LIFE SCIENCES

H: CHEMISTRY (COMPULSORY)

ONE MARKS QUESTIONS (1-6)

1. Which one of tile following is not a state function?
   a. Enthalpy (H)
   b. Internal energy (U)
   c. Work done (w)
   d. Entropy (S)

2. Specify which among he following statements describe uncertainty principle
   a. No two elections in an atom can have the same set of four quantum numbers
   b. It is impossible to determine simultaneously the velocity and moment tin of an object with certainty
   c. Matter like radiation exhibit a dual behavior
   d. It is impossible to simultaneously determine the position and momentum of an object with certainty

3. Among the given compounds, the most stable halogen containing compound of sulfur
   a. SF_6
   b. $S2Cl_2$
   c. SF_4
   d. $SOCl_2$

4. The nucleophile among the following is
   a. BF_3
   b. SO_2
   c. $(CH_3)_3N$
   d. NO_2^+

5. In the reaction

   A + B → Products,

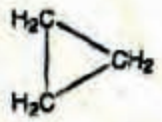
   If the concentration of A is doubled, the rate of the reaction increases by a factor of 4. However, ii the concentration of B is doubled, the rate remains unaltered. The order of the reaction with respect to A and B will be respectively
   a. 2 and 1
   b. 2 and 0
   d. 1 and 1

6. The major product (X) of the reactions

$$BrCH_2\text{-}CH_2\text{-}CH_2Br \xrightarrow{\text{Zinc dust}} (X)$$

is

a.



b. $CH_2=CH-CH_2Br$

c. $BrCH_2-CH=CH_2$

d. $CH_2=C=CH_2$

TWO MARKS QUESTIONS (7-24)

7. Which among the following steps is NOT present in the determination o lattice enthalpy of Nal using the Born- Haber cycle
   a. $\frac{1}{2} I_2(s) \rightarrow \frac{1}{2} I_2(g)$
   b. $Na(s) \rightarrow Na(1)$
   c. $\frac{1}{2} I_2(g) \rightarrow I(g)$
   d. $I(g) + e \rightarrow I^-(g)$

8. The boiling point of pure benzene is 80.0 °C. When a certain amount of benzoic acid was added to it, the boiling point increased to 82.5°C. If the ebullioscopic constant (Kb) is 2.5 K kg mol^{-1}, the modality of the solution will he
   a. 0.02
   b. 0.25
   c. 1.00
   d. 6.25

9. The structure of XeO_2F_2 based on VSEPR theory is best described as
   a. See-saw structure with the O-Xe-O angle close to 1200
   b. See-saw structure with F-Xe-F angle close to 120°
   c. A perfect tetrahedral arrangement of substituents around Xe

10. The hydrolysis of which of the following compounds would yield phosphorous acid (113103)?
    a. PCl_5
    b. $POCl_3$
    c. P_4O_{10}
    d. PCl_3

11. The type of hybridization that chromium show in $Cr(CO)_6$ and $[CrF_6]^{3-}$ are respectively [atomic number of chromium Is 24]
    a. sp^3d^2 and d^2sp^3
    b. sp^3d^2 and sp^3d^2
    c. d^2sp^3 and d^2sp^3
    d. d^2sp^3 and sp^3d^2

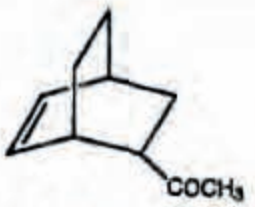
12. Which among the following molecules has the lowest bond dissociation energy?
    a. NO
    b. NO^+
    c. NO^-
    d. N_2

13. A transition metal ion in its +3 oxidation state forms complexes with excess of F^- as well as Cl^-. Given that the ionic radii of the metal ion, F^- and Cl^- are 0.64, 1.34 and 1.81 A respectively, the geometries of the metal complexes formed will be
    a. $[MF_6]^{3-}$, octahedral AND $[MCl_4]^-$, tetrahedral
    b. $[MF_6]^{3-}$,, octahedral AND $[MCl6]^{3-}$, octahedral
    c. $[MF_4]^-$, tetrahedral AND $[MCl_4]^-$, tetrahedral
    d. $[MF_4]^-$, tetrahedral AND $[MCl_6]^{3-}$, octahedral

14. The reagent required or the conversion

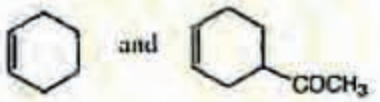
are
    a. Na in liquid ammonia
    b. $LiA1H_4$
    c. Sn/HCl
    d. $Pd/BaSO_4$ / Quinoline

15. For the synthesis of

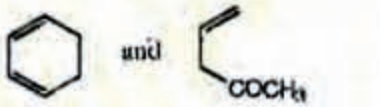


using Diel's -Alder reaction, the reactants required are

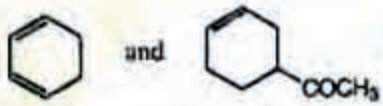
a.



b.



c.



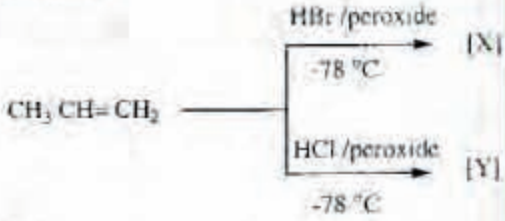
d.

16. Match the values of K_a (given in column 2) with the substituted beuzoic acids (given in column 1)

Column 1		Column 2	
[P]	p – NO_2	[X]	36×10^{-5}
[Q]	p – OH	[Y]	10×10^{-5}
[R]	p – Cl	[Z]	2.6×10^{-5}

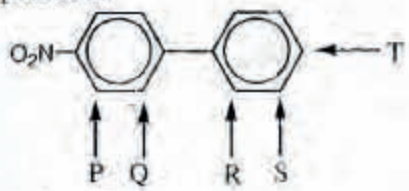
    a. P – X; Q – Y; R – Z
    b. P – Y; Q – X; R – Z
    c. P – Z; Q – Y; R – X
    d. P – X; Q – Z; R – Y

17. The - major products (X) and (Y) of the reactions



are
    a. X = $CH_3CHBrCH_3$; Y = $CH_3CHClCH_3$
    b. X=$CH_3CH_2CH_2Br$, Y=$CH_3CHCLCH_3$
    c. X=$CH_3CH_2CH_2Br$; Y=$CH_3CH_2CH_2Cl$

18. Nitration of p-nitro biphenyl is carried out. The new nitro group would introduce at position/s



a. P and T
b. Only Q
c. R and T
d. Q and S

19. In the reaction

$$CH_3(CH_2)_3\underset{\underset{X}{|}}{CH}\text{-}CH_3 \xrightarrow{\ominus OCH_3/CH_3OH}$$

If X = F in the first ease and X = Br in the second case, the major product formed will be respectively

a. 1-Hexene and I- Hexene
b. 1-Hexene and 2-Hexene
c. 2-Hexene and 2- Hexene
d. 2-Hexene and 1-Hexene

20. Henderson's equation can be represented as

a. $pH = pK_a + \log\frac{[Acid]}{[Salt]}$

b. $pH = pK_a + \log\frac{[Salt]}{[Acid]}$

c. $pK_a = pH + \log\frac{[Salt]}{[Acid]}$

d. $pK_a = pH + \log\frac{[Acid]}{[Salt]}$

21. A concentrated solution of NaCl is diluted ten times. The specific conductance (K) and molar conductance (Λ_m) will show the following behavior

a. decrease in K and increase in Am
b. increase in K and decrease in Am
c. no change in both
d. increase in both

22. In the reaction

$$2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$$

taking place at 27 °C, K_p is 3.0×10^{-23} atm. The value of K_c (in mol dm^{-3}) for the reaction is

a. 74×10^{-23}
b. 12×10^{-25}
c. 5×10^{-26}
d. 2×10^{-27}

Common Data Questions

Common Data for Questions 23 and 24:

$KMnO_4$ reacts with oxalic acid in the presence of excess H_2SO_4 to yield a manganese complex X which is colorless in dilute solutions and pale pink in the crystalline form [atomic number of manganese is 25].

23. The number of unpaired electrons present in the complex X is

a. 1
b. 3
c. 4
d. 5

24. The calculated spin only magnetic moment or the compound X is

a. 5.92 BM
b. 4.90 BM
c. 3.87 BM
d. 1.73 BM

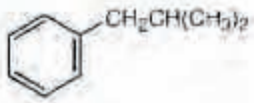
Linked Answer Questions: 25 to 28 carry two marks each.

Statement for Linked Answer Questions 25 and 26:

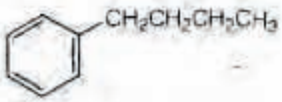
Benzene reacts with 1-chloro-2-methylpropane in presence of anhydrous $AlCl_3$ at 20°C to give major product (X),

25. The product (X) is

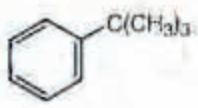
a.



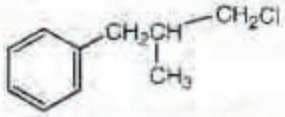
b.



c.



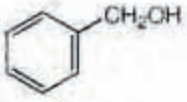
d.



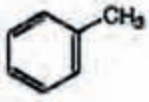
26. Compound (X) on treatment with hot acidic $KMnO_4$ followed by reaction with $LiAlH_4$ gives (Y). Compound (Y) is

a.

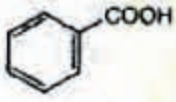
b.



c.



d.



Statement for Linked Answer Questions 27 and 28:

Consider a cell

$Zn(s) \mid Zn^{2+}(aq) \parallel Cu^{2+}(aq) \mid Cu(s)$ operating at 298 K

(Given $E°(Zn^{2+}/Zn) = -0.763V$ and $E°(Cu/Cu^{2+}) = -0337V$]

27. The emf of the cell ($E°_{cell}$) will be
   a. 1.100 V
   b. 0.426 V
   c. -1.10 V
   d. -0.426 V

28. The value of log K for the cell reaction: $Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$ where K is the equilibrium constant will be [Given R = 8.314 JK^{-1} mol^{-1}, F = 96,500 C mol^{-1}]
   a. 18.61
   b. 14.41
   c. -14.41
   d. 37.22

ONE MARKS QUESTIONS

1. Which of the following amino acids do NOT contribute to fluorescence of a protein?
   a. Tyrosine
   b. Phenyinlanine
   c. Cysteine
   d. Tryptophan

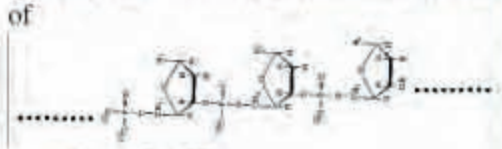
2. Immunological memory is manifested during
   a. primary memory responses
   b. non-specific immune responses
   c. innate immune responses
   d. secondary immune responses

3. The main function of the pentose phosphate pathway is to
   a. supply 'Those 5-phosphate and NADPH
   b. supply NADH and ATP
   c. provide a mechanism to use he carbon skeletons of excess amino acids
   d. provide carbon skeletons for oxidation of fatty acids

4. Which one of the following CANNOT be considered as a weak interaction?
   a. van der Waals forces
   b. Peptide bonds
   c. Hydrogen bonds
   d. Tonic interaction

5. Polynucleotide kinase is used
   a. to add a nitrogenous base at the 5' end of DNA
   b. to add a nitrogenous base at the 3' end of DNA
   c. to add a phosphate at the 5' end of DNA
   d. to add a phosphate at the 3' end of DNA

6. The polymer shown below is a component of



   a. polysaccharide
   b. polyribonucleotide

d. polydeoxyribonucleotide

TWO MARKS QUESTIONS (7-24)

7. FOS, JUN and MYC are
   a. proteins expressed on the surface of cancerous cells
   b. protein kinases that phosphorylate transcription factors in cancerous Cells
   c. proteins involved in regulation of expression of genes involved in growth promotion
   d. proteins involved in ion transport n cancerous cells

8. Using micro array technique it was demonstrated that when a mammalian cell line was exposed to a drug, the expression of 10 genes is increased. Which of the following pairs of techniques could be used to validate micro array data?
   a. Southern blotting and polymerase chain r action (PCR)
   b. Northern blotting and fluorescence in situ hybridization
   c. Southern blotting and reverse transcriptase (RT)-PCR
   d. Northern blotting and RT-PCR

9. Pepsin hydrolysis of IgG molecule will result in the production of
   a. one Fc fragment and one F(ab')2 fragment
   b. one Fc fragment and two Fab fragments
   c. one Fe fragment and one Fab fragment
   d. one F(ab')2 fragment and one Fab fragment

10. Select the correct combination to fill in the blanks.

    _____ are responsible for the production of anti body against free pathogens and soluble products from pathogens while _____ destroy pathogen and virally infected cells and abnormal cells
    a. Cytotoxic T cells and B cells
    b. Macrophages and T cells
    c. B cells and Helper T cells
    d. B cells and Cytotoxic T cells

11. Select the correct primer pair for the PCR amplification of the following DNA
    a. 5'-TTTTTTTTTTT-3' and 5'-GGGGGGGGGG-3'
    b. 5'-AAAAAAAA-3' and 5'-CCCCCCCCCC-3'
    c. 5'-TTTTTTTTTTT-3' and 5'-CCCCCCCCCC-3'
    d. 5'-AAAAAAAA-3' and 5'-GGGGGGGGGG-3'

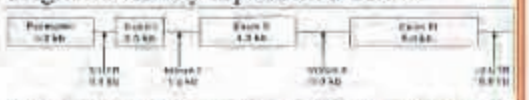
12. The double-reciprocal transformation of the Michaelis-Michaelis-Menten equation, also called the Lineweaver-Burk plot, is given by

$$1/V_0 = K_m/(V_{max}[S]) + 1/V_{max}$$

To determine Km from a double-reciprocal plot, you would
   a. take the reciprocal 0f the y-axis intercept
   b. Lake the reciprocal of the x-axis intercept
   c. multiply the reciprocal of the x-axis intercept by -1
   d. multiply the reciprocal of the y-axis intercept by-1

13. Which of the following statements is INCORRECT?
   a. Most of the eukaryotic eukaryotie mRNAs have a 7-methylguanosine cap at their 5' end
   b. TATA binding protein is involved in the synthesis of mRNA, tRNA and rRNA
   c. Histones have no other function except in chromatin organization
   d. Eukaryotci RNA polymerase II consists of more than 4 subunits

14. The organization of an eukaryotic gene expressed at high levels in liver is diagrammatically represented below:



The size of the mature mRNA generated by the transcription followed by normal splicing of the gene will be (assume that this mRNA is not polyadenylated; 5'UTR and 3'UTR refer to the 5' and 3' untranslated regions, respectively)
   a. 12.4 kb
   b. 13.0 kb

d. 12.6 kb

15. Incubation of a cell extract containing all enzymes of glycolysis with [γ-^{32}P] ATP and unlabeled inorganic phosphate results in the Formation of which of the following labeled compounds (assume that pyruvate kinase is inactivated)?

1. Glucose-6-^{32} Phosphate
2. (3-^{32}P)-Phosphoglycerate
3. (1-Phospho-3-^{32}Phospho)-Bisphosphoglycerate
4. (1-Phospho-6-^{32}Phospho)-Fructose bisphosphate

a. 1 and 3
b. 1, 2 and 3
c. 2 and 4
d. only 4

16. Electrophoresis of a purified protein named X in the presence of sodium dodecyl sulfate and 2-mercaptoethanol, shows, a single band of 45 kDa. In get filtration column chromatography, protein X elutes between alcohol dehydrogenase (160 kDa) and beta-amylase (190 kDa). How many identical subunits is protein X composed of?

a. One
b. Two
c. Three
d. Four

17. Identify the correct pairs for the primary functions of the different enzyme classes

P. Kinases
Q. Lyases
R. Synthases
S. phosphatases

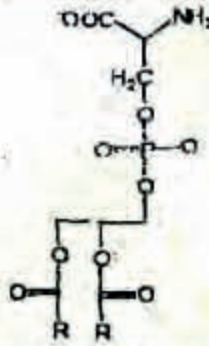
1. cleave bonds by elimination
2. make large molecules from small molecules
3. transfer phosphate group to biomolecules
4. remove phosphate group from biomolecules

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

18. Which of the following statements about the mitochondrial proton gradient and

a. Either of them is su… ke ATP from ADP + Pi
b. Both are required to make A…
c. Usually cancel one another s… system is at equilibrium
d. Neither of them is required for A… synthesis

19. The molecule shown is:

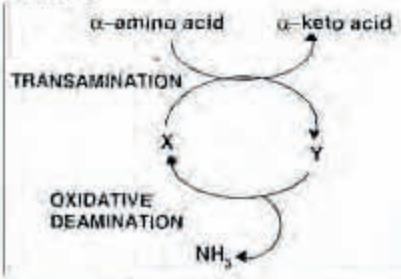


a. Phosphatidylserine
b. Phosphatidyleholine
c. Phosphatidylethanolamine
d. Phosphatidylinositol

20. Melting Curve of two DNA specimens X and Y at the same pH and ionic strength have Tm values of 85°C and 80°C, respectively. This means that

a. the AT content of Y is higher than X
b. the GC content of Y is higher than X
c. the AT content is same in X and Y
d. the GC content of X is higher than Y

21. Pail of the over flow in amino acid catabolism is shown in the figure, Identify X and Y



a. X: L-Glutamate; Y: α-Ketoglutarate
b. X: α-Ketoglutrate; Y: L-Glutamate
c. X: α-Ketoglutrate Y : L-Glutamate
d. X: α-Ketoglutarate; Y: D-Glutamate

22. Which one of the following statements refers to glycogen, and which one refers to cellulose?

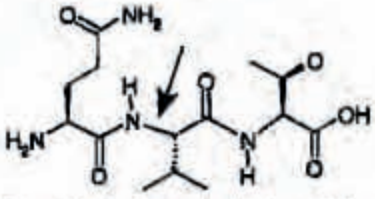
1. Branched molecule containing (1-1, 4-

2. Straight chain molecule containing β-1, 4-glycosidic bond
3. Branched molecule containing α-1, 6-glycosidic bond
4. Straight chain molecule containing α-1, 6-glycosidic bond

a. I = Glycogen; IV = Cellulose
b. II = Glycogen; III = Cellulose
c. III = Glycogen; II = Cellulose
d. IV = Glycogen; I = cellulose

Common Data Questions

Common Data for Questions 23 and 24:



23. The dihedral angle indicated by an arrow in the tripeptide structure corresponds to the
    a. psi angle
    b. phi angle
    c. chi angle
    d. omega angle
24. The amino acid sequence of the above tripeptide is
    a. Glutamine - valine - threonine
    b. Asparagine - valine - serine
    c. Glutamine – leucine - theonine
    d. Asparagine - valine - threonine

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

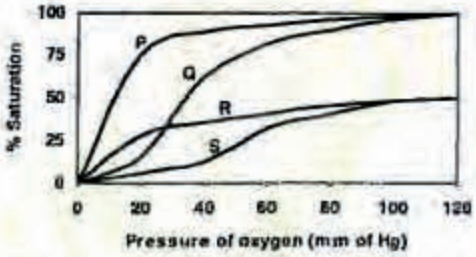
Statement for Linked Answer Question 25 and 26:

Binding of glucagon to its receptor results in the generation of a specific second messenger.

25. Which of the following second messengers is generated in this case?
    a. Calcium
    b. cGMP
    c. Phosphatidylinositol
    d. cAMP
26. Which of the following enzymes is activated by this second messenger?
    c. Phospholipase C
    d. Protein phosphatase 2A

Statement for Linked Answer Questions 27 and 28:

The figure shows the oxygen binding curves for hemoglobin (Hb) and myoglobin (Mb).



27. Identify the collect curves for Hb and Mb
    a. P:Mb; Q:Hb
    b. Q:Mb; P:Hb
    c. R:Mb; Q:Hb
    d. S:Mb; R:Hb
28. Sickle cell anemia arises due to the formation of a hydrophobic patch in one of the proteins shown in the above curves. This is due to the replacement of
    a. Glu 6 by Val 6 in the β subunit of P
    b. Glu 6 by Val 6 in the β subunit of Q
    c. Glu 6 by Val 6 in the β subunit of R
    d. Glu 6 by VM 6 in the β subunit of S

J: BIOTECHNOLOGY

ONE MARKS QUESTIONS (1-6)

1. A themostable DNA polymerase that can carry out both reverse transcription reaction and polymerization has been isolated form
    a. Thermococcus litoralis
    b. Thermus aquaticus
    c. Thermotoga maritime
    d. Thermus thermophilus
2. When present iii tissue culture medium, gibberellin
    a. helps to break dormancy of buds and bulbs
    b. promotes dormancy development in buds and bulbs

d. prevents normal recognition of auxin molecule

3. To promote attachment and spreading of anchorage-dependent animal cells the surface of the culture vessel needs to he coated with
   a. Trypsin
   b. collagen
   c. promise
   d. polyglycol

4. For amplification of GC rich sequences by polymerase chain reaction, identify the reagent that hinds and stabilizes AT sequences and destabilizes GC regions.
   a. Tetramethyl ammonium chloride
   b. Betaine
   c. 7-deaza-2'-deoxyguanosine triphosphate
   d. Sodium dodecyl sulphate

5. Which of the following statements is INCORRECT' about immobilized plant cell cultures?
   a. It is possible to use high cell densities
   b. Cells remain active for long periods
   c. Cell products or inhibitors can be removed easily
   d. It provides low shear resistance to cells

6. All the cells that participate in immune responses originate from a population of
   a. neutrophils
   b. stem cells
   c. macrophages
   d. lymphocytes

7. Identify the natural plant growth regulators coin the following list.
   (P) Zeatin
   (Q) Benzylaminopurine (BAP)
   (R) Indole-3-acetic acid (IAA)
   (S) 2, 4-D Dichlorophenoxyacetic acid
   a. P, Q
   b. Q, S
   c. P, R
   d. R, S

8. A hybrid derived from the fusion 01 : a myeloma cell (HPRT$^-$) with an antibody secreting B-lymphocyte (HPRT$^+$) can be selected to produce monoclonal antibody by growing in a medium containing
   a. thiamine, hypoxanthine, aminopterin
   d. thymidine, hypoxanth… …in

9. Match items in group 1 … options from those given in grou…
   Group I
   P. VNTR sequence
   Q. Leader sequence
   R. SD sequence
   S. cis-acting sequence
   Group 2
   1. Gene regulation on the same chromosome
   2. Ribosome binding site
   3. DNA finger printing
   4. Functions in attenuation
   Codes;

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

10. During cultivation of microorganisms in a fermenter, various parameters are controlled by appropriate sensor (probe). Match each probe in group 1 with the appropriate response mechanism in group 2.
    Group 1 (Probe)
    P. Thermistor
    Q. Oxygen electrode
    R. Metal rod
    S. pH electrode
    Group 2 (Response)
    1. Activation of acid / alkali pump
    2. Activation of vegetable oil pump
    3. Activation of hot / cold water pump
    4. Increase / decrease in stirrer motor speed
    Codes;

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

11. Which of these mice fall to develop a thymus?
    a. Motheaten mice
    b. Beige mice
    c. Knock out mice

12. What are the experimental steps needed for screening all expression library for crone encoding a protein X that has been isolated and purified?
(P) n-RNA isolation
(Q) Ant body preparation
(R) Cloning into an appropriate vector
(S) Western blotting on transferred plaques
a. P, S
b. Q, S
c. Q, R
d. R, S

13. When electroporation is used for introducing DNA into mammalian cell
(P) A carrier for DNA is not required
(Q) The lips bilayer (membrane) interacts with an electric pulse to generate permeation sites
(R) The viability of the cell becomes approximately zero percent
(S) The first step involves absorption of DNA on the cell membrance
a. P, Q
b. Q, R
c. P, S
d. Q, S

14. Immobilization of enzymes using entrapment method requires
(P) photosensitive polyethylene glycol dimethacrylate
(Q) CNBr activation of sepharose
(R) Polyfunctional reagent like hexamethylene diisocyanate
(S) Radiation of polyvinyl alcohol
a. P, Q
b. R, S
c. P, S
d. Q, S

15. Which one of the following monolayer culture systems have tile highest surface area medium ratio?
a. Roux bottle
b. Spiracell roller bottle
c. Hollow fibres
d. Plastic hag/film

16. Majority of the cereals are highly recalcitrant to agro bacterium-mediated transformation, and so direct transformation methods have been methods is applicable [illegible]lant tissues?
a. Calcium chloride and PE[illegible] transformation
b. Liposome-mediated transformation
c. Electro oration
d. Transformation using micro projectiles

17. Match items in group 1 with correct options from those given n group 2
Group 1
P. Tissue plasminogen activator
Q. Gamma interferon
R. Podophyllotoxin
S. Polyhydroxyalkanoate
Group 2
1. Immnomodulator
2. Biodegradable plastic
3. Clot dissolution
4. Anti-tumor agent
Codes:

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

18. Match items in group 1 with correct options from those given in group 2
Group 1
P. Amperometric biosensor
Q. Evanescent wave biosensor
R . alorimetric biosensor
S. Potentiometric biosensor
Group 2
1. Light beam
2. Flux of redox electrons
3. Field effect transistors
4. Exothermic reaction
Codes;

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

19. For prediction of three dimensional structure of protein
(P) homology mode tries many possible alignments
(Q) threading first identifies homologues

(S) homology modeling optimizes one model

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

20. Immobilization of enzymes

(P) Increases the specificity of the enzyme for its reactants
(Q) Facilitates reuse of the enzyme in batch reactions
(R) Makes it unsuitable for its us ill a continuous reactor system
(S) Decreases the operational cost of the industrial process

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

21. Which of the following would result in somaclonal variation in micro propagated plants?

(P) Propagation by axillary branching in the absence of plant growth regulators
(Q) Cell suspension maintained for five years before induction of somatic embryogenesis
(R) Callus induction using 20 μM 2, 4-Dichlorophenoxyacetic acid followed by shoot organogenesis
(S) Shoot organogenesis from an explant in the absence of an intermediate callus phase

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

22. The enzymes that can be used in 5' end labeling of DNA are

a. Alkaline phosphatase
b. DNA ligase
c. Terminal transferees
d. Polynucleotide Kinase

Common Data Questions

Common Data for Questions 23 and 24:

Lignocelluloses biomass was subjected to microbial compositing. The microbial consortium Produced an extra cellular enzyme xylanase weight of 68 kDa and a posi... An aqueous extract of the enzyme co... prepared from the compost.

23. What techniques would you recom... for confirming the molecular weight of t... purified enzyme?

(P) Isoelectric focusing
(Q) SDS-PAGE
(R) Native PAGE
(S) Gel filtration

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

24. If Con A sepharose column was used for the purification of enzyme, the separation would be based on

a. molecular exclusion
b. affinity binding
c. on exchange
d. hydrophobic interaction

Linked Answer Questions: Q.25 to Q.28 carry two marks each, Statement for Linked Answer Questions 25 and 26:

DNA content of Caenorhabditis elegans was analyzed and found to contain 1.0×10^8 bp.

25. How many standard? λ-phage vectors carrying 20kb DNA fragments or YACs carrying 250 kb DNA fragments are theoretically required to constitute a complete C. Elegans genomic library?

a. 500 λ-phage vectors or 40 yeast clones
b. 400 λ-phage vectors or 5000 yeast clones
c. 5000 λ-phage vectors or 400 yeast clones
d. 5×10^4 λ-phage vectors or 4000 yeast clones

26. How many λ-phage vectors / yeast clones should he prepared in order to ensure that every sequence is included in the library?

a. 25×10^3 λ-phage vectors / 2000 yeast clones
b. 20×10^3 λ-phage vectors / 1600 yeast clones
c. 5×10^4 λ-phage vectors / 4000 yeast

d. 10×10^4 λ-phage vectors / 10000 yeast clones

Statement for Linked Answer Questions 27 and 28:

A bioreactor of working volume 50 m^3 produces a metabolite (X) in batch culture under given operating conditions from a substrate (S). Then final concentration of metabolite (X) at the end of each run was 1.1 kg m^{-3}. The bioreactor was operated to complete 70 runs in each year.

27. What will be the annual output of the system (production of metabolite (X)) in kg per year?
    a. 55
    b. 3850
    c. 45.5
    d. 77
28. What will be the overall productivity of the system in kg $year^{-1}$ m^{-3}?
    a. 19250
    b. 38.50
    c. 3850
    d. 77

K: BOTANY

ONE MARKS QUESTIONS (1-6)

1. Penicillin functions as antibiotic mainly by inhibiting the ability of some bacteria to
    a. Form spores
    b. Replicate DNA
    c. Synthesize normal Cell wall
    d. Produce functional ribosome
2. Glyoxylate cycle is used for generating
    a. Cyclic adenosine monophosphate
    b. Precursors for synthesis of aromatic amino acids
    c. 4-carbon intermediates when cells grow on acetate
    d. 4-carbon intermediates during growth on hexose
3. Agar-agar is produced by
    a. Gelidium, Gracilaria and Gigartina
    b. Lamanaria, Lessonia and Eisenia
    c. Gelidium, Batrachospermum and
    d. Polysiphonia, Batrac[illegible]nd Sargassum
4. Which of the following par of [illegible] cell walls thickened with lignin?
    a. Collenchyma and cork
    b. Collenchyma and sclerenchyma
    c. Sclerenchyma and cork
    d. Sclerenchyma and xylem
5. Identify the mismatched corn pound
    a. Pectin
    b. Gum
    c. Cutin
    d. Agar
6. The second law of thermodynamics is represented by
    a. Energy pyramid
    b. Number pyramid
    c. Food pyramid
    d. Biomass pyramid

TWO MARKS QUESTIONS (7-24)

7. In Krebs cycle which of the following enzyme reactions release CO_2?
    P Malate dehydrogenase
    Q Succinate dehydrogenase
    R Isocitrate dehydrogenase
    S α-ketoglutarate dehydrogenase
    a. P, Q
    b. Q, R
    c. P, R
    d. R, S
8. Which of the following statements are features of fasiculated root?
    P An interesting tuberous root found in Asparagus
    Q The adventitious roots occur in clusters a id all are swollen
    R It is fusiform with abrupt tapering towards the lower end
    S The roots glow from the base of the plumules
    a. P, Q
    b. Q, R
    c. P, R
    d. R, S
9. Consider a cross between plants heterozygous hr two different genes (AaBh

What fraction of progeny will show the recessive phenotype for at least one gene?

a. 1/16
b. 9/16
c. 7/16
d. 3/16

10. Global warming is due to excessive emission of

P Carbon dioxide
Q Oxides of nitrogen
R Oxides of sulphur
S Hydrogen suiphide

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

11. A disease free tomato plant was planted in soil contaminated with Agrobacterium tumefacients harboring Ti plasmid that lacks VirA gene. Provided all other conditions are optimum for the bacterial infection, identify the appropriate consequence

P Octapine synthesis by the bacterium will enhance
Q Acetylsyringone receptor will not be synthesized
R The bacteria will fail to transfer the T DNA to the plant
S A fragmented T-DNA will be transferred to the tomato plant

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

12. Identify the correct statements for plantibodies

P Plantibodies are antibodies generated by bacteria
Q Plantibodies are pre made antibodies that are produced in transgenic plants
R Plantibodies can not uncoat the calcium ion binding sites on the coat protein of the virus
S Plantibodies are toxins produced by plants

a. P, R
b. R, S

13. Following is a DNA [illegible]ted from the beginning of a gen[illegible] correct mRNA sequence w[illegible] polatity.

DNA sequence: -
-CCC TAC GCC TTT CAG GTT-
-GGG ATG CGG AAA GTC CAA-

a. 3' AUG CGG AAA GUU CAA 5
b. 5' AUG COG AAA GUC CAA 3'
c. 5' UAC GCC UUU GUC CAA 3'
d. 3' UAC GCC UUU GAG GAA 5'

14. Achyranthus aspera and Delphinium staphisagria belong to the following families

a. Amarantheceae and Rutaceae
b. Amarantheceae and Ranunculaceae
c. Amarantheceae and Tiliaceae
d. Tiliaceae and Ranunculaceae

15. Active transport of ions across the membrane of a root hair cell can be assumed to be taking place if

P The cell produces more glutathione
Q The cell has mitochondria
R The uptake of ions stops when cyanide is added
S The uptake of ions is against the concentration gradient

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

Q. 16 - Q. 22 are matching exercises. In each question, each item A, B, C and D in Group I matches one of the items in Group II. Choose the correct match from the alternatives a, b, b and d.

16. Group I (Plant disease)

A. Nigrospora disease of lice
B. Loose smut of wheat
C. Ring spot of sugarcane
D. Leaf blotch of wheat

Group II (Causal organism)

1. Ustilago nuda
2. Cercospora concors
3. Septoria tritici
4. Pyricularia oryzae
5. Leptosphaeria sacchari

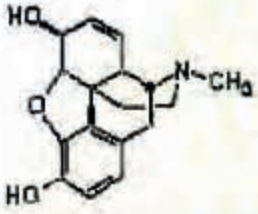
Codes;

	A	B	C	D
a.	6	1	3	2
b.	6	1	4	3
c.	6	1	5	3
d.	6	4	3	2

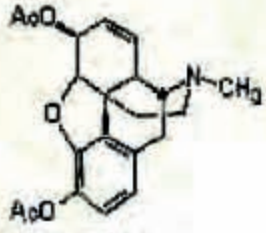
17. Group I (Fungal toxin)
A. Tabtoxin
B. Phaseolotoxin
C. Tentotoxin
D. Hv toxin
Group II (Causal disease)
1. Canker
2. Leaf blight
3. Chlorosis
4. Halo bligh
5. Wildfire
6. Wheat rust
Codes;

	A	B	C	D
a.	1	2	3	6
b.	5	4	3	2
c.	2	4	6	3
d.	4	5	6	1

18. Identify the compounds from the given structure
Group I (Structure)
A.



B.



Group II (Alkaloids)
1. Morphine
2. Vincristine
3. Heroin
4. Cocaine
Codes;

a.	1	2
b.	4	3
c.	3	1
d.	1	3

19. Group I
A. Filamentous fungi
B. Gram staining of bacteria
C. Agarose gel
D. Amino acid
Group II
1. Malachite green
2. Silver staining
3. Lactophenol-cotton blue
4. Crystal violet-safranin
5. Ethydium bromide
6. Ninhydrin reagent
Codes;

	A	B	C	D
a.	2	4	5	1
b.	3	6	2	5
c.	6	1	3	2
d.	3	4	5	6

20. Group I
A. Polysymbiosis
B. Helotism
C. Mycobiont
D. Crustose lichen
Group II
1. Algal component of a lichen
2. Fungal component of a lichen
3. Pendant forms
4. A combination of algae, fungi and nitrogen fixing bacteria in a lichen thallus
5. Lichen which form a crust closely adpressed to the substrate
6. A partnership between two organisms in which the association is decided at the expense of one

Codes;

	A	B	C	D
a.	1	2	3	4
b.	4	6	2	5
c.	2	6	3	4
d.	6	5	1	3

21. Group I (Meiosis I)
A. Zygonema
B. Diplonema

D. Metaphase I

Group II (Event)

1. Nucleolus and nuclear membrane disappear
2. Replicated chromosomes become visible
3. Assembly of spindle completed
4. Chromatids become fully visible, chiasmata becomes visible
5. Homologous chromosomes pair, crossing over occurs
6. Homologous chromosomes pair

Codes;

	A	B	C	D
a.	6	2	4	5
b.	1	2	5	4
c.	5	2	1	6
d.	6	4	1	3

22. Group I (Stress-induced biomolecules)

A. Phytochelatin
B. Scytonemin
C. Proline
D. Chaperonin

Group II (Stress)

1. Heat shock
2. Phosphate limitation
3. Carbon limitation
4. Metal stress
5. UV radiation
6. Osmotic stress

Codes;

	A	B	C	D
a.	2	5	6	1
b.	3	4	6	2
c.	4	5	6	1
d.	1	6	4	3

Common Data Questions

Common Data for Questions 23 and 24:

Nucleotide corn position of our molecules is given below:

Molecule	% A	% G	% T	% U	% C
P	33	17	33	0	17
Q	33	33	17	0	17
R	26	24	0	26	24
S	30	20	0	20	30

23. Thom the above table identify the single stranded RNA molecule

a. P

d. S

24. From the above data find o… stranded nucleic acid molecul… lowest T_m

a. P
b. Q
c. R
d. S

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

Statement for Linked Answer Questions 25 and 26:

Sucrose and maltose are two disaccharides which have the glycosidic linkages and play important role in living system.

25. Which of the following combination represent the correct structure of maltose and sucrose?

a. O-α-D-glucopyranosyl-(1→4)-β-D-glucopyranose and
O-β-D-galactopyranosly-(1→4)-β-D-glucopyranose

b. O-β-D-fructofuranosyl-(2→1)-α-D-glucopyranoside and
O-β-D glactopyranosyl-(1→4)-β-D-glucopyranose

c. O-α-D glucopyranosyl-(1→4)-β-D-glucopyranose and
O-β-D-fructofuranoslyl-(2→1)-α-D glucopyranoside

d. O-α-D glucopyranosyl-(1→6)-β-D-glucopyranose and
O-β-D-fructofuranosyl-(2→1)-α-D glucopyranoside

26. From the above structure, identify the correct statement for the reducing sugars

a. Maltose is a reducing sugar because the second glucose possesses anomeric carbon atom and its ring can open to give an aldehyde and sucrose is non-reducing as it has anormeric hydroxyl of α-D glucose which is condensed with the anomeric hydroxyl of β-D-fructose

b. Maltose is a non-reducing sugar as it has anomeric hydroxyl of α-D glucose which is condensed with β-D-fructose,

carbon atom and its ring can open to give au aldehyde

c. Maltose and sucrose are insoluble in water and thus non-reducing

d. The formation of a glycosidic bond is a condensation reaction in which water molecule is produced which makes the compound non-reducing

Statement for Linked Answer Questions 27 and 28:

The plant Arabidopsis thaliana has five pail-s of chromosomes AA, BE, CC, DD and EE and the plant is self fertilized.

27. Identify the correct chromosomal complement present in the root cells of the offspring
    a. A B C D E
    b. AAAA BBBB CCCC DDDD EEEE
    c. AA BB CC DD EE
    d. AAA BBB CCC DDD EEE
28. If the offsprings are selfed, identify the correct genotype of pollen mother cell of H_2 generation
    a. AAAA BBBB CCCC DDDD EEEE
    b. AA BB CC DD EE
    c. A B C D E
    d. AAA BBB CCC DDD FEE

L: MICROBIOLOGY

ONE MARKS QUESTIONS (1-6)

1. Which of the following scientists developed the modern concept of chemotherapy and chemotherapeutic agents?
    a. Robert Koch
    b. Paul Ehrlich
    c. Joseph Lister
    d. Louis Pasteur
2. The refractive index of the immersion oil used in microscopy to achieve higher resolution is
    a. Same as glass
    b. Less than air
    c. Less than glass
    d. Same as air
3. The refractive index of th oil used in microscopy to a resolution is
    a. Same as glass
    b. Less than air
    c. Less than glass
    d. Same as air
4. Which uric of the following s nol a lymphocyte?
    a. B-cell
    b. T-cell
    c. Nit-cell
    d. Mast-cell
5. Which of the following organism has a single stranded positive sense RNA genome?
    a. Influenza virus
    b. Poliovirus
    c. Hepatitis B virus
    d. Pox virus
6. Cyanobacteria comprises a large and morphologically heterogenous group of
    a. Chemoautotrophs
    b. Photoheterotrophs
    c. Photoautotrophs
    d. Chemoheterotrophs

TWO MARKS QUESTIONS (7-24)

7. In the peptidoglycan layer of bacterial cell wall, which of the following pair of aminoacids are usually found in D-configuration?
    a. Alanine and glutamic acid
    b. Alanine and lysine
    c. Alanine and arginine
    d. Glutamic acid and lysine
8. Which of the following inclusion bodies contains the enzymes responsible for carbon dioxide fixation in bacteria?
    a. Lysosomes
    b. Peroxisomes
    c. Metachromatic granules
    d. Carboxysomes
9. When bacterial cells are placed in a 2M NaCl solution, the plasmamembrane will
    a. Burst
    b. Undergo plasmolysis

10. Which of the following couple will have the maximum tendency to donate electrons? (Redox potentials are given in (he parenthesis)
    a. $2H^+ / H_2$ (-0.42V)
    b. $NAD^+ / NADH$ (-0.32V)
    c. NO_3^- / NO_2^- (+0.42V)
    d. $\frac{1}{2} O_2 / H_2O$ (+0.82V)

11. Match the following group of microorganism with their oxygen requirements.

Group of microorganisms	Oxygen requirement
P. Obligate aerobe	1. Grows equally well in presence or absence of oxygen
Q. Microaerophile	2. Grows only in presence of oxygen
R. Obligate anaerobe	3. Cannot tolerate oxygen
S. Aerotolerant anaerobe	4. Can grow only at reduced oxygen levels

    a. P-3; Q-1; R-2; 5-4
    b. P-4; Q-3; R-2; S-1
    c. P-2; Q-4; R-3; S-1
    d. P-1; Q-4; R-3; S-2

12. In which of he following cases of microbial growth, lag phase usually does not occur?
    a. If inoculum is taken from old (stationary phase) culture and inoculated into same medium
    b. Inoculum consists of damaged cells (hut not killed), inoculated into the same medium
    c. Inoculum is transferred from a rich culture medium to a poorer one
    d. If an exponentially growing culture is inoculated into the same medium under the same condition of growth

13. Which one of the following statements is INCORRECT about bacterial endospore?
    a. Core pH is about 5.5 to 6.0
    b. Resistant to lysozyme
    c. Dipicolinic acid is present
    d. Small acid soluble protein is absent

14. The following reaction of glyoxylate cycle requires two enzymes P and Q

    Isocitrate $\xrightarrow{P}$ succinate + glyxylate

    Glyoxyloate + acetyl CoA $\xrightarrow{Q}$ malate + CoA

    Which of the following combinations is the true representative of P and Q?
    a. Isocitrate lyase and malate synthase
    b. Isocitrate lyase and malate
    c. Isocitrate dehydroxyg… late dehydrogenase
    d. Isocitrare dehydrogenase a… synthase

15. Which of the following statements is … included in Koch's postulate?
    a. A specific organism can always be found in association with a given disease
    b. The organism can be isolated and grown in pure cultures in the laboratory
    c. The pure culture will produce the disease when inoculated into susceptible animal -
    d. It is possible to clone the organism of the organism from the experimentally infected animal

16. The commercially used technique for pasteuization of milk involves low temperature holding (LTH) and high temperature short time (HTST) methods. Which of the following methods is INCORRECT?
    a. expose milk to 145°F for 30 min
    b. expose milk to 161°F for 15 Sec
    c. expose milk to 143°F for 30 mm
    d. expose milk to 71.7°C for 15 sec

17. The phenomenon in which a prophage is able to make canges in the properties of a host bacterium in lysogeny is termed as
    a. Immunity repress on
    b. Lysogenic induction
    c. Lysogenic con version
    d. Lytic infection

18. Phage typing is frequently used in medical diagnosis for the identification of certain strains of pathogens, such as
    a. Staplylococci
    b. Enteroviruses
    c. Plasmodium falciparum
    d. Leishmania donovani

19. Which of the following virus needs a helper virus for their genome replication?
    a. Hepatitis A
    b. Hepatitis D
    c. Hepatitis C
    d. Hepatitis E

20. Which of the following viruses usually causes "latent infection" in the human

a. Poliovirus
b. Japanese Encephalitis virus
c. Herpes simplex virus type I
d. Rabies virus

21. Match the correct combination of toxin and the mode ct action

Taxin	Mode of action
P. Peitussis toxin	1. Prevents releases of glycine by nerve end
Q. Diptheria toxin	2. Blocks G-protein signal transduction
R. Botulinum toxin	3. Induces fluid loss from intestinal cells
S. Tetanus toxin	4. Inhibits protein synthesis in eukaryotes
	5. Causes haemolysis
	6. Blocks release of acetylcholine by nerve end

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

22. The following antibiotics affect the bacterial protein synthesis with their site of action. Which of the following combinations is coned?

Antibiotic

P. Streptomycin
Q. Tetracyclin
R. Erythromycin
S. Chloramphenicol

Site of action

1. Aminoacyl tRNA association with ribosome
2. Transpeptidation
3. Translocation
4. initiation of protein synthesis

Codes;

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

Common Data Questions

Common Data for Questions 23 and 24:

Besides the repression / derepression control of tryptophan codons within the tr... this phenomenon. The presence of tryptophan tRNA$_{trp}$ causes the premature term... transcription yields a 140 nucleotide lon... sequence transcript. By site-directed mutage... the two UGG Trp codons of the tipL sequen... were modified to CGG, arginine codon (arg).

23. Which of the following amino acid(s) would be able to restore the attenuation control of trp operon?
    a. Tryptophan alone
    b. Arginine alone
    c. Ttyptophan or arginine
    d. Neither arginine nor tryptophan

24. Eeletion of part of the trpL region will result in
    a. Increase in the rate of expression of 'trp' structural genes
    b. Decrease in the rate of expression of 'trp' structural genes
    c. No change in the rate of expression of up structural genes
    d. inhibition of the expression of all the genes in the operon

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

Statement for Linked Answer Questions 25 and 26:

The nucleic acid from a microorganism was isolated and dc base composition was determined to be as follows:

A = 35%, T = 15%, G = 35%, C = 15%

25. What could be the physical nature of the nucleic acid?
    a. Double stranded circular DNA
    b. Double stranded linear DNA
    c. Single stranded linear DNA
    d. Single stranded RNA

26. The optical density of the above nucleic acid was measured at 260 nm wave length at 37°C and 95°C What possible changes could you expect in the optical density with the increase in temperature?
    a. Significant increase
    b. Only two fold increase
    c. Significant decrease
    d. No significant change

Statement for Linked Answer Questions 27 and 28:

In a bacterial culture initial cell population is 1 x 10^3 cells. The generation time of the bacterial cell is 20 minutes and the lag phase is 1 hour,

27. If the culture is allowed to grow for 4 hours, how many generations would take place?
    a. 8
    b. 12
    c. 10
    d. 9
28. What will be the cell population after 3 hours?
    a. 6.4×10^6
    b. 3.2×10^4
    c. 3.2×10^6
    d. 6.4×10^4

M : ZOOLOGY

ONE MARKS QUESTIONS (1-6)

1. Which one of the following statements about amino acids is true
    a. All amino acids can form hydrogen bonds
    b. Only hydrophilic amino acids can form hydrogen bonds
    c. Hydrophobic amino acids cannot form hydrogen bonds
    d. Amino acids in general do not participate in hydrogen bonds
2. Biological membranes control flow of in formation between cells and their environment. Which of the following attributes is true for biological membranes?
    a. Symmetric
    b. Fluid structures
    c. Covalent assemblies
    d. Electrically depolarized
3. A "leader sequence" in an mRNA of eukaryotes can he found
    a. after the 'stop' codon
    b. between transcriptional start site and translational start site
    c. within the first exon
    d. in the exon-intron boundaries
4. Most cells are so small a[illegible]int in the size could be
    a. due to the surf ace-to-volum[illegible]
    b. that the low of nutrients in lar[illegible] will be much faster and therefor[illegible] not he controlled
    c. that larger cells might move material too fast through cytoplasm, leading to inefficient functioning
    d. to prevent contacting other cells
5. Which of the following is a population?
    a. A spider and flies trapped in its web
    b. All the plants that live near each other in a forest
    c. The earthworms that jive in a grassland plus the earthwomm that live in a forest
    d. All the sandalwood trees in a forest
6. Which of the following cells are parts of the nonspecific, second line of defense?
    a. Cytotoxic T cells
    b. B cells
    c. Prostagandins
    d. Macrophages

TWO MARKS QUESTIONS (7-24)

7. Mammalian hair evolved torn the scales of reptiles. On the other hand. the "hair" On many insects, such as bees, has a completely different on gin These facts mean that the hair of mammals and the hair of insects are
    a. Congruent structures
    b. Homologous structures
    c. Heterogonous structures
    d. Analogous structures
8. Rhodopsin is a transmembrane protein belonging to the large family of G protein-coupled receptors. It is found in tile discs of rod cells of human retina. Activation of rhodopsin is due to
    a. phosphorylation of its extracellular tyrosine residue
    b. binding of external ligands to its extracellular loops
    c. photoisomerization of its prosthetic group
    d. binding of calcium ions to its

9. In an equilibrium population, thousands of eggs and hundreds of tadpoles are produced by single pair of frogs. On average, about how many offspring per pair will live to reproduce 'ill flex t season?
   a. 0
   b. 2
   c. 10 to 20
   d. above 100

10. A man is admitted to the hospital suffering from an abnormally low body temperature, loss of appetite, and extreme thirst. A brain scan shows a tumor located in the
   a. hypothalamus
   b. cerebellum
   c. pons
   d. right cerebral hemisphere

11. The British geneticist. LBS. Haldane, once jokingly said that he would lay down his life for two brothers or eight cousins. In terms of altruistic behavior, Haldane would do this because
   a. either two brothers or eight cousins would result in as much representation of Haldane's genes as would two of his own offsprings
   b. Haldane's death would enhance the fitness of his brothers and cousins
   c. Haldane loved his brothers and cousins
   d. none of the above mentioned statements reflect altruistic behavior

12. An unwound DNA and a supercoiled DNA with the same linking number are
   a. topologically and geometrically identical
   b. topologically and geometrically different
   c. topologically identical but geometrically different
   d. topologically different but geometrically identical

13. Evolution is often ref cried to as speciation. Which is the most con-cut statement with respect to speciation?
   a. Inheritance of the gene pool from one generation to the other
   b. Origin of new character in a group of geographically isolated individuals
   c. Origin of distinct physical identities
   d. Origin of reprodu ion amongst the races of a gi

14. Modem day giraffes are believ descended from predecessors with necks. Darwinian theory of survi fittest would mean the following (sel the most likely explanation)
   a. Giraffes with longer necks were stronger and therefore they out-populated those with shorter necks
   b. Long-necked giraffes foraged better and therefore survived better than those with shorter necks
   c. Long-necked giraffes bred more than those with shorter necks
   d. During certain physical calamity all the short-necked giraffes perished from the face of the earth

15. Which one of the following choices does NOT correctly pair a biome with some of its characteristics?
   a. Temperate deciduous forest: cold winters, moderate to high rainfall
   b. Grassland: cool to cold winters, dry summers
   c. Taiga: Very cold winters, short growing seasons
   d. Savanna: long, cold winters, summer thaws of only the upper layers of soil

16. Uric acid is the nitrogenous waste by birds, insects and many reptiles. An advantage of excreting uric acid is that it but a disadvantage is that _____, but a disadvantage is that it _____
   a. saves water ..... costs energy
   b. saves energy ..... is highly toxic
   c. is not very toxic .....wastes a lot of water
   d. saves water ..... is highly toxic

17. In animal behavior, the term "imprinting" implies
   a. Innate behavior of a given animal which is genetically determined
   b. Learned behavior which the animals display during various stages of its life
   c. A time-dependent form of learning behavior by exposure to sign stimulus
   d. None of the above

18. In a series of immune system experiments, the thymus glands were removed from

a. The mice suffered from numerous allergies
b. The mice never developed cancerous tumors
c. The mice suffered from autoimmune diseases
d. The mice readily accepted tissue transplants

19. After eutrophication due to sewage contamination, a lake often becomes inhospitable to fish. Why?
a. Sewage input to a lake reduces the penetration of light into the lake, which results in the death of all the fish
b. Sewage is rich in nutrient and hence results in the explosive growth of algal and cyan bacterial populations. This reduces the penetration of light into the lake, which results in the death of all the fish
c. Sewage input to a lake causes explosive growth of algal and cyanobacterial populations. Bacterial decomposition of dead algae and cyanobacteria results in the depletion of oxygen in the water, which leads to the death of all the fish
d. Sewage input causes the death of algae and cyanobacteria, which eventually reduces the availability of food for fish within the lake

20. A baby is born with the normal number and distribution of rods, but no cones in his eyes. We would expect that the baby's vision would he
a. color-blind, easily blinded by bright light, and capable only of coarse resolving power
b. normal on the left side of the visual field hut blurred and gray on the right side
c. normal on the right side of the visual field hut totally blind on the left side
d. the baby would be totally blind

21. When body temperature is too _____, _____ helps to correct the situation because it _____
a. high……peripheral vasodilation…… dissipates heat at the surface
b. high……sweating……lowers the metabolic rate by dumping toxic ions
c. low……shivering…… the metabolic rate and co… sugar
d. low……peripheral vasodilati… conserves heat in the inner body

22. Blastomeres derived from early stages cleavage divisions (say second cleavage division) of frog embryo, when separated, can give rise to viable tadpoles. The blastomeres derived from late cleavage stages, however, fail to develop into normal tadpoles when separated from each other. Which is the most correct statement that explains the phenomenon?
a. Each early blastomere carries the entire genetic information for the development of a tadpole
b. Each early blastomere carries the entire cytoplasmic constituents necessary for development
c. Early blastomeres are mirror images of each other
d. None of the above

Common Data Questions

Common Data for Questions 23 and 24:

A major breakthrough in animal science research was achieved when the sheep "Dolly" was born to a foster mother. This represents the first case of cloning in mammals.

23. Dolly was a replica of one of its parents because
a. she received mitochondrial DNA From the foster mother
b. she was born out of asexual reproduction
c. she received entire genetic complement from one of her parents
d. she completely resembled one of her parents

24. Dolly, however, was distinct from her cousin, a transgenic sheep, due to one of the following reasons
a. Dolly received stern cells from her parents while her transgenic cousin received only specific gene(s)
b. Dolly was genetically identical to the donor parent while her transgenic cousin was not

c. Dolly phenotypically resembled her donor parent while her transgenic cousin did not
d. None of the above

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

Statement for Linked Answer Questions 25 and 26:

Hormones coordinate the menstrual and ovarian cycles in human females in such a way that growth of the follicle and ovulation are synchronized with the preparation of the uterine lining for possible implantation of an embryo. Five hormones participate in all elaborate schemes, involving both positive and negative feed-back controls.

25. The five critical hormones involved in the menstrual and ovarian cycles are
    a. GnRH, FSH, LH, estrogen and progesterone
    b. Prolactin, FSH, LH, MIS and androgen
    c. Prolactin, FSH, LH, progesterone and ox ytocin
    d. GnRH FSH, LH, estrogen and prolactin
26. Which one of the following statements is correct in explaining the feed-back control mechanisms regulating lie reproductive cycles in human female?
    a. Whereas a slow rise of progesterone inhibits the secretion of FSH and LH, high concentrations of progesterone have the opposite effect and stimulate the secretion of FSH and LH from the anterior pituitary
    b. Whereas a slow rise of estrogen inhibits the secretion of pituitary gonadotropins, high concentrations of estrogen have the opposite effect and stimulates the secretion of gonadotropins by acting on the hypothalamus to increase ts output of GnRH
    c. Whereas the slow rise of GnRH stimulates the release of LH and FSH, High concentrations of GnRH have the opposite effect and stimulates the secretion of LH and FSH
    d. Whereas the lower concentration of estrogen, higher co of prolactin have opposit stimulates the release of esti

Statement for Linked Answer Questions 27 28:

In the fruit fly, Drosophila cinnabar and brown refer to two mutant eye colorations in the adult eye which are otherwise dark brown in the wild type flies. In a genetic cross, mutant male flies with cinnabar eye color were mated with females with brown eye color. Following results were seen in Fl and F2 progeny: all Fl Flies displayed wild type eye color while of the 465 F2 progeny derived by intercross of Fl progeny, 274 were wild type, 85 were cinnabar, 95 were brown and finally, 11 flies displayed no eye color (white-eyed).

27. F1 progeny display wild typo eye color due to
    a. additive effect of two mutations: each mutant version being only part of the wild type eye color
    b. complementation between the two mutations since they represent two separate genes
    c. lack of comp Ic men tat ion between the two mutations since the are on the same eye coloration gene
    d. because these mutations represent two different genes which recombine n the progeny
28. What explains the origin of the new eye phenotype (no eye color-white) in the F2 progeny?
    a. Genes, mutated in flies showing brown and cinnabar eye colors, are linked
    b. These two genes (represented by cinnabar and brown eye colorations) DO NOT display di-hybrid ratio
    c. The flies displaying no eye color (white) are actually mutant for both cinnabar and brown eye coloration genes
    d. Genes mutated for brown and cinnabar eye colorations display segregation distortion