Q.P. Code :20784

[Time: Three Hours] **[Marks:100]**

Please check whether you have got the right question paper.

N.B:
1. All the questions are compulsory. Choice is internal.
2. Figures to the right indicate full marks.
3. All questions carry equal marks.
4. Draw flowcharts / diagrams wherever necessary.

Q.1 **A) State True or False:** **04**

i) Genetics is the study of how traits are passed from parents to offspring.
ii) Pollination in pea plants can occur in three ways.
iii) 'O⁺' blood group is universal donor.
iv) In a cross between two homozygous dominant individuals, 25% of the offspring may have the recessive phenotype.

B) Answer the following: (any three) **09**

i) Why is Mendel considered Father of Genetics?
ii) Samiksha is unsure of the genotype of an individual F2 corn plant that has purple, smooth kernels and would love to know its genotype. What cross would allow her to determine the genotype of the purple, smooth corn plant? Explain the same.
iii) Assume that you are investigating the inheritance of stem length in pea plants. You cross pollinate a short – stemmed plant with a long–stemmed plant. All of the offspring have long stems. Then, you let the offspring self–pollinate. Describe the phenotypic ratio of stem lengths that you would expect to find in the second generation of offspring.
iv) Compare and contrast : test and back crosses.
v) The Japanese four O' Clock plant is the model plant for which type of inheritance? Explain the same in detail.
vi) Citing the examples of *Neurospora*, explain maternal inheritance.

12

C) Answer the following: (any two)

i) With examples, differentiate between Mendelian and Non – Mendelian inheritance.
ii) Discuss in detail epistasis.
iii) Write an informative note on Mendel's law of inheritance.
iv) A brown–haired woman has a blonde – haired child. She claims that her second husband, who has brown hair, is the father. However, her first husband, a blonde, believes the child must be his and sues his ex-wife for custody. The judge in the case orders blood typing for all the parties involved. The results are as follows:

Q.P. Code :20784

Trait	Mother	Child	1st Husband	2nd Husband
Blood type	A	O	AB	B
Hair color	Brown	Blonde	Blonde	Brown

Based on the results of the blood typing, which husband would the judge decide is the father of the child? Also, explain the inheritance of hair color. Give detailed reasons for your answer.

Q.2 **A) State true or false:** **04**

i) The full DNA of sequence of an organism's diploid set is called genome.
ii) The amount and type of DNA supercoiling is controlled by transcriptase.
iii) Bacterial chromosome is arranged in a region called nucleoid.
iv) Nonhistones are basic proteins.

B) Answer the following: (any three) **09**

i) Compare and contrast histone and non-histone proteins.
ii) Differentiate between euchromatin and heterochromatin.
iii) Comment on telomere in a chromosome and state its significance.
iv) Discuss anaphase promoting complex in cell cycle and mention its function.
v) Briefly explain the organization and location of circular DNA.
vi) Describe the lysogenic pathway of a λ phage.

C) Answer the following : (any two) **12**

i) Mentioning the types, elaborate on how transduction is used for mapping bacterial genes.
ii) Give a detailed account of Avery's transformation experiment. Explain its role in identification of genetic material.
iii) Explain regulation of cell cycle.
iv) Describe the experiment carried out by Lederberg and Tatum showing occurrence of sexual recombination in *E.coli*. Also, represent schematically formation of F^+ cell from F^- cell.

Q.3 **A) Match the column:** **04**

Column A	Column B
a) Ferroreductase	i) Protein clathrin
b) Coated pits	ii) Fe^{2+} ions from Fe^{3+} ions
c) LDL	iii) Endoplasmic Reticulum
d) Ca^{2+} pump	iv) Lower density than IDL
	v) Fe^{3+} ions from Fe^{2+} ions
	vi) Transport of cholesterol

Q.P. Code :20784

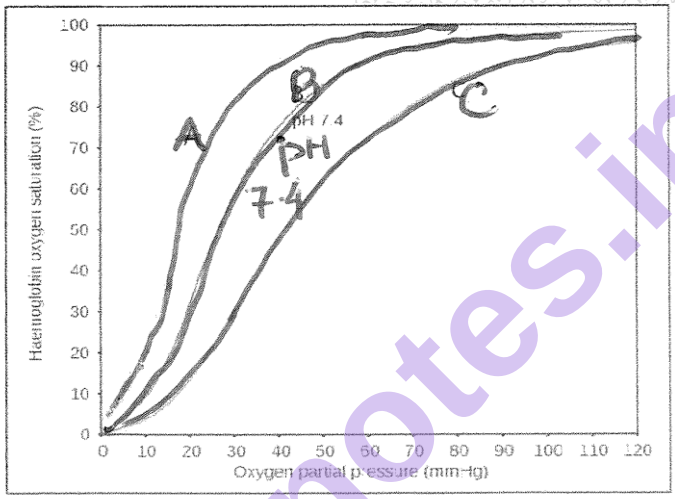
B) Answer the following: (any three) **09**

i) Compare and contrast: phagocytosis and pinocytosis.

ii) With the help of a schematic diagram, explain the different steps involved on exocytosis.

iii) Justify : "Chloride shift is responsible for increased capacity to transport bicarbonate ions."

iv) Observe the graph below:



If Curve "B: is normal which conditions lead to shift from B to A and B to C.

v) Differentiate between carrier and channel proteins.

vi) Give a brief note on physiological significance of ceruloplasmin.

C) Answer the following in detail: (any two) **12**

i) Discuss any two plasma proteins that act as transporters.

ii) Write a detailed note on passive transport and its type with one example of each.

iii) Explain in detail the events that occur during receptor mediated endocytosis.

iv) Giving examples differentiate between primary and secondary active transport.

Q.P. Code :20784

Q.4 **A) Define the following : (any five)** **10**

i) Dihybrid cross
ii) Law of segregation
iii) Topoisomerase
iv) G_0 phase
v) Endocytosis
vi) Chromopexin
vii) Serum albumin

15

B) Answer the following : (any three)

i) Explain the statement: " Some genes exhibit more than two alleles"
ii) Justify in detail giving examples: "Phenotypes may be affected by the environment"
iii) Give comparative account of prokaryotic and eukaryotic genetic material.
iv) Discuss the formation of nucleosome and solenoid model of chromatin fibre.
v) Give a detailed note on composition and function of **any two** lipoproteins.
vi) Write a detailed note on transport and storage of iron in humans.

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