

M.Sc. (Biotechnology) : 2008
Part A

Directions: Choose the best answer from each of the following questions:

1. DNA containing a genetic sequence that is to be cloned is referred to as
 - a) vector DNA
 - b) donor DNA
 - c) single-stranded DNA
 - d) host DNA
2. Bacterial enzymes that cut DNA at specific sites within the DNA molecule are called
 - a) exonucleases
 - b) methylases
 - c) transferases
 - d) restriction endonucleases
3. All of the following are common methods of experimentally introducing DNA into host cells except
 - a) transformation
 - b) transduction
 - c) conjugation
 - d) electroporation
4. Which of the following eukaryotic genera contain common cloning host cells?
 - a) *Paramecium*
 - b) *Saccharomyces*
 - c) *Penicillium*
 - d) *Euglena*
5. Sphaeroplasts lack the following cellular component
 - a) endoplasmic reticulum
 - b) ribosomes
 - c) intact cell wall
 - d) cytoskeleton
6. A prophage is
 - a) an auxotrophic mutant
 - b) a gene
 - c) host DNA packed into viral heads
 - d) a phage DNA incorporated into the host genome
7. Small circular molecules capable of self-replication are called
 - a) introns
 - b) exons
 - c) plasmids
 - d) transposable elements
8. Which of the following amino acids is specified by a single codon?
 - a) glutamine
 - b) tryptophan
 - c) asparagine
 - d) isoleucine
9. When a number of genes are transcribed as one mRNA, it is said to be:
 - a) multimeric
 - b) polymeric
 - c) polycistronic
 - d) polysomal
10. A protein structure on eukaryotic chromosomes to which spindle fibers bind is a:
 - a) telomere
 - b) kinetochore
 - c) centromere
 - d) centriole
11. An enzyme that phosphorylates a protein is known as:
 - a) a protein kinase
 - b) phosphatase
 - c) kinase
 - d) phosphorylase
12. The human embryo that consists of only two layers of cells is called
 - a) a blastocyst
 - b) an embryonic disc
 - c) a placenta
 - d) a yolk sac
13. Eukaryotic RNA that specifies proteins is modified before translation by
 - a) addition of a 5' cap
 - b) splicing of exons
 - c) addition of a 3' poly-A tail
 - d) all of the three
14. What is the chemical basis of gene imprinting?
 - a) methylation of DNA
 - b) phosphorylation
 - c) oxidation of DNA
 - d) glycosylation
15. The drug chloramphenicol blocks
 - a) cell-wall formation
 - b) transcription
 - c) translation termination release factors
 - d) polypeptide chain elongation
16. A bacterium on examination is found to lack superoxide dismutase, catalase and peroxidase. Which of the following statement best describes this bacterium?
 - a) This bacterium does not possess pilus.
 - b) This bacterium does not produce endotoxins.
 - c) This bacterium is an obligate anaerobe.
 - d) This bacterium will survive in an oxygen environment.
17. Selective inhibition of the synthesis of dipicolinic acid would inhibit the formation of the following structure:
 - a) Bacterial flagella
 - b) Bacterial endospores
 - c) Sex pilus
 - d) Glycocalyx

18. Uptake by a recipient cell of soluble DNA released from a donor cell is defined as:
- Competence
 - Conjugation
 - Transduction
 - Transformation.
19. Bacterial spores are a problem in sterilization as they are:
- Resistant to antibiotics
 - Resistant to physical and chemical agents
 - Easy to kill but are protected by organic matter
 - Most pathogenic bacteria are spore formers.
20. The iron scavenging compound produced by bacteria are called:
- Siderophores
 - Toxins
 - Lipopolysaccharides
 - Lipoproteins
21. The following causes food-borne gastrointestinal illness:
- Helicobacte*
 - Campylobacter*
 - Arthrobacter*
 - Rhodobacter*
22. Which of the following function to retard the desiccation of a bacterium?
- Outer membrane
 - Murein layer
 - Capsule
 - Peptidoglycan
23. Pasteurization is designed to:
- kill all living organisms present in the material being treated
 - make the material sterile
 - reduce the number of potentially harmful microorganisms
 - all the above.
24. Which one of the following is found in the outer membrane of bacteria?
- Teichoic acids
 - Capsules
 - Lipopolysaccharides
 - Peptidoglycan
25. Biological oxygen demand helps to determine the:
- extent of pollution in wastewater.
 - filtering capacity of soil.
 - types of biota in the ecosystem.
 - number of bacteria in a 100 ml sample of water.
26. Bacterial species of *Thiobacillus* and *Beggiatoa* play important role in:
- water cycle on earth
 - phosphorus cycle
 - sulphur cycle in soil
 - breakdown of sewage.
27. Porins are located in:
- Plasma membrane
 - Outer membrane
 - Peptidoglycan
 - S layer
28. The following bacterial transport mechanism is accompanied by a chemical change in the substance that is transported:
- Active transport
 - Facilitated diffusion
 - Group translocation
 - Antiport transport
29. IL-2, TNF, IFN, TGF are names of:
- hormones
 - cytokines
 - receptors
 - viruses
30. One of the following is an autoimmune disease:
- rheumatoid arthritis
 - myeloma
 - Burkitt's lymphoma
 - marasmus
31. A tumor arising from an epithelial or endothelial cell is called a:
- sarcoma
 - myeloma
 - carcinoma
 - leukemia
32. Examples of mononuclear phagocytes are:
- monocytes, macrophages
 - T lymphocytes, natural killer cells
 - basophils, eosinophils, neutrophils
 - hepatocytes, fibroblasts
33. T lymphocytes mature in the:
- thyroid
 - testes
 - thymus
 - hypothalamus
34. The cell that cannot act as a phagocytic cell is a:
- macrophage
 - neutrophil
 - erythrocyte
 - none of the three
35. The antibody type that can be found in pentameric form is

- b) Transport of small ions across the plasma membrane of a cell
 c) Transport of large molecules across the plasma membrane of a cell
 d) Attachment of a cell to the extracellular matrix
52. A small, membrane-limited, fluid-filled space within the cytoplasm of a cell is
 a) glyoxysome
 b) dictyosome
 c) a vesicle
 d) an inclusion body
53. Programmed cell death (PCD) is manifested as:
 a) Aging
 b) Apoptosis
 c) Necrosis
 d) De-differentiation
54. Post-mitotic cells:
 a) do not divide
 b) divide actively
 c) undergo destruction
 d) are arrested in the cell cycle
55. Pectin is a :
 a) Plasma membrane protein
 b) Cell wall polysaccharide
 c) Plasma membrane polysaccharide
 d) Cell wall glycolipid
56. Sites in a genome where mutations occur at rates higher than normal are known as:
 a) suppressor sites
 b) mutator sites
 c) hotspots
 d) cistron
57. With respect to linkage, the genes in a chromosome:
 a) are always completely linked
 b) are always completely unlinked
 c) are always partially linked
 d) may be completely linked, completely unlinked or partially linked
58. Hemophilia B or 'Christmas Disease' is caused by a reduction in the amount of
 a) Blood clotting factor VI
 b) Blood clotting factor VII
 c) Blood clotting factor VIII
 d) Blood clotting factor IX
59. The conversion of a normal cell to a cancer cell is called:
 a) Neoplastic transformation
 b) Cellular differentiation
 c) Mutagenesis
 d) Organogenesis
60. Human lymphocytes contain:
 a) the same amount of DNA as other cells
 b) more DNA than other cells
 c) less DNA than other cells
 d) no DNA
61. DNA Polymerase I isolated by Kornberg et al. from *E. coli* requires the following for *in vitro* synthesis of DNA
 a) CaCl_2
 b) NaCl
 c) MgCl_2
 d) KCl
62. Pleiotropism may be defined as:
 a) the multiple allelic forms of a single gene
 b) the multiple phenotypic effects of a single gene
 c) the combined phenotypic effect of multiple genes
 d) the partial phenotypic effect of a single gene
63. The gene responsible for xeroderma pigmentosum causes freckling in heterozygous individuals. This is because
 a) the gene is recessive lethal
 b) the gene is dominant lethal
 c) the gene is semilethal
 d) the gene is sublethal
64. In the Japanese morning glory, purple colored flower is produced by a dominant allele at either of two separate gene pairs A_bb , or $aaB_$. When dominant alleles are present at both gene pairs ($A_B_$), the flower color is blue, and when the gene pairs are recessive homozygous ($aabb$), the flower color is scarlet. If a blue F1 is produced by crossing two different purple types, what is the genotype of the parents?
 a) $Aabb \times aabb$
 b) $aaBB \times aabb$
 c) $aabb \times aabb$
 d) $AAbb \times aaBB$
65. The first multicellular organism whose genome was completely sequenced is:
 a) *Xenopus laevis*
 b) *Saccharomyces cerevisiae*
 c) *Drosophila melanogaster*
 d) *Caenorhabditis elegans*
66. Variations in genome sequence of individuals that may be the result of point mutations are called:
 a) Minisatellites
 b) Microsatellites
 c) Randomly Amplified Polymorphic DNA (RAPD)
 d) Single Nucleotide Polymorphisms (SNPs)
67. An *E. coli* cell in which the fertility factor is integrated into the bacterial chromosome is called:
 a) Fertile cell
 b) High frequency of recombination (Hfr) cell
 c) Donor cell
 d) Recipient cell

Part B

Fill in the Blanks

1. In an animal cell, DNA is found in the nucleus and in the _____.
2. Tonofilaments are components of the _____ of a cell.
3. Eukaryotic DNA replication occurs only during a part of the _____.
4. An over reactive immune system may give rise to _____.
5. A “membrane attack complex” is formed by reactions of the _____.
6. A trait in which the phenotype of an individual depends on its genotype in all the relevant loci, with each allele adding (or subtracting) a small amount is said to be _____.
7. The major sterol found in eukaryotic microorganism is _____.
8. Primase is a specific kind of RNA polymerase that is involved in the process of _____.
9. _____ is the functional and structural unit of chromosomes.
10. Glycosylation of proteins occurs in _____.
11. Phospholipid synthesis occurs in _____.
12. The basic structural unit of sphingolipid is _____.
13. _____ complexes are the main components of the cell cycle control system.
14. A chromosomal inversion which includes the centromere is called _____.
15. Manx cats are heterozygous for a dominant allele that causes _____ tail formation.
16. _____ rings are found on polytene chromosomes.
17. _____ is the primary enzyme involved in replication of the *E. coli* chromosome.
18. Random pieces of host chromosome carried along with an infecting bacteriophage and integrated into the genome of an infected bacterial cell is called _____ transduction.
19. *Agrobacterium tumefaciens* contains a plasmid for inducing tumor formation in the root of plants, this plasmid is called _____ plasmid.
20. Archaea are penicillin-resistant because they have no _____ in their cell walls.

21. The hospital superbug is _____.
22. Mutant strains of an organism with an inability to synthesize a particular organic compound required for growth are called _____.
23. *Thermus aquaticus* is the source of the thermotolerant polymerase called _____, which is used in PCR reactions.
24. Organisms which can grow at 0-15°C, e.g. microorganisms found in polar regions are called _____.
25. The phase of microbial growth where the microbial cells are preparing for cell division is called the _____ phase.
26. Pea plants form a symbiotic relationship with gram negative bacteria of the genus _____ for nitrogen fixation.
27. Adhesins are constituents of a pathogen's repertoire of _____ factors.
28. *Halobacterium* contains the photosynthetic pigment _____.
29. Plasmids carrying antibiotic-resistance genes are called _____ plasmids.
30. Rhinoviruses are in most cases responsible for _____.
