



ALL INDIA INSTITUTE OF SPEECH AND HEARING, MYSURU,
B.ASLP –Entrance Examination 2019
MATHEMATICS

Reg. No.

2	4	2	2
---	---	---	---

- Q. 1 What is the domain of the function $f(x) = -|x|$?
a) $[0, \infty)$ b) $(-\infty, 0]$ c) \mathbb{R} d) \mathbb{R}_+
- Q. 2 A group of 123 workers went to a canteen for cool drinks, ice cream and tea; 42 workers took icecream 36 tea and 30 cool drinks ; 15 workers purchased ice cream and tea; 10 ice cream and cool drinks; 4 cool drinks and tea but not ice cream; 11 took ice cream and tea but not cool drinks. Number of workers that did not purchase anything is
a) 54 b) 64 c) 56 d) 44
- Q. 3 The value of $\tan^{-1} \left[2\cos \left(2\sin^{-1} \frac{1}{2} \right) \right]$ is equal to
a) $\frac{\pi}{2}$ b) $\frac{\pi}{4}$ c) $-\frac{3\pi}{2}$ d) $\tan^{-1} \frac{65}{156}$
- Q. 4 $\cos 40^\circ + \cos 80^\circ + \cos 160^\circ + \cos 240^\circ =$
a) 0 b) 1 c) 1/2 d) -1/2
- Q. 5 If $Z_1 = 2 - i$, $Z_2 = 1 + i$, then $\left| \frac{Z_1 + Z_2 + 1}{Z_1 - Z_2 + 1} \right|$ is
a) 0 b) 1 c) $\sqrt{2}$ d) $\sqrt{3}$
- Q. 6 The number of binary operations on the set $\{a,b\}$ are
a) 2 b) 4 c) 8 d) 16
- Q. 7 If there are 12 persons in a party and if each two of them shake hands with each other, then the number of handshakes in the party is
(a) 132 (b) 72 (c) 24 (d) 66
- Q. 8 The number of arrangements that can be made with the letters of the word 'MATHEMATICS' in which all vowels come together is
a) $\frac{8! \times 4!}{2! \times 2!}$ b) $\frac{8! \times 4!}{2! \times 2! \times 2!}$ c) $\frac{8!}{2! \times 2! \times 2!}$ d) $\frac{8!}{4! \times 2! \times 2!}$
- Q. 9 The first term of an infinite G.P. is twice of the sum of all the successive terms, then common ratio is
a) 1/4 b) 1/3 c) 2/3 d) 2/5
- Q. 10 The sum of the coefficients in the expansion of $(x + y)^n$ is 4096. Then greatest coefficient in the expansion is
a) 1024 b) 924 c) 824 d) 724
- Q. 11 A straight line through the point A(3, 4) is such that intercept between the axes is bisected at A. Its equation is
a) $3x - 4y + 7 = 0$ b) $4x + 3y = 24$ c) $3x + 4y = 25$ d) $x + y = 7$
- Q. 12 The latus rectum of the hyperbola $16x^2 - 9y^2 = 144$ is
a) 16/3 b) 32/3 c) 8/3 d) 4/3
- Q. 13 If the eccentricity of the two ellipses $\frac{x^2}{169} + \frac{y^2}{25} = 1$ and $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ are equal, then the value of $\frac{a}{b}$ is
a) $\frac{5}{13}$ b) $\frac{6}{13}$ c) $\frac{13}{5}$ d) $\frac{13}{6}$
- Q. 14 If $f(1) = 1$, $f'(1) = 2$, then $\lim_{x \rightarrow 1} \frac{\sqrt{f(x)} - 1}{\sqrt{x} - 1}$ is
a) 2 b) 1 c) 1/2 d) 4

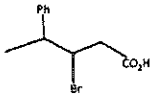
- Q. 15 The mean of 100 observations is 50 and their standard deviation is 5. The sum of all squares of all the observations is
 a) 50000 b) 250000 c) 252500 d) 255000
- Q. 16 "If x is a rational number then x^2 is not equal to 2", then the contrapositive of the above statement is
 a) If x^2 is equal to 2 then x is not a rational number b) If x is not a rational number then x^2 is equal to 2 c) If x^2 is not equal to 2 then x is a rational number d) If x is an irrational number then x^2 is equal to 2
- Q. 17 Which of the following functions from Z into Z are bijections?
 a) $f(x) = x^3$ b) $f(x) = x^2 + 1$ c) $f(x) = 2x + 1$ d) $f(x) = x + 2$
- Q. 18 Which of the following function is not one-one
 a) Signum function b) x^3 c) e^x d) $\log x$
- Q. 19 If $f(x) = x^2 + 3x + 1$ and $f(x) = 2x - 3$ then $(f \circ g)(x)$ is
 a) $4x^2 - 6x + 1$ b) $6x^2 - 4x + 1$ c) $4x^2 + 6x + 1$ d) $6x^2 + 4x - 1$
- Q. 20 If $\sin^{-1} \frac{2a}{1+a^2} + \cos^{-1} \frac{1-a^2}{1+a^2} = \tan^{-1} \frac{2x}{1-x^2}$, $a, x \in (0,1)$, Find x
 a) $\frac{2a}{1-a^2}$ b) $a/2$ c) a d) 0
- Q. 21 If $\sin^{-1}(1-x) - 2\sin^{-1}x = \frac{\pi}{2}$, then x is equal to
 a) $0, 1/2$ b) $1, 1/2$ c) 0 d) $1/2$
- Q. 22 If A is square matrix of order 3×3 and $|A| = 2$, then $|\text{adj } A| =$
 a) 2 b) 3 c) 4 d) 8
- Q. 23 If a matrix has 18 elements, then how many orders are possible?
 a) 4 b) 2 c) 8 d) 6
- Q. 24 If $A^2 - A + I = 0$, then the inverse of A is
 a) $A + I$ b) A c) $A - I$ d) $I - A$
- Q. 25 If $A = \begin{bmatrix} 3-x & y-3 \\ 0 & 2 \end{bmatrix}$ is a scalar matrix then the values of x & y are
 a) $1, 3$ b) $2, 2$ c) $3, 3$ d) $1, 1$
- Q. 26 Which of the following is not differentiable at origin
 a) $\sin x$ b) e^x c) $\tan x$ d) $|x|$
- Q. 27 If $f(x) = \frac{2-\sqrt{x+4}}{\sin 2x}$, ($x \neq 0$) is continuous function at $x=0$, then $f(0)$ is equal to
 a) $\frac{1}{4}$ b) $-\frac{1}{4}$ c) $\frac{1}{8}$ d) $-\frac{1}{8}$
- Q. 28 If $x = a \sin \theta, y = b \cos \theta$, then $\frac{d^2y}{dx^2}$ is equal to
 a) $\frac{a}{b^2} \sec^2 \theta$ b) $-\frac{b}{a} \sec^2 \theta$ c) $\frac{b}{a^2} \sec^3 \theta$ d) $-\frac{b}{a^2} \sec^3 \theta$
- Q. 29 If $x e^{xy} - y = \sin^2 x$ then $\frac{dy}{dx}$ at $x = 0$ is
 a) 0 b) 1 c) -1 d) 2
- Q. 30 The curves $y = a e^x$ and $y = b e^{-x}$ cut orthogonally, if
 a) $a = b$ b) $a = -b$ c) $ab = 1$ d) $ab = 2$

- Q. 31 The volume of a sphere is increasing at the rate of $4\pi \text{ cm}^3/\text{sec}$. The rate of increase of the radius when the volume is $288 \pi \text{ cm}^3$ is
a) $1/4$ b) $1/12$ c) $1/36$ d) $1/9$
- Q. 32 The function $f(x) = [x]$, where $[x]$ denotes the greatest integer function, is continuous at
a) 4 b) -2 c) 1 d) 1.5
- Q. 33 The integral $\int_0^{\pi/2} \frac{1}{1+\cot^3 x} dx$ is equal to
a) 0 b) 1 c) $\frac{\pi}{4}$ d) $\frac{\pi}{2}$
- Q. 34 Area of the region enclosed by $y = \cos x$ and x axis, between limits $x = 0$ & $x = \pi$ is,
a) 2 sq units b) 4 sq units c) 3 sq units d) 1 sq unit
- Q. 35 $\int_0^{\pi/4} \frac{\cos x - \sin x}{25 + 9 \sin 2x} dx$ is
a) $\frac{1}{12} \tan^{-1} \left(\frac{12 - 6\sqrt{2}}{8\sqrt{2} + 9} \right)$ b) $\frac{1}{24} \log \left(\frac{6 + \sqrt{2}}{1 + 3\sqrt{2}} \right)$ c) $\frac{1}{24} \tan^{-1} \left(\frac{12 + 6\sqrt{2}}{8\sqrt{2} - 9} \right)$ d) $\frac{1}{12} \log \left(\frac{6 - \sqrt{2}}{3\sqrt{2} - 1} \right)$
- Q. 36 $\int_{-1}^2 |x| dx$ is equal to
a) 1 b) $3/2$ c) 2 d) $5/2$
- Q. 37 Evaluate $\int \frac{x + \sin x}{1 + \cos x} dx$
a) $\log |1 + \cos x| + c$ b) $\log |x + \sin x| + c$ c) $x - \tan \frac{x}{2} + c$ d) $x \tan \frac{x}{2} + c$
- Q. 38 $\int_{a+c}^{b+c} f(x) dx$ is equal to
a) $\int_a^b f(x - c) dx$ b) $\int_a^b f(x + c) dx$ c) $\int_a^b f(x) dx$ d) $\int_{a-c}^{b-c} f(x - c) dx$
- Q. 39 $\int \log x dx$ is
a) $1/x + c$ b) $x \log x - x + c$ c) $x - \log x + c$ d) $(\log x/x) - (1/x) + c$
- Q. 40 The integrating factor of the differential equation $\frac{dy}{dx} + \frac{y}{x} = 2$ is
a) e^x b) $\frac{1}{x}$ c) $\log x$ d) x
- Q. 41 The order of differential equation of all circles of given radius a is
a) 1 b) 2 c) 3 d) 4
- Q. 42 If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, $|\vec{a}| = 3$, $|\vec{b}| = 5$ and $|\vec{c}| = 7$, then the angle between \vec{a} and \vec{b} is
a) $\frac{\pi}{2}$ b) $\frac{\pi}{4}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{3}$
- Q. 43 Number of vectors of unit length & \perp to vectors $\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}$ & $\vec{b} = \hat{j} + \hat{k}$ is
a) one b) two c) three d) infinite
- Q. 44 The area of the triangle whose sides are represented by the vectors $3\hat{i} + 4\hat{j}$ and $5\hat{i} + 7\hat{j} + \hat{k}$ is
a) $\frac{\sqrt{26}}{2}$ b) $\frac{\sqrt{30}}{2}$ c) $\frac{\sqrt{29}}{2}$ d) $\frac{\sqrt{13}}{2}$
- Q. 45 The distance between the point (3,4,5) and the point where the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ meets the plane $x+y+z=17$ is
a) 1 b) 2 c) 3 d) 5

- Q. 46 The distance of the point (1,-2,4) from the plane passing through the point (1,2,2) and perpendicular to the planes $x-y+2z=3$ and $2x-2y+z+12=0$ is
 a) $\frac{1}{\sqrt{2}}$ b) 2 c) $\sqrt{2}$ d) $2\sqrt{2}$
- Q. 47 Two dice are thrown. The probability of getting an odd number on the first and a multiple of 3 on the other is
 a) $\frac{5}{6}$ b) $\frac{2}{3}$ c) $\frac{1}{2}$ d) $\frac{1}{6}$
- Q. 48 A die is thrown 6 times. If 'getting an odd number' is a 'success', then the probability of getting at least one success is
 a) $\frac{63}{64}$ b) $\frac{1}{64}$ c) $\frac{7}{64}$ d) $\frac{2}{64}$
- Q. 49 The probabilities of selecting defective screw from three boxes A,B,C are $\frac{1}{5}, \frac{1}{6}, \frac{1}{7}$ respectively. A box is selected at random and a screw drawn from it at random is found to be defective. Then the probability that it came from box A is
 a) $\frac{42}{107}$ b) $\frac{4}{107}$ c) $\frac{2}{107}$ d) $\frac{1}{7}$
- Q. 50 For each $n \in \mathbb{N}$, $10^{2n+1}+1$ is divisible by
 a) 11 b) 13 c) 15 d) 21

CHEMISTRY

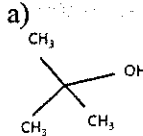
- Q. 51 In a flame test, strontium gives
 a) Blue colour b) Violet colour c) Yellow colour d) Crimson red colour
- Q. 52 Atoms with same atomic number but different atomic mass number are called
 a) Isotopes b) Isobars c) Isomers d) Isotones
- Q. 53 Which of the following is the valence electronic configuration of copper?
 a) $3d^9 4s^2$ b) $3d^8 4s^2$ c) $3p^6 3d^2 4s^2$ d) $3d^{10} 4s^1$
- Q. 54 How many unpaired electrons are there in Fe?
 a) 3 b) 4 c) 2 d) Zero
- Q. 55 Group 16 elements are called _____
 a) Halogens b) Noble gases c) Chalcogens d) Lanthanides
- Q. 56 What trend can you see in the atomic radii of elements when we go across a period from left to right?
 a) decreases b) increase c) remains same d) first increases and then decreases
- Q. 57 In the modern periodic table, the period indicates the value of _____
 a) atomic number b) atomic Mass c) principal quantum number d) azimuthal quantum number
- Q. 58 Buna-S is an example of _____?
 a) copolymer b) homopolymer c) condensation polymer d) monomer
- Q. 59 Which of the following values represent Avogadro number?
 a) 6.022×10^{23} b) 6.022×10^{13} c) 6.022×10^{-23} d) 6.023×10^{-13}
- Q. 60 Which of the following is the most symmetrical crystal system?
 a) Triclinic b) Cubic c) Tetragonal d) Monoclinic

- Q. 76 Why does NH_3 (Ammonia) form hydrogen bond but PH_3 (Phosphine) does not?
 a) because the electronegativity of Nitrogen and Hydrogen are same b) because the electronegativity of Phosphorus and Hydrogen are same c) because the electronegativity of Phosphorus is greater than Nitrogen d) because the electronegativity of Nitrogen is greater than Phosphorus
- Q. 77 The basic character of the hydrides of group 15 elements _____ down the group
 a) decreases b) increases c) remains same d) increases till Arsenic and then decreases
- Q. 78 Which of the following does not exhibit optical isomerism?
 a) $cis-[PtCl_2(en)_2]^{2+}$ b) $[Co(NH_3)_4Cl_2]^+$ c) $[Co(en)_3]^{3+}$ d) $cis-[CrCl_2(ox)_2]^{3-}$
- Q. 79 Cr^{3+} ion is octahedral field has following configuration
 a) $t_{2g}^2 e_g^1$ b) $t_{2g}^3 e_g^2$ c) $t_{2g}^3 e_g^0$ d) $t_{2g}^4 e_g^0$
- Q. 80 Which of the following is paramagnetic?
 a) O_2 b) Li_2 c) H_2 d) N_2
- Q. 81 Which one is **not** a constituent of DNA?
 a) Adenine b) Guanine c) Uracil d) Cytosine
- Q. 82 Isopropyl methyl ether when treated with cold HI gives?
 a) Isopropyl alcohol and methyl iodide b) Isopropyl iodide and methyl iodide c) Isopropyl alcohol and methyl alcohol d) Isopropyl iodide and methyl alcohol
- Q. 83 Name the reaction when sodium phenoxide is heated with carbon dioxide at 400K under 4 – 7 atm to give salicylic acid.
 a) Reimer-Tiemann reaction b) Kolbe's reaction c) Rosenmundsreary d) Hoffmann bromamide reaction
- Q. 84 Benzaldehyde and acetone can be distinguished by using _____
 a) 2, 4 – DNP b) Tollen's reagent c) Hydrazine d) Sodium hydroxide solution
- Q. 85 Write IUPAC names for the following compound $[Co(NH_3)_5Cl]Cl_2$
 a) pentammine cobalt (III) chloride b) pentammine chlorocobalt (III) chloride c) cobalt pent ammine (III) chloride d) cobalt pentammine chloro (III) chloride
- Q. 86 Bromomethane, Bromoform, Chloromethane and Dibromomethane can be arranged in the increasing order of their boiling point as
 a) Chloromethane < Bromomethane < Dibromomethane < Bromoform
 b) Bromomethane < Bromoform < Chloromethane < Dibromomethane
 c) Dibromomethane < Chloromethane < Bromomethane < Bromoform
 d) Bromoform < Bromomethane < Dibromomethane < Chloromethane
- Q. 87 Tertiary alkyl halide prefer to undergo _____ mechanism
 a) S_N2 b) E^1 c) S_N1 d) E^2
- Q. 88 Give IUPAC name for the following compound

 a) 4-phenyl-3-bromopentanoic acid b) 2-phenyl-3-bromopentanoic acid c) 3-Bromo-2-phenylpentanoic acid d) 3-Bromo-4-phenylpentanoic acid

Q. 89 An organic compound containing C, H and N gave the following analysis C= 40% H= 13.33% and N=46.67%. What would be its empirical formula?

- a) C_2H_7N b) $C_2H_7N_2$ c) CH_4N d) CH_5N

Q. 90 The treatment of CH_3MgBr with CH_3C-CH_3 , followed by the addition of water gives

- a)  b) $CH_3C(=O)CH_3$ c) $CH_3CH(OH)CH_2CH_3$ d) $CH_3CH_2CH_2CH_3$

Q. 91 Glucose and fructose are

- a) Chain Isomers b) Position Isomers c) Functional Isomers d) Optical Isomers

Q. 92 X_eOF_4 has _____ geometry

- a) pyramidal b) distorted octahedral c) tetrahedral d) square pyramidal

Q. 93 Which of the following elements is not actually a transition element but is placed with them?

- a) Zn b) Ti c) Ni d) Zr

Q. 94 $[Co(NH_3)_5SO_4]Br$ and $[Co(NH_3)_5Br]SO_4$ are examples of _____ isomers.

- a) linkage b) ionisation c) coordination d) solvate

Q. 95 Which is the major product formed when propene reacts with HCl in presence of peroxide?

- a) Propane b) 2-chloropropane c) 1,2-dichloropropane d) 1-chloropropane

Q. 96

Which of the following reactants would you prefer for producing $CH_3-C(OC_2H_5)_2-CH_3$

- a) $C_2H_5ONa + (H_3C)_3CCl$ b) $C_2H_5Cl + (CH_3)_3CONa$ c) $C_2H_5CO_2H + (CH_3)_3CONa$ d) $C_2H_5ONa + (CH_3)_3CHO$

Q. 97 Ozone has _____

- a) Two pi-bonds and two σ -bonds b) Two σ -bonds and one pi-bond c) Two pi-bonds and one σ -bond d) Three σ -bonds only

Q. 98 For the reaction

$2 Cl(g) \longrightarrow Cl_2(g)$, what are the signs of ΔH and ΔS , respectively?

- a) positive & positive b) positive & negative c) negative & positive d) negative & negative

Q. 99 Surface tension vanishes at _____

- a) melting point b) critical temperature c) condensation point d) triple point

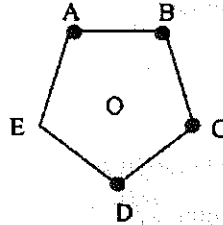
Q. 100 Which of the following compound can form zwitterion?

- a) Amino acid b) Aniline c) Benzoic acid d) Acetanilide

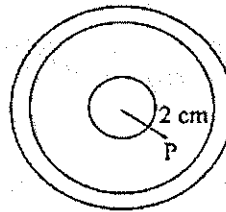
PHYSICS

- Q. 101 The SI unit of permittivity of free space (ϵ_0) is,
 a) C^2Nm^{-2} b) $C^2N^{-1}m^{-2}$ c) $C^{-2}Nm^2$ d) $C^2N^{-1}m^{-2}$

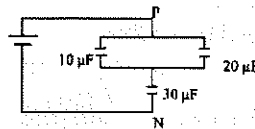
- Q. 102 Four particles each having a charge q , are placed on the four vertices of a regular pentagon. The distance of each corner from the centre is a . Find the electric field at the centre of the pentagon.



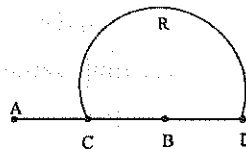
- a) $\frac{q}{4\pi\epsilon_0 a^2}$ along OE b) $\frac{q}{2\pi\epsilon_0 a^2}$ along OE c) $\frac{3q}{4\pi\epsilon_0 a^2}$ along OE d) $\frac{q}{\pi\epsilon_0 a^2}$ along OE
- Q. 103 A charge of $4 \times 10^{-8} C$ is distributed uniformly on the surface of a sphere of radius 1 cm. It is covered by a concentric hollow conducting sphere of radius 5 cm and a total charge of $6 \times 10^{-8} C$. Find the electric field at the point P. (Which is 2 cm away from the centre)



- a) $9 \times 10^9 N/C$ b) $9 \times 10^4 N/C$ c) $9 \times 10^5 N/C$ d) $9 \times 10^6 N/C$
- Q. 104 Find the equivalent capacitance between the points P and N



- a) $50 \mu F$ b) $\frac{110}{3} \mu F$ c) $\frac{60}{11} \mu F$ d) $15 \mu F$
- Q. 105 Charges $+q$ and $-q$ are placed at points A and B respectively which are at a distance of $2L$ apart, C is the midpoint of AB. The work done in moving a charge $+Q$ along a semicircle CRD is,

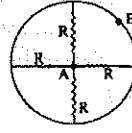


- a) $\frac{-qQ}{6\pi\epsilon_0 L}$ b) $\frac{qQ}{6\pi\epsilon_0 L}$ c) $\frac{qQ}{2\pi\epsilon_0 L}$ d) $\frac{-qQ}{2\pi\epsilon_0 L}$
- Q. 106 The energy density in the electric field created by a point charge falls off with the distance from the charge as,

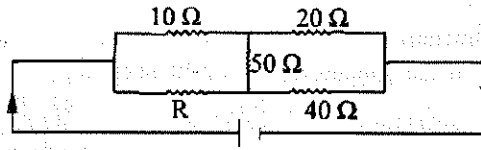
- a) $\frac{1}{r}$ b) $\frac{1}{r^2}$ c) $\frac{1}{r^4}$ d) $\frac{1}{r^3}$

- Q. 107 Potentiometer is better than voltmeter in measuring emf of a cell because,
 a) dial of the voltmeter is smaller than potentiometer
 b) potentiometer does not draw any current from the source
 c) resistance of potentiometer wire is high
 d) this is an economical method

- Q. 108 What is the equivalent resistance between A and B?

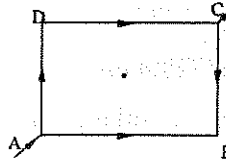


- a) $\frac{R}{2}$ b) $4R$ c) $2R$ d) $\frac{R}{4}$
- Q. 109 Find the value of R in figure below so that there is no current in the $50\ \Omega$ resistor



- a) $20\ \Omega$ b) $10\ \Omega$ c) $40\ \Omega$ d) $80\ \Omega$
- Q.110 The power of two electric bulbs are 100 W and 200 W. Both of them are joined with 220 V mains. The ratio of the resistance of the filaments would be,
 a) 1:4 b) 1:2 c) 2:1 d) 4:1
- Q. 111 An ammeter consists of a $480\ \Omega$ coil connected in parallel to a $20\ \Omega$ shunt. This ammeter is used to measure the current through a circuit consisting of a resistor of $140.8\ \Omega$ connected to a source of 20 V. What would be the reading of the ammeter?
 a) 0.04 A b) 0.125 A c) 0.4 A d) 0.0125 A

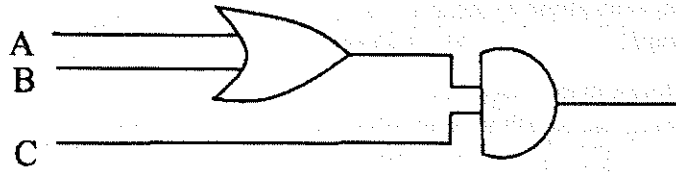
- Q. 112 In the figure given below, a current of 1A flows in at A. ABCD is a square loop made of uniform wire of side 20 cm. Find the magnetic field at the centre of the square loop.



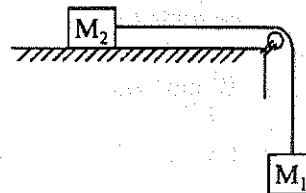
- a) $1.1 \times 10^{-7}\ \text{T}$ b) $2.2 \times 10^{-7}\ \text{T}$ c) $1.25 \times 10^{-7}\ \text{T}$ d) zero
- Q. 113 A charged particle of charge $6\ \mu\text{C}$ is moving with a speed of 20 m/s along a magnetic field line of 2 T. The magnetic force on the particle is,
 a) Zero b) $2.4 \times 10^{-4}\ \text{N}$ c) $1.2 \times 10^{-4}\ \text{N}$ d) $1.8 \times 10^{-4}\ \text{N}$
- Q. 114 A conducting circular loop is placed in a uniform magnetic field $B = 0.01\ \text{T}$ with its plane perpendicular to the field. Somehow, the radius of the loop starts shrinking at a constant rate of $10^{-4}\ \text{m/s}$. Find the induced emf in the loop at an instant when the radius is 2 cm.
 a) $0.25\ \mu\text{V}$ b) $0.025\ \mu\text{V}$ c) $0.0126\ \mu\text{V}$ d) $0.126\ \mu\text{V}$
- Q. 115 An alternating voltage $200 \sin(100t)$ is applied to a series combination of a resistance of $30\ \Omega$ and an inductor of 400 mH. The power factor of the circuit is,
 a) 0.06 b) 0.2 c) 0.6 d) 0.02

- Q. 116 An LCR series circuit with $L = 100 \text{ mH}$, $C = 100 \text{ } \mu\text{F}$ and $R = 120 \text{ } \Omega$ is connected to an ac source of emf of $30 \sin(100t)$. Find the resonant frequency of the circuit (approximately).
 a) 5 Hz b) 50 Hz c) 25 Hz d) 12.5 Hz
- Q. 117 Dimensions of $\frac{1}{(\mu_0 \epsilon_0)}$ is
 a) $[\text{M}^0 \text{L}^{-2} \text{T}^{+2}]$ b) $[\text{M}^0 \text{L}^{-2} \text{T}^{-2}]$ c) $[\text{M}^0 \text{L} \text{T}^2]$ d) $[\text{M}^0 \text{L}^2 \text{T}^{-2}]$
- Q. 118 A star emits yellow light. If it starts accelerating towards earth, what change in colour of the emitted light would be observed by a person on the earth?
 a) it gradually turns blue b) it gradually turns red c) it suddenly turns blue d) it suddenly turns red
- Q. 119 A small bulb is placed at the bottom of a tank containing water (refractive index = 1.33) to a depth of 50 cm. What is the area of the surface of water through which light from the bulb can emerge out?
 a) 0.6 m^2 b) 0.06 m^2 c) 1.02 m^2 d) 0.102 m^2
- Q. 120 A nearsighted man can clearly see objects up to a distance of 1.3333 m. What should be the power of the lens of the spectacles which he should use?
 a) 0.3333 D b) -0.75 D c) 0.75 D d) -0.3333 D
- Q. 121 A light of intensity I_0 falls on a polaroid P_1 . The transmitted light is passed through another polaroid P_2 . The pass axis of P_1 and P_2 make an angle of $\frac{\pi}{4}$. The transmitted light intensity is,
 a) $\frac{I_0}{2}$ b) $\frac{I_0}{\sqrt{2}}$ c) $\frac{\sqrt{3}}{2} I_0$ d) $\frac{3I_0}{4}$
- Q. 122 Planck constant has the same dimension as,
 a) force \times time b) force \times distance c) force \times speed d) force \times distance \times time
- Q. 123 A beam of 450 nm light is incident on a metal having a work function of 2.0 eV and placed in a magnetic field B . The most energetic electrons emitted perpendicular to the field are bent in circular arcs of radius 20cm. What is the value of B ?
 a) $1.46 \times 10^{-4} \text{ T}$ b) $2.92 \times 10^{-5} \text{ T}$ c) $1.46 \times 10^{-5} \text{ T}$ d) $2.92 \times 10^{-4} \text{ T}$
- Q. 124 What is the approximate wavelength of the radiation required to excite the electron in Li^{++} from the first to the third Bohr orbit?
 a) 114 nm b) 11.4 nm c) 228 nm d) 22.8 nm
- Q. 125 As we consider orbits with higher values of n in a hydrogen atom, the electric potential energy of the atom
 a) decreases b) increases c) remains the same d) cannot increase
- Q. 126 The mass number of a nucleus is
 a) more than the atomic number b) equal to the atomic number c) more than or equal to the atomic number d) less than the atomic number
- Q. 127 A radioactive sample has 8.0×10^{24} active nuclei at a certain instant. How many of these nuclei will still be in the same active state after four half lives?
 a) 2×10^{23} b) 5×10^{24} c) 5×10^{23} d) 2×10^{24}

- Q. 128 To get an output 1 from the circuit shown below, the input must be,

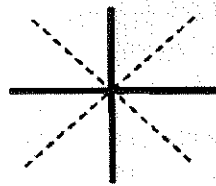


- a) $A = 1, B = 0, C = 1$ b) $A = 0, B = 1, C = 0$ c) $A = 1, B = 0, C = 0$ d) $A = 1, B = 1, C = 0$
- Q. 129 For a transistor in common emitter configuration, the current amplification factor is 4. If the change in base current is 6 mA, what is the change in the collector current?
a) 2.4 mA b) 3.6 mA c) 36 mA d) 24 mA
- Q. 130 A message signal of frequency 10 kHz and peak voltage of 10 V is used to modulate a carrier of frequency 1 MHz and peak voltage of 20 V, what would be the modulation index?
a) 0.05 b) 0.2 c) 0.02 d) 0.5
- Q. 131 Find the relative error in Z , if $Z = \frac{A^2 B^{1/4}}{C^3 D^{2/3}}$ and $A, B, C,$ and D each have a relative error of 0.1
a) 0.592 b) 0.0592 c) 0.296 d) 0.0296
- Q. 132 A ball is thrown from a field with a speed of 12.0 m/s at an angle of 45° with the horizontal. At what distance will it hit the field again? (Take $g = 10.0 \text{ m/s}^2$)
a) 7.2 m b) 144 m c) 14.4 m d) 72 m
- Q. 133 The value of the distance travelled by a particle in time t is given by $s = 2.5 t^2$. What is the average speed of the particle during the time 0 to 5 seconds?
a) 1.25 m/s b) 12.5 m/s c) 25 m/s d) 2.5 m/s
- Q. 134 Two bodies are dropped from different heights h_1 and h_2 . The ratio of time taken by them to reach ground will be
a) $h_1 : h_2$ b) $\frac{1}{\sqrt{h_1}} : \frac{1}{\sqrt{h_2}}$ c) $h_1^2 : h_2^2$ d) $\sqrt{h_1} : \sqrt{h_2}$
- Q. 135 In the diagram given below, $M_1 = 5 \text{ kg}$ and $M_2 = 2 \text{ kg}$. What would be the acceleration of the system? (Neglect friction) (Take $g = 10 \text{ m/s}^2$)



- a) $\frac{50}{7} \text{ ms}^{-2}$ b) $\frac{20}{7} \text{ ms}^{-2}$ c) $\frac{70}{5} \text{ ms}^{-2}$ d) $\frac{70}{2} \text{ ms}^{-2}$
- Q. 136 The force on a particle of mass 10 g is $(10\hat{i} + 5\hat{j}) \text{ N}$. If it starts from rest what would be its position at time $t = 5 \text{ s}$?
a) $(12.5\hat{i} + 62.5\hat{j}) \text{ m}$ b) $(12.5\hat{i} + 625\hat{j}) \text{ m}$ c) $(12500\hat{i} + 6250\hat{j}) \text{ m}$ d) $(125000\hat{i} + 62500\hat{j}) \text{ m}$
- Q. 137 A pendulum of time period T is kept suspended in a train accelerating uniformly. The time period would
a) increase b) decrease c) remain the same d) not be predicted as data is insufficient

- Q. 138 A body of mass 'm' is dropped from a height H reaches the ground with a speed of $1.2\sqrt{gH}$. What is the work done by air friction?
 a) $-0.28 mgH$ b) $0.28 mgH$ c) $-0.72 mgH$ d) $0.72 mgH$
- Q. 139 The two blocks in an Atwoods machine have masses 2.0 kg and 3.0 kg. Find the work done by gravity during the fourth second after the system is released from rest (take $g = 10 \text{ m/s}^2$)
 a) 90 J b) 350 J c) 35 J d) 70 J
- Q. 140 The work done on an object is equal to the change in
 a) speed b) acceleration c) kinetic energy d) momentum
- Q. 141 The density of a linear rod PQ of length 1 m varies as $P = 1.0 + 0.5x$ where x is the distance from the end P. What would be the distance of the centre of mass from the end P?
 a) 0.467 m b) 0.533 m c) 0.333 m d) 0.667 m
- Q. 142 Two uniform identical rods of each of mass (M) and length (l) are joined to form a cross as shown below. Find the moment of inertia of the cross about a bisector as shown dotted in the figure given below.



- a) $\frac{Ml^2}{6}$ b) $\frac{Ml^2}{4}$ c) $\frac{Ml^2}{8}$ d) $\frac{Ml^2}{12}$
- Q. 143 The gravitational field due to a mass distribution is given by $E = \frac{10.0}{x^{3/2}}$ units in the X-direction. Taking the gravitational potential to be zero at infinity, find its value at $x = 0.5$ units
 a) 84.8 units b) 8.48 units c) 848 units d) 0.848 units
- Q. 144 Two wires A and B are of the same material. Their length is in the ratio 1:2 and diameter is in the ratio 2:1. When stretched by forces F_A and F_B respectively, the wires A and B get equal elongations. The ratio of F_A to F_B is,
 a) 1:4 b) 4:1 c) 8:1 d) 1:8
- Q. 145 The cross sectional area A_0 of the aorta (a major blood vessel) of a normal resting person is 3 cm^2 and the speed V_0 of the blood through it is 30 cm/s. A typical capillary (diameter $\approx 6 \mu\text{m}$) has a cross sectional area A of $3 \times 10^{-7} \text{ cm}^2$ and a flow speed V of 0.05 cm/s. How many capillaries does such a person have?
 a) 6×10^8 b) 6×10^9 c) 3×10^9 d) 3×10^8
- Q. 146 A pendulum clock having a copper rod keeps correct time at 20°C . It gains 15 seconds per day if cooled to 0°C . The variation in time is given by $T = T_0(1 + \frac{1}{2}\alpha\theta)$ where T_0 = time period at 0°C , α = coefficient linear expansion of copper, and θ = change in temperature. What would be the coefficient of linear expansion of copper?
 a) $1.7 \times 10^{-5} \text{ }^\circ\text{C}^{-1}$ b) $1.7 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$ c) $1.7 \times 10^{-3} \text{ }^\circ\text{C}^{-1}$ d) $1.7 \times 10^{-4} \text{ }^\circ\text{C}^{-1}$
- Q. 147 A steam engine intakes 100g of steam at 100°C per minute and cools it down to 20° . What would be the heat rejected by the steam engine per minute? Latent heat of vaporization of steam is 540 cal/g.
 a) $0.8 \times 10^4 \text{ cal}$ b) $5.4 \times 10^4 \text{ cal}$ c) $4.6 \times 10^4 \text{ cal}$ d) $6.2 \times 10^4 \text{ cal}$

- Q. 148 The acceleration (a) and the displacement (x) of a particle executing a simple harmonic motion are related as, (ω^2 is a constant)
- a) $a = -\omega x$ b) $a = +\omega^2 x$ c) $a = -\omega^2 x$ d) $a = +\omega x$
- Q. 149 A uniform meter stick is suspended through a small pinhole at the 10 cm mark. The time period of small oscillation about the point of suspension would be, (take $g = 10 \text{ m/s}^2$)
- a) 1.55 s b) 1.62 s c) 1.43 s d) 1.71 s
- Q. 150 A guitar string is 90 cm long and has a fundamental frequency of 124 Hz. Where should it be pressed to produce a fundamental frequency of 186 Hz?
- a) 50 cm from an end b) 60 cm from an end c) 45 cm from an end d) 35 cm from an end