

Roll No:

Application No:

Name:

 Exam Date: **06-Oct-2020**

 Exam Time: **15:00-18:00**

 Examination: **1. Course Code - Ph.D.**
2. Field of Study - Life Sciences Group -II (GTWH)
SECTION 1 - PART I
Question No.1 (Question Id - 113)

Given below are two statements

Statement I:

Air sac in pigeon are not respiratory in function as they are non-vascular structure.

Statement II:

Air sac in pigeon are respiratory in function as they are formed by the dilation of mucous membrane of bronchus.

 In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☐ Both **Statement I** and **Statement II** are correct
- (B) ☐ Both **Statement I** and **Statement II** are incorrect
- (C) ☒ **Statement I is correct but Statement II is incorrect (Correct Answer)**
- (D) ☐ **Statement I** is incorrect and **Statement II** is correct

Question No.2 (Question Id - 109)

 Match the name of animals mentioned in **List-I** with the structure/function mentioned in **List- II**.

List-I	List-II
(name of animals)	(structure/function)
A. Earthworm	I. Hemocoel
B. Mollusks	II. Resemble vertebrate kidney
C. Nephridia	III. Closed circulatory system
D. Leeches	IV. Live in fresh water

 Choose the **correct** answer from the options given below:

- (A) ☒ **A - III, B - I, C - II, D - IV (Correct Answer)**
- (B) ☐ A - I, B - IV, C - II, D - III
- (C) ☐ A - I, B - II, C - III, D - IV
- (D) ☐ A - IV, B - II, C - I, D - III

Question No.3 (Question Id - 119)

 An enzyme catalyzed reaction has a K_m value of 5 mM and a V_{max} of 2.5 nM s^{-1} . What is the reaction velocity when the substrate concentration is 20 mM ?

- (A) ☐ 2 mM s^{-1}
- (B) ☒ **2 nM s^{-1} (Correct Answer)**
- (C) ☐ 2.5 mM s^{-1}
- (D) ☐ 4 nM s^{-1}

Question No.4 (Question Id - 101)

Statement I:

In isometric contraction, length of the muscle does not change. Tension increases and then decreases.

Statement II:

In isotonic contraction, the muscle get shorten during the time when tension is being generated.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☐ **Both Statement I and Statement II are true (Correct Answer)**
(B) ☐ Both **Statement I** and **Statement II** are false
(C) ☐ **Statement I** is correct but **Statement II** is incorrect
(D) ☐ **Statement I** is incorrect but **Statement II** is correct

Question No.5 (Question Id - 108)

In an experiment, a cell-line (Xq) was mutated to delete expression of aquaporin (Xqm). Thereafter, both the cell-lines were incubated at room temperature for about 30 min in distilled, sterilized water. Which of the following statements would be correct ?

- (A) ☐ Both the cell-lines will be lysed
(B) ☐ Only Xqm will be lysed
(C) ☐ None will be lysed
(D) ☐ **Only Xq will be lysed (Correct Answer)**

Question No.6 (Question Id - 112)

Given below are two statements

Statement I:

Growth hormone and prolactin stain blue with basic dyes.

Statement II:

Thyroid stimulating hormone and luteinizing hormone stain orange or red with acidic dye.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☐ Both **Statement I** and **Statement II** are correct
(B) ☐ **Both the Statement I and Statement II are incorrect (Correct Answer)**
(C) ☐ **Statement I** is correct, while **Statement II** is incorrect.
(D) ☐ **Statement I** is incorrect, while the **Statement II** is correct.

Question No.7 (Question Id - 111)

Frank Starling's law of the heart :

- A. Does not operate in the failing heart
B. Does not operate during exercise
C. Explains the increase in heart rate produced by exercise
D. Explains the increase in cardiac output that occurs, when venous return is increased
E. Explains the increase in cardiac output when the sympathetic nerves supplying the heart rate are stimulated

Choose the **correct** answer from the options given below :

- (A) ☐ A, C and E are correct
(B) ☐ B, D and E are correct
(C) ☐ **D is only correct (Correct Answer)**

Question No.8 (Question Id - 117)

In normal individuals although skeletal muscle may be tetanized, the heart muscle cannot. This is because :

- (A) ☐ absolute refractory period is shorter than the relative refractory period.
- (B) ☒ **absolute refractory period is longer than the relative refractory period. (Correct Answer)**
- (C) ☐ heart is supplied with autonomic nervous system.
- (D) ☐ heart is supplied with spinal as well as cranial nerves.

Question No.9 (Question Id - 104)

Rapid removal of neurotransmitters from the synaptic cleft occurs by :

- (A) ☐ metabolism only.
- (B) ☐ metabolism and reuptake only.
- (C) ☒ **diffusion, metabolism and reuptake only. (Correct Answer)**
- (D) ☐ receptor mediated reuptake only.

Question No.10 (Question Id - 116)

Generation of action potential follows all-or-none principle. This is due to :

- (A) ☒ **Opening of voltage gated Na^+ channels. (Correct Answer)**
- (B) ☐ Closing of voltage gated Na^+ channels.
- (C) ☐ Closing of chemical gated channels.
- (D) ☐ Opening of Ca^+ channels.

Question No.11 (Question Id - 102)

Myasthenia gravis is an autoimmune disease, in which skeletal muscles become weak. The disease is mainly caused by the formation of circulating antibody against :

- (A) ☒ **Nicotinic cholinergic receptor (Correct Answer)**
- (B) ☐ Muscarinic cholinergic receptor
- (C) ☐ Myosin
- (D) ☐ Acetyl-cholinesterase

Question No.12 (Question Id - 110)

Match the name of hormones mentioned in **List-I** with its sites of secretion/function mentioned in **List-II**.

List-I	List-II
(hormones)	(site of secretion/function)
A. Renin	I. hormone released by the kidney
B. Ghrelin	II. reabsorb more Na^+ from proximal tubule of the nephron
C. Erythropoietin	III. enzyme released by kidney
D. Aldosterone	IV. peptide secreted in the stomach

Choose the **correct** answer from the options given below:

- (A) ☐ A - I, B - II, C - III, D - IV
- (B) ☒ **A - III, B - IV, C - I, D - II (Correct Answer)**
- (C) ☐ A - IV, B - III, C - II, D - I
- (D) ☐ A - II, B - I, C - III, D - IV

Question No.13 (Question Id - 115)

Match the name of hormones mentioned in List-I with its peptidergic/steroidal nature mentioned in List-II

List-I	List-II
(hormones)	(peptidergic/steroidal)
A. Insulin	I. Nonapeptide
B. Prolactin inhibiting hormone	II. Polypeptide
C. Aldosterone	III. Amine
D. Vasopressin	IV. Steroid

Choose the **correct** answer from the options given below:

- (A) ☐ A - III, B - IV, C - II, D - I
 (B) ☐ A - IV, B - II, C - III, D - I
 (C) ☒ **A - II, B - III, C - IV, D - I (Correct Answer)**
 (D) ☐ A - I, B - II, C - IV, D - III

Question No.14 (Question Id - 114)

Which of the following cell types protects against sepsis secondary to translocation of intestinal bacteria ?

- (A) ☐ Hepatic stellate cells
 (B) ☒ **Kupffer cells (Correct Answer)**
 (C) ☐ Hepatocyte
 (D) ☐ Gall bladder epithelial cells

Question No.15 (Question Id - 103)

Botulinum toxin prevents the release of neurotransmitter by acting on :

- (A) ☐ terminal boutons
 (B) ☐ neurexins
 (C) ☒ **synaptosome-associated protein (SNAP-25) (Correct Answer)**
 (D) ☐ kiss and run neurotransmission discharge

Question No.16 (Question Id - 106)

Match the name of hormones mentioned in List - I with its functions/mode of action mentioned in List - II.

List - I	List - II
(hormones)	(functions/mode of action)
A. Angiotensin II	I. G-protein receptor
B. Loss of aldosterone	II. Increase glomerular filtration rate (GFR)
C. Prostaglandins	III. Increases vasopressin secretion
D. Vasopressin	IV. dehydration

Choose the **correct** answer from the options given below:

- (A) ☐ A - I, B - II, C - III, D - IV
 (B) ☐ A - IV, B - III, C - II, D - I
 (C) ☒ **A - III, B - IV, C - II, D - I (Correct Answer)**
 (D) ☐ A - II, B - IV, C - III, D - I

Question No.17 (Question Id - 118)

The latent period between suprathreshold stimulation and recording of action potential at a distance of 10 cm in a nerve bundle is 10 msec. The rate of conduction of action potential is :

- (A) ☐ 1 m/sec
 (B) ☐ 0.1 m/sec
 (C) ☒ **10 m/sec (Correct Answer)**

Question No.18 (Question Id - 120)

Sphingomyelin is an amphipathic molecule that is present in the plasma membrane. Name the hydrophobic and hydrophilic units in one molecule of sphingomyelin.

- (A) ☐ Hydrophobic : one fatty acid; Hydrophilic : Phosphoethanolamine
 (B) ☐ Hydrophobic : two fatty acids; Hydrophilic : Phosphoethanolamine
 (C) ☒ **Hydrophobic : one fatty acid and a hydrocarbon chain of sphingosine; hydrophilic : phosphocholine**

(Correct Answer)

- (D) ☐ Hydrophobic : two fatty acids and a hydrocarbon chain of sphingosine; hydrophilic : phosphocholine

Question No.19 (Question Id - 105)

Match the feeding behavior mentioned in **List - I** with the nutrients types mentioned in **List - II**.

List - I	List - II
(feeding behavior)	(nutrient)
A. Mesotrophic	I. feed upon organic matters
B. Osmotrophic	II. organisms need at least one amino acid for their nitrogen requirement
C. Detritus	III. organisms need several amino acid for their nitrogen requirement
D. Metatrophic	IV. tape worm

Choose the **correct** answer from the options given below:

- (A) ☐ A - I, B - III, C - IV, D - II
 (B) ☒ **A - II, B - IV, C - I, D - III (Correct Answer)**
 (C) ☐ A - IV, B - II, C - I, D - III
 (D) ☐ A - III, B - I, C - II, D - IV

Question No.20 (Question Id - 107)

Blood haemoglobin appears :

- (A) ☐ bright red when bound to CO₂
 (B) ☐ darkish when bound to O₂
 (C) ☒ **bright red when bound to CO (Correct Answer)**
 (D) ☐ darkish when bound to CO

SECTION 2 - PART II
Question No.1 (Question Id - 5)

Among F, Cl, O and N which of the following is the correct arrangement of their chemical reactivity ?

- (A) ☒ **F > Cl > O > N (Correct Answer)**
 (B) ☐ F > O > N > Cl
 (C) ☐ O > F > N > Cl
 (D) ☐ Cl > F > O > N

Question No.2 (Question Id - 17)

You are preparing a phosphate buffer by mixing 25 ml of 50 mM Na₂ HPO₄ and 50 ml of 50 mM NaH₂PO₄. What would be the final concentration of the buffer ?

- (A) ☒ **50 mM (Correct Answer)**
 (B) ☐ 25 mM
 (C) ☐ 100 mM
 (D) ☐

Question No.3 (Question Id - 72)

Which residue will distort the α - helix ?

- (A) ☐ Phenylalanine
 (B) ☐ Aspartic acid
 (C) ☒ **Proline (Correct Answer)**
 (D) ☐ Leucine

Question No.4 (Question Id - 2)

In a survey of 400 students in a school, 100 were listed as taking apple juice and 150 as taking orange juice and 75 were listed as taking both orange as well as apple juice. How many students were taking neither of these two ?

- (A) ☒ **225 (Correct Answer)**
 (B) ☐ 75
 (C) ☐ 325
 (D) ☐ 125

Question No.5 (Question Id - 38)

A multiple sequence alignment of the following six nucleotide sequences is performed.

ACGTTCTCCGAA
 GCATTTCTCCAAA
 CTGTTCTCTGAG
 TCATTCCTCCAAG
 CCATTCCTTCGAA
 ACGTTCTCCGAG

The consensus sequence representing most frequent nucleotide at a position using IUPAC-IUBMB nucleotide symbols will be, (where N- any nucleotide, R -purine, Y- pyrimidine)

- (A) ☒ **NCRTTCCTCCRAR (Correct Answer)**
 (B) ☐ NNNTTNCTCCAAY
 (C) ☐ NNYTTCCTNNYAR
 (D) ☐ NNRTTNCTRNYAR

Question No.6 (Question Id - 91)

An indicator of quantum yield of photosynthesis is the mole of O_2 evolved _____.

- (A) ☐ per unit area of leaf surface
 (B) ☐ per gram of leaf
 (C) ☐ per mole of light fallen on the leaf
 (D) ☒ **per mole of photon absorbed (Correct Answer)**

Question No.7 (Question Id - 15)

The decimal reduction time (D value) of a 1% solution of a bactericidal agent is 5 minutes. If a culture has initially 5×10^6 live bacteria, the number of live bacteria after 15 minutes of exposure will be :

- (A) ☒ **5×10^3 (Correct Answer)**
 (B) ☐ 3×10^4
 (C) ☐ 5×10^4
 (D) ☐ 3×10^5

Question No.8 (Question Id - 22)

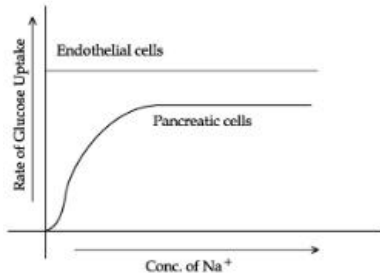
If the father has the genotype $hh I^B I^B$ and the mother has the genotype $HH I^A I^B$, then what proportion of progeny will have 'O' blood group ?

- (A) ☒ **0% (Correct Answer)**
 (B) ☐ 25%

(C) ☐ 50%
(D) ☐ 75%

Question No.9 (Question Id - 55)

Endothelial cells and pancreatic cells have different mechanism for glucose uptake. Below figure shows the rate of glucose uptake in the presence of increasing concentration of sodium (Na^+) in each of the cell type. Find the correct answers from the statements below :



- A. Rate of glucose uptake in endothelial cells is independent of $[\text{Na}^+]$.
- B. $[\text{Na}^+]$ is inhibitory for glucose uptake in pancreatic cells.
- C. A threshold level of $[\text{Na}^+]$ is required to maintain the role of glucose uptake in endothelial cells.
- D. Rate of glucose uptake is proportional to $[\text{Na}^+]$ up to a particular concentration and then steady state is maintained in pancreatic cells.

Choose the **most appropriate** answer from the options given below :

- (A) ☒ **A and D only (Correct Answer)**
- (B) ☐ A and B only
- (C) ☐ C and D only
- (D) ☐ C and B only

Question No.10 (Question Id - 44)

Which of the following are the properties of epitopes recognized by T Cell receptors ?

- A. Internal epitope
- B. Linear peptides
- C. Conformational
- D. Bound to MHC
- E. Non-sequential

Choose the **most appropriate** answer from the options given below :

- (A) ☐ A and B only
- (B) ☐ A, B and C only
- (C) ☒ **A, B and D only (Correct Answer)**
- (D) ☐ C, D and E only

Question No.11 (Question Id - 9)

The half-life of radium is about 1600 years. After how many years 200 g of Radium will turn into 25 g of Radium ?

- (A) ☐ 4000 years
- (B) ☐ 3200 years
- (C) ☒ **4800 years (Correct Answer)**
- (D) ☐ 9000 years

Match the molecules in **List-I** with its property/feature in **List-II**.

List-I	List-II
A. Cholesterol	I. Most abundant membrane lipid
B. Phospholipid	II. Lipid molecule with a characteristic four-ring steroid structure that is an important component of mammalian plasma membrane
C. Phosphatidylinositol	III. Found normally in cytoplasmic monolayer of the plasma membrane lipid bilayer
D. Phosphatidylserine	IV. Present in very small quantities in plasma membrane of mammalian cells

Choose the **correct** answer from the options given below:

- (A) ☐ A - III, B - IV, C - II, D - I
 (B) ☒ **A - II, B - I, C - IV, D - III (Correct Answer)**
 (C) ☐ A - IV, B - II, C - I, D - III
 (D) ☐ A - II, B - III, C - IV, D - I

Question No.13 (Question Id - 36)

Which of the following is NOT correct about Autophagy ?

- (A) ☐ Autophagy is triggered by nutritional starvation
 (B) ☐ Autophagy can be monitored by fluorescent probe
 (C) ☒ **Autophagy is a Caspase I-dependent process (Correct Answer)**
 (D) ☐ A process of cell death mediated by its own lysozyme

Question No.14 (Question Id - 24)

The ratio of sex chromosome (X) to Autosome (A) in a metamale Drosophila will be :

- (A) ☐ 1.5
 (B) ☐ 1.3
 (C) ☐ 0.67
 (D) ☒ **0.33 (Correct Answer)**

Question No.15 (Question Id - 6)

Which of the following contains lowest number of atoms ?

- (A) ☐ 1g H₂
 (B) ☐ 1g O₂
 (C) ☒ **1g Br₂ (Correct Answer)**
 (D) ☐ 1g N₂

Question No.16 (Question Id - 99)

The maximum absorption of short-chain fatty acids produced by bacteria occurs in the :

- (A) ☐ Duodenum
 (B) ☐ Jejunum
 (C) ☐ Ileum
 (D) ☒ **Colon (Correct Answer)**

Question No.17 (Question Id - 96)

In which subcellular compartment, glycolate is oxidized to glyoxalate ?

- (A) ☒ **Peroxisome (Correct Answer)**
 (B) ☐ Dictyosome
 (C) ☐ Chloroplast
 (D) ☐ Mitochondrion

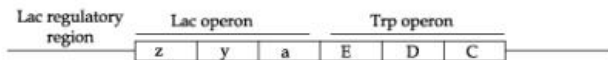
Question No.18 (Question Id - 8)

In colloidal system, which one of the following phenomena occurs against the action of gravity ?

- (A) ☐ Coagulation
(B) ☒ **Creaming (Correct Answer)**
(C) ☐ Coacervation
(D) ☐ Coalescence

Question No.19 (Question Id - 76)

The Trp operon encodes the enzymes for tryptophan biosynthesis, and the Lac operon encodes the enzymes necessary for lactose utilization. If a gene fusion is created as given below, under which set of conditions will the genes of the Trp operon be expressed in the cell that carries the fusion operon ?



- A. Only when lactose and glucose are both absent
B. Only when lactose and tryptophan are both present
C. Only when lactose is present and glucose is absent
D. Only when tryptophan is present
E. Only when tryptophan is absent

Choose the **correct** answer from the options given below :

- (A) ☐ A and E Only
(B) ☐ B Only
(C) ☒ **C Only (Correct Answer)**
(D) ☐ A and D Only

Question No.20 (Question Id - 53)

In eukaryotes, pre-mRNAs are spliced into mature mRNAs. The small nuclear ribonuclear proteins (snRNPs) have critical roles in splicing of eukaryotic nuclear pre-mRNAs into mRNAs. Following statements are made in this regard.

- A. snRNP, the core of the spliceosome, is formed by association of snRNA with at least seven protein subunits
B. Spliceosome uses energy of ATP hydrolysis
C. Proteins in the spliceosome exclusively carry out the catalysis
D. Catalytic role in splicing is largely performed by RNA molecules in the spliceosome

Choose the **correct** answer from the options given below :

- (A) ☐ A, B, C and D
(B) ☐ B, C and D Only
(C) ☐ A, C and D Only
(D) ☒ **A, B and D Only (Correct Answer)**

Question No.21 (Question Id - 77)

Given below are two statements :

Statement I:

DNA methylation in mammalian cells is found only when cytosines are located 5' to guanines.

Statement II:

DNA replication and DNA methylation occurs simultaneously during S phase of the cell cycle.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☐ Both **Statement I** and **Statement II** are correct
(B) ☐ Both **Statement I** and **Statement II** are incorrect
(C) ☐ **Statement I** is correct but **Statement II** is incorrect
(D) ☐ **Statement I is incorrect but Statement II is correct (Correct Answer)**

Question No.22 (Question Id - 42)

Tertiary lymphoid tissues are sites :

- (A) ☐ where lymphocytes develop and mature
(B) ☐ where lymphocytes encounter antigen for first time and become activated
(C) ☐ where lymphocytes undergo clonal expansion and differentiation into effector cells.
(D) ☐ **of infection to which lymphocytes return as effector cells and also reside as memory cells**
(Correct Answer)

Question No.23 (Question Id - 45)

Which of the following statements about T cells is TRUE ?

- A. T regulatory cells differentiate in the bone marrow
B. IL12 induces expression of FOXP3 in Treg cells
C. CTLA-4 binding to B7 inhibits TCR mediated T cell activation
D. Despite engagement of TCR by antigen, absence of co-stimulatory signal leads to anergy
E. CTLA-4 is constitutively expressed on all resting T cells

Choose the **correct** answer from the options given below :

- (A) ☐ A, B, C, D only
(B) ☐ A, B and C only
(C) ☐ C, D and E only
(D) ☐ **C and D only (Correct Answer)**

Question No.24 (Question Id - 18)

If you have to use 10 picomole of a 20 nucleotide oligonucleotide as a primer in a 50 μ l PCR reaction, how much oligonucleotide would you need ? (average formula weight of each nucleotide is 333)

- (A) ☐ 6.66 ng
(B) ☐ **66.6 ng (Correct Answer)**
(C) ☐ 666 ng
(D) ☐ 6660 ng

Question No.25 (Question Id - 62)

Homeodomain proteins are characterized by :

- (A) ☐ **Helix-turn-helix motif (Correct Answer)**
(B) ☐ Zinc-finger motif
(C) ☐ Cys-Cys-His-His motif
(D) ☐ Cys-Cys-Cys-Cys motif

Question No.26 (Question Id - 33)

Which one of the following regarding *Caenorhabditis elegans* development is TRUE ?

- (A) ☐ **It demonstrates both the conditional and autonomous modes of cell specification**
(Correct Answer)
(B) ☐ Inhibition of FOXO/DAF-16 promote longevity
(C) ☐ Deletion of distal tip cell will allow the nearby cells to be in a mitotic state

(D) ☐ PAL-1 is required for germ line cell fate

Question No.27 (Question Id - 88)

Which of the following Agrobacterium proteins are capable of moving up to the plant nucleus ?

- A. Vir A
- B. Vir G
- C. Vir D2
- D. Vir E2

Choose the **correct** answer from the following :

- (A) ☐ A and B only
- (B) ☐ B and C only
- (C) ☐ B and D only
- (D) ☐ **C and D only (Correct Answer)**

Question No.28 (Question Id - 12)

UGA is normally a stop codon that terminates polypeptide synthesis. But in case of certain proteins it is also used to incorporate an amino acid. Identify the amino acid.

- (A) ☐ Hydroxyl proline
- (B) ☐ D-alanine
- (C) ☐ **Selenocysteine (Correct Answer)**
- (D) ☐ Acetylated lysine

Question No.29 (Question Id - 78)

Which of the following is NOT a major force stabilizing the nucleic acid double helical structure ?

- (A) ☐ Hydrogen bond
- (B) ☐ Base stacking
- (C) ☐ **Ionic interactions (Correct Answer)**
- (D) ☐ Hydrophobic interactions

Question No.30 (Question Id - 70)

Glycosylation is the process of :

- (A) ☐ elongation of starch by the addition of glucose molecules
- (B) ☐ **addition of sugars to lipid or protein molecules (Correct Answer)**
- (C) ☐ breakdown of starch into glucose
- (D) ☐ internalization of glucose by endocytosis

Question No.31 (Question Id - 50)

Cells labelled with a fluorescent probe can be sorted into different populations using one of the following technique :

- (A) ☐ Fluorescent microscopy
- (B) ☐ **Flow cytometry (Correct Answer)**
- (C) ☐ Fluorescence recovery after photobleaching (FRAP)
- (D) ☐ Fluorescence Resonance Energy Transfer (FRET)

Question No.32 (Question Id - 58)

Which one of the following is referred to as the 21st amino acid ?

- (A) ☐ γ -Amino butyric acid
- (B) ☐ 4-Hydroxy proline
- (C) ☐ **Selenocysteine (Correct Answer)**
- (D) ☐

Question No.33 (Question Id - 25)

Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A :

Histone H3 lysine-9 acetylation is associated with transcription activation.

Reason R :

Acetylation of histone H3 lysine-9 weakens DNA interaction with nucleosome.

In light of the above statements, choose the **correct** answer from the options given below

(A) ☐ Both **A** and **R** are correct and **R** is the correct explanation of **A**

(Correct Answer)

(B) ☐ Both **A** and **R** are correct but **R** is not the correct explanation of **A**

(C) ☐ **A** is correct but **R** is not correct

(D) ☐ **A** is not correct but **R** is correct

Question No.34 (Question Id - 37)

In an experiment adipocytes are treated with insulin for 10 minutes. Which of the following statement is true for these cells ?

(A) ☐ insulin treatment increases the transcription of Glut4

(B) ☐ insulin treatment will increase the translation of Glut4

(C) ☐ **insulin treatment increases the Glut4 transport to plasma membrane**

(Correct Answer)

(D) ☐ insulin treatment increases the stability of Glut4 protein

Question No.35 (Question Id - 35)

Match the following pairs for Photosynthesis which involves C_3 and C_4 pathways.

A. CO_2 (C_4 pathway)	I. Two molecules of 3-phosphoglyceric acid
B. RuBisCO	II. Oxaloacetic acid
C. CO_2 (C_3 pathway)	III. C_3 plants
D. Mesophyll	IV. One molecule of 3-phosphoglyceric acid only

Choose the **correct** answer from the options given below :

(A) ☐ A - II, B - IV, C - I, D - III

(B) ☐ A - IV, B - I, C - II, D - III

(C) ☐ A - III, B - I, C - IV, D - II

(D) ☐ **A - II, B - I, C - IV, D - III (Correct Answer)**

Question No.36 (Question Id - 71)

Which internal symmetry is not observed in globular structure of proteins ?

(A) ☐ 6-fold symmetry

(B) ☐ 2-fold symmetry

(C) ☐ 4-fold symmetry

(D) ☐ **5-fold symmetry (Correct Answer)**

Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R

Assertion A:

Stem grafting in monocot plants often become unsuccessful.

Reason R:

The vascular bundle of monocots are scattered and thus do not align in the graft.

In light of the above statements, choose the **most appropriate** answer from the options given below

- (A) ☐ Both A and R are correct and R is the correct explanation of A
- (B) ☒ Both A and R are correct but R is not the correct explanation of A (Correct Answer)
- (C) ☐ A is correct but R is not correct
- (D) ☐ A is not correct but R is correct

Question No.38 (Question Id - 39)

Arrange in correct order the following steps involved in processing of antigen for presentation to CD8 positive T cells :

- A. Transport of peptides into ER via TAP transporters
- B. Tapasin-mediated loading of peptide onto MHC I
- C. Production of peptides by immunoproteasome
- D. Exit of MHC I peptide complex from ER
- E. ERAP mediated trimming of peptides

Choose the **correct** answer from the options given below :

- (A) ☐ A, B, C, D, E
- (B) ☐ C, B, D, A, E
- (C) ☒ C, A, E, B, D (Correct Answer)
- (D) ☐ B, C, D, E, A

Question No.39 (Question Id - 80)

Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R

Assertion A:

Leaf-like flat stems of cacti are homologous to stems and spines are homologous to leaves.

Reason R:

In cacti, leaves are modified into spines, and stems are modified into leaf-like structures.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☒ Both A and R are correct and R is the correct explanation of A (Correct Answer)
- (B) ☐ Both A and R are correct but R is not the correct explanation of A
- (C) ☐ A is correct but R is not correct
- (D) ☐ A is not correct but R is correct

Question No.40 (Question Id - 52)

Given below are two statements

Statement I :

Telomere sequence is different in each chromosome.

Statement II :

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☐ Both **Statement I** and **Statement II** are true
(B) ☐ Both **Statement I** and **Statement II** are false
(C) ☐ **Statement I** is correct but **Statement II** is false
(D) ☐ **Statement I is incorrect but Statement II is true (Correct Answer)**

Question No.41 (Question Id - 47)

Given below are two statements :

Statement I :

In case of $\beta 2$ microglobulin deficient mice, a functional MHC Class I molecule is not formed so transient MHC class I molecule expression is not observed on the cell surface.

Statement II :

In case of TAP-/- mice empty MHC class I molecules are transiently expressed on the surface of the cell.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☐ **Both Statement I and Statement II are correct (Correct Answer)**
(B) ☐ Both **Statement I** and **Statement II** are incorrect
(C) ☐ **Statement I** is correct but **Statement II** is incorrect
(D) ☐ **Statement I** is incorrect but **Statement II** is correct

Question No.42 (Question Id - 64)

Given below are two statements :

Statement I:

Transmission electron microscopy is used to examine the interior of a thin section.

Statement II:

Cryoelectron microscopy allows direct visualization of even interior features of three-dimensional structures.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☐ **Both Statement I and Statement II are true (Correct Answer)**
(B) ☐ Both **Statement I** and **Statement II** are false
(C) ☐ **Statement I** is correct but **Statement II** is false
(D) ☐ **Statement I** is incorrect but **Statement II** is true

Question No.43 (Question Id - 79)

In which of the following phenomenon there is a major change in hybridization ?

- (A) ☐ **Formation of carbocation (Correct Answer)**
(B) ☐ Resonance
(C) ☐ Keto-enol tautomerism
(D) ☐ Formation of carbanion

Question No.44 (Question Id - 31)

List - I	List - II
Mutations	Possible phenotypes observed
A. Gain of function mutation in <i>FGFR3</i>	I. Secondary axis forms
B. Homozygous for <i>sonic-hedgehog</i> mutation	II. Defective spermatogenesis
C. Knockout of endogenous <i>GSK3</i> in ventral cells of early amphibian embryo by a dominant negative of <i>GSK3</i>	III. Cyclopia
D. Homozygous mice mutant with allele of <i>Desert hedgehog</i> protein coding gene	IV. Thanotophoric dysplasia

Choose the **correct** answer from the options given below :

- (A) ☐ A - I, B - II, C - III, D - IV
 (B) ☐ A - II, B - III, C - IV, D - I
 (C) ☐ A - III, B - I, C - II, D - IV
 (D) ☒ **A - IV, B - III, C - I, D - II (Correct Answer)**

Question No.45 (Question Id - 34)

Double stranded DNA shows *helical chirality*. Accordingly, the relationship between two sets of tetra nucleotide ATGC and TACG is :

- (A) ☐ Enantiomer
 (B) ☐ Diastereomer
 (C) ☒ **Constitutional isomer (Correct Answer)**
 (D) ☐ Geometric isomer

Question No.46 (Question Id - 23)

What proportion of progeny will have *AaBbCcDdEe* genotype, when *AaBbCcDdEe* genotype is crossed with *AABbCcDdee* genotype ?

- (A) ☒ **1/32 (Correct Answer)**
 (B) ☐ 1/64
 (C) ☐ 1/128
 (D) ☐ 1/256

Question No.47 (Question Id - 16)

Human DNA contains 20% Cytosine on a molar basis. The mole percentage of Adenine, Guanine and Thymine are :

- (A) ☐ 40% Adenine, 20% Guanine and 20% Thymine
 (B) ☐ 20% Adenine, 40% Guanine and 20% Thymine
 (C) ☒ **30% Adenine, 20% Guanine and 30% Thymine (Correct Answer)**
 (D) ☐ 20% Adenine, 30% Guanine and 20% Thymine

Question No.48 (Question Id - 83)

Cytoskeletal structure that provides the site for new cell wall synthesis in plant is called :

- (A) ☐ metaphasic plate
 (B) ☐ middle lamella
 (C) ☒ **pre-prophase band (Correct Answer)**
 (D) ☐ spindle fiber

Question No.49 (Question Id - 97)

Which one of the following virus replicates in the nucleus ?

- (A) ☒ **Tobacco leaf curl virus (Correct Answer)**
 (B) ☐ Tobacco mosaic virus
 (C) ☐ Tobacco rattle virus
 (D) ☐ Tobacco necrosis virus

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Question No.50 (Question Id - 28)

Match the type of plots **List-I** with their applications **List-II** :

List - I	List - II
Type of plots	Applications
A. Ramachandran plot	I. Microbial growth
B. Lineweaver-Burk plot	II. Plotting and analysis software
C. Sigma plot	III. Enzyme kinetics
D. Sigmoidal curve	IV. Structure of proteins

Choose the **correct** answer from the options given below :

- (A) ☐ A - I, B - II, C - III, D - IV
 (B) ☐ A - II, B - IV, C - III, D - I
 (C) ☒ **A - IV, B - III, C - II, D - I (Correct Answer)**
 (D) ☐ A - III, B - II, C - I, D - IV

Question No.51 (Question Id - 90)

The pivotal success story of green revolution due to the efforts of Dr. Norman Borlaug and Dr. M. S. Swaminathan has primarily been an outcome of alteration in :

- (A) ☒ **Gibberellins signalling (Correct Answer)**
 (B) ☐ Auxin Response Factor (ARF)
 (C) ☐ ABA receptor
 (D) ☐ ethylene receptor

Question No.52 (Question Id - 11)

Which of the following is wrongly matched ?

- (A) ☒ **Charles's Law - Friction and perpendicular force (Correct Answer)**
 (B) ☐ Coloumb's Law - Charges of particles
 (C) ☐ Boyle's Law - Pressure and volume of gas
 (D) ☐ Stroke's Law - Expansion and compression of spring

Question No.53 (Question Id - 54)

cAMP is the secondary messenger. It is synthesized from ATP by which enzyme ?

- (A) ☐ ATP phosphatase
 (B) ☐ ATP dehydrogenase
 (C) ☒ **Adenyl cyclase (Correct Answer)**
 (D) ☐ Adenyl phosphodiesterase

Question No.54 (Question Id - 49)

Match the mode of action of following drugs :

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List - I	List - II
Drugs	Mechanism of action
A. Miconazole	I. Disrupts mitotic spindle
B. Griseofulvin	II. Inhibits ergosterol biosynthesis
C. Amphotericin B	III. Inhibits protein synthesis
D. Kanamycin	IV. Causes membrane damage

Choose the **correct** answer from the options given below :

- (A) ☐ A - I, B - II, C - III, D - IV
 (B) ☐ A - III, B - IV, C - I, D - II
 (C) ☐ A - IV, B - III, C - II, D - I
 (D) ☒ A - II, B - I, C - IV, D - III (Correct Answer)

Question No.55 (Question Id - 43)

Match the immune cells with their characteristics.

List - I	List - II
Immune cells	Characteristics
A. Neutrophils	I. Granulocytic cells that release pharmacologically active substances
B. Monocytes	II. Generally the first to arrive at the site of infection
C. Mast Cells	III. Circulating blood cells that differentiate into macrophages in the tissues
D. NK cells	IV. Cells that can use antibodies to recognize their target cells

Choose the **correct** answer from the options given below :

- (A) ☐ A - I, B - II, C - IV, D - III
 (B) ☒ A - II, B - III, C - I, D - IV (Correct Answer)
 (C) ☐ A - III, B - II, C - I, D - IV
 (D) ☐ A - IV, B - III, C - II, D - I

Question No.56 (Question Id - 94)

Match the diseases listed in **Column I** with their respective group of causal organisms listed in **Column II**.

Column-I	Column-II
(Diseases)	(Causal Organisms)
A. Potato Leaf Roll	I. Virus
B. Brown Rot of Potato	II. Bacteria
C. Potato Scab	III. Actinomycetes
D. Potato spindle tuber	IV. Viroid

Choose the **correct** answer from the options given below:

- (A) ☐ A - IV, B - II, C - III, D - I
 (B) ☒ A - I, B - II, C - III, D - IV (Correct Answer)
 (C) ☐ A - I, B - III, C - II, D - IV
 (D) ☐ A - IV, B - III, C - II, D - I

Question No.57 (Question Id - 67)

Catalysis of phosphatidylinositol 4,5 bis-phosphate (PIP₂) into diacylglycerol (DAG) and inositol trisphosphate (IP₃) requires which one of the following enzymes ?

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- (A) ☐ **phospholipase C (PLC) (Correct Answer)**
(B) ☐ Phosphoinositide 3-kinase (PI3K)
(C) ☐ Phosphodiesterase C (PdeC)
(D) ☐ Phosphatase

Question No.58 (Question Id - 21)

A bacteria with genotype $bio^+ met^+ lac^+$ was used as donor in a transformation experiment. The genotype of the acceptor bacteria was $bio^- met^- lac^-$. The genotypes of transformants were :

$bio^+ met^- lac^-$ = 50 transformants

$bio^+ met^+ lac^+$ = 149 transformants

$bio^+ met^+ lac^-$ = 10 transformants

$bio^+ met^- lac^+$ = 17 transformants

Based on the observed frequencies identify the most correct statement.

- (A) ☐ **bio and lac are close to each other on the genetic map. (Correct Answer)**
(B) ☐ bio and met are close to each other on the genetic map.
(C) ☐ The order of the gene is bio , met , lac .
(D) ☐ The distance between bio and lac is 7.5 m.u.

Question No.59 (Question Id - 66)

The Cyclin dependent kinase (Cdk)-cyclin A complex is a critical regulator of cell cycle progression. What happens to Cdk and Cyclin A during the metaphase stage ?

- (A) ☐ Only Cdk is degraded
(B) ☐ **Only cyclin A is degraded (Correct Answer)**
(C) ☐ Both Cdk and cyclin A are degraded
(D) ☐ Cdk is upregulated, but cyclin A remains stable

Question No.60 (Question Id - 89)

Accumulation of osmolytes under drought stress in soybean plant causes :

- (A) ☐ **Lowering of water potential (ψ_w) (Correct Answer)**
(B) ☐ Lowering of cell turgor (ψ_p)
(C) ☐ Reduction in cell volume
(D) ☐ Increase in water potential (ψ_w)

Question No.61 (Question Id - 86)

Sporic meiosis refers to the process in which :

- (A) ☐ spores undergo meiosis to develop haploid organisms
(B) ☐ **meiosis develops spores instead of gametes (Correct Answer)**
(C) ☐ meiosis forms gametes which fuse to form spores
(D) ☐ spores fuse to develop diploid cell that undergo meiosis

Question No.62 (Question Id - 3)

A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has at least one boy and one girl ?

- (A) ☐ **441 (Correct Answer)**
(B) ☐ 360
(C) ☐ 576
(D) ☐ 214

Question No.63 (Question Id - 59)

When blood glucose concentration decreases, liver glycogen is broken down, that increases glucose level. Identify the correct sequence of events in this regard.

- (A) ☐ **Glucagon → adenylate cyclase → cAMP → glucose 6P → glucose (Correct Answer)**
- (B) ☐ Glucagon → cAMP → adenylate cyclase → glucose 6P → glucose
- (C) ☐ Glucagon → adenylate cyclase → cAMP → glucose → glucose 6P
- (D) ☐ Glucagon → cAMP → adenylate cyclase → glucose → glucose 6P

Question No.64 (Question Id - 92)

Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A :

Rice genome has higher number of proteins than genes.

Reason R :

The non-coding sequences in the rice genome do not code for proteins.

In light of the above statements, choose the **correct** answer from the options given below

- (A) ☐ Both **A** and **R** are correct and **R** is the correct explanation of **A**
- (B) ☐ **Both A and R are correct but R is not the correct explanation of A (Correct Answer)**
- (C) ☐ **A** is correct but **R** is not correct
- (D) ☐ **A** is not correct but **R** is correct

Question No.65 (Question Id - 30)

Given below are two statements

Statement I :

The position where limbs emerge in chick from the body depends on Hox gene expression.

Statement II :

Tbx 4 induces the forelimb whereas Tbx5 (chick) and Islet1 (mouse) induce hindlimb identity.

In light of the above statements, choose the **most appropriate** answer from the options given below

- (A) ☐ Both **Statement I** and **Statement II** are correct
- (B) ☐ Both **Statement I** and **Statement II** are incorrect
- (C) ☐ **Statement I is correct but Statement II is incorrect (Correct Answer)**
- (D) ☐ **Statement I** is incorrect but **Statement II** is correct

Question No.66 (Question Id - 63)

Identify the statement that is NOT correct regarding SUMOylation.

- (A) ☐ It is a post-translational modification
- (B) ☐ SUMO proteins are similar to ubiquitin
- (C) ☐ It requires ligases
- (D) ☐ **It most occurs in bacterial pathogens (Correct Answer)**

Question No.67 (Question Id - 10)

Which of the following statement is **correct** ?

- (A) ☐ **Gamma (γ) rays have negligible mass and carry no charge and they are not deflected in an electric or magnetic field. (Correct Answer)**
- (B) ☐ Gamma (γ) rays have negligible mass but carry charge and they are deflected in an electric or magnetic field.
- (C) ☐ Gamma (γ) rays have less penetrating power than β-rays.
- (D) ☐ Alpha (α) rays have negligible mass and carry no charge and they are not deflected in an electric or magnetic field.

Question No.68 (Question Id - 100)

Match the word written in **List-I** with its relationship with the phenomenon/name of the animals mentioned in **List-II**.

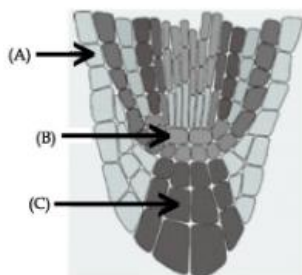
List-I	List-II
(Word)	(phenomenon/name of the animals)
A. Ovo-viviparous	I. Secondary sexual characters
B. Androgens	II. Crocodiles
C. Estrogens	III. Voice-deepening
D. Temperature-dependent sex determination	IV. Sharks

Choose the **correct** answer from the options given below :

- (A) ☐ A - II, B - I, C - III, D - IV
 (B) ☐ A - IV, B - I, C - III, D - II
 (C) ☒ **A - IV, B - III, C - I, D - II (Correct Answer)**
 (D) ☐ A - II, B - III, C - I, D - IV

Question No.69 (Question Id - 84)

Look at the diagram of a root-apical meristem given below and identify the cell/tissue types marked by arrows.



- (A) ☐ (A)-Epidermis, (B)-Quiescent centre, (C)-Columella
 (B) ☐ (A)-Epidermis, (B)-Vascular Initial, (C)-Cap cells
 (C) ☒ **(A)-Cap cells, (B)-Quiescent centre, (C)-Columella (Correct Answer)**
 (D) ☐ (A)-Cap cells, (B)-Vascular Initial, (C)-Cap Initials

Question No.70 (Question Id - 4)

In a class of 40 students 70% appear for an exam and one fourth of those who appeared for the exam scored more than or equal to 90%. How many students either did not appear for the exam or scored less than 90% ?

- (A) ☐ 21
 (B) ☐ 22
 (C) ☐ 28
 (D) ☒ **33 (Correct Answer)**

Question No.71 (Question Id - 82)

Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A :

Individual lipid molecules do not freely flip across the membrane.

Reason R :

Flipping across will require the hydrophilic head to move through the hydrophobic internal part of the bilayer which will be a thermodynamically non-favourable event.

In light of the above statements, choose the correct answer from the options given below

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- (A) ☐ Both **A and R are correct and R is the correct explanation of A (Correct Answer)**
 (B) ☐ Both **A** and **R** are correct but **R** is not the correct explanation of **A**
 (C) ☐ **A** is correct but **R** is not correct
 (D) ☐ **A** is not correct but **R** is correct

Question No.72 (Question Id - 7)

In a chemical reaction molecule 'X' donates electron to molecule 'Y'. Which of following statements are correct about X and Y molecules ?

- (A) ☐ Molecule X is oxidized and Y is a reductant
 (B) ☐ **Molecule X is oxidized and Y is an oxidant (Correct Answer)**
 (C) ☐ Molecule X is an oxidant and Y is oxidized
 (D) ☐ Molecule X is a reductant and Y is oxidized

Question No.73 (Question Id - 41)

Four unlabeled tubes contain either whole IgG or $F(ab')_2$ or Fab or Fc fragments of antibody. Tube A contents are able to cause agglutination but not able to fix complement. Tube B contents are able to cause agglutination and fix complement. Tube C contents are able to bind antigen but not able to agglutinate or fix complement. Tube D contents are neither able to bind to antigen nor agglutinate nor fix complement. Identify the contents of the tubes.

- (A) ☐ **A : $F(ab')_2$; B : IgG; C : Fab; D : Fc (Correct Answer)**
 (B) ☐ A : IgG; B : $F(ab')_2$; C : Fab ; D : Fc
 (C) ☐ A : Fc ; B : Fab; C : $F(ab')_2$; D : IgG
 (D) ☐ A : Fab ; B : Fc; C : IgG; D : $F(ab')_2$

Question No.74 (Question Id - 85)

Read the following two statements related to pollination and fertilization in angiosperms.

Statement I:

Pollen tube emerges from micropyle of pollen grain, moves through style, and enter through germination pore of the embryo sac.

Statement II:

Pollen tube is attracted towards embryo sac through LURE peptide secreted from synergids.

In light of the above statements, choose the **most appropriate** answer from the options given below

- (A) ☐ Both **Statement I** and **Statement II** are correct
 (B) ☐ Both **Statement I** and **Statement II** are incorrect
 (C) ☐ **Statement I** is correct but **Statement II** is incorrect
 (D) ☐ **Statement I is incorrect but Statement II is correct (Correct Answer)**

Question No.75 (Question Id - 69)

Which one of the following statements about α helix is FALSE ?

- (A) ☐ The ϕ and ψ torsional angles of α - helix are -60° and -30° respectively.
 (B) ☐ The α - helix has 3.6 residues per turn.
 (C) ☐ **The α -helix has 5.4 residues per turn. (Correct Answer)**
 (D) ☐ There is a hydrogen bond between $C=O$ of the n^{th} residue and NH of the $n+4^{th}$ residue.

Question No.76 (Question Id - 19)

You have dissolved 1.8 μ g glucose in 100 μ l water. The concentration of glucose would be (molecular weight glucose = 180)

- (A) ☐ 10 μ M
 (B) ☐ **100 μ M (Correct Answer)**

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- (C) ☐ 10 mM
 (D) ☐ 100 mM

Question No.77 (Question Id - 51)

Metagenomic studies of the oral cavity indicate that the site potentially contains microbes with a diverse range of antibiotic resistance genes (ARGs), such as those encoding resistance to tetracycline, amoxicillin and gentamycin. Similar studies performed on tribal communities living in isolation also show the presence of ARGs against the aforesaid antibiotics in their oral cavity. Identify the correct interpretation from the following options.

- (A) ☐ Oral ARGs are not a natural feature of human oral cavity.
 (B) ☒ **Prior exposure to antibiotics is not necessary for the evolution of antibiotic resistant strains.**

(Correct Answer)

- (C) ☐ Resistance mechanisms against tetracycline and amoxicillin are similar.
 (D) ☐ The ARGs detected in the oral cavity are solely due to the presence of a multidrug resistant bacterial strain.

Question No.78 (Question Id - 61)

Identify the molecule that belongs to a different class than the other three.

- (A) ☒ **Glycosides (Correct Answer)**
 (B) ☐ Cerebrosides
 (C) ☐ Gangliosides
 (D) ☐ Sphingomyelins

Question No.79 (Question Id - 56)

Match the following protein with their role in bacterial cell division.

List-I	List-II
(Protein)	(Role in bacterial cell division)
A. Fts2	I. Peptidoglycan synthesis
B. Fts1	II. Chromosome segregation and separation of chromosome dimers
C. FtsA	III. Forms 2 rings
D. FtsK	IV. anchors Z ring to plasma membrane

Choose the **correct** answer from the options given below:

- (A) ☒ **A - III, B - II, C - I, D - IV (Correct Answer)**
 (B) ☐ A - IV, B - I, C - III, D - II (Correct Answer)
 (C) ☐ A - III, B - I, C - IV, D - II (Correct Answer)
 (D) ☐ A - I, B - III, C - IV, D - II (Correct Answer)

Question No.80 (Question Id - 57)

List-I	List-II
A. Bacterial Artificial Chromosome	I. ColE1 replicon
B. pBR322 vector	II. Puromycin selection
C. Mammalian expression vector	III. Purification of proteins
D. Prokaryotic expression vector	IV. Cloning vector that can accommodate DNA upto 1 Mbp

Choose the **correct** answer from the options given below:

- (A) ☐ A - II, B - I, C - III, D - IV
 (B) ☐ A - III, B - IV, C - II, D - I
 (C) ☐ A - I, B - IV, C - II, D - III
 (D) ☒ **A - IV, B - I, C - II, D - III (Correct Answer)**

Question No.81 (Question Id - 75)

A cell receives a signal to synthesis the secretory protein 'X'. What is the correct order in which protein 'X' will traverse for secretion ?

- (A) ☐ Golgi cisternae - ER transport vesicle-Smooth ER-secretory vesicle-cell surface.
 (B) ☐ Smooth ER-Golgi transport vesicle-Golgi cisternae-secretory vesicle-cell surface.
 (C) ☒ **Rough ER-Golgi transport vesicle-Golgi cisternae-secretory vesicle-cell surface. (Correct Answer)**
 (D) ☐ Rough ER-Smooth ER-Golgi transport vesicle-Golgi cisternae-secretory vesicle-Cell surface.

Question No.82 (Question Id - 13)

If 100 microliter of starting culture with 7000 cells/ml is diluted to 5 ml, how many bacteriophage particles would be present per ml of the diluted culture, given that on an average each bacterial cell harbors about 20 bacteriophages.

- (A) ☒ **2800 (Correct Answer)**
 (B) ☐ 14000
 (C) ☐ 1400
 (D) ☐ 7000

Question No.83 (Question Id - 26)

The number of diploid genotypes possible for a gene with 4 alleles is :

- (A) ☐ 6
 (B) ☐ 8
 (C) ☒ **10 (Correct Answer)**
 (D) ☐ 12

Question No.84 (Question Id - 1)

Pioneering discovery of reverse-transcriptase that has paved the method for cDNA library construction from cellular mRNAs was made by :

- (A) ☐ J.D. Watson and F.H.C. Crick
 (B) ☒ **H. Temin and D. Baltimore (Correct Answer)**
 (C) ☐ P. Sharp and R. Roberts
 (D) ☐ M. Bishop and T. Hunter

Question No.85 (Question Id - 20)

A 2.5M NaCl solution is equivalent to (molecular weight of NaCl = 58.44)

- (A) ☐ 0.146% (w/v)
 (B) ☐ 1.46% (w/v)

- (C) ☐ 14.6% (w/v) (Correct Answer)
(D) ☐ 146% (w/v)

Question No.86 (Question Id - 60)

Which among the following is NOT a signaling kinase ?

- (A) ☐ MAP Kinase
(B) ☐ **Thymidine kinase (Correct Answer)**
(C) ☐ PI3 Kinase
(D) ☐ Akt kinase

Question No.87 (Question Id - 95)

Lateral roots of dicotyledonous plants mostly arise from _____.

- (A) ☐ Vascular initial
(B) ☐ **Differential cells of pericycle (Correct Answer)**
(C) ☐ Lateral cap and epithelial initials
(D) ☐ Axial root meristem

Question No.88 (Question Id - 46)

T-Bet is a transcription factor that induces the expression of _____ effector cytokine _____. This represses the expression of _____ transcriptional regulator _____.

- (A) ☐ **TH1, IFN γ , TH2, GATA-3 (Correct Answer)**
(B) ☐ TH2, IL4, TH1, GATA-3
(C) ☐ TH2, IL12, TH1, GATA-3
(D) ☐ TH1, GATA-3, TH2, IFN γ

Question No.89 (Question Id - 14)

Given below are two statements

Statement I :

The nucleotide sequences of many genes in humans are highly similar to their orthologs in chimpanzee.

Statement II :

The nucleotide sequence of human pseudogenes are highly similar to their functional counterpart in human genome.

In light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☐ **Both Statement I and Statement II are correct (Correct Answer)**
(B) ☐ Both **Statement I** and **Statement II** are incorrect
(C) ☐ **Statement I** is correct but **Statement II** is incorrect
(D) ☐ **Statement I** is incorrect but **Statement II** is correct

Question No.90 (Question Id - 81)

An Arabidopsis plant is a double mutant of *apetala1* and *apetala2*. What will be the phenotype of flowers ?

- (A) ☐ carpel-carpel-carpel-carpel
(B) ☐ **carpel-stamen-stamen-carpel (Correct Answer)**
(C) ☐ sepal-sepal-carpel-carpel
(D) ☐ sepal-sepal-sepal-sepal

Question No.91 (Question Id - 93)

Which of the following pigment in plants play key role in photomorphogenesis ?

- (A) ☐ Chlorophyll
(B) ☐ **Phytochrome (Correct Answer)**
(C) ☐ Cytochrome
(D) ☐ Anthocyanine

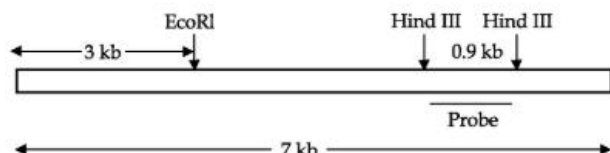
Question No.92 (Question Id - 74)

Immunotherapy using monoclonal antibodies against CTLA-4 results in tumor regression. The possible reason for this anti-tumour effect is :

- (A) ☐ CTLA-4 results in proliferation of tumour cells.
- (B) ☐ CTLA-4 prevents tumour antigen presentation by MHC molecules to T cells.
- (C) ☒ **CTLA-4 engagement results in T-cell inhibition. (Correct Answer)**
- (D) ☐ CTLA-4 engagement results in T-cell activation.

Question No.93 (Question Id - 98)

Researchers have developed transgenic rice plant with a DNA construct as shown below.



Southern hybridization was carried out using EcoRI digested genomic DNA and hybridized with a 0.9 kb Hind III fragment (probe) as shown above. Assuming that two unlinked copies of the construct got incorporated in the rice genome, which of the following pattern one can observe on autoradiogram ?

- (A) ☒ **Two bands greater than or equal to 4 kb (Correct Answer)**
- (B) ☐ A single band of 0.9 kb
- (C) ☐ Two bands of 4 kb and 3 kb
- (D) ☐ A single band greater than or equal to 7 kb

Question No.94 (Question Id - 68)

Following statements are made regarding cell signalling involving integrins :

- A. Integrins are receptors for extracellular matrix proteins
- B. Talin and α -actinin are cytoskeletal proteins that bind integrin subunits and link to more complex cytoskeleton structures like focal adhesins.
- C. They do not mediate interactions with proteins present on other cells.
- D. They initiate signalling that control cell cycle entry, cell proliferation and differentiation.

Choose the **correct** statements from the options given below :

- (A) ☐ A, B and C only
- (B) ☐ B, C and D only
- (C) ☒ **A, B and D only (Correct Answer)**
- (D) ☐ A, C and D only

Question No.95 (Question Id - 48)

Which of the following statements is FALSE ?

- (A) ☒ **Hfr cells cannot undergo conjugation with F^- cells. (Correct Answer)**
- (B) ☐ F^+ cells can undergo conjugation with F^- cells.
- (C) ☐ F^- cells cannot undergo conjugation with F^- cells.
- (D) ☐ F' cells can undergo conjugation with F^- cells.

Question No.96 (Question Id - 27)

The LD50/30 is the dose of radiation :

- (A) ☒ **required to kill 50% of the given population in 30 days after exposure (Correct Answer)**
- (B) ☐ that kills 50% of population if exposed to a beam with LET value of 30

- (C) ☐ required to kill 30-50% of the total population
 (D) ☐ that kills 30% of population if exposed to the beam with a LET value of 50

Question No.97 (Question Id - 40)

Given below are two statements :

Statement I :

All Ig molecules on surface of a given B cell have same idiotype.

Statement II :

All Ig molecules on surface of a given B cell have same isotype.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) ☐ Both **Statement I** and **Statement II** are correct
 (B) ☐ Both **Statement I** and **Statement II** are incorrect
 (C) ☐ **Statement I is correct but Statement II is incorrect (Correct Answer)**
 (D) ☐ **Statement I** is incorrect but **Statement II** is correct

Question No.98 (Question Id - 29)

Lysogenic conversion is defined as :

- (A) ☐ coexistence of a bacteriophage with its bacterial host.
 (B) ☐ **inheritance of a new phenotypic trait by the host. (Correct Answer)**
 (C) ☐ a process that triggers lysis of the host cell.
 (D) ☐ a process that results in DNA transfer from the bacterial host to the bacteriophage.

Question No.99 (Question Id - 32)

Following statements with respect to development in sea urchin were made :

- A. The blastopore becomes the mouth and the anus is formed elsewhere.
 B. The micromeres are specified autonomously where maternal β -catenin plays an important role.
 C. The macromeres regulate the fates of their neighbouring cells through juxtacrine and paracrine pathways.
 D. The large micromeres become the skeleton of the larva and the small micromeres contribute to coelomic pouches and the germ cells of the adult.

Choose the **most appropriate** answer from the options given below :

- (A) ☐ A and B only
 (B) ☐ A and C only
 (C) ☐ B and C only
 (D) ☐ **B and D only (Correct Answer)**

Question No.100 (Question Id - 73)



List-I	List-II
(Purification techniques)	(Principles)
A. Reverse phase chromatography	I. Hydrophobicity
B. Gel filtration chromatography	II. Ionic charge
C. Affinity chromatography	III. Molecular size
D. Ion exchange chromatography	IV. epitope recognition

The **correct** match is :

- (A) ☒ **A - I, B - III, C - IV, D - II (Correct Answer)**
(B) ☐ A - IV, B - I, C - II, D - III
(C) ☐ A - II, B - III, C - I, D - IV
(D) ☐ A - II, B - IV, C - III, D - I

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