



Entrance Examinations-2015
M.Sc. (5 - Year Integrated) Sciences
(Chemistry, Mathematics, Physics, Systems Biology and Earth Sciences)
Hall Ticket Number

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Time : 2 hours

Max. Marks. 100

Instructions

1. Please enter your Hall Ticket Number on this page and on the OMR Answer Sheet without fail.
2. Please read the following instructions carefully.
 - (a) There are 100 questions in this paper. Questions 1- 25 are in Biology, 26-50 are in Chemistry, 51-75 are in Mathematics and 76 - 100 are in Physics.
 - (b) **There is a negative marking. Each correct answer carries 1 mark and each wrong answer carries -0.33 mark. Each question has only one correct option.**
 - (c) The appropriate answer(s) should be coloured with either a blue or a black ball point or a sketch pen. **DO NOT USE A PENCIL.**
 - (d) Answers are to be marked on the OMR sheet following the instructions given there.
 - (e) Hand over the OMR answer sheet at the end of the examination to the invigilator.
 - (f) No additional sheets will be provided. Rough work can be done in the question paper itself/space provided at the end of the booklet.
 - (g) Calculators and mobile phones are not allowed.
 - (h) This book contains 22 pages including this page and excluding page for the rough work, Please check that your paper has all the pages

Biology

1. Apart from ATP, what are the end products of glycolysis
 - (A) CO₂ and H₂O
 - (B) H₂O and ethyl alcohol
 - (C) NADH and pyruvate
 - (D) CO₂ and ethyl alcohol

2. The quiescent stage of cell cycle
 - (A) G₁
 - (B) G₀
 - (C) S
 - (D) G₂

3. A cell has mitochondria, ribosomes, smooth and rough ER, and other parts. Based on this information, it could not be
 - (A) A cell from a pine tree
 - (B) A grasshopper cell
 - (C) A yeast (fungus) cell
 - (D) A bacterium

4. The scientific name of pea is
 - (A) *Oryza sativa*
 - (B) *Arabidopsis thaliana*
 - (C) *Pisum sativum*
 - (D) *Mangifera indica*

5. Fusion of two nuclei is called as
 - (A) Karyogamy
 - (B) Plasmogamy
 - (C) Cleistogamy
 - (D) Polygamy

6. Nematocysts are the organs of
 - (A) Sensation
 - (B) Reproduction
 - (C) Defence and offence
 - (D) Respiration

7. In photosystem I, the reaction centre chlorophyll a has an absorption peak at
- (A) 700nm
 - (B) 680nm
 - (C) 690nm
 - (D) 710nm
8. One of the following symptoms is not due to deficiency of macro- or micro-nutrients
- (A) Chlorosis
 - (B) Apoptosis
 - (C) Necrosis
 - (D) Stunted growth
9. The most active phagocytic white blood cells are
- (A) Neutrophils and monocytes
 - (B) Neutrophils and eosinophils
 - (C) Lymphocytes and macrophages
 - (D) Eosinophils and Lymphocytes
10. Which of the following represents a test cross
- (A) $ww \times WW$
 - (B) $Ww \times WW$
 - (C) $Ww \times Ww$
 - (D) $WW \times WW$
11. You have a friend who lost 15 pounds of fat on a diet. Where did the fat go (how was it lost)?
- (A) It was converted to urine and eliminated from the body
 - (B) Chemical energy was converted to heat and then released
 - (C) It was broken down to amino acids and eliminated from the body
 - (D) It was released as CO_2 and H_2O
12. The phenomenon of diffusion of water across a semi-permeable membrane is termed as
- (A) Plasmolysis
 - (B) Osmosis
 - (C) Turgidity
 - (D) Flaccid

13. A simple goiter results from

- (A) Lack of TSH
- (B) Too much PTH
- (C) Lack of iodine
- (D) Autoimmunity

14. Cyclic AMP is best matched with

- (A) Steroid hormones
- (B) Protein hormones
- (C) Muscle cells
- (D) The male hormone, testosterone

15. One of the following does not belong to Archaeobacteria

- (A) Methanogens
- (B) Thermoacidophiles
- (C) Halophiles
- (D) Cyanobacteria

16. The proteinaceous outer covering of endosperm that separate it from embryo

- (A) Scutellum
- (B) Coleoptile
- (C) Coleorhiza
- (D) Aleurone layer

17. The first invertebrates to develop a true nervous system are

- (A) Flat worms
- (B) Sponges
- (C) Coelenterates
- (D) Annelids

18. The internal tissue organization in a transverse section of primary dicot root is as follows

- (A) Cortex, epidermis, endodermis, pericycle
- (B) Epidermis, cortex, endodermis, pericycle
- (C) Pericycle, cortex, endodermis, exodermis
- (D) Pericycle, endodermis, exodermis, cortex

19. The blood calcium level is lowered by the deficiency of
- (A) Calcitonin
 - (B) Parathormone
 - (C) Thyroxine
 - (D) Both Calcitonin and Parathormone
20. One of the following is not required during nitrogen fixation
- (A) N_2
 - (B) ATP
 - (C) O_2
 - (D) Nitrogenase
21. One of the following belong to pteridophyta
- (A) Selaginella
 - (B) Funaria
 - (C) Chlamydomonas
 - (D) Cycas
22. The method of producing thousands of plants through tissue culture is called
- (A) Micropropagation
 - (B) Macropropagation
 - (C) Totipotency
 - (D) Somatic hybridization
23. The Nobel laureate Norman E. Borlaug developed semi-dwarf
- (A) Rice
 - (B) Wheat
 - (C) Barley
 - (D) Jowar
24. The hormone which is not produced in plants
- (A) Auxins
 - (B) Cytokinins
 - (C) Oxytocin
 - (D) Abscisic acid

25. Which enzyme is used in detergent formulations to remove oily stains from the laundry

- (A) Amylases
- (B) Lipases
- (C) Hydrolases
- (D) Proteases

Chemistry

26. Strontium is a

- (A) f-block element
- (B) s-block element
- (C) d-block element
- (D) p-block element

27. The correct order of increasing atomic radius is

- (A) $\text{Li} < \text{Be} < \text{B} < \text{C}$
- (B) $\text{B} < \text{C} < \text{Li} < \text{Be}$
- (C) $\text{C} < \text{B} < \text{Be} < \text{Li}$
- (D) $\text{C} < \text{Be} < \text{B} < \text{Li}$

28. The pH of the resulting solution when 1.15 g of sodium metal is reacted slowly in 500 cm³ of water is close to

- (A) 10
- (B) 8
- (C) 12
- (D) 13

29. The concentration of a reactant X in a first order reaction decreases from 0.4 M to 0.2 M in 20 minutes. In the same reaction the time taken for the reduction of concentration of X from 0.2 M to 0.05 M would be

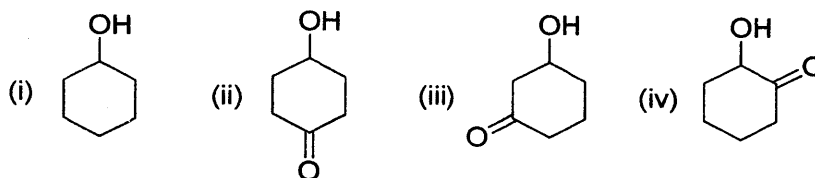
- (A) 5 minutes
- (B) 40 minutes
- (C) 80 minutes
- (D) 10 minutes

30. The mass of a photon with wavelength 1 Å is
- (A) 2.209×10^{-32} kg
 - (B) 6.626×10^{-24} kg
 - (C) 6.626×10^{-34} kg
 - (D) 2.209×10^{-42} kg
31. The solution with lowest freezing point is
- (A) 1 M aqueous solution of sucrose
 - (B) 1 M aqueous solution of common salt
 - (C) 1 M aqueous solution of calcium chloride
 - (D) 1 M aqueous solution of glucose
32. Angular momentum of electrons in the 4th orbit according to Bohr is
- (A) $h/2\pi$
 - (B) $h/8\pi$
 - (C) $8h/\pi$
 - (D) $2h/\pi$
33. The crystal in which the lattice is formed by covalent bond is
- (A) Table salt
 - (B) Ice
 - (C) Graphite
 - (D) Dry ice
34. The compound which on acid/base hydrolysis will not result in benzoic acid is
- (A) benzoyl chloride
 - (B) benzyl chloride
 - (C) phenyl cyanide
 - (D) phenyl benzoate

35. For the following reaction, under identical reaction conditions, the rate of the reaction is highest when X is

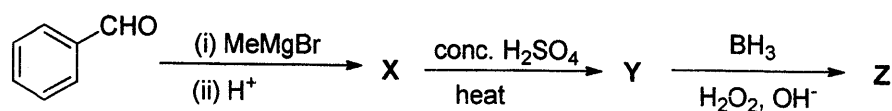


- (A) NH_2
 (B) OCH_3
 (C) Cl
 (D) $\text{O}-\text{C}(=\text{O})\text{CH}_3$
36. The polymer which shows less inter-chain interaction is
- (A) polyvinyl chloride
 (B) nylon [6,6]
 (C) nylon [6]
 (D) natural rubber
37. Arrange the following in the increasing order of basicity.
 (i) $\text{C}_2\text{H}_5\text{NH}_2$ (ii) $(\text{C}_2\text{H}_5)_2\text{NH}$ (iii) $(\text{C}_2\text{H}_5)_3\text{N}$
- (A) (i) < (ii) < (iii)
 (B) (iii) < (ii) < (i)
 (C) (i) < (iii) < (ii)
 (D) (iii) < (i) < (ii)
38. The optically active compounds among the following are



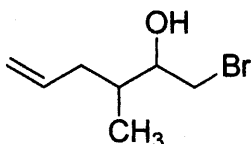
- (A) (i) and (ii)
 (B) (iii) and (iv)
 (C) (ii), (iii) and (iv)
 (D) (i), (ii), (iii) and (iv)

39. In the following reaction, the relationship between X and Z are



- (A) positional isomers
 (B) stereoisomers
 (C) metamers
 (D) functional isomers
40. Conversion of PhCOCl into PhCHO is best achieved by
 (A) CO, HCl, anhyd. AlCl₃/CuCl
 (B) Zn-Hg/HCl
 (C) H₂, Pd-BaSO₄
 (D) H₂NNH₂, KOH
41. The complex in which the metal is zero valent is
 (A) [Cu(NH₃)₄]Cl₂
 (B) [Ni(CO)₄]
 (C) K₂[Ni(CN)₄]
 (D) K₂[Fe(CN)₆]
42. Depletion of ozone layer by Chlorofluorocarbons (CFCs) is due to
 (A) physical penetration of CFCs through ozone layer
 (B) destruction of ozone molecules by fluorine radicals generated from CFCs
 (C) destruction of ozone molecules by chlorine radicals generated from CFCs
 (D) destruction of ozone molecules by chloride ions generated from CFCs
43. The volume of 0.01 M solution of AgNO₃ that is required replace the chloride present in 3 mL of 0.1 M solution of [Pt(NH₃)₅Cl]Cl₃ is close to
 (A) 9 mL
 (B) 30 mL
 (C) 90 mL
 (D) 120 mL

44. The IUPAC name of the following organic compound is



- (A) 1-bromo-2-hydroxy-3-methylhex-5-ene
(B) 1-bromo-3-methylhex-5-en-2-ol
(C) 6-bromo-4-methylhex-1-en-5-ol
(D) 6-bromo-4-methyl-5-hydroxyhex-1-ene
45. Actinides exhibit more number of oxidation states than lanthanides because
- (A) 5f, 6d and 7s orbitals are of comparable energies
(B) 5f, 6d and 7s orbitals have large difference in energies
(C) higher reactivity of actinides
(D) poor shielding of 5f orbital
46. High enthalpies of atomization of the transition metals is due to the
- (A) presence of many unpaired electrons
(B) presence of few unpaired electrons
(C) high conductivities of heat
(D) shielding of inner shell electrons
47. The silane that can give cross-linked silicone polymer on hydrolysis is
- (A) R₄Si
(B) R₃SiCl
(C) R₂SiCl₂
(D) RSiCl₃
48. Cyanide treatment is involved in the extraction of
- (A) copper
(B) nickel
(C) silver
(D) zinc

49. Water on electrolysis with certain amount of current generates 1.5 g of molecular hydrogen. The amount of molecular oxygen generated with the same amount of current will be close to
- (A) 8 g
 - (B) 12 g
 - (C) 4 g
 - (D) 24 g
50. When the concentration of any one of the reactants in an equilibrium is halved, the equilibrium constant would
- (A) be halved
 - (B) be doubled
 - (C) become one fourth of that of actual
 - (D) be the same

Mathematics

51. If $0 < \alpha < 1$ then which one of the following is true?

- (A) $\alpha^\alpha < \alpha^{\frac{1}{\alpha}} < \left(\frac{1}{\alpha}\right)^\alpha < \left(\frac{1}{\alpha}\right)^{\frac{1}{\alpha}}$.
- (B) $\alpha^\alpha < \alpha^{\frac{1}{\alpha}} < \left(\frac{1}{\alpha}\right)^{\frac{1}{\alpha}} < \left(\frac{1}{\alpha}\right)^\alpha$.
- (C) $\alpha^{\frac{1}{\alpha}} < \alpha^\alpha < \left(\frac{1}{\alpha}\right)^\alpha < \left(\frac{1}{\alpha}\right)^{\frac{1}{\alpha}}$.
- (D) $\alpha^\alpha < \left(\frac{1}{\alpha}\right)^\alpha < \alpha^{\frac{1}{\alpha}} < \left(\frac{1}{\alpha}\right)^{\frac{1}{\alpha}}$.

52. Let A, B, C be subsets of a set X and assume that $A \cap B \cap C = \phi$. Then

- (A) at least one of A, B, C is an empty set.
- (B) at least one of $A \cap B, B \cap C, C \cap A$ is an empty set.
- (C) no two of A, B, C are equal sets.
- (D) none of the above.

53. A *palindrome* is a word which reads the same forward or backward, (examples: MADAM, ANNA). The number of *palindromes* of length 15 which can be formed from an alphabet of k letters
- (A) k^7 .
 (B) k^8 .
 (C) 15^k .
 (D) $\frac{k!}{15!(k-15)!}$.
54. Urns A and B respectively contain 4 white, 6 black balls and 6 white, 4 black balls. An urn is selected and a ball is drawn at random from the selected urn. What is the probability that the ball drawn is white if the probability of selecting urn B is $1/3$?
- (A) $1/2$.
 (B) $7/15$.
 (C) $1/3$.
 (D) $2/3$.
55. The value of a for the function $f = \begin{cases} \frac{\sin(2x)}{x} + 5a & \text{if } x < 0, \\ \frac{3 \tan x}{x} + \frac{\sin^2 x}{x} & \text{if } x \geq 0. \end{cases}$ to be continuous is
- (A) $-1/3$.
 (B) 0 .
 (C) $1/2$.
 (D) $1/5$.
56. If $[x]$ is the greatest integer less than or equal to x then the value of $\lim_{x \rightarrow 0} \frac{[x + [x]]}{x}$
- (A) is 0 .
 (B) is -2 .
 (C) does not exist.
 (D) none of the above.

57. The graph of the function $y = f(x)$ is symmetrical about the line $x = a$. Then
- (A) $f(x) = f(-x)$.
- (B) $f(x + a) = f(-x - a)$.
- (C) $f(x + a) = f(a - x)$.
- (D) $f(x - a) = f(a - x)$.
58. The domain of the function $f(x) = \log \left(\frac{\sqrt{1+x} - \sqrt{1-x}}{x} \right)$ is equal to
- (A) $[-1, 0) \cup (0, 1]$.
- (B) $(-1, 0) \cup (0, 1)$.
- (C) $(0, 1)$.
- (D) $[0, 1]$.
59. Let A, B be two 3×3 matrices such that $AB = B, BA = A$ then $(A + B)^2$ is equal to
- (A) $A^2 + B^2 + 2AB$.
- (B) $A^2 + B^2$.
- (C) $A + B$.
- (D) $2A + 2B$.
60. If $\begin{vmatrix} a & 0 & a^3 - 1 \\ 1 & b & a^2 + b^2 + ab \\ 0 & 1 & a + b + c \end{vmatrix} = 0$ then
- (A) $a + b + c = 1$.
- (B) $ab + bc + ca = 1$.
- (C) $a^2 + b^2 + c^2 = 1$.
- (D) $abc = 1$.
61. The positive real number a such that the sum of the squares of the roots of the quadratic equation $x^2 - (a - 2)x - a - 1$ takes a minimum value is
- (A) -1 .
- (B) 1 .
- (C) 3 .
- (D) 10 .

62. If $[x]$ is the greatest integer less than or equal to x then for $n \in \mathbb{N}$, $\int_0^n (x - [x]) dx$ is equal to

- (A) n^2 .
- (B) $2n$.
- (C) $n/2$.
- (D) $n/4$.

63. $\int \sqrt{\left(1 - \frac{a^2}{x^2}\right)} dx$ is equal to

- (A) $\sqrt{x^2 - a^2} - a \sec^{-1} \left(\frac{x}{a}\right)$.
- (B) $\sqrt{x^2 - a^2} + a \sec^{-1} \left(\frac{x}{a}\right)$.
- (C) $\sqrt{x^2 + a^2} + a \tan^{-1} \left(\frac{x}{a}\right)$.
- (D) $\sqrt{x^2 - a^2} + a \tan^{-1} \left(\frac{x}{a}\right)$.

64. Let $C_k = \frac{n!}{k!(n-k)!}$. Then the value of $C_2 + 2C_3 + \dots + (n-1)C_n$ is equal to

- (A) $n2^{n-1} + 1$.
- (B) $n2^{n-1} - 2^n$.
- (C) $n2^n - 2^n - 1$.
- (D) $n2^{n-1} - 2^n + 1$.

65. Let $n \in \mathbb{Q}$, $x \in \mathbb{R}$. Then $\sum_{k=0}^{\infty} \frac{n(n+1)\dots(n+k)}{k!} \left(\frac{x}{1+x^2}\right)^k$ is equal to

- (A) $\left(\frac{1-x}{1+x^2}\right)^{-n}$.
- (B) $\left(\frac{1-x}{1+x^2}\right)^n$.
- (C) $\left(\frac{1-x+x^2}{1+x^2}\right)^{-n}$.
- (D) $\left(\frac{1-x+x^2}{1+x^2}\right)^n$.

66. The number of solutions of $\tan \theta + (\sqrt{3} + 1) \operatorname{cosec} 2\theta - (\sqrt{3} + 2) = 0$ in $[0, \pi]$ is
- (A) 0.
 - (B) 2.
 - (C) 4.
 - (D) infinitely many.
67. If $A + B + C = 2S$ then $\sin(S - A) + \sin(S - B) + \sin(S - C) - \sin S$ is equal to
- (A) $2 \cos(A/2) \cos(B/2) \cos(C/2)$.
 - (B) $2 \sin(A/2) \sin(B/2) \sin(C/2)$.
 - (C) $4 \cos(A/2) \cos(B/2) \cos(C/2)$.
 - (D) $4 \sin(A/2) \sin(B/2) \sin(C/2)$.
68. Let f and g be differentiable functions on $[0, 1]$ such that $f(0) = 2$, $g(0) = 0$, $f(1) = 6$ and $g(1) = 2$. Then there exists c in $[0, 1]$ such that
- (A) $f'(c) = g'(c)$.
 - (B) $f'(c) = 2g'(c)$.
 - (C) $2f'(c) = g'(c)$.
 - (D) $f'(c) = -g'(c)$.
69. If $f(x) = |x| + |x + 1| + |x - 1|$ then the value of $f'(-1/2)$ is equal to
- (A) -1.
 - (B) 0.
 - (C) 1.
 - (D) does not exist.
70. The order of the differential equation whose general solution is given by $y = c_1 \cos(2x + c_2) + (c_3 + c_4)a^{x+c_5}$ is equal to
- (A) 2.
 - (B) 3.
 - (C) 4.
 - (D) 5.
71. The number of normals to $y^2 = 4x$ from the point $(1, 0)$ is
- (A) 1.
 - (B) 2.
 - (C) 3.
 - (D) 6.

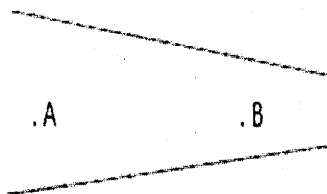
72. If $y = mx + c$ and $x \cos \alpha + y \sin \alpha = p$ represent the same straight line, then
- (A) $c^2 = p^2(1 + m^2)$.
 - (B) $c^2 = p^2(1 - m^2)$.
 - (C) $c^2 + p^2 = m^2$.
 - (D) $c^2 - p^2 = m^2$.
73. A circle touches x -axis and cuts off a chord of length 2ℓ from the y -axis. The locus of the centre of the circle is
- (A) a hyperbola.
 - (B) a straight line.
 - (C) a parabola.
 - (D) an ellipse.
74. Let \vec{a} , \vec{b} and \vec{c} be the position vectors of vertices of a triangle ABC . Then $|\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}|$ is equal to
- (A) twice area of the triangle ABC .
 - (B) area of the triangle ABC .
 - (C) 0.
 - (D) none of the above.
75. Let \vec{a} , \vec{b} and \vec{c} be nonplanar vectors and \vec{d} be a non zero vector. If $\alpha\vec{a} + \vec{b} + \vec{c} + \vec{d} = 0$ and $\vec{a} + \beta\vec{b} + \gamma\vec{c} + 2\vec{d} = 0$ then $\vec{a} + \vec{b} + \vec{c} + \vec{d}$ is equal to
- (A) \vec{a} .
 - (B) \vec{d} .
 - (C) $\vec{a}/2$.
 - (D) $\vec{d}/2$.

Physics

76. The dimension of the universal gravitational constant G is
- (A) $M^2L^{-2}T^{-1}$
 - (B) $M^2L^{-2}T^{-2}$
 - (C) $M^{-1}L^3T^{-1}$
 - (D) $M^{-1}L^3T^{-2}$

77. Which one of the following quantities does not have the unit of force per unit area?
- (A) Young's modulus of elasticity
 - (B) Stress
 - (C) Strain
 - (D) Pressure
78. A ball is thrown from a point A with a speed u at an angle θ with the horizontal. If g is the acceleration due to gravity, the total time taken for it to reach a point B on the same horizontal plane is
- (A) $2u^2 \sin\theta/g$.
 - (B) $2u \sin\theta/g$.
 - (C) $u \sin\theta/g$.
 - (D) $u \sin^2\theta/g$
79. Two soldiers of the same height each fire a bullet simultaneously, horizontally and with different speeds from the same place. Then
- (A) the bullet with slower speed falls to the ground first.
 - (B) the bullet with faster speed falls to the ground first.
 - (C) both the bullets will fall to the ground simultaneously.
 - (D) the bullets will reach the ground depending on their masses.
80. A clay ball of mass m and speed v strikes another metal ball of same mass m , which is at rest. They stick together after collision. The kinetic energy of the system after collision is
- (A) $\frac{mv^2}{2}$.
 - (B) $\frac{mv^2}{4}$.
 - (C) $2mv^2$.
 - (D) mv^2 .

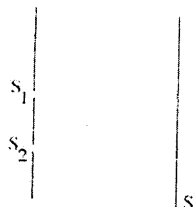
81. A nucleus moving with a velocity \vec{v} emits an α -particle. Let the velocities of the α -particle and the remaining nucleus be \vec{v}_1 and \vec{v}_2 and their masses be m_1 and m_2 .
- (A) \vec{v} , \vec{v}_1 and \vec{v}_2 must be parallel to each other.
 (B) Any two of \vec{v} , \vec{v}_1 and \vec{v}_2 should be parallel to each other.
 (C) $\vec{v}_1 + \vec{v}_2$ must be parallel to \vec{v} .
 (D) $m_1\vec{v}_1 + m_2\vec{v}_2$ must be parallel to \vec{v} .
82. The moment of inertia of a body does not depend upon
- (A) angular velocity of the body.
 (B) axis of rotation of the body.
 (C) mass of the body.
 (D) the distribution of the body.
83. A pendulum clock keeping correct time is taken to high altitudes. Which one of the following is true?
- (A) it will keep correct time.
 (B) its length should be increased to keep correct time.
 (C) its length should be decreased to keep correct time.
 (D) it can not keep correct time even if the length is changed.
84. A liquid of density 1200kg/m^3 flows steadily in a tube of varying cross-section as shown in the figure. The cross-section at point A is 1.0cm^2 and that at point B is 20mm^2 . Given that the points A and B are in the same horizontal plane and the speed of the liquid at A is 10cm/s , the difference in pressures at A and B is



- (A) 1.44 Pa
 (B) 1.56 Pa
 (C) 156 Pa
 (D) 144 Pa

85. A sound detector on a railway platform detects 12 kHz as the most dominant frequency in the whistle of a train approaching the platform at a speed of 36 km/hr. What would be the most dominant frequency of the whistle detected after the train stops on the platform? (The speed of sound in air is 340 meters/sec)
- (A) 10.7 kHz
 - (B) 11.6 kHz
 - (C) 12 kHz
 - (D) 12.6 kHz
86. Which of the following phenomena can be demonstrated by light, but not with sound waves in an air column?
- (A) Reflection
 - (B) Refraction
 - (C) Diffraction
 - (D) Polarization
87. In vacuum, all electromagnetic waves have the same
- (A) speed.
 - (B) frequency.
 - (C) phase.
 - (D) wavelength.
88. The refractive index of a prism is measured using three lines of a mercury vapour lamp. If μ_1 , μ_2 and μ_3 are the measured refractive indices for the mercury green, blue and yellow lines respectively, then
- (A) $\mu_2 > \mu_3 > \mu_1$.
 - (B) $\mu_2 > \mu_1 > \mu_3$.
 - (C) $\mu_3 > \mu_2 > \mu_1$.
 - (D) $\mu_1 > \mu_2 > \mu_3$.

89. In a Young's double slit experiment the intensity of light at each slit is I_0 . Interference pattern is observed along a direction parallel to the line $S_1 S_2$ on the screen S .



The minimum, maximum, and the intensity averaged over the entire screen respectively are

- (A) $0, 4I_0, 2I_0$.
 (B) $I_0, 2I_0, 3I_0/2$.
 (C) $0, 4I_0, I_0$.
 (D) $0, 2I_0, I_0$.
90. Two bodies A and B having equal surface areas are maintained at temperatures 10°C and 20°C . The thermal radiation emitted in a given time by A and B are in the ratio
- (A) 1 : 16
 (B) 1 : 4
 (C) 1 : 2
 (D) 1 : 1.15
91. A heated body emits radiation which has maximum intensity near the frequency ν_0 . The emissivity of the material is 0.5. If the absolute temperature of the body is doubled,
- (A) the maximum intensity of radiation will be near the frequency $2\nu_0$.
 (B) the maximum intensity of radiation will be near the frequency $\nu_0/2$.
 (C) the maximum intensity of radiation will be near the frequency ν_0 .
 (D) the total energy emitted will increase by a factor of 2.

92. A meter scale made of steel reads accurately at 20°C . In a sensitive experiment, distances accurate upto 0.055 mm in 1 meter are required. What is the range of temperature in which the experiment can be performed with this meter scale, given the coefficient of linear expansion of steel as $1.1 \times 10^{-5}/^{\circ}\text{C}$.
- (A) $20^{\circ}\text{C} - 30^{\circ}\text{C}$
(B) $10^{\circ}\text{C} - 20^{\circ}\text{C}$
(C) $25^{\circ}\text{C} - 35^{\circ}\text{C}$
(D) $15^{\circ}\text{C} - 25^{\circ}\text{C}$
93. When the amount of work done by a system is 333 Cal and change in its internal energy is 167 Cal, then the heat supplied is
- (A) 55611 Cal
(B) 500 Cal
(C) 333 Cal
(D) 166 Cal
94. The magnetic intensity H at a distance r , due to a magnetic pole of strength m is
- (A) $\frac{m}{2\pi r}$
(B) $\frac{m}{4\pi r}$
(C) $\frac{m}{4\pi r^2}$
(D) $\frac{m}{4\pi r^3}$
95. The current through one of the following components is in phase with the AC voltage:
- (A) a resistor.
(B) an inductor.
(C) a capacitor.
(D) a combination of these circuit elements.
96. As the temperature of a conductor increases, its resistivity and conductivity change. The ratio of its resistivity to conductivity
- (A) remains constant.
(B) increases.
(C) decreases.
(D) may increase or decrease depending on the actual temperature.

97. If the current through a resistor in a circuit decreases by 4%, the power dissipated by the resistor
- (A) increases approximately by 4% .
 - (B) decreases approximately by 4% .
 - (C) decreases approximately by 8%.
 - (D) decreases approximately by 16%.
98. A cylindrical copper rod has length L and resistance R . If it is melted and stretched to form another rod of length $2L$, the resistance will be
- (A) R .
 - (B) $2R$.
 - (C) $4R$.
 - (D) $8R$.
99. A diode, a resistor and a 50 Hz AC source are connected in series. The number of current pulses per second through the resistor is
- (A) 25.
 - (B) 100.
 - (C) 200.
 - (D) 50.
100. A bulb rated 60 W at 220 V is connected across a household supply of alternating voltage of 220 V. The maximum instantaneous current through the filament is
- (A) 0.39 A.
 - (B) 0.27 A.
 - (C) 0.19 A.
 - (D) 0.55 A.
