66

QUESTION PAPER SERIES CODE
A

Registration No. : | | | | | | |

Centre of Exam. : _____

Name of Candidate : _____

_____
Signature of Invigilator

COMBINED ENTRANCE EXAMINATION, 2014

M.Sc. BIOTECHNOLOGY

[Field of Study Code : BIT]

Time Allowed : 3 hours *Maximum Marks* : 240

INSTRUCTIONS FOR CANDIDATES

Candidates must read carefully the following instructions before attempting the Question Paper :

(i) Write your Name and Registration Number in the space provided for the purpose on the top of this Question Paper and in the Answer Sheet.

(ii) **Please darken the appropriate Circle of Question Paper Series Code on the Answer Sheet.**

(iii) The Question Paper is divided into two Parts : Part—A and Part—B. Both Parts have multiple-choice questions. All answers are to be entered in the Answer Sheet provided with the Question Paper for the purpose by darkening the correct choice, i.e., (a) or (b) or (c) or (d) with BALLPOINT PEN only against each question in the corresponding circle.

(iv) Part—A consists of 60 questions and all are compulsory. Answer all the questions in the Answer Sheet provided for the purpose. Each correct answer carries *1* mark. **There will be negative marking and ½ mark will be deducted for each wrong answer.**

(v) Part—B consists of 100 questions consisting Biological and Physical Sciences. **Answer any 60 questions.** Each correct answer carries *3* marks. **There will be negative marking and 1 mark will be deducted for each wrong answer.**
In case any candidate answers more than the required 60 questions, the first 60 questions attempted will be evaluated.

(vi) Answer written by the candidates inside the Question Paper will not be evaluated.

(vii) Calculators and Log Tables may be used.

(viii) Pages at the end have been provided for Rough Work.

(ix) Return the Question Paper and Answer Sheet to the Invigilator at the end of the Entrance Examination. **DO NOT FOLD THE ANSWER SHEET.**

INSTRUCTIONS FOR MARKING ANSWERS

1. Use only Blue/Black Ballpoint Pen (do not use pencil) to darken the appropriate Circle.
2. Please darken the whole Circle.
3. Darken ONLY ONE CIRCLE for each question as shown in example below :

Wrong	Wrong	Wrong	Wrong	Correct
● ⓑ ⓒ ●	⊘ ⓑ ⓒ ⓓ	⊘ ⓑ ⓒ ⊘	◉ ⓑ ⓒ ●	ⓐ ⓑ ⓒ ●

4. Once marked, no change in the answer is allowed.
5. Please do not make any stray marks on the Answer Sheet.
6. Please do not do any rough work on the Answer Sheet.
7. Mark your answer only in the appropriate space against the number corresponding to the question.
8. **Ensure that you have darkened the appropriate Circle of Question Paper Series Code on the Answer Sheet.**

PART—A

Answer **all** questions

1. Microbial capsules are stained by
   (a) acid-fast staining
   (b) negative staining
   (c) simple staining
   (d) Gram staining

2. Proteins produced by bacteria to inhibit growth of other strains of the same organism are called
   (a) antibiotics
   (b) B factors
   (c) R factors
   (d) bacteriocins

3. Which one of the following marine bacteria is capable of bioluminescence?
   (a) *Azotobacter*
   (b) *Salmonella typhi*
   (c) *Vibrio fisheri*
   (d) *Thiothrix nivea*

4. Gene for which of the following processes is ***not*** encoded in any virus for its propagation?
   (a) Replication of the genome
   (b) Modulation of host defenses
   (c) Membrane biosynthesis
   (d) Assembly and packaging of the genome

5. Nerve impulses are normally carried forward to another neuronal cell body by
   (a) synaptic cleft
   (b) dendrites
   (c) axon
   (d) myelin sheaths

6. The target tissue for luteinizing hormone is
   (a) liver
   (b) kidney
   (c) pancreas
   (d) gonad

7. The excretory organs of insects are called

(a) flame cells

(b) nephridia

(c) nephrons

(d) Malpighian tubules

8. Hemophilia is a sex-linked recessive trait in humans. If a father and a son are both hemophiliacs in a family but the mother is normal, her genotype must be

(a) X^hX^h

(b) X^HX^h

(c) X^HX^H

(d) X^HO

9. In diploid organisms, the specialized cell that undergoes meiosis is

(a) meiocyte

(b) oocyte

(c) antherozoid

(d) ovum

10. The exine of a pollen grain is made of

(a) lignocellulose

(b) pectin

(c) cellulose

(d) sporopollenin

11. Pollination which occurs in closed flower is known as

(a) allogamy

(b) cleistogamy

(c) protogyny

(d) protandry

12. The genotypic ratio of F_2 in a monohybrid cross is

(a) 3 : 1

(b) 15 : 1

(c) 1 : 2 : 1

(d) 9 : 6

13. The complete set of chromosomal and extra-chromosomal genes of an organism is called

(a) genome

(b) gene pool

(c) gene bank

(d) gene library

14. A nucleoside is formed of

(a) pentose sugar, phosphate and nitrogen base

(b) phosphate and nitrogen base

(c) pentose sugar and phosphate

(d) pentose sugar and nitrogen base

15. In forensic science, which of the following techniques is most frequently used?

(a) Bacterial cloning

(b) DNA footprinting

(c) DNA fingerprinting

(d) DNA cloning

16. Anticodon occurs in

(a) tRNA

(b) mRNA

(c) mtRNA

(d) rRNA

17. Isoelectric point of a protein is the pH at which net charge on the molecule is

(a) one

(b) zero

(c) positive

(d) negative

18. In prokaryotes, the genomic DNA is

(a) located in nucleus

(b) wrapped in histones

(c) located as nucleoid body

(d) located in endoplasmic reticulum

19. Which of the following is an unbranched polysaccharide?

(a) Cellulose

(b) Glycogen

(c) Starch

(d) Sucrose

20. Which amino acid is a major neurotransmitter in the brain?

(a) Tyrosine

(b) Glutamate

(c) Tryptophan

(d) Serine

21. Calculate the energy in kcal per mole associated with a radiation of a wavelength 300 nm ($h = 1 \cdot 58 \times 10^{-37}$ kcal-s, $c = 3 \cdot 0 \times 10^{8}$ m s^{-1}).

(a) 90·49

(b) 94·09

(c) 99·04

(d) 109·49

22. The magnetic quantum number is related to

(a) size

(b) shape

(c) orientation

(d) spin

23. $KMnO_4$ acts as an oxidant in neutral medium and gives MnO_2. The equivalent weight of $KMnO_4$ in neutral medium will be

(a) molecular weight / 7

(b) molecular weight / 4

(c) molecular weight / 3

(d) molecular weight / 2

24. In the reaction $Cl_2 \rightarrow Cl^- + ClO^{3-}$, the chlorine is

(a) oxidized

(b) reduced

(c) both oxidized and reduced

(d) neither oxidized nor reduced

25. The movement of the solute particles under the influence of an applied electric potential is called

(a) electrolysis

(b) electroosmosis

(c) electrophoresis

(d) electroplating

26. Hydrogenation of vegetable oil to yield Vanaspati Ghee (general name) is an example of

(a) autocatalysis

(b) negative catalysis

(c) homogeneous catalysis

(d) heterogeneous catalysis

27. The unit of rate constant for zero-order reaction is

(a) lit sec^{-1}

(b) lit $mole^{-1}$ sec^{-1}

(c) mole lit^{-1} sec^{-1}

(d) mole sec^{-1}

28. Of the four halogens, the one with the highest electron affinity is

(a) fluorine

(b) chlorine

(c) bromine

(d) iodine

29. The cation smallest in size is

(a) Na^{+}

(b) Mg^{2+}

(c) Al^{3+}

(d) Si^{4+}

30. Which one of the following does ***not*** hydrolyze?

(a) CCl_4

(b) $SiCl_4$

(c) $GeCl_4$

(d) $SnCl_4$

31. The gas that cannot be collected over water is

(a) N_2

(b) O_2

(c) SO_2

(d) PH_3

32. The process of converting hydrated alumina into anhydrous alumina is called

(a) roasting

(b) smelting

(c) dressing

(d) calcination

33. In C_2H_6, carbon atom is hybridized as

(a) sp^3

(b) sp^2

(c) sp

(d) sp^3d^2

34. Formaldehyde reacts with NH_3 to give

(a) formalin

(b) formamide

(c) hexamethylenetetramine

(d) methylamine

35. Hydroboration is the reduction of alkynes to

(a) alkenes giving *cis*-addition products

(b) alkenes giving *trans*-addition products

(c) alkenes giving mixture of *cis*- and *trans*-addition products

(d) alkanes

36. The number of solutions of $x^2 - y - 1 = 0$ and $x^2 + y - 1 = 0$ is

(a) 0

(b) unique

(c) finite but not unique

(d) infinite

37. The value of $\lim_{y \to \infty} y \sin\left(\frac{1}{y}\right)$ is

(a) 0

(b) 1

(c) infinity

(d) y

38. The vectors $\hat{i} + \hat{j}$ and $-\hat{i} - \hat{j}$ are

(a) parallel

(b) perpendicular

(c) scalar multiples of each other

(d) unit vectors

39. In how many points does the pair of lines $x = 0$ and $y = 0$ intersect?

(a) They do not intersect

(b) In only one point

(c) In infinite points

(d) In two points

40. If $A = \begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix}$, then $A^2 - 2A$ is

(a) $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$

(b) $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$

(c) $2\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$

(d) A

41. The function $f(x) = x^3 - 1$ has the real root(s)

(a) -1, 0 and 1

(b) -1 and 1

(c) 0 and 1

(d) 1

42. The function $\sin|x|$ is

(a) continuous and differentiable at $x = \pi$

(b) continuous but not differentiable at $x = \pi$

(c) differentiable but not continuous at $x = \pi$

(d) neither continuous nor differentiable at $x = \pi$

43. Consider the solutions $x(t)$ to the differential equation $\frac{dx}{dt} = -x$. Then

(a) $x(t)$ is always positive

(b) $x(t)$ is always negative

(c) $x(t)$ can never be equal to 0

(d) $x(t)$ can be 0 only if $x(t = 0) = 0$

44. Consider the salaries (in hundreds of rupees) of five persons :

5, 5, 5, 5, 1000

Then

(a) the mean salary is much larger than the median salary

(b) the median salary is much larger than the mean salary

(c) the sample size is too small to allow the computation of a mean or median

(d) every person earns 204 (the average salary)

45. The function $\sin x + \sin\frac{x}{2} + \sin(2x)$ has period

(a) 2π (b) $\frac{\pi}{2}$

(c) π (d) 4π

46. A rock thrown horizontally from a 180-m-high cliff strikes the ground 108 m from the base of the cliff. Calculate the speed at which it was thrown. Assume $g = 10\,m/s^2$.

(a) 180 m/s

(b) 9 m/s

(c) 18 m/s

(d) 10·8 m/s

47. The average speed of blood flow in the aorta (r = 1·0 cm) is about 40 cm/s. The viscosity of blood is 4×10^{-3} Pa s. Calculate the Reynolds number assuming density of blood to be equal to that of water.

(a) 1000

(b) 4100

(c) 400

(d) 10000

48. Sound intensity of a jet plane at a distance of 1 km is 80 W/m^2. What will be the intensity at 2 km ?

(a) 20 W/m^2

(b) 40 W/m^2

(c) 10 W/m^2

(d) 1 W/m^2

49. What is the total number of degrees of freedom of 1 mole of diatomic gas? Assume that the distance between the atoms is absolutely fixed.

(a) 6×10^{23}

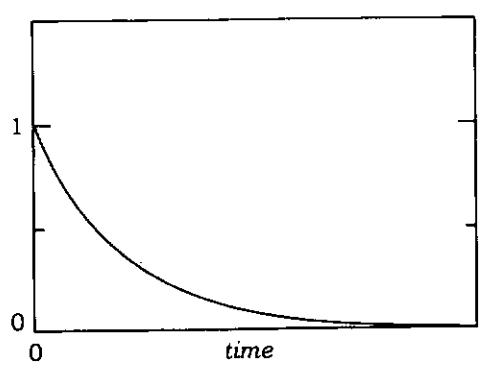
(b) 36×10^{23}

(c) 5

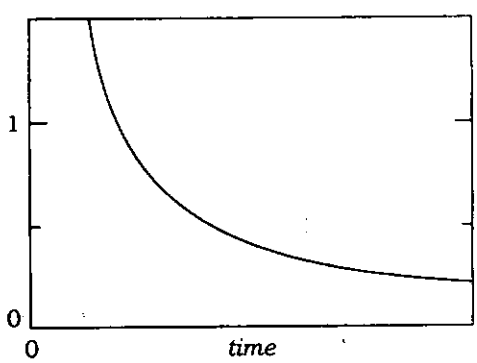
(d) 30×10^{23}

50. Which of the following plots of a function represents most accurately the decay of a radioactive material?

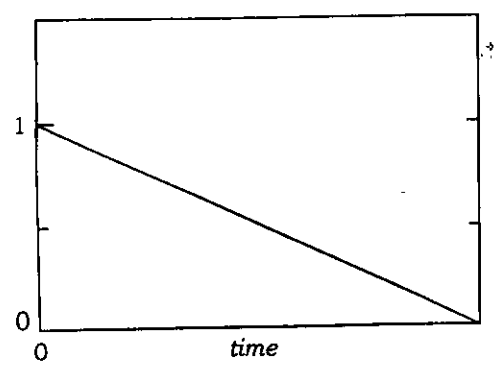
(a)



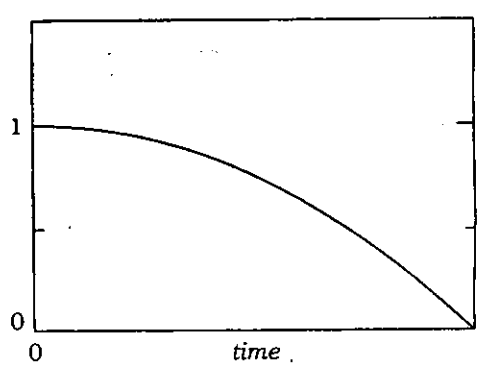
(b)



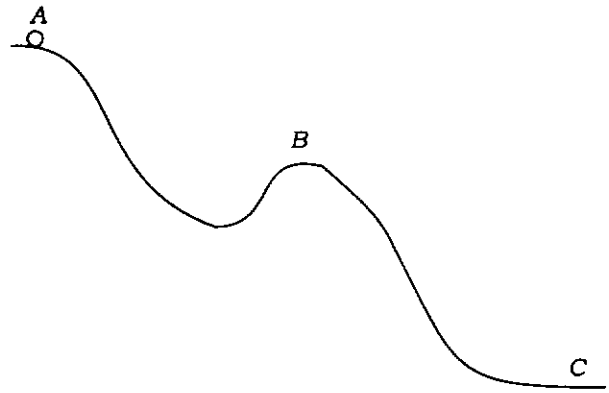
(c)



(d)

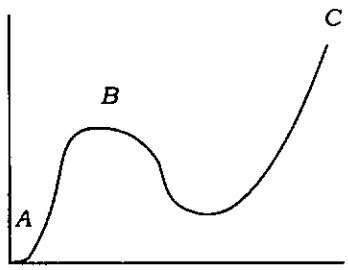


51. A ball of mass M at rest and positioned at A at the top of a hill starts rolling down from A towards B and then reaches its final position C at the bottom of the hill. See the figure below :

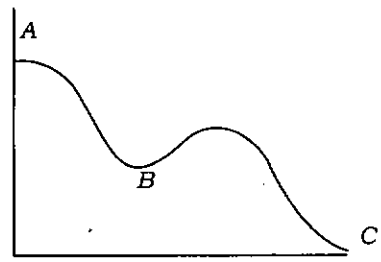


Which figure shown below best captures the potential energy as the ball goes from A to B to C?

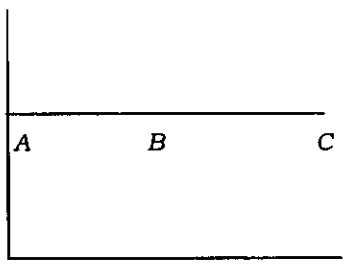
(a)



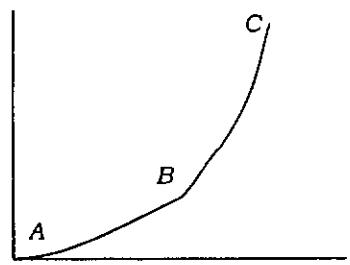
(b)



(c)



(d)



52. As a planet orbits the sun, which of the following must remain constant?

(a) Velocity

(b) Angular momentum

(c) Gravitational force

(d) Radius of the orbit

53. A bullet is fired from a gun. The gun recoils. The ratio of KE of the gun to that of the bullet is

(a) m_{bullet} / m_{gun}

(b) 1

(c) $(m_{bullet} / m_{gun})^2$

(d) $1 / (m_{bullet} / m_{gun})$

54. Refractive index of materials is approximately equal to square root of

(a) electrical permittivity

(b) magnetic permeability

(c) electrical permittivity × magnetic permeability

(d) electrical permittivity × magnetic susceptibility

55. An electric field can deflect

(a) X-rays

(b) neutrons

(c) β-particles

(d) γ-rays

56. In an *L-C-R* circuit, capacitance is changed from C to $2C$. For the resonant frequency to remain unchanged, the inductance should be changed from L to

(a) $4L$

(b) $2L$

(c) $L/2$

(d) $L/4$

57. In Young's double-slit experiment, an electron beam is used. If the electron beam is replaced by a neutron beam with the same velocity as that of electrons, we can maintain the same fringe width by

(a) there will be no interference pattern in the first place

(b) increasing the distance between the slits

(c) increasing the distance between slits and the detector

(d) the fringe width does not change on the nature of particles

58. The colour of the star indicates its

(a) weight

(b) size

(c) distance

(d) temperature

59. When yellow light is incident on a surface, no electrons are emitted while green light can emit. If blue light is incident on the surface, then

(a) no electrons are emitted

(b) electrons of the same energy as when green light was incident are emitted

(c) electrons of higher energy are emitted

(d) electrons of lower energy are emitted

60. Two stationary chambers 1 and 2, each of volume V, are filled with hydrogen gas and oxygen gas at the same pressure but temperature $T_1 > T_2$. Which of the following statements is correct?

(a) The number of molecules N, whose speed in x-direction is less than the value $c_{r.m.s.}/3$, is more for chamber 1 than for chamber 2

(b) The number of molecules N, whose speed in x-direction is less than the value $c_{r.m.s}/3$, is less for H gas than for O gas

(c) The number of molecules N, whose speed in x-direction is less than the value $c_{r.m.s}/3$, is the same in two chambers, because volume V is the same for both cases

(d) The number of molecules N, whose speed in x-direction is less than the value $c_{r.m.s}/3$, is the same in two chambers, because pressure P is the same for both cases

PART—B

Answer *any* **sixty** questions

61. Streptomycin and neomycin inhibit bacterial protein synthesis by

(a) inhibiting binding of aminoacyl tRNA to ribosomes

(b) preventing binding of $tRNA^{fmet}$ to the P site

(c) inhibiting peptidyl transferase activity

(d) preventing formation of 70S ribosomes

62. Some prokaryotes produce discrete layers external to cell wall. Which one of such layers will be used by bacteria as means to evade host defence system?

(a) Capsule

(b) Sheath

(c) Slime layer

(d) Protein jacket or S layer

63. The severity of disease caused by virus can vary greatly between infected individuals. What is the most important factor that determines the severity of viral disease?

(a) Nature of the host cell receptor used by virus for entry

(b) Nature of viral genome to be replicated inside the host cell

(c) Permissiveness of the cell to support viral infection

(d) Relationship that virus establishes with the host immune system

64. Which of the following is ***not*** the characteristic of bacterial growth curve?

(a) Shows development of microbial population under relatively stable environmental conditions

(b) Plotted with logarithmic numbers

(c) Graphs number of microbes versus time

(d) Each growth curve consists of four distinct phases

65. Which of the following is ***not*** associated with prokaryotic cells?

(a) Semiconservative replication

(b) Inducible operons

(c) Lagging and leading strand

(d) Introns and exons

66. Restriction enzymes were first discovered with the observation that

(a) DNA is restricted in the nucleus

(b) phage DNA is destroyed in host cells

(c) foreign DNA is kept out of cells

(d) foreign DNA is restricted to the cytoplasm

67. Which one of the following is a function of pyridoxine in nutrition of bacteria and archaea?

(a) It is a precursor of folic acid, a coenzyme involved in one carbon unit transfer

(b) It is a precursor of NAD and NADP, which are coenzymes involved in hydrogen transfer

(c) It is a component of the coenzyme for transaminase and amino acid decarboxylase

(d) It is a coenzyme involved in molecular rearrangements

68. In viral RNA, when a single-stranded loop region base pairs with a complementary sequence outside the loop creating a secondary structure, it is called

(a) multibranched loop

(b) pseudoknot

(c) interior loop

(d) bulge loop

69. Respiration in endoparasite cestodes is

(a) aerobic

(b) anaerobic

(c) both aerobic and anaerobic

(d) partially aerobic

70. Monophyodont and absence of corpus callosum are characteristic features of

(a) rabbit

(b) human

(c) kangaroo

(d) rat

71. The term 'humor' used in animal biology refers to

(a) tissue protein

(b) tissue fat and protein

(c) blood and lymph

(d) plasma and lymph

72. Parkinson's disease is associated with which of the following neurotransmitters?

(a) Acetylcholine

(b) Dopamine

(c) GABA

(d) Endorphin

73. How many teeth grow twice in the life of man?

(a) 4

(b) 12

(c) 20

(d) 28

74. Acetylcholinesterase is

(a) a neurotransmitter

(b) an enzyme that breaks down a neurotransmitter

(c) a triggering agent that initiates action potential

(d) an enzyme which stops propagation of neuronal impulse

75. In a polarized neuron at rest

(a) the inside of the neuron is more negatively charged than the outside

(b) outside of the neuron is more negatively charged than the inside

(c) either of the above can be true

(d) there is no charge at all

76. An extra finger in humans is rare but is due to a dominant gene. When one parent is normal and the other parent has an extra finger but is heterozygous for the trait, what is the probability that the first child will be normal?

(a) 0%

(b) 25%

(c) 50%

(d) 75%

77. LOD scores are used to predict

(a) crossover frequency

(b) gene sequence

(c) gene linkage

(d) number of genes involved in the expression of a given trait

78. Hairy root cultures for secondary metabolite production are induced by transforming plant cells with

(a) *Bacillus subtilis*

(b) *Agrobacterium tumefaciens*

(c) *Bacillus thuringiensis*

(d) *Agrobacterium rhizogenes*

79. The symbiotic relationship between fungi and roots of higher plants is called

(a) lichen

(b) helotism

(c) mutualism

(d) mycorrhiza

80. Heterocysts are found in

(a) Anabaena

(b) Synechocystis

(c) Spirulina

(d) Oscillatoria

81. Which of the following hormones stimulates ethylene release?

(a) Auxin

(b) Gibberellin

(c) Cytokinin

(d) Abscisic acid

82. Aerenchyma formation in wetland species especially in rice is induced by

(a) cytokinin

(b) auxin

(c) ABA

(d) ethylene

83. Culturing of cells in liquid agitated medium is called

(a) micropropagation

(b) liquid culture

(c) agar culture

(d) suspension culture

84. Which of the following is the best method for the production of virus-free plants?

(a) Embryo culture

(b) Meristem culture

(c) Ovule culture

(d) Anther culture

85. Treatment of DNA with base like 0·1 *N* NaOH

(a) has no effect

(b) disrupts hydrogen bonds, resulting in single-stranded polynucleotides

(c) hydrolyzes phosphodiester bonds, resulting in mononucleotides

(d) The effect will depend on the ratio of the DNA and NaOH

86. Unstable base that can be readily deaminated and leads to incorporation of wrong base during transcription is

(a) adenine

(b) guanine

(c) cytosine

(d) thymine

87. Protein coding gene in higher eukaryotes lacking introns is that encoding

(a) α-globin

(b) α-collagen

(c) immunoglobulin light chain

(d) histones

88. In agarose gel, bromophenol blue migrates at the same rate

(a) equivalent to 300 bp linear double-stranded DNA

(b) equivalent to 600 bp linear double-stranded DNA

(c) equivalent to 1 kb linear double-stranded DNA

(d) equivalent to 100 bp linear double-stranded DNA

89. Gene knockout involves

(a) heterologous repair

(b) homologous repair

(c) heterologous recombination

(d) homologous recombination

90. Wild type gene : ATG ACC AGG TG

⇩

Mutant : ATG AC A CAG GTG

The above mutation is an example of

(a) transition

(b) transversion

(c) frameshift

(d) inversion

91. Restriction enzymes do not destroy the DNA of the same organism that makes them, because

(a) their genome does not contain the restriction site for the particular enzyme

(b) restriction enzymes are secreted out and they are not localized in the cell

(c) their genome is protected by *de novo* methylation

(d) restriction enzyme will remain inactive in the same organism

92. Denaturing gradient gel electrophoresis separates DNA fragments on the basis of

(a) length

(b) sequence difference

(c) both length and sequence difference

(d) GC content

93. The final number of base pairs of a DNA segment that wrapped around the octameric disc of histones in nucleosomal core particle is

(a) 142

(b) 144

(c) 146

(d) 148

94. While comparing the expression levels of a gene 'X' in two experimental samples by PCR, the expression levels of housekeeping gene in both would be

(a) controlled

(b) standard

(c) exogenous normalizing variable

(d) endogenous normalizing variable

95. The mechanism by which some cells make discrete changes to specific nucleotides within mRNA molecule after it has been generated by RNA polymerase is

(a) RNA editing

(b) splicing

(c) capping

(d) polyadenylation

96. A ribonuclease that degrades the RNA portion of DNA-RNA hybrid molecule is

(a) RNase A

(b) RNase T_1

(c) RNase H

(d) RNase III

97. What extra property does a shuttle vector have as compared to a standard cloning vector?

(a) Longer multiple cloning sites with more restriction sites

(b) Two genes for antibiotic resistance instead of one

(c) Two origins of replication instead of one

(d) A promoter that can be easily controlled experimentally

98. Which of the following statements is ***not*** true of telomerase?

(a) It has ribozyme activity

(b) It adds repeat sequences to the 5′ end of DNA

(c) It is present in eukaryotes

(d) Its activity decreases with the cell age

99. The role of methylation of DNA is now viewed as

(a) interfering with DNA transcription by blocking base pairing between cytosine and guanine

(b) complexing with enhancers to prevent transcription

(c) preventing mutations

(d) insuring that genes that are turned off, stay off

100. RNA virus that changes proto-oncogene into oncogene upon integration of its genome in host chromosomal DNA is

(a) retrovirus

(b) Coronavirus

(c) measles virus

(d) Rubellavirus

101. In a globular protein, hydrophobic amino acids are generally found

(a) on the surface of the molecule

(b) in the interior of the molecule

(c) both on the surface and in the interior of the molecule

(d) in the hinge region of the molecule

102. Proper folding of proteins following synthesis is assisted by

(a) polysomes

(b) chaperones

(c) acyl carrier proteins

(d) histidyl-*cis*-*trans*-isomerase

103. Which of the following is a glycosaminoglycan?

(a) Glycogen

(b) Collagen

(c) Hyaluronic acid

(d) Chitin

104. α-Subunits of G-protein contain the binding site for

(a) cAMP

(b) cGMP

(c) GTP

(d) ATP

105. Transcription in prokaryotes is inhibited by

(a) nalidixic acid

(b) cycloheximide

(c) tetracycline

(d) rifampicin

106. Which of the following is a signalling receptor?

(a) Mannose receptor

(b) Toll-like receptor

(c) Vitamin D receptor

(d) Thyroid receptor

107. For performing SDS-gel electrophoresis, an excess of β-mercaptoethanol is added to protein samples for the purpose of

(a) disruption of disulfide bonds of proteins

(b) maintaining native structure of proteins

(c) maintaining buffering capacity of the solution

(d) hydrolysis of proteins

108. Which chemical force is disrupted by urea when it is used for solubilizing the aggregated proteins?

(a) van der Waals

(b) Ionic

(c) Hydrophobic

(d) Covalent

109. Blocking of enzyme action by blocking its active sites occurs during

(a) allosteric inhibition

(b) competitive inhibition

(c) feedback inhibition

(d) non-competitive inhibition

110. Which one of the following statements is true with reference to enzymes?

(a) Apoenzyme = Holoenzyme + Coenzyme

(b) Holoenzyme = Apoenzyme + Coenzyme

(c) Coenzyme = Apoenzyme + Holoenzyme

(d) Holoenzyme = Coenzyme – Apoenzyme

111. Nucleic acids in a solution can be estimated by measuring their absorption at 260 nm. Their absorption in this range is due to

(a) phosphate groups

(b) purine and pyrimidine bases

(c) ribose and deoxyribose sugars

(d) purines only

112. A 20-year-old anaemic man is found to have an abnormal form of β-globin that is 172 amino acids long, rather than the 141 found in the normal protein. Which of the following point mutations is likely to be associated with this abnormality?

(a) UAA → CAA

(b) UAA → UAG

(c) CGA → UGA

(d) GAU → GAC

113. Protein concentration estimated by Lowry's method is dependent on the contents of which of the following amino acids in the protein?

(a) Leucine and isoleucine

(b) Lysine and histidine

(c) Tryptophan and tyrosine

(d) Aspartic acid and glutamic acid

114. Vasopressin is a

(a) dipeptide

(b) nonapeptide

(c) tripeptide

(d) hexapeptide

115. A Biochemistry student isolates all the enzymes of the TCA cycle and adds OAA, acetyl CoA, appropriate energy precursors, cofactors and water. Which of the following will not be a direct product of his/her experiment?

(a) ATP

(b) GTP

(c) NADH

(d) $FADH_2$

116. Uncouplers are those which dissociate

(a) electron transport from oxidative phosphorylation

(b) electron transport from TCA cycle

(c) F0 subunit of ATP synthase from F1 subunit

(d) glycolysis from TCA cycle

117. Cellular organelles containing hydrolytic enzymes are called

(a) microsomes

(b) lysosomes

(c) chloroplasts

(d) ribosomes

118. Cytokine released from cell A stimulates an adjoining cell B. This is an example of

(a) autocrine signal

(b) paracrine signal

(c) endocrine signal

(d) cytocrine signal

119. Which of the following statements is ***not*** true in the context of mitochondrial electron transport and oxidative phosphorylation?

(a) Complex V is ATP synthase as well as ATPase

(b) ATP synthase is a proton pump

(c) Cytochrome C is a part of complex IV

(d) $FADH_2$ is fed to the electron transport chain through complex II

120. Which of the following statements is correct concerning prion disease?

(a) It is a disease process in which proteins are pathophysiologic entity

(b) It is a disease process in which a messenger RNA secondary structure appears to be the pathophysiologic entity

(c) It is found only in humans

(d) The disease process is readily reversible

121. The armature of a 60 Hz a.c. generator rotates in a magnetic field of 0·15 T. If the area of the coil is $2 \cdot 0 \times 10^{-2}$ m^2, how many loops must the coil contain if the peak output is to be $E_0 = 170$ V?

(a) 50 turns (b) 100 turns

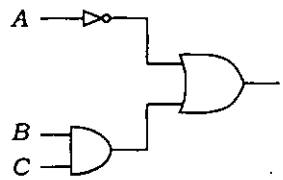
(c) 150 turns (d) 300 turns

122. The isotope C^{14} has a half-life of 5730 years. If sometime a sample contains 1×10^{22} C^{14} nuclei, what is the number of decays per second?

(a) 4×10^{12} (b) $1 \cdot 7 \times 10^{18}$

(c) $1 \cdot 7 \times 10^{-34}$ (d) $3 \cdot 8 \times 10^{10}$

123. The output of the logic gate



will be 1, when

(a) $A = 1,\ B = 0,\ C = 0$ (b) $A = 1,\ B = 1,\ C = 0$

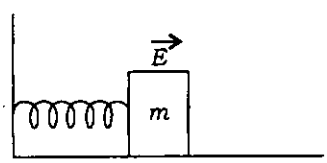
(c) $A = 1,\ B = 0,\ C = 1$ (d) $A = 0,\ B = 1,\ C = 1$

124. A parallel-plate capacitor is made by stacking n equally spaced plates connected alternately to the positive and negative terminals of a battery. If the capacitance between any two adjacent plates is C, then the resultant capacitance is

(a) $C/(n-1)$ (b) $(n-1)C$

(c) nC (d) C/n

125. A block of mass m and having charge $+q$ is placed on a frictionless horizontal surface and is connected with a spring of spring constant k as shown in the figure. A horizontal electric field of magnitude E is applied parallel to the spring. The maximum amplitude of the SHM of the block is



(a) $\frac{m}{k}$ (b) $\frac{qm}{k}$

(c) $\frac{qE}{k}$ (d) $\frac{mE}{k}$

126. A mercury thermometer reads $+0 \cdot 5$ °C when placed in a melting ice and 100·8 °C when placed in a steam. What is the true reading if the reading of the thermometer is 20 °C?

(a) 19·45 °C (b) 20·56 °C

(c) 21·56 °C (d) 18·98 °C

127. The driver of a car travelling with a speed 30 m/s towards a hill sounds a horn of frequency 500 Hz. If the velocity of sound in air is 330 m/s, the frequency of reflected sound as heard by the driver is

(a) 555 Hz (b) 600 Hz

(c) 458 Hz (d) 45 Hz

128. A thin glass (refractive index 1·5) lens has optical power of –5 D in air. Its optical power in a liquid medium with refractive index 1·4 will be

(a) 1 D (b) 25 D

(c) –25 D (d) –1 D

129. By what factor does the gravitational force per unit mass at the surface of a planetary sphere change, if the radius of the sphere is increased from R to $2R$? The density of matter of the planet remains constant.

(a) $\frac{1}{2}$ (b) 4

(c) 2 (d) $\frac{1}{4}$

130. Three capacitors, each of capacitance C and of breakdown voltage V, are joined in series. The capacitance and breakdown voltage of the combination will be

(a) $3C, V/3$ (b) $C/3, 3V$

(c) $3C, 3V$ (d) $C/3, V/3$

131. The magnetic force acting on a charged particle of charge $-2\,\mu C$ in a magnetic field of 2 T acting in y-direction, when the particle velocity is $(2\hat{i} + 3\hat{j}) \times 10^6$ m s^{-1}, is

(a) 4 N in z-direction (b) 8 N in y-direction

(c) 8 N in z-direction (d) 8 N in $-z$-direction

132. A solid metallic sphere of radius R is melted and remade into a solid cylinder of radius R. I_S and I_C are the moment of inertia of the sphere, and the cylinder around the axis passing through its centre and parallel to its length. The ratio of moment of inertia of the sphere and that of cylinder, i.e., I_S / I_C, is

(a) 4/5 (b) 2/3

(c) 1/5 (d) 7/5

133. Zeeman splitting is the splitting of energy levels

(a) on application of magnetic field

(b) by thermal energy

(c) on application of electric field

(d) by mechanical energy

134. The fingerprint region of an infrared spectrum is usually represented by

(a) 4000 cm^{-1} to 3000 cm^{-1}

(b) 3000 cm^{-1} to 2500 cm^{-1}

(c) 1500 cm^{-1} to 500 cm^{-1}

(d) 4000 cm^{-1} to 1500 cm^{-1}

135. Keesom forces are due to interaction between

(a) permanent dipole and induced dipole

(b) induced dipole and induced dipole

(c) permanent dipole and permanent dipole

(d) charge and charge

136. What is the correct order of increasing energy for the following spin-spin pairs?

(a) $\alpha\alpha < \alpha\beta = \beta\alpha < \beta\beta$

(b) $\alpha\alpha = \beta\beta < \alpha\beta = \beta\alpha$

(c) $\beta\beta < \alpha\beta = \beta\alpha < \alpha\alpha$

(d) $\alpha\beta = \beta\alpha < \alpha\alpha = \beta\beta$

137. Beckmann rearrangement is an example of

(a) 1,2-shift where migration origin is carbon and the migration terminus is nitrogen

(b) 1,3-shift where migration origin is carbon and the migration terminus is nitrogen

(c) 1,2-shift where migration origin is nitrogen and the migration terminus is carbon

(d) 1,3-shift where migration origin is nitrogen and the migration terminus is carbon

138. In a process, nitrogen is heated to 576 K in a vessel of constant volume. If it enters the vessel at 180 K and 55 atm, what pressure would it exert at the working temperature if it behaves as a perfect gas?

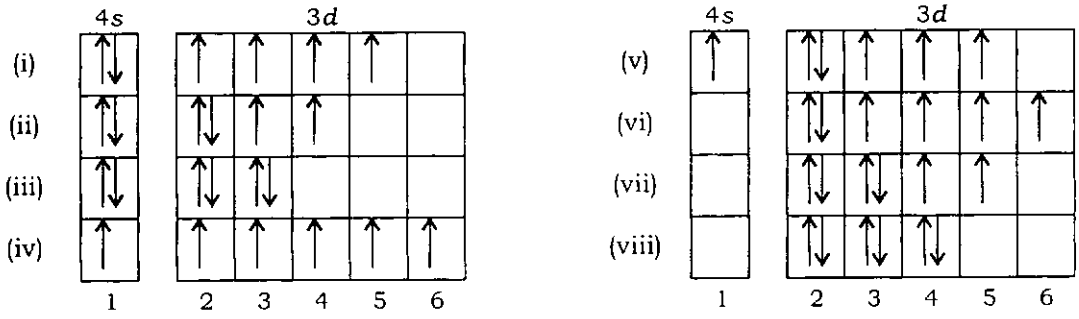
(a) 138 atm

(b) 176 atm

(c) 137·5 atm

(d) 167 atm

139. Assuming the energy difference between 4*s* and 3*d* orbitals to be small, following 8 electronic arrangements have been listed for the outer electronic configuration of chromium :



Which of these arrangements are ***not*** possible according to Aufbau principle?

(a) (ii), (v), (vii)

(b) (v), (vii), (viii)

(c) (iii), (v), (viii)

(d) (iii), (v), (vii)

140. The correct arrangement of the following molecules in the increasing bond order is

(a) $He_2 < O_2 < N_2 < C_2$ (b) $He_2 < O_2 \approx N_2 < C_2$

(c) $He_2 < O_2 \approx C_2 < N_2$ (d) $He_2 < N_2 < O_2 < C_2$

141. In wurtzite structure of ZnS, the sulfide (S^{2-}) ions are arranged in a hexagonal closed packed (hcp) arrangement and zinc ion occupies half of the tetrahedral sites. Therefore, the coordination numbers of Zn^{2+} and S^{2-} ions in wurtzite structure respectively are

(a) (6 : 4) (b) (4 : 4)

(c) (4 : 6) (d) (6 : 6)

142. Sulphamic acid, $H_2N(SO_2)OH$, behaves as a dibasic acid in liquid ammonia, whereas it acts as a monobasic acid in aqueous solution. This is because

(a) NH_2 group cannot donate a proton to water

(b) it is difficult to undergo protolysis in ammonia

(c) it requires a solvent that can give up a proton

(d) NH_2 can readily donate a proton to water

143. Alkali metals are typically soft, show low densities, and have low melting and boiling points. This is because they have

(a) only one valence electron

(b) large atomic size

(c) negative values of standard reduction potentials

(d) negligible electron gain enthalpy

144. The ionization enthalpy of hydrogen atom is $1 \cdot 312 \times 10^6$ J mol^{-1}. The energy required to excite the electron in the atom from $n = 1$ to $n = 2$ is

(a) $8 \cdot 51 \times 10^5$ J mol^{-1}

(b) $6 \cdot 56 \times 10^5$ J mol^{-1}

(c) $7 \cdot 56 \times 10^5$ J mol^{-1}

(d) $9 \cdot 84 \times 10^5$ J mol^{-1}

145. The expected spin-only magnetic moments of complexes of a transition metal like nickel or cobalt depend on

(a) oxidation state of the metal

(b) nature of the ligand

(c) geometry of the complex

(d) number of unpaired electrons in free transition metal ion

146. $[Ti(H_2O)_6]^{3+}$ complex gives purple colour when dissolved in water. This is attributed to

(a) promotion of t_{2g} electron to e_g level

(b) ligand to metal charge transfer

(c) metal to ligand charge transfer

(d) $\pi \rightarrow \pi^*$ transition

147. A negative $E°$ means that

(a) the redox couple is a stronger reducing agent than H^+/H_2 couple

(b) the redox couple is a weaker reducing agent than H^+/H_2 couple

(c) the reaction is not a spontaneous oxidation reduction reaction

(d) negative $E°$ value is not a determinant of oxidation reduction reaction

148. If E°_{cell} for the reaction

$$Mg(s) + 2Ag^+(0 \cdot 0001\ M) \rightleftharpoons Mg^{2+}(0 \cdot 130\ M) + 2Ag(s)$$

is 3·17 V, calculate its E_{cell}.

(a) 2·96 V (b) 3·17 V

(c) 3·38 V (d) 0·00 V

149. A solution of $CuSO_4$ was electrolyzed for 10 minutes with a current of 1·5 amperes. What is the mass of Cu deposited at the cathode? Faraday's constant is 96487 C/mol. 1 mol of Cu weighs 63 g.

(a) 0·2938 g (b) 0·2938 mg

(c) 0·1469 g (d) 0·1469 mg

150. For a reaction, $A + B + C \rightarrow P$, rate law is given by rate = $k[A][B]$. What is the order of the reaction?

(a) 0 (b) 1

(c) 2 (d) 3

151. Which one of the following has bacteriostatic effect on microbes?

(a) Penicillin (b) Aminoglycoside

(c) Ofloxacin (d) Tetracycline

152. The shape of XeO_2F_2 is

(a) square planar (b) distorted trigonal bipyramidal

(c) square pyramidal (d) distorted tetrahedral

153. If $\tan A$ and $\tan B$ are the roots of the equation $x^2 - px + q = 0$, then the value of $\tan(A + B)$ equals

(a) $\frac{p}{q}$ (b) $\frac{p}{1-q}$

(c) $\frac{q}{1-p}$ (d) $\frac{p}{1+q}$

154. A set contains $2n + 1$ elements. The number of subsets of the set having at most n elements is

(a) 2^n (b) 2^{n+1}

(c) 2^{2n} (d) 2^{2n-1}

155. The equation $x^2 + 4xy + 4y^2 + 5x + 10y + 4 = 0$ represents

(a) a parabola (b) a pair of intersecting lines

(c) a pair of parallel lines (d) an ellipse

156. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} p & q \\ q & p \end{bmatrix}$, then

(a) $p = a^2 + b^2,\ q = 2ab$ (b) $p = a^2 + b^2,\ q = a^2 - b^2$

(c) $p = 2ab,\ q = a^2 + b^2$ (d) $p = a^2 + b^2,\ q = ab$

157. The differential equation $\frac{dy}{dx} + \frac{y}{x} = 0$ represents

(a) a pair of lines passing through the origin

(b) a family of concentric circles

(c) a family of ellipses

(d) a family of hyperbolas

158. Let

$$f(x) = \begin{cases} x^2 & \text{if } 0 \le x < 1 \\ 2x + a & \text{if } 1 \le x \le 2 \\ b - x & \text{if } 2 < x \le 3 \end{cases}$$

be a continuous function on [0, 3], then

(a) $a = -1,\ b = 5$

(b) $a = 1,\ b = 5$

(c) $a = -1,\ b = -5$

(d) $a = 1,\ b = -5$

159. Let $f(x) = |x - 2| + |5 - x|$. Then the minimum value of the function is

(a) 0

(b) 1

(c) 2

(d) 3

160. $\lim\limits_{x \to 0} \frac{1 - \cos^3 x}{x \sin x \cos x}$ is equal to

(a) $\frac{2}{5}$

(b) $\frac{3}{5}$

(c) $\frac{3}{2}$

(d) $\frac{3}{4}$

★★★