QUESTION BANK

INTRODUCTION TO COMPUTATIONAL BIOLOGY

UNIT – 1

CHOOSE THE BEST ANSWER

1) The term cell was coined by, or the cell was first seen by

    a) **Robert Hooke**
    b) Leeuwenhoek
    c) Schleiden and Schwann
    d) Altmann and Kolliker

2) Figures of cork cells observed by Robert Hooke were published in

    a) Genera plantarum
    b) Species plantarum
    c) Origin of species
    d) **Micrographia**

3) The cells discovered in thin sections of cork by Robert Hooke were actually

    a) **Cell walls**
    b) Cellulose
    c) Protoplasm
    d) Nuclei

4) Largest organelle within a eukaryotic cell

    a) **Nucleus**
    b) Mitochondria
    c) Lysosome
    d) Ribosome

5) Letter S in the structural unit of ribosome denotes

    a) Concentration unit
    b) **Svedberg unit**
    c) Polymerization unit
    d) Stability unit

6) According to cell theory

    a) **Cells are fundamental structural units of organisms**
    b) Cells reproduce
    c) Cells are living
    d) Cells have nuclei

7) Schleiden and Schwann proposed cell theory in

a) 1836-37
b) **1838-39**
c) 1901-02
d) 1938-39

8) Vacuoles are

a) Cytoplasmic organelles
b) Noncytoplasmic organelles
c) **Noncytoplasmic sacs**
d) Cytoplasmic sacs

9) A single large central vacuole occurs in

a) Mature animal cells
b) **Mature plant cells**
c) Developing animal cells
d) Developing plant cells

10) Liquid content of a vacuole is called

a) **Cell sap**
b) Matrix
c) Nucleoid
d) Core

11) Nucleus was discovered by Robert Brown in

a) **Orchid root cells**
b) Bean root cells
c) Maize stem cells
d) Wheat stem cells

12) A well organised nucleus is present in

a) Bacteria
b) Prokaryotes
c) Blue green algae
d) **Eukaryotes**

13) Nucleoplasm is also called as

a) Nuclear sap
b) Karyolymph
c) **Both a and b**
d) Nuclear matrix

14) Nucleus controls cytoplasmic functioning by sending out

a) Cholesterol
b) Protein
c) **RNAs**
d) DNA copies

15) Chromatin material which remains condensed during interphase is called

a) **Heterochromatin**
b) Euchromatin
c) Chromonemata
d) Megachromatin

16) Nucleolus contains

a) **Ribosome assembly line**
b) Genetic instructions
c) Protein synthesis machinery
d) Enzymes for polysaccharide formation

17) Largest organelle of the cell is

a) **Nucleus**
b) Chloroplast
c) Mitochondrion
d) Vacuole

18) Basic unit of life is

a) **Cell**
b) Tissue
c) Organ
d) Organ system

19) The cell was discovered in

a) 18^{th} century
b) 19^{th} century
c) First half of 17^{th} century
d) **Second half of 17^{th} century**

20) Mitosis allows the eukaryotic cells to

a) Expose DNA for protein synthesis
b) Grow
c) Multiply
d) Become specialized

21) In prophase and metaphase, a chromosome contains two

a) **Chromatids**
b) Chromomeres
c) Centromeres
d) Centrioles

22) The correct sequence of different phases of mitosis is

a) Anaphase → Metaphase → Prophase → Telophase → Interphase
b) Interphase → Telophase → Metaphase → Anaphase → Prophase
c) Metaphase → Anaphase → Telophase → Prophase
d) **Interphase → Prophase → Metaphase → Anaphase → Telophase**

23) Which one of the organelles is responsible for the formation of aster in cell division?

a) Ribosome
b) **Centrosome**
c) Lysosome
d) Chromosome

24) Separation of daughter chromosomes takes place at

a) Telophase
b) Metaphase
c) **Anaphase**
d) Prophase

25) Mitosis takes place in

a) **All types of cells except those involved in gamete formation**
b) Specialized cells
c) Reproductive cells
d) None of the above

26) Plant and animal cell division differ in

a) Cell plate
b) Prophase
c) Telophase
d) Metaphase

27) Which one occurs once in life cycle?

a) Replication of DNA
b) Replication of chromosomes
c) **Meiosis**
d) Mitosis

28) In meiosis, chromosome replication occurs during

a) **Interphase**
b) Interkinesis
c) Prophase I
d) Prophase II

29) Chromosomes similar in size, shape, genes, and gene sequences are

a) Sister chromatids
b) Chromomeres
c) **Homologous chromosomes**
d) Parental chromosomes

30) Function of meiosis I is to separate

a) **Homologous chromosomes**
b) Sister chromatids
c) Crossovers
d) Parental chromosomes

31) Crossing over occurs in meiosis during

a) **Prophase I**
b) Prophase II
c) Interphase
d) Interkinesis

32) Pairing of homologous chromosomes is

a) Chiasma formation
b) **Synapsis**
c) Disjunction
d) Crossing over

33) Homologous chromosomes separate during

a) Prophase I
b) Prophase II
c) Metaphase I
d) **Anaphase I**

34) Name the stage in meiosis when there are two cells each with sister chromatids aligned at the equator of the spindle

a) Prophase
b) **Metaphase II**
c) Metaphase I
d) Anaphase II

35) The points of crossing over in meiosis appear as

a) Synaptinemal complexes
b) Protein axes
c) **Chiasmata**
d) Diakinesis

36) Chiasmata are formed during

a) Zygotene
b) Pachytene
c) **Diplotene**
d) Leptotene

37) Meiosis occurs in

a) Haploid cells
b) Mostly haploid cells but occasionally diploid cells
c) **Diploid cells**
d) Mostly diploid cells but occasionally haploid cells

38) Which one is the longest phase of cell cycle?

a) Prophase
b) **Interphase**
c) Metaphase
d) Telophase

39) Centriole replication occurs in

a) Early prophase
b) G1 - phase
c) **S - phase**
d) G0 – phase

40) The stage at which DNA/chromosome replication occurs is

a) Prophase
b) **Interphase**
c) Metaphase
d) Telophase

41) Phase of shortest duration is

a) Prophase
b) Metaphase
c) **Anaphase**
d) S-phase

42) After mitosis, the number of chromosomes in the daughter cell shall be

a) One fourth of parent cell
b) One half of parent cell
c) Twice of the parent cell
d) Same as the parent cell

43) Chromosomes having slightly unequal arms is called

a) Metacentric
b) **Submetacentric**
c) Telocentric
d) Acrocentric

44) If the centromere is terminal, the chromosome is

a) Metacentric
b) Submetacentric
c) **Telocentric**
d) Acrocentric

45) Eukaryotic chromosomes are composed of

a) **DNA + Protein**
b) DNA + RNA
c) RNA + Protein
d) Only DNA

46) Chromosomes other than sex chromosomes are called

a) Allosomes
b) **Autosomes**
c) Microsomes
d) All the above

47) The term cell membrane was coined by

a) **Nageli and Cramer**
b) Flemming
c) Sachs
d) Plowe

48) Cell membrane is

a) Unilaminar
b) Bilaminar
c) **Trilaminar**
d) Quadrilaminar

49) A biomembrane is made of

a) **Proteins, lipids and carbohydrates**
b) Proteins, lipids and RNA
c) Proteins, lipids and DNA
d) Proteins, lipids and hormones

50) Endoplasmic Reticulum is absent in

a) Animal cells
b) **Prokaryotes**
c) Plant cells
d) Protista and Fungi

51) Components of 70 S ribosome are

a) **50 S and 30 S**
b) 50 S and 20 S
c) 40 S and 40 S
d) 40 S and 30 S

52) Sedimentation unit of ribosome is

a) µ (micron)
b) µm (millimicron)
c) A° (Angstrom)
d) **S (Svedberg)**

53) Powerhouse of the cell are

a) ATP
b) Lysosomes
c) **Mitochondria**
d) Chloroplasts

54) Grana are present in

a) Mitochondria
b) **Chloroplasts**
c) Golgi bodies
d) Ribosomes

55) Kitchen of the cell

a) Mitochondria
b) **Chloroplasts**
c) Ribosomes
d) Endoplasmic Reticulum

56) The centriole pair occurs in a complex called

a) **Centrosome**
b) Centromere
c) Kinetochore
d) Basal plate

57) The membrane lining the vacuole is

a) Blastocyst
b) Epidermis
c) **Tonoplast**
d) Hypodermis

58) Cell wall is absent in

a) Fungi
b) **Animal cells**
c) Plant cells
d) Bacteria

59) Crossing over of non-sister chromatids of homologous chromosomes occurs during

a) Diakinesis
b) Diplotene
c) **Pachytene**
d) Zygotene

60) Undifferentiated cells are

a) Blood cells
b) **Stem cells**
c) Epithelial cells
d) All the above

61) Tissue Regeneration is possible with

a) Tissues
b) Cells
c) **Stem cells**
d) Blood cells

62) Following is not a stage of Interphase

a) **M**
b) G1
c) S
d) G2

63) The chromosome number is ---------- during Meiosis I

a) Doubled
b) Halved
c) Unaltered
d) Tripled

64) The ability of a cell to differentiate into any type of cell of an organism is

a) Multipotency
b) Unipotency
c) **Totipotency**
d) Differentiation

65) Following is the Microtubule Organizing Center

a) Ribosome
b) Lysosome
c) Cell wall
d) **Centrosome**

66) Suicide bags are

a) Ribosomes
b) **Lysosomes**
c) Centrosome
d) Golgi bodies

67) Site of protein synthesis

a) Lysosomes
b) **Ribosomes**
c) Mitochondria
d) Nucleus

68) Following organelle is responsible to maintain the cell shape

a) Cytoplasm
b) Protoplast
c) **Plasma membrane**
d) Endoplasmic reticulum

69) Bone marrow comprises

a) Parenchymal cells
b) **Hematopoietic stem cells**
c) Cord blood stem cells
d) All the above

70) Following is the process of cell division in Prokaryotes

a) Mitosis
b) Meiosis
c) **Binary fission**
d) Conjugation

71) The modern cell theory is called

a) Protoplasmic theory
b) Cell Principle
c) Cell Doctrine
d) **Both b and c**

72) Names of Schleiden and Schwann are associated with

a) Protoplasm as the physical basis of life
b) **Cell theory**
c) Theory of cell lineage
d) Nucleus functions as control centre of cell

73) Which is correct about cell theory in view of current knowledge about cell structure

a) It needs modification due to discovery of subcellular structures like chloroplasts and mitochondria
b) Modified cell theory means that all living beings are composed of cells capable of reproducing
c) **Cell theory does not hold good because all living beings (e.g., viruses) do not have cellular organization**
d) Cell theory means that all living objects consist of cells whether capable of reproducing or not

74) Watson and Crick proposed that DNA replication is

a) Dispersive
b) Semi-conservative
c) Conservative
d) Not Continuous

75) Initiation of Replication is by

a) DNA Primer
b) **RNA Primer**
c) DNA
d) RNA

76) Enzyme responsible for unwinding of DNA

a) DNA Primase
b) Ligase
c) **DNA helicase**
d) Polymerase

77) Leading strand is

a) The strand that replicates in chunks
b) **The first strand which replicates nucleotides one by one**
c) The parent strand
d) The copy of the synthesized strand

78) Synthesis of leading strand is a

a) Rare process
b) Discontinuous process
c) Random process
d) **Continuous process**

79) Okazaki fragments are associated with

a) Leading strand
b) **Lagging strand**
c) Primase
d) Ligase

80) DNA Polymerase catalyze replication in

a) 3’ to 5’ direction
b) **5’ to 3’ direction**
c) Bidirectional
d) No specific direction

81) Synthesis of lagging strand is

a) Continuous synthesis
b) Fast Forward synthesis
c) Discontinuous synthesis
d) Random synthesis

82) Which of the following statement/s about glucose is incorrect?

i) Insulin decreases blood glucose
ii) Glucagon increases blood glucose
iii) Glucagon and Insulin can be produced at the same time
iv) Hypoglycemia refers to high blood glucose level

a) Both I and ii
b) Only i
c) **Both iii and iv**
d) Only iv

83) Central part of neuron

a) Epikaryon
b) **Perikaryon**
c) Neuron centre
d) Axon

84) Temperature Regulation is an example of

a) Positive Feedback
b) No Feedback
c) Negative Feedback
d) Both Positive and Negative Feedback

85) Which of the following statements is incorrect?

a) **Reptiles and Amphibians are warm - blooded animals**
b) Birds and Mammals are warm - blooded animals
c) Vasodilation causes increased heat loss
d) Vasoconstriction causes reduced heat loss

86) Conversion of glucose to glycogen is

a) Glycogenolysis
b) **Glycogenesis**
c) Glucogenesis
d) All the above

87) A genetic algorithm is a search heuristic that is inspired by

a) **Charles Darwin's theory of natural evolution**
b) Theory of Lamarckism
c) Theory of Spontaneous generation
d) None of the above

88) Following is the correct order of phases in a genetic algorithm

a) **Initial Population → Fitness function → Selection → Crossover → Mutation**

b) Initial Population → Mutation → Selection → Crossover → Fitness function

c) Mutation → Fitness function → Selection → Crossover → Initial Population

d) Selection → Fitness function → Initial Population → Crossover → Mutation

89) Whittaker classified the living organisms into

a) 4 kingdoms
b) 3 kingdoms
c) 6 kingdoms
d) **5 kingdoms**

90) Following is the only prokaryote in Whitaker's five-kingdom classification

a) Protista
b) Fungi
c) **Monera**
d) Plantae

91) Adult Stem cells or Non-Embryonic Stem cells found

a) Only in adults
b) **In adults, infants, and children**
c) Only in children
d) Only in infants

92) The dilation of blood vessels to increase the blood flow is an example of

a) Extrinsic regulation
b) Induced effect
c) **Intrinsic regulation**
d) Allosteric effect

93) Control center in homeostatic mechanism

a) Muscle
b) Nerve
c) **Brain**
d) Heart

94) Raising of skin hairs is a response to

a) High temperature
b) High pressure
c) **Low temperature**
d) Low pressure

95) Chargaff's rule denotes

a) **A=T and G=C, (A+T) and (G+C) is constant**
b) A≠T and G≠C, (A+T) and (G+C) is constant
c) A=T and G=C, (A+T) and (G+C) is not constant
d) A=G and T=C, (A+T) and (G+C) is constant

96) Following is an enzyme that unwinds the double helix of DNA

a) DNA Polymerase
b) DNA helicase
c) RNA Primase
d) DNA Ligase

97) Synthesis of lagging strand is

a) **Discontinuous**
b) Continuous
c) Random
d) Spontaneous

98) ---------- controls Homeostasis

a) Muscle
b) Spinal cord
c) Hypothalamus
d) Bone marrow

99) Pairing of homologous chromosomes (Chromosomal Synapsis) occurs during

a) Pachytene
b) Zygotene
c) Diplotene
d) Diakinesis

100) Skeletal muscles shiver in response to high temperature

a) True
b) **False**

Answer the following (4 marks) – Draw diagrams wherever necessary

1) Explain Cell Theory
2) Explain Five-kingdom classification
3) What are the differences between Prokaryotic and Eukaryotic cell
4) What are the differences between Plant cell and Animal cell
5) Illustrate Fluid Mosaic Model of Plasma Membrane with a neatly labelled sketch
6) Comment on Mitochondria and its functions
7) Write about Endoplasmic Reticulum
8) Explain Negative Feedback with an example
9) Write about Embryonic Stem Cells
10) What is Genetic Algorithm? What are its applications?
11) Write brief notes on Cell cycle
12) What is Positive Feedback?

Answer the following (12 marks) – Draw diagrams wherever necessary

1) Explain DNA Replication
2) Illustrate Mitosis
3) Illustrate Meiosis
4) Write about Stem cells and their applications
5) Explain the phases of Genetic Algorithm and its applications
6) Explain Homeostasis
7) Write about Cell Organelles and their functions
8) Write about the differences between Mitosis and Meiosis