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PRERNA SAMPLE TEST PAPER

JEE (Main)/2019

SAMPLE PAPER

Time Allotted : 3 Hours **Maximum Marks : 360**

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

A. General Instructions :

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. 1 to 30 Physics, 31 to 60 Chemistry and 61 to 90 Mathematics.
3. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
4. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic device in any form, are not allowed.

B. Filling of OMR Sheet :

1. Ensure matching of OMR sheet with the question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with black/blue pen for each character of your Enrollment No. and write your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for making answer.

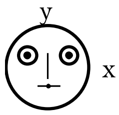
C. Marking Scheme for All Three Parts :

1. This booklet contains 90 questions & all questions are compulsory.
2. For each question you will be **awarded 4 marks** if you have darkened **only** the bubble corresponding to the correct answer and **zero mark** if no bubbles are darkened. In all other cases, **minus one (–1) mark** will be awarded.

Name of Candidate :

Enrollment No. :

1. Look at the drawing given in the figure, which has been drawn with ink of uniform line thickness. The mass of ink used to draw each of the two inner circles, and each of the two line segments is m. The mass of the ink used to draw the outer circle is 6 m. The coordinate of the centres of the different parts are : outer circle (0,0) left inner circle (- a, a), right inner circle (a , a), vertical line (0,0) and horizontal line (0, - a). The y – coordinate of the centre of mass of the ink in this drawing is



(a) a/10 (b) a/8 (c) a/12 (d) a/3

2. Two blocks of masses 10 kg and 4 kg are connected by a spring of negligible mass and placed on a frictionless horizontal surface. An impulse gives a velocity of 14 m/s to the heavier block in the direction of the lighter block. The velocity of the centre of mass it

(a) 30 m/s (b) 20 m/s (c) 10 m/s (d) 5 m/s

3. Two particles A and B initially at rest, move towards each other by mutual force of attraction. At the instant when the speed of A is v and the speed of B is 2v, the speed of the centre of mass of the system is

(a) 3 v (b) v (c) 1.5 v (d) zero

4. A particle moves in the X – Y plane under the influence of a force such that its linear momentum is P(t) = A [î cos (kt) – j^(cap) sin (kt)], where, A and K are constants. The angle between the force and the momentum is

(a) 0° (b) 45° (c) 30° (d) 90°

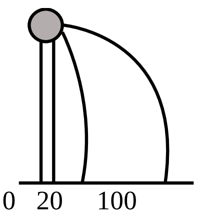
5. A particle of mass m moving in the x-direction with speed 2v is hit by another particle of mass 2m moving in the y-direction with speed v. If the collision is perfectly inelastic, the percentage loss in the energy during the collision is close to

(a) 50 % (b) 56 % (c) 62 % (d) 44 %

6. A particle of mass m is projected from the ground with an initial speed u_o at an angle a with the horizontal. At the highest point of its trajectory, it makes a completely inelastic collision with another identical particle, which was thrown vertically upward from the ground with the same initial speed u_o. The angle that the composite system makes with the horizontal immediately after the collision is

(a) π/4 (b) π/4 + a (c) π/4 – a (d) π/2

7. A ball of mass 0.2 kg rests on a vertical post of height 5 m. A bullet of mass 0.01 kg, travelling with a velocity v m/s in a horizontal direction, hits the centre of the ball. After the collision, the ball and bullet travel independently. The ball hits the ground at a distance of 20 m and the bullet at a distance of 100 m from the foot of the post. The initial velocity v of the bullet is



(a) 250 m/s (b) 250√2 m/s (c)400m/s (d) 500 m/s

8. An isolated particle of mass m is moving in horizontal plane (x - y), along the x – axis , at a certain height above the ground. It suddenly explodes into two fragment of masses m/4 and 3m/4. An instant later, the smaller fragment is at y = +15 cm. The larger fragment at this instant is at

(a) y = - 5 cm (b) y = + 20 cm (c)y=+ 5 cm (d) y = - 20 cm

9. A shell is fired from a cannon with a velocity v (m/s) at an angle θ with the horizontal direction. At the highest point in its path it explodes into two pieces of equal mass. One of the pieces retraces its path to the cannon and the speed (m/s) of the other piece immediately after the explosion is

(a) 3 v cos θ (b) 2 v cos θ (c)3/2 v cos θ (d) √3/2 v cos θ

10. A ball hits the floor and rebounds after an inelastic collision. In the case

(a) the momentum of the ball just after the collision is the same as that just before the collision

(b) the mechanical energy of the ball remains the same in the collision

(c) the total momentum of the ball and the earth is conserved

(d) the total mechanical energy of the ball and the earth is conserved

11. Statement 1 In an elastic collision between two bodies, the relative speed of the bodies after collision is equal to the relative speed before the collision. Statement II In an elastic collision, the linear momentum of the systems conserved.

(a) If statement 1 is true, statement II is true; Statement II is the correct explanation for statement 1

(b) If statement 1 is true, statement II is true; Statement II is not a correct explanation for statement 1

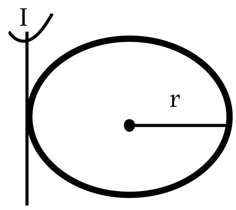
(c) If statement 1 is true; Statement II is false

(d) If statement 1 is false; Statement II is false

12. From a solid sphere of mass M and radius R, a cube of maximum possible volume is cut. Moment of inertia of cube about an axis passing through its centre and perpendicular to one of its faces is

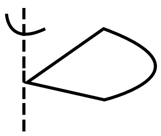
(a) $MR^2/32\sqrt{2}\pi$ (b) $4MR^2/9\sqrt{3}\pi$ (c) $MR^2/16\sqrt{2}\pi$ (d) $4MR^2/3\sqrt{3}\pi$

13. A solid sphere of radius R has moment of inertia I about its geometrical axis. It is melted into a disc of radius r and thickness t. If it's moment of inertia about the tangential axis (which is perpendicular to plane of the disc),is also equal to I, then the value of r is equal to



(a) $2/\sqrt{15}$ R (b) $2/\sqrt{5}$ R (c) $3/\sqrt{15}$ (d) $\sqrt{3}/\sqrt{15}$ R

14. One quarter section is cut from a uniform circular disc of radius R. This section has a mass M. It is made to rotate about a line perpendicular to its plane and passing through the centre of the original disc. Its moment of inertia about the axis of rotation is

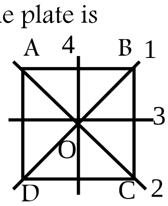


(a) $\frac{1}{2}MR^2$ (b) $\frac{1}{4}MR^2$ (c) $1/8\ MR^2$ (d) $\sqrt{2}\ MR^2$

15. Let I be the moment of inertia of a uniform square plate about an axis AB that passes through its centre and is parallel to two of its sides. CD is a line in the plane of the plate that passes through the centre of the plate and makes an angle

(a) I (b) $I\sin^2\theta$ (c) $I\cos^2 t\theta$ (d) $I\cos^2(\theta/2)$

16. The moment of inertia of a thin square plate ABCD, of uniform thickness about an axis passing through the centre O and perpendicular to the plane of the plate is



(a) $I_1 + I_2$ (b) $I_3 + I_4$

(b) $I_1 + I_3$ (d) $I_1 + I_3 + I_4$

17. A bob of mass m attached to an inextensible string of length L is suspended from a vertical support. The bob rotates in a horizontal circle with an angular speed (omega) rad/s about the vertical support. About the point of suspension

(a) angular momentum is conserved

(b) angular momentum changes in magnitude but not in direction

(c) angular momentum changes in direction but not in magnitude

(d) angular momentum changes both in direction and magnitude

18. **Statement I** Two cylinders, one hollow (metal) and the other solid (wood) with the same mass and identical dimensions are simultaneously allowed to roll without slopping down an inclined plane from the same height. The hollow cylinder will reach the bottom of the inclined plane first.

Statement II By the principle of conservation of energy, the total kinetic energies of both the cylinders are identical when they reach the bottom of the incline.

(a) If statement 1 is true, statement II is true; statement II is the correct explanation for statement I

(b) If statement 1 is true, statement II is true; statement II is not a correct explanation for statement I

(c) If statement 1 is true, statement II is false

(d) If statement 1 is false, statement II is true

19. The centre of mass of the disk undergoes simple harmonic motion with angular frequency (omega) equal to

(a) $\sqrt{K/M}$ (b) $\sqrt{2K/M}$ (c) $\sqrt{2K/3M}$ (d) $\sqrt{4K/3M}$

20. A smooth sphere A is moving on a frictionless horizontal plane with angular velocity (omega) and centre of mass velocity v. It collides elastically and head on with an identical sphere B at rest. Neglect friction everywhere. After the collision their angular speeds are (omega $_A$)and omega $_B$ respectively. Then

(a) omega $_A$ < omega $_B$ (b) omega $_A$ = omega $_B$

(c) omega $_A$ = omega (d) omega $_B$ = omega

21. A tube of length L is filled completely with an incompressible liquid of mass M and closed at both the ends. The tube is then rotated in a horizontal plane about the one of its ends with a uniform angular velocity omega. The force exerted by the liquid at the other end is

(a) M omega^2 L/2 (b) M omega^2 L

(c) M omega^2 L/4 (d) M omega^2 $L^2/2$

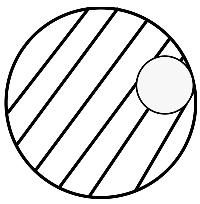
22. A planet of radius R = 1/10 X (radius of earth) has the same mass density as earth. Scientists dig a well of depth R/5 on it and lower a wire of the same length and of linear mass density 10^{-3} kgm^{-1} into it. If the wire is not touching anywhere, the force applied at the top of the wire by a person holding it in place is (take the radius of earth = 6 x 10^6 m and the acceleration due to gravity of earth is 10 ms^{-2})

(a) 96 N (b) 108 N (c) 120 N (d) 150 N

23. If the radius of the earth were to shrink by one per cent, its mass remaining the same, the acceleration due to gravity on the earth' surface would

(a) decrease (b) remain unchanged (c)increase (d) be zero

24. From a solid sphere of mass M and radius R, a spherical portion of radius (R/2) is removed as shown in the figure. Taking gravitational potential V = 0 at r = ∞, the potential at the centre of the cavity thus formed is (G = gravitational constant)



(a) - GM/R (b) - GM/R (c)-2GM/3R (d) - 2 GM/R

25. Two spherical planets P and Q have the same uniform density p, masses M_p and surface areas A and 4 A, respectively. A spherical planet R also has uniform density p and its mass is ($M_p + M_q$). The escape velocities from the planets P , Q and R are V_p ,V_Q and V_R, respectively. Then

(a) $V_Q > V_R > V_P$ (b) $V_R > V_Q > V_P$ (c) $V_R/V_P = 3$ (d) $V_P/V_Q = 1/2$

26. What is the minimum energy required to lunch a satellite of mass m from the surface of a planet of mass M and radius R in a circular orbit at an altitude of 2R?

(a) 5GmM/6R (b) 2GmM/3R (c) GmM/2R (d) GmM/3R

27. A satellite is moving with a constant speed v in a circular orbit about the earth. An object of mass m is ejected from the satellite such that it just escapes from the gravitational pull of the earth. At the time of its ejection, the kinetic energy of the object is

(a) ½ mv^2 (b) mv^2 (c) 3/2 mv^2 (d) $2mv^2$

28. A geostationary satellite orbits around the earth in a circular orbit of radius 36,000 km. Then, the time period of a spy satellite orbiting a few hundred km above the earth's surface (Re = 6400 km) will approximately be

(a) ½ h (b) 1 h (c) 2 h (d) 4 h

29. A satellite S is moving in an elliptical orbit around the earth. The mass of the satellite is very small compared to the mass of the earth

(a) the acceleration of S is always directed towards the centre of the earth

(b) the angular momentum of S about the centre of the earth changes in direction, but its magnitude remains constant

(c) the total mechanical energy of S varies periodically with time

(d) the linear momentum of S remains constant in magnitude

30. **Statement I** An astronaut in an orbiting space station above the earth experiences weightlessness. **Statement II** An object moving around the earth under the influence of earth's gravitational force is in a state of free-fall

(a) If statement 1 is true, statement II is true; statement II is the correct explanation for statement 1

(b) If statement 1 is true, statement II is true; statement II is not a correct explanation for statement 1

(c) If statement 1 is true, statement II is false (d) If statement 1 is false, statement II is true

31. The sublimation energy of $I_2(s)$ is 57.3 KJ/ mol and the enthalpy of fusion is 15.5 kJ/mol . The enthalpy of vaporisation of I_2 is:

(a) 41.8 kJ/mol (b) - 41.8 kJ/mol (c)72.8kJ/mol (d) - 72.8 kJ/mol

32. Consider the reaction, $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$; carried out at constant temperature and pressure. If ΔH and ΔU are enthalpy change and internal energy change respectively, which of the following expression is true?

(a) $\Delta H = 0$ (b) $\Delta H = \Delta U$ (c)$\Delta H < \Delta U$ (d) $\Delta H > \Delta U$

33. Standard entropies of X_2, Y_2 and XY_3 are 60, 40 and 50 JK^{-1} mol^{-1} respectively. For the reaction ; ½ X_2 + 3/2 $Y_2 \rightarrow XY_3$, ΔH = - 30 KJ to be at equilibrium, the temperature will be?

(a) 1000 K (b) 1250 K (c)500K (d) 750 K

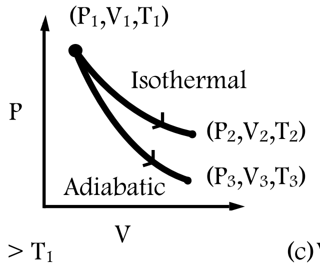
34. A I g sample of substance A at 100°c is added to 100 ml of H_2O at 25°C. Using separate 100 mL portion of H_2O, the procedure is repeated with substance B and then with substance C. How will the final temperatures of the water compare?

Substance	Specific heat
A	0.6 J g^{-1} ° C^{-1}
B	0.4 J g^{-1} ° C^{-1}

C	$0.2\ J\ g^{-1}\ {}^{o}C^{-1}$

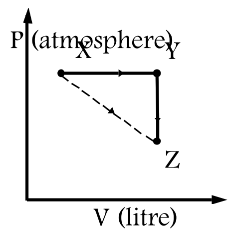
(a) $T_C > T_B > T_A$ (b) $T_B > T_A > T_C$ (c) $T_A > T_B > T_C$ (d) $T_A = T_B = T_C$

35. The reversible expansion of an ideal gas under adiabatic and isothermal condition is shown in the figure. Which of the following statement(s) is (are) correct?



(a) $T_1 + T_2$ b) $T_3 > T_1$ (c) $W_{isothermal}$ (d) $\Delta U_{isothermal} > \Delta U_{adiabatic}$

36. For an ideal gas, consider only P-V work in going from an initial state X to the final state Z. The final state Z can can be reached by either of the two paths shown in the figure. Which of the following choice(s) is (are) correct ? [take ΔS as change in entropy and w as work done]



(a) $\Delta S_{x \to Z} = \Delta S_{x \to Y} + \Delta S_{x \to Y}$

(b) $W_{x \to Z} = W_{x \to Y} + W_{y \to z}$

(c) $W_{x \to y \to z} = W_{x \to Y}$

(d) $\Delta S_{x \to y \to Z} = \Delta S_{x \to y}$

37. The value of 10 $\log_{10}$ K for a reaction A ⇆ B is: (given, $\Delta_r H^o_{298k} = -\ 54.07$ KJ mol^{-1}, $\Delta_r S^o_{298k} = 10\ JK^{-1}\ mol^{-1}$ and R = 8.314 $JK^{-1}\ mol^{-1}$; 2.303 X 8.314 X 298 = 5705)

(a) 5 (b) 10 (c) 95 (d) 100

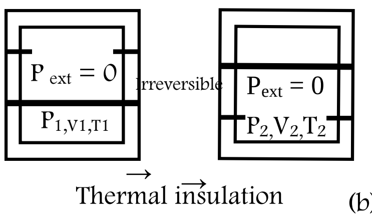
38. A gas expands adiabatically at constant pressure such that: $T \propto 1/\sqrt{V}$ The value of Y , i.e., (C_p / C_v) of the gas will be

(a) 1.30 (b) 1.50 (c) 1.70 (d) 2

39. For an ideal gas [C_{pm}/C_{vm} = Y]; of molar mass, its specific heat capacity at constant volume is :

(a) $Y^R/(Y - 1)M$ b) $Y/M(Y - 1)$ (c) $M/R(Y-1)$ (d) $Y^{RM}/Y - 1$

40. An ideal gas in a thermally insulated vessel at internal pressure = P_1 , volume = V_1 and absolute temperature = T_1 expands irreversibly against zero external pressure, as shown in the diagram. The final external pressure, volume and absolute temperature of the gas are P_2 , V_2 and T_2 respectively. For this expansion :

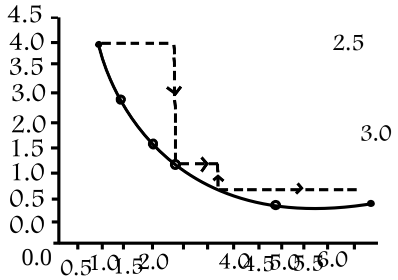


(a) q = 0 (b) $T_2 = T_1$

(c) $P_2 V_2 = P_1 V_1$ (d) $P_1 V_2^{\,y} = P_1 V_1^{\,y}$

41. One mole of an ideal gas is taken from a to b along two paths denoted by the solid and the dashed lines as shown in the graph below. If the work done along the solid line path is W_S and that along the dotted line path is W_d, then the integer closest to the ratio W_d / W_S is :

(INTEGER TYPE QUESTION)



42. For van der Waals' constant 'a' and 'b', the unit of the ratio a/b will be :

(a) atm litre $^{-1}$ (b) litre-atm mol^{-1} (c) litre-atm mol^{-2} (d) litre mol^{-1}

43. A spherical air bubble is rising from the depth of a lake when pressure is P atm and temperature is T K. The percentage increase in its radius when its comes to the surface of a lake will be: (Assume temperature and pressure at the surface to be respectively 2T K and P/4.)

(a) 100% (b) 50% (c) 40 (d) 200%

44. Consider a gaseous mixture of oxygen and nitrogen kept in a cylinder at room temperature. As compared to nitrogen molecules, the oxygen molecules will hit the wall of the cylinder.

(a) with greater average kinetic energy (b) with smaller average kinetic energy

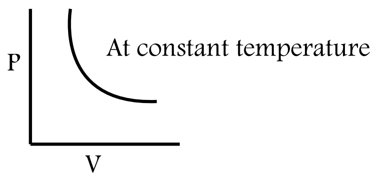
(c) with smaller average speed (d) with smaller average speed and smaller average kinetic energy

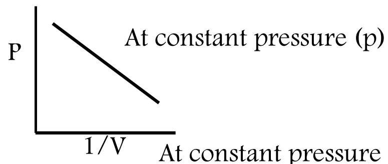
45. To what temperature must a neon gas sample be heated to double the pressure, if the initial volume of a gas at 75°C is decreased by 15%?

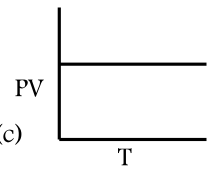
(a) 319°C (b) 592°C

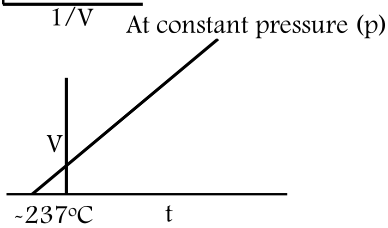
(c) 128°C (d) 60°C

46. The graph that does represent the behaviour of an ideal gas is:

(a)


(b)


(c)


(d)


47. Which of the following relationship is/are not true?

(a) Most probable velocity = $\sqrt{2RT/M}$ (b) PV = 3/2 KT

(c) Compressibillity factor Z = PV/nRT (d) Average kinetic energy of gas = ½ KT

48. The quantity (PV / K_BT) represent the:

(a) number of molecules in the gas (b) mass of the gas

(c) number of moles of the gas (d) translation energy of the gas

49. Arrange the following in the increasing order of oxidation state of Mn:

(i) Mn^{2+} (ii) Mno_2 (iii) $KMnO_4$ (iv) K_2MnO_4

(a) (i) > (ii) > (iii) > (iv) (b) (i) < (ii) < (iii) < (iv)

(c) (ii) < (iii) < (i) < (iv) (d) (iii) < (i) < (iv) < (ii)

50. Which of the following chemical reaction depicts the oxidising behaviour of H_2SO_4?

(a) $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$ (b) $Ca(OH)_2 + H_2SO_4 \rightarrow CaSO_4 + 2H_2O$

(c) $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCL$ (d) $2PCl_5 + H_2SO_4 \rightarrow 2POCl_3 + 2HCL + SO_2Cl_2$

51. The pair in which phosphorous atoms have a formal oxidation state of + 3 is ;

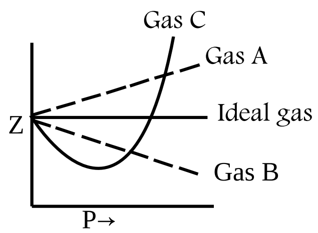
(a) Orthophosphorous and phyrophosphorous acids (b) Pyrophosphorous and hypophosphoric acids

(c) Orthophosphorous and hypophosphoric acids (d) phyrophosphorous and pyrophosphoric acids

52. The oxidation states of sulphur in caro's and Marshall's acid are:

(a) + 6, + 6 (b) + 4, + 6 (c) + 6, - 6 (d) + 6, + 4

53. Consider the following plot :



Which of the following statement is wrong ?

(a) For a gas A, a = 0, and Z will linearly depend on pressure

(b) For a gas B, b = 0, and Z will linearly depend on pressure

(c) Gas C is a real gas and we can find 'a' and 'b' if intersection data is given

(d) All van der Waals gases will behave like gas C and gives positive slope at high pressure

54. If the ratio of the masses of SO_3 and O_2 gases confined in a vessel is 1:1, then the ratio of their partial pressure would be

(a) 5 : 2 b) 2 : 5 (c) 2 : 1 (d) 1 : 2

55 50 mL of each gas A and of gas B takes 150 and 200 seconds respectively for effusing through a pin hole under the similar condition. If molecular mass of gas A is 36, the molecular mass of gas B will be

(a) 96 (b) 128 (c) 32 (d) 64

56. The compressibility factor for a real gas at high pressure is

(a) 1 (b) 1 + pb/RT (c) 1 – pb/RT (d) 1 + RT/pb

57. In thermodynamics, a process is called reversible when

(a) surroundings and system change into each other

(b) there is no boundary between system and surroundings

(c) the surroundings are always in equilibrium with the system

(d) the system change into surroundings spontaneously

58. Considering entropy (s) as a thermodynamic parameter, the criterion for the spontaneity of any process is

(a) $\Delta S_{System} - \Delta S_{Surrounding} > 0$ (b) $\Delta S_{System} > 0$

(c) $\Delta S_{Surrounding} > 0$ (d) $\Delta S_{System} + \Delta S_{Surrounding} > 0$

59. Which of the following reaction are correct ?

(a) $\Delta S = \Delta H - \Delta T/T$ (b) $\Delta S = q_{irrev}/T$ (c) $K = e^{\Delta Go/RT}$ (d) $[d(\Delta H)^T/dT]_p = \Delta C_p$

60.The incorrect expression among the following is

(a) in isothermal process, $W_{reversible} = -$ nRT In V_f/V_i (b) In $K = \Delta H^o - T\,\Delta\, S^o/RT$

(c) $K = e^{-\Delta Go(degree)\backslash RT}$ (d) $\Delta G_{system}/\Delta\, S_{total} = -T$

61. If x_1,x_2,x_3 as well as y_1,y_2,y_3, are in G.P. with the same common ratio,then the points (x_1,y_1), (x_2,y_2) and (x_3,y_3)

(a) Lie on a straight line (b) Lie on an ellipse (c) Lie on a circle (d) are vertices of a triangle.

62. Let PS be the median of the triangle with vertices P(2,2), Q(6, -1)and R(7,3). The equation of the line passing through (1,-1) and parallel to PS is

(a) 2x - 9y - 7= 0 (b) 2x - 9y - 11= 0 (b) 2x +9y - 11= 0 (d) 2x +9y + 7= 0

63. For a > b > c > 0, the distance between (1,1) and the point of intersection of the lines ax + by +c = 0 and bx + ay + c = 0 is less than $2\sqrt{2}$. Then

(a) a + b - c > 0 (b) a - b + c < 0 (c) a - b + c > 0 (d) a + b - c < 0

64. A triangle with vertices (4, 0), (-1, -1), (3, 5) is

(a) isosceles ad right angled (b) isosceles but not right angled

(c) right angled but not isosceles (d) neither right angled nor isosceles

65. Locus of mid point of the portion between the axes of x cos a + y sin a = p where p is constant is

(a) $x^2+ y^2 = 4/p^2$ (b) $x^2+ y^2 = 4p^2$

(c) $1/x^2 + 1/y^2 = 2/p^2$ (d) $1/x^2 + 1/y^2 = 4/p^2$

66. Locus of centroid of the triangle whose vertices are (a cos t, a sin t,) (b sin t, - b cos t) and (1 , 0), where t is a parameter, is

(a) $(3x + 1)^2 + (3y)^2 = a^2 - b^2$ (b) $(3x - 1)^2 + (3y)^2 = a^2 - b^2$

(c) $(3x - 1)^2 + (3y)^2 = a^2 + b^2$ (d) $(3x + 1)^2 + (3y)^2 = a^2 + b^2$

67. Let A(2,-3) and B(-2,3) be vertices of a triangle ABC. If the centroid of this triangle moves on the line 2x+3y=1, then the locus of the vertex C is the line

(a) 3x - 2y = 3 (b) 2x - 3y = 7 (c) 3x + 2y = 5 (d) 2x + 3y = 9

68. The equation of the straight line passing through the point (4,3) and making intercepts on the co-ordinate axes whose sum is -1 is

(a) x/2-y/3 = 1 and x/-2+y/1 = 1 (b) x/2 – y/3 = -1 and x/-2+y/1= -1

(c) x/2+y/3 = 1 and x/2+y/1 = 1 (d) x/2+y/3 = -1 and x/-2+y/1 = -1

69. If the sum of the slopes of the lines given by x2 - 2cxy - 7y2 = 0 is four times their product c has the value

(a) -2 (b) -1 (c) 2 (d) 1

70. If oe of the lines given by 6x2 - xy + 4cy2 = 0 is 3x + 4y = 0 is 3x + 4y = 0 , then c equals

(a) -3 (b) -1 (c) 3 (d) 1

71. If a vertex of a triangle is (1,1) and the mid points of two sides through this vertex are (-1 , 2) and

(3,2) then the centroid of the triangle is

(a) (-1, 7/3) (b) (-1/3 , 7/3) (c) (1, 7/3) (d) (1/3 , 7/3)

72. A square is inscribed in the circle $x^2+ y^2 -2x + 4y +3 = 0$.Its side are parallel to the coordinate axes.The one vertex of the square is

(a) $(1 + \sqrt{2}, -2)$ (b) $(1 - \sqrt{2}, -2)$ (c) $(1, -2 + \sqrt{2})$ (d) none of these

73. Two circles $x^2 + y^2 = 6$ and $x^2 + y^2 - 6x + 8 = 0$ are given. Then the equation of the circle through their point of intersection and the point (1,1) is

(a) $x^2 + y^2 - 6x + 4 = 0$ (b) $x^2 + y^2 - 3x + 1 = 0$ (c) $x^2 + y^2 - 4y + 2 = 0$ (d) none of these

74. The centre of the circle passing through the point (0,1) and touching the curve $y = x^2$ at (2,4) is

(a) (-16/5, 27/10) (b) (-16/7, 53/10) (c) (-16/5, 53/10) (d) none of these

75. The equation of the circle passing through (1,1) and the point of

intersection of $x^2 + y^2 + 13x - 3y = 0$ and $2x^2 + 2y^2 + 4x - 7y - 25 = 0$ is

(a) $4x^2 + 4y^2 - 30x - 10y - 25 = 0$ (b) $4x^2 + 4y^2 + 30x - 13y - 25 = 0$

(c) $4x^2 + 4y^2 - 17x - 10y + 25 = 0$ (d) none of these

76. The centre of the circle passing through (0,0) and (1,0) and touching the circle $x^2 + y^2 = 9$ is

(a) (1/2, 1/2) (b) $(1/2, -\sqrt{2})$ (c) (3/2, 1/2) (d) (1/2, 3/2)

77. The equation of a circle with origin as a centre and passing through equilateral triangle whose median is of length 3a is

(a) $x^2 + y^2 = 9a^2$ (b) $x^2 + y^2 = 16a^2$ (c) $x^2 + y^2 = 4a^2$ (d) $x^2 + y^2 = a^2$

78. The lines $2x - 3y = 5$ and $3x - 4y = 7$ are diameters of a circle having area as 154 sq.units. Then equation of the circle is

(a) $x^2 + y^2 - 2x + 2y = 62$ (b) $x^2 + y^2 + 2x - 2y = 62$

(c) $x^2 + y^2 + 2x - 2y = 47$ (d) $x^2 + y^2 - 2x + 2y = 47$

79. If the lines $2x + 3y + 1 = 0$ and $3x - y - 4 = 0$ lie along diameter of a circle of circumference 10 (pia), then the equation of the circle is

(a) $x^2 + y^2 + 2x - 2y - 23 = 0$ (b) $x^2 + y^2 - 2x - 2y - 23 = 0$

(c) $x^2 + y^2 + 2x + 2y - 23 = 0$ (d) $x^2 + y^2 - 2x + 2y - 23 = 0$

80. if the bisector of the angle P of a triangle PQR meets QR in S, then

(a) QS = SR (b) QS : SR = PR : PQ (c) QS : SR = PQ : PR (d) none of these

81 . From the top of a light - house 60 meters high with its base at the sea-level, the angle of depression of a boat is 15° . The distance of the boat from the foot of the light house is

(a) $(\sqrt{3}-1/\sqrt{3}+1)$ 60 metres (b) $(\sqrt{3}+1/\sqrt{3}-1)$ 60 metres

(c) $(\sqrt{3}+1/\sqrt{3} - 1)^2$ 60 metres (d) none of these

82. In a triangle ABC, angle A is greater than angle B. If the measures of angles A and B satisfy the equation $3 \sin x - 4 \sin^3 x - k = 0, 0 < k < 1$, then the measure of angle C is

(a) $\pi/3$ (b) $\pi/2$ (c) $2\pi/3$ (d) $5\pi/6$

83. If the lengths of the sides of triangle are 3, 5, 7 then the largest angle of t5he triangle is

(a) $\pi/2$ (b) $5\pi/6$ (c) $2\pi/3$ (d) $3\pi/4$

84. In a triangle ABC, $< B = \pi/3$ and $< C = \pi/4$. Let D divide BC internally in the ratio 1:3 then $\sin<BAD/\sin < CAD$ is equal to

(a) $1/\sqrt{6}$ (b) 1/3 (c) $1/\sqrt{3}$ (d) $\sqrt{2}/3$

85. In a triangle ABC, 2ac sin 1/2 (A - B+ C) =

(a) $a^2 + b^2 - c^2$ (b) $c^2 + a^2 - b^2$ (c) $b^2 - c^2 - a^2$ (d) $c^2 - a^2 - b^2$

86. The sides of a triangle are 3x+4y, 4x+3y and 5x+5y where x,y>0 then the triangle is

(a) right angled (b) obtuse angled (c) equilateral (d) none of these

87. In a triangle with sides a, b, c, $r_1 > r_2 > r_3$ (which are the exradii) then

(a) $a > b > c$ (b) $a < b < c$ (c) $a > b$ and $b < c$ (d) $a < b$ and $b > c$

88. The side of triangle are sin a, cos a and $\sqrt{1+\sin a \cos a}$ for some $0 < a < \pi/2$. Then the greatest angle of the triangle is

(a) 150° (b) 90° (c) 120° (d) 60°

89. A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite bank of the river is 60° and when he retires 40 meters away from the tree the angle of elevation becomes 30°. The breadth of the river is

(a) 60 m (b) 30 m (c) 40 m (d) 20 m

90. A tower stands at the centre of a circular park. A and B are two point on the boundary of the park such that AB (= a) subtends an angle of 60° at the foot of the tower, and the angle of elevation of the top of the tower from A or B is 30° . The height of the tower is

(a) $a / \sqrt{3}$ (b) $a\sqrt{3}$ (c) $2a / \sqrt{3}$ (d) $2a\sqrt{3}$