JEE MAIN- 2024-25 (Part Test-4)

(Physics, Chemistry and Mathematics)

SYLLABUS

Physics :- Thermal Properties of matter, Thermodynamics & KTG
Chemistry :- Chemical Equilibrium, Ionic Equilibrium
Mathematics :- Straight Line, Circle

4
PART TEST

CLASS-XIth

Date :- ..... **Time :- 3:00 Hrs.** **Marks :- 300**

Important Instructions :

1. The test duration is of **3 hours**.
2. The Test Booklet consists of 90 questions. The maximum marks are 300.
3. There are **three** parts in the question paper consisting of **Physics, Chemistry** and **Mathematics** having 30 questions in each part of equal weightage. Each part (subject) has two sections.

   (i) **Section-A:** This section contains 20 multiple choice questions which have only one correct answer. Each question carries **4 marks** for correct answer and **–1 mark** for wrong answer.
   (ii) **Section-B:** This section contains 10 questions. In Section-B, attempt any **five questions out of 10.** The answer to each of the questions is a numerical value. Each question carries **4 marks** for correct answer and **–1 mark** for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

Student's Name :- .....
School Name :- .....

Student's Signature :- ..... **Invigilator's Signature :- .....**

PHYSICS

SECTION-A

1. A gas is at pressure P and temperature T. Coefficient of volume expansion of one mole of gas at constant pressure is -

(A) $\frac{1}{T}$ (B) T (C) $\frac{1}{T^2}$ (D) T^2

2. If specific heat of a substance is infinite, it means-
(A) Heat is given out
(B) Heat is taken in
(C) No change in temperature takes place whether heat is taken in or given out
(D) All of the above

3. RMS velocity of an ideal gas at 27°C is 500 m/s. Temperature is increased four times, rms velocity will become -
(A) 1000 m/s (B) 560 m/s
(C) 2000 m/s (D) None of these

4. The equation of process of a diatomic gas is $P^2 = \alpha^2 V$, where α is a constant. Then choose the correct option-
(A) Work done by gas for a temperature change T is $\frac{2}{3}$ nRT
(B) The change in internal energy is $\frac{5}{2}$ nRT for a temperature change T
(C) Specific heat for the process is $\frac{19}{9}$ R
(D) The change in internal energy for a temperature change T is $\frac{5}{2}\alpha$ nRT

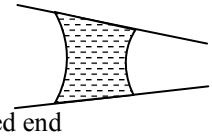
5. An anisotropic material has coefficient of linear expansion α , 2α and 3α along the three co-ordinate axis. Coefficient of cubical expansion of material will be equal to -
(A) 2α (B) $\sqrt[3]{6\alpha}$
(C) 6α (D) None of these

6. 80 gm of water at 30°C is poured on a large block of ice at 0°C. The mass of ice that melts is -
(A) 160 gm (B) 80 gm (C) 40 gm (D) 30 gm

7. A triatomic molecule can be modelled as three rigid sphere joined by three rigid rods forming an triangle. Consider a triatomic gas consisting such molecule. If gas performs 30 J work when it expands under constant pressure the heat given to gas is -
(A) 60 J (B) 30 J (C) 45 J (D) 120 J

8. Which of the following is a FALSE statement?
(A) Heat is energy transferred into or out of a system as a result of a temperature difference between the system and its surroundings.
(B) The heat added to an ideal gas during the transition from state 1 to state 2 depends only on the initial and final states, 1 and 2, and not on the path by which the gas went from one to the other.
(C) When a gas goes from one state to another, the work done depends on the path followed
(D) It does not make sense to refer to "the amount of heat in a body".

9. A conical pipe shown in figure have a water drop. The drop will tend to move towards -



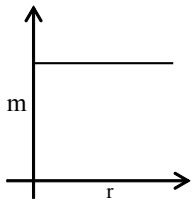
(A) tapered end
(B) wider end
(C) in any direction
(D) no tendency to move

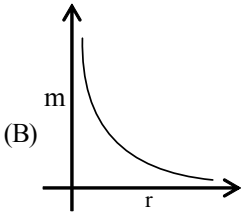
10. A liquid of cubical expansivity Y is heated in a vessel having linear expansivity $\frac{Y}{3}$ .Then level of liquid -
(A) Increase (B) decrease
(C) remain same (D) all-possible

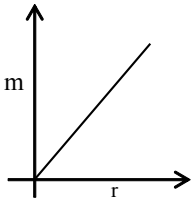
11. Ice point and steam point on a particular scale reads 10° and 80° respectively. The temperature on °F scale when temperature on new scale is 45° is -
(A) 50° F (B) 112°F (C) 122°F (D) 138°F

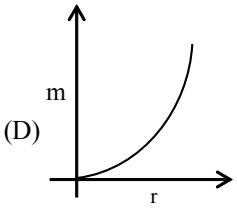
12. An ideal gas is held in a container of volume V at pressure P. The average speed of a gas molecule under these conditions is v. If now the volume and pressure are changed to 2V and 2P, the average speed of a molecule will be
(A) 1/2 v (B) v (C) 2v (D) 4v

13. Graph between the mass of liquid inside the capillary and radius of capillary is -

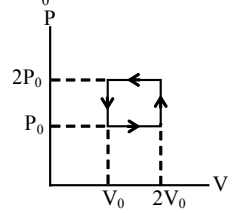
(A) 

(B) 

(C) 

(D) 

14. In Figure, an ideal gas is carried around the cyclic process. How much work is done in one cycle if P_0 = 8atm and V_0 = 7.00 liters.

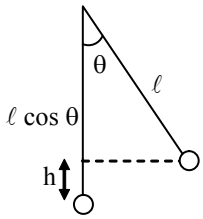


(A) 5656 J (B) -5656 J
(C) 10,600 J (D) 11,300 J

15. A rectangular block is heated from 0ºC to 100ºC. The percentage increase in its length is 0.10%. What will be the percentage increase in its volume ?
(A) 0.03 % (B) 0.10 %
(C) 0.30 % (D) None of these

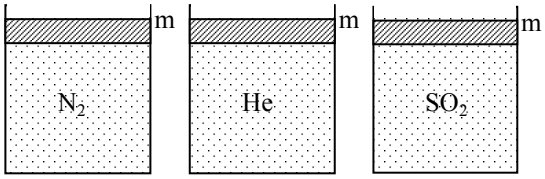
16. 300 g of water at 25°C is added to 100g of ice at 0°C. The amount of ice melts is -
(A) 6.25 g (B) 93.75 g
(C) 100 g (D) none of the above

17. A sphere of mass M kg is suspended by a metal wire of length L and diameter d. When in equilibrium there is a gap of $\Delta\ell$ between the sphere and the floor. The sphere is gently pushed aside so that it makes an angle θ with the vertical. Find θ_{max} so that sphere fails to rub the Floor. Young's modulus of the wire is Y -



(A) $\sin^{-1}\left(1-\frac{Y\pi d^2\Delta\ell}{8MgL}\right)$
(B) $\tan^{-1}\left(1-\frac{Y\pi d^2\Delta\ell}{8MgL}\right)$
(C) $\cos^{-1}\left(1-\frac{Y\pi d^2\Delta\ell}{8MgL}\right)$
(D) none

18. Container below are filled with three different gases as shown. Piston is made to oscillate in below three cases. Time Period of oscillation is T_A, T_B, T_C. Then-



(A) $T_A > T_B > T_C$ (B) $T_C > T_A > T_B$
(C) $T_C > T_B > T_A$ (D) $T_B > T_A > T_C$

19. The pressure and volume of a given mass of gas at a given temperature are P and V respectively. Keeping temperature constant, the pressure is increased by 10% and then decreased by 10%. The volume how will be -
(A) less than V
(B) more than V
(C) equal to V
(D) less than V for diatomic and more than V for monoatomic

20. The coefficients of thermal conductivity of copper, mercury and glass are respectively K_c, K_m and K_g such that $K_c > K_m > K_g$. If the same quantity of heat is to flow per second per unit area of each and corresponding temperature gradients are X_c, X_m and X_g.
(A) $X_c = X_m = K_g$ (B) $X_c > X_m > X_g$
(C) $X_c < X_m < X_g$ (D) $X_m < X_c < X_g$

SECTION-B

21. Temperature of a body while measuring with a centigrade scale was found to be 30ºC and was increasing at a rate $\frac{5}{3}$ ºC/sec. What will be rate of increase if we are measuring it with a Fahrenheit scale at the same instant ? (Ans in ºF/sec)

22. A diatomic molecule can be modelled as two rigid ball connected with spring such that the ball can vibrate with respect to centre of mass of the system (spring + balls). Consider a diatomic gas contain such diatomic molecule. If gas performs 20 Joule work under isobaric condition, then heat given to the gas (in Joule) is.

23. A bar measured with a Vernier Caliper is found to be 1800 mm long. The temperature during the measurement is 10ºC.
The measurement error if the scale of the Vernier Caliper has been graduated at a temperature of 20ºC is found to $x \times 10^{-2}$ mm. Find x.

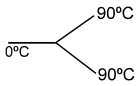
24. An aluminium sphere of 20 cm diameter is heated from 0ºC to 100ºC. Its volume changes by (given that coefficient of linear expansion for aluminium $\alpha_{Al} = 23 \times 10^{-6}$/ºC)

25. The molar heat capacity for the process is xR, where R is gas constant, when 10 J of heat added to a monoatomic ideal gas, then gas performs a work of 5 J on its surrounding, then x is.

26. A certain bullet of mass 6 gm melts at 300ºC and has specific heat as 0.20 Kcal/kg ºC and a heat fusion of $\frac{15\text{kcal}}{\text{kg}}$. The heat needed to melt the bullet if it was originally at 0ºC, can be written as λ kJ. Then the value of λ is. (J = 4)

27. Under standard conditions the gas density is 1.3 mg/cm^3 and the velocity of sound propagation in it is 330 m/s, then the number of degrees of freedom of gas is.

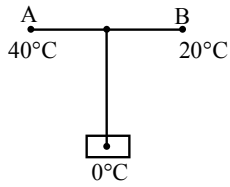
28. Three rods made of the same material and having the same cross-section are joined as shown in the fig. Each rod is of same length. The left and right ends are kept at 0°C and 90°C respectively. The temperature in ºC of the junction of the three rods will be :



29. If the termpreature of the sun were to increase from T to 2T and its radius from R to 2R, then the ratio of the radiant energy received on earth to what it was previously will be-

30. In the figure shown AB is a rod of length L and thermal resistance R_H = 10 SI unit and end A and B are maintained by 20°C and 40°C. At mid point of rod another rod of thermal resistance $R'_H = R_H/4$ SI unit connected and other end of rod is inserted into ice.

After steady state reach, we start counting of time, and find the amount of ice (in kg) melt in 5.6×10^4 s. ($L_f = 3.36 \times 10^5$ J/kg)



31. In a chemical equilibrium, the rate constant for the backward reaction is 7.5×10^{-4} and the equilibrium constant is 1.5. The rate constant for the forward reaction is:-
(A) 2×10^{-3} (B) 5×10^{-4}
(C) 1.12×10^{-3} (D) 9.0×10^{-4}

32. In this reaction $Ag^+ + 2NH_3 \rightleftharpoons Ag(NH_3)_2^+$ at 298K molar concentration of Ag^+, $Ag(NH_3)_2^+$ and NH_3 is 10^{-1}, 10^{-1}, and 10^3. The value of K^C at 298 K for this equilibrium :-
(A) 10^{-6} (B) 10^6 (C) 2×10^{-3} (D) 2×10^6

33. The equilibrium constant in a reversible reaction at a given temperature: -
(A) Depends on initial concentration of the reactants.
(B) Depends on the concentration of the products at equilibrium.
(C) Does not depend on the initial concentrations.
(D) It is not characteristic of the reaction.

34. Which of the following example shows effect of catalyst on reversible reaction ?
(A) It gives new reaction path with low activation energy.
(B) It shifts equilibrium right side.
(C) It decrease kinetic energy of activated molecules.
(D) It decrease rate of backward reaction.

35. For the reaction: $P \rightleftharpoons Q + R$. Initially 2 mol of P was taken. Up to equilibrium 0.5 mol of P was dissociated. What would be the degree of dissociation?
(A) 0.5 (B) 1 (C) 0.25 (D) 4.2

36. If 8 mol of PCl_5 heated in a closed vessel of 10L capacity and 25% of its dissociates into PCl_3 and Cl_2 at the equilibrium then value of K_P will be equal to:-
(A) P/30 (B) P/15 (C) 2/3P (D) 3/2P

37. The vapour density of completely dissociated NH_4Cl would be :-
(A) Slightly less than half of that of ammonium chloride
(B) Half of that of ammonium chloride
(C) Double of that of ammonium chloride
(D) Not measured

38. Basicity of H_3PO_3 and H_3PO_2 are respectively :-
(A) 1 and 2 (B) 2 and 3
(C) 3 and 2 (D) 2 and 1

39. The pH of 0.15 M solution of HOCl ($K_a = 9.6 \times 10^{-6}$) is:-
(A) 4.42 (B) 2.92 (C) 3.42 (D) None

40. pH of K_2S solution is:-
(A) 7 (B) Less than 7
(C) More than 7 (D) 0

41. The equilibrium concentration of $[B]_{eq}$ for the reversible reaction $A \rightleftharpoons B$ can be evaluated by the expression:
(A) $KC[A]e^{-1}$ (B) $\frac{k_f}{k_b}[A]_e^{-1}$
(C) $k_f k_b^{-1}[A]_e$ (D) $k_f k_b [A]^{-1}$

42. The reaction quotient Q for $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is given by $Q = \frac{[NH_3]^2}{[N_2][H_2]^3}$. The reaction will proceed in backward direction, when
(A) $Q = K_C$ (B) $Q < K_C$ (C) $Q > K_C$ (D) $A = 0$

43. Match the following :

Column-I (Assume only reactant were present initially)		Column -II	
(A)	For the equilibrium $NH_4I(s) \rightleftharpoons NH3(g) + HI(g)$, if pressure is increased at equilibrium	(P)	Forward shift
(B)	For the equilibrium $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$, inert gas is added at constant pressure at equilibrium	(Q)	No shift in equilibrium
(C)	For the equilibrium $PCl_5 \rightleftharpoons PCl_3 + Cl_2$, Cl_2 is removed at equilibrium.	(R)	Backward shift

(A) (A - r) ; (B - q) ; (C - p)
(B) (A - q) ; (B - r) ; (C - p)
(C) (A - p) ; (B - q) ; (C - r)
(D) (A - p) ; (B - r) ; (C - q)

44. **Assertion :** For the reaction, $N_2 + O_2 \rightleftharpoons 2NO$, increase in pressure at equilibrium has no effect on the reaction.
Reason : $\sum$ moles of gaseous product – $\sum$ moles of gaseous reactant = 0.
(A) Both assertion and reason are correct, and the reason is the correct explanation for the assertion
(B) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion
(C) The assertion is incorrect, but the reason is correct
(D) Both are assertion and reason are incorrect

45. If the solubility of lithium sodium hexafluoro aluminate $Li_3Na_3(AlF_6)_2$ is 'S' mole/litre. Its solubility product is equal to :-
(A) S^8 (B) $12\ S^3$ (C) $18S^3$ (D) $2916\ S^8$

46. If the solubility product of $AgBrO_3$ and Ag_2SO_4 are 5.5×10^{-5} and 2×10^{-5} respectively, the relationship between the solubilities of these can be correctly represented as:-
(A) $sAgBrO_3 > sAg_2SO_4$ (B) $sAgBrO_3 = sAg_2SO_4$
(C) $sAgBrO_3 < sAg_2SO_4$ (D) $sAgBrO_3 = sAgSO_4$

47. Find the percentage ionisation of 0.2 M acetic acid solution, whose dissociation constant is 1.8×10^{-5}
(A) 0.198 (B) 0.290
(C) 0.950 (D) None of these

48. The pK_a of acetylsalicylic acid (aspirin) is 3.5. The pH of gastric juice in human stomach is about 2-3 and the pH in the small intestine is about 8. Aspirin will be:
(A) Unionised in the small intestine and in the stomach
(B) Completely ionised in the small intestine and in the stomach
(C) Ionised in the stomach and almost unisonised in the small intestine
(D) Ionised in the small intestine and almost unionized in the stomach

49. **Assertion :** Aqueous solution of $CuSO_4$ turns red litmus blue.
Reason : It gives basic solution on hydrolysis.
(A) Both assertion and reason are correct, and the reason is the correct explanation for the assertion
(B) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion
(C) The assertion is incorrect, but the reason is correct
(D) Both are assertion and reason are incorrect.

50. The conjugate base of $H_2PO_4^-$ is :
(A) PO_4^{3-} (B) P_2O_5 (C) H_3PO_4 (D) HPO_4^{2-}

SECTION-B

51. For the reaction $C(s) + CO_2(g) \rightleftharpoons 2CO(g)$ the partial pressure of CO and CO_2 are 2.0 and 4.0 atm, respectively at equilibrium. The K_p for the reaction is

52. For the reactions :- $A \rightleftharpoons B$; $K_C = 2$, $B \rightleftharpoons C$; $K_C = 4$, $C \rightleftharpoons D$; $K_C = 6$; K_C for the reaction $A \rightleftharpoons D$:-

53. The equilibrium constant of the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ is 64. If the volume of the container is reduced to one fourth of its original volume, the value of the equilibrium constant will be

54. 4 mol of PCl_5 are heated at constant temperature in closed container. If degree of dissociation for PCl_5 is 0.5 then calculate total number of moles at equilibrium.

55. In a 13 L vessel initially following reaction occur $C(s) + S_2(g) \rightleftharpoons CS_2(g)$ by 12 g C, 64 g S_2, 76 g CS_2 at 1027°C temperature then total pressure in term of 'R'.

56. The degree of dissociation of acetic acid is given by the expression $\alpha = 0.1 \times C^{-1}$ (where C = concentration of the acid). What is the pH of the solution?

57. 1.50 moles each of hydrogen and iodine were placed in a sealed 10 litre container maintained at 717 K. At equilibrium 1.25 moles each of hydrogen and iodine were left behind. The equilibrium constant, K_c for the reaction.
$H_2(g) + I_2(g)$ '! 2HI(g) at 717 K is

58. Vapour density of PCl_5 is 104.16 but when heated to 230°C its vapour density is reduced to 62. The degree of dissociation of PCl5 at this temperature will be :

59. Solubility product of $Mg(OH)_2$ is 1×10^{-11}. At what pH, precipitation of $Mg(OH)_2$ will begin from 0.1 M Mg^{2+} solution?

60. What volume of 0.05 M H_2SO_4 must be added to 10 ml of 0.1 M NaOH solution to neutralise 50% base ?

61. The locus of the foot of the perpendicular from the origin upon chords of the circle $x^2 + y^2 - 2x - 4y - 4 = 0$, which subtend a right angle at the origin is.
(A) $x^2 + y^2 - x - 2y - 2 = 0$
(B) $2(x^2 + y^2) - 2x - 4y + 3 = 0$
(C) $x^2 + y^2 - 2x - 4y + 4 = 0$
(D) $x^2 + y^2 + x + 2y - 2 = 0$

62. If the coordinates of A and B be (1, 1) and (5, 7), then the equation of the perpendicular bisector of the line segment AB is-
(A) $2x + 3y = 18$ (B) $2x - 3y + 18 = 0$
(C) $2x + 3y - 1 = 0$ (D) $3x - 2y + 1 = 0$

63. The graphs of
$$x^2 + y^2 = 4 + 12x + 6y$$
$$x^2 + y^2 = k + 4x + 12y$$
intersect where k satisfies $a \le k \le b$ & for no other value of k. Find $(b - a)$.
(A) 144 (B) 140 (C) 104 (D) 68

64. Two circles of radii r_1 and r_2 are both touching the coordinate axes and intersecting each other orthogonally. The value of $\frac{r_1}{r_2}$ (where $r_1 > r_2$) equals
(A) $2 + \sqrt{3}$ (B) $\sqrt{3} + 1$
(C) $2 - \sqrt{3}$ (D) $2 + \sqrt{5}$

65. Suppose x and y are real numbers such that $(x + 5)^2 + (y - 12)^2 = 196$. The minimum value of $(x^2 + y^2)$ is
(A) 1 (B) $\frac{1}{2}$ (C) $\sqrt{2}$ (D) $\sqrt{3}$

66. If two vertices of an equilateral triangle are A $(-a, 0)$ and B $(a, 0)$, $a > 0$ and the third vertex C lies above x-axis then the equation of the circumcircle of triangle ABC is
(A) $x^2 + y^2 - 2ay = a^2$
(B) $x^2 + y^2 - \sqrt{3}\,ay = a^2$
(C) $3x^2 + 3y^2 - 2\sqrt{3}\,ay = 3a^2$
(D) $3x^2 + 3y^2 - 2ay = 3a^2$

67. The equation of a line which is concurrent with lines $L_1 : x - 2y - 1 = 0$ and $L_2 : x + y - 2 = 0$ and tangent to the circle $x^2 + y^2 - 6x + 2y + 6 = 0$, is
(A) $3x - 3y = 4$ (B) $9x - 3y = 14$
(C) $3x - 9y = 2$ (D) none

68. The equation of a line inclined at an angle $\frac{\pi}{4}$ to the axis X, such that the two circles $x^2 + y^2 = 4$ and $x^2 + y^2 - 10x - 14y + 65 = 0$ intercept equal lengths on it, is
(A) $2x - 2y - 3 = 0$ (B) $2x - 2y + 3 = 0$
(C) $x - y + 6 = 0$ (D) $x - y - 6 = 0$

69. If the equation $x^2 + y^2 + 2xy + 2gx + 2fy + 4 = 0$ represents a pair of real straight lines, then the possible value of g is equal to
(A) -1 (B) 0 (C) 1 (D) 2

70. An incident ray is reflected by the line mirror $y = 1$ at the point (2, 1). If the reflected ray touches the circle $x^2 + y^2 = 1$, then the equation of incident ray is
(A) $3x - 4y - 2 = 0$ (B) $3x + 4y - 10 = 0$
(C) $4x - 3y - 5 = 0$ (D) $4x + 3y - 11 = 0$

71. The equation of line through (1, 2) and parallel to $3x - y - 4 = 0$ is-
(A) $3x - y + 1 = 0$ (B) $x + 3y - 1 = 0$
(C) $x - 3y + 1 = 0$ (D) $3x - y - 1 = 0$

72. Let ABC be an equilateral triangle and suppose KLMN be a rectangle with K, L on BC, M on AC and N on AB. If $\frac{AN}{NB} = 2$ and area of triangle BKN is 6, then area of triangle ABC is equal to
(A) 48 (B) 54 (C) 96 (D) 108

73. The least positive integral value of 'b' for which the point $(2b + 3, b^2)$ lies above the line $3x - 4y - a(a - 2) = 0\ \forall\ a \in R$, is
(A) 1 (B) 2 (C) 3 (D) 4

74. If pair of straight lines $x^2 - y^2 + 2x + 4y - k = 0$ are tangents to a circle $(x + 1)^2 + (y - 9)^2 = r^2$ then the value of $(k + 2r^2)$ is equal to
(A) 10 (B) 22 (C) 32 (D) 52

75. In ΔABC, let its incircle touches the sides BC, CA and AB at D, E and F respectively and I is its incentre. If area $(\Delta IAC) = 2$ area $(\Delta IBF) = 4$ sq. unit, then area (ΔABC) is
(A) 6 sq. units (B) 12 sq. units
(C) 18 sq. units (D) 24 sq. units

76. A ray of light is sent along the line $x - 2y - 3 = 0$ upon reaching the line $3x - 2y - 5 = 0$, the ray is reflected from it. Find the equation of the line containing the reflected ray.
(A) $29x - 2y - 31 = 0$ (B) $29x + 2y + 31 = 0$
(C) $29x - 2y + 31 = 0$ (D) $29x + 2y - 31 = 0$

77. The number of integer values of m, for which the x co-ordinate of the point of intersection of the lines $3x + 4y = 9$ and $y = mx + 1$ is also an integer, is
(A) 2 (B) 0 (C) 4 (D) 1

78. The area bounded by the angle bisectors of the lines $x^2 - y^2 + 2y = 1$ and the line $x + y = 3$, is
(A) 2 (B) 3 (C) 4 (D) 6

79. The area of triangle formed by the lines $x^2 - y^2 = 0$ and the line passing through (3, 2) with slope $\frac{3}{2}$, is
(A) $\sqrt{2}$ (B) $\frac{1}{2}$ (C) $5\sqrt{2}$ (D) 5

80. Given a point M(–1, 2) and a variable point N lies on the locus whose equation is $xy = 4$, then the locus of the point dividing MN internally in the ratio 2 : 3 is
(A) $25xy - 30x + 15y = 34$
(B) $25xy - 15x + 30y = 34$
(C) $25xy - 30x + 15y = 2$
(D) $25xy - 15x + 30y = 2$

SECTION-B

81. If the line passing through (4, 3) and (2, k) is perpendicular to $y = 2x + 3$, then k=

82. The number of points on the line $3x + 4y = 5$, which are at a distance of $\sec^2\theta + 2\,\text{cosec}^2\theta$, $\theta \in R$, from the point (1, 3), is-

83. Let **K** denotes the square of the diameter of the circle whose diameter is the common chord of the two circles $x^2 + y^2 + 2x + 3y + 1 = 0$ and $x^2 + y^2 + 4x + 3y + 2 = 0$ and **W** denotes the sum of the abscissa and ordinates of a point P where all variable chords of the curve $y^2 = 8x$ subtending right angles at the origin, are concurrent. and **H** denotes the square of the length of the tangent from the point (3, 0) on the circle $2x^2 + 2y^2 + 5y - 16 = 0$.
Find the value of KWH.

84. If circle $x^2 + y^2 + 6x + 8y + a = 0$ bisects circumference of circle $x^2 + y^2 + 2x - 6y - b = 0$ then $|a + b| =$

85. The circles, which cut the family of circles passing through the fixed points A ≡ (2, 1) and B ≡ (4, 3) orthogonally, pass through two fixed points (x_1, y_1) and (x_2, y_2), which may be real or imaginary. Find the value of $\left(x_1^3 + x_2^3 + y_1^3 + y_2^3\right)$.

86. If the variable line $y = \beta x + c$, $c \neq 0$, $\beta \neq \pm 1$ (β is fixed and c varies) intersects the curve $y^2 - x^2 = 0$ at A and B then locus of the middle point of A and B is the curve $c_\beta = 0$. Find the area of the region enclosed by the curves $c_2 = 0$, $c_{1/2} = 0$ and $x = 2$.

87. Two sides of a square lie on the lines $x + y = 1$ and $x + y + 2 = 0$. If its area is k then find the value of 2k ?

88. In ΔABC, the equation of the perpendicular bisector of AC is $3x - 2y + 8 = 0$ and the coordinates of the points A and B are (1, –1) and (3, 1) respectively. If the equation of the line BC is $x + ay = b$ where a and b are coprime, then find (a + b).

89. For $a > 0$, the area of the quadrilateral formed by the lines $3x - 2y + 3a = 0$, $x + 3y - a = 0$, $x + 3y + 4a = 0$ and $3x - 2y + 7a = 0$ is 220 square units. Find the value of a.

90. Let ABCD in order be a square. The coordinates of A and C are (1, 3) and (5, 1) respectively. Find the product of the abscissae of B and D.