L: Microbiology

Q. 1 – Q. 6 carry one mark each.

Q.1 Reverse transcriptase used in genetic engineering was discovered by

(A) Temin & Baltimore
(B) Smith & Arber
(C) Smith & Baltimore
(D) Temin & Arber

Q.2 Infection of *E.coli* by bacteriophage λ is normally detected by

(A) Resistance of the bacteria to an antibiotic
(B) Growth of single colony on the agar plate
(C) The appearance of plaques or lysed bacteria on agar plates
(D) Restriction digest of the bacterial DNA

Q.3 A microscope that has a total magnification of 1500X with an oil immersion lens has an ocular of power

(A) 1.5X (B) 15X (C) 150X (D) 1500X

Q.4 Which of the following species shows a high resistance to radiation damage?

(A) *Deinococcus* (B) *Micrococcus* (C) *Staphylococcus* (D) *Planococcus*

Q.5 Peptic ulcers are caused by

(A) *Shigella sonei*
(B) *Giardia lambia*
(C) *Enterobius vermicularis*
(D) *Helicobacter pylori*

Q.6 The evolutionary history of an organism is called

(A) Taxonomy (B) Dendrogram (C) Phylogeny (D) Cladogram

Q. 7 – Q. 24 carry two marks each.

Q.7 Which vector would be the most appropriate for cloning a 150 kb fragment of DNA?

(A) pBR322 (B) λ vector (C) YAC (D) BAC

Q.8 Which group of microorganisms have a high level of unsaturated fatty acids in their cell membrane?

(A) Mesophilic
(B) Psychrophilic
(C) Thermophilic
(D) Hyperthermophilic

Q.9 Complete denitrification of nitrate results in the formation of

(A) N_2 (B) NH_3 (C) N_2O_5 (D) NH_2OH

Q.10 Which of the following disease is **NOT** caused by the *Coxsackie* virus?

(A) Intestinal infection
(B) Meningitis
(C) Gingivitis
(D) Myocarditis

Q.11 Bacterial cell wall biosynthesis is inhibited by the antibiotic

(A) Vancomycin
(B) Tetracycline
(C) Chloramphenicol
(D) Erythromycin

Q.12 Match the correct combination of plasmid DNA to their properties

Plasmid DNA	**Property**
(P) Conjugative plasmid	(1) can integrate into the chromosome and replicate when the chromosome is copied
(Q) Cryptic plasmid	(2) capable of transferring itself between prokaryotes
(R) Episome	(3) Does not appear to have any function

(A) P-1, Q-3, R-2 (B) P-2, Q-3, R-1 (C) P-2, Q-1, R-3 (D) P-3, Q-2, R-1

Q.13 An Hfr bacterium is one that contains

(A) Many unusual plasmids
(B) Chromosomal material acquired from a recipient cell
(C) The ability to undergo transduction
(D) A plasmid integrated into its chromosome

Q.14 Match the following product/process to the microorganism involved

Product/Process	**Microorganism**
(P) Bioplastics	(1) *Beauveria bassiana*
(Q) Bioremediation	(2) *Thiobacillus thiooxidans*
(R) Bioleaching	(3) *Ralstonia eutropha*
(S) Biopesticide	(4) *Pseudomonas putida*

(A) P-3, Q-2, R-4, S-1
(B) P-1, Q-2, R-3, S-4
(C) P-3, Q-4, R-2, S-1
(D) P-1, Q-4, R-2, S-3

Q.15 Which of the following enzymes convert glucose-6-phosphate to 6-phosphoglucono-δ-lactone in the Entner-Doudoroff pathway?

(A) Glucose-6-phosphate dehydrogenase
(B) Phosphoglucoisomerase
(C) Phosphoglucolactonase
(D) 6-phosphogluconate dehydrase

Q.16 The process in which a molecule is transported into the cell while being chemically **altered** is called

(A) Passive transport
(B) Group translocation
(C) Facilitated transport
(D) None of the above

Q.17 MacConkey agar is a type of

(A) Selective media
(B) Differential media
(C) Both selective & differential media
(D) None of these

Q.18 Which of the following modes of DNA replication are used by bacteria?

(A) Rolling circle
(B) Theta replication
(C) Bidirectional replication
(D) All of the above

Q.19 Which of the following is **INCORRECT** about negative staining procedure?

(A) It utilizes a stain such as Nigrosin
(B) Microorganisms stain deeply
(C) Microorganisms repel the dye
(D) An acidic dye is used

Q.20 A mutation in the codon **UCG** to **UAG** is described as

(A) Nonsense mutation
(B) Silent mutation
(C) Mis-sense mutation
(D) Neutral mutation

Q.21 The ineffectiveness of many antibiotics today is closely associated with

(A) Bacteriophages
(B) F plasmids
(C) R plasmids
(D) Bacterial transformations

Q.22 Which type of cells actually secrete antibodies?

(A) T cells (B) Macrophages (C) Monocytes (D) Plasma cells

Common Data Questions

Common Data for Questions 23, 24:
The 50µL of competent *E.coli* cells (10^9 CFU/mL) were transformed using 0.5ng of a 5kb plasmid DNA to which 950µL of SOC medium was added. Only 50 µL of this was plated on a selective agar plate. After an 12h incubation at 37°C, 90 colonies were observed

Q.23 Calculate the efficiency of this transformation in CFU/µg of DNA

(A) 3.6×10^5 (B) 3.6×10^6 (C) 1.8×10^5 (D) 1.8×10^6

Q.24 Calculate the percentage of transformed cells

(A) 0.36% (B) 0.72% (C) 3.6% (D) 7.2%

Linked Answer Questions: Q. 25 to Q. 28 carry two marks each.

Statement for Linked Answer Questions 25 & 26:
An egg sandwich got contaminated with 10 cells of a bacterium. It was left open at 37°C for 4 hours. It was found to contain 40960 cells.

Q.25 What is the generation time of this bacterium?

(A) 15 min (B) 20 min (C) 25 min (D) 30 min

Q.26 If the initial inoculum was only 1 cell, then after 10 hours what will be the number of cells?

(A) 2^{20} (B) 2^{24} (C) 2^{30} (D) 2^{40}

Statement for Linked Answer Questions 27 & 28:
A researcher desires to clone a gene (1kb) of a microorganism. Its genome size is 1.5×10^4 kb. The average size of its library fragment is 5kb.

Q.27 What is the ratio of genome size of the microorganism relative to average size of the fragment in the gene library?

(A) 3000 (B) 1500 (C) 45000 (D) None of these

Q.28 The genomic library was created in vectors that were transformed into bacterial cells. If there is a 95% probability of the transformation, how many recombinant bacterial colonies will have to be screened to find this particular gene?

(A) 7000 (B) 8000 (C) 9000 (D) 10000