

DAV PUBLIC SCHOOLS, ODISHA
PRE-BOARD EXAMINATION
(2023-24)

SET-2

- Please check that this question paper contains **13** printed pages.
- Check that this question paper contains **33** questions.
- Write down the serial number of the question in the left side of the margin before attempting it.
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed 15 minutes prior to the commencement of the examination. The students will read the question paper only and will not write any answer on the answer script during this period.

CLASS –XII
SUB : BIOLOGY (044)

Time allowed: 3 Hours

Maximum Marks -70

General Instructions:

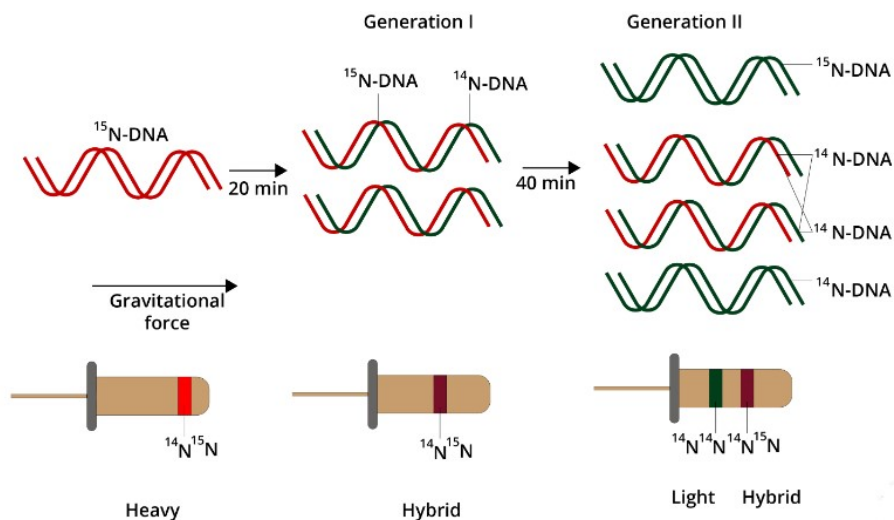
- (i) All questions are compulsory.
- (ii) The question paper has five sections and 33 questions.
- (iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E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

SECTION-A

1. In a flower the megaspore mother cell forms megaspores without undergoing meiosis and if one of the megaspores develops into an embryo sac, its nuclei would be **1**
 - (a) Halploid
 - (b) Diploid
 - (c) Few halploids and few diploids
 - (d) triploid

2. From the given statements identify the incorrect one. **1**
 - (a) Insects that consume pollen without bringing about pollination are called pollen robbers.
 - (b) Pollen germination in pollen tube growth are regulated by chemical components of pollen and its interaction with stigma.
 - (c) Reptiles are also reported as pollinators in some plant species.
 - (d) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of same species grows into the style.

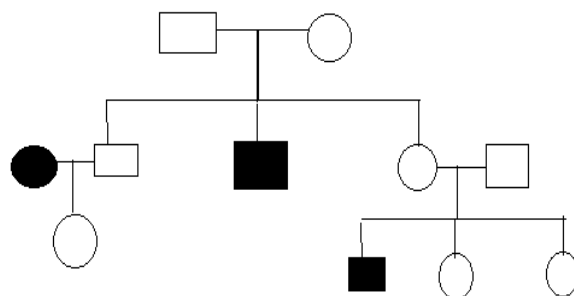
3. If there are 666 bases in an RNA that codes for a protein with 222 amino acids; If the base at position 601 is deleted and the length of RNA becomes 665 bases; how many codons will be altered ? 1
 (a) 22 (b) 20 (c) 33 (d) 23
4. In a certain taxon of insects some have 17 chromosomes and others have 18 chromosomes. The 17 and 18 chromosomes bearing organisms are: 1
 (a) Males and females respectively. (b) Females and males respectively.
 (c) All males. (d) All females.
5. For the MN blood group system the frequencies of M and N alleles are 0.6 and 0.4 respectively. The expected frequencies of MN blood group bearing organism is likely to be 1
 (a) 42% (b) 48% (c) 54% (d) 36%
6. Consider the following four statements (1-4) and select the option which includes all the correct ones only: 1
 1. Branching descent and natural selection are two key concepts of Darwinian theory of evolution.
 2. According to Lamarck, evolution of life forms had occurred by use and disuse of organs.
 3. The work of Darwin on populations influenced Thomas Malthus.
 4. According to Hugo de Vries mutations are random and directional.
 Options:
 (a) Statements (1), (3) and (4) (b) Statements (1) and (2)
 (c) Statements (3) and (4) (d) Statements (1), (2) and (4)
7. Study the given diagrammatic representation of Meselson and Stahl experiment to demonstrate the replication in *E.coli*. If this experiment is continued for 140 minutes, the ratio of heavy, hybrid and light DNA formed will be 1



- (a) 2:0:126 (b) 0:1:63 (c) 1:0:31 (d) 0:2:62

8. The given pedigree chart shows the family history of

1



- (a) Phenylketonuria, sex linked recessive
- (b) Haemophilia, sex linked recessive
- (c) Colourblindness, sex linked recessive
- (d) Myotonic dystrophy, autosomal dominant

9. Identify the blank spaces A, B, C and D in the following table and select the correct option.

1

Type of Microbe	Scientific name	Commercial product
Bacterium	A	Streptokinase
B	<i>Aspergillus niger</i>	Citric acid
Fungus	<i>Trichoderma polysporum</i>	C
Bacterium	D	Butyric acid

- (a) A-*Streptococcus* , B-Fungus, C-Cyclosporin A, D- *Clostridium butylicum*
- (b) A- *Clostridium butylicum* , B-Bacterium, C-Fungus ,D-*Lactobacillus*
- (c) A-*Streptococcus*, B-Yeast, C-Cyclosporin A, D-*Lactobacillus*
- (d) A-*Streptococcus* , B-Bacterium, C-Statins, D- *Clostridium butylicum*

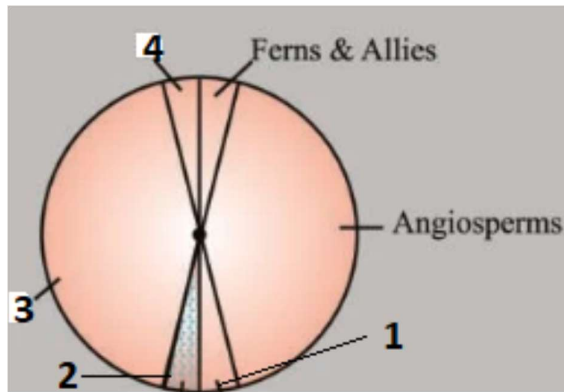
10. Hyderabad's Footwear Design and Development Institute (FDDI), which was founded less than eight years ago, has been successful in obtaining six patents for goods created by its students. Their USPs (Unique Selling Points) are environmental friendly and helpful to those with disabilities. Based on the given information, choose the correct statement:

1

- (a) In 1995, an American company got rights on Basmati rice.
- (b) It is not necessary for patent to be new and useful
- (c) A patent is a set of exclusive right given for any invention which is new, non obvious and useful.
- (d) Nature's Tulsi products are examples of patent.

11. Identify the areas labelled (1) , (2) , (3) and (4) in the pie chart given below representing the biodiversity of plants showing their proportionate number of species of major taxa .

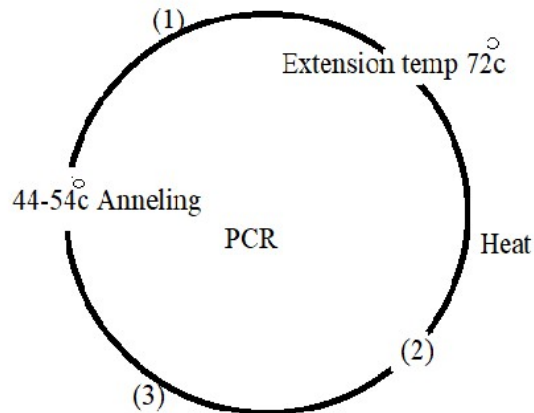
1



- (a) 1-Lichens, 2-Algae, 3-Fungi, 4-Mosses
- (b) 1-Liverworts, 2-Algae, 3-Mosses, 4-Fungi
- (c) 1-Pteridophytes, 2-Mosses, 3-Algae, 4-Liverworts
- (d) 1-Pteridophytes, 2-Algae, 3-Liverworts, 4-Mosses

12. Identify 1,2 and 3 in the following diagram.

1



- (a) (1) Taq polymerase (2) Denaturation at 94° C (3) Primer
- (b) (1) Denaturation at 94° C (2) Taq polymerase (3) Primer
- (c) (1) Primer (2) Denaturation at 94° C (3) Primer
- (d) (1) Taq polymerase (2) Extension (3) Ligation

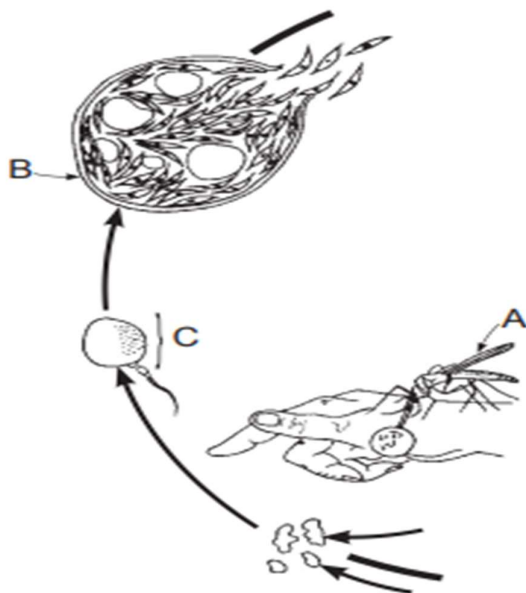
Questions No 13 to 16 consist of two statements – Assertion(A) and Reason(R). Answer these questions by selecting the appropriate options given below.

- (a) Both assertion and reason are true and the reason is the correct explanation of the assertion.
- (b) Both assertion and reason are true but the reason is not the correct explanation of the assertion.
- (c) Assertion is true but reason is false.
- (d) Assertion is false and reason is true

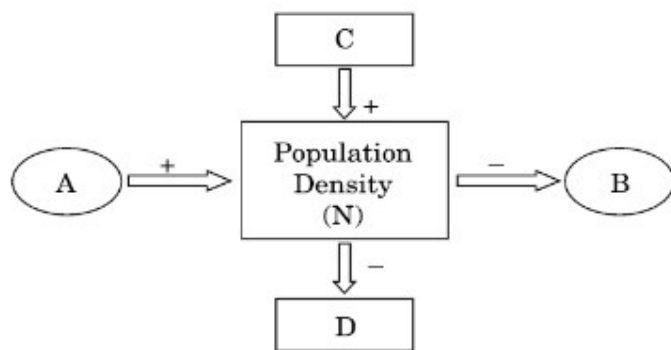
13. **Assertion:** Xenogamy is observed in papaya plant.

1

Reason: Both autogamy and geitonogamy are not seen in dioecious plants.



- (a) Identify A and state the event depicted.
 (b) Name the event 'C' and mention the specific site, where it is taking place.
 (c) Identify the organ 'B' and name the cells, which are stored and released from it.
20. Recombinant DNA technology is of great significance in the field of medicine. 2
 Describe, how this technology has been used by Eli Lilly to prepare the genetically engineered human insulin.
21. 2



- Study the schematic representation given above and answer the following questions:
- (a) Identify A and D in it.
 (b) When the population density at time t is N as shown above, write the population density at time $t + 1$ in the form of an equation using appropriate symbols.

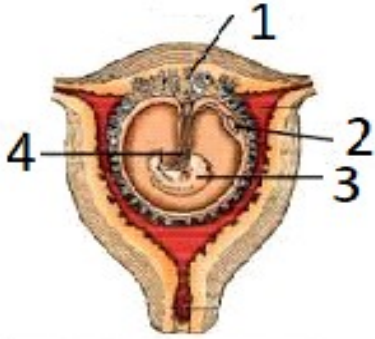
OR

- (a) Draw a 'pyramid of number' of a situation where large population of insects feed upon a very big tree. The insects in turn, are eaten by small birds which in turn are fed upon by big birds.
 (b) Differentiate giving reason, between the pyramid of biomass of the above situation and the pyramid of numbers that you have drawn.

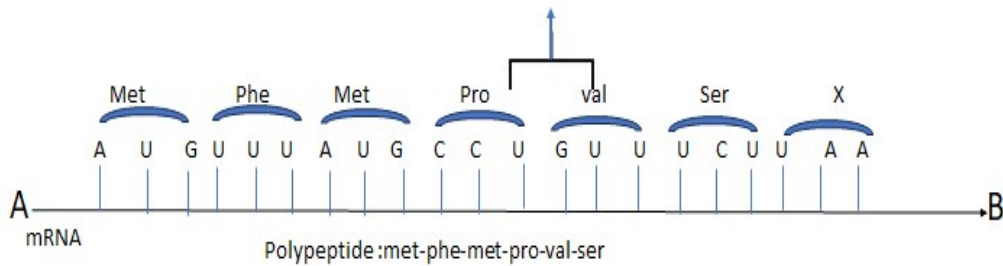
SECTION-C

22. As part of assisted reproductive technologies (ART) : 3
- (a) What is the destination for blastomeres with a count of less than 8 cells and more than 8 cells?
- (b) Which of the above destinations will be more preferable in ART and why?
- (c) What techniques are used to transfer the blastomeres to the destinations identified in (a)?

23. 3



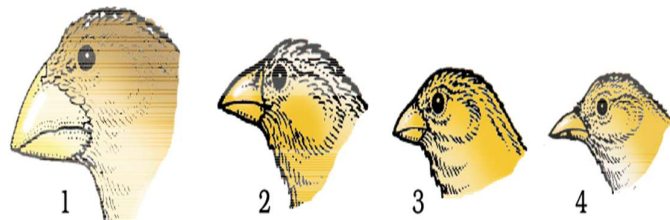
- (a) Identify the parts labelled 1,2,3 and 4 in the above diagram given.
- (b) Parturition is induced by a complex neuro endocrine mechanism. Explain.
24. A hypothetical mRNA is shown below. Read the sequence of nucleotides in it and the sequence of amino acids in the polypeptide translated by it. 3



Answer the following questions based on the above mRNA.

- (a) Mention the polarity of 'A' and 'B'.
- (b) Write the sequence of coding strand from which this mRNA has been synthesized.
- (c) If the last nucleotide of second codon changes to 'C', mention the amino-acid that will be added during translation.
- (d) Name the enzyme that helps in joining of amino acids during protein synthesis.

25. 3



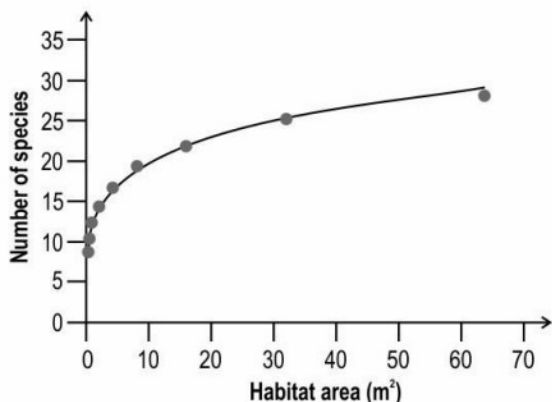
Observe the diagram given above and answer the questions

- (a) Mention the specific geographical region where these organisms are found.
 - (b) Name and define the phenomenon that has resulted the evolution of such diverse species in the given region.
 - (c) Cite an example where more than one adaptive radiations have occurred in an isolated geographical area. Name the type of evolution your example depicts.
26. The primary effluent in the treatment of sewage is sent to large aeration tanks for secondary treatment in the presence of aerobic bacteria. 3
- (a) Explain the process of formation of activated sludge during secondary treatment.
 - (b) Cow dung and water is mixed and this slurry is fed into the biogas plant for digestion by microbes. The person performing the process shares that there is no need to provide inoculum for it. Why? What is the role of microbes at the source? Under which condition this will be most active and effective.
27. (a) You have created a recombinant DNA molecule by ligating a gene to a plasmid vector. By mistake, your friend adds exonuclease enzyme to the tube containing the recombinant DNA. How will your experiment get affected as you plan to go for transformation now? 3
- (b) Restriction enzymes present in the cloning site of a vector should not have more than one recognition site. Comment.
 - (c) How can DNA segments, separated by gel electrophoresis be visualized?

OR

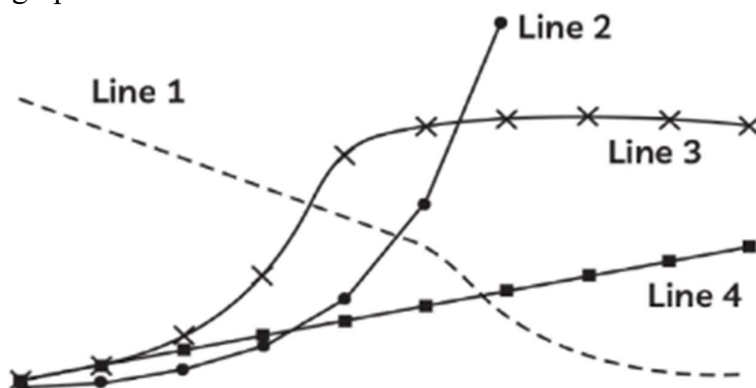
- Scientists have succeeded in recovering healthy sugarcane plants from a diseased one:
- (a) Name the part of the plant used as explant by the scientists. State the basis of selection of explant in the above case. Give an example of another plant variety where this method was successful.
 - (b) Name the technology used and state the characteristics of such plants produced through it.
 - (c) Mention the property of plant cells that has helped them to grow into a new plant in laboratory conditions.
28. Diversity is seen in the living world at various levels. The distribution of biodiversity shows specific patterns that account for the species richness or paucity across the globe. 3
- (a) Explain, with examples, how species diversity changes with changing latitudes.
 - (b) The graph below represents species-area relationship. What does such a graph signify? Name the scientist who explored this relationship.

Species-area Relationship



SECTION-D

29. The population growth curves for a particular population at different parameters are depicted in the graph below. 4

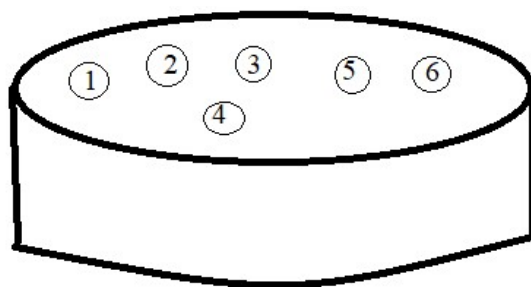


- Which kind of curve/line best illustrates a population in a resource-constrained setting? Explain the curve.
- Which line represents a population that reaches a carrying capacity? Mention the shape of the curve.
- Identify the curve that represents population growth when resources are unlimited. Name the type of growth model exhibited by it.
- Which one of the above population growth curve is more realistic? Give an explanation in support of your answer.

OR

Write the equation of curve-3. Give the r value for human population in India in 1981.

30. In an experiment the cloning vector used is pBR322 and the RE is *Pvu*I and the host is *E. coli*. So, the master plate prepared from the experiment is having the given bacterial colonies 1,2,3,4,5 and 6. In this plate 1&3 colonies do not grow in either of the antibiotic containing nutrient media. 2,4,5 and 6 grow in tetracycline medium whereas only 5,6 grow in ampicillin containing medium. 4



- (a) Identify the colonies which are transformant-recombinants and transformant-non recombinants respectively.
- (b) Mention the importance of selectable markers in a cloning vector? Name any two such selectable markers.
- (c) Ori has a dual role in a cloning vector. Mention them.

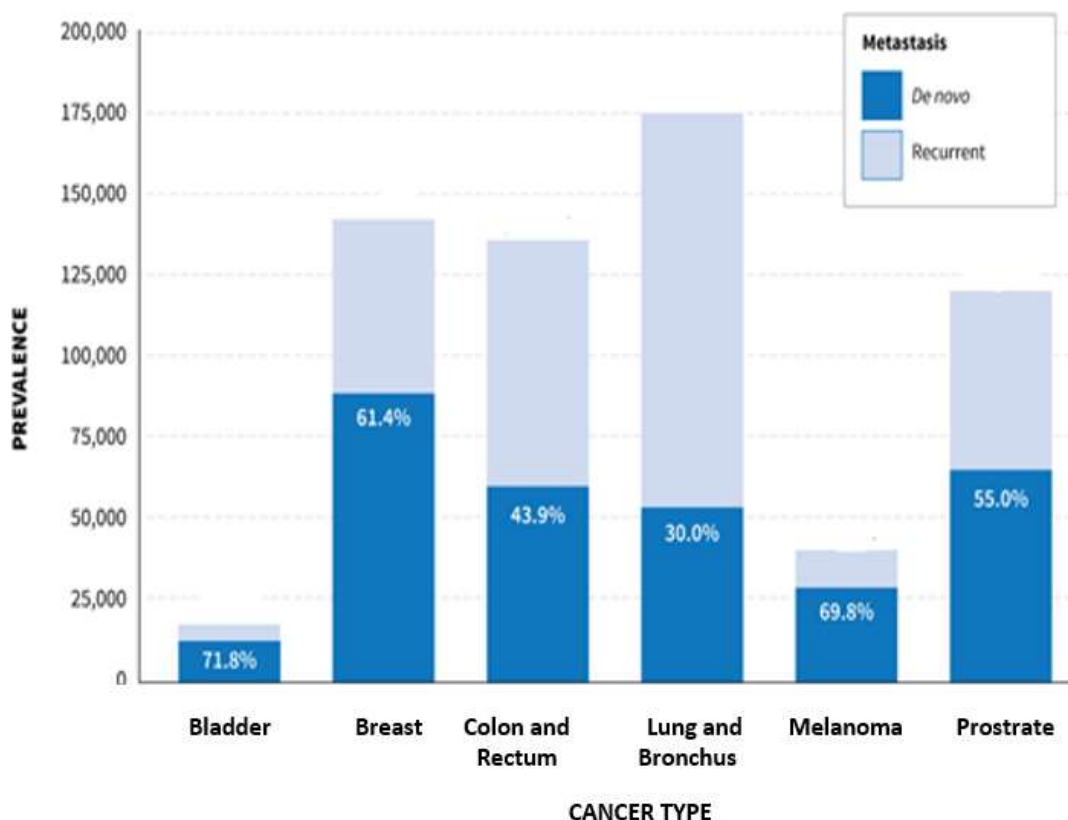
OR

If rop sequence from the cloning vector pBR322 is removed, how will it affect the expression of recombinant DNA?

SECTION-E

31.

5



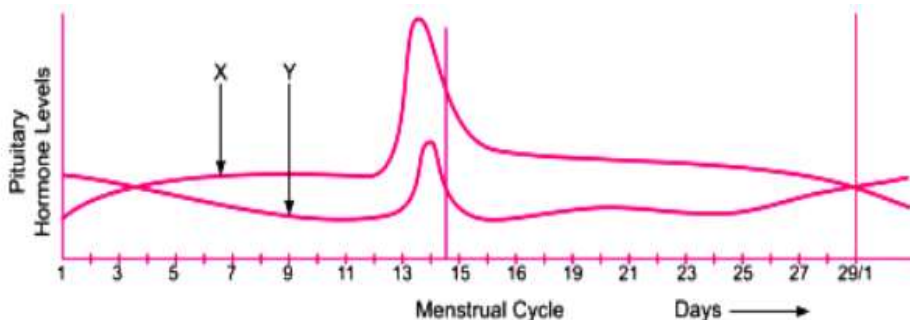
Estimated numbers of individuals living with metastatic cancer in the U.S on January 1, 2018, by cancer type, and percentage by cancer type who were diagnosed with metastasis de novo versus with early-stage disease that progressed to metastatic disease. Numbers above each bar represent total estimated metastatic prevalence for each cancer type.

- With reference to the above graph, which type of recurrent cancer is maximum. Mention its prevalence number.
- Name the techniques that can be used for detection of cancer of internal organs (Any two).
- Name and explain the most feared property of cancer cells.
- Name the specific genes present in human beings which when activated can lead to oncogenic transformation.
- The cancer patients are often given α -interferon as part of the treatment. Why?

OR

Antibiotics are the chemical substances, which are produced by some microbes and kill or retard the growth of other (disease-causing) microbes. They are regarded as one of the most significant discoveries of the twentieth century. The word 'antibiotic' means 'against life' in the context of disease-causing microbes and 'pro-life' with regards to human beings.

- Name the first antibiotic discovered and its source organism.
 - Name the scientist who discovered the first antibiotic and the experimental organism on which he worked with.
 - Name the two other scientists who along with the discoverer of first antibiotic shared Nobel prize in Physiology and Medicine (1945).
 - Name any four deadly diseases that can be treated by the use of antibiotics.
- 32.** The levels of pituitary hormones during different days of the reproductive cycle of a human female are shown in the graph given below. They influence the events in different ways during the different phases of the menstrual cycle. **5**

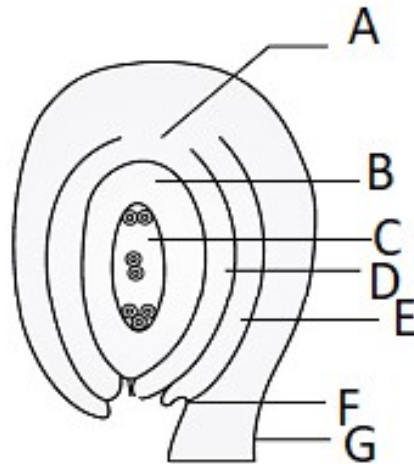


- Identify the hormones labelled as X and Y.
- Mention the effects of the hormone Y on the ovarian cycle.
- State the effect of peak levels of hormone X on the ovarian events? Mention its functions.
- Mention the specific phase in which corpus luteum is formed and name the hormone secreted from it.
- Name the hormone and its source gland, which stimulates the secretion of the hormones X and Y.

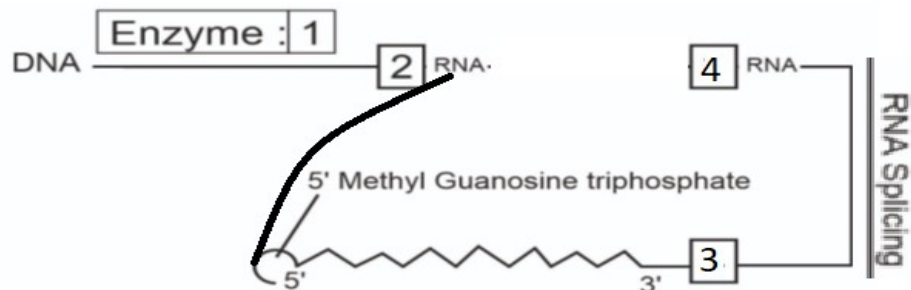
OR

Read the following passage and answer the questions that follows:

One or more ovule(s) arise(s) from the placenta, located in the ovarian cavity, called locule. After fertilization it transforms into a seed, enclosed in the fruit. The diagram of typical anatropous ovule of an angiosperm is given below. Observe the diagram and answer the questions that follow



- (a) Give the technical term for the ovule.
(b) Identify and name the part that
- Attaches the ovule to the placenta.
 - Remains as perisperm in some seeds.
 - Form the testa of seed.
 - Represents the basal part of the ovule.
 - Represents the female gametophyte.
 - Is the junction between the body of the ovule and its stalk?
- (c) In brief trace the origin and development of 'C' in the ovule.
33. (a) Given below is a sequence of steps that helps in the formation of RNA in a eukaryotic cell. Fill up the blanks (1, 2, 3, 4) left in the sequence. 5

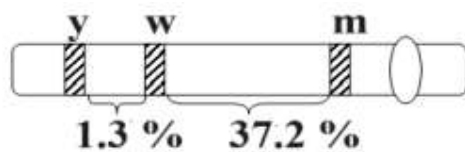


- (b) Both the processes of transcription and translation are coupled in bacteria but not in eukaryotes. Justify.
(c) Name the enzymes involved in the transcription of 28s rRNA and 5s rRNA respectively.

OR

(a) A couple who has blood groups A and B have four children. Each child has a different blood group. Explain with the help of crosses to show how this is possible.

(b)



y - yellow body
w - white eye
m - miniature wing
in *Drosophila*

Above figure indicates the percentage of recombination between 2 pairs of genes – y and w; w and m. On the basis of this data answer the following question.

- (i) Which two of these genes are tightly linked? Justify your answer.
- (ii) Which scientist used such data of the frequency of recombination between gene pairs on the same chromosome to prepare genetic maps and how?
- (iii) How are genetic maps useful?
