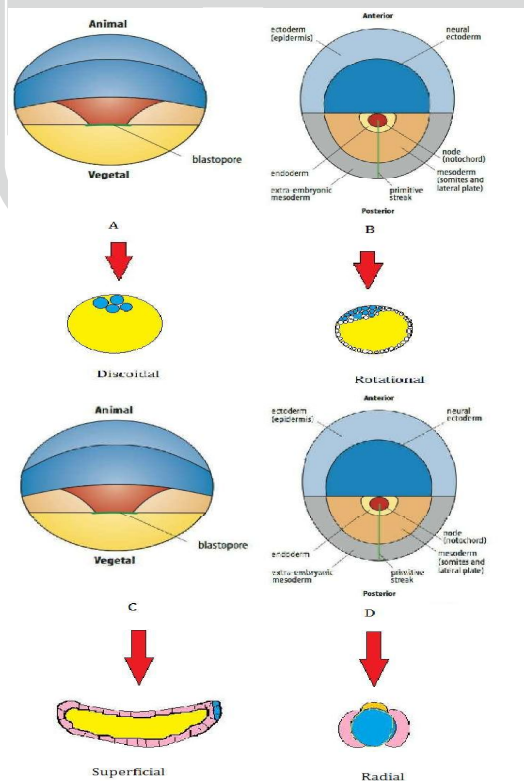


QUESTION PAPER
CSIR NET LIFE SCIENCES

June-2012

21. Which nitrogen of adenosine gets protonated if pH of nucleoside is lowered from 7 to 3?
(a) N1 (b) N3 (c) N7 (d) N9
22. Phosphatidyl serine, an important component of biological membrane. is located in
(a) the outer leaflet but flip flop to inner
(b) both leaflets of plasma membrane
(c) middle of the bilayer
(d) the inner leaflet but flip flops to outer leaflets under specific conditions
23. The oligopeptide, with F-A-R-P-M-T-S-R-P-G-F is treated with trypsin, chymotrysin and carboxypeptidase-B. Apart from original, the number of fragments obtained will be
(a) 4 (b) 3 (c) 2 (d) 0
24. The word “fermentation” is used in biochemistry and Microbial technology to denote different phenomenon. If the former is called C and latter is called T. Which of the following statement is true?
(a) All C is T but all T is not C
(b) All T is C but C is not T
(c) T is always a product of genetic engineering while C is not
(d) C is always an aerobic process, while T can be aerobic or anaerobic
25. All cytosolic proteins have nuclear export signals that allows them to be removed from nucleus when it reassembles after
(a) meiosis (b) mitosis
(c) both mitosis and meiosis (d) DNA replication
26. ATP- binding cassette (ABC) transporters
(a) all are P-glycoprotein
(b) found only in eukaryotes
(c) are both membrane spanning transporter domain that recognizes substrate and ATP-binding domain
(d) affect translocation by forming channels
27. Which one of the following interactions plays a major role in stabilizing B-DNA?
(a) Hydrogen bond (b) Hydrophobic interactions
(c) Van der Waal’s interactions (d) Ionic interactions
28. Which of the following statement is NOT true about small interfering RNA (siRNA)?
(a) siRNA has 21-25 nucleotide sequence with 2 nucleotide overhang at 3’ end
(b) siRNA is processed by RNA protein complex RISC
(c) siRNA is often induced by viruses
(d) siRNA does not generally act at the level of transcription.
29. Regulatory elements for expression of ribosomal RNA genes resides in the
(a) transcribed spacer region
(b) non-transcribed spacer region
(c) 5’ flanking region of individual ribosomal genes
(d) internal regions within the genes

30. Presence of an internal ribosomal entry site (IRES) in mRNA
 (a) Inhibit its translation (b) promotes its post transcriptional processing
 (c) has no impact on its translation (d) promotes its translation under adverse conditions
31. *Mycobacterium tuberculosis* is an intra-cellular bacterium. It prefers to infect
 (a) Macrophages (b) B-cells (c) T-cells (d) neutrophils
32. Integrin molecule link extracellular matrix (ECM) to the actin cytoskeleton of cell. Integrin binds to which of the following ECM macromolecules?
 (a) Laminin (b) Collagen (c) Fibronectin (d) Vitronectin
33. Major stimulus for spore formation in bacteria is
 (a) Nutrient limitation (b) heat stress (c) Cold stress (d) pH stress
34. Which of the following matches of oncogene-protein product is NOT correct?
 (a) *erb A* → Thyroid hormone receptor
 (b) *erb B* → Epidermal Growth Factor receptor
 (c) *ras* → Guanine nucleotide binding protein with GTPase activity
 (d) *fos* → Platelet derived growth factor receptor
35. Which of the following statement is INCORRECT in relation to treatment of pre-B cell with phorbol ester?
 (a) Phorbol esters activates NF- κ B for translocation into nucleus
 (b) Phorbol esters activate protein kinase C
 (c) Phorbol ester leads to phosphorylates of NF- κ B
 (d) Phorbol ester remove the inhibitor from inactive NF- κ B complex in the cytoplasm
36. CD 19 is a marker for
 (a) B-cells (b) T-cells (c) Macrophage (d) Natural Killer cells
37. Given below are fate map of two organisms and the pattern by which embryos undergo cleavage. Which of the following is/are the right combination(s)?



(a) B only

(b) B and A

(c) A and C

(d) B and D

38. Ced-9 gene appears to be a binary switch that regulates cell survival and apoptosis in nematodes. Considering that CED-9 protein can bind to and inactivate CED-4, which of the following would lead to apoptosis?
 (a) Activation of *Ced-9* gene (b) Loss of function of CED-3
 (c) Loss of function of *Ced-9* gene (d) Loss of function of CED-4
39. In case of *Xenopus levis* which cells make up the Knewkoop center and Spemann's organizer?
 (a) endodermal and mesodermal, respectively (b) mesodermal and endodermal, respectively
 (c) endodermal and ectodermal, respectively (d) ectodermal and endodermal, respectively
40. Photosystem II functions as a light dependent water plastoquinone oxidoreductase. What are the names of two reaction center protein that bind electron transfer prosthetic group, such as P680, pheophytin and plastoquinone?
 (a) CP43 and CP47 (b) D1 and D2 (c) 33 kDa and 23kDa (d) F_A and F_B
41. Which one of the following combinations of secondary metabolite biosynthetic pathway result in the biosynthesis of terpenes?
 (a) Mevalonic acid and MEP pathways (b) Malonic acid and MEP pathways
 (c) Shikimik acid and Malonic acid pathway (d) Shikimik acid and Mevalonic acid pathways
42. Symbiotic biological nitrogen fixation takes place with the association between a plant and a nitrogen fixing prokaryote as shown in the following table:

List of plants	Nitrogen fixing
A. Soyabean	(a) <i>Frankia</i>
B. <i>Casurina</i>	(b) <i>Bradyrhizobium</i>
C. <i>Gunneria</i>	(c) <i>Anabaena</i>
D. <i>Azolla</i>	(d) <i>Nostoc</i>

The correct combination is :

- | | | | | |
|-----|---|---|---|---|
| | A | B | C | D |
| (a) | 1 | 2 | 3 | 4 |
| (b) | 2 | 1 | 4 | 3 |
| (c) | 3 | 2 | 1 | 4 |
| (d) | 4 | 3 | 2 | 1 |
43. Plants have evolved with multiple photoreceptors, which can perceive specific wavelength of light. Which of the following statement is correct about photoreceptors?
 (a) Phytochrome A can receive both far-red and blue light
 (b) Phytochrome C can receive far-red light
 (c) Cryptochrome 1 and phytochrome B are for perceiving blue light
 (d) Phytochrome B can predominantly perceive far red light
44. Which of the following statement describes the process of phloem loading?
 (a) Triose phosphate is transported from chloroplast to cytosol
 (b) Sugars are transported into sieve elements and companion cells
 (c) Sugars are transported from producing cells in mesophyll in the vicinity of sieve element
 (d) Solutes are transported from roots to the shoots
45. Which of the following is responsible for initiation of maternal behaviour in first time pregnant rats after parturition?
 (a) high prolactin levels in blood (b) Stimulation of sensory receptors during delivery
 (c) changes in uterine volume (d) Presence of male rats

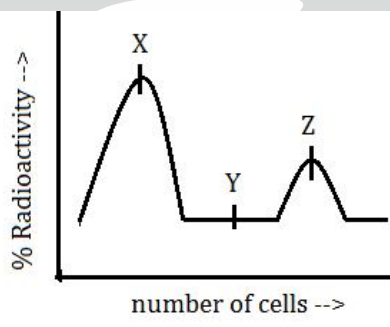
46. Which one of the following changes will occur in the cell membrane of nodal tissue of heart., which results in an increased heart rate due to stimulation of sympathetic nerves?
(a) Opening of sodium channels is facilitated. (b) Potassium conductance is increased.
(c) Opening of L-calcium channels are facilitated.(d) 'h' channels are inhibited.
47. A person takes 1.0 ml of insulin injection daily at 8:00 AM. His son gave him 1.5 ml insulin at 8.00 AM considering the father will go to party and eat more during lunch. The father also avoided breakfast, as he planned to eat more during lunch. Which one of the following events will occur?
(a) Father will be normoglycemic.
(b) Father will be in hypoglycemic condition before lunch.
(b) Father will be in hyperglycemic condition before lunch
(d) Blood glucose of father will be low after taking lunch
48. A gene encoding t-RNA undergoes a mutational event in its anticodon region that enables it to recognize a mutant nonsense codon and permit completion of translation. Such a mutation is known as
(a) silent mutation (b) neutral mutation
(c) reversion (d) Non sense suppressor
49. Mutation at two different loci of the same gene X results in altered functions. These two mutated versions of gene X are called
(a) alleles. (b) complementation groups.
(c) interrupted genes. (d) linkage groups.
50. Spermatogonial stem cell undergoes extensive metamorphosis to become a spermatozoan. Meiosis leads to the formation of spermatid containing 22 autosomes and one sex chromosome. A male mouse was found in a colony which always produced only female puff upon matting. Which one of following is a possible reason
(a) Spermiogenesis was defective
(b) All spermgonial stem cells contained only X and no Y chromosomes
(c) Activation of Y-chromosome linked post meiotic death related gene may lead to such a situation
(d) Activation of X-chromosome linked post meiotic death related gene may lead to such a situation
51. Two pure lines of corn have mean cob length of 9 inches and 3 inches, respectively. The polygenes involved in this trait exhibit additive gene action. Crossing these two lines is expected to produce a progeny population with mean cob length (inches) of:
(a) 12.0 (b) 7.5 (c) 6.0 (d) 2.75
52. How many genetically different gametes can be made by an individual of genotype AaBbccDDEe ?
(a) 3 (b) 5 (c) 8 (d) 32
53. A paraphyletic group
(a) contains unrelated organisms
(b) includes the most recent common ancestors but not all of its descendants
(c) includes all the representatives of a clade but not the most recent common ancestor
(d) contains all the representative of clade and most recent common ancestor
54. Which of the following organism is widely used as a biocontrol in organic farming?
(a) *Rhizobium tropici* (b) *Trichoderma viridie*
(c) *Fusarium oxysporum* (d) *Nostoc muscorum*
55. Which of the following is NOT an adaptive modification in a xerophytic plant?
(a) Strongly developed Sclerenchyma (b) Sunken stomata
(c) Sparse stomata (d) Presence of Lacunar tissues

56. If the milk is left open, lactose is fermented first to produce acid. This is followed by proteolytic bacteria which increases the pH. Ultimately milk fats are degraded to produce rancidity. This is an example of
(a) ecological succession (b) Antagonism
(c) interference competition (d) Microevolution
57. Based on per molecule, which of the following gas has the most powerful greenhouse effect?
(a) CO₂ (b) CH₄ (c) N₂O (d) CFCs
58. The Hardy-Wienberg principle comes from considering what happens when Mendelian genes act on population. The model predicts that there will be no change in allele frequencies when
(a) Migration into the population occurs at a steady rate
(b) The population suffers a bottle neck
(c) A rare new mutation is associated with a sharp increase in fitness
(d) No evolutionary process is at work
59. Among the following events in history of life.
a. prokaryotic cell b. eukaryotic cell
c. natural selection d. organic molecules
e. self replicating molecule
- Which is the correct chronological order?
(a) d → e → c → a → b (b) d → e → a → b → c
(c) e → d → a → c → b (d) d → e → a → c → b
60. Sexual selection results in variation in the reproductive success of males, often due to female choice with particular phenotypes. This type of sexual selection is because
(a) Males cannot compete with other males
(b) Cost of breeding is higher for females as compared to males
(c) Inappropriate mating results in a similar reduction in fitness of females and males
(d) Males are a limiting resource for females
61. Which is best method for checking mycoplasma contamination in a mammalian cell line
(a) Southern Hybridisation (b) ELISA
(c) PCR (d) Western Hybridization
62. Major disadvantage of using liposome as targeted drug delivery vehicle is that
(a) It get internalized by phagocytosis inside lysosome
(b) It is very unstable and has low shelf life
(c) It get intercalated in cell membrane
(d) Its drug entrapment efficiency is very low
63. If 'r' denotes correlation coefficient and 'm' denotes slope of regression line, interchanging X and Y axes would.
(a) Change 'm' but not 'r' (b) Change 'r' but not 'm'
(c) changes both 'r' and 'm' (d) nor change 'r' or 'm'
64. Which of the following statement is NOT true during infection of plant cell by Agrobacterium?
(a) The protein products of virulence genes Vir A and VirG perceives acetosyringone
(b) The VirB protein forms a connection between Agrobacterium and the plant cell and facilitates T-DNA transfer into the plant
(c) The T-DNA is excised and bound to VirD2 protein
(d) The T-DNA, after becoming coated with VirF binds to phosphorylated VIP1, which allows the complex to enter the plant's nucleus

65. Which of the following does not represent strategy for phytoremediation?
(a) Phytodegradation
(b) Phytomining
(c) Continuous removal through hyper accumulators
(d) Chelate mediated extraction of pollutants
66. Among existing technologies, which of the following vector system would you prefer to use for generating a library for 140 kb eukaryotic genomic DNA fragments, while giving due consideration to size as well as stability of insert?
(a) Phage (b) Cosmid (c) BAC (d) YAC
67. The use of biotinylated secondary antibody in ELISA?
(a) increase the sensitivity of assay but compromises the specificity
(b) increases the sensitivity of assay without compromising the specificity
(c) does not alter either sensitivity or specificity
(d) decreases both sensitivity and specificity
68. Secondary sewage treatment involves
(a) Physical removal of solids from polluted water by filtration and sedimentation
(b) Removal of chemical remains by precipitation
(c) Removal of dissolved organic compounds by activated sludge or trickling filter
(d) Removal of microbial pathogens by chlorination or ozonization
69. Site specific recombination results in precise DNA rearrangements, which is limited to specific sequences. The enzymes that are important to carry out the process are
(a) Restriction endonuclease and DNA Polymerase (b) nuclease and ligase
(c) DNA polymerase and ligase (d) DNA polymerase and DNA gyrase
70. To replace animal use in testing hepatic toxicity of a drug on trial, which one of the following would be used *in vitro* to be closest to the *in vivo* scenario?
(a) Liver cells (b) Hepatic cell lines
(c) Liver slices (d) Co-culture of liver parenchymal cells and kupfer cells
71. A plot of $V/[S]$ versus V is generated for an enzyme catalyzed reaction and a straight line is obtained. Indicate the information that can be obtained from the plot.
(a) V_{max} and turnover number K_m can be obtained only from a plot of $1/V$ versus $1/[S]$
(b) K_m/V_{max} from the slope
(c) V_{max} , K_m and turnover number
(d) only K_m and turnover number
72. Phosphorylation of ADP to ATP occurs through energy metabolism, comprising oxidative phosphorylation or substrate level phosphorylation or photo-phosphorylation (in plants). ATP can also be formed from ADP through the action of adenylate kinase. Crystal structure determination of adenylate kinase shows that the C-terminal region has the sequence-val-asp-asp-val-phe-ser-gln-val-cys-thr-his-leu-asp-thr-leu-lys. What can be a possible conformation of the sequence?
(a) A helix that is not amphipathic (b) Amphipathic helix
(c) Leucine zipper helix (d) Beta helix
73. Consider a 51-residue long protein containing only 100 bonds about which rotation can occur. Assume that 3 orientations per bond are possible. Based on these assumptions, how many conformations will be possible for this protein?
(a) 3^{100} (b) 100^3 (c) 3^{51} (d) $51 \times 100 \times 3$

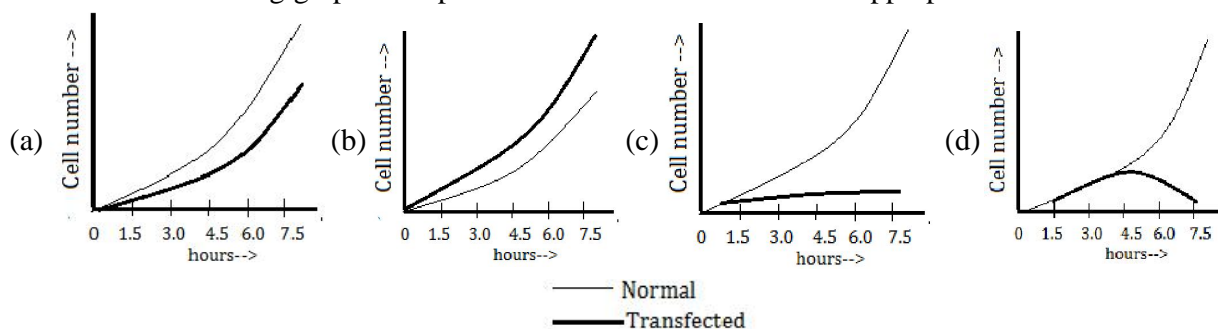
74. Phosphogluconolactone is added to 0.1 M glucose-6-phosphate (G-6-P). The standard free energy change of the reaction, $G-6-P \rightleftharpoons G-1-P$ is 1.8 kcal/mole at 25°C. The equilibrium concentrations of G-6-P and G-1-P, respectively are
 (a) 96 mM, 45 mM (b) 100 mM, 0 mM (c) 45 mM, 96 mM (d) 0 mM, 100 mM
75. Differential scanning calorimetric study of calf thymus DNA was carried out to measure midpoint of thermal denaturation (T_m). ΔH_m (enthalpy change at T_m) and ΔC_p (constant-pressure heat capacity change). It has been observed that $\Delta C_p = 0$, $T_m = 75.5^\circ\text{C}$ and $\Delta H_m = 50.4$ kcal/mole. The Gibbs free energy change at 37°C is
 (a) 25.5 kcal/mole (b) 2.6 kcal/mole (c) 0.6 kcal/mole (d) 5.6 kcal/mole
76. The following reactions are part of the citric acid cycle. The numbers in parenthesis indicate the number of carbon atoms in each molecule.
 Isocitrate (6) \xrightarrow{A} α -ketoglutarate (5) \xrightarrow{B} succinyl CoA (4) \xrightarrow{C} succinate (4) \xrightarrow{D} fumarate (4)
 Which of the following sequences of the reaction system A→D is correct ?
 (a) $\text{NAD}^+ \rightarrow \text{NADH} + \text{H}^+$, $\rightarrow \text{NAD}^+$, $\text{CO}_2 \rightarrow \text{NADH} + \text{H}^+$, GDP , $\text{CO}_2 \rightarrow \text{GTP}$, FAD , $\text{iP} \rightarrow \text{FADH}_2$
 (b) $\text{NAD}^+ \rightarrow \text{NADH} + \text{H}^+$, NAD^+ , $\text{CO}_2 \rightarrow \text{NADH} + \text{H}^+$, ADP , $\text{CO}_2 \rightarrow \text{ATP}$, FAD , $\text{iP} \rightarrow \text{FADH}_2$
 (c) $\text{NAD}^+ \rightarrow \text{NADH} + \text{H}^+$, FAD^+ , $\text{CO}_2 \rightarrow \text{FADH}_2$, $\text{ADP} \rightarrow \text{ATP}$, NAD^+ , $\text{iP} \rightarrow \text{NADH} + \text{H}^+$, CO_2
 (d) $\text{NAD}^+ \rightarrow \text{NADH} + \text{H}^+$, FAD^+ , $\text{CO}_2 \rightarrow \text{FADH}_2$, $\text{GDP} \rightarrow \text{GTP}$, NAD^+ , $\text{iP} \rightarrow \text{NADH} + \text{H}^+$, CO_2
77. The respiratory chain is relatively inaccessible to experimental manipulation in intact mitochondria. Upon disrupting mitochondria with ultrasound, however, it is possible to isolate functional sub mitochondrial particles, which consist of broken cristae that have resealed inside out into small closed vesicles. In these vesicles the components that originally faced the matrix are now exposed to the surrounding medium. This arrangement helps in studying electron transport and ATP synthesis because:
 (a) it is difficult to manipulate the concentration of small molecules (NADH, ATP, ADP, Pi) in the matrix of intact mitochondria
 (b) in broken cristae, the enzymes and other molecules responsible for electron transport are more active
 (c) intact mitochondria are more unstable than broken cristae
 (d) purification of intact mitochondria is not possible
78. Cystic fibrosis (CF) trans membrane conductance regulator (CFTR) protein is known to be a cAMP-dependent Cl⁻ channel. CF patients (with mutant CFTR proteins) show reduced Cl⁻ permeability and as a result exhibit elevated Cl⁻ level in sweat. To prove this, CFTR proteins (both wild type and mutant) are inserted in a model membrane (liposome) and Cl⁻ transport is followed with radioactive Cl⁻. It is known that topology of CFTR in membrane is important for its function. Despite no proteolytic degradation of denaturation of CFTR proteins, wild type CFTR failed to transport Cl⁻ in liposome.
 Which of the following is the correct explanation of this?
 (a) CFTR protein gets mutated during insertion in liposomes.
 (b) CFTR protein loses affinity with Cl⁻ ions.
 (c) CFTR protein gets wrongly inserted in liposomes.
 (d) CFTR protein loses channel forming property in liposomes.
79. Which of the following statement regarding aquaporin or water channels is NOT correct?
 (a) Aquaporins are found in both plants and animals membranes
 (b) Aquaporins cannot transport uncharged molecules like ammonia
 (c) Phosphorylation and calcium concentration regulates aquaporin activity
 (d) Activity of aquaporin is regulated by pH and reactive oxygen species

80. The intestinal absorption of glucose is impaired by use of ouabain, an inhibitor of $\text{Na}^+\text{-K}^+$ ATPase. Indicate the correct explanation
- The inhibitor has blocked the transport of Na^+ from intestinal lumen to epithelial cells
 - The inhibitor has blocked the transport of Na^+ from epithelial cells to intestinal lumen
 - The inhibitor has blocked the transport of Na^+ from intestinal lumen to interstitial cells
 - The inhibitor has blocked the transport of Na^+ from interstitial cell to intestinal lumen
81. A synthetically prepared mRNA contains repetitive AU sequences. The mRNA was incubated with mammalian cell extract which contains ribosomes, tRNA s and all the factors required for protein synthesis. Assuming no initiation codon is required for protein synthesis, which of the following peptides will most likely be synthesized?
- A single peptide composed of the same amino acid sequence.
 - A single peptide with alternating sequence of two amino acids.
 - A single peptide with alternating sequence of three amino acids.
 - Three different peptides each sequence composed of a single amino acid.
82. Hoechst 33342 is a membrane-permanent dye that fluoresces when it binds to DNA through intercalating process. If a population of cells is incubated briefly with Hoechst dye and stored in flow cyclometer the cells display various levels of fluorescence in different phases of cell cycles as shown in figure below (marked as X,Y,Z)



Which of the following is correct?

- X is G_1 , Y is $G_2 + M$ and Z is S
 - X is G_1 , Y is S and Z is $G_2 + M$
 - X is S, Y is $G_2 + M$ and Z is G_1
 - X is S, Y is G_1 and Z is $G_2 + M$
83. During cell cycle regulation in eukaryotes, there are post- translational modifications of protein factors, which act as switches for different phases of cell cycle. A cell population of yeast was transfected with gene for wee 1 kinase (modifies cdc2 protein). Assuming that the transfection efficiency was 50% only, which of the following graphical representation of the results is most appropriate?



84. In semi-conservative mode of DNA replication two parental strands unwind and are used for synthesis of new strands following the rule of complementary base pairing. Synthesis of complementary strands require that DNA synthesis proceeds in opposite direction, while the double helix is progressively unwinding and replicating in only one direction. One of the DNA strands is continuously synthesised in the same direction as the advancing replication fork and is called leading strand whereas the other

strands is synthesised discontinuously in segments and is referred to as lagging strand. These short fragments made discontinuously are labelled as okazaki fragments. These okazaki fragments need to be matured into continuous DNA strand by which one of the following combination of enzymes?

- (a) DNA Pol III and DNA ligase (b) DNA pol I and DNA ligase
(c) DNA pol II and DNA ligase (d) DNA gyrase and DNA ligase

85. The lac operon in *E. coli* is controlled by both the lac repressor and the catabolite activation protein CAP. In an *in vivo* experiment with lac operon, the following observations are made:

- A. cAMP levels are high B. Repressor is bound with allolactose
C. CAP is interacting with RNA polymerase

Which one of the following conclusions is most appropriate based on the above observations?

- (a) Glucose and lactose are present. (b) Glucose is present and lactose is absent
(c) Both are absent (d) Glucose is absent and lactose is present

86. Assuming that the histone octamer forms a cylinder 9 nm in diameter and 5 nm in height and that the human genome forms 32 million nucleosomes, what fraction (approximately) of the volume of nucleus (6 μm diameter) is occupied by histone octamers?

- (a) 1/22 (b) 1/11 (c) 10/21 (d) 10/11

87. A reporter cell line with stably integrated retroviral promoter-luciferase construct was transfected with an expression vector for a cellular protein. The protein seems to regulate the activation of retroviral promoter as analyzed by luciferase activity assay. Which one of the following techniques will you use to show '*in vivo*' recruitment of the cellular protein on the integrated retroviral promoter?

- (a) Electrophoretic mobility shift assay (b) RNase protection assay
(c) DNase hypersensitivity assay (d) Chromatin immunoprecipitation assay

88. In a tissue, cells are bound together by physical attachment between cell to cell and between cell to extra cellular matrix. Following are some of the characteristics of cell junctions:

- A. Adherens junctions are cell-cell anchoring junctions connecting actin filament in one cell with that in next cell.
B. Desmosomes are cell-matrix anchoring junctions connecting actin filament to extra cellular matrix
C. gap junctions are channel forming junctions allowing passage of small water soluble molecules from cell to cell.
D. Tight junctions are occluding junctions, which seal gap between two cells
E. Hemidesmosomes are cell-matrix anchoring junctions connecting intermediate filament in one cell to extra cellular matrix.

Which of the following combinations of statements is NOT correct?

- (a) A and B (b) A and C (c) C and D (d) D and E

89. A mouse was primed with trinitrophenyl-lipopolysaccharide (TNP-LPS) whereas another mouse was primed with TNP-keyhole limpet hemocyanin (TNP-KLH). After three weeks, these mice were sacrificed and splenic cells were fractionated to B cells and T cells. B cells from TNP-LPS primed mice were co-cultured with T cells from TNP-LPS or TNP-KLH-primed mice. Similarly, B cells from TNP-KLH primed mice were co-cultured with the T cells from TNP-LPS or TNP-KLH-primed mice. So, we have four co-cultures:

- (A) $B^{\text{TNP-LPS}} \times T^{\text{TNP-LPS}}$ (B) $B^{\text{TNP-LPS}} \times T^{\text{TNP-KLH}}$ (C) $B^{\text{TNP-KLH}} \times T^{\text{TNP-LPS}}$ (D) $B^{\text{TNP-KLH}} \times T^{\text{TNP-KLH}}$

Among these co-cultures, where do you expect the highest IgG production?

- (a) A (b) B (c) C (d) D

90. A large protein of a pathogenic bacterium has been enzymatically digested to generate a mixture of peptides ranging in size from 3 to 8 amino acid in length. Peptide mixture were then administered in experimental animals to generate peptide-specific antibodies. In order to develop diagnostics for the bacteria, the antisera were used Western blotting to detect bacterial antigen. Western blotting failed despite the use of a wide range of antisera concentrations. What is the most probable cause of the problem?

- (a) Peptide-specific antibody mixture is unstable.
(b) Peptide-specific antibodies were not generated as adjuvant was not administered.
(c) Peptide-specific antibodies were not generated as they were not coupled to a protein carrier.
(d) Peptide-specific antibodies could not recognize the bacterial antigen.
91. Ten different mouse strains were primed with whole Keyhole limpet hemocyanin (KLH). KLH was broken into 10 peptides for *in vitro* stimulation. The splenocytes from ten different primed mouse strains were re-stimulated with each of these 10 peptides and responsiveness to these were measured *in vitro*. It was found that each of these mouse strains had responded to one of the peptides. When the peptide 3 responder was mated with peptide 4 responder, the splenocyte of F₁ offsprings responded to both the peptide. Which of the following is most appropriate.
(a) Mouse strains responding to peptide 3 or peptide 4 have different MHC haplotypes
(b) Mouse strains responding to peptide 3 or peptides 4 have either of these T cell receptors
(c) Mouse strains responding to peptide 3 or peptide 4 cannot process KLH
(d) Mouse strains responding to peptide 3 or peptide 4 did not express MHC class 1 molecule
92. Upon ligand binding, cell surface receptors move laterally to be capped and internalized. *Leishmania* a protozoan parasite, can use several receptors on macrophages to get internalized. one of them is Toll-like receptor 2 (TLR2) that binds lipophosphoglycan on *Leishmania*. Once internalized, the parasite is destroyed in the phagolysosome. Which of the following treatments of *Leishmania*-infected macrophages will result in lowest parasite number in macrophages?
(a) membrane cholesterol-depleting drug, β -methyl cyclodextrin (β -MCD)
(b) ammonium chloride that increases lysosomal pH
(c) both β -MCD and ammonium chloride
(d) anti-TLR2 antibody
93. Oncogenes and tumor suppressor genes are termed as cancer-critical genes. Increasingly powerful tools are now available for systematically searching the DNA or mRNAs of cancer cells for either significant mutations or altered expression. To identify independently an oncogene or a tumor suppressor gene, which of the following would be the most convincing tests to be used?
(a) Transgenic mice that overexpress the candidate oncogene and knockout mice that lack candidate tumour suppressor gene.
(b) Transgenic mice that overexpress the candidate tumor suppressor gene and knockout mice that lack candidate oncogene.
(c) Transgenic mice that overexpress the candidate oncogene and tumor suppressor gene.
(d) Knockout mice that lack the candidate oncogene and tumor suppressor gene.
94. The functionality of the pax6 gene in the formation of optic and nasal structure may be attributed to the following
A. Pax6 makes the optic vesicle competent and allows lens formation.
B. The optic vesicle can induce any part of the head ectoderm to form the nasal and optic structures, due to presence of Pax6.
C. Pax6 renders the head ectoderm competent to receive signals from optic vesicle.
D. Apart from the optic vesicle, the head ectoderm may also be induced by BMP and FGF, so pax6 is not exclusive for lens formation.
Which of the above attributes are true?
(a) (A) and (D) (b) (C) and (D) (c) (B) and(C) (d) (C) only

95. The pattern of embryonic cleavage specific to a species is determined by two major parameters.
- A. The amount and distribution of yolk protein within the cytoplasm.
 - B. The factors in the cytoplasm that influence the angle mitotic spindles and the timings of its formation.
- Which of the following statements are true?
- (a) Species having telolecithal egg follow a holoblastic cleavage.
 - (b) Species having isolecithal egg follow a holoblastic cleavage.
 - (c) Species having centrolecithal egg follow a holoblastic cleavage.
 - (d) Species having isolecithal egg follow a meroblastic cleavage.
96. The fate of a cell or a tissue is specified when it is capable of differentiating autonomously on being placed in a neutral environment with respect to the developmental pathway. An embryo will show development pattern based on its type of specification:
- Based on the above facts it can be said that potency of a cell is:
- A. Equal to its normal fate in regulative development
 - B. greater than its normal fate in regulative development
 - C. equal to its normal fate in mosaic development
 - D. greater than its normal fate in mosaic development
- Which of the above statements are true?
- (a) (B) and (C)
 - (b) (A) and (D)
 - (c) (A) and (C)
 - (d) (B) and (D)
97. In the context of the proximal-distal growth and differentiation of a tetrapod limb following experiments were visualized
- A. If the apical ectodermal ridge (AER) is removed at any time during the limb development, further development of distal limb skeletal elements ceases.
 - B. If leg mesenchyme is placed directly beneath the wing AER, proximal hind limb structures develop at the end of the limb
 - C. If an extra AER is grafted onto an existing limb bud, supernumerary structures are formed usually at the distal end of the limb.
 - D. If leg mesenchyme is placed directly beneath the wing AER, proximal hind limb structures develop at the end of the limb.
- Which of the above experiments would show the possible interactions between the AER and the limb mesenchyme directly beneath it during limb development?
- (a) (A) and (B) only
 - (b) (B) and (C) only
 - (c) (C) and (D) only
 - (d) (A), (B) and (C)
98. The following statements have been proposed for plant vegetative development:
- (i) Lateral roots develop from epidermal cells.
 - (ii) Shoots axillary meristem develops from shoot apical meristem during differentiation of leaf primordia.
 - (iii) Root cap is made of dead cells
 - (iv) Lateral meristem and cylindrical meristem found in roots and shoots results in secondary growth.
- Which of the above statements are true ?
- (a) (i) and (ii)
 - (b) (ii) and (iv)
 - (c) (i), (ii) and (iv)
 - (d) (iii) and (iv)
99. Red and far-red lights are perceived by plants through various photoreceptors including phytochromes. The activation of phytochrome is caused by:
- (a) conversion of Pr to Pfr form through the effect of red light.
 - (b) repression of Pr form through the effect of far-red light.
 - (c) equal proportion of red and far-red lights at same fluence rates.
 - (d) presence of red and far-red light at different fluence rates.

- 100.** Following are some facts regarding localization of photosynthetic supramolecular complexes on plastid lamellae:
- A. PSII is preferentially localized on granal lamellae
 - B. ATP synthase and PSI is preferentially localized in stromal lamellae
 - C. PSI and PSII are located adjacent to each other in stromal lamellae
 - D. Cytochrome b_6/f complex is not a membrane bound complex
- Which of the following combinations of the above statements is true?
- (a) A and B (b) C and D (c) B and D (d) B and C
- 101.** Phenyl ammonia lyase (PAL) and chalcone synthase (CHS) involved in biosynthesis of phenolic compound in plants. Following are some statements regarding the action of PAL and CHS:
- A. Substrate for PAL is phenyl alanine and for CS is chalcone
 - B. PAL catalyze conversion of phenyl alanine to trans-cinnamic acid
 - C. PAL catalyze conversion of phenyl alanine to p-coumaric acid
 - D. Coumaryl CoA is converted to chalcone by chalcone synthase
- Which of the following combinations of above statement is true?
- (a) A and B (b) A and C (c) B and C (d) B and D
- 102.** Upon absorption of photon, a chlorophyll molecule gets converted to its excited state when the energy of photon is
- (a) more than that of ground state of pigment molecule
 - (b) equal to that of pigment molecule's excited state
 - (c) more than that of ground state but lesser than excited state of the pigment molecule
 - (d) equal to energy gap between ground state and excited state energy
- 103.** Following are certain facts about the effect of abscisic acid (ABA) on the development and physiological effect of plants:
- A. ABA promotes leaf senescence independent of ethylene.
 - B. ABA promotes shoot growth and inhibits root growth at low water potentials.
 - C. ABA inhibits gibberellin induced enzyme production.
 - D. Seed dormancy is controlled by the ratio of ABA and gibberellin.
- Which one of the following combinations of the above statements is true?
- (a) A, B and C (b) B, C and D (c) A, B and D (d) A, C and D
- 104.** While studying the primary effect of different abiotic stresses on plants, a researcher observed water potential reduction and cellular dehydration. Which of the following combination of abiotic stress may cause observed effect?
- (a) Water deficit, salinity and chilling (b) Salinity, high temperature and Flooding
 - (c) Freezing, salinity and water deficit (d) Freezing, chilling and flooding
- 105.** In an experiments, sperm removed from epididymis of a male mouse was added in a dish containing appropriate media and oocyte. No fertilization was seen. However, when sperm from epididymis were directly placed in uterus of an ovulated female, she became pregnant. These observation suggest that
- (a) The sperm need to travel some distance to attain fertilizing ability.
 - (b) The oocyte secretes some biochemicals or factors which help sperm to fertilize.
 - (c) The hormones in body help sperm to attain fertilizing ability.
 - (d) The contents of female reproductive tract interact with sperm and activate it for fertilization

106. Level of follicle stimulating hormone (FSH) during infancy and adulthood is the same but spermatogenesis is seen only during adulthood. mRNA levels coding for FSH receptor are also found to be the same in testis of both age groups. Which of the following investigations will clarify this paradox a little more?
- Culture testicular cells and add LH to see testosterone production.
 - Culture testicular cells and add testosterone to see comparative rise in FSH mRNA from both age groups.
 - Culture testicular cells and add FSH to see comparative rise in cAMP production by both age groups.
 - Add both LH and FSH to testicular cells and evaluate cAMP production
107. GnRH is secreted during infancy (0-6 month) and puberty onwards (4 years and above) in monkeys. However, *i.v.* injection of GnRH during pre-pubertal period (about 2 years of age) led to elevated LH and FSH in blood compared to untreated 2 years old monkey. This suggest that
- Hypothalamus is active during pre-pubertal period
 - GnRH action on pituitary is age dependent
 - Pituitary matures during adulthood
 - Pituitary is active in all stages of development in monkeys
- Which one of the following is true?
- A and B
 - B and C
 - C only
 - D only
108. The stereocilia of auditory hair cells are arranged in rows but the height of stereocilia are not the same in all the rows. Though the height of stereocilia is the same within a particular row, the heights increase in subsequent rows. When the stereocilia of shorter rows are mechanically pushed towards the taller rows, the hair cells are depolarized but a push on opposite direction hyperpolarizes them. The significance of this graded height of stereocilia is:
- Each row of stereocilia may be displaced independent of other rows in physiological conditions.
 - The tip of the taller stereocilia will show greater displacement as compared to shorter ones when all the rows are moving in the same axis.
 - The hair cells will be depolarized or hyperpolarized in different grades when the axis of displacement is changed.
 - The taller stereocilia are involved with depolarization and shorter ones are responsible for hyperpolarization.
- Which one of the following is correct?
- A only
 - B only
 - B and C
 - A and D
109. A person suffering from thyrotoxicosis has extremely high Level of thyroid hormone in blood. There is a failure of feed back regulation in hypothalamic-pituitary-thyroid axis. The detailed blood investigation exhibited high level of the following:
- Thyroid stimulating hormone (TSH).
 - Thyroid stimulating immunoglobulin (TSI).
 - Thyroid releasing hormone.
 - Parathyroid hormone.
- In your opinion, which one of the following is the reason for such thyrotoxicosis?
- A only
 - B only
 - A and C
 - C and D
110. A person has been suffering from night blindness. On consultation, the doctor advised person to eat carrots and/or cod fish oil. After some time having seen no improvement, doctor gave person Vitamin A injection. Still no marked improvement was seen. The doctor made several suggestions indicating lack of the following enzymes for the failure of treatment:
- Retinol dehydrogenase
 - Retinal reductase
 - Retinal isomerase
 - Retinal synthase
- According to your opinion which is correct reason for night blindness in above case?
- A only
 - B only
 - B and C both
 - C and D both

111. The rate of mutation in *E. coli* from lac^- to lac^+ are determined using medium containing lactose, as the only sole source of energy. The principle of spontaneity can be said to be violated if:
- the rate of mutation increase during starvation
 - in the presence of lactose the rate of mutation from lac^- to lac^+ increases but overall rate of mutation does not
 - The rate of mutation in lac gene is always greater than in other genes
 - The rate of mutation in lac gene is always less than in other genes
112. Three *E. coli* mutants were isolated which require compound 'A' for their growth. The compounds B, C and D are known to be involved in biosynthetic pathway to A. In order to determine pathway, the mutants were grown in a minimal medium supplemented with ONE OF THE COMPOUNDS, A TO D. The results obtained are summarized below:

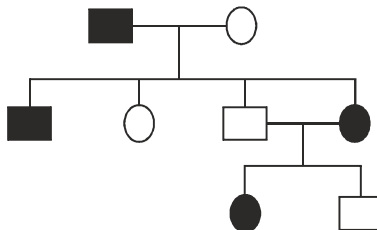
Mutant	Medium supplemented with compound			
	A	B	C	D
1	+	0	0	0
2	+	0	0	+
3	+	0	+	+

'+' = Growth on medium

'0' = No growth

Which of the following equation represents the biosynthetic pathway of A?

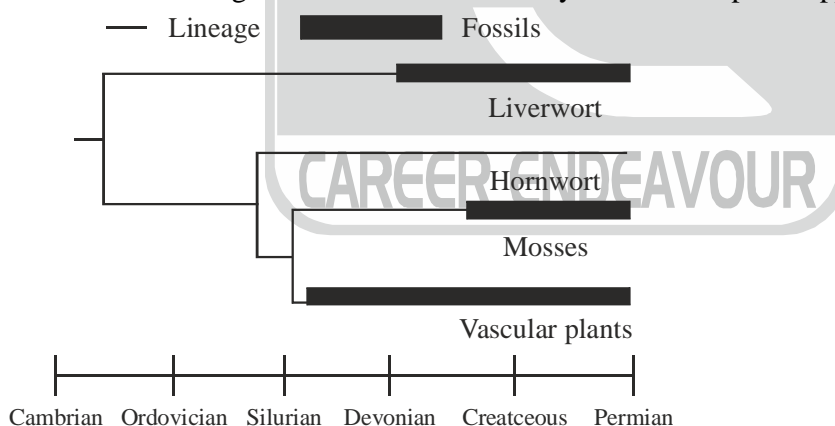
- $B \rightarrow C \rightarrow D \rightarrow A$
 - $C \rightarrow D \rightarrow B \rightarrow A$
 - $B \rightarrow D \rightarrow C \rightarrow A$
 - $A \rightarrow C \rightarrow D \rightarrow B$
113. A cell undergoing meiosis produces four daughter cells, two of which are aneuploids, while two are haploid. This can occur due to:
- Non-dysjunction during first meiotic division only
 - Non-dysjunction during second meiotic division only
 - Non-dysjunction during either first or second meiotic divisions
 - Non-dysjunction during both first and second meiotic divisions
114. When two independent pure lines of pea with white flowers are crossed, the F_1 progeny has purple flowers. The F_2 progeny obtained on selfing shows both purple and white flower in a ratio of 9 : 7. The following conclusions were made
- Two different genes are involved, mutation in which lead to formation of white flower.
 - These two genes show independent assortment.
 - This is an example of complementary gene action.
 - This is an example of duplicate genes.
- Which of the following conclusions are correct?
- A and C only
 - A and D only
 - A, B and D
 - A, B and C
115. Following are four modes of inheritance
- X-linked recessive
 - X-linked dominant
 - Autosomal recessive
 - Autosomal dominant
- Which of the above modes of inheritance can explain the pedigree shown below?



Which of the following modes can be represented by pedigree chart above?

- A and C
- B and C
- C and D
- D only

116. Four different mutant lines showing similar phenotype were identified from a genetic screen. When genetic crosses amongst these mutants were carried out, the first mutant was found to complement the second, third and fourth mutant lines. However, no other complementation groups do the four mutant lines belongs to ?
 (a) 1 (b) 2 (c) 3 (d) 4
117. Why lysogenic cycle is more beneficial to a virus than lytic cycle under certain circumstances?
 (a) The Lysogenic cycle prevent local extinction of host while still retaining infectious potential
 (b) By integrating with the bacterial chromosomes, the genetic instructions for the virus become re-freshed after one or more replication events during binary fission
 (c) Lysogenic infection cycles do not harm their host cells, so they can produce virus particles indefinitely
 (d) Lysogeny causes more mutations to occur in the virus, creating more variants upon which natural selection can operate
118. Two auxotrophic strains of *E. coli* : A ($met^- bio^- thr^+ leu^+ thi^+$) and B ($met^+ bio^+ thr^- leu^- thi^+$) were incubated together for 18 hours in liquid medium and then $\sim 10^8$ cells were plated on minimal medium. Prototrophs were observed at frequency of 1×10^{-7} cells. This may have happened by process of genetic recombination between two strains or by mutation of strains. Which of the following control experiment would help rule out the possibility of mutation?
 (a) Plating strains A and B directly on minimal medium
 (b) Growing the mixture of strain A and B for 18 hours and then plating on complete medium
 (c) Growing strains A and B individually in a liquid complete medium for 18 hours and then plating on a minimal medium
 (d) Growing the obtained prototroph in a liquid complete medium for 18 hours and then plating them on minimal medium
119. According to fossil record, the earliest fossils of liverworts are found in late Devonian, of mosses in early cretaceous, and vascular plants in the later Silurian/early Devonian. *Anthoceros* (hornworts) fossils have not been recovered. Reading fossil records we would say that vascular plants appeared first and then liverworts.



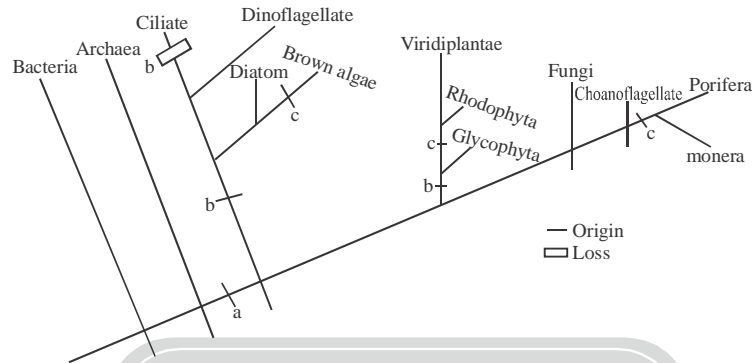
However phylogenetic relationship (shown in figure) suggest otherwise. It may be that

- A. evolutionary history can be read directly from fossil record
 B. The moss lineage goes back to at least early Silurian/early Devonian
 C. Fossil can only set a maximum age for a lineage
 D. Fossil can only sets a minimum age for a lineage
 E. the divergence between liverworts and rest of land plants goes back to at least early Ordovician

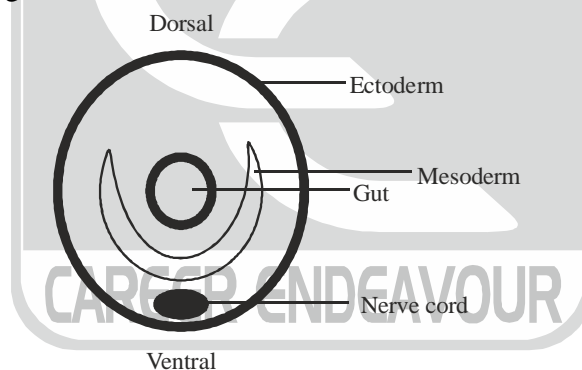
Which of the following statements is correct?

- (a) A, B, C and E (b) B, D and E (c) A, B, D and E (d) B, C and E

120. Which of the following hypothesis best explains the occurrence of Himalayan floral element in Western Ghats of India?
 (a) Continental drift theory (b) Deccan trap hypothesis
 (c) Himalayan glaciations theory (d) Coromondal coast hypothesis
121. In which of the following classes of vertebrates there are groups of animals without limbs?
 (a) fish, reptiles and mammals (b) Reptiles only
 (c) Reptiles and amphibians (d) Amphibians only
122. Identify 'a', 'b' and 'c' in the figure:



- (a) a = mitochondria, b = multicellularity, c = chloroplast
 (b) a = mitochondria, b = chloroplast, c = multicellularity
 (c) a = chloroplast, b = multicellularity, c = mitochondria
 (d) a = chloroplast, b = nucleus, c = multicellularity
123. The schematic section given below of an animal indicates that the animal is



Based on above diagram the organism is

- (a) triploblastic, coelomate and invertebrate (b) triploblastic, acoelomate and invertebrate
 (c) diploblastic, coelomate and invertebrate (d) triploblastic, coelomate and vertebrate
124. A researcher collected information from four forest using sensors to assess their green cover. Observed average spectral values from each of the forest are given in the table below :

Forest	Spectral value	
	NIR	VIS
A	0.50	0.08
B	0.04	0.30
C	0.50	0.20
D	0.60	0.20

The forest cover in the order of highest to lowest is

- (a) A > C > B > D (b) A > D > C > B (c) B > C > D > A (d) D > A > B > C

125. In Lotka and Volterra's two species competition model :

$$\frac{dN_1}{dt} = r_1 N_1 \left[\frac{K_1 - N_1 - N_2 \alpha_{12}}{K_1} \right] \text{ and } \frac{dN_2}{dt} = r_2 N_2 \left[\frac{K_2 - N_2 - \alpha_{21} N_1}{K_2} \right]$$

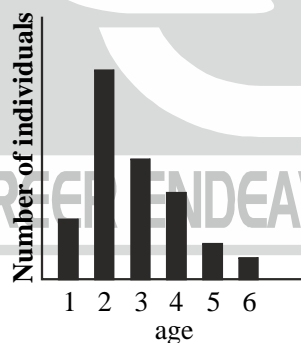
Where N represents population size, r growth rate and K maximum carrying capacity for species 1 and

2. The interspecific competition coefficient $\alpha_{12} < 1$ will mean :

- (a) Individuals of species 2 have less inhibiting effect on individuals of species 1 than individuals of species 1 on other of their own species
 (b) Individuals of species 2 have greater inhibiting effect on individuals of species 1 than individuals of species 1 on other of their own species
 (c) Individuals of species 1 have less inhibiting effect on individuals of species 2 than individuals of species 2 on other of their own species
 (d) Individuals of species 1 have greater inhibiting effect on individuals of species 2 than individuals of species 2 on other of their own species
126. While studying the diversity of 4 communities, 5 species and 50 individuals were recorded from each community. The number of individuals under each species was listed as mentioned in the following Table. In which of the following community Pielou's Evenness index (e) will be 1?

	Community	Species				
		1	2	3	4	5
(a)	A	20	8	7	5	10
(b)	B	10	10	10	10	10
(c)	C	10	12	10	8	10
(d)	D	1	1	1	1	46

127. At a given time, the age class distribution of a population was as shown in figure



Which of the following can be inferred from the figure ?

- (a) Age class 2 has maximum fecundity (b) Age class 2 has maximum survival
 (c) Age class distribution is at equilibrium (d) Age class distribution is not at equilibrium
128. Average annual precipitation and temperature are two important determinants of world's major biomes. Which of the following combinations are correct ? **[NET-JUNE-2012]**

	Temperature and Precipitation		Biome
A	25°C and 255 cm	i.	Temperate Forest
B	15°C and 300 cm	ii.	Savannah
C	15°C and 100 cm	iii.	Temperate rain forest
D	25°C and 255 cm	iv.	Tropical rain forest

- (a) A - (iv), B - (iii), C - (i), D - (ii) (b) A - (iii), B - (ii), C - (iv), D - (i)
 (c) A - (ii), B - (i), C - (iii), D - (iv) (d) A - (i), B - (iv), C - (ii), D - (iii)

129. Which of the following is a prediction of neutral theory of molecular evolution that is supported by data?
- Human and chimps differ more in DNA sequences of psuedogenes than in coding regions of functional genes
 - Human and chimps differ more in DNA sequences of coding regions of functional genes than of psuedogenes
 - Human have a faster evolution of most of their DNA sequences than chimps
 - The more advanced species have more number of functional genes
130. During line-transect sampling of two solitary species of ground mammals the following observations were made :

		Smaller species	Larger species
A	Transect length (Km)	100	100
B	Number of animals recorded	30	36
C	Mean perpendicular distance from transect line (m)	10	40

Which of the following can be inferred from the data ?

- Smaller species is more abundant but seen less frequently
 - Smaller species is less abundant but seen less frequently
 - Larger species is more abundant but seen less frequently
 - The large species is seen more frequently but its abundance cannot be compared with smaller species
131. In hymenoptera insects, males are haploid and females are diploid. All fertilized eggs give rise to female and unfertilized eggs give rise to males. As a result, if a female mates with a single male, the females in progeny are related to 75%. But if the mother had mated with males, the mean genetic relatedness of female progeny is correctly represented by



132. There are 'n' numbers of alleles at a given locus in a diploid population. The proportion of all homozygotes in the population
- All alleles are equal abundant
 - All alleles are not in equal abundant
- $1/n$ and $<1/n$
 - $1/n$ and $>1/n$
 - $1/n^2$ and $<1/n^2$
 - $1/n^2$ and $>1/n^2$
133. A species has the following population characteristics :
- reduction in population size $\geq 90\%$ over last 10 years or 3 generations
 - geographical range : Extent of occurrence $< 100 \text{ Km}^2$ and Area of occupancy: $< 10 \text{ km}^2$

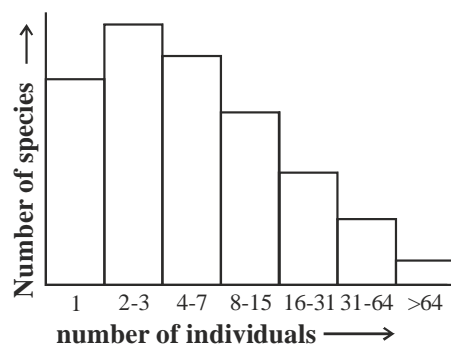
C. Population size less than 50 mature individuals

D. Probability of extinction in wild at least 50% within the next 10 years or 3 generations

To which of the following categories the species will be assigned according to IUCN categorization of threatened species (version 3.1)?

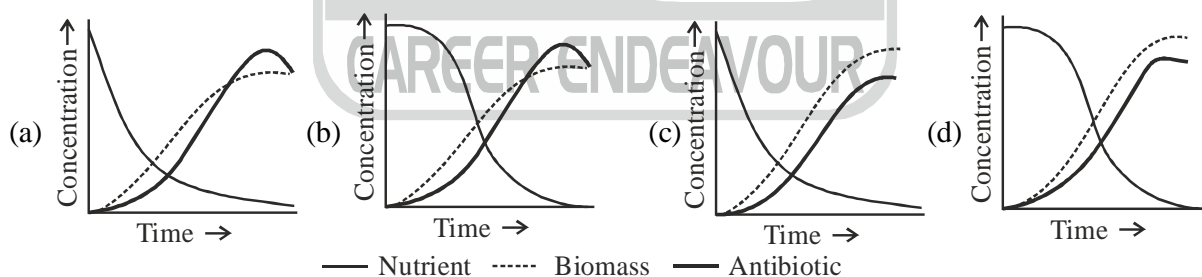
(a) Endangered (b) Vulnerable (c) Critically endangered (d) Extinct in wild

134. Biologist randomly sampled about 300 insects from a newly found island. The distribution of their abundance in the samples in the figure given below.



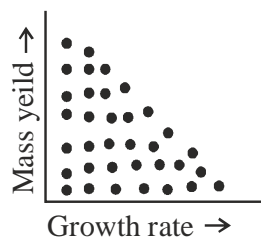
Which of the following can be correctly inferred from the graph?

- (a) Many species have only one individual each on the island
 (b) The bar on the extreme right represents a large number of species with very few individuals
 (c) Summation of the height of all columns will be exactly equal to the total number of species present on the island
 (d) All species from the island may not be represented in the sample
135. Northern elephant seal had been reduced to about 20 in 1800s. Biologist studied variation in protein in the species. They found no genetic differences in the protein among individuals. This lack of variation is due to
- (a) the fact that elephant seal lives in constant environment where there was no need for genetic variation
 (b) population bottle neck and genetic drift
 (c) natural selection resulting in a single best genotype
 (d) a very low rate of mutation
136. Which of the following curve correctly represents the antibiotic production by *Streptomyces* species?



137. Stem cells are widely used for their regenerative property and capacity to differentiate into different lineages. A person with a damaged liver approaches a stem cell therapist. Which of the following therapeutic strategy would be safest?
- (a) Transplanting adult liver cells from healthy donor and grafting them into patient
 (b) Transforming skin cells from patient into iPS cells and using them for further differentiation and grafting in liver
 (c) Injecting embryonic stem cells into the damaged liver
 (d) Injecting cord blood cells into the liver directly

138. The Scatter plot of growth rate and growth yield for 100 random environment isolates of bacteria is shown below



Which of the following can be inferred from data ?

- (a) The two parameters are not related.
 (b) Growth rate is inversely proportional to growth yield.
 (c) Growth yield is negatively correlated with growth rate.
 (d) High growth rate cannot be accompanied by high growth yield.
139. In RadioImmunoassay (RIA) for glucocorticoid hormone, glucocorticoid (tritiated) is added to RIA cocktail. When the amount of bound hormone was measured no radioactive counts were observed. The following possible explanation(s) were proposed:
- A. The radioactive hormone was insufficient
 B. The radioactive tag to the hormone completely dissociated during storage
 C. Antibody was not added to the cocktail
 D. The specific activity of tritium was low
- Choose the correct option(s):
- (a) A only (b) C only (c) B and C (d) A and D
140. Four different receptors viz, A, B, C and D bind to same ligand 'X'. In order to determine when receptors has the highest ligand binding affinity following experiment was carried out. Cells were transfected with green fluorescent protein (GFP)-tagged receptors (A, B, C and D) individually, then incubated with red fluorescent protein (RFP) tagged ligand 'X' and subjected to FACS. Following are the results

	Receptor A		Receptor B		Receptor C		Receptor D	
RFP	24 %	5 %	52 %	19 %	19 %	52 %	5 %	24 %
	52 %	19 %	24 %	5 %	5 %	24 %	19 %	52 %

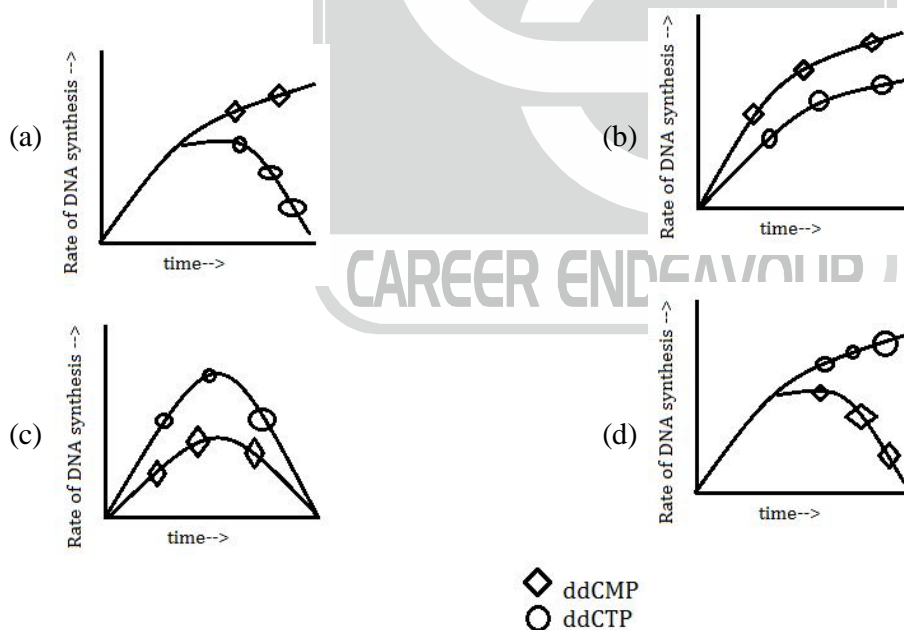
Which receptor has highest binding affinity for ligand 'X'?

- (a) A (b) B (c) C (d) D
141. If one wishes to design a microarray chip for whole genome expression analysis of an eukaryotic system, which region of the gene should be preferred for selection of unique target sequences?
- (a) Any region of coding DNA sequence
 (b) 3' region from coding DNA sequence (CDS) and 3' untranslated region (UTR)
 (c) 5' region of CDS and 5' UTR
 (d) 1st intron only
142. For the generation of transgenic plant in crop improvement, one important regulatory gene 'X' was overexpressed in a crop plant. Out of 30 transgenic rice plants generated, 22 showed high levels of gene 'X' expression. However, rest 8 lines displayed low level of expression. One explanation of such observation may be:
- (a) Suppression effect of the transgene (b) Knock down effect of gene X
 (c) Gene silencing effect (d) Co-suppression effect of transgene

143. For 5' end labelling of DNA, the following reaction are carried out sequentially as indicated
 5' dephosphorylated DNA \rightarrow [γ 32] dATP + T4 polynucleotide kinase (T4PNK) and incubated for 2 hours \rightarrow Ammonium acetate \rightarrow Tris EDTA \rightarrow Ethanol

If the trace amount of ammonium ion (NH_4^+) is present in initial DNA mix, which of the following statement would most likely be true?

- (a) NH_4^+ ion activates T4PNK, thereby increasing the labeling efficiency
 (b) NH_4^+ ion inhibits T4PNK, therefore should not be present in DNA mix
 (c) NH_4^+ ion does not have any effect on T4PNK
 (d) NH_4^+ ion dephosphorylates DNA, thereby increasing labeling efficiency
144. A protein contains 2 Trp and 4 Tyr residues. The molecular mass of the protein is 17000 D and that of Trp and Tyr are 204 and 180 D respectively. Values of $E_{1\text{cm}}^{1\%}$, the absorption coefficient of 1% (g/v) solutions of Trp and Tyr in 1-cm cell at 280 nm, are 269.60 and 83.33, respectively. The absorption of 1 mg/ml protein solution in 1 cm-cell at 280 nm will be:
 (a) 0.1 (b) 1.0 (c) 0.7 (d) 1.7
145. Double stranded DNA replicates in a semi-conservative manner. In an in vitro DNA synthesis reaction, dideoxy CTP and dideoxy CMP were individually added in excess (in separate reaction tubes) in addition to dNTPs and other necessary reagents. Rate of DNA Synthesis was measured by incorporation of ^3H -thymidine. The four graphs drawn below represent the rate of DNA synthesis in two separate reaction tubes. Which of the following graphs represents the expected data?



==== end =====