Previous Year Solved Question Paper

of

G.A.T.E. (XL) 2015

LIFE SCIENCES

XL: K Microbiology

Examination

(Original Question Paper with Answer Key)

GRADUATE APTITUDE TEST IN ENGINEERING

K: MICROBIOLOGY

Q. 1 – Q. 10 carry one mark each.

Q.1 Lophotrichous bacteria have

(A) one flagellum
(B) a cluster of flagella at one or both ends
(C) flagella that are spread evenly over the whole surface
(D) a single flagellum at each pole

Ans. B

Q.2 In aerobic respiration, the final electron acceptor is

(A) hydrogen (B) nitrogen (C) sulfur (D) oxygen

Ans. D

Q.3 A process in which fatty acids are shortened by two carbons at a time resulting in release of acetyl-CoA is known as

(A) photophosphorylation (B) carboxylation
(C) β-oxidation (D) oxidative phosphorylation

Ans. C

Q.4 Limulus Amoebocyte Lysate (LAL) assay is used to identify the presence of

(A) endotoxin (B) exotoxin (C) anthrax toxin (D) tetanus toxin

Ans. A

Q.5 Match scientists in **Group I** with terms related to their major scientific contributions in **Group II**

Group I	**Group II**
(P) Sanger	(i) DNA double helix structure
(Q) Watson and Crick	(ii) DNA sequencing
(R) Waksman	(iii) Complement
(S) Bordet	(iv) Streptomycin
	(v) Immune tolerance

(A) P-iii, Q-iv, R-ii, S-i (B) P-ii, Q-iii, R-iv, S-v
(C) P-iv, Q-i, R-ii, S-v (D) P-ii, Q-i, R-iv, S-iii

Ans. D

Q.6 Base-pair substitutions caused by the chemical mutagen ethyl methane sulfonate are a result of

(A) hydroxylation (B) alkylation (C) deamination (D) intercalation

Ans. B

Q.7 The classical way of representing taxonomic hierarchy of living organisms in **ASCENDING ORDER** is

(A) genus, species, class, order, family (B) species, genus, order, family, class
(C) species, genus, family, order, class (D) genus, species, order, class, family

Ans.C

Q.8 Of the following, the most effective method to kill bacterial endospores is

(A) moist heat sterilization (B) UV irradiation
(C) filtration (D) pasteurization

Ans. A

Q.9 The class of enzymes, which catalyze addition of groups to double bonds and non-hydrolytic removal of chemical groups, is

(A) oxidoreductase (B) transferase (C) hydrolase (D) lyase

Ans. D

Q.10 Anammox organisms carry out

(A) anaerobic reduction of NO_3^-
(B) anaerobic oxidation of NH_4^+
(C) aerobic oxidation of NH_4^+
(D) aerobic oxidation of NO_2^-

Ans. B

Q. 11 – Q. 20 carry two marks each.

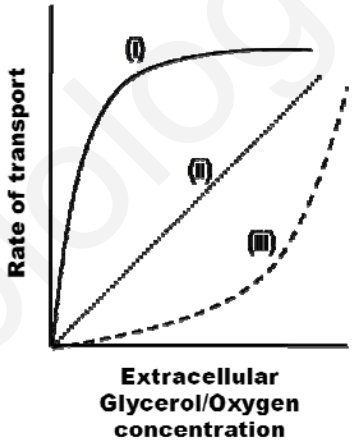
Q.11 Which combination of the following statements about specialized transduction is **TRUE**?

(P) Specialized transducing phages can transport only certain genes between bacteria
(Q) Specialized transducing phages can transport any gene between bacteria
(R) Phage P22 is a specialized transducing phage
(S) Phage lambda (λ) is a specialized transducing phage

(A) P and S only
(B) Q and R only
(C) P and R only
(D) Q and S only

Ans. A

Q.12 Which combination of profiles in the following figure accurately represents the transport rate of glycerol and oxygen into *E. coli* cells as a function of their extracellular concentration?



(A) glycerol-(ii) and oxygen-(iii)
(B) glycerol-(ii) and oxygen-(i)
(C) glycerol-(iii) and oxygen-(i)
(D) glycerol-(i) and oxygen-(ii)

Ans. D

Q.13 Which one of the following about the standard free energy change ($\Delta G^{o\prime}$) and the equilibrium constant (K_{eq}) of an exergonic reaction, at pH 7.0, is **TRUE**?

(A) $\Delta G^{o\prime}$ is positive and K_{eq} is less than one
(B) $\Delta G^{o\prime}$ is negative and K_{eq} is less than one
(C) $\Delta G^{o\prime}$ is negative and K_{eq} is greater than one
(D) $\Delta G^{o\prime}$ is positive and K_{eq} is greater than one

Ans. C

Q.14 An oil immersion objective of a light microscope has a numerical aperture of 1.25. Using the Abbé equation, the maximum theoretical resolving power (in nm) of the microscope with this objective and blue light (wavelength = 450 nm) is _____

Ans. 180

Q.15 The working volume (in liter) of a chemostat with 0.1 h^{-1} dilution rate and 100 ml/h feed flow rate is_____

Ans. 1

Q.16 If the decimal reduction time for spores of a certain bacterium at 121°C is 12 seconds, the time required (in minutes) to reduce 10^{10} spores to one spore by heating at 121°C is _____

Ans. 2

Q.17 The doubling time (in minutes) of a bacterium with a specific growth rate of 2.3 h^{-1} in 500 ml of growth medium is _____

Ans. 17.9 to 18.3

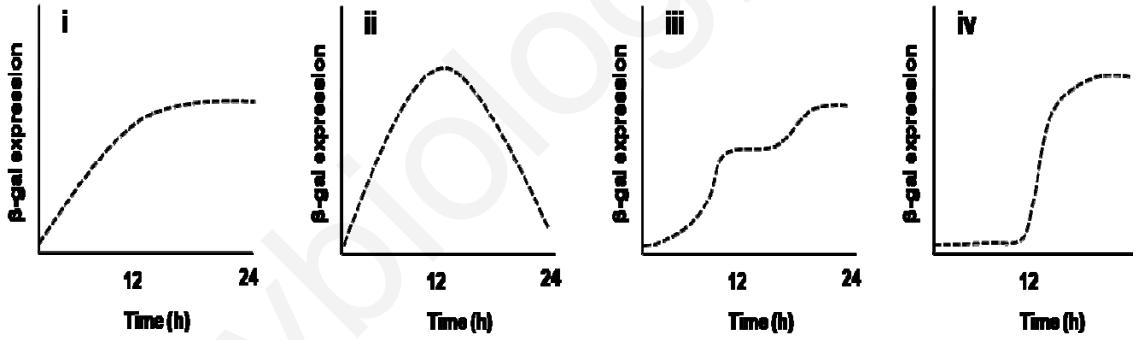
Q.18 A bacterial culture is grown using 2.0 mg/ml fructose as the sole source of carbon and energy. The bacterial biomass concentrations immediately after inoculation and at the end of the growth phase are 0.1 mg/ml and 0.9 mg/ml, respectively. Assuming complete utilization of the substrate, the bacterial growth yield (*Y*) on fructose is _____

Ans. 0.4

Q.19 The volume (in ml) of a 1.0 mg/ml stock solution of ampicillin to be added to 0.1 liter of growth medium for achieving a final ampicillin concentration of 50 µg/ml is _____

Ans. 5

Q.20 An *E. coli* strain is grown initially on glucose as the sole carbon source. Upon complete consumption of glucose following 12 h of growth, lactose is added as the sole carbon source and the strain is further grown for 12 h. Assuming that the *E. coli* strain has a functional wild type *lac* operon, which one of the following profiles is the most **ACCURATE** representation of β-galactosidase (*β-gal*) expression (in arbitrary units)?



(A) i (B) iii (C) ii (D) iv

Ans. D

END OF THE QUESTION PAPER

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