

CLASS - XII
MID TERM EXAM
SUBJECT – BIOLOGY (044)
SET – A2

Time: 3 hours

M. Marks: 70

General Instructions:

- i. This question paper consists of 15 printed pages.
- ii. This question paper has five sections and 33 questions.
- iii. All questions are compulsory.
- iv. 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.
- v. 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.
- vi. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section - A (1 mark each)

Q 1. Which of the following amino acid substitution is responsible for causing sickle cell anemia?

- (a) Valine is substituted by Glutamic acid in the α globin chain at the sixth position
- (b) Valine is substituted by Glutamic acid in the β globin chain at seventh position
- (c) Glutamic acid is substituted by Valine in the α globin chain at the sixth position
- (d) Glutamic acid is substituted by Valine in the β globin chain at the sixth position

1

Q 2. Given below are two columns. In Column I is the list of four enzymes and in Column II is the list of functions of the given enzymes. Which one of the following options shows the enzymes matched with their respective functions correctly ?

Column I

Column II

(Enzyme)

(Function)

P. DNA Ligase

Q. Restriction exonuclease

R. Taq polymerase

S. Restriction endonuclease

i. Removes nucleotides from ends of DNA

ii. Extends primer on a DNA template

iii. Joins the DNA fragments

iv. Cuts DNA at a specific position

Options :

(a) P-i, Q-ii, R-iv, S-iii

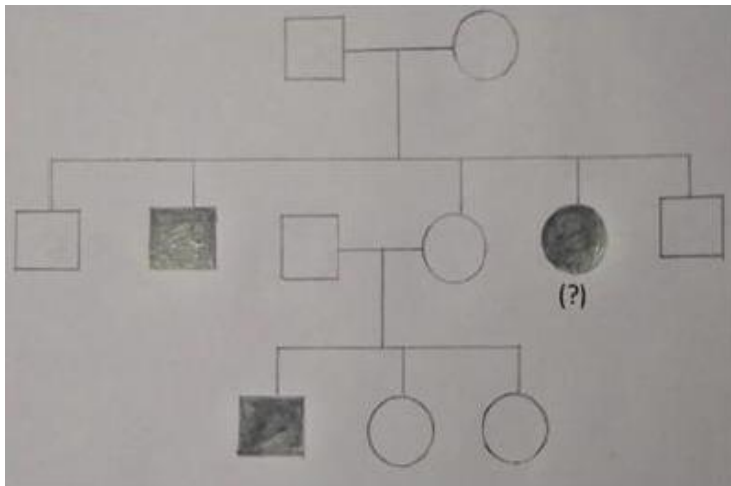
(b) P-iv, Q-iii, R-ii, S-i

(c) P-i, Q-iv, R-iii, S-ii

(d) P-iii, Q-i, R-ii, S-iv

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Q 3. What should be the genotype of the indicated member?



(a) AA

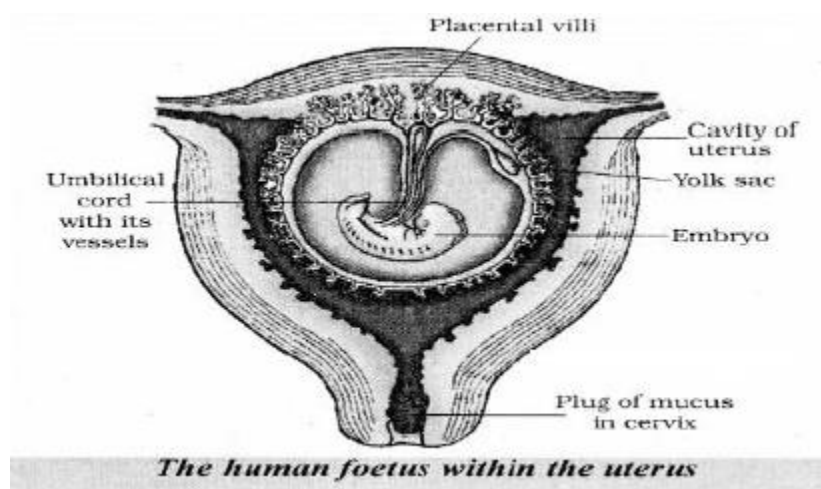
(b) Aa

(c) XY

(d) aa

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Q 4. Concentration of which of the following substances will decrease in the maternal blood as it flows from embryo to placenta through the umbilical cord?



- i. Oxygen
- ii. Amino Acids
- iii. Carbon dioxide
- iv. Urea

- (a) i and ii
- (b) ii and iv
- (c) iii and iv
- (d) i and iv

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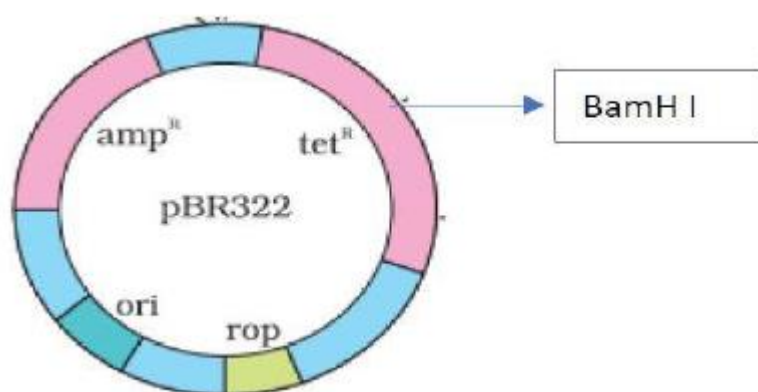
Q 5. Given below are four contraceptive methods and their modes of action. Select the correct match:

| S. No. | Method | S. No | Mode of action |
|--------|-----------|-------|---------------------------------------|
| a) | Condom | (i) | Ovum not able to reach Fallopian tube |
| b) | Vasectomy | (ii) | Prevents ovulation |
| c) | Pill | (iii) | Prevents sperm reaching the cervix |
| d) | Tubectomy | (iv) | Semen contains no sperms |

- (a) a)–(i) b)–(ii) c)–(iii) d)–(iv)
 (b) a)–(ii) b)–(iii) c)–(iii) d)–(i)
 (c) a)–(iii) b)–(iv) c)–(ii) d)–(i)
 (d) a)–(iv) b)–(i) c)– (iii) d)–(ii)

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Q 6. The figure below shows the structure of a plasmid.



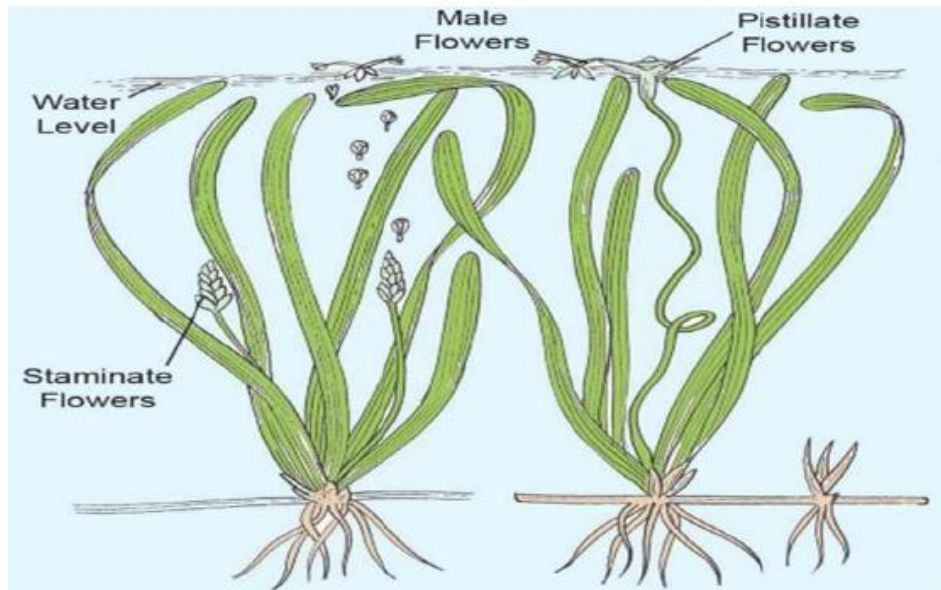
A foreign DNA was ligated at BamH1. The transformants were then grown in a medium containing antibiotics tetracycline and ampicillin.

Choose the correct observation for the growth of bacterial colonies from the given table

| | <i>Medium with Tetracycline</i> | <i>Medium with Ampicillin</i> |
|-----|---------------------------------|-------------------------------|
| (a) | Growth | No growth |
| (b) | No growth | Growth |
| (c) | No growth | No Growth |
| (d) | Growth | Growth |

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Q 7. In the dioecious aquatic plant shown, identify the characteristics of the male flowers that reach the female flowers for pollination:



| | Size of the flower | Colour of flower | Characteristic feature of pollengrain |
|---|--------------------|-------------------|---------------------------------------|
| A | small | brightly coloured | Light weight and non-sticky |
| B | large | colourless | large and sticky |
| C | small | white | small, covered with mucilage |
| D | large | colourless | non sticky |

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Q 8. Meselson and Stahl carried out centrifugation in CsCl_2 density gradient to separate:

- (a) DNA from RNA
- (b) DNA from protein
- (c) The normal DNA from ^{15}N -DNA
- (d) DNA from tRNA

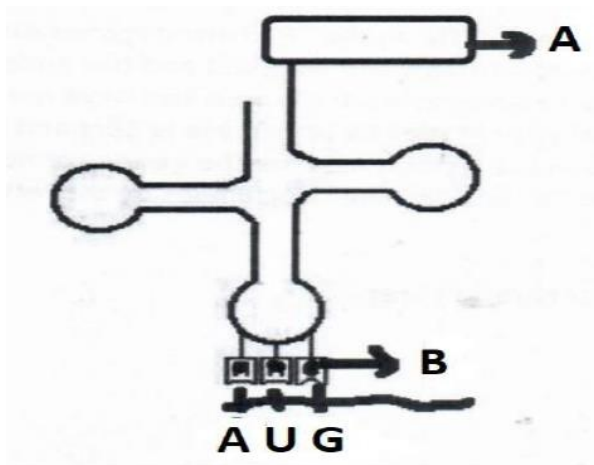
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Q 9. Nematode specific genes were introduced into the tobacco host plant using a vector

- (a) pBR 322
- (b) Plasmid
- (c) *Bacteriophage*
- (d) *Agrobacterium*

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Q 10. AUG on the mRNA will result in the activation of which of the following RNA having correct combination of amino acids:



| | Site A | Site B |
|----|------------|------------|
| A. | UAC | Methionine |
| B. | Methionine | UAC |
| C. | Methionine | AUG |
| D. | AUG | Methionine |

1

Q 11. Choose the option that gives the correct number of pollen grains that will be formed after 325 microspore mother cells undergo microsporogenesis.

- (a) 325
- (b) 650
- (c) 1300
- (d) 975

1

Q 12. The microbes commonly used in kitchens are

- (a) *Lactobacillus* and Yeast
- (b) *Penicillium* and Yeast
- (c) *Microspora* and *E. coli*
- (d) *Rhizopus* and *Lactobacillus*

1

Q 13. **Assertion:** Statins reduce the blood cholesterol level.

Reason: They competitively inhibit the enzyme responsible for synthesis of cholesterol.

- 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. Both assertion and reason are false.

1

Q 14. **Assertion:** Both the strands of DNA are not copied during the process of transcription.

Reason: The two molecules of RNA complementary to each other form the double stranded RNA and this would prevent RNA from being translated into protein.

- 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. Both assertion and reason are false.

1

Q 15. **Assertion:** Functional ADA cDNA genes must be inserted in the lymphocytes at the early embryonic stage.

Reason: Cells in the embryonic stage are mortal, differentiated and easy to manipulate.

- 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. Both assertion and reason are false.

1

Q 16. **Assertion:** Parturition is induced by a complex neuro endocrine mechanism.

Reason: At the end of gestation period, the maternal pituitary releases prolactin which causes uterine contractions.

- 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. Both assertion and reason are false.

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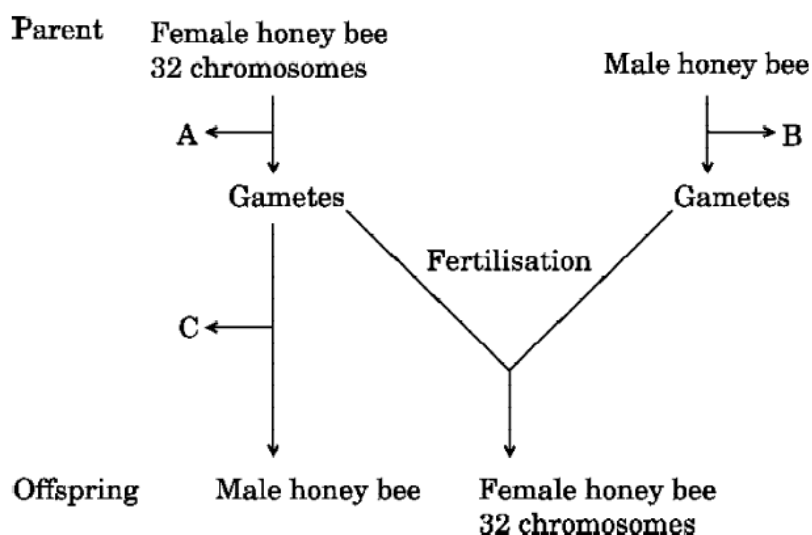
Section – B (2 marks each)

Q 17. (a) Explain how is the separated DNA visualized in the technique of Gel electrophoresis.

(b) DNA fragments of size 500 bp, 1600 bp and 2000 bp are separated by Gel electrophoresis. Which fragment will migrate fast & why?

2

- Q 18. The cytological observations made in a number of insects led to the development of the concept of genetic/chromosomal basis of sex-determination mechanism. Honey bee is an interesting example to study the mechanism of sex-determination. Study the schematic cross between the male and the female honey bees given below and answer the questions that follow:



- (a) Identify the cell divisions 'A' and 'B' that lead to gamete formation in female and male honey bees respectively.
- (b) Name the process 'C' that leads to the development of male honey bee (drone).

2

- Q 19. Name and explain the technique that can be used in developing improved crop varieties in plants bearing female flowers only.

2

OR

List the three hormones produced in women only during pregnancy. What happens to the levels of estrogen and progesterone during pregnancy?

2

Q 20. Micro-organisms play an important role for the biological treatment of sewage.”
Justify.

2

Q 21. Write the contributions of the following scientists in deciphering the genetic code.
Marshall Nirenberg; Severo Ochoa

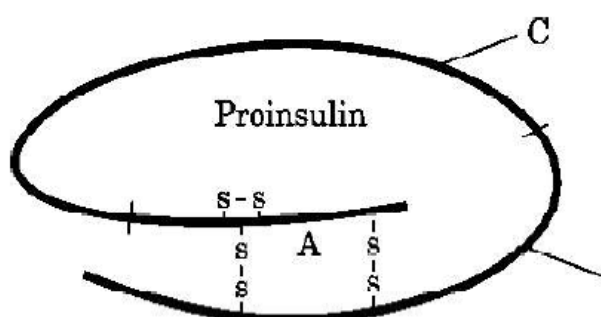
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Section – C (3 marks each)

Q 22. (a) Explain the mode of action of Cu^{2+} releasing IUDs as a good contraceptive.
How is hormone releasing IUD different from it?
(b) Why is ‘Saheli’ a preferred contraceptive by women (any two reasons)?

3

Q 23. Insulin in the human body is secreted by 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:



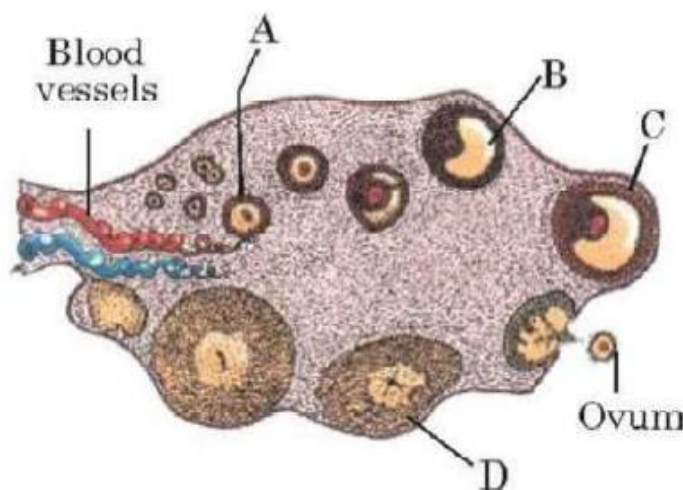
- State the change the proinsulin undergoes at the time of its processing to become functional.
- Name the technique the American company Eli Lilly used for the commercial production of human insulin.
- How are the two polypeptides of a functional insulin chemically held together?

3

Q 24. Name the different types of RNA polymerases in a eukaryotic cell. Write their roles in transcription.

3

Q 25. Study the transverse section of human ovary given below and answer the questions that follow:



- (a) Name the hormone that helps in the growth of $A \rightarrow B \rightarrow C$
- (b) Name the hormone secreted by A and B.
- (c) State the role of the hormone produced by D.

3

OR

Explain three different modes of pollination that can occur in a chasmogamous flower.

3

Q 26. Name any two natural cloning vectors. Give reasons that make them act as cloning vectors. Write the two characteristics the engineered vectors are made to possess.

3

- Q 27. F1 progeny of pea plant bearing violet flowers and Snapdragon plant bearing red flowers were selfed to produce their respective F2 progeny. Compare the phenotypes, the genotypes and the pattern of inheritance of their respective F2 progeny.

3

- Q 28. Name the group of bacteria involved in setting milk into curd. Explain the process they carry in doing so. Write another beneficial role of such bacteria.

3

Section – D (4 marks)

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

- Q 29. Infertility is a disease of the male or female reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. Infertility affects millions of people and has an impact on their families and communities. The cause of infertility may be difficult to determine but may include inadequate levels of certain hormones in both men and women. The main symptom is an inability to get pregnant. In many cases, there are no additional symptoms.

Many treatments significantly improve the chances of getting pregnant. They include hormone treatments, fertility drugs and surgery. In addition, assisted reproduction uses various medical techniques to fertilize an egg.

Answer the following questions based on the above information:

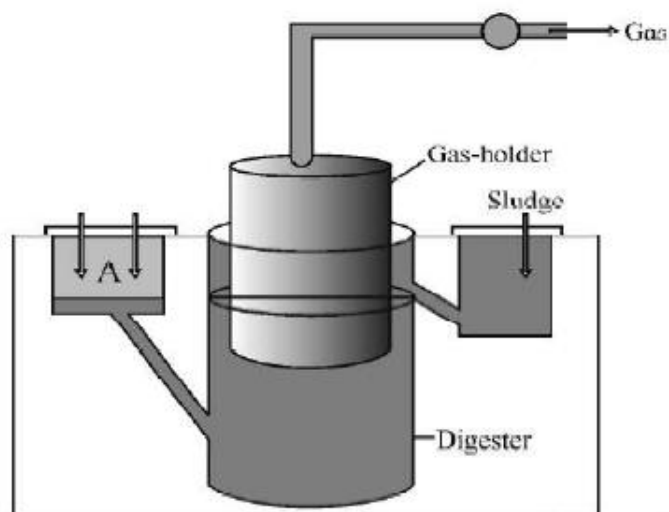
- (a) List any two reasons other than physical and congenital disorders for causing infertility in couples.
- (b) Explain how IVF as a technique helped childless couples in having children.
- (c) Describe GIFT.

OR

- (c) Describe ICSI.

4

Q 30. Study the picture of biogas plant given below and answer the questions that follow :



- (a) Name the components gaining entry from A into the chamber.
- (b) Mention the group of bacteria and the condition in which they act on the component that entered from A in the digester.
- (c) Name the components that get collected in gas holder.

OR

- (c) Write any two advantages of Biogas.

Section – E (5 marks)

- Q 31. (a) Differentiate between pleiotropy and polygenic inheritance by taking one example of each.
- (b) Generally, it is observed that human males suffer from haemophilia more than human females, who rarely suffer from it. Explain giving reasons.

5

OR

Explain the discovery made by Hershey and Chase using radioactive sulphur and phosphorus in their experiment.

5

- Q 32. Genetic engineering has played a very important role in the field of agriculture. Perhaps the most significant being the development of transgenic crops, resistance to herbicides, insect pests, pathogens and environmental stresses.

The attack of insects, pests and many other pathogens have greatly reduced our crop's yield and quality. To overcome these losses transgenic technology provides an alternative method to improve pest control management and thus helped in increasing the yield and quality of crops.

Answer the following questions based on transgenic technology:

- List the two important benefits of using transgenic technology over the use of chemical pesticides or use of conventional breeding methods.
- Write the scientific name of the organism from where Bt genes are isolated.
- Explain how the specific Bt gene gets isolated and incorporated into the cotton plant and provides resistance against bollworm.

5

OR

- a) Describe the technique that is very effectively used in Biotechnology to get a large amount of desired DNA for research and detailed investigation.
- b) Name a specific restriction endonuclease and write the palindromic nucleotide sequence in the DNA recognised by this enzyme. Also, indicate the site at which it makes the cut.

5

- Q 33. (a) Describe the process of megasporogenesis, in an angiosperm by schematic representation only.
- (b) Draw a diagram of a mature embryo sac of an angiosperm labeling six parts.

5

OR

- (a) Name the three different parts of a human sperm and write their involvement in the process of fertilization.
- (b) Mention the pituitary hormones involved in the process of spermatogenesis. State their functions.

5