JEE Mains (Dropper)

Sample Paper - I

DURATION : 180 Minutes **M. MARKS : 300**

General Instructions:

1. Immediately fill in the particulars on this page of the test booklet.
2. The test is of **3 hours** duration.
3. The test booklet consists of **90** questions **(75 to attempt)**. The maximum marks are **300**.
4. There are three subjects in the question paper, Subject I, II and III consisting of Section-I (**Physics),** Section-II **(Chemistry)**, Section-III **(Mathematics)**, and having **30 questions** in each part.
5. There will be a total of **20 MCQs** and **10 Numerical** Value Based Questions **(attempt any 5)**.
6. Each correct answer will give 4 marks while 1 Marks will be deducted for a wrong response.
7. No student is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. inside the examination room/hall.
8. On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them.
9. **Do not fold or make any stray mark on the Answer Sheet (OMR).**

Name of the Student (In CAPITALS): _____

Roll Number: _____

Candidate's Signature: _____

Section-I (PHYSICS)

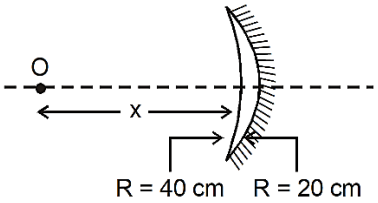
[Section – A]

1. Block 'A' is hanging from a vertical spring and is at rest. Block 'B' strikes the block 'A' with velocity 'v' and sticks to it. Then the value of 'v' for which the spring just attains natural length is:

(1) $\sqrt{\frac{60mg^2}{k}}$ (2) $\sqrt{\frac{6mg^2}{k}}$

(3) $\sqrt{\frac{10mg^2}{k}}$ (4) None of these

2. Radii of curvature of a concavo-convex lens (refractive index = 1.5) are 40 cm (concave side) and 20 cm (convex side) as shown. The convex side is silvered. The distance x on the principal axis where an object is placed so that its image is created on the object itself, is equal to:



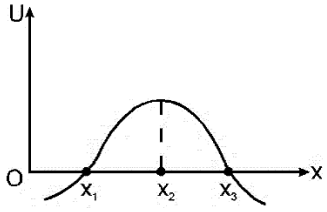
(1) 12 cm (2) 15 cm
(3) 16 cm (4) 24 cm

3. The readings of a constant potential difference is noted four times by a student. The student averages these readings but does not take into account the zero error of the voltmeter. The average measurement of the potential difference is

Reading 1	1.176 V
Reading 2	1.178 V
Reading 3	1.177 V
Reading 4	1.176 V

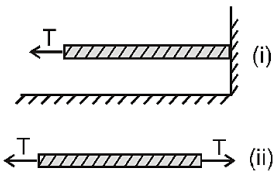
(1) precise and accurate
(2) precise but not accurate
(3) accurate but not precise
(4) not accurate and not precise

4. In the figure shown the potential energy U of a particle is plotted against its position 'x' from origin. Then which of the following statement is correct. A particle at



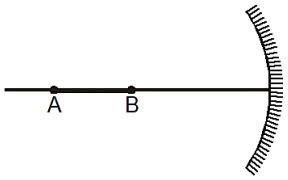
(1) x_1 is in stable equilibrium
(2) x_2 is in unstable equilibrium
(3) x_3 is in stable equilibrium
(4) none of these

5. In the figure (i) an extensible string is fixed at one end and the other end is pulled by a tension T. In figure (ii) another identical string is pulled by tension 'T' at both the ends. The ratio of elongation in equilibrium of string in (i) to the elongation of string in (ii) is



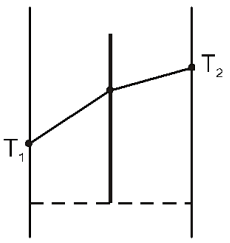
(1) 1 : 1 (2) 1: 2
(3) 2 : 1 (4) 0

6. A linear object AB is placed along the axis of a concave mirror. The object is moving towards the mirror with speed V. The speed of the image of the point A is 4 V and the speed of the image of B is also 4V. If centre of the line AB is at a distance L from the mirror then length of the object AB will be



(1) $\frac{3L}{2}$ (2) $\frac{5L}{3}$
(3) L (4) $\frac{4L}{3}$

7. The wall of a house is made of two different materials of same thickness. The temperature of the outer wall is T_2 and that of inner wall is $T_1 < T_2$. The temperature variation inside the wall as shown in the figure. Then:



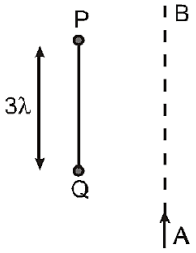
(1) thermal conductivity of inner wall is greater than that of outer.
(2) thermal conductivity of outer wall is greater than that of inner
(3) thermal conductivities of the two are equal
(4) no conclusion can be drawn about thermal conductivities

8. In a photoelectric experiment, with light of wavelength λ, the fastest electron has speed v. If the exciting wavelength is changed to $\frac{3\lambda}{4}$, the speed of the fastest emitted electron will become

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

(3) less than $v\sqrt{\frac{3}{4}}$ (4) greater than $v\sqrt{\frac{4}{3}}$

9. Two coherent light sources P and Q each of wavelength λ are separated by a distance 3λ as shown. The maximum number of minima formed on line AB which runs from $-\infty$ to $+\infty$ is:



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

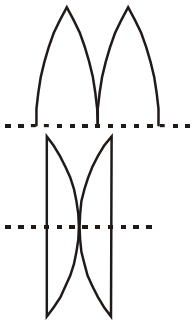
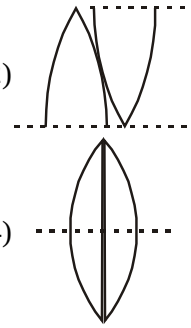
10. The average rotational kinetic energy of hydrogen molecule at a temperature T is E. The average translational kinetic energy of helium at same temperature will be:

(1) $\frac{2E}{3}$ (2) $\frac{5E}{3}$
(3) E (4) $\frac{3E}{2}$

11. A system consists of two point masses, *A* and *B* of masses 1 kg and 2 kg respectively. At an instant the kinetic energy of *A* with respect to the centre of mass is 2 Joules and the velocity of centre of mass is 2 m/s. The kinetic energy of the system at this instant is:

(1) 9 J (2) 11 J
(3) 13 J (4) none of these

12. A convex lens is cut into two parts inaaz different ways that are arranged in four manners, as shown. Which arrangement will give maximum optical power?

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

13. A vernier calipers which is used to measure length of a cylinder has 1 mm marks on the main scale. It has 10 equal division on the vernier scale which match with 8 marks of main scale. If main scale reading is 4 and vernier reading is 5 then the length of cylinder is 1.25 N × 10^{-3} m then the value of *N* is:

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

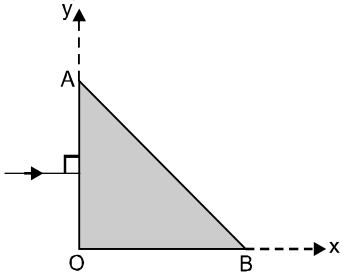
14. The potential energy (in SI units) of a particle of mass 2 kg in a conservative field is $U = 6x - 8y$. If the initial velocity of the particle is $\vec{U} = -1.5\,\hat{i} + 2\,\hat{j}$ then the total distance travelled by the particle in first two seconds is

(1) 10 m (2) 12 m
(3) 15 m (4) 18 m

15. The elongation in a metallic rod hinged at one end and rotating in a horizontal plane becomes four times of the initial value. The angular velocity of rotation becomes:

(1) two times the initial value
(2) half of initial value
(3) one third of initial value
(4) four times the initial value.

16. A triangular medium has varying refracting index $n = n_0 + ax$, where x is the distance (in cm) along x–axis from origin and $n_0 = \frac{4}{3}$. A ray is incident normally on face *OA* at the mid–point of *OA*. The range of a so that light does not escape through face *AB* when it falls first time on the face *AB* (*OA* = 4 cm, *OB* = 3 cm and *AB* = 5 cm): (Surrounding medium is air)



(1) $a > \frac{1}{9}$ (2) $a > \frac{2}{9}$
(3) $a > \frac{1}{3}$ (4) None of these

17. A tugsten bulb radiates 2 W of energy. The filament of the bulb has surface area 2 mm^2 and an emissivity of 0.9. The temperature of the bulb is: (Stefan's Constant s = 5.6 × 10^{-8} S.I. units)

(1) 3500 K (2) 4210 K
(3) 2110 K (4) 211 K

18. In an *x*-ray tube, if the accelerating potential difference is changed, then:

(1) the frequency of characteristic *x*-rays of a material will get changed
(2) number of electrons emitted will change
(3) the difference between λ_0 (minimum wavelength) and $\lambda_{k\alpha}$ (wavelength of k_α *x*-ray) will get changed
(4) difference between $\lambda_{k\alpha}$ and $\lambda_{k\beta}$ will get changed.

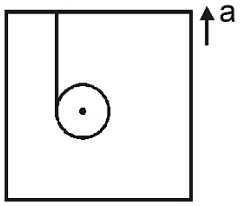
19. In a calm pond, water (μ = 4/3) is filled uniformly upto 1 m depth. The maximum wavelength of the electromagnetic radiation incident normally from air onto the water surface, that will be strongly reflected is: [assume: $n_{ground} > n_{water}$]

(1) $\frac{16}{3}$m (2) $\frac{8}{3}$m
(3) $\frac{4}{3}$m (4) 8 m

20. In an adiabatic expansion the product of pressure and volume:
(1) decreases
(2) increases
(3) remains constant
(4) first increases, then decreases.

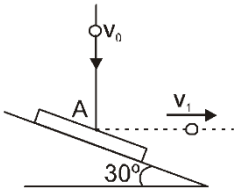
[Section – B]

21. In the figure shown a thin light inextensible string is wrapped around a uniform disc. One end of the string is fixed to the ceiling of the lift and the other end is fixed to the circumference of the disc. Acceleration 'a' of the lift in such that the centre of disc does not move with respect to ground. Find the value of $\frac{a}{g}$. (String does not slip-on pulley)



22. Light of intensity = 3 W/m^2 is incident on a perfectly absorbing metal surface of area 1m^2 making an angle of 60° with the normal. If the force exerted by the photons on the surface is $p \times 10^{-9}$ (in Newton), find the value of p.

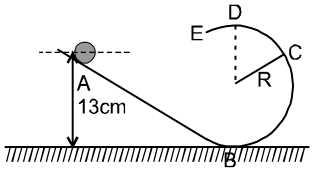
23. A steel ball falling vertically strikes a fixed rigid plate A with velocity v_0 and rebounds horizontally as shown. Assuming surface to be same and the effect of gravity on motion of ball to be neglected. If the coefficient of the restitution for the ball is 'e' then find the value of $\frac{1}{e}$.



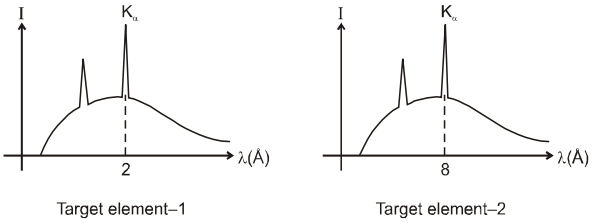
24. Force acting on a particle is $\vec{F} = (\alpha y\,\hat{i} + \beta xy\,\hat{j})$. Find the work done by this force, when particle is moved along the line 2x = 3y from origin to the point (3, 2) {take all quantities in SI units and α = 1, β = 1}

25. An ionization counter is used to investigate the disintegration rate of a certain radioactive sample. At the start of the experiment, the counter gives 141 pulses in 20s. After 3 days it gives 100 pulses in 20s. Its half-life is (in days).

26. A rough track *ABCDE* ends in a circular loop of radius *R* as shown in figure. A solid cylinder of radius 2 cm slides down the track from point *A* which is at height *h* = 13 cm. Find the maximum value of *R* (in cm) for the cylinder to complete the loop successfully. Friction is sufficient to provide pure rolling. Do not consider effect of collision at B.



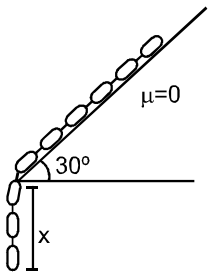
27. Intensity *v*/*s* wavelength of *x*-rays graphs are given for two different target elements. If number of protons in an atom of target element-1 is 37. If number of protons in an atom of target element-2 is 95/*n* then find the value of *n*.



28. A particle collides with horizontal rough floor with a speed u at an angle 45° with vertical and after collision it moves vertically upward. Coefficient of restitution for normal impact is $\frac{1}{2}$, If the friction coefficient between particle and surface is μ find 3 μ.

29. The chain of length *L* is released from rest on a smooth incline with *x* = 0 as shown in the figure. The velocity *v* of the chain when a half of the length has fallen is $\sqrt{\frac{Ngl}{8}}$, then find N.

(Take *L* = $\frac{4}{25}$ m) in m/s. (Neglect edge effect of inclined).



30. A block of mass 2kg is pulled by a constant power 100W is placed on a rough horizontal plane. The frictional coefficient between block and surface is 1. Find the maximum velocity of block.

Section-II (CHEMISTRY)

[Section – A]

31. 2.5 g of a sample of sodium bicarbonate when strongly heated give 310 cc of CO_2 measured at 27°C and 760 mm of Hg pressure. Calculate percentage purity of sample

(1) 84.63 % (2) 64.85 %
(3) 92.05 % (4) 48.34 %

32. Which will form maximum boiling azeotrope ?

(1) $C_6H_6 + C_6H_5CH_3$ solution
(2) $HNO_3 + H_2O$ solution
(3) $C_2H_5OH + H_2O$ solution
(4) n-hexane and n-heptane

33. What $[H_3O^+]$ must be maintained in a saturated H_2S solution to precipitate Pb^{+2} but not Zn^{+2} from a solution in which each ion present at a concentration of 0.01 M?
(K_{sp} $H_2S = 1.1 \times 10^{-22}$, K_{sp} $ZnS = 1 \times 10^{-21}$)

(1) 4.32×10^{-2} (2) 2×10^{-2}
(3) 3.32×10^{-2} (4) 3.32×10^{-2}

34. $E°(Ni^{2+}|Ni) = -0.25$ volt, $E°(Au^{3+}|Au) = 1.50$ volt. The standard emf of the voltaic cell.
$Ni_{(s)} | Ni^{2+}_{(aq)}$ (1.0 M) || $Au^{3+}_{(aq)}$ (1.0 M) | $Au_{(s)}$ is

(1) 1.25 volt (2) –1.75 volt
(3) 1.75 volt (4) 1.75 volt

35. Which of the following characteristics is not correct for physical adsorption

(1) Adsorption is spontaneous at suitable conditions
(2) It is not specific in nature
(3) It is reversible in nature
(4) Degree of adsorption increases with temperature

36. For a first order reaction
$3A(g) \rightarrow 2B(g) + 3C(g) + D(g)$
if initial pressure of A is P and after time 't' the pressure of gaseous mix is P_t the Rate Constant is

(1) $K = \frac{1}{t}\ell n\frac{P_0}{2P_0 - P_t}$

(2) $K = \frac{1}{t}\ell n\frac{2P_0}{2P_0 - P_t}$

(3) $K = \frac{1}{t}\ell n\frac{P_0}{P_0 - P_t}$

(4) None of these

37. Which oxide of 'N' is isoelectronic with CO_2

(1) NO_2 (2) NO
(3) N_2O (4) N_2O_2

38. Which of the following pairs are isostructural

(1) $\overset{+}{N}H_4$ and NH_2^- (2) $\overset{-}{C}H_3$ and $\overset{+}{C}H_3$

(3) SO_4^{2-} and PO_4^{3-} (4) $\overset{+}{N}H_4$ and NH_3

39. Select the CORRECT order

(1) $EA(Na^+) < EA(K^+)$
(2) $EA(Se) < EA(O)$
(3) $IE_2(S) > IE_2(Cl)$
(4) Size of $Al^{+3}_{(aq.)}$ < Size of $Mg^{+2}_{(aq.)}$

40. Which of the following reactions is incorrect ?

(1) $Pb(NO_3)_2 \xrightarrow{\Delta} PbO_2 + NO_2 + O_2$

(2) $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2$

(3) $Fe_2(SO_4)_3 \xrightarrow{\Delta} Fe_2O_3 + 3SO_3$

(4) $2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$

41. Correct order of bond angle is

(a) $NH_4^+ > NH_2^-$ (b) $OF_2 < Cl_2O$
(c) $NO_2^+ < NO_2^-$ (d) $BF_3 < BCl_3$

(1) a, c, d (2) a, b, c
(3) Only a, b (4) Only c, d

42. Match List-I with List-II and select the correct order using codes given below in the lists

List-I	List-II
(A) Cyanide process	(P) Ultrapure Ge
(B) Floatation process	(Q) Pine oil
(C) Electrolytic reduction	(R) Extraction of Al
(D) Zone refining	(S) Extraction of Au

(1) (A)-(R); (B)-(P); (C)-(S); (D)-(Q)
(2) (A)-(S); (B)-(Q); (C)-(R); (D)-(P)
(3) (A)-(R); (B)-(Q); (C)-(S); (D)-(P)
(4) (A)-(S); (B)-(P); (C)-(R); (D)-(Q)

43. Mercurous chloride turns black on treatment with ammonium hydroxide. This is due to the formation of

(1) $Hg(NH_2)Cl$
(2) $Hg_2Cl_2 . NH_4OH$
(3) Hg and $Hg(NH_2)Cl$
(4) $HgCl_2 . NH_2OH$

44. Riboflavin is the chemical name of

(1) Vitamin-B_3
(2) Vitamin-B_2
(3) Vitamin-B_5
(4) Vitamin-B-complex

45. Compounds capable of reacting with ammoniacal $AgNO_3$ solution are

(1) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-C\equiv CH$

(2) $HC\equiv CH$

(3) 1- Butyne

(4) all the above

46. Which of the following is a biodegradable polymer's

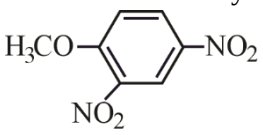
(1) Polythene

(2) PVC

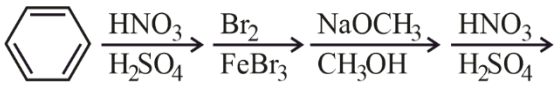
(3) Bakelite

(4) PHBV

47. Which is the best method for synthesis of



(1)



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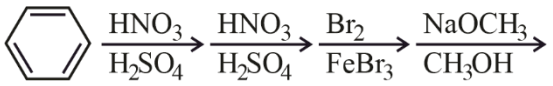

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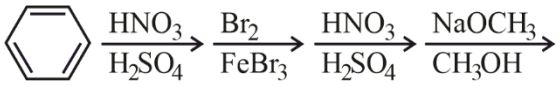

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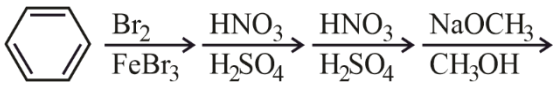
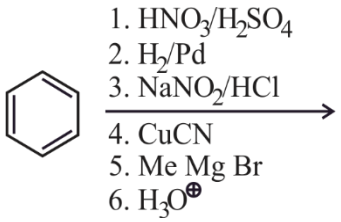
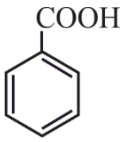
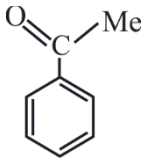
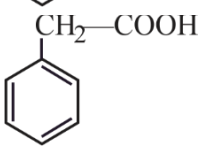


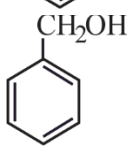
48. Give the product of the following reaction sequence



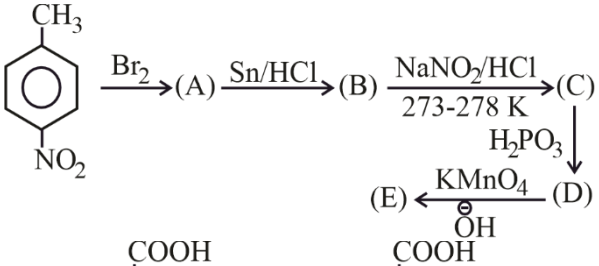
(1) 

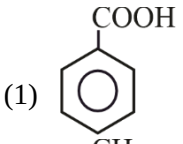
(2) 

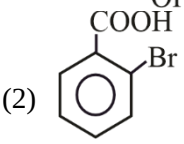
(3) 

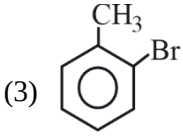
(4) 

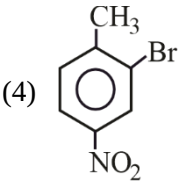
49. Identify the product (E) in the following sequence of reaction



(1) 

(2) 

(3) 

(4) 

50. Which of the following not gives effervescence with $NaHCO_3$

(1) Phenol

(2) Benzoic acid

(3) 2,4-Dinitrophenol

(4) 2,4,6-Trinitrophenol

[Section – B]

51. The edge length of a face centered cubic cell of an ionic substance is 508 pm. If the radius of the cation is 110 pm, the radius of the anion is

52. One mole of ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C. If the work done by the gas in the process is 3 kJ, the final temperature will be equal to ($C_{V,m}$ = 20 J/K mol)

53. How many among the following aqueous solution can act as a buffer solution.

(1) 100 mL of 0.1 M CH_3COONa + 50 mL of 0.1 M HCl

(2) 100 mL of 0.1 M CH_3COOH + 50 mL of 0.1 M NaOH

(3) 100 mL of 0.1 M Borax solution

(4) 100 mL of 1 M H_3PO_4 + 150 mL of 1 M NaOH

(5) 100 mL of 0.1 M NH_4Cl + 50 mL of 0.1 M NaOH

54. How many maximum electrons can be there in an Fe^{+2} ion having quantum number n(principal quantum number) = 3, and |m|= 1 (m = magnetic quantum number) ?

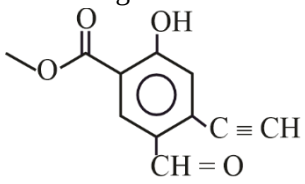
55. How many of these compounds can release Oxygen gas upon heating ?

KO_2, Na_2O_2, H_2O_2, BaO_2, CaO, K_2O, $NaNO_3$

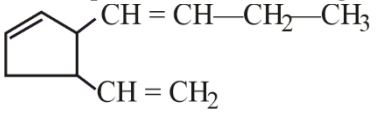
56. The total No. of possible isomers of the compound $[Cu^{II}(NH_3)_4][Pt^{II}Cl_4]$ are

57. Count the sp^3d hybridised species among the following
BrF_5, SF_6, XeF_4, PCl_5, ICl_3, $XeOF_4$, CCl_4, IF_7

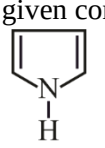
58. How many moles of RMgX can be consumed by one mole of following compound when it reacts with excess of RMgX.



59. Stereoisomer possible for following compound



60. How many πe^- in given compound?



Section-III (MATHEMATICS)

[Section – A]

61. The sum of coefficients of integral powers of x in the binomial expansion of $\left(1-2\sqrt{x}\right)^{50}$ is

(1) $\frac{1}{2}\left(3^{50}\right)$ (2) $\frac{1}{2}\left(3^{50}-1\right)$

(3) $\frac{1}{2}\left(2^{50}+1\right)$ (4) $\frac{1}{2}\left(3^{50}+1\right)$

62. The mean of the data set comprising of 16 observations is 16. If one of the observation valued 16 is deleted and three new observations valued 3, 4 and 5 are added to the data, then the mean of the resultant data, is

(1) 16.0 (2) 15.8

(3) 14.0 (4) 16.8

63. Let O be the vertex and Q be any point on the parabola, $x^2 = 8y$. If the point P divides the line segment OQ internally in the ratio 1 : 3, then the locus of P is

(1) $y^2 = x$ (2) $y^2 = 2x$

(3) $x^2 = 2y$ (4) $x^2 = y$

64. If 12 identical balls are to be placed in 3 identical boxes, then the probability that one of the boxes contains exactly 3 balls is

(1) $55\left(\frac{2}{3}\right)^{10}$ (2) $220\left(\frac{1}{3}\right)^{12}$

(3) $22\left(\frac{1}{3}\right)^{11}$ (4) $\frac{55}{3}\left(\frac{2}{3}\right)^{11}$

65. A compex number z is said to be unimodular if $|z| = 1$. Suppose z_1 and z_2 are complex numbers such that $\frac{z_1-2z_2}{2-z_1\bar{z}_2}$ is unimodular and z_2 is not unimodular. Then the point z_1 lies on a

(1) straight line parallel to y-axis
(2) circle of radius 2
(3) circle of radius $\sqrt{2}$
(4) straight line parallel to x-axis

66. The integral $\int \frac{dx}{x^2\left(x^4+1\right)^{3/4}}$ equals

(1) $\left(x^4+1\right)^{1/4}+c$ (2) $-\left(x^4+1\right)^{1/4}+c$

(3) $-\left(\frac{x^4+1}{x^4}\right)^{1/4}+c$ (4) $\left(\frac{x^4+1}{x^4}\right)^{1/4}+c$

67. The equaton of the plane containing the line $2x-5y+z=3; x+y+4z=5$, and parallel to the plane, $x+3y+6z=1$, is

(1) $x+3y+6z=-7$
(2) $x+3y+6z=7$
(3) $2x+6y+12z=-13$
(4) $2x+6y+12z=13$

68. The area (in sq. units) of the region described by $\left\{(x,y): y^2 \le 2x \text{ and } y \ge 4x-1\right\}$ is

(1) $\frac{5}{64}$ (2) $\frac{15}{64}$

(3) $\frac{9}{32}$ (4) $\frac{7}{32}$

69. If m is the A.M. of two distinct real numbers l and n (l, $n > 1$) and G_1, G_2 and G_3 are three geometric means between l and n, then $G_1^4+2G_2^4+G_3^4$ equals

(1) $4lm^2n$ (2) $4lmn^2$

(3) $4l^2m^2n^2$ (4) $4l^2mn$

70. Locus of the image of the point (2, 3) in the line $(2x-3y+4)+k(x-2y+3)=0, k \in R$, is a

(1) straight line parallel to *y*-axis

(2) circle of radius $\sqrt{2}$

(3) circle of radius $\sqrt{3}$

(4) straight line parallel to *x*-axis

71. Let $\tan^{-1} y = \tan^{-1} x + \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, where $|x| < \frac{1}{\sqrt{3}}$. Then a value of *y* is

(1) $\frac{3x+x^3}{1-3x^2}$ (2) $\frac{3x-x^3}{1+3x^2}$

(3) $\frac{3x+x^3}{1+3x^2}$ (4) $\frac{3x-x^3}{1-3x^2}$

72. The negation of $\sim s \vee (\sim r \wedge s)$ is equivalent to

(1) $s \wedge (r \wedge \sim s)$

(2) $s \vee (r \vee \sim s)$

(3) $s \wedge r$

(4) $s \wedge \sim r$

73. If the angles of elevation of the top of a tower from three collinear points *A*, *B* and *C*, on a line leading to the foot of the tower, are 30°, 45° and 60° respectively, then the ratio, *AB* : *BC*, is

(1) $\sqrt{3}:\sqrt{2}$

(2) $1:\sqrt{3}$

(3) 2 : 3

(4) $\sqrt{3}:1$

74. $\lim\limits_{x\to 0} \frac{(1-\cos 2x)(3+\cos x)}{x \tan 4x}$ is equal to

(1) 3 (2) 2

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

75. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three non-zero vectors such that no two of them are collinear and $(\vec{a} \times \vec{b}) \times \vec{c} = \frac{1}{3}|\vec{b}||\vec{c}|\vec{a}$. If θ is the angle between vectors $\vec{b}$ and $\vec{c}$, then a value of sin θ is

(1) $\frac{-\sqrt{2}}{3}$ (2) $\frac{2}{3}$

(3) $\frac{-2\sqrt{3}}{3}$ (4) $\frac{2\sqrt{2}}{3}$

76. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying the equation $AA^T = 9I$, where *I* is 3 × 3 identity matrix, then ordered pair (*a*, *b*) is equal to

(1) (– 2, 1) (2) (2, 1)

(3) (– 2, –1) (4) (2, –1)

77. If the function $g(x) = \begin{cases} k\sqrt{x+1}, & 0 \le x \le 3 \\ mx+2, & 3 < x \le 5 \end{cases}$ is differentiable, then the value of $k + m$ is

(1) $\frac{16}{5}$ (2) $\frac{10}{3}$

(3) 4 (4) 2

78. The set of all values of λ for which the system of linear equations

$2x_1 - 2x_2 + x_3 = \lambda x_1$

$2x_1 - 3x_2 + 2x_3 = \lambda x_2$

$-x_1 + 2x_2 = \lambda x_3$

has a non-trivial solution,

(1) is a singleton

(2) contains two elements

(3) contains more than two elements

(4) is an empty set

79. The normal to the curve, $x^2 + 2xy - 3y^2 = 0$, at (1, 1)

(1) meets the curve again in the second quadrant

(2) meets the curve again in the third quadrant

(3) meets the curve again in the fourth quadrant

(4) does not meet the curve again

80. Let $y(x)$ be the solution of the differential equation $(x \log x)\frac{dy}{dx} + y = 2x \log x, (x \ge 1)$. Then $y(e)$ is equal to

(1) 0 (2) 2

(3) $2e$ (4) e

Section – B]

81. The sum of first 9 terms of the series $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \ldots$ is

82. Let $f(x)$ be a polynomial of degree four having extreme values at $x = 1$ and $x = 2$. If $\lim\limits_{x\to 0}\left[1 + \frac{f(x)}{x^2}\right] = 3$, then $f(2)$ is equal to

83. Let α and β be the roots of equation $x^2-6x-2=0$. If $a_n=\alpha^n-\beta^n$, for $n \geq 1$, then the value of $\frac{a_{10}-2a_8}{2a_9}$ is equal to

84. The number of points, having both co-ordinates as integers, that lie in the interior of the triangle with vertices (0, 0), (0, 41) and (41, 0), is

85. The distance of the point (1, 0, 2) from the point of intersection of the line $\frac{x-2}{3}=\frac{y+1}{4}=\frac{z-2}{12}$ and the plane $x-y+z=16$, is

86. The area (in sq. units) of the quadrilateral formed by the tangents at the end points of the latusrectum to the ellipse $\frac{x^2}{9}+\frac{y^2}{5}=1$, is

87. The number of integers greater than 6,000 that can be formed, using the digits 3, 5, 6, 7 and 8, without repetition, is

88. Let A and B be two sets containing four and two elements respectively. Then the number of subsets of the set $A \times B$, each having at least three elements is

89. The integral $\int_2^4 \frac{\log x^2}{\log x^2+\log\left(36-12x+x^2\right)}dx$ is equal to

90. The number of common tangents to the circles $x^2+y^2-4x-6y-12=0$ and $x^2+y^2+6x+18y+26=0$, is

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