JEE MAIN MODEL TEST-3

PHYSICS

1. In a certain system of units, 1 unit of time is 5 sec, 1 unit of mass is 20 kg and unit of length is 10 m. In this system, one unit of power will correspond to

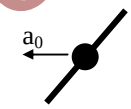
1) 16 watts 2) 1/16 watts 3) 25 watts 4) None of these

2. In a projectile motion, the acceleration of the projectile is

1) Increasing continuously 2) First increasing and then decreasing

3) First decreasing and then increasing 4) Remaining constant

3. A bead of mass m is fitted on a rod and can move on it without friction. Initially the bead is at the middle of the rod and the rod moves translationally in a horizontal plane with an acceleration a_0 in a direction forming angle α with the rod. The acceleration of bead with respect to rod is



1) $g \sin \alpha$ 2) $(g + a_0)\sin \alpha$ 3) $g \sin \alpha + a_0 \cos \alpha$ 4) $g \sin \alpha - a_0 \cos \alpha$

4. The horsepower of a pump of efficiency 80%, which sucks up water from 10 m below ground and ejects it through a pipe opening at ground level of area 2 cm^2 with a velocity of 10 m/s, is about

1) 1.0 hp 2) 0.5 hp 3) 0.75 hp 4) 4.5 hp

5. A merry go-round in a park consists of an uniform 200 kg solid disk rotating about a vertical axis. The radius of the disk is 6.0 m, and a 100-kg man is standing on its outer edge when it is rotating at a speed of 0.20 rev/s. How fast will the disk be rotating if the man walks 3.0 m in toward the centre along a radius?

1) 0.32 rev/s 2) 1.2 rev/s 3) 2.8 rev/s 4) 3.6 rev/s

6. A uniform rod of mass m and length l is rotating with constant angular velocity ω about an axis which passes through its one end and perpendicular to the length of rod. The area of cross section of the rod is A and its Young's modulus is Y. Neglect gravity. The strain at the mid point of the rod is

1) $\frac{m\omega^2 l}{8AY}$ 2) $\frac{3m\omega^2 l}{8AY}$ 3) $\frac{3m\omega^2 l}{4AY}$ 4) $\frac{m\omega^2 l}{4AY}$

7. The speed of Earth's rotation about its axis is ω. Its angular speed increases to x times to make the effective value of acceleration due to gravity zero at the equator. Then the value of x is (approximately) [g = 10 m/s^2]

1) 1 2) 8.5 3) 17 4) 34

8. A composite string is made up by joining two strings of different masses per unit length, μ and 4μ. The composite string is under the same tension. A transverse wave pulse, Y = (6 mm)sin (5t + 40x), where t is in seconds and x is in meters, is sent along the lighter string towards the joint. The joint is at x = 0. The equation of the wave pulse reflected from the joint is

1) (2 mm) sin (5t – 40x) 2) (4 mm) sin (40x – 5t)

3) –(2 mm) sin (5t – 40x) 4) (2 mm) sin (5t – 10x)

9. The resultant of two rectangular single harmonic motion of the same frequency and unequal amplitude but differing in phase by π/2 is

1) Simple harmonic 2) Circular 3) Elliptical 4) Parabolic

10. The height of the real image formed by a concave mirror is four times larger than the object height when the object is 30 cm in front of the mirror. The radius of curvature of the mirror is

1) 80 cm 2) 60 cm 3) 48 cm 4) 20 cm

11. A conducting liquid drop has charge uniformly distributed over the surface. Electrostatic energy of drop E_0. Now this drop is broken in 8 small liquid drops such that mass and charge get equally distributed. What is the change in electrostatic energy of the system is the process. Assume drops to be widely separated after break up i.e. interaction between the drops is not to be considered.

1) 0 2) $-\frac{3E_0}{4}$ 3) $\frac{E_0}{2}$ 4) $\frac{3E_0}{4}$

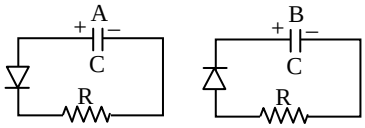
12. In BJT, maximum current flows in which of the following?

1) Emitter region 2) Base region 3) Collector region 4) Equal in all the regions

13. Power generated across a uniform wire connected across a supply is H. If the wire is cut into n equal parts and all the parts are connected in parallel across the same supply, the total power generated in the wire is

1) H/n^2 2) n^2 H 3) nH 4) H/n

14. Two identical capacitors A and B are charged to the same potential V and are connected in two circuits at t = 0 as shown in the figure. The charges on the capacitors at time t = RC are respectively

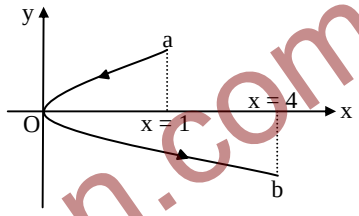


1) VC, VC 2) VC/e, VC 3) VC, VC/e 4) VC/e, VC/e

15. The electric potential due to a dipole, at a point p at an angle θ from the axis of dipole at a distance r is

1) $k(\vec{p}.\vec{r}/r^3)$ 2) $k(\vec{p}.\vec{r}/r^2)$ 3) $k(\vec{p}\times\vec{r}/r^3)$ 4) $k(\vec{p}\times\vec{r}/r^2)$

16. A conducting wire bent in the form of a parabola $y^2 = x$ carrying a current i = 1 A as shown in the figure. This wire is placed in a magnetic field $\vec{B}=-2\hat{k}$ tesla. The unit vector in the direction of force is



1) $\frac{3\hat{i}+4\hat{j}}{5}$ 2) $\frac{\hat{i}+\hat{j}}{\sqrt{2}}$ 3) $\frac{\hat{i}+2\hat{j}}{\sqrt{5}}$ 4) None

17. Fast neutrons can easily be slowed down by

1) The use of lead shielding 2) Passing them through heavy water

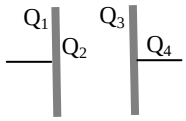
3) Elastic collisions with heavy nuclei 4) Applying a strong electric field

18. A logic gate is an electronic circuit which

1) Makes logic decisions 2) Allows electron flow only in one direction

3) Allows hole flow only in one direction 4) Alternates between 0 and 1 value

19. In an isolated parallel plate capacitor of capacitance C, the four surface have charges Q_1, Q_2, Q_3 and Q_4 as shown. The potential difference between the plates is



1) $\frac{Q_1+Q_2+Q_3+Q_4}{2C}$ 2) $\frac{Q_2+Q_3}{2C}$ 3) $\frac{Q_2-Q_3}{2C}$ 4) $\frac{Q_1+Q_4}{2C}$

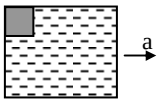
20. In a YDSE, λ = 6000 Å. If a thin film of refractive index μ = 1.5 is introduced in front of the lower slit, then the 3rd maxima is formed at the initial position of central maxima. Calculate the thickness t of the film

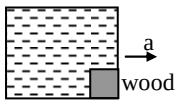
1) 3.6 μm 2) 3.6 mm 3) 1.8 μm 4) 1.8 mm

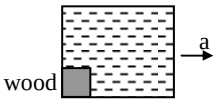
21. A gas is heated at a constant pressure. If the ratio of total heat supplied to change in internal energy is 7/5, then the degrees of freedom of the gas are

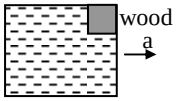
1) 3 2) 5 3) 6 4) 7

22. A beaker closed from above and filled with water is moving with horizontal acceleration 'a'. A piece of wood is also kept in water. Which of the following represent the actual situation?

1) 

2) 

3) 

4) 

23. A rectangular loop carrying current is placed near a long straight fixed wire carrying strong current such that long sides are parallel to wire. If the current in the nearer long side of loop is parallel to current in the wire. Then the loop

1) Experiences no force
2) Experiences a force towards wire
3) Experiences a force away from wire
4) Experiences a torque but no force

24. Let r be the distance of a point on the axis of a bar magnet from its centre. The magnetic field at such a point is proportional to

1) $1/r$
2) $1/r^2$
3) $1/r^3$
4) None of these

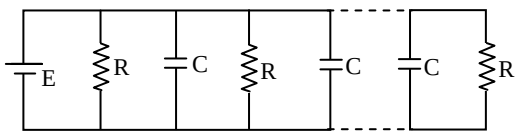
25. Consider (I) the law of reflection and (II) the law of refraction. Huygen's Principle can be used to derive.

1) I only
2) Both (I) and (II)
3) Neither (I) nor (II)
4) Question is irrevalent because Huygen's Principle is for wave fronts while (I) and (II) are concerned with rays

26. A uniform conductor of resistance R is cut into 20 equal pieces. Half of them are joined in series and the remaining half of them are connected in parallel. If the two combinations are joined in series, the effective resistance of all the pieces is

1) R
2) R/2
3) 101R/200
4) 201R/200

27. n resistances each of resistance R are joined with capacitors of capacity C (each) and a battery of emf E as shown in the figure. In steady state condition ratio of charge stored in the first and last capacitor is



1) n : 1
2) (n – 1) : R
3) $(n^2 + 1) : (n^2 - 1)$
4) 1 : 1

28. Modulation is the process of

1) Generating constant frequency radio waves

2) Combining radio and audio frequency waves at the transmission end

3) Reducing distortion in QF amplifier

4) Improving thermal stability of transmitter

29. A spring-mass system oscillates in a car. If the car accelerates on a horizontal road, the frequency of oscillation will

1) Increase 2) Decrease 3) Remain same 4) Become zero

30. Mark the correct option

1) To convert a galvanometer into an ammeter a large resistance has to be connected in series with galvanometer coil

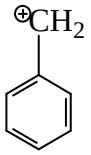
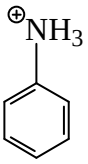
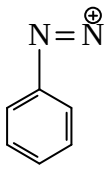
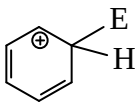
2) To convert a galvanometer into an ammeter a small resistance has to be connected in parallel with galvanometer coil

3) To convert a galvanometer into a voltmeter a small resistance has to be connected in series with galvanometer coil

4) All of these

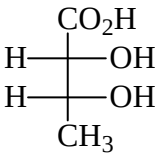
CHEMISTRY

31. Which of the following has localized positive charge?

1) 
2) 
3) 
4) 

32. An organic compound [X] of the formula C_7H_8O is soluble in NaOH but not in $NaHCO_3$. It gives colour with alcoholic $FeCl_3$. On treatment with bromine water it gives a tribormo product. The compound (A) is

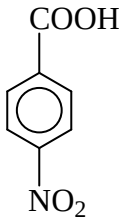
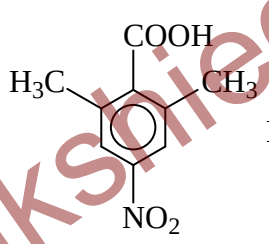
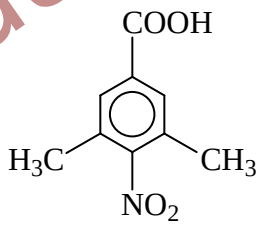
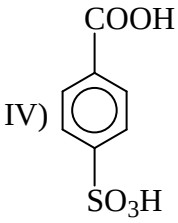
1) o-cresol 2) m-cresol 3) p-cresol 4) Either of the three

33. The incorrect statement about 

1) It is erythro diastereomer 2) It has 2R, 3R configuration

3) It is meso form 4) A and B

34. The correct order of decreasing acid strength is

I) 
II) 
III) 
IV) 

1) IV > I > II > III 2) II > IV > III > I 3) I > IV > II > III 4) IV > II > I > III

35. The relative nucleophilicity of H_3N, H_2O and HF towards bromoethane is

1) $H_3N < H_2O < HF$ 2) $H_3N > H_2O > HF$ 3) $H_3N > H_2O < HF$ 4) $H_3N < H_2O > HF$

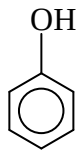
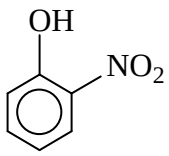
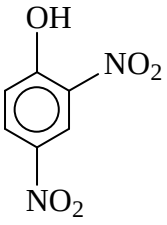
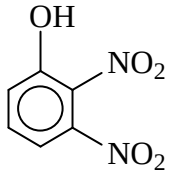
36. In the following compounds

I) Phenol II) 4-methyl phenol III) 3-nitrophenol IV) 4-nitrophenol

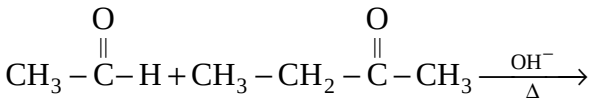
The order of acidity is

1) III > IV > I > II 2) I > IV > III > II 3) II > I > III > IV 4) IV > III > I > II

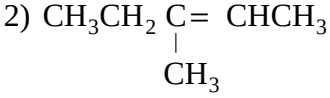
37. Which of the following can dissolve in aq.$NaHCO_3$?

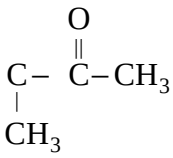
1) 
2) 
3) 
4) 

38. What is the final product of the following crossed aldol condensation?



1) 

2) 

3) 

4) $CH_3CH = CHCH = CHCH_3$

39. The weakest acid among the following is

1) CH_3COOH 2) CH_3CH_2COOH 3) $(CH_3)_2CHCOOH$ 4) $(CH_3)_3CCOOH$

40. In fuel cells, … is converted into electrical energy

1) Neutralisation energy 2) Combustion energy

3) Kinetic energy 4) Potential energy

41. Which of the following compounds exhibits stereoisomerism?

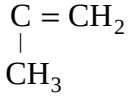
1) 2-methylbutene-1 2) 3-methylbutene-1

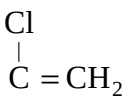
3) 3-methylbutanoic acid 4) 2-methylbutanoic acid

42. Buna-N synthetic rubber is a copolymer of

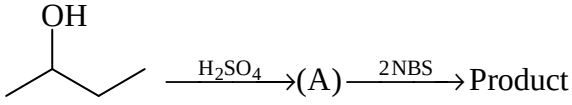
1) $H_2C = CH - CH = CH_2$ and $H_5C_6 - CH = CH_2$

2) $H_2C = CH - CN$ and $H_2C = CH - CH = CH_2$

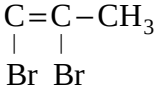
3) $H_2C = CH - CN$ and 

4)  and $H_2C = CH - CH = CH_2$

43. What is the end product of the following sequence of reaction?



1) $Br - CH_2 - CH = CH - CH_2 - Br$ 2) $CH_3 - CH = CH - CH_3$

3)  4) None of these

44. The conductivity of 0.001028 mol L^{-1} acetic acid is 4.95×10^{-5} S cm^{-1}. Its dissociation constant is …. If $\wedge_m^o$ for acetic acid is 390.5 S dm^2 mol^{-1}.

1) 48.15×10^{-3} mol L^{-1} 2) 2.75×10^{-5} mol L^{-1}

3) 1.78×10^{-5} mol L^{-1} 4) 3.2×10^{-3} mol L^{-1}

45. Solubility of AgCl in water, 0.01 M $CaCl_2$, 0.01 M NaCl and 0.05 M $AgNO_3$ are S_1, S_2, S_3 and S_4 respectively then

1) $S_1 > S_2 > S_3 > S_4$ 2) $S_1 > S_3 > S_2 > S_4$ 3) $S_1 > S_2 = S_3 > S_4$ 4) $S_1 > S_3 > S_4 < S_2$

46. A metal crystallizes in two cubic phases, fcc and bcc whose unit cell lengths are 3.5 Å and 3.0 Å respectively. The ratio of density of fcc and bcc is

1) 2 2) 1.26 3) 3.34 4) 1.8

47. When a sample of baking soda is strongly ignited in a crucible, it suffered a loss in weight of 3.1 g. The mass of baking soda is

1) 16.8 g 2) 8.4 g 3) 11.6 g 4) 4.2 g

48. The elements X and Y form two different binary compounds XY_2 and XY_4. When dissolved in 20 g of CS_2 solvent, 1 g of XY_2 lowers the freezing point by 2.5°C, whereas 1 g of XY_4 lowers the freezing point by 1.5°C. The molal depression constant for CS_2 is 5. The atomic mass of element Y will be

1) 42.64 2) 64.42 3) 33.34 4) 12.8

49. The poles of $1/X_A$ vs. $1/Y_A$ (where X_A and Y_A are the mole fraction of liquid A in liquid and vapour phase respectively) is linear with slope and intercepts respectively

1) P_A^0 / P_B^0 and $\frac{(P_A^0 - P_B^0)}{P_B^0}$ 2) P_A^0 / P_B^0 and $\frac{(P_B^0 - P_A^0)}{P_B^0}$

3) P_B^0 / P_A^0 and $\frac{(P_A^0 - P_B^0)}{P_B^0}$ 4) P_B^0 / P_A^0 and $\frac{(P_B^0 - P_A^0)}{P_B^0}$

50. An ionic compound contains X cations and Y anions. Anions adopt fcc alignment while cations occupy 25% of tetrahedral holes. The formula of the compound is

1) XY 2) X_2Y_3 3) XY_2 4) XY_4

51. The order of Cl – O bond distance of HClO, $HClO_2$, $HClO_3$, $HClO_4$

1) $HClO > HClO_2 > HClO_3 > HClO_4$ 2) $HClO > HClO_2 > HClO_4 > HClO_3$

3) $HClO > HClO_3 > HClO_2 > HClO_4$ 4) $HClO_4 > HClO_3 > HClO_2 > HClO$

52. Increasing order of EAN of the metals in $[Ni(CN)_4]^{2-}$ $[Fe(CN)_6]^{3-}$ and $[Cu(CN)_4]^{3-}$

1) $[Ni(CN)_4]^{2-} < [Fe(CN)_6]^{3-} < [Cu(CN)_4]^{3-}$ 2) $[Ni(CN)_4]^{2-} > [Fe(CN)_6]^{3-} < [Cu(CN)_4]^{3-}$

3) $[Ni(CN)_4]^{2-} < [Cu(CN)_4]^{3-} < [Fe(CN)_6]^{3-}$ 4) $[Cu(CN)_4]^{3-} < [Fe(CN)_6]^{3-} < [Ni(CN)_4]^{2-}$

53. The matter obtained in the metallurgy of copper has the approximate composition

1) FeS + CuO 2) Cu_2S + FeO 3) Cu_2S + FeS 4) CuS + FeS_2

54. The deep blue complex produced by adding excess of Ammonia to $CuSO_4$ solution is

1) $[Cu(NH_3)_2]^{2+}$ 2) $[Cu(NH_3)_4]^{2+}$ 3) $[Cu(NH_3)_6]^{2+}$ 4) Cu^{2+}

55. Both geometrical and optical isomerism was shown by

1) $[Pt(NH_3)_2Cl_2]$ 2) $[Pt(NH_3)_4Cl_2]$ 3) $Pt[(en)_2Cl_2]$ 4) $[Pt(en)_3]$

56. In Nitrogen family the H-M-H angle in the hydrides MH_3 gradually becomes closer to 90° on going from N to Sb. This shows that gradually

1) The basic strength of the hydrides increases

2) Due to the increase in the size of central atom M and increase in its electronegativity

3) The bond energies of M-H increase

4) The bond pairs of electrons become closer to each other

57. Which of the following combines with Fe(II) ions to form a brown complex?

1) N_2O 2) NO 3) N_2O_3 4) N_2O_5

58. In the complex $MCl_3.5H_2O$, the coordination number of the metal M is six and there is no molecule of hydration. Then the volume of 0.1 M $AgNO_3$ solution needed to precipitate the free chloride ions in 200 ml of 0.01 M solution of the complex is

1) 80 ml 2) 40 ml 3) 20 ml 4) 120 ml

59. The statements regarding hydrides of VIA group elements are

i) The order of volatility $H_2O < H_2Te < H_2Se < H_2S$

ii) The order of B.P. $H_2O > H_2Te > H_2Se > H_2S$

iii) The order of bond angles $H_2O > H_2S > H_2Se > H_2Te$

The correct combination is

1) All are correct 2) Only i is correct 3) ii and iii are correct 4) i and iii are correct

60. Which of the following has an optical isomer?

1) $[Co(en)(NH_3)_2]^{2+}$ 2) $[Co(H_2O)_4(en)]^{3+}$ 3) $[Co(en)_2(NH_3)_2]^{3+}$ 4) $[Co(NH_3)_3Cl]^{+}$

MATHEMATICS

61. Let f(x) = $\max\left\{\left|x^2-2|x|\right|,|x|\right\}$ **and** $g(x)=\min\left\{\left|x^2-2|x|\right|,|x|\right\}$ **then**

1) Both f(x) and g(x) are non differentiable at 5 points

2) f(x) is not differentiable at 5 points whether g(x) is non differentiable at 7 points

3) Number of points of non differentiability for f(x) and g(x) are 7 and 5 respectively

4) Both f(x) and g(x) are non differentiable at 3 and 5 points respectively

62. Let f(x) = f(x) sin x, where f(x) is a twice differentiable function on (–∞, ∞) such that f′(–π) = 1. The value of g″(–π) equals

1) 1 2) 2 3) –2 4) 0

63. If f(x) = (x – a)(x – b)(x – c)(x – d); a < b < c < d, then minimum number of roots of the equation f″(x) = 0 is

1) 1 2) 2 3) 3 4) 4

64. The area bounded by the curves y = x(x – 3)^2 and y = x is (in sq.units)

1) 28 2) 32 3) 4 4) 8

65. The value of the definite integral $\int_0^{3\pi/4}\left((1+x)\sin x+(1-x)\cos x\right)dx$ **is**

1) $2\tan\frac{3\pi}{8}$ 2) $2\tan\frac{\pi}{4}$ 3) $2\tan\frac{\pi}{8}$ 4) 0

66. If $y=2\cot^{-1}\frac{x}{2}+x$ **then** $\int\frac{x^2dx}{(x^2-4)\sin x+4x\cos x}=$

1) ln|cosec 2y + cot y| + C 2) ln|cosec 2y – cot y| + C

3) ln|cosec y + cot y| + C 4) ln|cosec y – cot y| + C

67. Let f(x) = g(x)/h(x), where g and h are continuous functions on the open interval (a, b). Which of the following statements is true for a < x < b?

1) f is continuous at all x for which x is not zero

2) f is continuous at all x for which g(x) = 0

3) f is continuous at all x for which g(x) is not equal to zero

4) f is continuous at all x for which h(x) is not equal to zero

68. In [0, 1] Langranges Mean value theorem is not applicable to

1) $f(x)=\begin{cases}\frac{1}{2}-x, & x<\frac{1}{2}\\ \left(\frac{1}{2}-x\right)^2, & x\geq\frac{1}{2}\end{cases}$

2) $f(x)=\begin{cases}\frac{\sin x}{x}, & x\neq 0\\ 1, & x=0\end{cases}$

3) f(x) = x|x

4) f(x) = |x|

69. The sum of the coordinates of the point on the graph $f(x) = x^3 + 4x$ of the tangent at which is parallel to the chord joining the points (–2, –16) and (1, 5) is

1) –6 2) 4 3) –8 4) 5/2

70. f(x) is a continuous function such that f(x + 4) = f(x + 2) – f(x). The value of $\int_{\lambda}^{\lambda+12} f(x)dx$ is

1) $\int_0^{12} f(x)dx$ 2) $\int_0^{6} f(x)dx$ 3) $\int_0^{8} f(x)dx$ 4) None

71. If $\int_1^5 (\{x\})^{[x]}\,dx=\lambda$ where [.] and {.} denotes greatest integer and fractional part functions. Then the value of 60λ/11 is

1) 6 2) 5 3) 8 4) 7

72. In a class of 40 boys and 30 girls, the average age is 16 years. If the mean age of boys is 1 year more than the mean age of girls, then find the mean age of girls

1) 108/7 2) 107/7 3) 108/11 4) 105/8

73. $\lim_{n\to\infty}\frac{1\cdot\sum_{r=1}^{n} r+2\cdot\sum_{r=1}^{n-1} r+3\cdot\sum_{r=1}^{n-2} r+\ldots+n\cdot 1}{n^4}=$

1) 1/24 2) 1/12 3) 1/3 4) 1/4

74. Number of 4 digit positive integers if the product of their digits is divisible by 3 is

1) 2700 2) 7704 3) 7703 4) 5464

75. The number of 3 digit odd numbers divisible by 3, which can be formed using the digits 3, 4, 5, 6 when repetition of digits within the number is allowed is

1) 12 2) 13 3) 9 4) 10

76. If $\binom{n}{r} = {}^{n}C_{r}$, then the value of $\binom{100}{0}\binom{200}{150}+\binom{100}{1}\binom{200}{151}+\binom{100}{2}\binom{200}{152}+...+\binom{100}{50}\binom{200}{200}$ is

1) $\binom{300}{50}$ 2) $\binom{100}{50}\times\binom{200}{150}$ 3) $\binom{100}{50}^2$ 4) $\binom{200}{100}^2$

77. If $\log_{(5.2^x+1)} 2 ; \log_{(2^{1-x}+1)} 4$ and 1 are in Harmonical Progression then

1) x is a positive real 2) x is a negative real

3) x is rational which is not integral 4) x is an integer

78. The equation $(a + 2)x^2 + (a – 3)x = 2a – 1, a \neq –2$ has rational roots for

1) All rational values of a except a = –2 2) All real values of a except a = –2

3) Rational values of a > 1/2 4) None of these

79. Given z = f(x) = ig(x) where f, g : (0, 1) $\rightarrow$ (0, 1) are real valued functions then, which of the following holds good?

1) $z=\frac{1}{1-ix}+i\left(\frac{1}{1+ix}\right)$ 2) $z=\frac{1}{1+ix}+i\left(\frac{1}{1-ix}\right)$

3) $z=\frac{1}{1+ix}+i\left(\frac{1}{1+ix}\right)$ 4) $z=\frac{1}{1-ix}+i\left(\frac{1}{1-ix}\right)$

80. A plane P passes through a point P(3, –2, 1) and is perpendicular to the vector $\vec{V}=4\hat{i}+7\hat{j}-4\hat{k}$. The distance between the plane P and the plane $\vec{r}\cdot(4\hat{i}+7\hat{j}-4\hat{k})+33=0$, equals

1) 3 2) 2 3) 1 4) 28/9

81. In which one of the following cases a unique plane can be established?

1) Plane passing through a given point and is parallel to a given line not lying in the plane

2) Plane containing origin and is parallel to a given vector

3) Plane passing through a given point and perpendicular to a given plane

4) Plane at a given distance from the origin and is normal to a given vector

82. In an experiment with 15 observations on x, the following results were available $\Sigma x^2 = 2830, \Sigma x = 170$. One observation that was 20, was found to be wrong and was replaced by the correct value 30, then the correct variance is

1) 78 2) 188.66 3) 177.33 4) 8.33

83. If $(p\wedge\sim r)\rightarrow(\sim p\vee q)$ is false, then the truth values of p, q and r are respectively

1) T, F and F 2) F, F and T 3) F, T and F 4) T, F and T

84. If the planes x – y + z = 0, 2x + y – z = 2 and λx – 2y + 2z = 1 meets along a single line, then the value of λ is

1) 1 2) –1 3) 2 4) None

85. The plane denoted by Π_1 : 4x + 7y + 4z + 81 = 0 is rotated through a right angle about its line of intersection with the plane Π_2 : 5x + 3y + 10z = 25. If the plane in its new position be denoted by Π, and the distance of this plane from the origin is $\sqrt{k}$ where k ∈ N, then sum of digits of k, is

1) 8 2) 6 3) 5 4) 4

86. If the vertices P and Q of a triangle PQR are given by (2, 5) and (4, –11) respectively, and the point R moves along the line N : 9x + 7y + 4 = 0, then the locus of the centroid of the triangle PQR is a straight line parallel to

1) PQ 2) QR 3) RP 4) N

87. E_1 is an ellipse whose eccentricity is e. E_2 is another ellipse having the same eccentricity e, whose one focus is the right focus of E_1 and the corresponding directrix is the left directrix of E_1. Then $\frac{\text{area of } E_1}{\text{area of } E_2}$ is equal to

1) $\frac{1-e}{1+e}$ 2) $\left(\frac{1-e}{1+e}\right)^2$ 3) $\frac{1-e^2}{1+e^2}$ 4) $\left(\frac{1-e^2}{1+e^2}\right)^2$

88. Let F_1, F_2 are the foci of the hyperbola $\frac{x^2}{16}-\frac{y^2}{9}=1$ and F_3, F_4 are the foci of its conjugate hyperbola. If e_H and e_C are their eccentricities respectively then the statement which holds true is

1) Their equations of the asymptotes are different

2) $e_H > e_C$

3) Area of the quadrilateral formed by their foci is 50 sq.units

4) Their auxillary circles will have the same equation

89. The absolute value of the expression $\tan\frac{\pi}{16}+\tan\frac{5\pi}{16}+\tan\frac{9\pi}{16}+\tan\frac{13\pi}{16}$ is

1) 5 2) 2 3) 4 4) 3

90. The least period of the function $\sin\left(\frac{\pi[x]}{12}\right)+\cos\left(\frac{\pi x}{4}\right)+\tan\left(\frac{\pi[x]}{3}\right)$ is λ, then the value of λ/24 must be (where [.] denotes the greatest integer function)

1) 1 2) 2 3) 3 4) 4

KEY

1) 1	2) 4	3) 4	4) 2	5) 1	6) 2	7) 3	8) 3	9) 3	10) 3
11) 2	12) 1	13) 2	14) 2	15) 1	16) 2	17) 2	18) 1	19) 3	20) 1
21) 2	22) 4	23) 2	24) 4	25) 2	26) 3	27) 4	28) 2	29) 3	30) 2
31) 2	32) 4	33) 4	34) 4	35) 3	36) 4	37) 3	38) 3	39) 4	40) 2
41) 4	42) 3	43) 1	44) 3	45) 2	46) 2	47) 2	48) 3	49) 2	50) 3
51) 1	52) 1	53) 3	54) 2	55) 4	56) 4	57) 2	58) 3	59) 1	60) 3
61) 2	62) 3	63) 2	64) 4	65) 1	66) 4	67) 4	68) 1	69) 1	70) 1
71) 4	72) 4	73) 1	74) 3	75) 3	76) 1	77) 2	78) 1	79) 2	80) 1
81) 4	82) 1	83) 1	84) 1	85) 3	86) 4	87) 4	88) 3	89) 3	90) 1