a) Write the name of diagnostic test by which it is confirm that your batchmate 'X' is positive to HIV.

(b) How the parents are convinced, that 'X' continues to study in the same school after a lecture by a qualified doctors

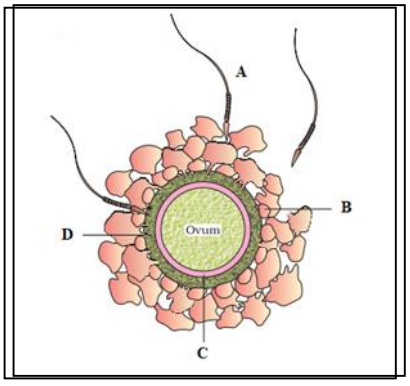
(c) Write any four way of transmission of HIV- infection.

OR

(c) What programmes has started by WHO to prevent the spreading of HIV infection. **[4]**

(SECTION – E)

31. Given below is the diagram of ovum surrounded by few sperms. Observe it and answer the question that follow :-



(a) Labeled the A,B,C and D.

(b) Analyse the changes occurring in the ovum during the process.

(c) What is the role of zona pellucida in this process?

(d) Mention what helps in the entry of sperm into the ovum?

(e) Specify the region of female reproductive system where the event represented in the diagram takes place. **[5]**

OR

(a) Draw a diagrammatic sketch of a transverse section of anther of a angiosperm. Label its different walls and the tissue forming microspore mother cells.

(b) Write the function of innermost layer of transverse section of an anther. **[5]**

32. The average length of a DNA double helix in a typical mammalian cell is approximately 2.2 meters and the dimension of the nucleus is about 10^{-6} m.

(a) How is it possible that long DNA molecules is packed within a very small nucleus?

(b) Differentiate between euchromatin and heterochromatin.

(c) Mention the role of non- histone chromosomal protein.

OR

Explain how does lac operon in *E. coli* operate.

(a) in the absence of an inducer.

(b) in the presence of an inducer. **[5]**

33. Study the following passage and answer the following questions.

The crown gall is a neoplastic disease of most dicotyledonous plants and is caused by the soil bacterium *Agrobacterium tumefaciens*. A plasmid in these bacteria was found to be responsible for this disease plasmid is known as Ti plasmid. Bacteria free crown gall cells can be cultured in the absence of phytohormones. Ti plasmid is widely used in genetic engineering to deliver the desirable genes. The part of Ti plasmid transferred into plant cell is called T-DNA. T-DNA with desired DNA segment is inserted into the genome of host plant where it copies of itself.

(a) What is represented by Ti in the given plasmid.

(b) What is T- DNA in the Ti plasmid ?

(c) What do you means by disarmed plasmid ?

(d) Why *Agrobacterium tumefaciens* is known as a natural genetic engineer of plant ?

(e) What are advantages of *Agrobacterium* mediated gene transfer ?

OR

The plants having foreign genes in their genome inserted through genetic engineering are called transgenic plants. Genes can be incorporated either through a vector or through direct introduction of DNA. Bt cotton is a genetic modified organism which is pest resistant. It is used to control the growth of some insects. Bt cotton can resist cotton bollworm and produce higher yields. Cry protein (Bt toxin) is produced by cry gene. It is an endotoxin which remains as protoxin in plants and converted to active toxin after getting ingested by the insects. The activated toxin creates pores in the midgut of the insects which in turn leads to their death.

(a) Why does the toxin produced by *Bacillus thuringiensis* not kill the Bacillus ?

(b) Write the name of groups of insects which killed by protein produced by *Bacillus thuringiensis* ?

(c) How protoxin are converted in to active Bt toxins ?

(d) Mention the role of the proteins encoded by the genes cryIAc and cryIIAb.

(e) How can *Bacillus thuringiensis* used is bio-pesticies ?