JEE MAIN MODEL TEST-2

PHYSICS

1. When 2.0347 is added to 15.7, the sum is

1) 17.7347 2) 17.734 3) 17.13 4) 17.7

2. A ball rolls off from the top of a staircase with a horizontal velocity u m/s. If the steps are

h metre high and b metre wide, the ball hit the edge on the nth step, if

1) $n = \frac{2hu}{gb^2}$ 2) $n = \frac{2hu^2}{gb}$ 3) $n = \frac{2hu^2}{gb^2}$ 4) $n = \frac{hu^2}{gb^2}$

3. Mark the correct statement(s)

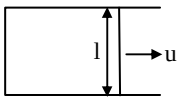
1) Friction force is invariant in nature

2) Tension in string is an example of electromagnetic force

3) One can't imagine a force in the absence of a physical object on which it is exerted

4) All the above

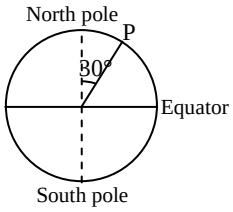
4. A soap film is created in a small wire frame as shown in figure. The sliding wire of mass m is given a velocity u to right and assume that u is small enough so that film does not break. Plane of the film is horizontal and surface tension is T. Then time to regain the original position of wire is equal to



1) $\frac{um}{Tl}$ 2) $\frac{Tl}{um}$

3) $\frac{u^2m}{Tl}$ 4) it will never regain original position

5. A planet identical to earth found to have rotation about its axis in such a way that a person standing at equator experiences weightlessness. What is the minimum coefficient of friction required for him to stand at a place of co-latitude (point P) of 30° on this planet

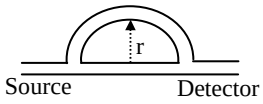


1) $\frac{\sqrt{3}}{2}$ 2) $\frac{1}{\sqrt{3}}$ 3) $\frac{1}{2}$ 4) $\frac{3}{4}$

6. The displacement of two identical particles executing SHM are represented by equations $x_1 = 4 \sin[10t + (\pi/6)]$ and $x_2 = 5 \cos \omega t$. For what value of ω energy of both the particles is same

1) 16 units 2) 6 units 3) 4 units 4) 8 units

7. A sound wave of 42 cm wavelength enters the tube a shown in figure. What must be the smallest radius r so that a detector would hear minima?



1) 12.12 cm 2) 16.26 cm 3) 18.40 cm 4) 21.62 cm

8. Two separated sources emit sinusoidal traveling waves that has the same wavelength λ and are in phase at their respective sources. One travels a distance l_1 to get to the observation point. While the other travels a distance l_2. The amplitude is minimum at the observation point if

$l_1 - l_2$ is

1) Odd integral multiple of λ 2) even integral multiple of λ

3) Odd integral multiple of $\lambda/2$ 4) Odd integral multiple of $\lambda/4$

9. Two particles P and Q describe SHM with the same amplitude A and the same frequency f. The maximum distance separating the particles is observed to be A. The phase difference between the particles is

1) zero 2) $\pi/2$ 3) $\pi/3$ 4) $2\pi/3$

10. An erect real object is placed in front of a spherical mirror on the principal focus of it. The magnification is –4 this means…

1) The image is real, inverted, on same side of mirror and mirror is concave

2) The image is virtual, inverted, on same side as the object and mirror is convex

3) The image is real, inverted, on opposite side of mirror and mirror is concave

4) The image is real, inverted, on same side of mirror and mirror is convex

11. What is immaterial for an electric fuse wire?

1) Its specific resistance 2) Its radius

3) Its length 4) Current flowing through it

12. A 12.0 V battery has an internal resistance of 0.24Ω and a capacity of 50.0 A-h. The battery is charged by passing a current of 10 A through it for 5 hours. Determine the terminal voltage during the charging and the total electrical energy supplied to battery during charging?

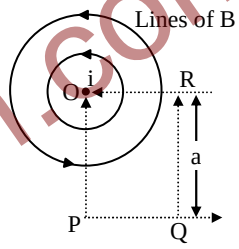
1) 9.6 V, 120 W 2) 14.4 V, 144 W 3) 9.6 V, 96 W 4) 14.4 V, 120 W

13. The statement "For a given body resistance is unique" is

1) True 2) False

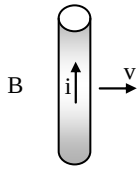
3) Cannot be predicted 4) None of these

14. A current carrying wire (current = i) perpendicular to the plane of the paper produces a magnetic field, as shown in figure. A square of side a is drawn with one of its vertices on the wire. The integral $\int \vec{B} \cdot d\vec{r}$ along PQR has the value



1) $+\mu_0 i$ 2) $\frac{\mu_0 i}{8}$ 3) $\frac{\mu_0 i}{4}$ 4) $\frac{\mu_0 i}{2}$

15. A conducting wire is moving towards right in a magnetic field B. The direction of induced current in the wire is shown in the figure. The direction of magnetic field will be



1) In the plane of paper pointing towards right

2) In the plane of paper pointing towards left

3) Perpendicular to the plane of paper and into the paper

4) None of the above

16. If the frequency of K_α x-ray emitted from the element with atomic number 31 is f, then the frequency of K_α x-ray emitted from element with atomic number 51 would be

1) $\frac{5f}{3}$ 2) $\frac{51f}{3}$ 3) $\frac{9f}{2f}$ 4) $\frac{25f}{9}$

17. A given quantity of an ideal gas is at pressure P and absolute temperature T. The isothermal bulk modulus of the gas is

1) 2P/3 2) P 3) 3P/2 4) 2P

18. Which of the following pairs of electric and magnetic field vector represent an electromagnetic wave traveling along negative z-axis?

1) $E = E_0 \sin(\omega t - kz)\hat{i},\ B = B_0 \sin(\omega t - kz)\hat{j}$

2) $E = E_0 \sin(\omega t + kz)\hat{j},\ B = B_0 \sin(\omega t + kz)\hat{i}$

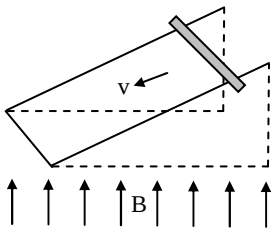
3) $E = E_0 \sin(\omega t + kz)\hat{i},\ B = B_0 \sin(\omega t + kz)\hat{j}$

4) $E = E_0 \sin(\omega t - kz)\hat{j},\ B = B_0 \sin(\omega t - kz)\hat{i}$

19. In an LR series AC circuit the angular frequency of applied emf is 2×10^4 rad/s and the value of resistance is 20 Ω. The instant at which the value of emf is maximum, the value of current at this moment is $i_0/\sqrt{2}$. The inductance in the circuit will be

1) 1 mH 2) 40 mH 3) 8 mH 4) Cannot be predicted

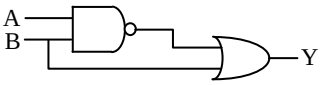
20. A conducting bar rolls down a slope made of conducting rails. The bottom ends of the rails are connected by another conducting rail as shown in the figure. There is a uniform magnetic field B pointing upward. Due to the bar's motion, there is an induced current in the bar-rail circuit. What is the direction of the magnetic force on the bar?



1) Up along the slope 2) Down the slope

3) Towards left (horizontal) 4) Towards right (horizontal)

21. Given the output of the given logic gate

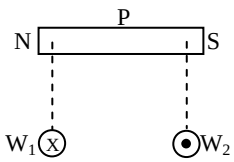


1) $Y = \bar{A}B + \bar{B}$ 2) $Y = \bar{A}B + \bar{B}A$ 3) Y = 1 4) $Y = (\bar{A} + \bar{B})\bar{B}$

22. Digital multimeters use the following component for display

1) Transistor 2) p-n junction diode 3) LED 4) None of these

23. Figure shows a barmagnet and two infinite long wires W_1 & W_2 carrying equal currents in opposite direction. The magnet is free to move & rotate, P is the mid point of magnet. For this situation mark the correct statement(s)



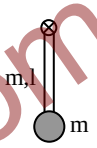
1) Magnet experiences a net torque in clockwise direction & zero net force

2) Magnet experiences a net force towards left and a net torque in ACW direction

3) Magnet experiences a net force towards right and a net torque in ACW direction

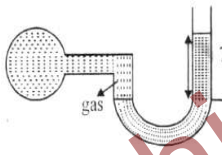
4) Magnet experience zero net force and a net torque in ACW direction

24. A particle is attached to the lower end of a uniform rod which is hinged at its other end as shown in the figure. The minimum speed given to the particle so that the rod performs circular motion in a vertical plane will be : [length of the rod is l, consider masses of both rod and particle to be same]



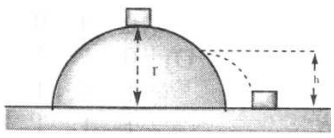
1) $\sqrt{5gl}$ 2) $\sqrt{4gl}$ 3) $\sqrt{4.5gl}$ 4) None of these

25. The presence of gas in the bulb in Pa is (use known values)



1) 1.01×10^5 Pa 2) 1.01×10^{10} Pa 3) 2.02×10^5 Pa 4) 2.02×10^{10} Pa

26. A small body of mass m slides down from the top of a hemisphere of radius r. The surface of block and hemisphere are frictionless. The height at which the body lose contact with the surface of the sphere is

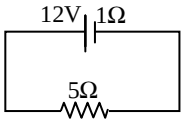


1) $\frac{3}{2}r$ 2) $\frac{2}{3}r$ 3) $\frac{1}{2}gt^2$ 4) $\frac{v^2}{2g}$

27. Two metal spheres of capacitances C_1 and C_2 carry some charges. They are put in contact and then separated. The final charges Q_1 and Q_2 on then satisfy

1) $\frac{Q_1}{C_1} > \frac{Q_2}{C_2}$ 2) $\frac{Q_1}{C_1} = \frac{Q_2}{C_2}$ 3) $\frac{Q_1}{C_1} < \frac{Q_2}{C_2}$ 4) $\frac{Q_1}{C_2} = \frac{Q_2}{C_1}$

28. For the circuit shown in figure mark the current statement(s)



1) The rate at which non-electrical energy is converted to electrical energy within the battery is 24 W

2) The rate at which energy is dissipated in the battery is 4W

3) The rate at which energy is supplied to 5Ω resistor is 20 W

4) All the above

29. X-rays are produced in an X-ray tube operating at a given accelerating voltage. The wavelength of the continuous X-rays has values from

1) 0 to ∞

2) λ_{min} to ∞ where $\lambda_{min} > 0$

3) 0 to λ_{min} where $\lambda_{min} < \infty$

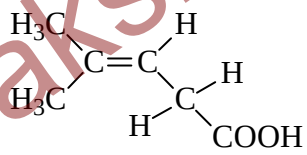
4) λ_{min} to λ_{max} where $0 < \lambda_{min} < \lambda_{max} < \infty$

30. An inductor of inductance L and resistor of resistance R are joined in series and connected to an ac source of frequency ω. Power dissipated in the circuit is

1) $\frac{(R^2+\omega^2L^2)}{V}$ 2) $\frac{V^2R}{(R^2+\omega^2L^2)}$ 3) $\frac{V}{(R^2+\omega^2L^2)}$ 4) $\frac{\sqrt{R^2+\omega^2L^2}}{V^2}$

CHEMISTRY

31. The structure can exhibit



1) Geometrical isomerism

2) Optical isomerism

3) Geometrical and optical isomerism

4) Tautomerism

32. Which pair does not represent isomers?

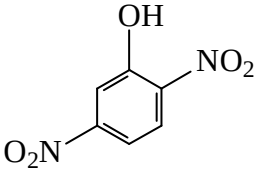
1) CH_3COOH and $HCOOCH_3$

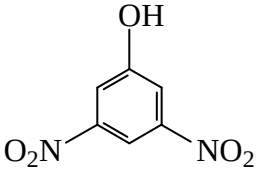
2) $CH_3 - CHO$ and $CH_2 = CH - OH$

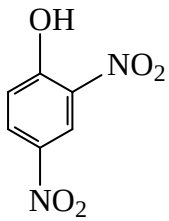
3) $CH_3 - CHO$ and $CH_3 - CO - CH_3$

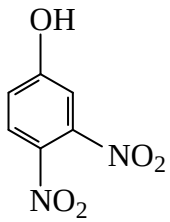
4) $CH_3 - CO - CH_3$ and $CH_3 - CH_2 - CHO$

33. The most acidic among the given compounds is

1) 

2) 

3) 

4) 

34. $CH_3-CHO \xrightarrow{OH^-} A$ **, then IUPAC name of A is**

1) Aldol 2) Prop-1-ene-2-ol

3) 4-hydroxy-4methyl-2-pentanone 4) 3-hydroxy butanal

35. When acetone is treated with $Ba(OH)_2$ it gives

1) Mesitylene 2) Diacetone alcohol 3) Urotropine 4) Mercaptol

36. Which of the following carboxylic acids undergoes decarboxylation easily?

1) $C_6H_5-CO-CH_2COOH$ 2) $C_6H_5-CO-COOH$

3) $C_6H_5-\underset{\underset{OH}{|}}{C}H-COOH$ 4) $C_6H_5-\underset{\underset{NH_2}{|}}{C}H-COOH$

37. The product C of the reaction, $CH_3CN \xrightarrow{H_2O} A \xrightarrow{NH_3} B \xrightarrow{\Delta} C$ **is**

1) Methyl amine 2) Ammonium acetate 3) Ethyl amine 4) Acetamide

38. The biodegradable polymer, Nylon-2-Nylon-6 is formed by the condensation of glycine and

1) Acrylonitrile 2) Amino Caproic Acid 3) Alanine 4) Adipic Acid

39. The bond dissociation enthalpy C-X in CH_3X (where X is halogen) follows the order

1) $CH_3-Cl > CH_3-Br > CH_3-I$ 2) $CH_3-Br < CH_3-Cl < CH_3-I$

3) $CH_3-Cl > CH_3-I < CH_3-Br$ 4) $CH_3-I < CH_3-Br > CH_3-Cl$

40. Which of the following is not suitable to prepare neopentyl chloride?

1) $(CH_3)_3C-CH_2-OH \xrightarrow{PCl_5/\Delta}$ 2) $(CH_3)_3C-CH_2-OH \xrightarrow{PCl_3}$

3) $(CH_3)_3C-CH_2-OH \xrightarrow{SOCl_2/Pyridine}$ 4) $(CH_3)_3CCH_2OH \xrightarrow{Cl_2/h\nu\Delta}$

41. The reaction described below is

$$CH_3(CH_2)_5-\underset{H}{\overset{H_3C}{\overset{|}{C}}}-Br \xrightarrow{Conc.OH} CH_3(CH_2)_4CH=CH-CH_3$$

1) S_N1 2) E^2 3) E^1 4) S_N2

42. Mark the wrong statement about enzymes.

1)Enzymes are highly specific both in binding chiral substrates and in catalyzing their reactions

2) Each enzyme can catalyse a number of similar reactions

3) Enzymes catalyse chemical reactions by lowering the energy of activation

4) Enzymes are needed only in very small amounts for their action

43. 2-Acetoxy bezoic acid can be used as

1) Antiseptic 2) Antipyretic 3) Antibiotic 4) Mordant dye

44. Which of the following statements is/are incorrect?

I) Amylose does not give blue colour with I_2 solution

II) Amylopectin gives blue colour with I_2 solution

III) Amylum is present in what, maize, rice, potatoes, barley, sorghum etc

IV) Amylose is linear polymer of α-D-Glucose

1) I and II only 2) III and IV only 3) I and III only 4) II and III only

45. The increasing order of boiling points of below mentioned alcohols is

A) 1,2-Dihydroxy benzene **B) 1,3- Dihydroxy benzene**

C) 1,4- Dihydroxy benzene **D) Dihydroxy benzene**

1) A < B < C < D 2) A < B < D < C 3) D < A < B < C 4) D < B < A < C

46. Edge length of M^+X^- (fcc structure) is 7.2 Å. Assuming $M^+ - X^-$ contact along the cell edge, radius of X^- ion is (r_{M+} = 1.6 Å)

1) 2.0 Å 2) 5.6 Å 3) 2.8 Å 4) 3.8 Å

47. A micelle formed during the cleansing action by soap is

1) A discrete particle of soap 2) Aggregated particles of soap and dirt

3) A discrete particle of dust 4) An aggregated particle of dust and water

48. Which of the following process refers to ionization potential?

1) $X_{(s)} \rightarrow X^+_{(g)} + e^-$ 2) $X_{(g)} + aq \rightarrow X^+_{(aq)} + e^-$ 3) $X_{(g)} \rightarrow X^+_{(g)} + e^-$ 4) $X_{(g)} + e^- \rightarrow X^-_{(g)}$

49. For a spontaneous process in a reaction

1) $\Delta S_{total} = (\Delta S_{system} + \Delta S_{surroundings}) < O$ 2) $\Delta S_{total} = (\Delta S_{system} + \Delta S_{surroundings}) = O$

3) $\Delta S_{total} = (\Delta S_{system} + \Delta S_{surroundings}) > O$ 4) $\Delta S_{sys} > O$ only

50. Standard electrode potential for Fe electrode are given as

$Fe^{2+} + 2e^- \rightarrow Fe$, $E^0 = -0.44$ V

$Fe^{3+} + e^- \rightarrow Fe^{2+}$, $E^0 = +0.77$ V

Fe^{2+}, Fe^{3+} and Fe block are kept together then

1) $[Fe^{3+}]$ decreases 2) $[Fe^{3+}]$ increases

3) $[Fe^{2+}, Fe^{3+}]$ remains unchanged 4) $[Fe^{2+}]$ decreases

51. The compressibility factor for one mole of a vanderwaal's gas at 0°C and 100 atm pressure is found to be 0.5. Assume that the volume of gas molecule is negligible. Calculate the vander waals constant 'a'.

1) 1.253 atm lit^2 mol^{-2} 2) 12.53 atm lit^2 mol^{-2}

3) 0.125 atm lit^2 mol^{-2} 4) 22.53 atm lit^2 mol^{-2}

52. Mark the wrong statement among the following. The iron ore after washing is roasted with a little coal in excess of air. During roasting

1) Moisture is removed

2) S and As are removed in the form of heir volatile oxides

3) Any ferrous oxide is oxidized to ferric oxide

4) The mass becomes compact and thus makes it suitable for ready reduction to metallic iron

53. 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

54. 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) $[Co(NH_3)_3Cl]^+$

55. On hydrolysis NCl_3 gives NH_3 and on hydrolysis PCl_3 gives

1) PH_3 2) $POCl_3$ 3) $P(OH)_3$ 4) H_3PO_4

56. The correct order of hybridization of the central atom in the species $NH_3, [PtCl_4]^{2-}, PCl_5$ and BCl_3 is

1) dsp^2, dsp^3, sp^2 and sp^3 2) sp^3, dsp^2, dsp^3 and sp^2

3) dsp^2, sp^2, sp^3 and dsp^3 4) sp^3, sp^3, dsp^3 and sp^2

57. Observe the following statements regarding purification of bauxite:

I) During Hall's process, silica, is removed as Si(vapour)

II) Bauxite ore contaminated with Fe_2O_3 is purified in Baeyer's process

III) During Serpeck's process, AlN is formed

The correct answer is

1) I, II and III are correct 2) Only I and II are correct

3) Only I and III are correct 4) Only II and III are correct

58. A and B are compounds of sodium. A is thermally stable. On passing CO_2 through the solution of A, B is formed. B on heating gives A. Phenolphthalein is added to the aqueous solution of A and B. The colours of solutions are

1) Colourless, colourless 2) Pink, colourless

3) Colourless, pink 4) Pink, pink

59. $H_3BO_3 \xrightarrow{\text{Red heat}} X$**. The X in the reaction is**

1) $H_2B_4O_7$ 2) HBO_2 3) B_2O_3 4) B

60. $Al_4C_3 + H_2O \rightarrow A + B$**; A and B are**

1) $CH_3 - CH = CH_2$ and $Al(OH)_3$ 2) CH_4 and $Al(OH)_3$

3) C_2H_2 and $Al(OH)_3$ 4) C_2H_4 and $Al(OH)_3$

MATHEMATICS

61. Let f(x) be a continuous function in R such that f(x) + f(y) = f(x + y) then $\int_{-2}^{2} f(x)dx =$

1) $2\int_{0}^{2} f(x)dx$ 2) 2f(2) 3) 0 4) 4

62. Let f be a positive function. Let $I_1 = \int_{1-k}^{k} xf(x(1-x))dx$ and $I_2 = \int_{1-k}^{k} f(x(1-x))dx$ where 2k – 1 > 0. Then I_2/I_1 is

1) k 2) 1/2 3) 1 4) 2

63. $\int 4\cos\left(x+\frac{\pi}{6}\right)\cdot\cos 2x\cdot\cos\left(\frac{5\pi}{6}+x\right)dx =$

1) $-\left(x+\frac{\sin 4x}{4}+\frac{\sin 2x}{2}\right)+c$ 2) $-\left(x+\frac{\sin 4x}{4}-\frac{\sin 2x}{2}\right)+c$

3) $-\left(x-\frac{\sin 4x}{4}+\frac{\sin 2x}{2}\right)+c$ 4) $-\left(x-\frac{\sin 4x}{4}+\frac{\cos 2x}{2}\right)+c$

64. The area bounded by curves $y = x^2 + 2$, $y = -x$, $x = 0$ and $x = 1$ is

1) 12/5 2) 17/6 3) 17/3 4) 17/2

65. Let 'a' be a positive constant number. Consider two curves $C_1 : y = e^x$, $C_2 : y = e^{a-x}$. Let S be the area of the part surrounding by C_1, C_2 and the y-axis, then $\lim_{a\to 0}\frac{S}{a^2}$ equals

1) 4 2) 1/2 3) 0 4) 1/4

66. The solution of $1+y^2+\left(x-e^{\tan^{-1}y}\right)\frac{dy}{dx}=0$ is

1) $x-2=ce^{-\tan^{-1}y}$ 2) $2xe^{\tan^{-1}y}=e^{2\tan^{-1}y}+c$

3) $xe^{\tan^{-1}y}=c+\tan^{-1}y$ 4) $xe^{2\tan^{-1}y}=c+\tan^{-1}y$

67. The function $g(x)=\begin{cases}x+b, x<0\\ \cos x, x\geq 0\end{cases}$ can be made differentiable at x = 0

1) If b is equal to zero 2) If b is not equal to zero

3) If b takes any real value 4) For no value of b

68. Over the interval $\left(\frac{1}{2010\pi}, \frac{1}{2006\pi}\right)$ the function $\frac{\sin(1/x)}{\sin(1/x)}$ is discontinuous at k points then k must be equal to

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

69. The tangent to the curve $y = e^x$ drawn at the point (c, e^c) intersects the line joining the points $(c-1, e^{c-1})$ and $(c+1, e^{c+1})$

1) On the left of x = c 2) On the right of x = c

3) At no point 4) At all points

70. The graphs $y = 2x^3 - 4x + 2$ and $y = x^3 + 2x - 1$ intersect in exactly 3 distinct points. The slope of the line passing through two of these points

1) Is equal to 4 2) Is equal to 6 3) Is equal to 8 4) Is not unique

71. $\int_{1/2}^{2} \frac{1}{x}\sin\left(x - \frac{1}{x}\right)dx$ has the value equal to

1) 0 2) 3/4 3) 5/4 4) 2

72. Let $I_1 = \int_0^3 \frac{\sin x}{\left[\frac{x}{\pi}\right] + \frac{1}{2}}dx$ and $I_2 = \int_{-3}^{0} \frac{\sin x}{\left[\frac{x}{\pi}\right] + \frac{1}{2}}dx$, then (where [ ] represent greatest integral part)

1) $I_1 = 3I_2$ 2) $I_2 = 3I_1$ 3) $I_1 = I_2$ 4) $I_1 + I_2 = 0$

73. The median of a set of 11 distinct numbers is 20.5. If each of largest 5 observations is increased by 2 and each of the smallest observations is decreased by 3 then. Choose the correct statement.

1) Mean remains unchanged 2) Median remains unchanged

3) Mean increases 4) Median decreases

74. Let $f : (e, \infty) \to R$ be a function defined by $f(x) = \log_e(\log_e(\log_e x))$, then

1) f is one-one and onto 2) f is one-one and not onto

3) f is onto but not one-one 4) The range of f is equal to the domain of f

75. The integers from 1 to 1000 are written in order around a circle. Starting at 1, every fifteenth number is marked (i.e. 1, 16, 31, etc.). This process is continued until a number is reached which has already been marked, then the number of marked numbers is

1) 200 2) 400 3) 600 4) 800

76. Consider the following three words (written in capital letters): 'PRANAM', 'SALAAM' and 'HELLO'. One of the three words is chosen at random and a letter from it is drawn. The letter is found to be 'A' or 'L' then the probability that it has come from the word 'PRANAM', is

1) 0 2) 1/3 3) 2/5 4) 5/21

77. There are four six faced dice such that each of two dice bears the numbers 0, 1, 2, 3, 4 and 5 and the other two dice are ordinary dice bearing numbers 1, 2, 3, 4, 5 and 6. If all the four dice are thrown, the probability that the total of numbers coming up or all the dice is 10 is

1) 125/1296 2) 85/1296 3) 135/1296 4) 115/1296

78. The set of equations $\lambda x - y + (\cos\theta)z = 0$, $3x + y + 2z = 0$, $(\cos\theta)x + y + 2z = 0$, $0 \le \theta < 2\pi$, has non-trivial solution(s)

1) For no value of λ and θ

2) For all values of λ and θ

3) For all values of λ and only two values of θ

4) For only one value of λ and all values of θ

79. If ω is an imaginary cube root of unity, then the value of, $(p+q)^3 + (p\omega + q\omega^2)^3 + (p\omega^2 + q\omega)^3$ is

1) $p^3 + q^3$ 2) $3(p^3 + q^3)$

3) $3(p^3 + q^3) - pq(p+q)$ 4) $3(p^3 + q^3) + pq(p+q)$

80. If $\vec{V}_1 = \hat{i} + \hat{j} + \hat{k}$, $\vec{V}_2 = a\hat{i} + b\hat{j} + c\hat{k}$ where a, b, c $\in$ {–2, –1, 0, 1, 2}, then find the number of non zero vectors $\vec{V}_2$ which are perpendicular to $\vec{V}_1$

1) 18 2) 16 3) 20 4) 24

81. $\sim(p \vee q) \wedge (\sim p \wedge q)$ is logically equivalent to

1) ~p 2) p 3) ~q 4) q

82. Possible number of words taking all letters from the word 'MATHEMATICS' such that in each word both M's are together and both T's are together but both A are not together

1) $\frac{9!}{2!2!2!}$ 2) $7! \times {}^{8}C_{2}$ 3) $\frac{11!}{2!2!2!} - \frac{9!}{2!2!2!}$ 4) $\frac{9!}{2!2!}$

83. If $\sum_{i=1}^{18}(x_i - 8) = 9$ and $\sum_{i=1}^{18}(x_i - 8)^2 = 45$, then the standard deviation of $x_1, x_2, \ldots x_{18}$ is

1) 4/9 2) 9/4 3) 3/2 4) None of these

84. Passing through a point A(6, 8) a variable secant line L is drawn by the circle S : $x^2 + y^2 - 6x - 8y + 5 = 0$. From the points of intersection of L with S, a pair of tangent lines are drawn which intersect at P.

Statement-1: Locus of the point P has the equation $3x + 4y - 40 = 0$.

Statement-2: Point A lies outside the circle.

1) Statement-1 is true, Statement-2 is true, Statement-2 is the correct explanation for Statement-1

2) Statement-1 is true, Statement-2 is true, Statement-2 is not a correct explanation for Statement-1

3) Statement-1 is true, Statement-2 is false

4) Statement-1 is false, Statement-2 is true

85. The distance of the origin from the line contained by the planes $2x - 2y - z = 2$ and $x + 2y - 2z - 4 = 0$, is

1) $\frac{2\sqrt{3}}{5}$ 2) $\sqrt{5}$ 3) $\frac{3\sqrt{5}}{2}$ 4) $\frac{2\sqrt{5}}{3}$

86. Which one of the following functions is not homogeneous?

1) $f(x,y) = \frac{x-y}{x^2+y^2}$

2) $f(x,y) = x^{1/3} \cdot y^{-2/3} \tan^{-1}\frac{x}{y}$

3) $f(x,y) = x(\ln\sqrt{x^2+y^2} - \ln y)ye^{x/y}$

4) $f(x,y) = x\left[\ln\frac{2x^2+y^2}{x} - \ln(x+y)\right] + y^2 \tan\frac{x+2y}{3x-y}$

87. The vertex A of the parabola $y^2 = 4ax$ is joined to any point P on it and PQ is drawn at right angles to AP to meet the axis in Q. Projection of PQ on the axis is equal to

1) Twice the latus rectum 2) The latus rectum

3) Half the latus rectum 4) One fourth of the latus rectum

88. Maximum number of common chords of a parabola and a circle can be equal to

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

89. A pole stands vertically inside a triangular park ΔABC. If the angle of elevation of the top of the pole from each corner is same, then in ΔABC the foot of the pole is at the

1) Centroid 2) Circum-centre 3) Incentre 4) Orthocentre

90. Area enclosed between the curves $|y| = 1-x^2$ and $x^2 + y^2 = 1$ is

1) $\frac{3\pi-8}{3}$ sq.units 2) $\frac{\pi-8}{3}$ sq.units 3) $\frac{2\pi-8}{3}$ sq.units 4) $\frac{\pi+2}{3}$ sq.units

Key

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