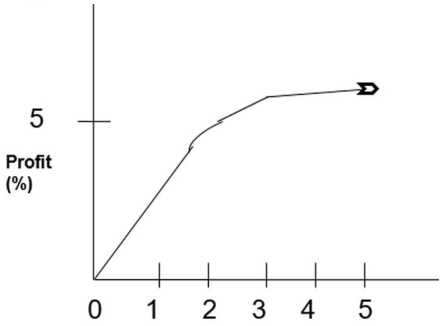
CSIR NET/JRF Life Sciences: JUNE 2011

SECTION – A

1. The cumulative profits of a company since its inception are shown in the diagram. If the net worth of the company at end of 4year is 99 crores, the principal it had started with was



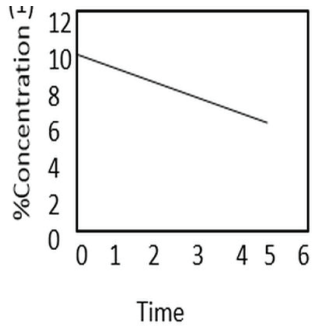
1. 9.0 Crore
2. 99 Crore
3. 90 Crore
4. 9.9 Crore

2. Popular use of which of the following fertilizers increases the acidity of soil?
1. Potassium Nitrate
2. Ammonium sulphate
3. Urea
4. Superphosphate of lime

3. Exposing an organism to a certain chemical can change nucleotide bases in a gene, causing mutation. In one such, mutated organism if a protein had only 70% of the primary amino acid sequence, which of the following is likely?
1. Mutation broke the protein
2. The organism could not make amino acid
3. Mutation created a terminator codon
4. The gene was not transcribed

4. A reference material is required to be prepared with 4ppm calcium. The amount of $CaCO_3$ (molecular weight=100) required to prepare 1000 gm of such a reference material is
1. 10µg
2. 4 µg
3. 4 mg
4. 10mg

5. Identify the figure which depicts a first order reaction

1.


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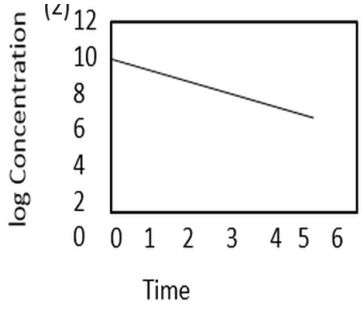

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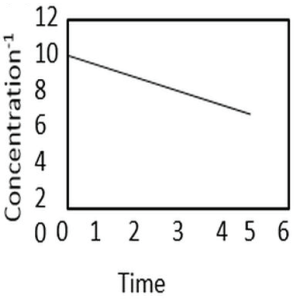

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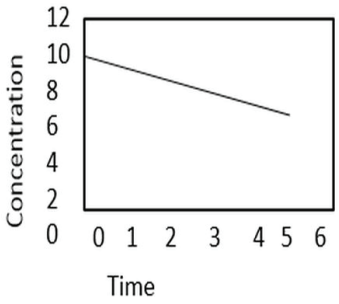


6. The speed of car increases every minute as shown in the following table. The speed at the end of 19th minute would be

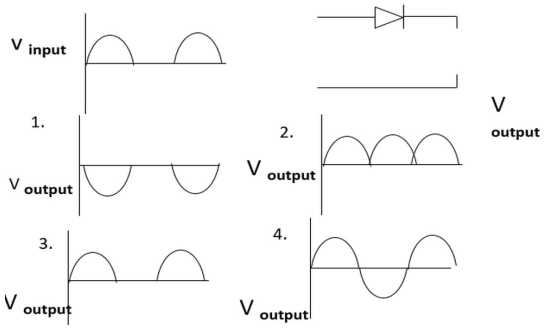
Time (minutes)	Speed (m/sec)
1	1.5
2	3.0
3	4.5
.	.
.	.
24	36.0
25	37.5

1. 26.5
2. 28.0
3. 27.0
4. 28.5

7. If the atmospheric concentration of carbon di oxide is doubled and there are favourable conditions of water, nutrients, light and temperature, what would happen to water requirement of plants?

1. It decreases initially for short time and then return to original value
2. It increases
3. It decreases
4. It increases initially for the short time and then return to original value

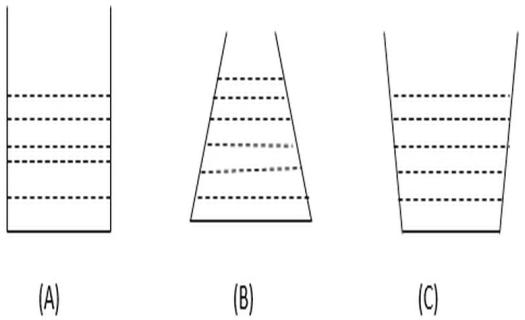
8. If V_{input} is applied to circuit shown, the output would be



9. A physiological disorder X always leads to the disorder Y. However, disorder Y may occur by itself. A population shows 4% incidence of disorder Y. Which of the following inferences is valid?

1. 4% of the population suffers from both X & Y
2. Less than 4% of the population suffers from X
3. At least 4% of the population suffers from X
4. There is no incidence of X in the given population

10. Water is dripping out of a tiny hole at the bottom of three flasks whose base diameter is the same, and are initially filled to the same height, as shown



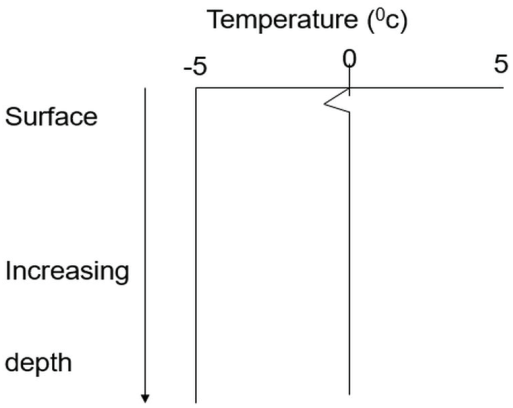
Which is the correct comparison of the rate of fall of the volume of water, in the three flasks?

1. A fastest, B slowest
2. B fastest, A slowest
3. B fastest, C slowest
4. C fastest, B slowest

11. How many σ bonds are present in the following molecule?

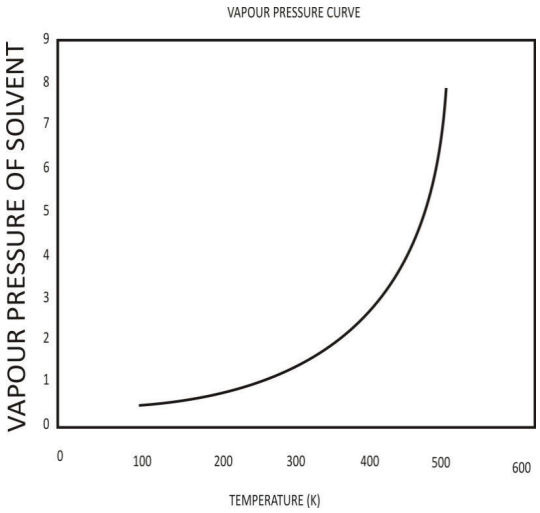
$HC \equiv CCH \equiv CHCH_3$

1. 4 **2.** 10
3. 6 **4.** 13



12. The graph represent, the depth profile of temperature in open ocean; in which region this is likely to be prevalent?

1. Tropical region
2. Equatorial region
3. Polar region
4. Sub-tropical region



13. The normal boiling point of a solvent (whose vapour pressure curve is shown in the figure) on a planet whose normal atmospheric pressure is 3 bar, is about

1. 400K
2. 273 K
3. 100 K
4. 500K

14. Diabetic patients are advised a low glycaemic index diet. The reason for this is

1. They require less carbohydrate than healthy individuals
2. They cannot assimilate ordinary carbohydrate
3. They need to have slow, but sustained release of glucose in their blood stream
4. They can tolerate lower, but not higher than normal blood sugar levels.

15. Glucose molecules diffuse across a cell of diameter d in the time . If the cell diameter is tripled, the diffusion time would

1. Increase to 9
2. Decrease to
3. Increase to 3r
4. Decrease to

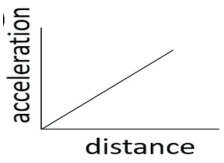
16. The reason for the hardness of the diamond is

1. Extended covalent bonding
2. Layered structure
3. Formation of cage structures
4. Formation of tubular structures

17. Which of the following particles has the largest range in a given medium if their initial energies are the same?

1. Alpha
2. Gamma
3. Positron
4. Electron

18. A ball is dropped from a height h above the surface of the earth. Ignoring air drag, the curve that best represent its variation of acceleration is

1.


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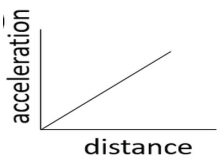

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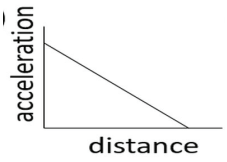

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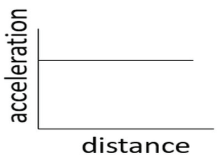


19. Standing on a polished stone floor one feels colder than on a rough floor of the same stone. This is because

1. Thermal conductivity of the stone depends on the surface smoothness
2. Specific heat of the stone changes by polishing it
3. The temperature of the polished floor is lower than that of rough floor
4. There is a greater heat loss from the soles of the feet when in contact with the polished floor than with the rough floor

20. The acidity of normal rain water is due to

1. SO_2
2. CO_2
3. NO_2
4. NO

SECTION – B

BIOCHEMISTRY

21. The free energy ΔG of a dissolved solute
1. Increases with solute concentration
2. Decreases with solute concentration
3. Is independent of solute concentration
4. Depends only on temperature

22. Routinely used glucose biosensor estimates blood glucose level by sensing the concentration of
1. Glucose **2.** Oxygen
3. Δ-gluconolactone **4.** H_2O_2

23. The area of allowed regions in the Ramachandran map will be least for
1. Gly
2. L-Ala
3. L-Prol
4. α-methyl L-valine

CELL BIOLOGY

24. Transport of water across aquaporins is regulated by the presence of which of the following sequence of three highly conserved amino acids?
1. Ala-Asn-Pro
2. Pro-Asn-Ala
3. Asn-Pro-Ala
4. Pro-Ala-Asn

25. Which of the cyclins have/has essential functions in S-phase of cell cycle?
1. A-type **2.** B-type
3. D-type **4.** Both B and D-types

26. During generation of an action potential, depolarization is due to
1. K^+ efflux **2.** Na^+ efflux
3. Na^+ influx **4.** K^+ influx

27. G protein-linked receptors are trans-membrane proteins of
1. Single-pass
2. Three-pass
3. Five-pass
4. Seven-pass

28. Polar bears maintain their body temperature because they have more of
1. Transducin protein
2. Uncoupling protein
3. Myoglobin protein
4. Fo-F_1 ATPase

29. Which of the following molecules is involved in Ca^{2+}-dependent cell-cell adhesion?
1. Calmodulin **2.** Cadherin
3. N-CAM **4.** Calpain

30. Na^+-K^+ ATPase is a tetramer of 2α and 2β subunits. On which of the following subunits are the Na^+ and K^+ binding sites present?
1. Both on α
2. Both on β
3. Na^+ on α and K^+ on β
4. Na^+ on β and K^+ on α

31. With which protein of Yersinia would integrin proteins of mammalian cells interact for internalization?
1. Pilin
2. Fimbrin
3. Invasin
4. Adherin

MOLECULAR BIOLOGY

32. Small RNAs with internally complementary sequences that form hairpin-like structure, synthesized as precursor RNAs and cleaved by endonucleases to form short duplexes are called
1. snRNA **2.** mRNA
3. tRNA **4.** miRNA

33. The 5' Cap of RNA is required for the
1. Stability of RNA only
2. Stability and transport of RNA
3. Transport of RNA only
4. Methylation of RNA

34. What is the minimum number of NTPs required for the formation of one peptide bond during protein synthesis?
1. One **2.** Two
3. Four **4.** Six

35. A culture of an *E. Coli* strain that is lysogenic for phage lambda is grown at 32°C. Induction of the prophage from the host chromosome will occur when the culture is exposed to

1. 40°C
2. Ultraviolet radiation
3. Infra-red radiation
4. Wild type *E. Coli* culture

36. The fidelity of replicative base selection can be reduced by a factor of 10^2 when the repair of DNA synthesis involves

1. AP endonuclease
2. ABC exinuclease
3. DNA photolyase
4. TLS DNA polymerase

CELL COMMUNICATION

37. ELISA assay uses

1. An enzyme which can react with secondary antibody
2. An enzyme which can react with the antigen
3. A substrate which gets converted into a coloured product
4. A radiolabelled secondary antibody

38. Th2 response is generated and maintained mainly by which of the following pair of cytokines?

1. IL-4 and IL-10 **2.** IL-12 and IFN-γ
3. IFN-γ and TNF-α **4.** IL-2 and IL-12

DEVELOPMENTAL BIOLOGY

39. In mature Arabidopsis embryo, root apical meristem consists of cells derived from

1. Embryo and apical suspensor cell
2. Embryo only
3. Suspensor only
4. Hypophysis only

40. In amphibian oocyte, the germplasm which gets segregated during cleavage to give rise to primordial germ cells (PGC's) is normally

1. Distributed evenly throughout the oocyte
2. Localized at animal pole
3. Localized at vegetal pole
4. Aggregated in central part of oocyte

41. Cytoplasmic determinants coding for anterior structure of *Drosophila* embryo, if injected elsewhere in the recipient embryo, would lead to

1. Normal development
2. Formation of additional ectopic head
3. Degeneration
4. A phenotype with two heads and two tails

PLANT PHYSIOLOGY

42. The transition to flowering in plants requires

1. Growth of plants under long- day conditions
2. Growth of plant under short- day conditions
3. Reprogramming of the shoot apical meristem
4. Synthesis of the flowering hormone florigen

43. The dwarf pea mutant (le) used by Mendel was defective in which of the following enzyme involved gibberellin biosynthesis?

1. ent-Kaurene synthase
2. GA 3β-hydroxylase
3. GA 20-oxidase
4. ent-Kaurenoic acid hydroxylase

44. Both halophytes and glycophytes compartmentalize cytotoxic ions into the intracellular compartment or actively pump them out of the cell to the apoplasts with the help of membrane transport proteins. Among these, the Na^+ - H^+ antiporter, NHX1, is localized in the

1. The plasma membrane
2. Chloroplast (inner envelope)
3. Mitochondria (outer membrane)
4. Tonoplast

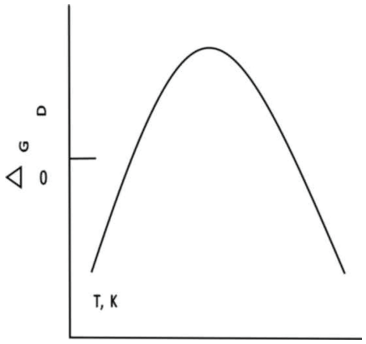
45. The photoreceptor commonly involved in light entrainment of the biological clock in flies, moulds and plants is

1. Phytochrome **2.** Rhodopsin
3. Carotenoid **4.** Cryptochrome

46. Which of the following statements with respect to alternate oxidase activity in cyanide-resistant respiration in plants, is not correct?

1. Alternate oxidase accepts electrons directly from cytochrome C

The stability curve for the protein simulated using the observed thermodynamic values is given below:



The shape of the stability curve is due to

1. Hydrogen-bonding and electrostatic interactions only
2. Van-der Waals and electrostatic interactions only
3. Only electrostatic interactions
4. Only hydrophobic interaction

75. An α-helix in a peptide or protein is characterized by hydrogen bonds and characteristic dihedral angles. Choose the right combination.

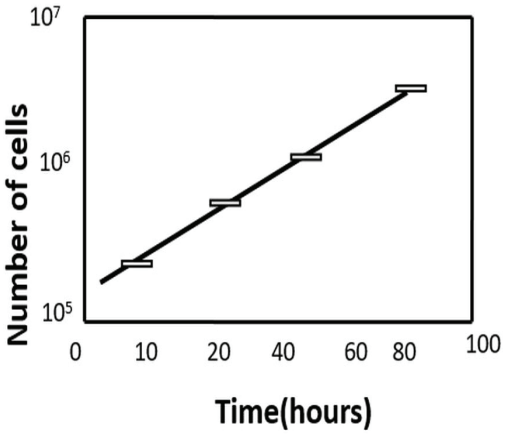
1. Hydrogen bonding between the amide CO of residue i and amide NH of reside i + 4. Dihedral angles in the region $\phi = 50°$, $\psi = -60°$
2. Hydrogen bonding between the amide NH of residue i and amide CO of residue i + 4. Dihedral angles in the region of $\phi = 50°$, $\psi = 60°$
3. Hydrogen bonding between the amide CO of residue i and amide NH of residue i + 4. Dihedral angles in the region of $\phi = -50°$, $\psi = +60°$
4. Hydrogen bonding between the amide CO of residue i and amide NH of residue 1 + 3. Dihedral angles in the region of $\phi = -50°$, $\psi = -60°$

CELL BIOLOGY

76. You are studying the binding of proteins to the cytoplasmic face of cultured liver cells and have found a method that gives a good yield of inside-out vesicles from the plasma membrane. Unfortunately, your preparations are contaminated with variable amounts of right-side-out vesicles. Nothing you have tried avoids this contamination. Somebody suggests that you pass the vesicles over an affinity column made of lectin coupled to Sepharose beads. What is the rational of this suggestion?

1. Right-side-out-vesicles will be lysed by lectin coupled to Sepharose beads
2. Right-side-out-vesicles will simply bind to the lectin coupled Sepharose beads
3. Lectin will bind to the carbohydrate residues present only on the inside out vesicles
4. Lectin will bind to only glycoproteins and glycolipids present on the inside-out vesicles

77. The overall length of the cell cycle can be measured from the doubling time of a population of exponentially proliferating cells. The doubling time of a population of mouse L cells was determined by counting the number of cells in samples of culture at various times. What is the overall length of the cell cycle in mouse L cells?



1. 30 h
2. 20h
3. 10 h
4. 40 h

78. Budding yeast cells that are deficient for Mad2, a component of the spindle-attachment-check point, are killed by treatment with benomyl, which causes microtubules to depolymerise. In the absence of benomyl, however, the cells are perfectly viable. Which explanation out of the following is ab to justify this observation?

1. In the absence of benomyl, the majority of spindles forms normally and the spindle-attachment checkpoint (Mad2) plays no role
2. In the presence of benomyl, the majority of spindles form normally and Mad2 plays critical role in cell survival

3. Other than the role in cell survival, microtubule depolymerization affects oxidative phosphorylation in the absence of Mad2
4. Benomyl also affects protein synthesis in the absence of Mad2

79. During receptor-mediated endocytosis, apolipoprotein B on the surface of a LDL particle binds to the LDL-receptor present in coated pits containing clathrin. The receptor-LDL complex is internalized by endocytosis, trafficked to lysosomes and the LDL-receptor is finally recycled. A patient reports with familial hypercholesterolemia. This could be due to

1. Mutation in the LDL molecule
2. Defect in LDL-receptor recycling
3. Mutation in the LDL-receptor
4. Defect in cholesterol binding with its receptor

80. Cancer causing genes can be functionally classified into mainly three types:

i. Genes that induce cellular proliferation,
ii. Tumor suppressor genes,
iii. Genes that regulate apoptotic pathway.

Epstein-Barr virus that causes cancer by modulating apoptotic pathway, contains a gene having sequence homology with which of the following genes?

1. Bax
2. Bcl-2
3. p53
4. Caspase-3

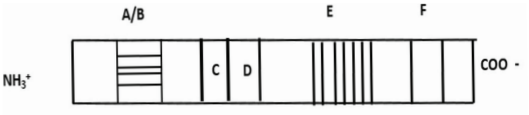
81. Glucose is mobilized in muscle when epinephrine activates $G_{\alpha s}$. In an experiment in which muscle cells were stimulated with epinephrine, glucose mobilization was observed even after withdrawal of epinephrine. This could be

1. Due to the presence of a cAMP phosphodiesterase inhibitor
2. Very low rates of cyclic AMP formation
3. Due to the presence of a cAMP phosphodiesterase activator
4. Due to the absence of protein kinase A

82. Eukaryotic genomes are organized into chromosomes and can be visualized at mitosis by staining with specific dyes. Heat denaturation followed by staining with Giemsa produced alternate dark and light bands. The dark bands obtained by this process are mainly

1. AT -rich and gene rich regions
2. AT -rich and gene desert regions
3. GC-rich and gene rich regions
4. GC-rich and gene desert regions

83. Based on the structural regions of a nuclear receptor shown in the diagram, the following predictions were made



A. Region F is responsible for binding to ligands and contains two zinc finger-like binding motifs
B. Receptors with A/B domains generally associate with chaperones and do not bind to DNA.
C. Region E indicates that receptors associate with chaperones which protect the nuclear hormone receptors.
D. Region C contains the P-box and the D-box required for dimerization of the receptor and creates contact with DNA phosphate backbone.

Which one of the following is true?

1. A and B
2. B and C
3. B and D
4. C and D

MOLECULAR BIOLOGY

84. Lac repressor inhibits expression of genes in lac-operon whereas purine biosynthesis is repressed by the Pur repressor. The two proteins have 31% identical sequences and have similar three-dimensional structures. The gene regulatory properties of these proteins differ in relation to

A. Binding of small molecules to the repressor
B. Presence of recognition sites on the genome
C. Oligomeric nature of the repressor
D. DNA binding property

The correct statements are

1. A and B
2. A, B and C
3. A and C
4. B, C and D

85. Two *E. Coli* cultures A and B are taken. Culture A was earlier grown in the presence of optimum concentration of gratuitous inducer IPTG. Both the cultures are now used

to inoculate fresh medium containing sub-optimal concentration of gratuitous inducer. It was observed that culture B was unable to utilize lactose, whereas culture A did so efficiently. The reason behind this is

1. Pre treatment with IPTG has resulted in a mutation as a result of which lac operon is constitutively expressed

2. IPTG has made the cell membrane more porous to small molecules and so lactose is taken up more efficiently by A as compared to B

3. In culture A, lactose permease was induced to a high level, during pretreatment with IPTG, which allowed the preferential uptake of lactose

4. In culture A, IPTG activated a receptor which bound lactose more efficiently, thereby triggering a signal

86. It has been observed that in 5-10% of the eukaryotic mRNAs with multiple AUGs, the first AUG is not the initiation site. In such cases, the ribosome skips over one or more AUGs before encountering the favourable one and initiating translation. This is postulated to be due to the presence of the following consensus sequence (s):

A. CCA CC AUG G

B. CCG CC AUG G

C. CCG CC AUG C

D. AAC GG AUG A

Which of the following sequence sets related to the above postulations is correct?

1. A and B **2.** A and C

3. C and D **4.** B and D

87. Presence of circular mRNAs for a specific protein in an eukaryotic cell reflects a rapid rate of synthesis of that protein. Following mechanisms are suggested:

A. EIF-4G and PABP promote this process through 5'-3' interaction of mRNA

B. Ribosomes are less active in recognizing circular mRNA

C. PABP and eIF-4A promote this process

D. Ribosomes can reinitiate translation without being disassembled

Which of the following is correct?

1. A and D **2.** B and D

3. A and C **4.** B and C

88. siRNAs and miRNAs are used for achieving gene silencing. Although, major steps are similar there are distinct differences in the key players of the two processing pathways. Following statements relate to some characteristic features of gene silencing

A. Both siRNA and miRNA are processed by cytoplasmic endonuclease Dicer.

B. 'Drosha' is needed for processing miRNA and precursor siRNA.

C. Both siRNA and miRNA show association with Argonaute protein.

D. Both the processing pathways involve RISe complex.

Which of the following combination is NOT correct?

1. A and C **2.** C and D

3. A and B **4.** D and A

89. In eukaryotic chromatin, 30 nm fiber (solenoid) can open up to give rise to two kinds of chromatin. In one type (A), the promoter of a gene within the open chromatin is occupied by a nucleosome whereas in the other (B), the promoter is occupied by histone H1. The following possibilities are suggested.

A. The gene in (A) is repressed.

B. The gene in (B) is repressed.

C. The gene in (A) is active.

D. The gene in (B) is active.

Which of the following sets is correct?

1. A and D **2.** A and B

3. B and D **4.** C and D

90. Bacteria often acquire genes by the process of lateral or horizontal transfer. Such 'foreign' genes, if acquired in recent past, may be identified by their atypical GC content, as compared to 'native' genes. Suppose the genomic GC content of a bacterium is 40%. Gene A of this organism contains 1000 bases with 225 G and 215 C. Another gene B of length 800 bases contains 160 G and 140 C. Which one of the following would be the most acceptable hypothesis (given that $x^2 = 3.841$ at 0.05 significance level)?

1. A: native, B: Foreign

2. A: Foreign, B: Native

3. A: Foreign, B: Foreign

4. A: Native, B: Native

91. Genetic studies demonstrated that TBP mutant cell extracts are deficient in transcription of genes from all three promoters viz. class I, II and III. Following statements describe characteristic features of TBP.

A. TBP is considered as a universal basal transcription factor

B. TBP is not required for transcription of archaeal genes

C. TBP is involved in recognizing TATA box

D. TBP operates at all promoters regardless of their TATA content

Which of the following combinations is NOT correct?

1. A and D

2. C and D

3. B and D

4. A and C

CELL COMMUNICATION

92. Intracellular pathogens like *Mycobacteria*, *Salmonella*, *Leishmania* and *Listeria* survive in macrophages by modulating host cellular machinery. In order to study the fate of these intracellular pathogens in macrophages, cells were labeled with lysotracker Red arid infected with GFP-labelled organisms. After 2 hours at 37°C, cells were fixed, stained with anti-transferrin receptor antibody and probed with secondary antibody conjugated-blue dyes. Cells were viewed under confocal microscope.

Observation: GFP-labelled *Mycobacteria*, *Salmonella* and *Listeria* were localized in the same compartment labelled with blue dyes; whereas GFP-*Leishmania* colocalize with red labelled compartment. Which of the following statement is true based on these observations?

1. *Mycobacteria*, *Salmonella* and *Listeria* reside in the lysosomes

2. *Leishmania* reside in lysosome like compartment

3. *Leishmania* reside in a compartment which bears characteristics of early endocytic compartment

4. *Mycobacteria*, *Salmonella* and *Listeria* lyse the phagosomal membrane and reside in cytosol

93. Industrial products in which bacteria are employed for production are shown in the following table:

I. List of products	II. Microogranism
A. 2, 3-Butane diol	i. *Leuconostoc*
B. Dextran	ii. *Brevibacterium*
C. Glutamic acid	iii. *Bacillus polymyxa*
D. Cobalamine	iv. *Propionibacterium*

The correct combinations are

1. A – iii, B –i, C – ii, D – iv

2. A – i, B – ii, C –iii, D – iv

3. A – iii, B – ii, C – iv, D – i

4. A – ii, B – iii, C – iv, D – i

94. Mouse bone marrow cells were fractionated to derive stem cell antigen-1^+ (Sca-1^+) cells. These cells were cultured with interleukin-3, or granulocyte-macrophage colony stimulating factor, or macrophage-colony stimulating factor, or granulocyte colony stimulating factor. Most numerous and varied colonies were obtained in the culture stimulated with

1. Interleukin-3

2. Granulocyte-macrophage colony stimulating factor

3. Macrophage-colony stimulating factor

4. Granulocyte-colony stimulating factor

95. Toll-like receptor 4 is associated with responsiveness to LPS, an endotoxin that causes lethal endotoxic shock. The mice deficient In Toll-like receptor 4 and BALB/c mice were injected with Escherichia coli. In addition, some BALB/b mice were also injected with the same bacteria alone or with anti-interleukin-10 (IL-10) antibody. The mice resistant to the lethal effect of the bacteria were:

1. BALB/b mice receiving the bacteria

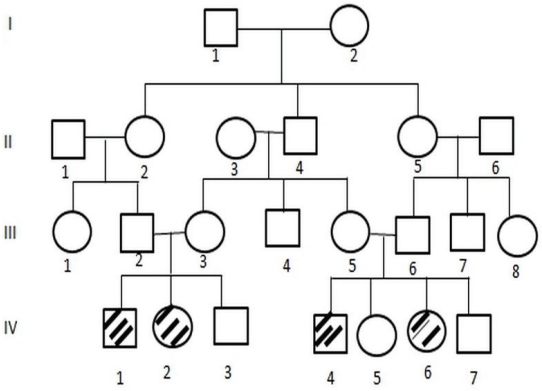
2. BALB/b mice receiving the bacteria and the anti-IL-10 antibody

3. Mice deficient In Toll-like receptor

4. BALB/c mice receiving the bacteria

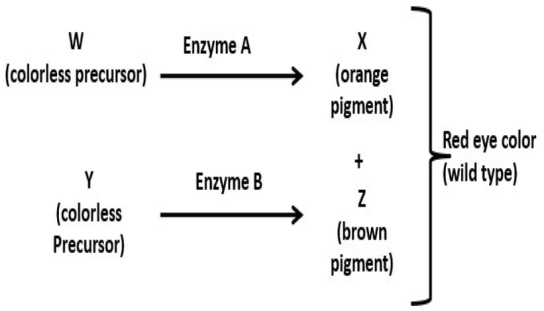
96. Macrophages were collected from BALB/c mice, CD40-deficient mice, $CD86^-$ deficient mice and ICAM-1-deficient mice. These macrophages were co-cultured with LCMV peptide specific T cells in presence of the LCMV peptide for three days. The cells were

assuming that the members coming from outside the family are homozygous for the dominant allele.



1. III-2, III-3,III-5,III-6,II-1,II-3 and II-6
2. III-2,III-3,III-5,III-6,II-2,II-4,II-5 and I-2
3. III-2, III-3,III-5,III-6,II-2,II-4 and II-5
4. III-1,III-4,III-7,II-2,II-4,II-5

116. The following is a hypothetical pathway for the development of wild type (red) eye colour in an insect: Enzymes A and B are encoded by the genes a^+ and b^+, respectively.



The following statements are made regarding inheritance of the genes involved in the development of eye color:

A. When two heterozygous individuals of the genotype a^+ab^+b are mated, progenies with red, orange, brown and white eye colour will be observed irrespective of whether the genes are independently assorting or showing incomplete linkage
B. When two heterozygous individuals of the genotype a^+ab^+b are mated, progenies with red, orange, brown and white eye colour will be observed in a ratio of 9:3:3:1, when the genes are independently assorting
C. When a heterozygous individual of the genotype $a^+b/a\ b^+$ is test crossed, progenies with red and white eye colour will be more in number
D. When a heterozygous individual of the genotype $a^+b/a\ b^+$ is test crossed, progenies with orange and brown eye colour will be more in number

Which of the above statements is TRUE?

1. A and C **2.** B and C
3. A, B and C **4.** A, B and D

117. To detect mutation (GAG--→GTG) allele specific hybridization method is used. Four members of an affected family are investigated. DNA isolated from blood samples of parents and two offsprings are spotted on a membrane after appropriate processing and probed with either TGACTCCTGAGGAGAAGTC (first probe) or TGACTCCTGTGGAGAAGTC (second probe) after labelling. While probed with first oligonucleotide, signals are obtained for the positions where DNA are spotted from parents and offspring II. When probed with second oligonucleotide, signals are obtained at position where DNA from the parents and offspring I are spotted. Results are shown below:

	Father	Mother	Offspring I	Offspring II
First Probe	+	+	-	+
Second Probe	+	+	+	-

On the basis of the result, which of the following statements is correct?

1. Parents are affected
2. Offspring I is affected
3. Offspring II is carrier
4. Offspring II is affected

118. When F1 female *Drosophila* of the genotype $a^+a\ b^+b\ c^+c$ is test crossed, the following progenies were obtained:

Progeny classes*	No. of Progenies
$a^+b^+c^+$	22
$a^+b^+\ c$	28
$a\ b\ c^+$	26
$a\ b\ c$	24
$a^+\ b\ c^+$	230
$a^+\ b\ c$	220
$a\ b^+\ c^+$	225
$a\ b^+\ c$	225
Total	**1000**

The progeny has been shown as classes derived from the female gamete. Statements A to F as given below are conclusions derived from the above result.

A. Genes a and b are linked in *cis*

B. Genes a and b are linked in *trans*

C. Genes a and b are linked in cis while b and c are linked in *trans*

D. The genotype of the parents are $a^+a^+b^+b^+$ and aabb

E. The genotype of the parents are a^+a^+bb and aab^+b^+

F. Genes a and b are 10cM apart

Which of the above statements are correct?

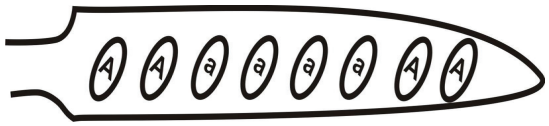
1. C alone

2. A, E and F

3. B, E and F

4. A, D and F

119. In *Neurospora* a cross between the genotypes 'A' and 'a' results in an ascus with ascospores of genotypes as shown below:



Statements A to D are events that could have occurred during meiosis.

A. Crossing over between the centromere and the gene

B. Segregation of alleles 'A' and 'a' in meiosis I

C. Segregation of alleles 'A' and 'a' in meiosis II

D. Assortment of alleles 'A' and 'a'

Which of the above events could correctly explain the observation shown in the figure?

1. A followed by C

2. C alone

3. A followed by B

4. D alone

120. Mendel crossed tall pea plants with dwarf ones. The F1 plants were all tall. When these F1 plants were selfed to produce F2 generation, he got a 3: 1 tall to dwarf ratio in the offspring. What is the probability that out of three plants (of F2 generation) picked up at random two would be dwarf and one would be tall?

1. 3/4 **2.** 3/8

3. 9/64 **4.** 9/32

121. The total variance in a phenotypic character can be split into two components genetic (V_G) and environmental (V_E). The heritability of a phenotypic trait can be expressed quantitatively as heritability coefficient (h^2). Which is calculated as $h^2 =$

1. $(V_G) - (V_E)$ **2.** $(V_E) / (V_G)$

3. $\frac{V_G}{(V_G + V_E)}$ **4.** $\frac{V_G}{(V_G - V_E)}$

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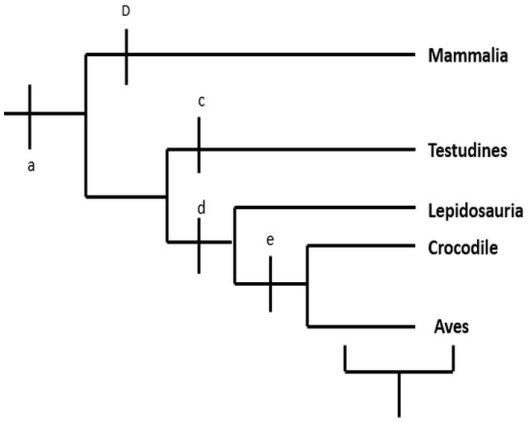
122. Identify the apomorphic characters marked in the cladogram:



1. a - amniotic egg; b - 4-chambered heart; c-anapsidian skull; d-diapsidian skull; e-synapsid skull

2. a - amniotic egg; b-synapsidan skull; c--4 -chambered heart; d. anapsidan skull; e-diapsidan skull

3. a - 4-chambered heart; b-synapsid skull; c-amniotic egg; d-diapsidan skull; e-anapsidan skull

4. a - amniotic egg; b - synapsidan skull; c-anapsidan skull, d. diapsidan skull; e-4-chambered heart

123. An organism has the following architectural pattern:

i. Multicellular with germ layers

ii. A coelom derived from the mesoderm

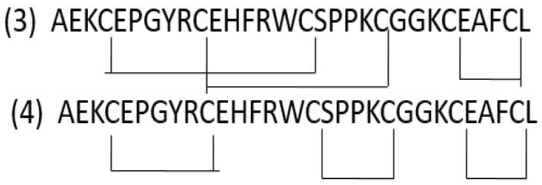
iii. Primary bilateral symmetry with secondary radial symmetry

iv. Presence of endoskeletal plates

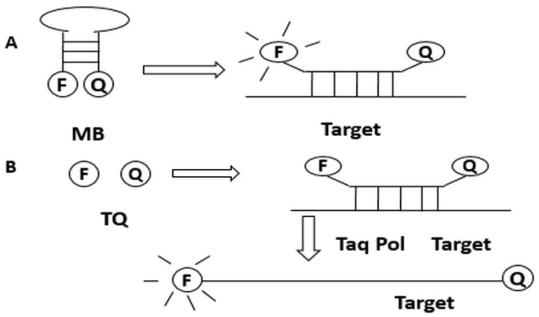
Such an organism is most likely to

A. Have mesohyl as its connective tissue

B. Undergo torsion, whereby the mouth and anus are properly oriented



145. Molecular beacons (MB) and Taqman (TQ) are used as probes in Real time PCR experiments. Both these probes are based on the principle of FRET and employ a fluorophor (F) and a quencher (Q). However, the mechanisms by which they function are different as illustrated below. At what stage of the PCR we would be able to detect fluorescence?



1. Annealing step for both
2. Extension step for both
3. Annealing for A and Extension for B
4. Extension for A and Annealing for B

JUNE 2011 ANSWER KEY									
Que	**Ans**	**Que**	**Ans**	**Que**	**Ans**	**Que**	**Ans**	**Que**	**Ans**
1	3	31	3	61	1	91	3	121	3
2	2	32	4	62	4	92	2	122	2
3	3	33	2	63	3	93	1	123	4
4	4	34	2	64	2	94	2	124	4
5	2	35	2	65	4	95	3	125	3
6	4	36	4	66	3	96	2	126	3
7	2	37	3	67	4	97	3	127	2
8	3	38	1	68	3	98	2	128	3
9	2	39	1	69	2	99	4	129	2
10	4	40	3	70	2	100	1	130	1
11	2	41	2	71	1	101	1	131	1
12	3	42	3	72	4	102	2	132	1
13	1	43	2	73	3	103	2	133	1
14	3	44	4	74	4	104	1	134	1
15	4	45	4	75	1	105	4	135	1
16	1	46	1	76	2	106	1	136	2
17	2	47	2	77	2	107	2	137	3
18	4	48	3	78	1	108	3	138	3
19	4	49	1	79	3	109	4	139	2
20	2	50	1	80	2	110	1	140	1
21	1	51	3	81	1	111	2	141	1
22	2	52	4	82	3	112	3	142	2
23	3	53	3	83	3	113	1	143	2
24	3	54	1	84	1	114	3	144	1
25	1	55	2	85	3	115	3	145	3
26	3	56	3	86	1	116	4		
27	4	57	3	87	3	117	2		
28	2	58	2	88	2	118	3		
29	2	59	2	89	1	119	1		
30	1	60	3	90	2	120	3		