MCKV Institute of Engineering

Paper Code: BS BIO401

Paper Name: Biology

Time Allotted: 1 Hour ***Full Marks: 30***

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *five* of the following: 5×1=5

(i) Which of these works differently as compared to the camera?

(a) Choroid (b) Iris (c) Pupil (d) Focal length of lens.

(ii) The basic principle of flying is based on.

(a) First law of thermodynamics (b) Bernoulli's principle

(c) Archimedes Principle (d) Torricelli's Principle.

(iii) Which part of the airplane is responsible for changing flying height?

(a) Nose (b) Engine (c) Tail (d) Wing flips

(iv) In aircraft, propulsion causes according to

(a) Bernoulli's principle (b) Newton's 1st law of motion

(c) Newton's 2nd law of motion (d) Newton's 3rd law of motion

(v) Archaebacteria differ from eubacteria In

(a) mode of nutrition (b) cell membrane structure (c) cell shape (d)mode of reproduction

(vi) When alleles of two contrasting characters are present together, one of the characters express and the other remains hidden. This happens according to

a) law of purity of gametes b) law of segregation

c) law of dominance d) law of independent assortment

MCKV Institute of Engineering

Paper Code : ES-IT401

Paper Name : Discrete Mathematics

Time Allotted: 1 Hour | *Full Marks: 30*

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *five* of the following: 5×1=5

(i) A group (M,*) is said to be abelian if

(a) x+y=y+x
(b) x*y=y*x
(c) x+y=x
(d) x+y=y

(ii) If A' is the complement of the set A then $A \cap A'$ is

(a) the empty set Ø
(b) A'
(c) A
(d) the universal set U

(iii) The greatest common divi. of $3^{13}.5^{17}$ and $2^{12}.3^5$ is

(a) 3^2
(b) 3^3
(c) 3^4
(d) 3^5

(iv) If $A = \{1, 2, 4\}, B = \{2, 4, 5\}$ and $C = \{2, 5\}$ then $(A - B) \times (B - C)$ is

(a) {(1,1)}
(b) {(4,4)}
(c) {(1,4)}
(d) {(4,1)}

(v) The relation 'is parallel to' on the set of lines in a plane is

(a) reflexive only
(b) symmetric only
(c) transitive only
(d) equivalence

(vi) . Let A and B be two sets, then $(A \cup B)^C \cup (A^C \cap B)$=

B 206 CSE-DS (40)

MCKV Institute of Engineering

Paper Code: BS-BIO301

Biology

Time Allotted: 3 Hours | *Full Marks:* 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***ten*** of the following: 10×1=10

i) Who is known as the "Father of Genetics"?
(a) Morgan (b) Mendel (c) Watson (d) Bateson

ii) Cellulose is made up of repeating units of
(a) β-1-4 linkage between D-glucose units (b) β-1-2 linkage between D-glucose units
(c) α-1-4 linkage between D-glucose units (d) α-1-2 linkage between D-glucose units

iii) How many ATPs are produced in aerobic respiration?
(a) 36 (b) 2 (c) 38 (d) 34

iv) Which of the following is not a hereditary disease?
(a) Cystic fibrosis (b) Thalassemia (c) Hemophilia (d) Cretinism

v) Which of the following is a disaccharide?
(a) Ribose (b) Maltose (c) Glucose (d) Cellulose

vi) Which is non-reducing sugar
(a) Glucose (b) Galactose (c) Mannose (d) Sucrose

vii) H_2 donor during photosynthesis
(a) ATP (b) NADP (c) NADPH (d) NADH

viii) The 3' – 5' phosphodiester linkage joins
(a) Two DNA strands (b) Two nucleotides
(c) A nitrogenous base with pentose sugar (d) Two nucleosides

ix) Information flow or central dogma of modern biology is:

(a) RNA → Proteins → DNA (b) DNA → RNA → Proteins.

(c) RNA → DNA → Proteins (d) DNA → RNA → Proteins

x) What is the count of genes that determine the synthesis of one enzyme?

(a) one (b) four (c) eight (d) sixteen

xi) Rapid bacterial growth occurs in

(a) Lag phase (b) Logarithmic phase (c) Stationary phase (d) Death phase

xii) The EMP pathway in eukaryotes usually takes place in

(a) nucleus (b) cytoplasm (c) lysosome (d) golgi apparatus

Group – B

(Short Answer Type Questions)

Answer any ***three*** of the following 3×5=15

2. What are the different types of carbohydrates on the basis of carbon numbers? What are the differences between nucleotides and nucleosides? State the functions of cellulose. (2+2+1)

3. Differentiate between secondary structure and tertiary structure of protein. Give examples of motor protein and receptor protein. How the protein is denatured? (2+2+1)

4. Briefly explain the different sterilization processes used in the laboratory. (5)

5. Differentiate between autosomal recessive and X linked disorder. Why DNA is called as genetic material? What is nucleosome? (2+2+1)

6. What is electron microscope? Classify bacteria on the basis of shape. Name the growth stages of bacteria. (1+2+2)

Group – C

(Long Answer Type Questions)

Answer any ***three*** of the following 3×15=45

7. State the major 4 differences between mitosis and meiosis. What are different stages of cell division? What is the function of histone protein? Name the seven Mendelian characters of pea. Give two reasons for using of pea as experimental plant by Mendel. Define linkage and complete dominance. (2+2+1+3+2+5)

8. What are the differences between competitive and noncompetitive inhibition? Explain with a picture. What are the differences between catalytic site and active site? What is activation energy? What is the nature of an enzyme? Mention the different enzymes involved in carbohydrate, protein, and lipid metabolism. How the enzyme activity is affected by pH and temperature? (5+2+2+1+3+2)

9. What is 5 kingdom classifications? Give examples. Write down 2 characters of vertebrata and mollusca. What are the differences between 'family' and 'order'? How can microbes be used to decrease the use of chemical fertilizers and pesticides? (5+4+2+4)

10. Differentiate between frame shift and point mutation. What is r-RNA and m-RNA? Describe the functions of them. State the role of t-RNA in translation. Describe the process of DNA replication. (2+4+2+2+5)

11. How are the alleles of a gene different from each other? What is its importance? Differentiate between dominance, and incomplete dominance. Define the chromosomal theory of inheritance? Define Linkage. What is test cross and back cross? What is multiple allele? Give an example. What is the genotype of Turner syndrome? (2+1+2+2+2+2+2+1+1)

MCKV Institute of Engineering

Paper Code: BS-BIO401

BIOLOGY

Time Allotted: 1 Hour | *Full Marks: 30*

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Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***five*** of the following: 5×1

(i) Airplane get lift when it flies based on

a) Schrodinger's wave equation b) Bernoulli's principle

c) Archimede's principles d) Newton's laws of motion

(ii) In aircraft, propulsion causes according to

a) Bernoulli's principle b) Newton's 1st law of motion

c) Newton's 2nd law of motion d) Newton's 3rd law of motion

(iii) Which of the following refer to a domain?

a) Yeast, b) Bacteria, c) Algae d) Eukarya

(iv) Five kingdom system of classification suggested by R.H. Whittaker is not based on:

a) presence or absence of a well-defined nucleus. b) mode of reproduction

c) mode of nutrition d) complexity of body organization

(v) Pick up the wrong statement:

a) nuclear membrane is present in Monera, b) Cell wall is absent in Animalia,

c) Protista has photosynthetic and heterotrophic modes of nutrition, d) Some fungi are edible.

(vi) Sweating in hot-summer causes in accordance with which thermodynamic law?

a) Zeroth law b) First law c) second Law d) None

Group – B

(Short Answer Type Questions)

Answer any *two* of the following 2×5

2. (a) Write the name of the similar parts of the human eye and camera. (b) What is the key difference between human eye and camera? [3+2]

3. a) What are the main objectives of biological classification? [3]

   b) How does archaebacteria differ from bacteria? [2]

4. (a) What are the basic differences between pKa and pH values? [3]

   (b) What is the pH of a $10^{-8}M$ solution of HCl? [2]

Group – C

(Long Answer Type Questions)

Answer any *one* of the following 1×15

5. a) On the basis of flying techniques & mechanism, write down the difference between bird and aircraft. [3]

   b) What are the three domains of life? Explain. [3+2]

   c) What is taxonomical hierarchy? explain briefly and how Scientific Names are related to it? [5+2]

6. (a) Describe Michaelis-Menta Equation for Kinetics of Enzyme-Catalysed reaction? [10]

   (b) What is the significance of $\frac{1}{2}V_{max}$ in the above equation? Show with a graph and explain. [5]

MCKV Institute of Engineering

Paper Code: BS-BIO401

BIOLOGY

Time Allotted: 1 Hour | *Full Marks: 30*

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Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***five*** of the following: 5×1

(i) If a plant with genotype AaBb is self-fertilized, the probability of getting AABB genotype will be (A and B are not linked)

(a) ½ (b) ¼ (c) ⅛ (d) 1/16

(ii) The crossing of F1 to either of the parents is known as

(a) Test cross (b) Back cross (c) F1 cross (d) All of the above

(iii) Which of the following statements is true regarding the "law of segregation"?

(a) Law of segregation is the law of purity of genes

(b) Alleles separate from each other during gametogenesis

(c) Segregation of factors is due to the segregation of chromosomes during meiosis

(d) All of the above

(iv) Homozygosity and heterozygosity of an individual can be determined by

(a) Back cross (b) Self-fertilization (c) Test cross (d) All of the above

(v) Sickle cell anemia is

(a) Sex-linked recessive disorder (b) Autosomal dominant disorder

(c) Autosomal recessive disorder (d) Sex-linked dominant disorder

(vi) An exception to Mendel's law is

(a) Independent assortment (b) Linkage

(c) Dominance (d) Purity of gametes

(vii) The smallest unit of genetic material which produces a phenotypic effect on mutation is

(a) Muton (b) Gene (c) Recon (d) Nucleic acid

Group – B

(Short Answer Type Questions)

Answer any *two* of the following 2×5

1. a) What is the basic difference between oils and fats? [2]

   b) Explain with neat diagram the structure of i) bilayer and ii) Liposome. [3]

2. (a) How does glucose convert into fructose? [5]

3. (a) What is epistasis? [2]

   (b) What do mean by genotypes and phenotypes? [2]

   (c) Mention one exception to Mendel's law. [1]

Group – C

(Long Answer Type Questions)

Answer any *one* of the following 1×15

(d) a) State and deduce Beer Lambert's Law. [10]

b) Upon passing through a cuvette filled with absorbing solute dissolved in nonadsorbing solvent the power of the incidented beams reduced to half when transmitted from the cuvette. Find the absorbance. [5]

(e) (a) What is the difference between a homozygous and a heterozygous species? [3]

(b) What is linkage? [2]

(c) Define mutation, recombination and complementation. [6]

(d) What are autosomes and sex chromosomes? How many autosomes and sex chromosomes are there in the human system? [2]

(e) Name one autosomal and one sex-linked disorder. [2]

MCKV Institute of Engineering

Paper Code: BS-BIO401

BIOLOGY

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   (b) What do mean by genotypes and phenotypes? [2]

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Group – C

(Long Answer Type Questions)

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B-6-23, 30-39
C-7-14, 20-24

MCKV Institute of Engineering

Paper Code: BS-BIO401

Biology

Time Allotted: **3 Hours** ***Full Marks:*** **70**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***ten*** of the following: 10×1=10

(i)Immunology is the study of

a) Disease causing agents b) Defence mechanism of the body

c) Symbiotic bacteria d) None of these

(ii) Which of these works differently as compared to the camera?

a) Pupil b) Iris c) Focal length of lens d) Choroid

(iii)In oligosaccharide, monosaccharides are joined by

a) Ionic bond b) Peptide bond c) Glycosidic bond d) None of these

(iv)Bentham and Hooker gave which system of classification?

a) Numerical b) Phylogenetic c) Artificial d) Natural

(v)Which of the following is not an example of Brownian motion?

a) Movement of dust in a room b) Diffusion of calcium through bones

c) Solution of salt in water d) Diffusion of SPM in air

(vi) H_2 donor during photosynthesis is

a) ATP b) NADP c) NADPH d) NADH

(vii)What is a taxon?

a) A group of related families b) A type of living organisms

c) A group of related species d) A group of any ranking

(viii)The smallest unit of genetic material which produces a phenotypic effect on mutation is

a) Muton b) Gene c) Recon d) Nucleic acid

(ix)When rod shaped bacteria appears in pairs, is known as?

a) Streptobacilli b) Diplococcus c) Diplobacilli d) Staphylococcus

(x)Blood agar is used for the cultivation of

a) Mosquitoes b) Fastidious organisms c) Red algae d) None of these

(xi)Which of the following is not an essential amino acid?

a) Leucine b) Isoleucine c) Lysine d) Glycine

(xi)The portion of the growth curve where rapid growth of bacteria is observed is known as

a) Lag phase b) Logarithmic phase c) Stationary phase d) Death phase

Group – B

(Short Answer Type Questions)

Answer any ***three*** of the following 3×5=15

2. Differentiate between prokaryotes and eukaryotes. Give two important uses of culture medium. 3+2=5
3. What are the two major components of a conjugated enzyme? How can you define them? What are prosthetic groups? 2+2+1=5
4. Explain the first law of thermodynamics in biological systems. Give one biological example each, for endothermic and exothermic reactions. 3+2=5
5. Show the final form of Michaelis-Menten's equation and also mention the identities of each term used in that equation. Write down the equation for the Lineweaver-Burk plot? Also mention the slope of that equation. 2+2+1=5
6. What is epistasis? What do mean by genotypes and phenotypes? Mention Mendel's first law on heredity 1+2+2=5

Group – C

(Long Answer Type Questions)

Answer any ***three*** of the following 3×15=45

7. What is enzyme inhibitor? Explain competitive and non-competitive inhibition with suitable diagram. What is active site? How does temperature affect enzyme activity? 1+5+5+1+3=15
8. What is the difference between a homozygous and a heterozygous species? Define linkage, recombination and complementation. What are autosomes and sex chromosomes? How many autosomes and sex chromosomes are there in the human system? Name one autosomal and one sex-linked disorder. 3+6+2+2+2=15
9. What is DNA replication? State if there is any difference between the leading and lagging strand synthesis in DNA. What are Okazaki fragments? Draw the picture of a replication fork with proper labelling to

MCKV Institute of Engineering

Paper Code: BS-BIO401

Paper Name: Biology

Time Allotted: **1 Hour** ***Full Marks: 30***

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Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ***five*** of the following: 5×1=5

(i) A 5-carbon sugar is

(a) Galactose, (b) Ribose, (c) Raffinose (d) Glyceraldehyde

(ii) Name a storage protein

(a) Hemoglobin (b) Acetyl choline receptor (c) Collagen) (d) Albumin

(iii) Which of the following helps in opening of DNA double helix in front of replication fork?

(a) Topoisomerase (b) DNA polymerase-I (c) DNA gyrase (d) DNA ligase

(iv) Trypsin is involved in

(a) Carbohydrate metabolism (b) Protein anabolism (c) Protein catabolism (d) Lipid metabolism

(v) Hemoglobin has a

(a) Primary structure (b) Secondary structure (c) Tertiary structure (d) Quaternary structure

(vi) How many ATPs are produced in aerobic respiration?

(a) 36 (b) 2 (c) 38 (d) 34

Group – B

(Short Answer Type Questions)

Answer any *two* of the following 2×5=10

2. Define active site. Distinguish between active site and catalytic site. What are the different enzymes involved in DNA replication process? *[CO5, remember, understand LOCQ]* [1+1+3]

3. How the gene performs a particular function in biological system? Give an example in each – Receptor protein, structural protein, motor protein, transport protein. *[CO4, remember, LOCQ]* [3+2]

4. Classify carbohydrates on the basis of carbon numbers and give an example in each. [5]

[CO4, understand, LOCQ]

Group – C

(Long Answer Type Questions)

Answer any ***one*** of the following 1×15=15

5. (a) What is holoenzyme? [1]

(b) What are the differences in competitive and noncompetitive enzyme inhibition? [5]

(c) Name 2 enzymes involved in each- carbohydrate, protein and lipid metabolism. [6]

Lipase Trypsin Lipase
Maltase chymotrypsine

[CO5, remember, understand LOCQ]

(d) What are the differences between quaternary and tertiary structures of protein? [3]

[CO4, remember, LOCQ]

6. (a) How the RNA transcription is terminated? [4]

(b) What is codon and anticodon. [2]

(c) Brief the process of protein translation. [4]

(d) Define Okazaki fragment. [2]

(e) Why DNA synthesis is called semiconservative? [3]

[CO6, remember, understand LOCQ]

demonstrate the process of replication. Name the three enzymes that participate in the processes of Replication, Transcription and Translation respectively. 2+2+2+6+3=15

10. Give the ecological importance of microorganism. Write about the sterilization methods generally used in laboratory. Write a note on chemical indicators of successful sterilization. Give the name of two commonly used chemical used for sterilization. 4+5+4+ 2=15

11. Write down the differences between motifs and domains. Mention the names of different types of motifs. Match the elements of the following table. 4+3+8=15

Name of the protein	Functional class
a) Trypsin	1) Receptor protein
b) Keratin	2) Storage protein
c) Albumin	3) Enzymatic protein
d) Hemoglobin	4) Defense protein
e) Insulin	5) Motor protein
f) Acetylecholine receptor	6) Transport protein
g) Actin	7) Hormonal protein
h) Antibodies	8) Structural protein