Charotar University of Science and Technology

Education Campus, Changa – 388 421.

M Sc (BIOTECHNOLOGY/ MICROBIOLOGY)
SEMESTER II EXAMINATION
BT706/ML706: GENETICS AND BIOCHEMISTRY

Date: 29.04.2010
Time: 10.00 AM to 1.00 PM

Total Marks: 70

Instructions to the candidates:

1. Attempt all questions
2. Questions in **Part A** should be answered in the question paper itself. Please do not write your candidate ID number on the question paper.
3. Write answers for Section I and Section II of **Part B** in separate answer sheets.

PART A

Total marks: 20

Q1. Choose the correct option and put √ mark in front of it:

1. In a heterozygote, one allele conceals the presence of another. This is Mendel's:

a. principle of segregation. b. principle of independent assortment.

c. principle of dominance. d. principle of dihybrid crosses

2. The stage of meiosis in which chromosomes pair and cross over is known as:

a. prophase I b. metaphase I c. prophase II d. metaphase II

3. Polyploidy refers to:

a. extra copies of a gene adjacent to each other on a chromosome

b. an individual with complete extra sets of chromosomes

c. a chromosome which has replicated but not divided

d. multiple ribosomes present on a single mRNA

4. A gene showing codominance has

a both alleles independently expressed in the heterozygote

b. one allele dominant to the other

c. alleles tightly linked on the same chromosome

d. alleles expressed at the same time in development

5. An Hfr strain of *Escherichia coli* contains:

a. a vector of yeast or bacterial origin which is used to make many copies of a particular DNA sequence

b. a bacterial chromosome with a human gene inserted

c. a bacterial chromosome with the F factor inserted

d. a human chromosome with a transposable element inserted

6. A temperate bacteriophage is absolutely required for

(a) patial transduction (b) conjugal transduction

(c) specialized transduction (d) generalized transduction

7. Transformation occurs:

a. passively, with many bacteria. b. actively, with few bacteria.

c. in all bacteria as a result of a "competence factor". d. none of the above

8. In *F* factor mating, which of the following statements are incorrect?

a. F^+ act as donors.

b. Genes are carried on the *F* factor encoding for cell-cell contact and the formation of sex pili.

c. Recombination can occur between *IS* in the *F* factor and chromosome to generate *F'* cells.

d. *F* factor is regarded as an episome.

9. Lower K_M value of an enzyme for a specific substrate implies that the substrate concentration required to achieve Vmax is:

a) high b) low c) intermediate d) is independent of substrate concentration

10. Uncompetitive inhibitor can bind only to an enzyme that is in the following form:

a) free b) bound to substrate c) inactive d) all of the above

11. Gluconeogenesis is a process by which organisms synthesize glucose is a reversal of glycolysis.

[True] [False]

12. The following is an enzyme which transfers activated CO_2 from biotin to acetyl-CoA, to produce malonyl-CoA.

a) Biotin carboxylase b) Transcarboxylase c) acetyl-CoA carboxylase d) none of the above

13. Citrate lyase that catalyses the conversion of citric acid to Acetyl CoA is activated by:

a) citric acid b) insulin c) palmitoil CoA d)glucagon

14. Conversion of fumarate to malic acid catalyzed by fumarase in TCA cycle is the following reaction:

a) hydrolysis b)hydration c) dehydration d) oxidation

15. Ascorbate, the ionized form of ascorbic acid, serves as:

a) oxidizing agent b) reducing agent c) hydrating agent d) group transferring agent

16. The following is **NOT AN** example of an amino acid containing aromatic R group:

a) tyrosine b) tryptophan c) phenylalanine d) proline

17.The following **IS NOT** the property of unsaturated fatty acids:

a) low melting point b) loosely packed molecules c) solid at room temperature d) all of the above

18. The following **IS NOT** an epimer of D- glucose:

a) D- mannose b) D-fructose c) D- arabinose d) all of the above

19. Molecule that binds to the active site of the enzyme is termed as :

a) Prosthetic group b) Co-factor c) Co-enzyme d) none of the above

20. Different enzymes that catalyze same reactions are known as:

a) holoenzyme b) apoenzyme c) allosteric enzyme d) isoenzyme

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(PART B)

Section I

Q1. (A) Mendel crossed tall pea plants with dwarf ones. The F1 plants were all tall. When these F1 plants were selfed to produce the F2 generation, he got a 3:1 tall-to-dwarf ratio in the offspring. Predict the genotypes and phenotypes and relative proportions of the F3 generation produced when the F2 generation was selfed. **(03)**

Q1. (B) If two black mice are crossed, ten black and three white mice result.
a. Which allele is dominant?
b. Which allele is recessive?
c. What are the genotypes of the parents? **(02)**

OR

Q1. (B) State differences between: **(02)**
(i) Semidominant and codominant alleles
(ii) Continuous and discontinuous variation?

Q1. (C) Explain the Mandel's first rule of dominance and discuss it with suitable example. **(03)**

OR

Q1 (C) A plant that has the genotype *AA bb cc DD EE* is mated with one that is *aa BB CC dd ee*. F_1 individuals are selfed. What is the chance of getting an F_2 plant whose genotype exactly matches the genotype of one of the parents? **(03)**

Q1 (D) Define any two of the following terms in one or two sentences **(02)**
(i) Reciprocal cross (ii) Dihybrids (iii) Testcross (iv) QTL (v) Cistron

Q2. (A) Attempt any one of the following: **(03)**
(i) Describe the salient features of Generalized Transduction
(ii) Compare and contrast the DNA uptake mechanisms of *Streptococcus* and *Haemophilis*

Q2. (B) Draw and explain: Hfr X F⁻ **(03)**

Q2. (C) How do *IS* elements of *E. coli* contribute to horizontal gene transfer? **(02)**

OR

Q2. (C) Specialized transduction of λ phage will only transduce *gal* and *bio* genes. Why? **(02)**

Q2 (D) Write a note on any one of the following: **(02)**

(i) Characteristic features of F-plasmid
(ii) The molecular properties of plasmid
(iii) Site specific transduction

OR

Q2 (D) How do *IS* elements of *E. coli* contribute to horizontal gene transfer? **(02)**

Section II

Q.3.A. Give examples of phospholipids and explain their functions **(04)**

OR

Q.3.B. Explain in detail the classification of Carbohydrates.

Q.3.B. Differentiate between any two of the following: **(06)**

i. Essential amino acids and non-essential amino acids

ii) Reducing sugar and nonreducing sugar

iii. Satturated and Unsaturated fatty acids

Q.4.A. Give the reaction and importance of any one of the following: **(04)**

i. Glutamate dehydrogenase
ii. Pyruvate Carboxylase

Q.4.B.Explain any two of the following: **(06)**

i. Transport of Fatty acid in mitochondria
ii. Regulation of glycolysis
iii. Transformation of glycerol released from lipids into Dihydroxy acetone phosphate

Q.5.A. What is k_m? Explain the significance of k_m value of an enzyme? **(04)**

OR

Q.5.A Explain the following terms: **(04)**

(i) Unit Activity of Enzyme (ii) Km (iii) Active site (iv) Allosteric site

Q.5.B. Answer any two of the following: **(06)**

i. Explain in detail the mechanisms of multi-substrate enzyme catalyzed reactions
ii. Explain the mode of action of lysozyme.
iii. Explain irreversible inhibition of enzymes g[illegible] **two examples.**