3

QUESTION PAPER SERIES CODE
A

Centre of Examination : _____

Roll No. : _____

Name of Candidate : _____

S A U

Entrance Test for M.Sc. (Biotechnology)

[2013]

Time : 3 hours *Maximum Marks* : 100

INSTRUCTIONS FOR CANDIDATES

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

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

(ii) This Question Paper has Two Parts : Part—A and Part—B.

(iii) Part—A (Objective-type) has 30 questions of **1** mark each. Please attempt **all** questions of Part—A.

(iv) Part—B (Objective-type) has 120 questions (Q. Nos. **31** to **150**) out of which, please attempt 70 questions only. Each question carries **1** mark.

(v) *PLEASE DO NOT ATTEMPT MORE THAN 70 QUESTIONS IN PART—B. IF YOU ATTEMPT MORE THAN 70 QUESTIONS, ONLY first 70 WILL BE EVALUATED.*

(vi) **Please darken the appropriate Circle of 'Question Paper Series Code' on the OMR/Answer Sheet in the space provided.**

(vii) Part—A and Part—B (Multiple choice) questions should be answered on OMR/Answer Sheet.

(viii) Answers written by the candidates inside the Question Paper will **NOT** be evaluated.

(ix) Calculators and Log Tables may be used.

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

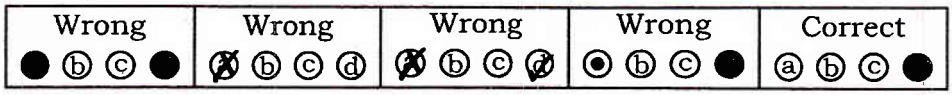
(xi) **Return the Question Paper and the OMR/Answer Sheet** to the Invigilator at the end of the Entrance Test.

(xii) **DO NOT FOLD THE OMR/ANSWER SHEET.**

INSTRUCTIONS FOR MARKING ANSWERS IN THE 'OMR SHEET'

1. **Please ensure that you have darkened the appropriate Circle of 'Question Paper Series Code' on the OMR Sheet in the space provided.**
2. Use only Blue/Black Ballpoint Pen to darken the Circle. Do not use Pencil, to darken the Circle for Final Answer.
3. Please darken the whole Circle.
4. Darken ONLY ONE CIRCLE for each question as shown below in the example.

Example :



5. Once marked, no change in the answer is allowed.
6. Please do not make any stray marks on the OMR Sheet.
7. Please do not do any rough work on the OMR Sheet.
8. Mark your answer only in the appropriate circle against the number corresponding to the question.
9. There will be no negative marking in evaluation.

PART—A

1. In an electric circuit, current is

(a) inversely proportional to voltage

(b) directly proportional to resistance

(c) a product of resistance and voltage

(d) voltage divided by resistance

2. How much of a $2N$ sodium hydroxide solution should be added to 500 ml water to get a pH of 11·0?

(a) 250 µl

(b) 500 µl

(c) 1000 µl

(d) 2500 µl

3. In $KMnO_4$, the oxidation number of Mn is

(a) -5

(b) -7

(c) +5

(d) +7

4. Gamma rays

(a) would have no charge

(b) would have zero energy

(c) are positively charged

(d) represent fast-moving nuclei of hydrogen

5. Burning one gram of cyclohexene produces 100 calorie energy. How much energy will be produced by burning half a mole of cyclohexene?

(a) 50 cal

(b) 2100 cal

(c) 4200 cal

(d) 3900 cal

6. Which one of the following bonds is uncommon in biomolecules?

(a) Hydrogen bond

(b) Covalent bond

(c) Ionic bond

(d) Metallic bond

7. Complete reduction of acetic acid will yield

(a) ethanol

(b) ethane

(c) propane

(d) methane

8. A bird of mass 50 g flies from the ground to a branch 10 m above. The work it has to do against gravity is

(a) 4·9 kg m^2s^{-2}

(b) 4·9 gm m^2s^{-2}

(c) Cannot be determined from the above information

(d) 0·49 kg m^2s^{-2}

9. Potential energy of an object kept at a certain height from the surface of the earth is

(a) inversely proportional to its mass

(b) directly proportional to its mass

(c) proportional to the square of its height from the earth's surface

(d) proportional to the under-root of its height from the earth's surface

10. [Energy of a beam with frequency n] / [Energy of a beam with frequency $2n$] is equal to

(a) 2

(b) 4

(c) 6

(d) 0·5

11. Which one of the following is not a vector?

(a) Force

(b) Torque

(c) Momentum

(d) Volume

12. Derivative of $y = ax^4 - bx^2$ (a and b are constants) is

(a) $4ax^3 - 2bx$

(b) $4ax^2 - 2bx$

(c) $\left(\frac{a}{4}\right)x^3 - \left(\frac{1}{2}\right)bx$

(d) $ax^3 - bx^2$

13. Given two complex numbers $z_1 = -2 + i$ and $z_2 = 1 - 2i$, the product of z_1 and z_2 will be

(a) $5i$

(b) $-5i$

(c) 0

(d) $-1 - i$

14. Which one of the following structural formulas is not possible?

(a) CH_4

(b) C_4H_8

(c) C_3H_8O

(d) C_3H_{10}

15. During mitosis, endoplasmic reticulum and nucleolus begin to disappear at

(a) early prophase

(b) late prophase

(c) early metaphase

(d) late metaphase

16. In human secondary spermatocyte, how many chromosomes are present?

(a) 45

(b) 23

(c) 30

(d) 15

17. Connective tissues mainly contain

(a) actin

(b) reticulin

(c) collagen

(d) elastin

18. Which of the following glands secrete hormones directly into the extracellular space?

(a) Endocrine gland

(b) Apocrine gland

(c) Merocrine gland

(d) None of the above

19. Which one of the following is not correctly matched?

(a) Liver—Kupffer cells

(b) Pancreas—Glisson's capsule

(c) Kidney—Nephrons

(d) Testis—Seminiferous tubules

20. The HCl in gastric juice converts

(a) disaccharide to monosaccharide

(b) pepsinogen to pepsin

(c) prorenin to renin

(d) polypeptide to peptide

21. Which of the following factors is required for the maturation of erythrocytes?

(a) Vitamin A

(b) Vitamin B_{12}

(c) Vitamin C

(d) Vitamin D

22. Glucose is converted to glycogen in liver and stored in

(a) liver and spleen

(b) liver and muscle

(c) liver

(d) spleen and muscle

23. DNA replication takes place during

(a) G_1-phase

(b) S-phase

(c) G_2-phase

(d) prophase

24. Adenosine is not a structural component of

(a) coenzyme A

(b) ubiquinone

(c) NADH

(d) FAD

25. In aerobic animals, citric acid cycle serves as

(a) essentially a catabolic process

(b) essentially an anabolic process

(c) an amphibolic pathway

(d) an anaplerotic reaction

26. The two cysteine residues interact in the tertiary structure of a protein through

(a) hydrogen bonds

(b) polar bonds

(c) covalent bonds

(d) van der Waals interaction

27. Which of the following components is not a constituent of nucleic acid?

(a) Adenine

(b) Thiamine

(c) Cytosine

(d) Uracil

28. Which one of the following activities involves rearing of silkworm?

(a) Apiculture

(b) Pisciculture

(c) Sericulture

(d) Horticulture

29. Terrestrial insects produce

(a) urea

(b) ammonia

(c) uric acid

(d) hippuric acid

30. The effect of DDT on birds is

(a) fewer tail feathers

(b) increased growth of nails

(c) blindness

(d) thinning of egg shell

PART—B

31. Which one of the following is true?

(a) Cellular respiration occurs in mitochondria and in chloroplasts

(b) Photosynthesis occurs in chloroplasts and cellular respiration occurs in mitochondria

(c) Photosynthesis occurs in mitochondria and in chloroplasts

(d) Neither cellular respiration nor photosynthesis occurs in mitochondria and in chloroplasts

32. The function of the Calvin cycle is to

(a) absorb light energy

(b) synthesize RuBP

(c) fix carbon

(d) convert glucose to CO_2, yielding energy

33. Enzymes embedded in the membrane of the smooth endoplasmic reticulum

(a) synthesize lipids

(b) synthesize carbohydrates

(c) synthesize protein

(d) may be used for detoxification

34. In which of the following stages, crossing-over occurs

(a) pachytene

(b) zygotene

(c) leptotene

(d) diplotene

35. ATPase enzyme needed for muscle contraction is located in

(a) actinin

(b) troponin

(c) myosin

(d) actin

36. In eukaryotes, the interaction of enhancer and promoter elements is brought closer by

(a) zinc finger

(b) DNA looping

(c) helix turn helix

(d) palindrome

37. The absence of sigma factor in RNA polymerase

(a) affects elongation only

(b) blocks initiation only

(c) affects both initiation and elongation

(d) does not affect transcription

38. Which one of the following features is not required in the initiation step of protein synthesis?

(a) Amino acid activation

(b) Binding of mRNA to the ribosomes

(c) Transfer of activated amino acid to tRNA

(d) Peptide bond formation

39. Which one of the following is a natural inducer of the *lac* operon in *E. coli*?

(a) Lactose

(b) Galactose

(c) Allolactose

(d) IPTG

40. A protein is poorly expressed in a diseased tissue. To determine whether the defect is at the level of transcription or translation, which of the following blotting methods would you use?

(a) Southern

(b) Southern and Northern

(c) Northern and Western

(d) Western

41. Which of the following techniques is primarily undertaken to amplify DNA?

(a) PCR

(b) Microarray

(c) Northern blotting

(d) Southern blotting

42. If the molar amount of G in a DNA sample is 20%, what is the molar amount of T in the sample?

(a) 20%

(b) 30%

(c) 40%

(d) 25%

43. Which is true of the melting temperature (T_m) of G-C pairs compared to A-T pairs in DNA?

(a) The T_m are equal

(b) T_m of G-C is less than the T_m of A-T

(c) T_m of G-C is greater than the T_m of A-T

(d) None of the above

44. DNA methylation is associated with

(a) CpG islands

(b) CAT box

(c) TATA box

(d) increasing gene transcription

45. Unwinding of DNA is done by

(a) topoisomerase

(b) exonuclease

(c) helicase

(d) ligase

46. Mutations are usually induced by

(a) alpha rays

(b) gamma rays

(c) beta rays

(d) infrared rays

47. Wobble hypothesis establishes

(a) peptide chain formation

(b) initiation of peptide chain

(c) termination of peptide chain

(d) economy in tRNA molecule

48. DNA replication is

(a) conservative

(b) semiconservative and discontinuous

(c) semiconservative and semidiscontinuous

(d) conservative and discontinuous

49. A polymorphonuclear neutrophil (PMN)

(a) is a bone marrow multipotent stem cell

(b) is closely similar to a mast cell

(c) contains microbicidal cytoplasmic granules

(d) is not a professional phagocytic cell

50. Lysozyme

(a) is a cytoplasmic organelle

(b) activates complement

(c) is a proteolytic enzyme

(d) hydrolyses peptidoglycan

51. Immunological unresponsiveness to self-antigens is called

(a) tolerance

(b) atopy

(c) memory

(d) acquired immunity

52. Edward Jenner vaccinated against smallpox using

(a) killed smallpox virus

(b) a recombinant protein derived from smallpox

(c) an antiserum

(d) cowpox virus

53. Which of the following cell types produces antibodies?

(a) Macrophages

(b) T-lymphocytes

(c) NK cells

(d) Plasma cells

54. The basic Ig unit is composed of

(a) 2 identical heavy and 2 identical light chains

(b) 2 identical heavy and 2 different light chains

(c) 2 different heavy and 2 identical light chains

(d) 2 different heavy and 2 different light chains

55. Which of the following gene clusters do not contribute to antigen binding?

(a) VL

(b) CL

(c) VH

(d) D

56. A hapten is

(a) eight-carbon linear alkane

(b) eight-carbon cyclic alkane

(c) a small chemical grouping which reacts with antibodies

(d) portion of a protein antigen that binds antibody

57. An epitope

(a) is the area on an antigen which contacts antibody

(b) is the area on an antibody which contacts antigen

(c) requires both antigen-binding arms of the antibody molecule for its recognition

(d) is usually composed of a linear sequence of amino acids

58. The stability of DNA to heat denaturation (melting)

(a) increases with increasing concentration of salt

(b) decreases with increasing concentration of salt

(c) is independent of G+C content

(d) increases with increasing pH

59. Digestion of the peptide Val-Lys-Glu-Met-Ser-Trp-Arg-Ala with chymotrypsin will produce

(a) Val-Lys + Glu-Met-Ser + Trp-Arg-Ala

(b) Val-Lys-Glu + Met-Ser-Trp-Arg-Ala

(c) Val-Lys-Glu-Met + Ser-Trp-Arg-Ala

(d) Val-Lys-Glu-Met-Ser-Trp + Arg-Ala

60. Maltose, but not sucrose, reduces Fehling's solution, because

(a) maltose is a monosaccharide unlike sucrose

(b) maltose is made up of 2 glucose units unlike sucrose

(c) maltose has a free anomeric carbon unlike in sucrose

(d) None of the above

61. An example of a lipid with ether-linked fatty acid is

(a) triacylglycerol

(b) sphingolipid

(c) plasmalogen

(d) glycolipid

62. For storage and transport of sterols, cholesterol forms sterol esters with a fatty acid using its

(a) hydroxyl group of the ring A

(b) methyl group (C19) in the steroid nucleus

(c) alkyl side chain of the ring D

(d) choline group

63. Which of the following enzymes plays a role in gluconeogenesis?

(a) Hexokinase

(b) Phosphofructokinase I

(c) PEP carboxykinase

(d) Pyruvate kinase

64. The characteristic strong absorbance of light by most proteins at a wavelength of 280 nm is due to the presence of

(a) thiol groups in methionine and cysteine

(b) aromatic side chains in tyrosine and tryptophan

(c) long polar side chains in lysine and arginine

(d) peptide bond

65. An example of an uncommon amino acid not found in proteins is

(a) 4-hydroxyproline

(b) selenocysteine

(c) phosphoserine

(d) citrulline

66. In which of the following tissues in mammals, gluconeogenesis does not happen?

(a) Liver

(b) Kidney

(c) Small intestine

(d) Brain

67. Which of the following neorotransmitters is not directly derived from an amino acid?

(a) Acetylcholine

(b) Dopamine

(c) Norepinephrine

(d) Gamma-amino butyric acid

68. Enzymes that catalyze transfer of electrons are grouped as

(a) oxydoreductases

(b) transferases

(c) hydrolases

(d) isomerases

69. Acrosomal enzymes in a mammalian sperm originate from

(a) peroxisomes

(b) lysosomes

(c) microsomes

(d) mitochondria

70. A diploid human genome contains about

(a) 10000 nucleotides

(b) 10000 genes

(c) 6 billion nucleotides

(d) 3·3 billion genes

71. Who among the following developed the rabies vaccine?

(a) Robert Koch

(b) Robert Gallo

(c) Walther Hesse

(d) Louis Pasteur

72. Erythropoietin, the hormone involved in the synthesis of RBCs, is released to blood circulation by

(a) red blood cells

(b) bone marrow stem cells

(c) renal cells

(d) hepatic cells

73. *Agrobacterium tumefaciens* causes

(a) hairy root disease

(b) crown gall disease

(c) late blight

(d) loose smut

74. Globally, the most abundantly grown genetically modified crop is

(a) *Bt* cotton

(b) golden rice

(c) *Bt* maize

(d) herbicide-resistant soybean

75. Most abundant greenhouse gas in the atmosphere is

(a) carbon dioxide

(b) water vapour

(c) methane

(d) ozone

76. Agrobacterium naturally infects

(a) monocots

(b) dicots

(c) Both monocots and dicots

(d) None of the above

77. Primary cell wall of plants is primarily composed of

(a) starch

(b) glycogen

(c) cellulose

(d) pectin

78. In C4 plants, the step catalyzed by Rubisco occurs in

(a) bundle sheath cells

(b) mesophyll cells

(c) stomata

(d) epidermal cells

79. Photolysis of water occurs at

(a) PSI

(b) PSII

(c) Dark reaction

(d) Krebs cycle

80. Insectivorous plants possess —— (an enzyme) usually not possessed by autotrophic plants.

(a) cellulase

(b) amylase

(c) xylanase

(d) chitinase

81. Carl Woese's discovery replaced the classification scheme of five kingdoms with a scheme of three

(a) phyla

(b) domains

(c) classes

(d) orders

82. When light is absorbed by an object and emitted at a longer wavelength, this phenomenon is called

(a) fluorescence

(b) magnification

(c) reflection

(d) refraction

83. All electromagnetic radiations travel through a vacuum at what speed?

(a) 3×10^8 mm/sec

(b) 3×10^8 cm/sec

(c) 3×10^8 m/sec

(d) 3×10^8 ft/sec

84. Which of the following are believed to be the product of ancestral engulfment of prokaryotic cells, followed by evolution of endosymbiosis?

(a) Nucleus and mitochondrion

(b) Chloroplast and Golgi apparatus

(c) Nucleulus and nucleus

(d) Mitochondrion and chloroplasts

85. Directed movements toward or away from a chemical or physical signal are known as

(a) gliding

(b) flagellation

(c) taxis

(d) locomotion

86. Microorganisms constantly struggle to survive in natural habitats because of the competition for

(a) food

(b) sunlight

(c) water

(d) oxygen

87. The most widely used solidifying agent that is derived from seaweed is

(a) agar

(b) gelatin

(c) starch

(d) cellulose

88. When the population doubles during each given unit of time, the growth is

(a) linear

(b) semilogarithmic

(c) exponential

(d) geometric

89. Which of the following are typically evolved to survive multiple extreme environments?

(a) Psychrophiles

(b) Extremophiles

(c) Halophiles

(d) Thermophiles

90. A bacterium that thrives in your stomach is probably a/an

(a) thermophile

(b) neutrophile

(c) alkalophile

(d) acidophile

91. Which of the following epidemics is not virus-borne?

(a) AIDS

(b) Bubonic plague

(c) Polio

(d) SARS

92. Genes encoding the form of antibiotic resistance involving an efflux transport system are commonly encoded on

(a) chromosomes

(b) plasmids

(c) bacteriophage

(d) transposons

93. Not all enzymes are proteins; in some enzymes, the catalytic properties depend on

(a) DNA

(b) RNA

(c) polysaccharides

(d) lipids

94. Lichens are a coevolved symbiosis of which two organisms?

(a) Plant and bacterium

(b) Paramecium and bacterium

(c) Alga and paramecium

(d) Fungus and alga

95. Based on the criteria given in Table 1 below, where should this newly discovered organism be placed?

Table 1 : Results of unknown organism
Observation#1 : Unicellular, photosynthetic, found in aquatic and marine environs
Observation#2 : Unique bipartite shell made of silica
Observation#3 : Daughter cells smaller than parent cells, with each generation

(a) Brown alga/kelp

(b) Foraminiferan

(c) Diatom

(d) Ameba

96. Bacille Calmette-Guerin (BCG) is a weakened strain used to vaccinate against

(a) Diphtheria

(b) Whooping cough

(c) Tuberculosis

(d) Pneumonia

97. The ability of a given allele to be expressed phenotypically to varying degree is called

(a) penetrance

(b) expressivity

(c) pleiotropic

(d) prepotency

98. Eye colour in *Drosophila* is an example of

(a) sex-linked inheritance

(b) sex-limited inheritance

(c) sex-influenced inheritance

(d) incomplete dominance

99. Compound, which induces developmental abnormalities, is called

(a) carcinogen

(b) clastogen

(c) mutagen

(d) teratogen

100. Which of the following disorders is caused by genetic transposition?

(a) AIDS

(b) Tuberculosis

(c) Cancer

(d) Down syndrome

101. What would be the frequency of individuals with genotype AABBCC in the progeny from a mating of two AaBbCc parents?

(a) $\frac{1}{64}$

(b) $\frac{1}{32}$

(c) $\frac{1}{16}$

(d) $\frac{1}{8}$

102. An Hfr strain of *E. coli* refers to

(a) a vector used to make many copies of a particular DNA sequence

(b) bacterial chromosome with deleted ori

(c) bacterial chromosome with the F factor inserted

(d) bacterial chromosome with phage DNA inserted

103. The derivative of $\exp(ax)$, $d(\exp(ax))/dx$, is

(a) $a \cdot \exp(ax)$

(b) $\frac{a}{x}$

(c) ax

(d) x^a

104. The slope of the tangent to the parabola $y = x^2$ at $x = \frac{1}{2}$ is

(a) 90° with respect to the x-axis

(b) 0° with respect to the x-axis

(c) 45° with respect to the x-axis

(d) 30° with respect to the x-axis

105. The following forces act on a particle P:

$$\mathbf{F}_1 = 2\mathbf{i} + 3\mathbf{j} - 5\mathbf{k}$$
$$\mathbf{F}_2 = -5\mathbf{i} + \mathbf{j} + 3\mathbf{k}$$
$$\mathbf{F}_3 = \mathbf{i} - 2\mathbf{j} + 4\mathbf{k}$$
$$\mathbf{F}_4 = 4\mathbf{i} - 3\mathbf{j} - 2\mathbf{k}$$

The resultant force is

(a) $2\mathbf{i} - \mathbf{j}$

(b) $2\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$

(c) $\mathbf{j} - 3\mathbf{k}$

(d) $3\mathbf{i} + 5\mathbf{k}$

106. The angle between two vectors $\mathbf{A} = 3\mathbf{i} + 2\mathbf{j} - 6\mathbf{k}$ and $\mathbf{B} = 4\mathbf{i} - 3\mathbf{j} + \mathbf{k}$ is

(a) 0°

(b) 45°

(c) 90°

(d) 180°

107. Given, $\mathbf{R} = \sin t\mathbf{i} + \cos t\mathbf{j} + t\mathbf{k}$, $\frac{d^2\mathbf{R}}{dt^2}$ is

(a) $-\sin t\mathbf{i} - \cos t\mathbf{j}$

(b) $\sin t\mathbf{i} + \cos t\mathbf{j}$

(c) $-\sin t\mathbf{j} + \mathbf{k}$

(d) $\cos t\mathbf{j} + \mathbf{k}$

108. If A and B are two matrices (a and b are numbers), which one of the following relations is not true?

(a) $A + (B + C) = (A + B) + C$

(b) $A + B = B + A$

(c) $a(A + B) = aA + aB$

(d) $(a + b)A = aA + abA$

109. If $r = \cos \omega t\mathbf{i} + \sin \omega t\mathbf{j}$ (r is a position vector, ω is a constant), $\mathbf{v}$ is velocity, t is time, $\mathbf{a}$ is acceleration, then which one of the following relations is not correct?

(a) $\mathbf{v} = -\omega \sin \omega t\mathbf{i} + \omega \cos \omega t\mathbf{j}$

(b) $\mathbf{a} = -\omega^2 r$

(c) $r \times \mathbf{v} = \omega\mathbf{k}$

(d) All of the above

110. An electric battery is charged by supplying +250 kJ of energy and lost 25 kJ as heat. The change in internal energy of the battery is

(a) −225 kJ

(b) +225 kJ

(c) +275 kJ

(d) −275 kJ

111. $\cot(-\theta)$ is equal to

(a) $\cot(\pi - \theta)$

(b) $\sin(\theta + \pi)$

(c) $\tan(\pi - \theta)$

(d) $\cos(\pi - \theta)$

112. $X = Y^Z$ can also be expressed as

(a) $Y = \log_Z X$

(b) $Z = \log_Y X$

(c) $Y = \log_X Z$

(d) $Z = \log_X Z$

113. Which one of the following is not correct?

(a) $\int_a^b f(x)dx = -\int_b^a f(x)dx$

(b) $\int_1^e \frac{dx}{x} = 1$

(c) $\int_0^{\pi/2} \cos\theta \, d\theta = 1$

(d) $\int_0^{\pi} \sin\theta \, d\theta = -1$

114. A Bragg reflection from the (111) lattice planes of a cubic crystal was observed at a glancing angle of 11·2° (wavelength of the X-ray—154 pm). The length of the unit cell was

(a) 154 pm

(b) 354 pm

(c) 687 pm

(d) Cannot be calculated from the information provided

115. In answering a question on multiple-choice test, a student either knows the answer or guesses. p is the probability that she knows the answer, and $(1-p)$ is the probability that she guesses. If a student who guesses the answer will be correct with a probability $1/m$, when m is the number of multiple-choice alternatives, what is the conditional probability that she knew the answer to a question given that she answered it correctly?

(a) $\dfrac{mp}{1+(m-1)p}$

(b) $\dfrac{1}{1+(m-1)p}$

(c) $\dfrac{m}{1+(p-1)p}$

(d) $\dfrac{mp}{1+(m+1)p}$

116. The velocity v of a point moving along a straight line is given by

$$v^2 = a + \frac{2b}{s}$$

where a and b are constants. The acceleration is

(a) $\dfrac{b}{s}$

(b) $\dfrac{b}{s^2}$

(c) $-\dfrac{b}{s^2}$

(d) $\dfrac{1}{s}$

117. The area bounded by a parabola $y = x^2$, the x-axis, and the ordinates $x = 2$ and $x = 4$ is

(a) $\dfrac{56}{3}$

(b) $\dfrac{72}{2}$

(c) $\dfrac{72}{3}$

(d) $\dfrac{56}{2}$

118. Which one of the following statements is incorrect?

(a) Benzene is planar

(b) Benzene has six-fold symmetry

(c) All carbon atoms in the benzene ring are *sp*-hybridized

(d) All carbon-carbon bond lengths in benzene are equal

119. Which one of the following statements is not correct?

(a) An electrophile accepts a pair of electrons

(b) A nucleophile donates a pair of electrons

(c) A free radical contains an unpaired electron

(d) A nucleophile attacks the atomic nucleus

120. Deuterium is an isotope of hydrogen that contains

(a) one proton and one neutron in the nucleus

(b) one proton and two neutrons in the nucleus

(c) one proton and three neutrons in the nucleus

(d) one proton and zero neutron in the nucleus

121. Which of the following is not a state function?

(a) Internal energy

(b) Work

(c) Entropy

(d) Enthalpy

122. The pressure exerted by 1·22 gm of carbon dioxide confined to a volume of 500 ml at 37 °C is

(a) 1·39 kPa

(b) 12·3 kPa

(c) 143 kPa

(d) 225 kPa

123. If we pass a current of 10 A from a 12 V supply for 300 s, then the energy supplied as heat is

(a) 360 kJ

(b) 36 kJ

(c) 4·0 kJ

(d) 0·4 kJ

124. A reaction has a rate law of the form $k[A]^2[B]$ and the reaction rate is measured in $mol.dm^{-3}.s^{-1}$. The unit of the rate constant k is

(a) $dm^6.mol^{-2}.s^{-1}$

(b) $mol.dm^{-3}.s^{-1}$

(c) $dm^3.mol^{-2}.s^{-1}$

(d) s^{-1}

125. According to de Broglie relation, the wavelength of an electron accelerated from rest in an electric potential difference of 10^6 V is

(a) 0·12 pm

(b) 1·2 pm

(c) 12 pm

(d) 120 pm

126. Electronic configuration of an O^{-2} ion is

(a) $1s^2 2s^2 2p^6$

(b) $1s^2 2s^2 2p^4$

(c) $1s^2 2s^2 2p^8$

(d) $1s^2 2s^2 2p^4 2d^2$

127. Which one of the following molecules is chiral?

(a) CH_4

(b) CH_3OH

(c) $(CH_3)_2 \cdot CH \cdot OH$

(d) $(C_2H_5)(CH_3) \cdot CH \cdot OH$

128. According to Nernst heat theorem, entropy at 0 kelvin is

(a) ~ zero

(b) $273{\cdot}15\ K^{-1}$

(c) $-\ 273{\cdot}15\ K^{-1}$

(d) $\frac{1}{273{\cdot}15}\ K^{-1}$

129. In elastic light scattering, wavelength of the

(a) incident light and scattered light remains the same

(b) incident light is larger than that of the scattered light

(c) incident light is smaller than that of the scattered light

(d) All of the above

130. Given that the speed of the light in air ($n = 1$) is 3×10^{10} cm/sec, the speed of light in diamond ($n = 2{\cdot}42$) is

(a) $0{\cdot}124 \times 10^{10}$ cm/sec

(b) $1{\cdot}24 \times 10^{10}$ cm/sec

(c) $2{\cdot}42 \times 10^{10}$ cm/sec

(d) $12{\cdot}4 \times 10^{10}$ cm/sec

131. If the heat capacity of water is 0·5 kJ K^{-1} and temperature of water changes by 4 K, the heat transferred to the water is

(a) 2·0 kJ

(b) – 2·0 kJ

(c) 20 kJ

(d) – 0·2 kJ

132. Which one of the following is a longitudinal wave?

(a) Sound

(b) X-ray wave

(c) Visible light

(d) Infrared wave

133. Coulomb energy between two opposite charges, placed in water as compared to in vacuum, is

(a) increased

(b) reduced

(c) unaltered

(d) All of the above can happen depending upon the chemical nature of the ions

134. Oxidation numbers of chlorine atoms in $CaOCl_2$ are

(a) +1 and –1

(b) +2 and –2

(c) +1 for both

(d) +2 for both

135. Rate of forward reaction decreases, when

(a) concentration of products is increased

(b) concentration of reactants is increased

(c) concentration of products is decreased

(d) Both (b) and (c)

136. For the second order of reaction, unit of rate constant (k) is

(a) mole L^{-1} $time^{-1}$

(b) $time^{-1}$

(c) L $mole^{-1}$ $time^{-1}$

(d) L $mole^{-2}$ $time^{-1}$

137. Alkaline hydrolysis of urea with dilute NaOH gives

(a) biuret and ammonia

(b) sodium bicarbonate and ammonia

(c) nitrogen and ammonia

(d) nitrogen and sodium bicarbonate

138. The 5d orbitals are d_{xy}, d_{yz}, d_{zx}, d_{z^2} and

(a) $d_{x^2-y^2}$

(b) $d_{x^2+y^2}$

(c) $d_{x/y}$

(d) d_{xyz}

139. A C=C involves

(a) two sigma bonds

(b) one sigma and one pi bond

(c) two pi bonds

(d) one pi bond and *dp-pp* interaction

140. An S_N2 nucleophilic substitution reaction at a chiral carbon produces

(a) an inversion of configuration

(b) a racemic mixture

(c) an achiral product

(d) retention of configuration

141. Which of the following pairs is unusual?

(a) sp^3-tetrahedral

(b) *sp*-trigonal

(c) sp^3d^2-octahedral

(d) sp^2-planar

142. Which of the following isomer pairs are related by mirror symmetry?

(a) Enantiomers

(b) Diastereoisomers

(c) *Cis-trans* isomers

(d) None of the above

143. A sodium halide solution was acidified with nitric acid and a few drops of silver nitrate were added. A yellow precipitate was seen. The salt was

(a) NaCl

(b) NaBr

(c) NaF

(d) NaI

144. An acid-catalyzed conversion of an oxime to an amide is

(a) Beckmann rearrangement

(b) Birch reduction

(c) Friedel-Crafts reaction

(d) Diels-Alder reaction

145. Oxidation state of Cr in CrO_5 is

(a) +5

(b) +6

(c) +10

(d) +15

146. The following are the marks obtained in Mathematics class by the students :

15 students obtained 30 marks
20 students obtained 40 marks
15 students obtained 50 marks

What is the mean of the marks obtained by that class?

(a) 50

(b) 40

(c) 45

(d) 35

147. A bag has 5 white balls and 3 black balls. What are chances of getting two black balls, when two balls are taken out of the bag one at a time?

(a) $\frac{3}{8}$

(b) $\frac{2}{7}$

(c) $\frac{3}{28}$

(d) $\frac{8}{15}$

148. In a normal distribution curve

(a) mean > median > mode

(b) mean < median < mode

(c) mean = median = mode

(d) mean = standard deviation

149. The number of runs scored by 11 players of a cricket team are as follows :

5, 19, 42, 11, 50, 30, 21, 0, 52, 36, 27

The median of the above data is

(a) 30

(b) 27

(c) 21

(d) 52

150. How many ways can 5 students occupy 3 vacant seats?

(a) 30

(b) 40

(c) 50

(d) 60

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SPACE FOR ROUGH WORK

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