

J B Academy
Half Yearly Examination 2023-24
Class XII Biology (Subject Code-044)

Time: 3 hours

Maximum 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 labelled diagrams should be drawn.

SECTION -A

Q1. Remnants of nucellus are persistent during seed development in:

- (a) Pea (b) groundnut (c) wheat (d) black pepper

Q2. In a certain species of insects, some have 13 chromosomes, and the others have 14 chromosomes. The 13 and 14 chromosome bearing organisms are

- (a) males and females, respectively (b) females and males, respectively
(c) all males (d) all females

Q3. What is the smallest part of a DNA molecule that can be changed by a point mutation?

- (a) Oligonucleotide (b) Codon (c) Gene (d) Nucleotide

Q4. A patient was advised to have a kidney transplant. To suppress the immune reaction, the doctor would administer him:

- (a) statins produced from *Monascus purpureus*
(b) statins produced from *Streptococcus thermophilus*
(c) cyclosporin A produced from *Trichoderma polysporum*
(d) cyclosporin A produced from *Clostridium butylicum*

Q5. Which of the following can not be detected in a developing foetus by amniocentesis?

- (a) Jaundice (b) Down's syndrome (c) Cystic fibrosis (d) Colour blindness

Q6. The fact that a purine base always pairs through hydrogen bonds with a pyrimidine base in the DNA double helix leads to

- (a) The anti-parallel nature (b) The semi-conservative nature
(c) Uniform width throughout DNA (d) Uniform length in all DNA

Q7. Pick out the correct statements:

- (I) Haemophilia is a sex- linked recessive disease.
(II) Down's syndrome is due to aneuploidy.

(III) Phenylketonuria is an autosomal recessive gene disorder.

(IV) Sickle cell anaemia is a X-linked recessive gene disorder.

(a) II and IV are correct

(b) I, III and IV are correct

(c) I, II and III are correct

(d) I and IV are correct

Q8. A man marries a woman and both do not show any apparent traits of inherited disease. Five sons and two daughters are born, and three of their sons suffer from a disease. However, none of the daughters is affected. The following mode of inheritance for the disease is:

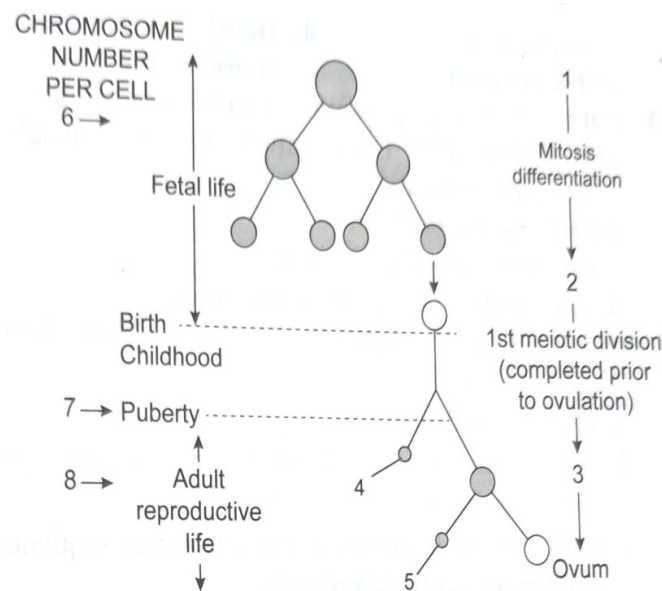
(a) Sex-linked recessive

(b) Sex-linked dominant

(c) Autosomal dominant

(d) None of these

Q9. Observe the illustration and select the correct option:



(a) 1-Oogonia, 2- Primary Oocyte, 3- Secondary Oocyte, 6-46

(b) 1-Primary Oocyte, 2- Secondary Oocyte, 3 - Oogonia,7-46

(c) 1-Primary Oocyte, 2- Oogonia, 3- Secondary Oocyte, 8-23

(d) 1-Primary Oocyte, 2- Secondary Oocyte, 3- First Polar Body, 8-23

Q10. While analysing the DNA of an organism a total number of 5386 nucleotides were found, out of which the proportion of different bases were: Adenine = 29%, Guanine = 17%, Cytosine = 32%, Thymine = 17%.

considering the Chargaff's rule it can be concluded that

(a) It is a double stranded circular DNA

(b) It is a single stranded circular DNA

(c) It is a double stranded linear DNA

(d) No conclusion can be drawn

Q11. If Meselson and Stahl's experiment is continued for 4th generations in bacteria the ratio of N^{15}/N^{15} : N^{15}/N^{14} : N^{14}/N^{14} containing DNA in the fourth generation would be

(a) 1:1:0

(b) 1:4:0

(c) 0:1:3

(d) 0:1:7

Q12. Match column I with column II

	column I		column II
A	NHC	I	Transcriptionally active
B	Euchromatin	Ii	200 base pairs
C	Heterochromatin	Iii	Packaging of chromatin at higher level
D	Nucleosome	Iv	Inactive

(a) A- (iii), B- (i), C- (iv), D- (ii)

(b) A- (ii), B - (i), C - (iv), D- (iii)

(c) A- (i), B -(ii), C- (iv), D- (iii)

(d) A- (ii), B - (iii), C- (iv), D- (i)

Q13. The signals for parturition originate from:

(a) Placenta only

(b) Placenta as well as fully developed foetus

(c) Oxytocin released from maternal pituitary

(d) Fully develop foetus only

Question No. 14 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.

Q14 Assertion: Primary endosperm nucleus is diploid.

Reason: It is the product of double fertilisation.

Q15. Assertion: Ribosomal RNA is synthesized in the nucleus of the cell.

Reason: It is translated with the enzyme RNA polymerase III.

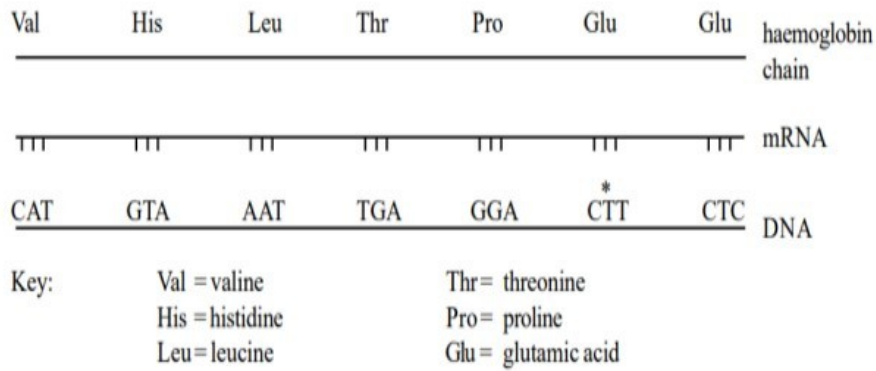
Q16. Assertion: Smoking can raise blood pressure and increase heart rate.

Reason: Nicotine stimulates adrenal glands to release adrenaline and noradrenaline into the blood circulation, both of which raise blood pressure and increase heart rate.

SECTION-B

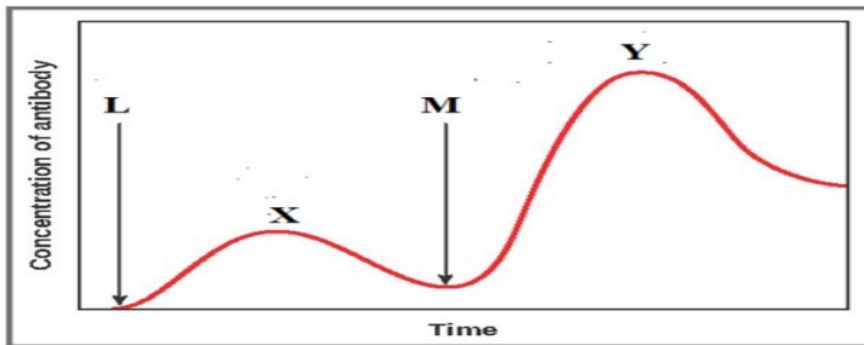
Q17. Explain the process of hormonal regulation of spermatogenesis.

Q18. The diagram below shows the sequence of amino acids in part of a haemoglobin molecule



- a) If the base T* was substituted with A, how would it affect the haemoglobin chain?
- b) Name the condition and the effects associated with the above substitution

Q19. The graph given below indicates the administration of the first (L) and second dose (M) of a vaccine. The corresponding response of the body is indicated by X and Y. Interpret the graph and explain the reason for such a response shown by the body.



Q.20 In case of an infertile couple the male partner can inseminate normally but the mobility of sperm is below 40%. Which kind of ART is suitable in this situation to form an embryo in the laboratory conditions without involving a donor?

Q21. What the chemical composition of exine of pollen grains? Write its importance.

OR

Human blood group is a good example of multiple allelism and co-dominance. Justify.

SECTION-C

Q22. Explain the phases in embryonic development from the morula stage till the establishment of pregnancy in a human female.

Q.23 A pregnant human female was advised to undergo MTP. It was diagnosed that the foetus she was carrying had developed from a zygote having 45 chromosomes with only one X chromosome.

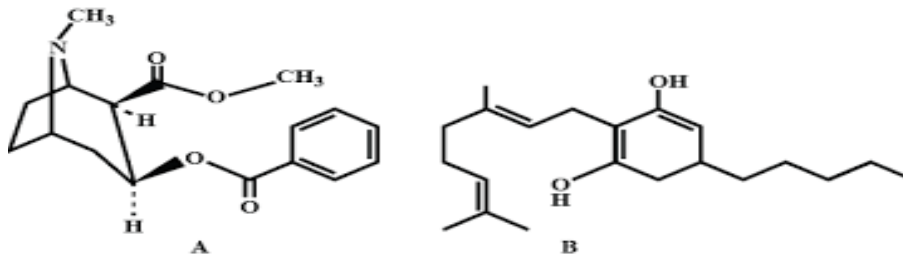
- a) What is this condition called and how does it arise?
- b) Why was she advised to undergo MTP?

Q.24 Write the causative organism and one symptoms of the following diseases:

Pneumonia, Typhoid, Common cold, Ascariasis, Ringworm, Amoebiasis

OR

Given below chemical structure of two drugs A and B. Write the name of the drugs and source plants from which they obtained.



Q.25 Name two hormones that are constituents of contraceptive pills. Why do they have high and effective contraceptive value? Name a commonly prescribed non-steroidal oral pill.

Q.26 Apomixis resembles asexual reproduction as well as mimics the sexual reproduction in plants. Explain with the help of suitable examples.

Q.27 A colour-blind man marries a woman with normal vision whose father was colour-blind. Work out a cross to show genotype of the couple and their respective sons.

Q.28 Describe the three different types of IUDs available at present, with an example for each.

SECTION - D

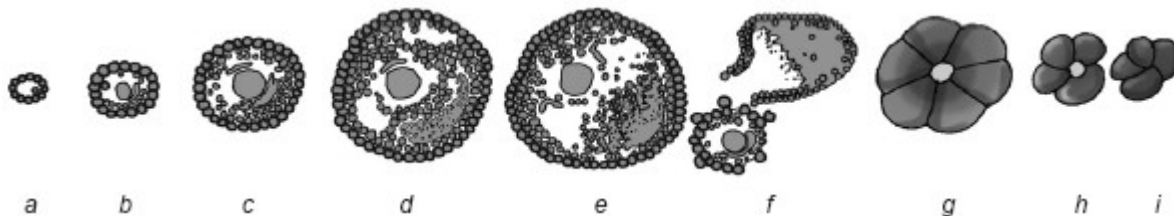
Q. No. 29 and 30 are case-based questions. Each question has five parts. Attempt any four.

Q.29 Pollination is the transfer of pollen grains from the anther of a flower to the stigma, which results formation of fruits and seeds. Seed is a fertilised ovule which is the final product of sexual reproduction. Upon germination in favourable condition, they produce new plants.

A flower of tomato plant following the process of sexual reproduction produces 240 viable seeds. Answer the following questions giving reasons:

- What is the minimum number of pollen grains that must have been involved in the pollination of its pistil?
- What would have been the minimum number of ovules present in the ovary?
- How many megaspore mother cells were involved?
- What is the minimum number of microspores involved in the above case?
- How many male gametes were involved in this case?

Q.30 The following is the illustration of the sequence of ovarian events (a – i) in a human female.



- (i) Identify the figure that illustrates ovulation and mention the stage of oogenesis it represents.
- (ii) Name the ovarian hormone and the pituitary hormone that have caused the above-mentioned event.
- (iii) Explain the changes that occur in the uterus simultaneously in anticipation.
- (iv) Write the difference between 'c' and 'h'.
- (v) Draw a labelled sketch of the structure of a human ovum prior to fertilization.

SECTION -E

Q.31 Given below is a stretch of DNA showing the coding strand of a structural gene of a transcription unit.

5'--ATG ACC GTA TTT TCT GTA GTG CCC GTA CTT CAG GCA TAA—3'

- a) Write the corresponding template strand and the mRNA strand that will be transcribed, along with its polarity.
- b) If GUA of the transcribed mRNA is an intron, depict the sequence involved in the formation of mRNA /the mature processed hnRNA strand.
 - i. In a bacterium
 - ii. In humans
- c) Upon translation, how many amino acids will the resulting polypeptide have? Justify.

OR

Q. In shorthorn cattle, the coat colours red or white are controlled by a single pair of alleles. A calf which receives the allele for red coat from its mother and the allele for white coat from its father is called a 'roan'. It has an equal number of red and white hairs in its coat.

- a) Is this an example of codominance or of incomplete dominance?
- b) Give a reason for your answer.
- c) With the help of genetic cross explain what will be the consequent phenotype of the calf when
 - i. red is dominant over white
 - ii. red is incompletely dominant

Q.32 It was diagnosed by a specialist through ELISA test that the immune System of the body of a patient has been suppressed. Describe the infection & the mechanism of its proliferation in the body.

OR

Give reasons:

- i) Mechanism responsible for parturition.
- ii) Role of oxytocin during expulsion of the baby out of uterus.
- iii) Why does zona pellucida layer block the entry of additional sperms?
- iv) Sperms can not reach ovum without seminal plasma.
- v) All copulations do not lead to fertilization and pregnancy.

Q.33 (a) Describe the experiment which demonstrated the existence of 'transforming principle'.

(b) How was the biochemical nature of this 'transforming principle' determined by Avery, MacLeod and McCarty?

OR

Where do transcription & translation take place in a prokaryotic and eukaryotic cell? Describe the three steps involved in translation?