XL: LIFE SCIENCES

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GRADUATE APTITUDE TEST IN ENGINEERING

General Aptitude

1) Choose the most appropriate word from the options given below to complete the following sentence.
The principal presented the chief guest with a _____ as token of appreciation.

a) momento b) memento c) momentum d) moment

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2) Choose the appropriate word/phrase, out of the four options given below, to complete the following sentence
Frogs

a) croak b) roar c) hiss d) patter

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3) Choose the word most similar in meaning to the given word
Educe

a) Exert b) Educate c) Extract d) Extend

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4) Operators $\square$,$\diamond$ and $\rightarrow$ are defined by: a$\square b = \frac{a-b}{a+b}; a \diamond b = \frac{a+b}{a-b}; a \rightarrow b = ab$. Find the value of (66$\square$6) $\rightarrow$ (66$\diamond$6).

a) -2 b) -1 c) 1 d) 2

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5) If $\log_x(5/7)$=-1/3, then the value of x is
a) 343/125
b) 125/343
c) -25/49
d) -49/25

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6) The following question presents a sentence, part of which is underlined. Beneath the sentence you find four ways of phrasing the underlined part. Following the requirements of the standard written English, select the answer that produces the most effective sentence.
Tuberculosis, together with its effects, ranks one of the leading causes of death in India.
a) ranks as one of the leading causes of death
b) rank as one of the leading causes of death
c) has the rank of one of the leading causes of death
d) are one of the leading causes of death

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7) Read the following paragraph and choose the correct statement.
Climate change has reduced human security and threatened human well being. An ignored reality of human progress is that human security largely depends upon environmental security. But on the contrary, human progress seems contradictory to environmental security. To keep up both at the required level is a challenge to be addressed by one and all. One of the ways to curb the climate

change may be suitable scientific innovations, while the other may be the Gandhian perspective on small scale progress with focus on sustainability.

a) Human progress and security are positively associated with environmental security.
b) Human progress is contradictory to environmental security.
c) Human security is contradictory to environmental security.
d) Human progress depends upon environmental security.

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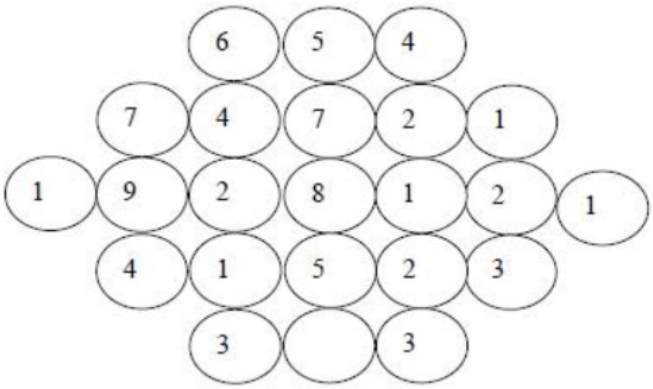
8) Fill in the missing value **GATE XL 2015**



9) A cube of side 3 units is formed using a set of smaller cubes of side 1 unit. Find the proportion of the number of faces of the smaller cubes visible to those which are NOT visible

a) 1:4 b) 1:3 c) 1:2 d) 2:3

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10) Humpty Dumpty sits on a wall every day while having lunch. The wall sometimes breaks. A person sitting on the wall falls if the wall breaks.
Which one of the statements below is logically valid and can be inferred from the above sentences?

a) Humpty Dumpty always falls while having lunch
b) Humpty Dumpty does not fall sometimes while having lunch
c) Humpty Dumpty never falls during dinner
d) When Humpty Dumpty does not sit on the wall, the wall does not break

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Chemistry

11) The molecule having net ńon-zero dipole momentís

a) CCl_4 b) NF_3 c) CO_2 d) BCl_3

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12) The Diels-Alder adduct from the reaction between cyclopentadiene and benzyne is

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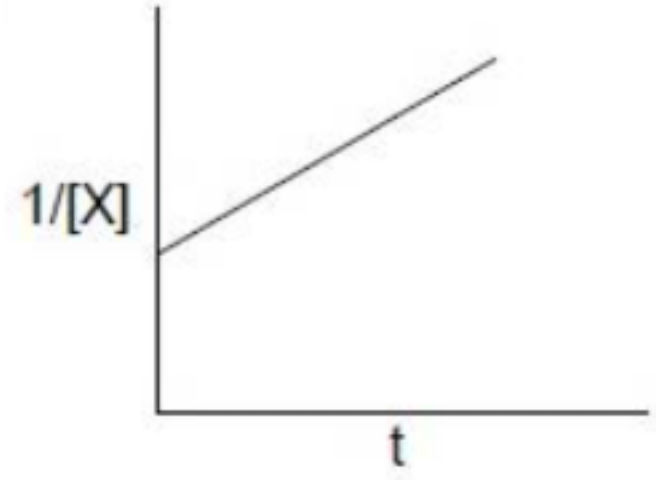
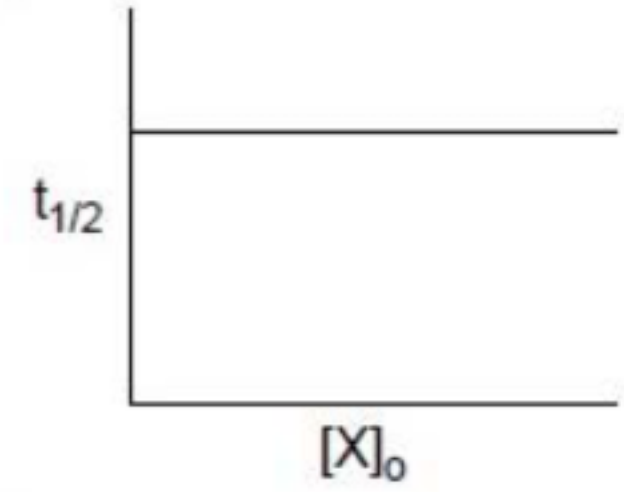
13) The number of possible enantiomeric pair(s) in HOOC-CH(OH)-CH(OH)-COOH is _____. **GATE XL 2015**

14) For the electrochemical reaction, $Cu^{2+}(aq) + Zn(s) \rightleftharpoons Cu(s) + Zn^{2+}(aq)$ the equilibrium constant at 25 $25°C$ is 1.7×10^{37}.The change in standard Gibbs free energy (ΔG) for this reaction will be ($Given : R = 8.314 JK^{-1}mol^{-1}$)_____ kJ mol^{-1} (*up to one decimal place*). **GATE XL 2015**

15) Among the following diagrams, the one that correctly describes a zero order reaction (*X product*) is (*Given* : $[X]_0$ = *initial concentration of reactant X*, $[X]$ = *concentration of reactant X at time t and* $t_{1/2}$ =



a)



b)

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16) If the radius of first Bohr orbit is 0.53 Å, then the radius of the third Bohr orbit is

a) 2.12 Å b) 4.77 Å c) 1.59 Å d) 3.18 Å

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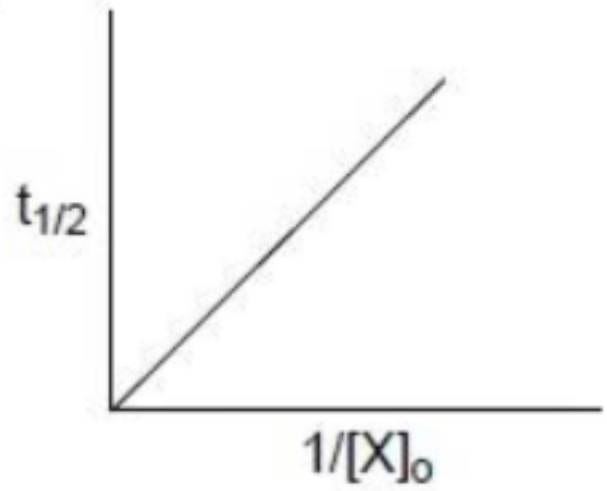
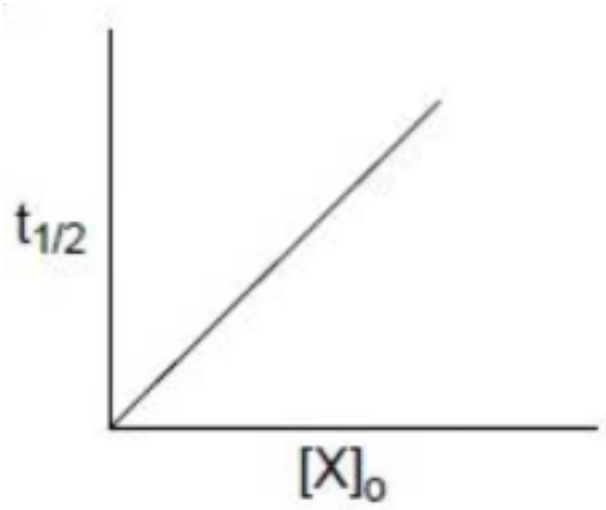
17) If 50 mL of 0.02 M HCl is added to 950 mL of H_2O then the pH of the final solution will be _____ **GATE XL 2015**



c)



d)

18) Stability of $[CrCl_6]^{3-}(X), [MnCl_6]^{3-}(Y) and [FeCl_6]^{3-}(Z)$ follows the order
(Given: Atomic numbers of Cr = 24 Mn = 25 and Fe = 26)

a) $X > Y > Z$ b) $X < Y < Z$ c) $Y < X < Z$ d) $X < Y = Z$

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19) Among the following pairs, the paramagnetic and diamagnetic species, respectively, are

a) CO and O_2^- b) NO and CO c) O_2^{2-} and CO d) NO^+ AND O_2^-

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20) In compounds K4$[Fe(CN)_6]$ – –4 (P) and Fe(CO)s (Q), the iron metal centre is bonded to

a) C of CN^- in P and C of CO in Q
b) N of CN^- in Pand C of CO in Q
c) C of CN^- in P and O of CO in Q
d) N of CN^- in P and O of CO in Q

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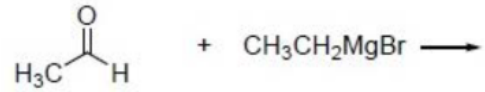
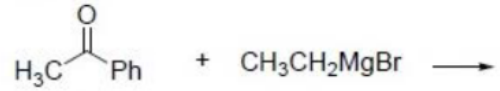
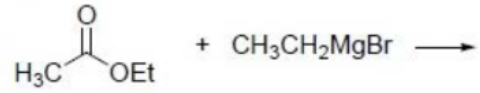
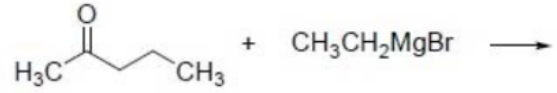
21) Among the following reactions, the one that produces achiral alcohol (after hydrolysis) is

(A) 

(B) 

(C) 

(D) 

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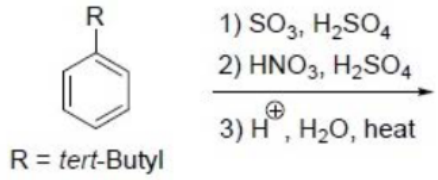
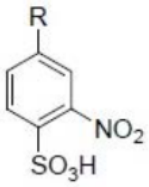
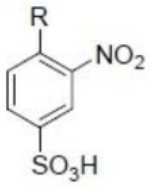
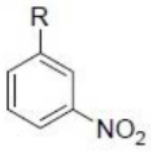
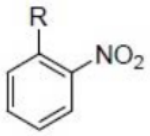
22) The major product from the following reaction is



(A) 

(B) 

(C) 

(D) 

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23) The order of resonance energy for the following molecules is

a) (1) > (3) > (2) > (4)
b) (1) > (3) > (4) > (2)
c) (1) > (4) > (2) > (3)
d) (1) > (3) > (4) > (2)

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24) The molar enthalpy of vaporization for a liquid ($normal boiling point$ = $78.3C) is 39 kJ mol^{-1}$. If the liquid has to boil at 25°C, the pressure must be reduced to Torr ($up to one decimal place$).
($Given : R = 8.314 JK mol, 1 atm = 760 Torr$) **GATE XL 2015**

25) For the process, H_2O (l) ↔ H_2O (s) at $0°C$ and 1 atm, the correct statement is

a) $\Delta S_{system} = 0$
b) $\Delta S_{total} > 0$
c) $\Delta S_{total} = 0$
d) $\Delta S_{total} < 0$

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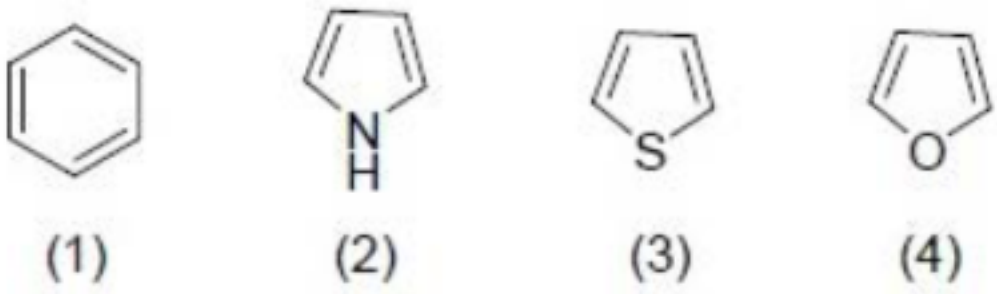

Biochemistry

26) Which one of the following small molecules is a prerequisite for fatty acid oxidation?

a) Inositol b) Choline c) Carnitine d) Glycerol

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27) Which one of the following bases is NOT found in the T-arm of an aminoacyl t-RNA?

a) Dihydrouridine
b) Pseudouridine
c) Uracil
d) Guanine

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28) Oxidation of one molecule of glucose via the glycerol-phosphate shuttle produces

a) 32 molecules of ATP
b) 32 molecules of NADPH
c) 30 molecules of ATP
d) 30 molecules of NADPH

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29) Ribulose-5-phosphate epimerase is involved in which one of the following processes?

a) Glycolysis
b) TCA cycle
c) Glycosylation
d) Pentose phosphate pathway

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30) Proteolytic enzymes are usually biosynthesized as large, inactive precursors known as

a) holoenzymes
b) zymogens
c) ribozyme
d) apoenzymes

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31) The formation of a carbocation, also called an oxonium ion, occurs during the reaction catalyzed by

a) aldolase b) lysozyme c) ribonuclease A d) carboxypeptidase

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32) Which one of the following amino acid substitutions is likely to cause the largest change in protein conformation?

a) Phe→ Ile b) Ser→ Thr c) Gin→ Tyr d) Glu→Val

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33) Which one of the following does NOT constitute the lipid moiety in lipid-linked membrane proteins?

a) Palmitic acid b) Farnesyl groups c) Stearic acid d) Myristic acid

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34) A closed circular B-DNA of 4000 base pairs is negatively supercoiled by introduction of 4 writhes. The super helical density of the resultant DNA molecule will be **GATE XL 2015**

35) Which one of the following is NOT a receptor tyrosine kinase?

a) Platelet derived growth factor receptor
b) Insulin like growth factor-1 receptor
c) Macrophage colony stimulating factor receptor
d) Transforming growth factor β receptor

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36) Match the entries in Column-1 with those in Column-2

Column-1
P. Vitamin B1
Q. Carboxypeptidase
R TCA cycle
S. Reducing sugar

Column-2
1. Thiamine pyrophosphate
2. Aconitase
3. Sucrose
4. Zn
5. Riboflavin
6. Lactose

a) P-1; Q-4, R-2, S-6
b) P-5; Q-1; R-2; S-3
c) P-1; Q-4; R-5; S-6
d) P-5; Q-2; R-1; S-6

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37) The following table provides information about four proteins.

Protein	Native mol.wt.*Da*	pI	Type
P	32000	6.4	monomer
Q	40000	8.5	homodimer
R	25000	4.9	monodimer
S	45000	8.5	homodimer

Which one of the following options correctly identifies the order of elution in size exclusion chromatography and the increasing order of mobility in SDS polyacrylamide gel?

a) Chromatrography SQPR; Electrophoresis: RPQS
b) Chromatrography: PRQS; Electrophoresis: PRQS
c) Chromatrography: RPQS, Electrophoresis: SQPR
d) Chromatrography: SQPR, Electrophoresis: PRQS

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38) The predicted molar extinction coefficient at 280 nm for the peptide **GEEFHISFLLIMFGAWSTHMYRTYWFIHEMISTRY** is_____ $M^{-1}cm^{-1}$
Molar extinction coefficients for phenylalanine, tryptophan and tyrosine at 280 nm are 200, 5600 and 1400 $M^{-1}cm^{-1}$, respectively **GATE XL 2015**

39) Match the contents of Column I with the most appropriate options in Column II

Column I	Column II
P. Complement Clq	1. CD34
Q. L-Selectin	ii. Complement CSb
R. Membrane Attack Complex	im. Fc region of antibody
S. T-Helper cells	iv. Complement CSa
	v. CD40L

a) P-iii; Q-v: R-iv, S-i
b) P-i Q-ii R-iv S-v
c) P-iii; Q-i R-ii S-v
d) P-iv Q-v: R-iiS-i

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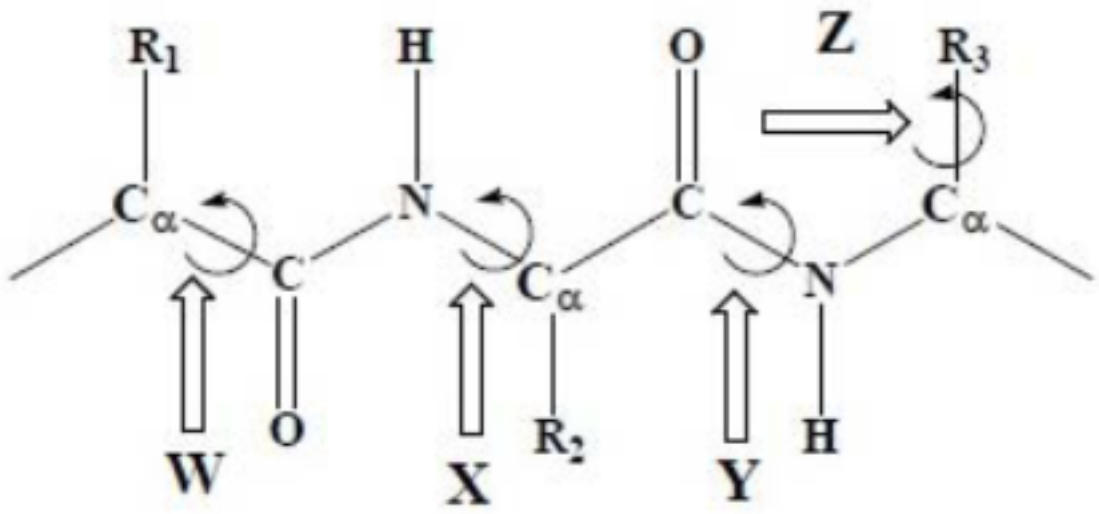
40) The value of ΔG at $3725°C$ for the movement of Ca^{2+} ions from the endoplasmic reticulum where $[Ca^{2+}]$ is 1 mM to the cytosol where $[Ca^{2+}]$ is 0.1 μM at -50 mV membrane potential is_____ kJ mol^{-1}.
[R-8.314 JK mol^{-1} and 1 Faraday = 96500 Coulombs] **GATE XL 2015**



41) Which of the following identifies the correctly matched pairs?
a) W-iii X-i Y-iv, Z-ii
b) W-i X-iii, Y-iv, Z-ii
c) W-i X-iii: Y-ii Z-iv
d) W-iii; X-i Y-ii Z-iv

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42) Which of the following statements is/are INCORRECT about hemoglobin (Hb)?
I. Hb demonstrates higher oxygen carrying capacity compared to myoglobin
II. There is covalent bonding between the four subunits of Hb
III. During deoxygenation the loss of the first oxygen molecule from oxygenated Hb promotes the dissociation of oxygen from the other subunits
a) II
b) II and III
c) I and III
d) III

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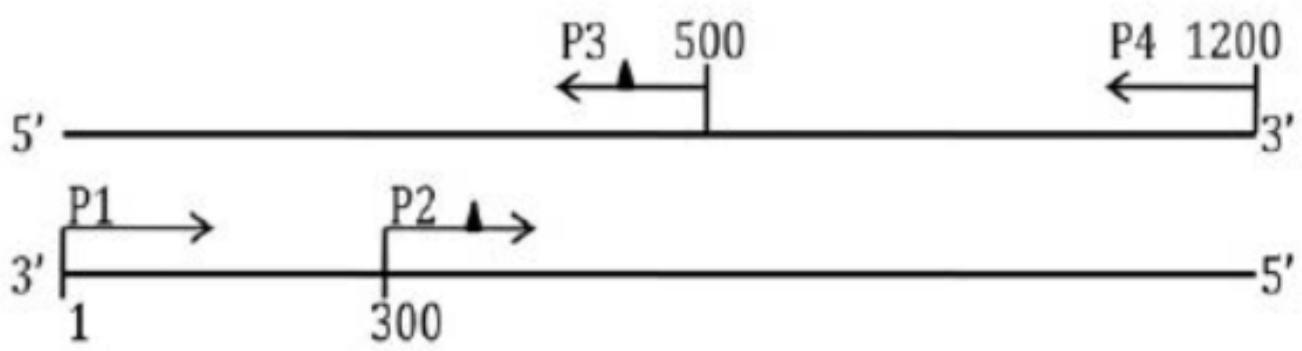
43) A 1.2 kb DNA fragment was used as a template for PCR amplification using primers P1, P2, P3 and P4 as shown in the scheme below. The annealing positions of primers on the template are indicated by numbers. Primers P2 and P3 contain single base mismatches as indicated by filled triangles.



PCR was performed using primer pair P1 and P3 in one vial and P2 and P4 in another vial. The purified PCR products from the two vials were mixed and subjected to another round of PCR with primers P1 and P4. The final PCR product will correspond to a

a) .2 kb wild type DNA
b) 1.2 kb DNA with two point mutations
c) 0.9 kb DNA with one point mutation
d) 0.5 kb DNA with one point mutation

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44) A cell suspension was subjected to membrane disruption followed by differential centrifugation to fractionate the cellular components.

Match the centrifugal conditions in Column I to the appropriate subcellular components in Column II

Column I	Column II
P. 1000 g, 10 min	1. Microsomes and small vesicles
Q. 20000g 30 min	ii. Ribosomes
R. 80000 g, 1 hour	in. Nuclei
S. 150000 g, 3 hours	iv. Lysosomes and peroxisomes

a) P - iii, Q-iv, R-i, S-ii
b) P - i, Q-iv, R-iii, S-ii
c) P - iii, Q-iv, R-ii, S-i
d) P - ii, Q-i, R-iv, S-iii

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45) Given below are the maps of a 1200 base pairs (bp) long DNA insert and a 3000 bp expression vector. The BamHI (B) and HindIII (H) restriction sites and DNA length between them are indicated in base pairs.

The insert is cloned into the vector at the BamHI site and the desired orientation is shown by the arrow. After cloning, the orientation of the insert in the recombinant plasmid is tested by complete HindIII digestion followed by agarose gel electrophoresis. Which one of the following band patterns reveals the correct orientation of the insert in the construct?

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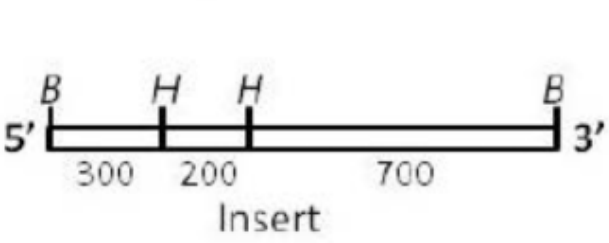
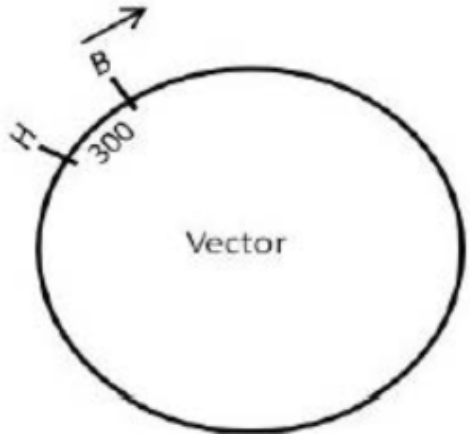
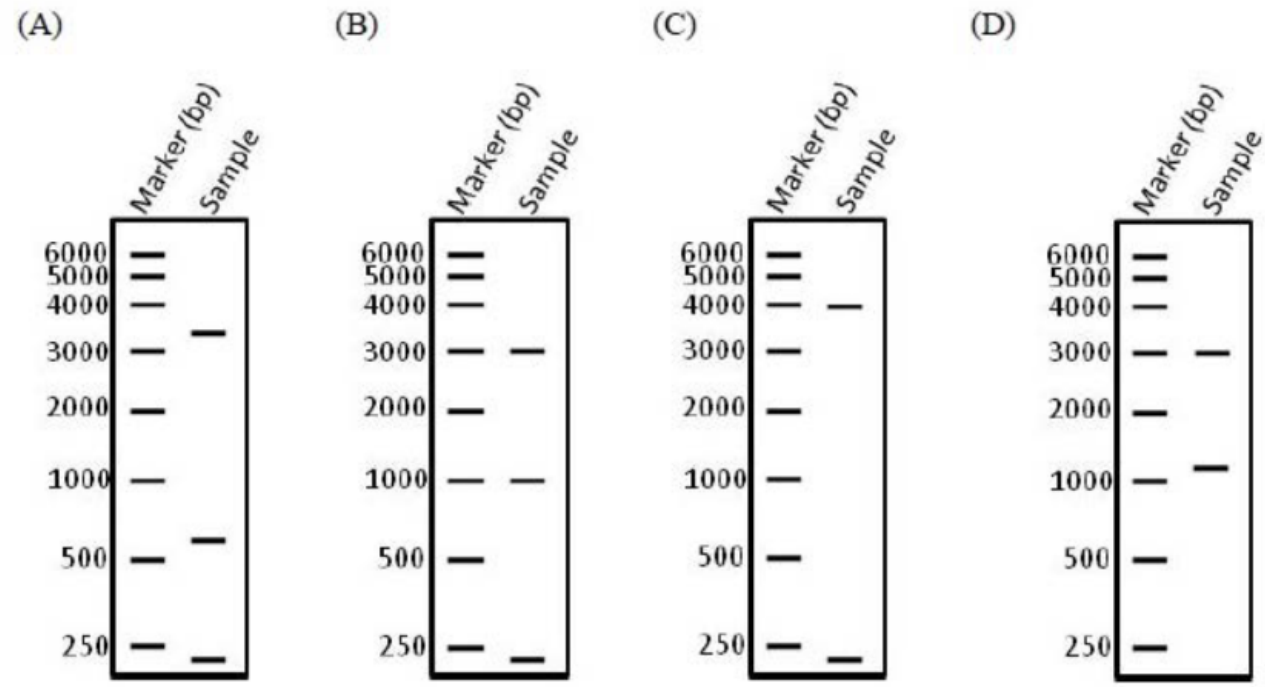
Botany

46) Nuclear membrane is absent in







a) Chlamydomonas
b) Nostoc
c) Volvox
d) Chlorella

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47) An organized and differentiated cell having cytoplasm but no nucleus is found in
a) Companion cell
b) Xylem parenchyma
c) Sieve tube element
d) Phloem parenchyma

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48) Double haploids in plants can be induced by

a) Mitomycin-C
b) Mirin
c) Colchicine
d) 5-Azacytidine

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49) During fatty acid biosynthesis, the first intermediate malonyl-CoA is formed from
a) Acetyl-CoA and bicarbonate
b) Two acetyl-CoA molecules
c) Acetyl-CoA and biotin
d) Palmitoyl CoA and acyl-carrier protein (ACP)

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50) Which of the following techniques is NOT applicable for evaluating the expression of a transgene?
a) Northern blot
b) RT-PCR
c) Western blot
d) Southern blot

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51) Identify the CORRECT family possessing the following characters presence of glucosinolates, tetradynamous stamens, superior ovary with parietal placentation and siliqua type fruit
a) Brassicaceae
b) Capparidaceae
c) Fumariaceae
d) Papavaraceae

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52) Which of the following reduces the transpiration rate when applied to aerial parts of plants?
a) Phosphon-D
b) Paraquat
c) Phenyl mercuric acetate
d) Valinomycin

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53) A tube like membrane structure that forms the connection between the endoplasmic reticulum of neighboring cells through plasmodesmata is
a) Desmotubule
b) Desmosome
c) Dictyosome
d) Microtubule

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54) Which one of the followings is NOT a cryoprotectant for plant tissue?
a) Dimethyl sulfoxide
b) Glycerol
c) Ethylene glycol
d) Liquid nitrogen

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55) Two similar holotypes are called
a) Monotype
b) Neotype
c) Isotype

d) Syntype

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56) A cross was made berween AABBCCDDEE and aabbccddee. The resultants F, were selfed. Applying Mendelian principle, PREDICT the proportion of phenotype showing all the recessive characters in F; generation.

a) 1/64
b) 1/256
c) 1/512
d) 1/1024

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57) Identify the CORRECT statements with respect to functioning of ecosystem.
P. A food chain is a series of organisms, each one feeding on the organism succeeding it
Q. Food web presents a complete picture of the feeding relationships in any given ecosystem
R. In ecosystem, energy flows in unidirectional way, whereas nutrients flow in cyclic fashion
S. In biogeochemical cycles, nutrients do not alternate between organisms and environment

a) P,Q
b) P, R
c) R, S
d) Q, R

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58) Match the name of the diseases with their causal organisms.

Disease
P. Loose smut of wheat
Q. Wart disease of potato
R. Panama disease of banana
S. Tikka disease of groundnut

Causal Organism
1. Cercospora personata 2. Alternaria solani
3. Synchytrium endobioticum
4. Ustilago tritici
5. Fusarium oxysporum
6. Erwinia amylovora

a) P-6, Q-4, R-3, S-2
b) P-4. Q-6, R-1, S-3
c) P-4. Q-3, R-5, S-1
d) P-2, Q-3, R-2, S-6

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59) Match the plant products with their sources and the plant parts from which they are obtained,

Product
P. Annatto
Q. Cutch
R. Henna
S. Alizarin

Source
1. Acacia catechu
3. Bixa orellana
i. Root
4. Lawsonia inermis

Plant part
1. Seed
2. Rubia tinctorum
n. Leaf IV. Stem

a) P-3-n, Q-4-1, R-2-m, S-1-iv
b) P-3-1, Q-1-1v, R-4-n, S-2-m
c) P-2-ii. Q-1-in. R-4-iv, S-3-1
d) P-4-ii, Q-3-iv, R-1-ii, S-2-4

GATE XL 2015

60) Match the floral structures with the families and representative plant species.

Floral structure P. Gynostegium
Q. Gynostemium
R. Gynobasic style
S. Gynophore

Family
1. Orchidaceae
2. Lamiaceae
3. Capparidaceae
4. Asclepiadaceae

Plant 1. Ocimum sanctum
ii. Cleome gynandra
in. Calotropis procera
iv. Vanilla planifolia

a) P-2-i, Q-3-iii, R-4-ii, s-1-iv

b) P-3-ii, Q-4-i, R-2-iii, s-1-iv
c) P-4-iii, Q-1-iv, R-2-i, s-3-ii
d) P-4-ii, Q-2-iii, R-1-iv, s-3-i

GATE XL 2015

61) Identify the INCORRECT statements with respect to plastid transformation.
P. Antibiotic used for selection of trasplastomic plant is spectinomycin
Q. Chances of gene escape from transplastomic plants are high
S. Levels of transgene expression are low
R. Microprojectile bombardment is the method of DNA delivery
a) P,R
b) P,Q
c) Q,S
d) R,S

GATE XL 2015

62) Which of the following statements are TRUE with regard to the similarities between Crassulacean. Acid Metabolism (CAM) and C_4, cycle?
P. Stomata open during night and remain closed during the day
Q. PEPcase is the carboxylating enzyme to form C_4 acid
R. C, acid is decarboxylated to provide CO_2 for C_3, cycle
S. Kranz anatomy is predominant in both CAM and C_4 plants
a) P,S
b) Q,S
c) P,Q
d) R,S

GATE XL 2015

63) With respect to germination of seeds, the CORRECT sequence of events is
P. Seed imbibes water
Q. Mobilization of starch reserve to embryo
R. Diffusion of gibberellin from embryo to aleurone layer
S. Synthesis of a-amylase in the aleurone layer
a) P. Q. S. R
b) R. P. Q. S
c) P. R. S. Q
d) R. Q. P. S

GATE XL 2015

64) Identify the CORRECT statements with regard to the function of plant hormones
P. ABA is synthesized from chorismate and promotes viviparous germination
Q. Auxin induces acidification of cell wall followed by turgour-induced cell expansion
R. Gibberellin-reponsive genes become activated by the repression of DELLA protein
S. Cytokinin regulates the G_2 to M transition in the cell cycle
a) P,Q
b) Q,R
c) Q,S
d) P,R

GATE XL 2015

65) Statements given below are either TRUE (T) or FALSE (F). Find the correct combination
P. Somatic embryo is umpolar in nature
Q. Heterokaryon can be selected using a fluorescence-activated cell sorter (FACS)

R. The term somaclonal variation is coined by Larkin and Scowcroft
S. Differentiation of shoot buds during in vitro culture is known as somatic embryogenesis

a) P-T, Q-F. R-T. S-F
b) P-F. Q-T. R-F. S-T
c) P-T, Q-F. R-F, S-T
d) P-F. Q-T, R-T, S-F

GATE XL 2015

66) 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

GATE XL 2015

67) In aerobic respiration, the final electron acceptor is
a) hydrogen
b) nitrogen
c) sulfur
d) oxygen

GATE XL 2015

68) 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) B-oxidation
d) oxidative phosphorylation

GATE XL 2015

69) Limulus Amoebocyte Lysate (LAL) assay is used to identify the presence of
a) endotoxin
b) exotoxin
c) anthrax toxin
d) tetanus toxin

GATE XL 2015

70) Match scientists in Group I with terms related to their major scientific contributions in Group II
Group I
(P) Sanger
(Q) Watson and Crick
(R) Waksman
(S) Bordet Group II
(1) DNA double helix structure
(1) DNA sequencing
(in) Complement
(iv) Streptomycin
(v) Immune tolerance
a)
b)
c)
d)

GATE XL 2015

71) Base-pair substitutions caused by the chemical mutagen ethyl methane sulfonate are a result of
a) hydroxylation
b) alkylation
c) deamination
d) intercalation

GATE XL 2015

72) The classical way of representing taxonomic hierarchy of living organisms in ASCENDING ORDER is
a) genus, species, class, order, family
b) genus, species, class, order, family
c) species, genus, family, order, class
d) genus, species, order, class, family

GATE XL 2015

73) Of the following, the most effective method to kill bacterial endospores is
a) moist heat sterilization
b) UV irradiation
c) filtration
d) pasteurization

GATE XL 2015

74) 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

GATE XL 2015

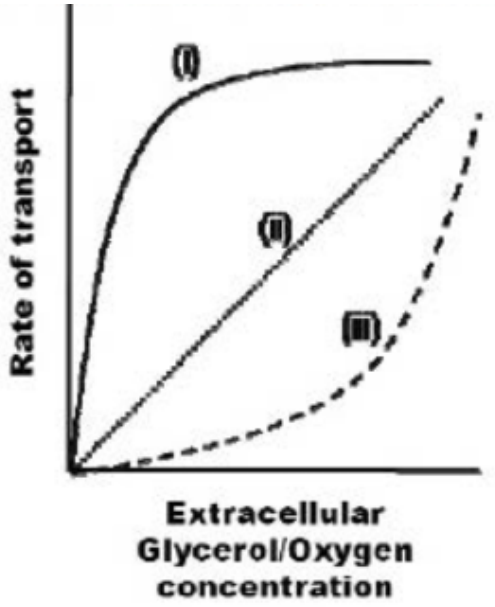
75) Anammox organisms carry out
a) anaerobic reduction of NO
b) anaerobic oxidation of NH
c) aerobic oxidation of NH
d) aerobic oxidation of NO

GATE XL 2015

76) 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 (2) is a specialized transducing phage
a) P and S only
b) Q and R only
c) Q and S only
d) P and R only

GATE XL 2015

77) 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)



GATE XL 2015

78) Which one of the following about the standard free energy change (ΔG) and the equilibrium constant (K_{eq}) of an exergonic reaction, at pH 7.0, is TRUE?
   a) ΔG is positive and K_{eq} 15 less than one
   b) ΔG is negative and K_{eq} is less than one
   c) ΔG is negative and K_{eq} is greater than one
   d) ΔG is positive and K_{eq} is greater than one

GATE XL 2015

79) An oil immersion objective of a light microscope has a numerical aperture of 1.25. Using the AbbÃ© equation, the maximum theoretical resolving power (*innm*) of the microscope with this objective and blue light (*wavelength* = 450*nm*) is

GATE XL 2015

80) The working volume (in liter) of a chemostat with 0.1 h^{-1} dilution rate and 100 ml/h feed flow rate 15 **GATE XL 2015**

81) 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 **GATE XL 2015**

82) 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 **GATE XL 2015**

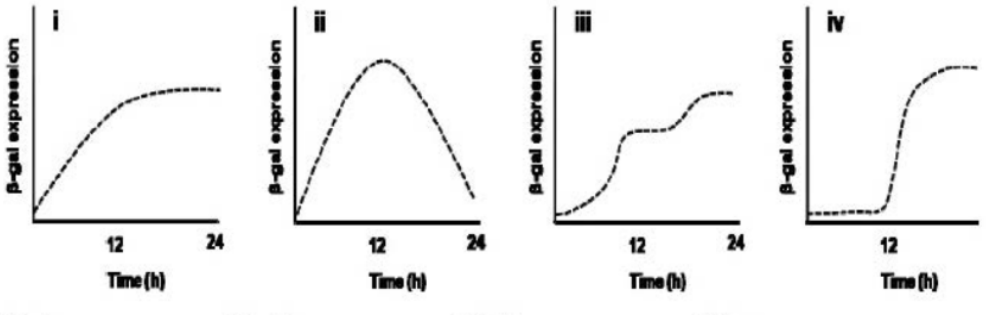
83) A bacterial culture is grown using 2.0 mg/ml fructose as the sole source of carbon and energy. The bacterial biomass concentrations immediately after inoculation and at the end of the growth phase are 0.1 mg/ml and 0.9 mg/ml, respectively. Assuming complete utilization of the substrate, the bacterial growth yield (1) on fructose is

GATE XL 2015

84) 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 **GATE XL 2015**

85) 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 B-galactosidase ($B - gal$)

expression (*inarbitraryunits*)?



a) i
b) ii
c) iii
d) iv

GATE XL 2015

Zoology

86) The term ”paedomorphosis” refers to
a) Accelerated reproductive development as compared to somatic development
b) A transient stage in the developmental event
c) Two independent structures resembling each other, yet performing different functions
d) A form of mimicry

GATE XL 2015

87) Which one of the following statements is TRUE when determining the age of a fossil using carbon dating?
a) Carbon dating is based on carbon-13 to carbon-12 ratio in fossils
b) Carbon dating is useful for determining the age of only fossils older than 100,000 years
c) Older the fossil, lesser the carbon-14 to carbon-12 ratio
d) Older the fossil, lesser the carbon-12 to carbon-14 ratio

GATE XL 2015

88) Constitutive enzymes are
a) Induced by effector molecules
b) Repressed by repressors
c) Encoded by sequences that occur as part of an operon
d) Always produced in the cell

GATE XL 2015

89) Which one of the following is a function of intermediate filaments?
a) Chromosome movement during the cell division
b) Cytoplasmic streaming
c) Formation of tight junctions
d) Anchorage of the nucleus

GATE XL 2015

90) Which one of the following statements is FALSE with respect to phospholipids?
a) Phospholipids have amphipathic character
b) Phospholipids form the lipid bilayer of the cell membrane
c) Phospholipids form micelles in living systems

d) Some phospholipid molecules may contain a double bond in hydrophobic tails

GATE XL 2015

91) Which one of the following organs is INCORRECTLY paired with its function?
a) Intestinal villi - absorption
b) Epiglottis - closure of larynx
c) Gall bladder - carbohydrate digestion
d) Parietal cells - hydrochloric acid

GATE XL 2015

92) Where do B lymphocytes acquire immune competence?
a) Thymus
b) Bone Marrow
c) Lymph nodes
d) Spleen

GATE XL 2015

93) Which one of the following life cycle stages of Plasmodium falciparum is infectious?
a) Sporozoite
b) Cryptozoite
c) Merozoite
d) Trophozoite

GATE XL 2015

94) What is the role of the notochord during organogenesis in a vertebrate embryo?
a) Signaling the development of placenta
b) Induction of neural plate formation
c) Stimulation of the umbilical chord formation
d) Suppression of the development of extra-embryonic membranes

GATE XL 2015

95) The behavior of young ducks following their mother is known as
a) Imprinting
b) Innate behavior
c) Habituation
d) Mimicry

GATE XL 2015

96) Match the species names with class names

P. Calotes versicolor	1. Insecta
Q. Periplaneta americana	11. Reptilia
R. Glyphidrilus birmancus	III. Actinopterygi
S. Clarias batracus	iv. Clitellata

a) P-1, Q-1, R-IV, S-m
b) P-1: Q-11, R-1; S-1V
c) P-11, Q-1, R-m; S-iv
d) P-111, Q-1; R-11; S-1V

GATE XL 2015

97) A population of spotted deer found in a national forest is in Hardy-Weinberg equilibrium. For a particular genetic locus in this deer species, only two alleles A and a are possible. If the frequency of the Aa allele in this population is 0.6, and the frequency of the a allele is 0.4, what will be the frequency of the geotype Aa?
a) 0.24
b) 0.48

c) 0.96
d) 1.6

GATE XL 2015

98) In *Drosophila*, the gene for eye colour is present on the X chromosome. When a red-eyed female was mated with a white-eyed male, a total of 100 progeny were obtained 50 females and 50 males. Of the 50 females, 25 were red-eyed, and 25 were white-eyed. How many of the male progeny were red-eyed?
a) 0
b) 10
c) 20
d) 25

GATE XL 2015

99) Defect in poly-A tail formation in eukaryotic mRNA leads to
a) Increased translation of the resulting mRNA
b) Decreased translation of the resulting mRNA
c) Premature transcription termination
d) Decreased mRNA stability

GATE XL 2015

100) Assuming equal frequency for all 4 nucleotides (G, A, T, C), how many EcoRI recognition sites (GAATTC) are possible in a bacterial artificial chromosome of 100,000 base pairs?
a) 6
b) 12
c) 24
d) 48

GATE XL 2015

101) Choose the correct option that shows pairing of the organelle to its function

P. Smooth endoplasmic reticulum.	1. Internalization of receptors
Q. Peroxisome	11. Protein secretion
R. Golgi apparatus	ii. Membrane biogenesis
S. Endosome	iv. Breakdown of fatty acids

a) P-i;Q-ii;R-iii;S-iv
b) P-i;Q-iii;R-ii;S-iv
c) P-iii;Q-iv;R-ii;S-i
d) P-ii;Q-iii;R-iv;S-i

GATE XL 2015

102) Choose the correct option based on your understanding of the circulatory system

P. Open circulatory system	i. Fish
Q. Closed circulatory system	ii. Frog
R. Three chambered heart	iii. Earthworm
S. Two chambered heart	iv. Grasshopper

a) P-iv;Q-iii;R-ii;S-i
b) P-iv;Q-i;R-ii;S-iii
c) P-i;Q-iv;R-ii;S-iii
d) P-i;Q-iii;R-iv;S-ii

GATE XL 2015

103) The popular birth control pills for women have a combination of synthetic forms of estradiol and progesterone. Which one of the following statements is INCORRECT with regard to their function as contraceptive?
a) The pills inhibit the release of GnRH leading to inhibition of gonadotropin-stimulated ovarian

function
b) They act directly on the pituitary gland to inhibit gonadotropin surges
c) The low dose of estradiol in the pill inhibits the release of FSH, and thus blocks ovulation
d) The synthetic forms of estradiol and progesterone bring about their effects by binding to their respective intracellular receptors

GATE XL 2015

104) Which one of the following is consistent with the germplasm theory of August Weismann?
a) Regulative development observed in frog embryos
b) Mosaic development observed in tunicates
c) Normal embryonic development of embryos formed by somatic nuclear transfer
d) Ability of differentiated cells to form pluripotent stem cells under certain conditions

GATE XL 2015

105) Which one of the following statements DOES NOT explain altruism?
a) Altruism reduces the fitness of the individual that displays this behavior
b) Altruism increases the fitness of other individuals in the population
c) Altruism reduces the fitness of the individual that displays this behavior and at the same time increases the fitness of other individuals in the population
d) Altruistic behavior helps the individual escape from predators

GATE XL 2015

Food Technology

106) Standard pasteurization protocol for milk is adequate for destroying
a) Clostridium sporogenes.
b) Bacillus cereus
c) Clostridium batulinum
d) Listeria monocytogenes

GATE XL 2015

107) Which one of the following is NOT a component of an evaporator?
a) Heat exchanger
b) Vacuum separator
c) Condenser
d) Cyclone separator

GATE XL 2015

108) Among the following animal foods, the fat content is least in
a) Beef
b) Chicken meat
c) Pork
d) Lamb flesh

GATE XL 2015

109) The enzyme that hydrolyzes starch to maltose is
a) α-amylase
b) glucoamylase
c) β-amylase
d) cyclodextrin glucanotransferase

GATE XL 2015

110) Which one of the following is NOT enriched in endosperm during parboiling of paddy?
a) Thiamine
b) Niacin

c) Iron
d) Fat

GATE XL 2015

111) Heat-treated legume seed proteins are more digestible than those of untreated legume seed proteins due to
a) reaction of reducing sugars with e-amino group of lysine
b) increased binding of lectins to intestinal mucosal cells
c) thermolabile nature of lectins and Kunitz-type protease inhibitors
d) thermolabile nature of Bowman-Birk type of inhibitor

GATE XL 2015

112) What is the percent relative humidity at which both the dry bulb and wet bulb thermometers would record equal temperatures?
a) 0
b) 10
c) 50
d) 100

GATE XL 2015

113) How many fold would the g-number of a centrifuge increase by doubling both the spinning speed and bowl diameter?
a) 2
b) 4
c) 8
d) 16

GATE XL 2015

114) Prolonged fermentation of cocoa seeds lead to ”off-taste” due to the release of
a) glucose
b) short chain fatty acids
c) carbon dioxide
d) phospholipids

GATE XL 2015

115) The gradual decrease in viscosity of tomato paste during storage can be prevented by quickly heating it to 82 °C, because
a) water soluble pectin interacts with calcium
b) hemicellulose prevents decrease in viscosity.
c) lignin prevents decrease in viscosity
d) pectin methyl esterase is inactivated

GATE XL 2015

116) Match the enzyme in Group I with its corresponding application in Group II

Group I	Group II
(P) Chymosin	(1) Removal of cooked flavor from milk
(Q) Sulfhydryl oxidase	(2) Soybean milk coagulation
(R) B-Galactosidase	(3) For rennet puddings
(S) Microbial proteases	(4) Lactose removal

a) P-3,Q-2,R-1,S-4
b) P-3,Q-1,R-4,S-2
c) P-1,Q-3,R-4,S-2
d) P-4,Q-3,R-2,S-1

117) Milk is flowing at 0.12 m^3/min in a 2.5 cm diameter pipe. The temperature of the milk is 21 °C and

the corresponding viscosity and density are 2.1 x 10 Pas and 1029 kg/m^2, respectively. If the flow is found to be turbulent under the given conditions, the Reynolds number is **GATE XL 2015**

118) Whole milk (34,950 kg) containing 4% fat is to be separated in 6 h period into skim milk with 0.45% fat and cream with 45% fat. The flow rate of cream stream (kg/h) from the separator is

GATE XL 2015

119) Match the edible plant tissue in Group I with the type of carotenoid given in Group II

Group I	Group II
(P) Corn	(1) Lycopene
(Q) Red pepper	(2) B-Carotene
(R) Pumpkin	(3) Capsanthin
(S) Tomato	(4) Lutein

a) P-3,Q-2,R-2,S-1
b) P-3,Q-1,R-3,S-4
c) P-4,Q-3,R-2,S-1
d) P-1,Q-2,R-4,S-3

120) Green tea is considered to be a more healthy option than black tea because it

a) has high content of polyphenols
b) is richer in thearubigin
c) does not require any sweetener during tea preparation
d) has no microbial load

GATE XL 2015

121) A dilute pineapple juice is heated in a double pipe heat exchanger from 28 ° C to 75° C by heat exchanging with hot eatr flowing in shell in counter current direction. Hot water is entering the shell at 95 ° C and leaving at 85 °C. The log mean temperature difference ($°C$) is _____ **GATE XL 2015**

122) Granulated sugar, having an average particle size of 500 μm, is milled to produce icing sugar having an average particle size of 25 μm. The power requirement was 10 kW as obtained by Rattinger's law. If the same mill were to be used to produce fondant sugar having an average particle size of 20 um at the same capacity, the power requirement (kW) would be _____

GATE XL 2015

123) One ton of soybean containing 18% oil, 35% protein, 27.1% carbohydrates, 9.4% of fibre and ash, and 10.5% moisture is crushed and pressed. The residual oil content in the pressed cake is 6%. Assuming that there is no loss of protein and water with oil, the amount of oil (kg) obtained from the crusher is _____ **GATE XL 2015**

124) Match the processing method in Group I with the operation carried out in Group II

Group I	Group II
(P) Degumming	(1) Crystallization of triacylglycerol by cooling to remove fat crystals
(Q) Deacidifying	(2) Passing heated oil over charcoal
(R) Bleaching	(3) Using alkaline solution to remove fatty acids
(S) Winterizing	(4) Wetting with water to remove lecithin

a) P-3, Q-1, R-4, S-2
b) P-4, Q-3, R-1, S-2
c) P-4, Q-3, R-2, S-1
d) P-3. Q-1, R-2, S-4

GATE XL 2015

125) The order of succession of microbes in the spoilage of milk, involving (P) *Lactobacillus*, (Q) protein digesting bacteria. (R) *Lactococcus lactis*, (S) yeasts and molds, is

a) $S > R > Q > P$ b) $S > Q > R > P$ c) $R > P > S > Q$ d) $Q > S > P > R$

GATE XL 2015