MEGA Solution Series

Volume III

Biotechnology Biochemistry Microbiology

covers following examinations

- CUET – PG
- University of Delhi
- Banaras Hindu University
- University of Hyderabad

Editor
Kar Debasish

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CHAPTER

01

DU Biochemistry 2018

1. Which of the following organism is exploited for transfer of genes in plants?

(*a*) Clostridium perfringens

(*b*) Staphylococcus aureus

(*c*) Agrobacterium tumefaciens

(*d*) Escherichia coli

2. Which of the following defects in the adrenal cortex leads to lack of glucocorticoids and mineralocorticoids?

(*a*) Testosterone deficiency

(*b*) Androstenedione deficiency

(*c*) Estrone deficiency

(*d*) C 21 hydroxylase deficiency

3. Which of the following is true for allosteric inhibition of an enzyme?

(*a*) It always leads to a reduced binding of substrate

(*b*) The inhibitor binds to some other site than the active site of the enzyme

(*c*) The inhibitor binds to the active site of the enzyme

(*d*) It causes the enzyme to work faster

4. Which of the following is true about Michaelis-Menten kinetics?

(*a*) It assumes that covalent binding occurs between enzyme and substrate

(*b*) Km, the Michaelis constant, is defined as that concentration of substrate at which enzyme is working at maximum velocity

(*c*) Km, the Michaelis constant is defined as the dissociation constant of the enzyme-substrate complex

(*d*) It describes single substrate enzymes

5. Which of the following increases Ca^{+2} release from ER

(*a*) Diacylglycerol (DAG)(*b*) Parathyroid hormone

(*c*) Calcitonin (*d*) Inositol triphosphate

6. Intrinsic fluorescence of GFP is contributed by

(*a*) Cyclization and oxidation of residues: Ser-Tyr-Gly

(*b*) Cyclization and oxidation of residues: Ser-Tyr-Pro

(*c*) Cyclization and oxidation of residues: Ser-Pro-Gly

(*d*) Cyclization and oxidation of residues: Tyr-Gly-Pro

7. Intrinsic fluorescence of proteins is primarily contributed by

(*a*) Histidine (*b*) Proline

(*c*) Cysteine (*d*) Tryptophan

8. Angiotensin converting enzyme inhibitor are used to treat

(*a*) Diabetes (*b*) Obesity

(*c*) Hypertension (*d*) Hyperthyroidism

9. Hashimoto's disease is

(*a*) a viral disease

(*b*) an autoimmune disorder that causes hypoglycemia

(*c*) an autoimmune disorder that causes hypothyroidism

(*d*) an autoimmune disorder that causes hyperthyroidism

10. Lovastatin is a

(*a*) Competitive inhibitor of HMG CoA synthetase

(*b*) Non-competitive inhibitor of HMG CoA reductase

(*c*) Competitive inhibitor of acetyl CoA carboxylase

(*d*) Competitive inhibitor of HMG CoA reductase

11. FACS is used to measure two types of scatters, namely forward and side. What physical properties are determined by the se parameters?

(*a*) Forward- Granularity of the cell; Side-Size of the cell

(*b*) Forward- Volume of the cell; Side-Size of the cell

(*c*) Forward- Size of the cell; Side- Granularity of the cell

(*d*) Forward- Size of the cell; Side-Volume of the cell

12. Snake venom phosphodiesterase is a

(*a*) Restriction endonuclease

(*b*) Lipase

(*c*) Endonuclease

(*d*) Exonuclease

13. The active site of chymotrypsin consists of a catalytic triad composed of which of the following amino acid residues?

(*a*) Serine, histidine and aspartate

(*b*) Serine, histidine and glutamate

(*c*) Threonine, histidine and aspartate

(*d*) Methionine, histidine and aspartate

14. Passive administration of antibodies is employed as a mechanism for providing immediate protection against several toxins and pathogens. Which of the following are treated by passive immunization?

(*a*) Tuberculosis (*b*) Botulism

(*c*) Typhoid (*d*) Leprosy

15. Folic acid is important for

(*a*) Fatty acid oxidation

(*b*) Fatty acid synthesis

(*c*) Gluconeogenesis

(*d*) One carbon metabolism

16. Patients with cystic fibrosis have mutation in the gene that codes for a

(*a*) Chloride ion channel (*b*) Toll like receptor

(*c*) IFN-γ receptor (*d*) Potassium channel

17. Dolly sheep was created by

(*a*) Artificial insemination

(*b*) Somatic cell nuclear transfer

(*c*) Embryonic stem cell mediated gene transfer

(*d*) Pronuclear microinjection

18. On exposure to a pathogen, diagnostic tests showed increase in neutrophil count. What kind of pathogen is the patient most likely to be affected with ?

(*a*) Influenza (*b*) Staphylococcus aureus

(*c*) Plasmodium (*d*) HIV

19. AB is a substrate for enzyme D which converts AB to AC. In the presence of an competitive inhibitor E in place of substrate AB, the enzyme's

(*a*) Km increases and Vmax remains same

(*b*) Km increases and Vmax decreases

(*c*) Km decreases and Vmax increases

(*d*) Km and Vmax both remains same

20. In the liver gluconeogenesis is induced in response to which of the following molecules?

(*a*) Insulin (*b*) cAMP

(*c*) cGMP (*d*) ATP

21. The rate limiting step of urea cycle is mediated by

(*a*) Arginase

(*b*) Carbamoyl phosphate synthetase I

(*c*) Arginosuccinate synthetase

(*d*) Ornithine transcarbamoylase

22. How many ATP molecules are produced by one glucose in aerobic respiration?

(*a*) 38 (*b*) 28

(*c*) 42 (*d*) 40

23. A 32 year old man is fasting for religious purpose for several days. Which of the following will be utilized by the brain as an alternative source of energy?

(*a*) Alanine (*b*) Beta-hydroxy butyrate

(*c*) Fatty acids (*d*) Glycerol

24. Individuals with familial hypercholesterolemia have mutations in the

(*a*) LDL receptor (*b*) Ferritin receptor

(*c*) HDL receptor (*d*) Insulin receptor

25. The process by which an amino acid catabolizes its carbon chain into acetoacetyl CoA is considered to be

(*a*) Glycogenic

(*b*) Both glycogenic and ketogenic

(*c*) Neither glycogenic nor ketogenic

(*d*) Ketogenic

26. A human enzyme contains 4 disulphide bonds, essential for its folding. The enzyme was expressed in the oxidising environment of periplasm of E. coli host BL21 (DE3) RIL and was found to be inactive. However, the expression of the same enzyme in the oxidising environment of cytosol of E. coli Shuffle strain led to fully active enzyme. Which of the following is the likely reason for this observation?

(*a*) Cytosol of E. coli Shuffle provides cofactor required for enzyme's activity

(*b*) Cytosol of E. coli Shuffle provides more space for enzyme to fold

(*c*) Periplasm is rich in proteases that inactivate the enzyme

(*d*) The enzyme for disulphide bond formation is only present in E. coli cytosol

27. An unknown bacteriophage has a base composition of 23 % A, 36 % T, 21 % G, and 20 % C. Its genome is likely to be

(*a*) Double stranded RNA

(*b*) Double stranded DNA

(*c*) Single stranded DNA

(*d*) Single stranded RNA

28. Deficiency of iodine will cause which of the following?
(*a*) Decreased secretion of TSH
(*b*) Increased basal metabolic rate
(*c*) Increased secretion of TSH
(*d*) Directly affect the synthesis of thyroglobin

29. If enthalpy change for a reaction is zero, then ΔG° equals to
(*a*) lnkeq (*b*) $-\Delta E^\circ$
(*c*) $-T\Delta S^\circ$ (*d*) $T\Delta S^\circ$

30. Peptides get loaded on the MHC-Class I molecules in which part of the cell?
(*a*) Lysosome
(*b*) Mitochondria
(*c*) Endoplasmic Reticulum
(*d*) Cytosol

31. Where do T-lymphocytes develop into fully competent but not activated T-cells?
(*a*) The thyroid gland (*b*) The thymus gland
(*c*) The bone marrow (*d*) The lymph nodes

32. Lactose deficiency is characterized by the inability to hydrolyze:
(*a*) Alpha-1,4-glucosidic bonds
(*b*) Beta-1,6-galactosidic bonds
(*c*) Beta-1,4-glucosidic bonds
(*d*) Beta-1,4-galactosidic bonds

33. DNA polymerase I does not contain the following activity:
(*a*) 5'-3' exonuclease activity
(*b*) 3'-5' exonuclease activity
(*c*) 5'-3' polymerase activity
(*d*) 5'-3' endonuclease activity

34. If taken in equal amount, which of the following antibodies would be most efficient in causing agglutination of RBCs?
(*a*) IgE (*b*) IgM (*c*) IgD (*d*) IgG

35. In bacteriophage λ life cycle high levels of CII protein leads to
(*a*) High levels of C1 repressor and subsequent lytic cycle
(*b*) High levels of C1 repressor and subsequent lysogeny
(*c*) Low levels of C1 repressor and subsequent lysogeny
(*d*) Low levels of C1 repressor and subsequent lytic cycle

36. What happens if citrate concentration is increased during glycolysis?
(*a*) Inhibits triose phosphate isomerase and increase glycolysis
(*b*) Inhibits phosphoglyceratekinase and slows down glycolysis
(*c*) Inhibits phosphofructokinase and slows down glycolysis
(*d*) Inhibits phosphofructokinase and increases glycolysis

37. A student performed immunoprecipitation with anti-J chain antibodies. Which of the following class of antibodies are expected to be immuno-precipitated predominantly?
(*a*) IgG (*b*) IgM (*c*) IgE (*d*) IgD

38. A researcher wants to clone a PCR amplified insert (1 kb) into a PCR amplified vector backbone (4 kb) using blunt end ligation. The PCR was performed with Pfu DNA polymerase to reduce error rate. For successful cloning, the PCR amplified insert should be treated with which of the following enzymes before setting up the ligation reaction?
(*a*) T4 DNA polymerase
(*b*) Klenow fragment exo
(*c*) Terminal transferase
(*d*) T4 polynucleotide kinase

39. A researcher was trying to express a highly toxic protein cloned under T7 promoter in BL21 (DE3) host. However, the culture OD was insufficient for induction of expression and culture showed lysis. Which of the following strains is better suited for such an application?
(*a*) BL21 (DE3) pLysS (*b*) BL21 (DE3) Shuffle
(*c*) BL21 (DE3) Origami (*d*) BL21 (DE3) RIL

40. Secretion of progesterone from corpus luteum is stimulated by:
(*a*) Thyroid stimulating hormone
(*b*) Follicle stimulating hormone
(*c*) Luteinizing hormone
(*d*) Prolactin

41. In case of pET expression systems, the host strain can be transformed with pLysE plasmids, which allow expression of T7 Lysozyme. Which of the following properties of this enzyme are correct?
(*a*) It promotes cell lysis and reduces the division time of host cells
(*b*) It promotes cell lysis and inhibits transcription by T7 RNA polymerase
(*c*) It promotes cell lysis and facilitates folding of expressed protein
(*d*) It promotes cell lysis and promotes transcription by T7 RNA polymerase

42. S-Adenosyl methionine is required for the synthesis of which of the following?

(*a*) Serotonin (*b*) Melanin

(*c*) Thyroid hormone (*d*) Epinephrine

43. The cells that tear down and remodel bone are the

(*a*) Osteocytes (*b*) Macrophages

(*a*) Osteoclasts (*b*) Osteoblasts

44. In which type of chromatography, solvents of increasing polarity are passed through a column of silica gel?

(*a*) Thin layer chromatography

(*b*) Gas-liquid chromatography

(*c*) Adsorption chromatography

(*d*) Lectin affinity chromatography

45. An Indian student applied for post doctorate fellowship in Singapore and was asked to undergo test for Tuberculosis. He went to AIIMS, New Delhi for testing. The Tuberculin skin test (1st test) turned out to be positive, however, culture-based confirmation test (2nd test) revealed that he was negative for tuberculosis. What is the most likely reason for this observation?

(*a*) The student was vaccinated with BCG.

(*b*) The student had autoimmune antibodies

(*c*) The 1st test was not performed correctly

(*d*) The 2nd test was not performed correctly

46. Melt curve analysis is routinely performed during real time PCR. It is used for:

(*a*) Specificity of the reaction

(*b*) Quantification of the amplicon

(*c*) Quantification of the amplicon

(*d*) Melting temperature of primers

47. What is the action of sildenafil?

(*a*) Phosphodiesterase activator

(*b*) Phosphodiesterase inhibitor

(*c*) Phospholipase inhibitor

(*d*) Phospholipase activator

48. What is cas9 in CRISPR-Cas9-based DNA editing tool?

(*a*) It is a RNA molecule that provides specificity to the editing process

(*b*) DO.It is a RNA molecule that cleaves target DNA

(*c*) It is a protein molecule that cleaves the target DNA

(*d*) It is a protein molecule that cleaves the guide RNA

49. What is the phenotypic effect of Sam7 mutation on lambda bacteriophage?

(*a*) It causes accumulation of bacteriophages in cells

(*b*) It prevents packaging of DNA inside bacteriophage head

(*c*) It makes lambda bacteriophage non-infectious

(*d*) It inhibits bacteriophage replication

50. What is the correct order of use of different enzymes in a typical cycle of pyrosequencing reaction?

(*a*) DNA polymerase, Apyrase, Luciferase, ATP sulphurylase

(*b*) DNA polymerase, Luciferase, Apyrase, ATP sulphurylase

(*c*) DNA polymerase, Luciferase, ATP sulphurylase, Apyrase

(*d*) DNA polymerase, ATP sulphurylase, Luciferase, Apyrase

51. Surface Plasmon resonance (SPR) is widely employed to characterize antibodies. Which of the following cannot be determined using SPR?

(*a*) Equilibrium dissociation constant of the antibody

(*b*) Glycosylation of the antibody

(*c*) Dissociation rate constant of the antibody

(*d*) Association rate constant of the antibody

52. Phage display is an elegant technology to display proteins on bacteriophage surface. M13 bacteriophage is widely used for phage display. Which of the following proteins cannot be employed to display a peptide fragment on M13 bacteriophage surface?

(*a*) gIVp (*b*) gVIIIp

(*c*) gVIIp (*d*) gIIIp

53. Iodine deficiency in an adult male will lead to:

(*a*) Decreased secretion of thyroid stimulating hormone

(*b*) Increased secretion of thyroid stimulating hormone

(*c*) Increase metabolic rate

(*d*) Increased heart rate and blood pressure

54. During the growth of mammalian cells, the growth media was supplemented with radioactive amino acids. Which of the following molecules will be labelled? (I) Proteins (II) Ribosomes (III) RNA (IV) Glycolipids

(*a*) I and IV (*b*) I and II

(*c*) I and III (*d*) II and III

CHAPTER 01

University of Hyderabad Biochemistry 2016

Part-A

1. When two heterozygous individuals are mated, the percent of heterozygous offsprings will be
(*a*) 0 (*b*) 50
(*c*) 25 (*d*) l00

2. The following receptor (type) mediates odorants and bitter taste signals:
(*a*) G-protein coupled receptors
(*b*) EGFR
(*c*) Nuclear receptors
(*d*) Receptors with tyrosine kinase activity

3. In dicotyledonous leaves, stomata are arranged in
(*a*) Linear rows (*b*) Parallel manner
(*c*) Scattered (*d*) Radially

4. Coir is made from which part of the coconut?
(*a*) Epicarp (*b*) Seedcarp
(*c*) Mesocarp (*d*) Pericarp

5. Which one of the following statements is not true?
(*a*) Rate of facilitated transport is saturable
(*b*) Facilitated transport is specific with respect to the type of molecules transported
(*c*) Rate of transport by simple diffusion is saturable
(*d*) Active transport can take place against concentration gradient

6. Transfer of DNA from donor to recipient by a bacteriophage is
(*a*) Transformation
(*b*) Transduction
(*c*) Conjugation
(*d*) Transposition

7. Coliform bacteria are used as indicators of sewage pollution because they:
(*a*) Are non-pathogenic
(*b*) Survive best in sewage
(*c*) Are abundant in human intestine
(*d*) Are easy to culture

8. Lichens are combinations of green algae and fungi. They exist in a------ relationship
(*a*) Opportunistic (*b*) Commensal
(*c*) Mutualistic (*d*) Parasitic

9. Carpel, the female reproductive part of a flower consists of all these parts except:
(*a*) Stigma (*b*) Ovary
(*c*) Style (*d*) Calyx

10. Which of the following blood cell types is NOT in the same group as others?
(*a*) Lymphocyte (*b*) Eosinophil
(*c*) Neutrophils (*d*) Basophil

11. Leeches feed on blood for which their saliva contains an anticoagulant. Which of the following is secreted by leeches in their saliva?
(*a*) Heparin (*b*) Hirudin
(*c*) Hematin (*d*) Hemoglobin

12. The portion of the nervous system that is responsible for the bodily functions without any conscious directions, such as breathing, heartbeat, and digestive processes etc are called:
(*a*) Somatic nervous system
(*b*) Sensory nervous system
(*c*) Autonomic nervous system
(*d*) Motor nervous system

13. Oleic acid has which of the following functional groups?
(*a*) Carboxylic acid, alcohol
(*b*) Alkene, carboxylic acid
(*c*) Alkene, alcohol and carboxylic acid
(*d*) Alkene and alcohol

14. Deamination of cytosine leads to the formation of
(*a*) Thymine (*b*) Uridine
(*c*) 5-Methylcytosine (*d*) Uracil

15. When 150 g of urea (MW60) was dissolved in 1.35 kg of water it gave a solution of density 1.2 g/mL. What would be the molarity (M) of the solution?

(*a*) 1.85 (*b*) 2.22

(*c*) 1.54 (*d*) 2.00

16. Which of the following proteins is an ATPase in the skeletal muscle?

(*a*) Actin (*b*) Myosin

(*c*) Troponin (*d*) Tropomyosin

17. Which of the following characteristics best defines gymnosperms:

(*a*) Exposed seeds, vascular, unisexual flowers

(*b*) Exposed seeds, bisexual flowers, haploid endosperm

(*c*) Vascular, triploid endosperm, flat leaves

(*d*) Cone like leaves, triploid endosperm, hard wood producing

18. The major site of regulation of glycolysis is with

(*a*) Pyruvate kinase (*b*) Phosphofructokinase

(*c*) Hexokinase (*d*) Aldolase

19. Starch is best defined as

(*a*) Polysaccharide of glucose and galactose in 1,6-glycosidic linkage

(*b*) Polysaccharide of glucose in 1,4 and 1,6-glycosidic linkage

(*c*) Polysaccharide exclusively of glucose in 1,4-alpha glycosidic linkage

(*d*) Polysaccharide of galactose in 1,4-glycosidic linkage

20. The cause of disease scurvy is due to the deficiency ed

(*a*) Vitamin B6 (*b*) Ascorbic acid

(*c*) Niacin (*d*) Pantothenic acid

21. What is concentration of H+ ion in a solution of 0.1 M NaOH?

(*a*) 10^{-13} M (*b*) 10^{-10} M

(*c*) 10^{-7} M (*d*) 10^{-2} M

22. All prokaryotic organisms are classified under

(*a*) Archaebacteria, Eubacteria. and Protists

(*b*) Archaebacteria and Protists

(*c*) Protists and Eubacteria

(*d*) Eubacteria and Archaebacteria

23. Which of the following is the correct sequence showing the highest taxonomical grade (most inclusive) to lowest taxonomical grade (least inclusive)?

(*a*) Kingdom, Phylum, Domain, Order, Class, Family, Genus, Species

(*b*) Kingdom, Phylum, Family, Class, Order, Genus, Species

(*c*) Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species

(*d*) Species, Genus, Family, Class, Order, Phylum, Kingdom

24. Which of the following is a poor immunogen?

(*a*) Enzymes

(*b*) Antibodies

(*c*) Glycogen

(*d*) Whole yeast cell

25. Antigenic determinants of an antibody consist of

(*a*) Variable regions of light chains only

(*b*) Variable regions of heavy chains only

(*c*) Variable regions of both heavy and light chains

(*d*) Constant regions of both heavy and light chains

Part-B

26. Which of the following are true of sphingolipids?

(*a*) Cerebrosides and gangliosides are sphingolipids.

(*b*) Phosphatidylcholine is a typical sphingolipid.

(*c*) They always contain glycerol and fatty acids.

(*d*) Sphingomyelin is a phosphosphingolipid.

27. Which of the enzymatic reactions in the citric acid cycle produces high energy containing phosphate compound?

(*a*) Succinyl CoA synthetase

(*b*) Succinate dehydrogenase

(*c*) Isocitrate dehydrogenase

(*d*) Citrate synthetase

28. Which of the following bonds/interactions is (are) NOT responsible for binding antibody to its cognate region on an antigen?

(*a*) Ionic interactions

(*b*) Hydrophobic forces

(*c*) Hydrogen bonds

(*d*) Disulfide bonds

29. Which of the following statement(s) about antibodies is (are) NOT correct

(*a*) They serve as the specific receptors on B and T lymphocytes.

(*b*) They are composed of two heavy (H) chains and two light (L) chains.

(*c*) The two light (L) chains alone have the variable regions that can bind antigen.

(*d*) The amino acid sequence within the variable (V) regions varies widely from one clone of B-cell to another

30. Which of the following genes code(s) for receptors that recognize(s) and present(s) foreign antigens only?

(*a*) Class I MHC (*b*) Class II MHC

(*c*) Class III MHC (*d*) CD4 receptors

31. Which of the statements about point mutations are correct? They can be

(*a*) Induced by chemicals

(*b*) Responsible for a genetic disease

(*c*) Mapped by a technique similar to Maxam-Gilbert sequencing

(*d*) Detected easily by Southern blotting

32. Identify the statements that describe correctly the events in transcription

(*a*) RNA synthesis initiates denovo (*no* requirement for primer)

(*b*) 'U' is inserted opposite to 'T' during transcription

(*c*) Sigma factor in bacterial polymerase is required for accurate initiation

(*d*) Eukaryotic mRNA is capped with a modified 'G'

33. Identify the events that occur in the cytoplasm

(*a*) Polyadenylation of mRNA

(*b*) Modification of tRNA

(*c*) Assembly of small and large ribosomal subunits

(*d*) Synthesis of protein

34. Degenerate codons are

(*a*) Usually different in the third base

(*b*) Third base is invariant

(*c*) Recognized by the same tRNA

(*d*) Different DNA sequences that encode the same amino acid

35. Which of the following statements about viruses are true?

(*a*) Have DNA or RNA as genetic material

(*b*) Encode their complete replication machinery

(*c*) Require a host cell for propagation

(*d*) Do not infect plants

36. A buffer solution can be prepared from a mixture of

(*a*) Sodium acetate and acetic acid in water

(*b*) Sodium acetate and hydrochloric acid in water

(*c*) Ammonia and ammonium chloride in water

(*d*) Ammonia and sodium hydroxide in water

37. Which of the following is true for the rate constant of a chemical reaction?

(*a*) Depends only on temperature and catalyst

(*b*) Always increases with temperature

(*c*) Linearly related to rate of reaction

(*d*) Same for both directions in a reversible reaction

38. Which of the following is false about chymotrypsin?

(*a*) Hydrolytic cleavage of a peptide bond by chymotrypsin has two phases

(*b*) It is activated in the presence of trypsin

(*c*) It is synthesized in the thyroid gland

(*d*) Polypeptide chains in chymotrypsin are linked by S–S bonds

39. Which of the following compound(s) can react with PCl_5 to give $POCI_3$.

(*a*) O_2 (*b*) CO_2

(*c*) SO_2 (*d*) H_2O

40. Which of the following is not a type of post translational modification?

(*a*) Proteolysis (*b*) Protein folding

(*c*) Glycosylation (*d*) Lipid addition

41. Which of the following will exemplify passive immunity?

(*a*) A person recovers from an infection

(*b*) A person receives immune serum during treatment for hepatitis

(*c*) A foetus receives maternal antibodies that cross the placenta

(*d*) A person given BCG vaccine against tuberculosis

42. Which of the following is CORRECT for differentiating Crustaceans and Insects?

(*a*) Crustaceans alone have fused head and thorax making cephalothorax

(*b*) Crustaceans have three pairs of legs in their thorax region

(*c*) Only insects have tri-segmented body

(*d*) Insects have ommatidia as photoreceptors

Answer Keys

Chapter-1 : University of Hyderabad Biochemistry 2016

1. (*b*)	**2.** (*a*)	**3.** (*c*)	**4.** (*c*)	**5.** (*c*)
6. (*b*)	**7.** (*b*, *c*)	**8.** (*c*)	**9.** (*d*)	**10.** (*a*)
11. (*b*)	**12.** (*c*)	**13.** (*b*)	**14.** (*d*)	**15.** (*d*)
16. (*b*)	**17.** (*b*)	**18.** (*b*)	**19.** (*b*)	**20.** (*b*)
21. (*a*)	**22.** (*d*)	**23.** (*c*)	**24.** (*c*)	**25.** (*d*)
26. (*a*, *d*)	**27.** (*a*)	**28.** (*d*)	**29.** (*a*, *c*)	**30.** (*a*, *b*)
31. (*a*, *b*, *c*, *d*)	**32.** (*a*, *c*, *d*)	**33.** (*c*, *d*)	**34.** (*a*, *c*)	**35.** (*a*, *c*)
36. (*a*, *c*)	**37.** (*b*, *c*)	**38.** (*c*)	**39.** (*c*, *d*)	**40.** (*b*)
41. (*b*, *c*)	**42.** (*c*)	**43.** (*a*, *c*)	**44.** (*d*)	**45.** (*a*, *c*)
46. (*a*,*b*, *d*)	**47.** (*a*, *b*)	**48.** (*b*, *d*)	**49.** (*a*, *b*, *c*)	**50.** (*a*, *b*, *d*)
51. (*a*, *b*, *c*)	**52.** (*a*, *b*)	**53.** (*a*, *c*)	**54.** (*a*, *b*)	**55.** (*a*, *c*)
56. (*c*, *d*)	**57.** (*b*, *c*)	**58.** (*a*, *b*, *c*)	**59.** (*b*, *c*)	**60.** (*b*, *c*)
61. (*a*, *c*)	**62.** (*a*, *b*, *c*)	**63.** (*b*)	**64.** (*b*, *c*)	**65.** (*a*, *c*)
66. (*b*, *d*)	**67.** (*a*, *c*)	**68.** (*a*, *b*, *d*)	**69.** (*d*)	**70.** (*a*, *b*, *d*)
71. (*b*)	**72.** (*c*)	**73.** (*a*)	**74.** (*b*)	**75.** (*b*)
76. (*a*)	**77.** (*b*)	**78.** (*d*)	**79.** (*c*)	**80.** (*c*)
81. (*b*)	**82.** (*c*)	**83.** (*c*)	**84.** (*d*)	**85.** (*c*)

Chapter-2 : University of Hyderabad Biochemistry 2017

1. (*b*)	**2.** (*d*)	**3.** (*b*)	**4.** (*d*)	**5.** (*b*)
6. (*a*)	**7.** (*c*)	**8.** (*a*)	**9.** (*a*)	**10.** (*b*)
11. (*d*)	**12.** (*b*)	**13.** (*a*)	**14.** (*c*)	**15.** (*c*)
16. (*b*)	**17.** (*a*)	**18.** (*a*)	**19.** (*b*)	**20.** (*c*)
21. (*b*)	**22.** (*a*)	**23.** (*a*)	**24.** (*c*)	**25.** (*a*)
26. (*b*)	**27.** (*b*)	**28.** (*a*, *b*, *d*)	**29.** (*a*, *b*, *c*, *d*)	**30.** (*b*, *d*)
31. (*a*)	**32.** (*b*, *c*)	**33.** (*a*, *b*, *c*)	**34.** (*a*, *b*, *c*)	**35.** (*a*, *c*)
36. (*c*)	**37.** (*b*, *c*, *d*)	**38.** (*a*, *b*)	**39.** (*a*, *b*, *c*)	**40.** (*a*, *c*)
41. (*a*, *b*, *d*)	**42.** (*b*, *c*, *d*)	**43.** (*a*, *c*)	**44.** (*a*, *b*, *d*)	**45.** (*c*, *d*)
46. (*b*, *c*, *d*)	**47.** (*b*, *c*)	**48.** (*c*, *d*)	**49.** (*a*, *b*, *d*)	**50.** (*a*, *c*)
51. (*b*, *d*)	**52.** (*d*)	**53.** (*a*)	**54.** (*c*)	**55.** (*b*, *d*)
56. (*a*, *b*)	**57.** (*a*, *b*, *d*)	**58.** (*b*, *c*)	**59.** (*d*)	**60.** (*a*, *b*)
61. (*c*)	**62.** (*a*, *b*, *c*)	**63.** (*a*, *d*)	**64.** (*b*, *c*, *d*)	**65.** (*b*, *d*)
66. (*b*, *c*, *d*)	**67.** (*a*, *b*, *c*, *d*)	**68.** (*a*, *b*, *d*)	**69.** (*a*, *b*)	**70.** (*a*, *d*)
71. (*b*)	**72.** (*b*)	**73.** (*d*)	**74.** (*c*)	**75.** (*c*)
76. (*c*)	**77.** (*d*)	**78.** (*d*)	**79.** (*d*)	**80.** (*a*)
81. (*c*)	**82.** (*c*)	**83.** (*d*)	**84.** (*c*)	**85.** (*b*)

Chapter-3 : University of Hyderabad Biochemistry 2018

1. (*a*)	**2.** (*c*)	**3.** (*b*)	**4.** (*b*)	**5.** (*b*)
6. (*c*)	**7.** (*a*)	**8.** (*c*)	**9.** (*a*)	**10.** (*d*)
11. (*b*)	**12.** (*c*)	**13.** (*b*)	**14.** (*b*)	**15.** (*d*)
16. (*b*)	**17.** (*a*)	**18.** (*c*)	**19.** (*d*)	**20.** (*b*)
21. (*d*)	**22.** (*b*)	**23.** (*b*)	**24.** (*c*)	**25.** (*c*)
26. (*a*, *c*)	**27.** (*b*, *c*)	**28.** (*a*, *d*)	**29.** (*a*, *b*, *d*)	**30.** (a, *b*, *d*)
31. (*a*, *b*, *c*)	**32.** (*a*, *b*, *d*)	**33.** (*a*, *b*, *d*)	**34.** (*a*, *c*, *d*)	**35.** (*a*)
36. (*d*)	**37.** (*a*, *b*, *c*)	**38.** (*b*, *d*)	**39.** (*a*, *b*)	**40.** (*a*)
41. (*a*, *b*, *c*)	**42.** (*a*, *b*)	**43.** (*a*)	**44.** (*c*)	**45.** (*a*)
46. (*b*)	**47.** (*b*)	**48.** (*a*, *b*)	**49.** (*a*, *c*)	**50.** (*a*, *b*, *c*)
51. (*b*, *d*)	**52.** (*a*, *d*)	**53.** (*b*, *c*)	**54.** (*b*, *c*)	**55.** (*a*, *b*, *c*, *d*)
56. (*a*, *b*)	**57.** (*a*, *c*)	**58.** (*b*, *c*)	**59.** (*c*)	**60.** (*b*, *c*)
61. (*d*)	**62.** (*a*, *c*, *d*)	**63.** (*a*, *d*)	**64.** (*a*, *b*, *c*, *d*)	**65.** (*a*)
66. (*a*, *c*)	**67.** (*a*, *c*, *d*)	**68.** (*b*)	**69.** (*b*)	**70.** (*b*)
71. (*a*)	**72.** (*b*)	**73.** (*a*)	**74.** (*a*)	**75.** (*c*)
76. (*c*)	**77.** (*b*)	**78.** (*c*)	**79.** (*d*)	**80.** (*a*)
81. (*d*)	**82.** (*b*)	**83.** (*b*)	**84.** (*b*)	**85.** (*c*)

Chapter-4 : University of Hyderabad Biochemistry 2019

1. (*b*)	**2.** (*a*)	**3.** (*a*)	**4.** (*d*)	**5.** (*b*)
6. (*d*)	**7.** (*a*)	**8.** (*a*)	**9.** (*a*)	**10.** (*d*)
11. (*a*)	**12.** (*c*)	**13.** (*b*)	**14.** (*c*)	**15.** (*c*)
16. (*b*)	**17.** (*b*)	**18.** (*b*)	**19.** (*a*)	**20.** (*c*)
21. (*b*)	**22.** (*d*)	**23.** (*b*)	**24.** (*b*)	**25.** (*c*)
26. (*a*, *b*, *c*)	**27.** (*c*, *d*)	**28.** (*b*, *c*)	**29.** (*a*, *b*)	**30.** (*a*, *b*, *c*)
31. (*a*)	**32.** (*c*)	**33.** (*b*)	**34.** (*a*, *c*)	**35.** (*a*)
36. (*a*, *b*)	**37.** (*a*, *c*)	**38.** (*b*, *d*)	**39.** (*a*, *d*)	**40.** (*b*)
41. (*a*, *c*, *d*)	**42.** (*d*)	**43.** (*c*)	**44.** (*d*)	**45.** (*c*)
46. (*d*)	**47.** (*a*, *b*, *d*)	**48.** (*b*, *d*)	**49.** (*a*, *d*)	**50.** (*a*, *b*, *c*, *d*)
51. (*a*, *c*)	**52.** (*a*, *d*)	**53.** (*b*, *d*)	**54.** (*a*, *c*)	**55.** (*a*)
56. (*b*, *c*, *d*)	**57.** (*a*, *b*, *d*)	**58.** (*a*, *c*)	**59.** (*a*, *b*, *d*)	**60.** (*a*)
61. (*a*, *b*)	**62.** (*a*,*b*, *d*)	**63.** (*b*)	**64.** (*a*)	**65.** (*c*)
66. (*b*, *c*)	**67.** (*a*, *b*, *c*, *d*)	**68.** (*a*, *c*)	**69.** (*a*, *b*, *c*)	**70.** (*a*, *c*, *d*)
71. (*b*)	**72.** (*b*)	**73.** (*c*)	**74.** (*b*)	**75.** (*d*)
76. (*c*)	**77.** (*c*)	**78.** (*d*)	**79.** (*b*)	**80.** (*c*)
81. (*b*)	**82.** (*d*)	**83.** (*b*)	**84.** (*d*)	**85.** (*b*)

Explanations

Chapter-1 : University of Hyderabad Biochemistry 2016

Part-A

1. (*b*) Let the heterozygous individual be Tt. The gene for tall trait is T.

	T	*t*
T	TT (homozygous tall)	T*t* (heterozygous tall)
t	*t*T (heterozygous tall)	*tt* (homozygous dwarf)

Thus, mating of two heterozygous individuals produces 50% heterozygous offsprings.

2. (*a*) The odorant receptors are expressed primarily in olfactory sensory neurons, and belong to the G-protein coupled receptor (GPCR) family, all of which share a 3-dimensional structure containing seven transmembrane helices.

The standard bitter, sweet, or umami taste receptor is a G protein-coupled receptor with seven transmembrane domains. Ligand binding at the taste receptors activate second messenger cascades to depolarize the taste cell. Gustducin is the most common taste Gα subunit, having a major role in TAS2R bitter taste reception.

3. (*c*) In dicot plants, reticulate type of venation is found. Reticulate venation spreads the whole surface area in a very delicate manner. So, to fulfill this aim, stomata have to maximize the surface area- volume ratio, which is possible only with the scattered way of their arrangement.

4. (*c*) Coir is a natural fiber extracted from the mesocarp of the coconut fruit that is present between the hard, internal shell and the outer coat of a coconut. Coir is made up of lignin which is a woody plant substance, and cellulose. Coconut fruit is made up of three layers such as exocarp, mesocarp, and endocarp. The exocarp is the outer green covering, the mesocarp is the fleshy part that becomes husk after drying and the endocarp is the woody inner part. Coir is manufactured from retted coconut husks through a process called defibering. The coir fibre thus extracted is then combed using steel combs to make the fibre clean and to remove short fibres. Bristle coir fibre is used as bristles in brushes for domestic and industrial applications.

5. (*c*) Transporters for molecules and ions bind their substrates with high specificity, catalyze transport at rates well below the limits of free diffusion, and are saturable in the same sense as are enzymes: there is some substrate concentration above which further increases will not produce a greater rate of transport. Channels generally allow transmembrane movement of ions at rates that are orders of magnitude greater than those typical of transporters, approaching the limit of unhindered diffusion (tens of millions of ions per second per channel). Channels typically show some specificity for an ion, but are not saturable with the ion substrate, in contrast to the saturation kinetics seen with transporters.

Active transporters can drive substrates across the membrane against a concentration gradient, some using energy provided directly by a chemical reaction (primary active transporters) and some coupling uphill transport of one substrate with downhill transport of another (secondary active transporters).

6. (*b*) Bacteria exchange genetic material by three different mechanisms- Conjugation, Transformation, and Transduction, all entailing some type of DNA transfer and recombination between the transferred DNA and the bacterial chromosome.

Conjugation takes place when genetic material passes directly from one bacterium to another. In conjugation, DNA is transferred only from donor to recipient, with no reciprocal exchange of genetic material.

Transformation takes place when a bacterium takes up DNA from the medium in which it is growing.

Transduction takes place when bacterial viruses (bacteriophages) carry DNA from one bacterium to another.

Transposition is the ability of genes to change position on chromosomes and is a process in which a transposable element is removed from one site and inserted into a second site in the DNA.

7. (*b, c*) Faecal coliform are predominantly organisms that are found in intestinal tract of man and other animals. Untreated surface water may contain many types of bacteria out of which coliform bacteria is of significant importance. Faecal coliform is useful indicator of sewage pollution. They provide an excellent means of monitoring natural water for sewerage pollution because they can be readily detected even in relatively small number using simple microbiological techniques such as membrane filtration. Thus, because coliforms and *E. coli* are easy and inexpensive to detect, their presence in water samples is used as an indicator of water quality, and more specifically-possible faecal contamination by humans or animals.

8. (*c*) Symbiosis in lichens is the mutually helpful symbiotic relationship of green algae and/or blue-green algae (cyanobacteria). The algae or cyanobacteria benefit their fungal partner by producing organic carbon compounds through photosynthesis. In return, the fungal partner benefits the algae or cyanobacteria by protecting them from the environment by its filaments, which also gather moisture and nutrients from the environment, and (usually) provide an anchor to it.

9. (*d*) The three main parts of a carpel are the stigma, style, and ovary. The stigma is where pollination occurs. The style is a tube connecting the stigma to the ovary, which contains a chamber called a locule. Inside a locule is an ovule, and the ovule contains an egg cell that, when fertilized, will develop into an embryo.

Collectively the sepals are called the calyx (plural calyces), the outermost whorl of parts that form a flower.

10. (*a*) White blood cells(WBCs) are of two types- Granulocytes & Agranulocytes. Granulocytes are a type of WBC that has small granules. These granules contain proteins. The specific types of granulocytes are neutrophils, eosinophils, and basophils. Granulocytes, specifically neutrophils, help the body fight bacterial infections.

Agranulocytes are WBCs that have no distinct granules in their cytoplasm. Lymphocytes have large single nuclei that occupy most of the cells. Monocytes are the largest of the WBCs.

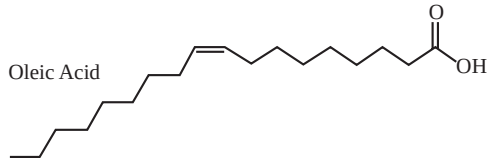
11. (*b*) Leeches are known to suck the blood through the oral sucker. There is an anticoagulant called as hirudin present in the salivary glands. Hirudin is a naturally occurring peptide found in the salivary glands of leeches. This peptide has a blood anticoagulant property.

12. (*c*) The nervous system as a whole is divided into two subdivisions: the central nervous system (CNS) and the peripheral nervous system (PNS). The peripheral nervous system is further subdivided into an afferent (sensory) division and an efferent (motor) division. The afferent or sensory division transmits impulses from peripheral organs to the CNS. The efferent or motor division transmits impulses from the CNS out to the peripheral organs to cause an effect or action.

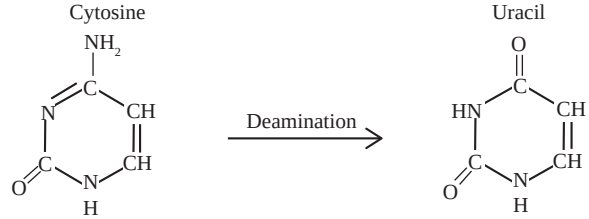
Finally, the efferent or motor division is again subdivided into the somatic nervous system and the autonomic nervous system.

The somatic nervous system, also called the somatomotor or somatic efferent nervous system, supplies motor impulses to the skeletal muscles. Because these nerves permit conscious control of the skeletal muscles, it is sometimes called the voluntary nervous system. The autonomic nervous system, also called the visceral efferent nervous system, supplies motor impulses to cardiac muscle, to smooth muscle, and to glandular epithelium. It is further subdivided into sympathetic and parasympathetic divisions. Because the autonomic nervous system regulates involuntary or automatic functions, it is called the involuntary nervous system.

13. (*b*) Oleic acid is classified as a monounsaturated omega-9 fatty acid, abbreviated with a lipid number of 18:1 cis-9. It has the formula $CH_3(CH_2)_7CH = CH(CH_2)_7COOH$. Oleic acid is a larger (18 carbons) and an unsaturated fatty acid because it also has an alkene functional group.



14. (*d*) Spontaneous deamination is the hydrolysis reaction of cytosine into uracil, releasing ammonia in the process.



15. (*d*) We know, Number of moles of solute(n) $= \frac{\text{Weight of solute}}{\text{Molecular weight of the solute}}$

$\therefore n = 150/60 = 2.5$ moles of urea

We also know, Volume $= \frac{\text{Mass}}{\text{Density}}$

$\therefore$ Volume $= \frac{\text{Mass of solute} + \text{Mass of solvent (water)}}{\text{Density of the solution}}$

$= \frac{150 + 1350}{1.2} = 1250$ mL $= 1.250$ L

Now, Molarity $= \frac{\text{Number of moles}}{\text{Volume in litre}} = \frac{2.5}{1.250} = 2$M

16. (*b*) Myosin proteins have a globular head region consisting of a heavy and a light chain. The heavy chain bears an α-helical tail of varying length. The head has an ATPase activity and can bind to and move along actin filaments – the basis for myosin function as a motor protein. Myosin ATPase is an enzyme that catalyses the hydrolysis of myosin ATP in the presence of actin to form myosin ADP and orthophosphate. In the absence of actin, myosin ATPase activity is low and requires calcium ions.

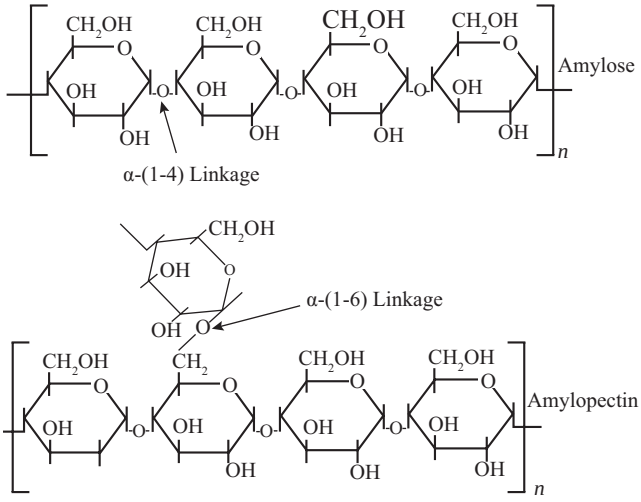
17. (*b*) Gymnosperms are flowerless plants that produce cones and seeds. The term gymnosperm literally means "naked seed," as gymnosperm seeds are not encased within an ovary. Some of the most recognizable examples of these woody shrubs and trees include pines, spruces, firs, and ginkgoes. They are perennial or woody, forming trees or bushes. Gymnosperm wood is considered softwood, unlike the hardwood of some angiosperms.

Although they were considered flowerless, the micro and megasporophyll of the gymnosperms are compared with the flowers in the literature nowadays.

Endosperm of gymnosperm is a pre-fertilisation tissue. It is basically the female gametophyte. Hence, it is haploid unlike triploid in angiosperm.

18. (*b*) Phosphofructokinase-1 (PFK-1) catalyzes the important "committed" step of glycolysis, the conversion of fructose 6-phosphate and ATP to fructose 1,6-bisphosphate and ADP. It is the key regulatory enzyme of glycolysis. PFK-1 is subject to complex allosteric regulation; its activity is increased whenever the cell's ATP supply is depleted or when the ATP breakdown products, ADP and AMP (particularly the latter), accumulate. The enzyme is inhibited whenever the cell has ample ATP and is well supplied by other fuels such as fatty acids. In some organisms, fructose 2,6-bisphosphate is a potent allosteric activator of PFK-1. Ribulose 5-phosphate, an intermediate in the pentose phosphate pathway, also activates phosphofructokinase indirectly.

19. (*b*) Starch or amylum is a polymeric carbohydrate consisting of numerous glucose units joined by glycosidic bonds. It consists of two types of molecules: the linear and helical amylose and the branched amylopectin. Amylose consists of a linear, helical chains of roughly 500 to 20,000 alpha-D-glucose monomers linked together through alpha (1-4) glycosidic bonds. Amylopectin molecules are huge, branched polymers of glucose, each containing between one and two million residues. Amylopectin has alpha (1-6) glycosidic bonds.



20. (*b*) Scurvy is the name for a vitamin C deficiency. It can lead to anaemia, debility, exhaustion, spontaneous bleeding, pain in the limbs, and especially the legs, swelling in some parts of the body, and sometimes ulceration of the gums and loss of teeth. Vitamin C, also known as L-ascorbic acid, is a water-soluble vitamin that is naturally present in some foods.

21. (*a*) NaOH ionizes as: NaOH $Na^+(aq) + OH^-(aq)$

Since NaOH is completely ionized, we have

$[OH^-] = [NaOH] = 0.1\ M = 1 \times 10^{-1}$ mol/L

$[H_3O^+] = \frac{Kw}{[OH]}$, where Kw = ionic product of water

$= 1.008 \times 10^{-14}$ mol^2 L^{-2} at 298 K.

$[H_3O^+] = (1 \times 10^{-14}) \div (1 \times 10^{-1}) = 10^{-13}$ mol/L

$= 10^{-13}$ M

22. (*d*) All living organisms fall into one of three large groups (domains) that define three branches of the evolutionary tree of life originating from a common progenitor. Two large groups of single-celled microorganisms can be distinguished on genetic and biochemical grounds: Bacteria (or Eubacteria) and Archaea (or Archaebacteria). All eukaryotic organisms, which make up the third domain, Eukarya,

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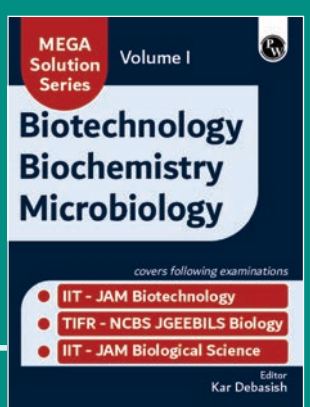

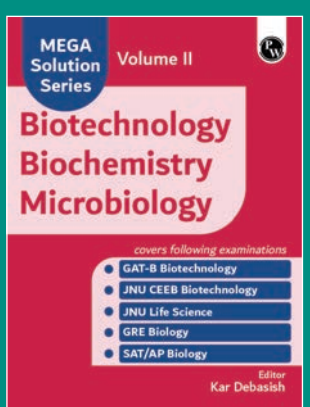

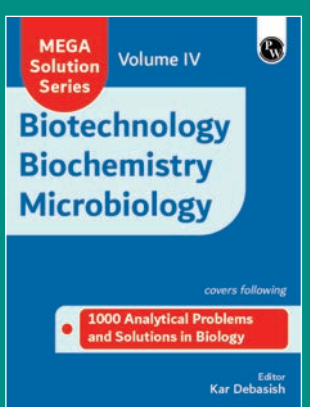

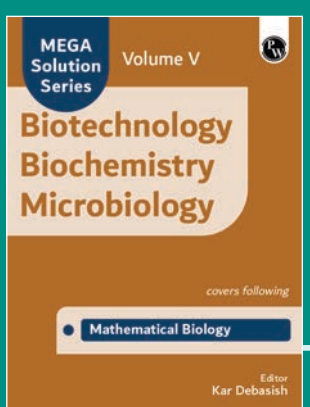

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