FIITJEE PET – IV (REG_2ND YEAR)

MAINS_SET–A

DATE: 30.06.2018

Time: 3 hours **Maximum Marks: 360**

INSTRUCTIONS:

Instructions to the Candidates

1. This Test Booklet consists of **90 questions**.

   Use **Blue/Black ball Point Pen only** for writing particulars and bubbling of OMR.

2. For each correct answer **4 Marks** will awarded and for each wrong answer **1 Mark** will be deducted.

3. Attempt all questions.

4. In case you have not darkened any bubble you will be awarded 0 mark for that question.

5. Use of calculator/logarithmic table is not permitted.

Don't write / mark your answers in this question booklet.
If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐☐☐

1. Equation of the circle passing through A(1, 2), B(5, 2) so that the angle subtended by AB at points on the circle is $\frac{\pi}{4}$ is
(A) $x^2 + y^2 - 6x - 8 = 0$ (B) $x^2 + y^2 - 6x - 8y + 17 = 0$
(C) $x^2 + y^2 - 6x + 8 = 0$ (D) $x^2 + y^2 - 6x - 8y - 25 = 0$

2. An equilateral triangle is inscribed in the circle $x^2 + y^2 = a^2$. The length of the side of the triangle is
(A) $a\sqrt{2}$ (B) $a\sqrt{3}$ (C) 2a (D) none of these

3. A circle of radius r passes through the origin and meets the axes at A and B. The locus of the centroid of ΔOAB is
(A) $x^2 + y^2 = 4r^2$ (B) $x^2 + y^2 = 3r^2$ (C) $3(x^2 + y^2) = r^2$ (D) $9(x^2 + y^2) = 4r^2$

4. The equation of the circle which passes through the origin and cuts off chords of length 2 from the lines x = y and x = –y is
(A) $x^2 + y^2 \pm 2\sqrt{2}\,x = 0,\ x^2 + y^2 \pm 2\sqrt{2}\,y = 0$ (B) $x^2 + y^2 \pm 3\sqrt{3}\,x = 0,\ x^2 + y^2 \pm 3\sqrt{3}\,y = 0$
(C) $x^2 + y^2 + 4\sqrt{3}\,x = 0,\ x^2 + y^2 \pm 4\sqrt{3}\,y = 0$ (D) none of these

5. The equation of the circle concentric with the circle $x^2 + y^2 - 6x + 12y + 15 = 0$ and of double its area is
(A) $x^2 + y^2 - 6x + 12y - 15 = 0$ (B) $x^2 + y^2 - 6x + 12y - 30 = 0$
(C) $x^2 + y^2 - 6x + 12y - 25 = 0$ (D) $x^2 + y^2 - 6x + 12y - 20 = 0$

6. Three distinct points A, B and C are given in the 2–dimensional coordinate plane such that the ratio of the distance of any one of them from the point (1, 0) to the distance from the point (–1, 0) is equal to $\frac{1}{3}$. Then the circumcentre of the triangle ABC is at the point
(A) $\left(\frac{5}{4},0\right)$ (B) $\left(\frac{5}{2},0\right)$ (C) $\left(\frac{5}{3},0\right)$ (D) (0, 0)

7. The equation to the circle of radius 5, which pass through the two points on the x-axis which are at a distance of 4 from the origin is
(A) $x^2 + y^2 - 6x - 16 = 0$ (B) $x^2 + y^2 - 6y - 25 = 0$ (C) $x^2 + y^2 + 6y - 16 = 0$ (D) none of these

8. A circle is inscribed in an equilateral triangle and a square is inscribed in the circle. The ratio of the area of the triangle to the area of the square is
(A) $\sqrt{3} : \sqrt{2}$ (B) $\sqrt{3} : 1$ (C) $3\sqrt{3} : 2$ (D) $3 : \sqrt{2}$

9. The farthest point on the circle $x^2 + y^2 - 4x + 6y - 12 = 0$ from (–13, 17) is
(A) (5, –7) (B) (–1, 1) (C) (–1, 2) (D) (–2, 2)

Space for rough work

10. The circle $x^2 + y^2 – 4x – 4y + 4 = 0$ is inscribed in a triangle which has two of its sides along the coordinate axes. The locus of the circumcentre of the triangle is $x + y – xy + k(x^2 + y^2)^{1/2} = 0$. Then k =
(A) 0 (B) 1 (C) –1 (D) 2

11. The equation to the side BC of ΔABC is $x + 5 = 0$. If (–3, 2) is the orthocenter of ΔABC. The point where the altitude through A meets the circumcircle of the triangle is
(A) (2, 7) (B) (2, –7) (C) (–7, 2) (D) (7, –2)

12. The radius of the circle which has the lines $x + y – 1 = 0$, $x + y – 9 = 0$ as tangents is
(A) $\sqrt{2}$ (B) $2\sqrt{2}$ (C) $3\sqrt{2}$ (D) $4\sqrt{2}$

13. If the equation of one tangent to the circle with centre (2, –1) from the origin is $3x + y = 0$, then the equation of the other tangent through the origin is
(A) $3x – y = 0$ (B) $x + 3y = 0$ (C) $x – 3y = 0$ (D) $x + 2y = 0$

14. Let A be the centre of the circle $x^2 + y^2 – 2x – 4y – 20 = 0$. Suppose that the tangent at the points B(1, 7) and D(4, –2) on the circle meet at the point C. The area of the quadrilateral ABCD is
(A) 75 sq. unit (B) 145 sq. unit (C) 150 sq. unit (D) 50 sq. unit

15. If a tangent drawn from the point (4, 0) to the circle $x^2 + y^2 = 8$ touches it at a point A in the first quadrant, then the coordinates of another point B on the circle such that AB = 4 are
(A) (2, –2) or (–2, 2) (B) (1, –2) or (–2, 1) (C) (–1, 1) or (1, –1) (D) (3, –2) or (–3, 2)

16. The locus of the point of intersection of the perpendicular tangents to the circles $x^2 + y^2 = a^2$, $x^2 + y^2 = b^2$ is
(A) $x^2 + y^2 = a^2 + b^2$ (B) $x^2 + y^2 = a^2 – b^2$ (C) $x^2 + y^2 = (a + b)^2$ (D) $x^2 + y^2 = (a – b)^2$

17. The tangents to $x^2 + y^2 = a^2$ having inclinations α and β intersect at P. If $\cot \alpha + \cot \beta = 0$, then the locus of P is
(A) $x + y = 0$ (B) $x – y = 0$ (C) $xy = 0$ (D) none of these

18. A line segment AM = a moves in the XOY plane such that AM is parallel to the X–axis. If A moves along the circle $x^2 + y^2 = a^2$, then the locus of M is
(A) $x^2 + y^2 = 4a^2$ (B) $x^2 + y^2 = 2ax$ (C) $x^2 + y^2 = 2ay$ (D) $x^2 + y^2 = 2ax + 2ay$

19. The centre of the circle touching the y-axis at (0, 3) and making an intercept 2 unit on positive x-axis is
(A) $\left(10, \sqrt{3}\right)$ (B) $\left(\sqrt{3}, 10\right)$ (C) $\left(\sqrt{10}, 3\right)$ (D) $\left(3, \sqrt{10}\right)$

20. The equation of a circle which has normals $(x – 1)(y – 2) = 0$ and a tangent $3x + 4y = 6$ is
(A) $x^2 + y^2 – 2x – 4y + 4 = 0$ (B) $x^2 + y^2 – 2x – 4y + 5 = 0$
(C) $x^2 + y^2 = 5$ (D) $(x – 3)^2 + (y – 4)^2 = 5$

Space for rough work

21. From the point A(0, 3) on the circle $x^2 + 4x + (y - 3)^2 = 0$, a chord AB is drawn and extended to a point P, such that AP = 2AB. The locus of P is
(A) $x^2 + 4x + (y - 3)^2 = 0$ (B) $x^2 + 8x + (y - 3)^2 = 0$
(C) $x^2 + 4x - (y - 3)^2 = 0$ (D) $x^2 + 8x - (y - 3)^2 = 0$

22. O is the origin and OA, OB are a pair of tangents to the $x^2 + y^2 + 2gx + 2fy + c = 0$, $c > 0$, then the equation to the circum circle of ΔOAB is
(A) $x^2 + y^2 - gx - fy = 0$ (B) $x^2 + y^2 + gx + fy = 0$
(C) $x^2 + y^2 - gx = 0$ (D) $x^2 + y^2 + fy = 0$

23. The interval in which the value of λ should lie if the line $3x - 4y = \lambda$ cuts the circle $x^2 + y^2 - 4x - 8y = 5$ in real points is
(A) (15, 35) (B) [15, 35] (C) (–35, 15) (D) [–15, 35]

24. The length of the tangent from a point on the circle $x^2 + y^2 + 4x - 6y - 12 = 0$ to the circle $x^2 + y^2 + 4x - 6y + 4 = 0$ is
(A) 4 (B) 12 (C) 16 (D) 8

25. The equation of the circle which is touched by y = x, has its centre on the positive direction of the x-axis and cuts off a chord of length 2 unit along the line $\sqrt{3}y - x = 0$ is
(A) $x^2 + y^2 - 4x + 2 = 0$ (B) $x^2 + y^2 - 4x + 1 = 0$ (C) $x^2 + y^2 - 8x + 8 = 0$ (D) $x^2 + y^2 - 4y + 2 = 0$

26. The locus of the foot of the perpendicular drawn from the origin to any chord of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ which subtends a right angle at the origin is
(A) $x^2 + y^2 + gx + fy + \frac{c}{2} = 0$ (B) $2(x^2 + y^2) + gx + fy + c = 0$
(C) $2(x^2 + y^2 + gx + fy) + 3c = 0$ (D) $x^2 + y^2 + 2(gx + fy + c) = 0$

27. If the lengths of the tangents from the point (1, 2) to the circles $x^2 + y^2 + x + y - 4 = 0$ and $3x^2 + 3y^2 - x - y - \lambda = 0$ are in the ratio 4 : 3, then λ =
(A) $\frac{23}{4}$ (B) $\frac{21}{4}$ (C) $\frac{17}{4}$ (D) $\frac{19}{4}$

28. A circle with centre at (2, 4) is such that the line x + y + 2 = 0 cuts a chord of length 6. The radius of the circle is
(A) $\sqrt{11}$ (B) $\sqrt{21}$ (C) $\sqrt{31}$ (D) $\sqrt{41}$

Space for rough work

29. Given that for the circle $x^2 + y^2 - 4x + 6y + 1 = 0$, the line with equation $3x - y = 1$ is a chord. The midpoint of the chord is

(A) $\left(\frac{2}{5},\frac{11}{5}\right)$ (B) $\left(-\frac{2}{5},\frac{11}{5}\right)$ (C) $\left(-\frac{2}{5},-\frac{11}{5}\right)$ (D) $\left(\frac{2}{5},-\frac{11}{5}\right)$

30. From the origin chords are drawn to the circle $x^2 + y^2 - 2y = 0$. The locus of the middle points of these chords is

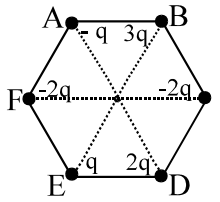
(A) $x^2 + y^2 - y = 0$ (B) $x^2 + y^2 - x = 0$ (C) $x^2 + y^2 - 2x = 0$ (D) $x^2 + y^2 - x - y = 0$

31. A point charge 50μC is located in the XY plane at the point of position vector $\vec{r}_0 = 2\hat{i} + 3\hat{j}$. What is the electric field at the point of position vector $\vec{r} = 8\hat{i} - 5\hat{j}$

(A) 1200V/m (B) 0.04V/m (C)900V/m (D) 4500 V/m

32. Six charges are placed at the corner of a regular hexagon as shown. If an electron is placed at its centre O, force on it will be:

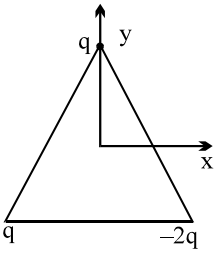
(A) Zero
(B) Along OF
(C) Along OC
(D) None of these



33. An equilateral triangle wire frame of side L having 3 point charges at its vertices is kept in x-y plane as shown. Component of electric field due to the configuration in z direction at (0, 0, L) is [origin is centroid of triangle]

(A) $\frac{9\sqrt{3}kq}{8L^2}$ (B) zero

(C) $\frac{9kq}{8L^2}$ (D) None



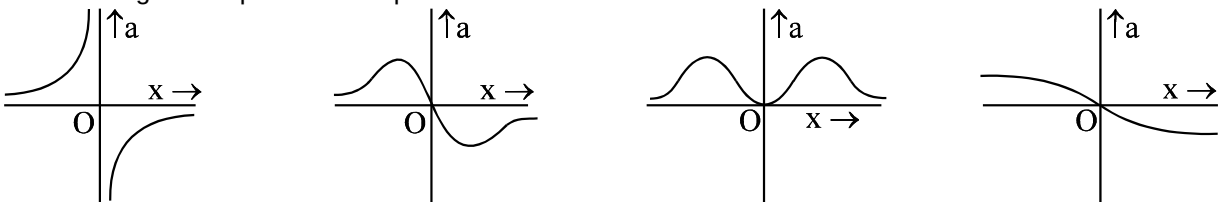
34. Two free positive charges 4q and q are a distance l apart. What charge Q is needed to achieve equilibrium for the entire system and where should it be placed form charge q?

(A) Q = $\frac{9}{4}$ q (negative) at $\frac{\ell}{3}$ (B) Q = $\frac{4}{9}$ q (positive) at $\frac{\ell}{3}$

(C) Q = q (positive) at $\frac{\ell}{3}$ (D) Q = q (negative) at $\frac{\ell}{3}$

Space for rough work

35. Two identical positive charges are fixed on the y-axis, at equal distances from the origin O. A particle with a negative charge starts on the x-axis at a large distance from O, moves along the + x-axis, passes through O and moves far away from O. Its acceleration a is taken as positive along its direction of motion. The particle's acceleration a is plotted against its x-coordinate. Which of the following best represents the plot?



(A) (B) (C) (D)

36. A non-conducting ring of radius R has uniformly distributed positive charge Q. A small part of the ring, of length d, is removed (d << R). The electric field at the centre of the ring will now be

(A) directed towards the gap, inversely proportional to R^3

(B) directed towards the gap, inversely proportional to R^2

(C) directed away from the gap, inversely proportional to R^3

(D) directed away from the gap, inversely proportional to R^2

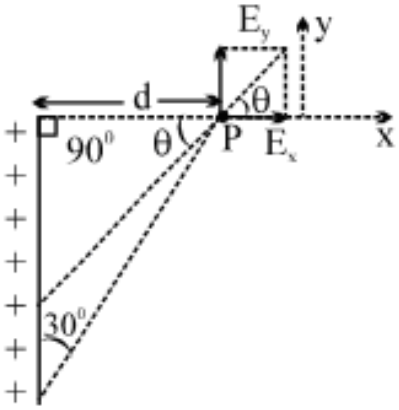
37. The direction (θ) of field at point P due to uniformly charged finite rod will be

(A) at angle 30^0 from x-axis

(B) 45^0 from x - axis

(C) 60^0 from x-axis

(D) none of these



38. A charged particle having some mass is resting in equilibrium at a height H above the centre of a uniformly charged non-conducting horizontal ring of radius R. The force of gravity acts downwards. The equilibrium of the particle will be stable

(A) for all values of H (B) only if $H > \frac{R}{\sqrt{2}}$ (C) only if $H < \frac{R}{\sqrt{2}}$ (D) only if $H = \frac{R}{\sqrt{2}}$

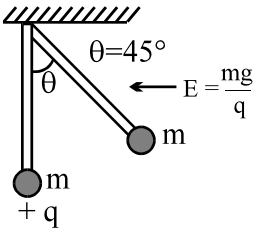
Space for rough work

39. When a negative charge is released and moves in electric field, it moves toward a position of
(A) lower electric potential and lower potential energy
(B) lower electric potential and higher potential energy
(C) higher electric potential and lower potential energy
(D) higher electric potential and higher potential energy

40. Two identical thin rings, each of radius R meter are coaxially placed at distance R meter apart.If Q_1 and Q_2 coulomb are respectively the charges uniformly spread on the two rings, the work done in moving a charge q from the centre of one ring to that of the other is

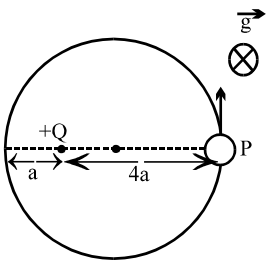
(A) zero
(B) $a(Q_1 - Q_2)\left(\sqrt{2}-1\right)/\left(\sqrt{2}\,4\pi\varepsilon_0 R\right)$
(C) $q\sqrt{2}(Q_1 + Q_2)/4\pi\varepsilon_0 R$
(D) $q\sqrt{2}(Q_1 + Q_2)/4\pi\varepsilon_0 R$

41. In space a horizontal Electric Field (E = (mg)/q) exists as shown in figure and a mass m attached at the end of a light rod. If mass m is released from the position shown in figure find the angular velocity of the rod when it passes through the bottom most position



(A) $\sqrt{\frac{g}{\ell}}$
(B) $\sqrt{\frac{2g}{\ell}}$
(C) $\sqrt{\frac{3g}{\ell}}$
(D) $\sqrt{\frac{5g}{\ell}}$

42. The diagram shows a small bead of mass m carrying charge q. The bead can freely move on the smooth fixed ring placed on a smooth horizontal plane. In the same plane a charge +Q has also been fixed as shown. The potential at the point P due to +Q is V. The velocity with which the bead should projected from the point P so that it can complete a circle should be greater than



(A) $\sqrt{\frac{6qV}{m}}$
(B) $\sqrt{\frac{qV}{m}}$
(C) $\sqrt{\frac{3qV}{m}}$
(D) None

Space for rough work

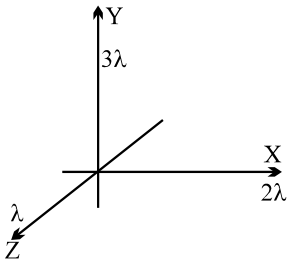
43. A charged particle of charge Q is held fixed and another charged particle of mass m and charge q (of the same sign) is released from a distance r. The impulse of the force exerted by the external agent on the fixed charge by the time distance between Q and q becomes 2r is

(A) $\sqrt{\frac{Qq}{4\pi \in_0 mr}}$ (B) $\sqrt{\frac{Qq}{4\pi \in_0 mr}}$

(C) $\sqrt{\frac{Qqm}{\pi \in_0 r}}$ (D) $\sqrt{\frac{Qqm}{2\pi \in_0 r}}$

44. In a uniform electric field, the potential is 10V at the origin of coordinates, and 8V at each of the points (1, 0, 0), (0, 1, 0) and (0, 0, 1). The potential at the point (1, 1, 1) will be
(A) 0 (B) 4 V (C) 8 V (D) 10 V

45. The diagram shows three infinitely long uniform line charges placed on the X, Y and Z axis. The work done in moving a unit positive charge from (1, 1, 1) to (0, 1, 1) is equal to



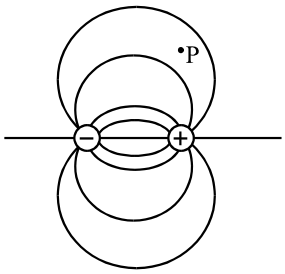
(A) $(\lambda \ln 2) / 2\pi \in_0$

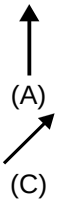
(B) $(\lambda \ln 2) / \pi \in_0$

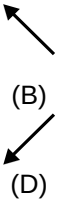
(C) $(3\lambda \ln 2) / 2\pi \in_0$

(D) None

46. Figure shows the electric field lines around an electric dipole. Which of the arrows best represents the electric field at point P ?




(A)

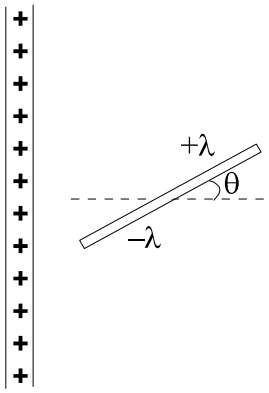

(B)

(C)

(D)

Space for rough work

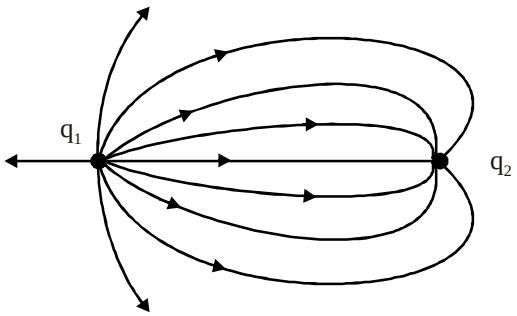
47. A large sheet carries uniform surface charge density σ. A rod of length 2l has a linear charge density λ on one half and $-\lambda$ on the second half. The rod is hinged at mid point O and makes an angle θ with the normal to the sheet. The torque experienced by the rod is



(A) 0 (B) $\frac{\sigma\lambda\ell^2}{2\varepsilon_0}\sin\theta$

(C) $\frac{\sigma\lambda\ell^2}{\varepsilon_0}\sin\theta$ (D) $\frac{\sigma\lambda\ell}{2\varepsilon_0}$

48. The figure shows the electric field lines in the vicinity of two point charges. Which one of the following statements concerning this situation is true?



(A) Both q_1 and q_2 have the same sign of charge

(B) The magnitude of the ratio (q_2/q_1) is less than one.

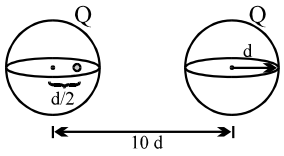
(C) The electric field is strongest midway between the charges.

(D) The magnitude of the ratio (q2/q1) is more than one.

49. Electric flux through a surface of area 100 m^2 lying in the xy plane is (in V-m) if $\vec{E} = \hat{i} + \sqrt{2}\hat{j} + \sqrt{3}\hat{k}$

(A) 100 (B) 141.4 (C)173.2 (D)200

50. Two spherical, nonconducting, and very thin shells of uniformly distributed positive charge Q and radius d are located a distance 10d from each other. A positive point charge q is placed inside one of the shells at a distance d/2 from the center, on the line connecting the centers of the two shells, as shown in the figure. What is the net force on the charge q?



(A) $\frac{qQ}{361\pi\varepsilon_0 d^2}$ to the left (B) $\frac{qQ}{361\pi\varepsilon_0 d^2}$ to the right

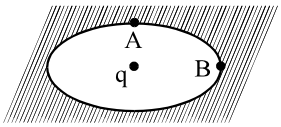
(C) $\frac{362qQ}{361\pi\varepsilon_0 d^2}$ to the left (D) $\frac{360qQ}{361\pi\varepsilon_0 d^2}$ to the right

Space for rough work

51. A solid sphere of radius R is charged uniformly. At what distance from its surface is the electrostatic potential half of the potential at the centre?
(A) R (B) R/2 (C) R/3 (D) 2R

52. Two identical small conducting spheres, having charges of opposite sign, attract each other with a force of 0.108 N when separated by 0.5 m. The spheres are connected by a conducting wire, which is then removed, and thereafter, they repel each other with a force of 0.036 N. The initial charges on the spheres are
(A) $\pm 5 \times 10^{-6}$ C and 15×10^{-6} C (B) $\pm 1.0 \times 10^{-6}$ C and 3.0×10^{-6} C
(C) $\pm 2.0 \times 10^{-6}$ C and 6.0×10^{-6} C (D) $\pm 0.5 \times 10^{-6}$ C and 1.5×10^{-6} C

53. An ellipsoidal cavity is carved within a perfect conductor. A positive charge q is placed at the center of the cavity. The points A & B are on the cavity surface as shown in the figure. Then:
(A) electric field near A in the cavity = electric field near B in the cavity
(B) charge density at A = charge density at B
(C) potential at A = potential at B
(D) total electric field flux through the surface of the cavity is $q/\in_0$.

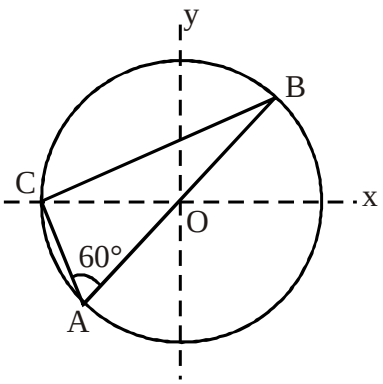


54. There are four concentric shells A, B, C and D of radii a, 2a, 3a and 4a respectively. Shells B and D are given charges +q and –q respectively. Shell C is now earthed. The potential difference $V_A - V_C$ is.
(A) $\frac{Kq}{2a}$ (B) $\frac{Kq}{3a}$ (C) $\frac{Kq}{4a}$ (D) $\frac{Kq}{6a}$

55. Under the influence of the Coulomb field of charge +Q, a charge –q is moving around it in an elliptical orbit. Find out the correct statement(s).
(A) The angular momentum of the charge –q is constant
(B) The linear momentum of the charge –q is constant
(C) The angular velocity of the charge –q is constant
(D) The linear speed of the charge –q is constant

Space for rough work

56. Consider a system of three charges q/3,q/3 and –2q/3 placed at points A, B and C, respectively, as shown in the figure. Take O to be the centre of the circle of radius R and angle CAB = 60°



(A) The electric field at point O is $\frac{q}{8\pi\varepsilon_0 R^2}$ directed along the negative x-axis

(B) The potential energy of the system is zero

(C) The magnitude of the force between the charges at C and B is $\frac{q^2}{54\pi\varepsilon_0 R^2}$

(D) The potential at point O is $\frac{q}{12\pi\varepsilon_0 R}$

57. A long, hollow conducting cylinder is kept coaxially inside another long, hollow conducting cylinder of larger radius. Both the cylinders are initially electrically neutral.

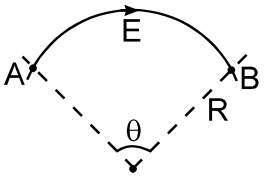
(A) A potential difference appears between the two cylinders when a charge density is given to the inner cylinder

(B) A potential difference appears between the two cylinders when a charge density is given to the outer cylinder

(C) No potential difference appears between the two cylinders when a uniform line charge is kept along the axis of the cylinder

(D) No potential difference appears between the two cylinders when same charge density is given to both the cylinders

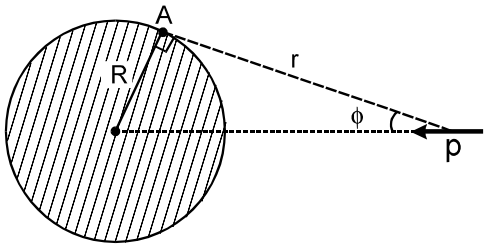
58. Figure shows an electric line of force which curves along a circular arc. The magnitude of electric field intensity is same at all points on this curve and is equal to E. If the potential at A is V, then the potential at B is



(A) $V - ER\theta$ (B) $V - 2ER\sin\frac{\theta}{2}$ (C) $V + ER\theta$ (D) $V + 2ER\sin\frac{\theta}{2}$

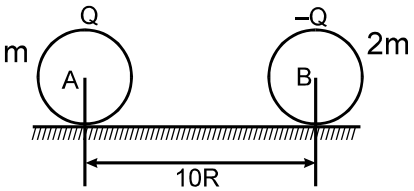
Space for rough work

59. A dipole having dipole moment p is placed in front of a solid uncharged conducting sphere as shown in the diagram. The net potential at point A lying on the surface of the sphere is :



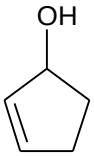
(A) $\frac{kp\cos\phi}{r^2}$ (B) $\frac{kp\cos^2\phi}{r^2}$ (C) zero (D) $\frac{2kp\cos^2\phi}{r^2}$

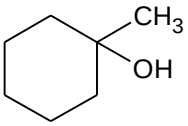
60. Two smooth spherical non conducting shells each of radius R having uniformly distributed charge Q & -Q on their surfaces are released on a smooth non-conducting surface when the distance between their centres is 10 R. The mass of A is m and that of B is 2 m. The speed of A just before A and B collide is: [Neglect gravitational interaction]



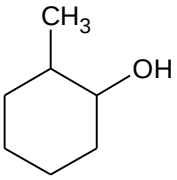
(A) $\sqrt{\frac{2KQ^2}{15mR}}$ (B) $\sqrt{\frac{4KQ^2}{15mR}}$ (C) $\sqrt{\frac{8KQ^2}{15mR}}$ (D) $\sqrt{\frac{16KQ^2}{15mR}}$

61. Compound which does not form aldehyde or ketone when treated with P.C.C. is

(A) 

(B) 

(C) $CH_3–CH(OH)–CH_3$

(D) 

62. The formation of cyanohydrin from ketone is an example of
(A) Electrophilic addition (B) Nucleophilic addition
(C) Nucleophilic substitution (D) Electrophilic substitution

Space for rough work

63. Benzaldehyde can be formed by treating benzene with

(A) $CO/HCl/AlCl_3$ (B) $HCN/HCl/AlCl_3, H_2O/H^+$

(C) $CH_3-Cl/AlCl_3, CrO_2Cl_2/\Delta$ (D) All of these

64. When 1–ethyl–2–methyl benzene is ozonised followed by Zn/H_2O, it does not give

(A) C_2H_5–CHO (B) CH_3COCHO

(C) C_2H_5–$(CO)_2$–CH_3 (D) HCHO

65. On the hydrolysis of gem trihalides by aq. Alkali, it gives

(A) aldehyde (B) ketone

(C) carboxylic acid (D) all of these

66. The reactivity order of the following towards Nucleophilic addition reaction is

$\underset{(I)}{HCHO}, \underset{(II)}{CH_3CHO}, \underset{(III)}{CH_3COCH_3}$

(A) I > II > III (B) III > II > I (C) I > III > II (D) II > III > I

67. $CH \equiv CH \xrightarrow[H_2O]{Hg^{2+}/H^+} A \xrightarrow{LiAlH_4} B \xrightarrow{P/Br_2} C$. The compound C is

(A) $CH_2(Br)-CH_2(Br)$ (B) C_2H_5Br

(C) BHC (D) C_2H_5OH

68. $CH_3CH_2-COO-C_2H_5 \xrightarrow[(ii)H_3O^+]{(i)\ DIBAL-H(1eq)} A + B$

A and B are respectively

(A) $CH_3CH_2CH_2OH + C_2H_5OH$ (B) $CH_3CH_2CHO + C_2H_5OH$

(C) $CH_3CH_2CHO + CH_3CHO$ (D) $CH_3CH_2CH_2OH + CH_3CHO$

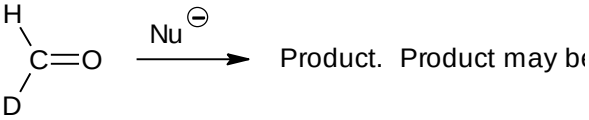
69. $CH_3CHO + LiAlH_4 \longrightarrow CH_3CH_2OH$

Nucleophile added in this reaction is

(A) H (B) Li^+ (C) H^+ (D) H^-

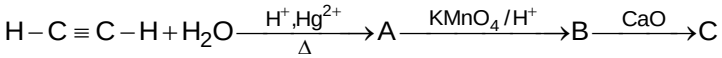
Space for rough work

70.

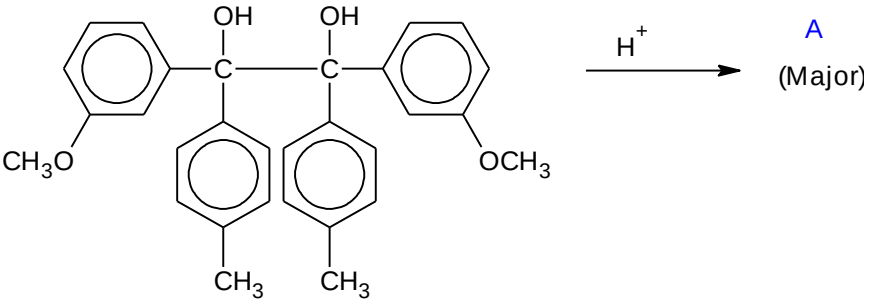


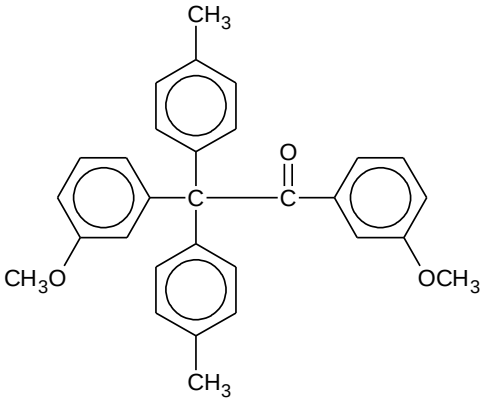
Product. Product may be

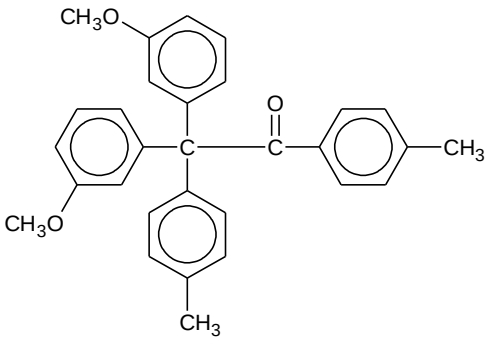
(A) Meso (B) Racemic (C) Inversion (D) All of these

71. 

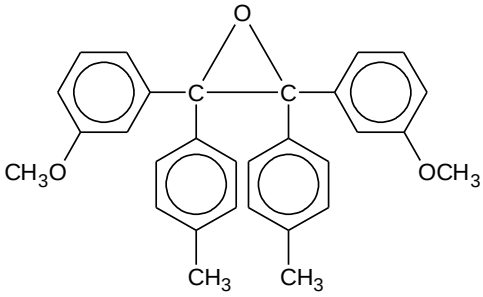
(A) chloroform can be prepared from both A & C
(B) The reaction leading to the formation of A is electrophilic addition
(C) C is 2-propanone
(D) Both A & C are correct.

72. 

(A) 

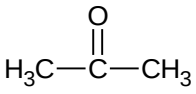
(B) 

(C) Both 1 & 2

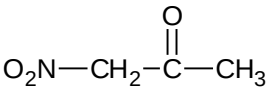
(D) 

Space for rough work

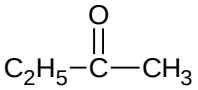
73. Reactivity order of the following >C=O group with respect to nucleophilic addition



(I)



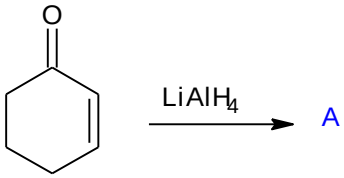
(II)



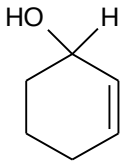
(III)

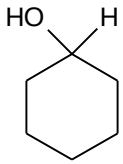
(A) I > II > III (B) III > II > I (C) II > I > III (D) II > III > I

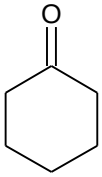
74.

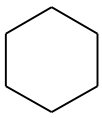


The product predominates is

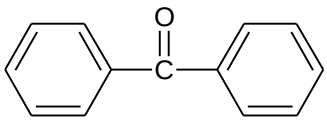
(A) 

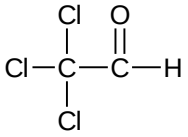
(B) 

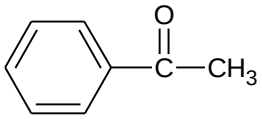
(C) 

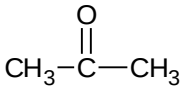
(D) 

75. Which of the following is the correct reactivity order of various carbonyl compounds towards cyanohydrin formation ?

(I) 

(II) 

(III) 

(IV) 

(A) I > III > II > IV (B) IV > II > III > I (C) III > I > II > IV (D) II > IV > III > I

76. The hybridization of C in CH_3CHO is

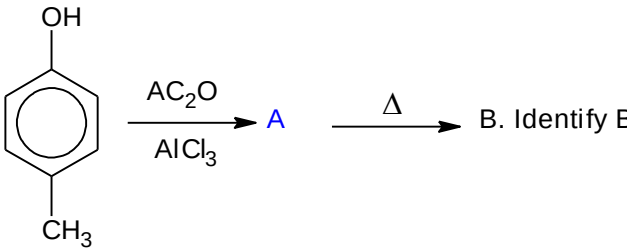
(A) sp (B) sp^2 (C) sp^3 (D) sp^2 & sp^3

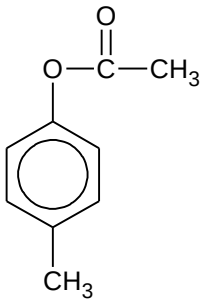
Space for rough work

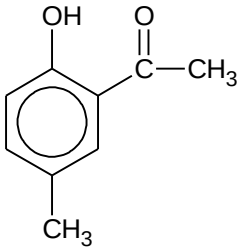
77. Which of the following is most reactive towards nucleophilic addition reactions ?
(A) HCHO (B) CH_3CHO (C) C_2H_5CHO (D) CH_3COCH_3

78. Which of the following is correct order of rate of HCN addition to compound A $\rightarrow$ D
HCHO(A) , CH_3COCH_3(B) , $PhOCH_3$(C) , PhCOPh(D)
(A) A < B < C < D (B) D < C < B < A (C) D < B < C < A (D) D < C < A < B

79.



(A)


(B)


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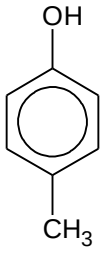
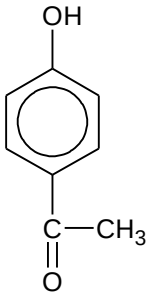


(D)


80. Which among the following is a gas ?
(A) HCHO (B) CH_3CHO (C) CH_3COCH_3 (D) $PhCOCH_3$

Space for rough work

81. Which of the following reaction is used in preparation of carbonyl compound

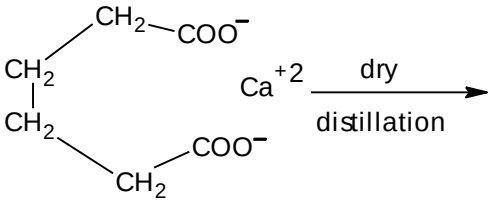
(A) $CH_3-CH_2-COO-CH_3 \xrightarrow{DIBAL-H}$ (B) $R-C\equiv C-H \xrightarrow{HBO}$

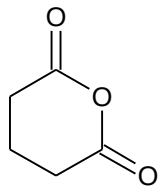
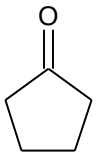
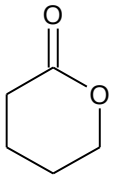
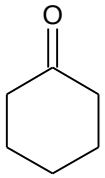
(C) $CH_3-CH_2-CH=CH_2 \xrightarrow[Zn/H_2O]{O_3}$ (D) All

82. Which among the following cannot be prepared using Rosenmund reduction.

(A) HCHO (B) CH_3COCH_3 (C) CH_3CHO (D) both a & b

83.



(A)  (B)  (C)  (D) 

84. In the reaction, $PhCN \xrightarrow[2.\ H_2O,\ heat]{1.\ SnCl_2/HCl}$

The modification of the functional group and the change in hybridization of the functional carbon are, respectively :

(A) –CN to $-CH_2NH_2$, sp^2 to sp^2 (B) –CN to $-CONH_2$, sp to sp^2

(C) –CN to –COOH, sp^2 to sp^3 (D) –CN to –CHO, sp to sp^2

85. In the reaction, $CH_3CHO + HCN \rightarrow CH_3CHOHCN$, chiral centre is produced. The product is :

(A) meso compound (B) laevorotatory

(C) dextrorotatory (D) racemic mixture

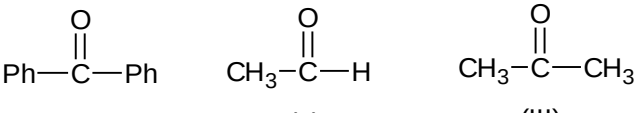
86. The product(s) obtained via oxymercuration ($HgSO_4 + H_2SO_4$) of but–1–yne would be :

(A) $CH_3CH_2CH_2CHO$ (B) $CH_3CH_2COCH_3$

(C) $CH_3CH_2CHO + HCHO$ (D) $CH_3CH_2COOH + HCOOH$

Space for rough work

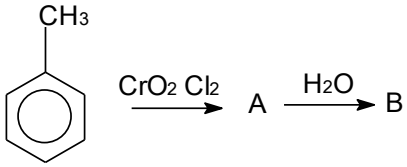
87. The correct order of reactivity of PhMgBr with,



(I) (II) (III)

(A) I > II > III (B) III > II > I (C) II > III > I (D) I > III > II

88.



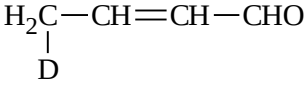
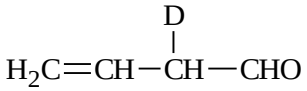
The functional group present in B and name of the reaction would be

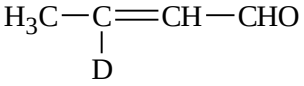
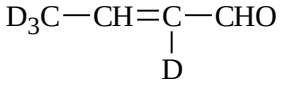
(A) -CHO, gattermann aldehyde synthesis

(B) -CHO, Etard reaction

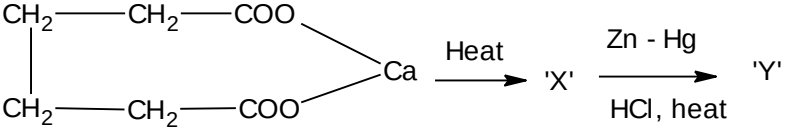
(C)  , Friedel Craft reaction (D) - CHO, OXO reaction

89. The compound CH_3—CH = CH—CHO is treated with sufficient OD^- in presence of D_2O. Which of the following is not likely to be present at all when equilibrium is reached?

(A)  (B) 

(C)  (D) 

90. Identify the product 'Y' in the following reaction sequence :



(A) pentane (B) cyclobutane (C) cyclopentane (D) cyclopentanone

Space for rough work

FIITJEE PET – IV (REG_2ND YEAR)

MAINS_SET–A_ANSWERS

DATE: 30.06.2018

MATHEMATICS

1.	**B**	2.	**B**	3.	**D**	4.	**A**
5.	**A**	6.	**A**	7.	**C**	8.	**C**
9.	**A**	10.	**B**	11.	**C**	12.	**B**
13.	**C**	14.	**A**	15.	**A**	16.	**A**
17.	**C**	18.	**B**	19.	**C**	20.	**A**
21.	**B**	22.	**B**	23.	**C**	24.	**A**
25.	**A**	26.	**A**	27.	**B**	28.	**D**
29.	**C**	30.	**A**				

PHYSICS

31.	**D**	32.	**D**	33.	**B**	34.	**Bonus**
35.	**B**	36.	**A**	37.	**A**	38.	**B**
39.	**C**	40.	**Bonus**	41.	**B**	42.	**A**
43.	**Bonus**	44.	**B**	45.	**B**	46.	**B**
47.	**B**	48.	**B**	49.	**C**	50.	**A**
51.	**C**	52.	**B**	53.	**C**	54.	**D**
55.	**A**	56.	**C**	57.	**A**	58.	**A**
59.	**B**	60.	**C**				

CHEMISTRY

61.	**B**	62.	**B**	63.	**D**	64.	A or **D**
65.	**C**	66.	**A**	67.	**B**	68.	**B**
69.	**D**	70.	**B**	71.	**Bonus**	72.	A or **B**
73.	**C**	74.	**A**	75.	**D**	76.	**D**
77.	**A**	78.	**B**	79.	**B**	80.	**A**
81.	**D**	82.	**D**	83.	**B**	84.	**D**
85.	**D**	86.	**B**	87.	**C**	88.	**B**
89.	**C or D**	90.	**C**				

FIITJEE PET – IV (REG_2ND YEAR)

MAINS_SET–B

DATE: 30.06.2018

Time: 3 hours **Maximum Marks: 360**

INSTRUCTIONS:

Instructions to the Candidates

1. This Test Booklet consists of **90 questions**.

   Use **Blue/Black ball Point Pen only** for writing particulars and bubbling of OMR.

2. For each correct answer **4 Marks** will awarded and for each wrong answer **1 Mark** will be deducted.

3. Attempt all questions.

4. In case you have not darkened any bubble you will be awarded 0 mark for that question.

5. Use of calculator/logarithmic table is not permitted.

Don't write / mark your answers in this question booklet.
If you mark the answers in question booklet, you will not be allowed to continue the exam.

NAME: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐

1. From the point A(0, 3) on the circle $x^2 + 4x + (y - 3)^2 = 0$, a chord AB is drawn and extended to a point P, such that AP = 2AB. The locus of P is
(A) $x^2 + 4x + (y - 3)^2 = 0$ (B) $x^2 + 8x + (y - 3)^2 = 0$
(C) $x^2 + 4x - (y - 3)^2 = 0$ (D) $x^2 + 8x - (y - 3)^2 = 0$

2. O is the origin and OA, OB are a pair of tangents to the $x^2 + y^2 + 2gx + 2fy + c = 0$, $c > 0$, then the equation to the circum circle of ΔOAB is
(A) $x^2 + y^2 - gx - fy = 0$ (B) $x^2 + y^2 + gx + fy = 0$
(C) $x^2 + y^2 - gx = 0$ (D) $x^2 + y^2 + fy = 0$

3. The interval in which the value of λ should lie if the line $3x - 4y = \lambda$ cuts the circle $x^2 + y^2 - 4x - 8y = 5$ in real points is
(A) (15, 35) (B) [15, 35] (C) (–35, 15) (D) [–15, 35]

4. The length of the tangent from a point on the circle $x^2 + y^2 + 4x - 6y - 12 = 0$ to the circle $x^2 + y^2 + 4x - 6y + 4 = 0$ is
(A) 4 (B) 12 (C) 16 (D) 8

5. The equation of the circle which is touched by y = x, has its centre on the positive direction of the x-axis and cuts off a chord of length 2 unit along the line $\sqrt{3}y - x = 0$ is
(A) $x^2 + y^2 - 4x + 2 = 0$ (B) $x^2 + y^2 - 4x + 1 = 0$ (C) $x^2 + y^2 - 8x + 8 = 0$ (D) $x^2 + y^2 - 4y + 2 = 0$

6. The locus of the point of intersection of the perpendicular tangents to the circles $x^2 + y^2 = a^2$, $x^2 + y^2 = b^2$ is
(A) $x^2 + y^2 = a^2 + b^2$ (B) $x^2 + y^2 = a^2 - b^2$ (C) $x^2 + y^2 = (a + b)^2$ (D) $x^2 + y^2 = (a - b)^2$

7. The tangents to $x^2 + y^2 = a^2$ having inclinations α and β intersect at P. If $\cot\alpha + \cot\beta = 0$, then the locus of P is
(A) x + y = 0 (B) x – y = 0 (C) xy = 0 (D) none of these

8. A line segment AM = a moves in the XOY plane such that AM is parallel to the X–axis. If A moves along the circle $x^2 + y^2 = a^2$, then the locus of M is
(A) $x^2 + y^2 = 4a^2$ (B) $x^2 + y^2 = 2ax$ (C) $x^2 + y^2 = 2ay$ (D) $x^2 + y^2 = 2ax + 2ay$

9. The centre of the circle touching the y-axis at (0, 3) and making an intercept 2 unit on positive x-axis is
(A) $\left(10, \sqrt{3}\right)$ (B) $\left(\sqrt{3}, 10\right)$ (C) $\left(\sqrt{10}, 3\right)$ (D) $\left(3, \sqrt{10}\right)$

10. The equation of a circle which has normals $(x - 1)(y - 2) = 0$ and a tangent $3x + 4y = 6$ is
(A) $x^2 + y^2 - 2x - 4y + 4 = 0$ (B) $x^2 + y^2 - 2x - 4y + 5 = 0$
(C) $x^2 + y^2 = 5$ (D) $(x - 3)^2 + (y - 4)^2 = 5$

Space for rough work

11. Equation of the circle passing through A(1, 2), B(5, 2) so that the angle subtended by AB at points on the circle is $\frac{\pi}{4}$ is

(A) $x^2 + y^2 - 6x - 8 = 0$ (B) $x^2 + y^2 - 6x - 8y + 17 = 0$
(C) $x^2 + y^2 - 6x + 8 = 0$ (D) $x^2 + y^2 - 6x - 8y - 25 = 0$

12. An equilateral triangle is inscribed in the circle $x^2 + y^2 = a^2$. The length of the side of the triangle is

(A) $a\sqrt{2}$ (B) $a\sqrt{3}$ (C) 2a (D) none of these

13. A circle of radius r passes through the origin and meets the axes at A and B. The locus of the centroid of ΔOAB is

(A) $x^2 + y^2 = 4r^2$ (B) $x^2 + y^2 = 3r^2$ (C) $3(x^2 + y^2) = r^2$ (D) $9(x^2 + y^2) = 4r^2$

14. The equation of the circle which passes through the origin and cuts off chords of length 2 from the lines x = y and x = –y is

(A) $x^2 + y^2 \pm 2\sqrt{2}x = 0, x^2 + y^2 \pm 2\sqrt{2}y = 0$ (B) $x^2 + y^2 \pm 3\sqrt{3}x = 0, x^2 + y^2 \pm 3\sqrt{3}y = 0$
(C) $x^2 + y^2 + 4\sqrt{3}x = 0, x^2 + y^2 \pm 4\sqrt{3}y = 0$ (D) none of these

15. The equation of the circle concentric with the circle $x^2 + y^2 - 6x + 12y + 15 = 0$ and of double its area is

(A) $x^2 + y^2 - 6x + 12y - 15 = 0$ (B) $x^2 + y^2 - 6x + 12y - 30 = 0$
(C) $x^2 + y^2 - 6x + 12y - 25 = 0$ (D) $x^2 + y^2 - 6x + 12y - 20 = 0$

16. The locus of the foot of the perpendicular drawn from the origin to any chord of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ which subtends a right angle at the origin is

(A) $x^2 + y^2 + gx + fy + \frac{c}{2} = 0$ (B) $2(x^2 + y^2) + gx + fy + c = 0$
(C) $2(x^2 + y^2 + gx + fy) + 3c = 0$ (D) $x^2 + y^2 + 2(gx + fy + c) = 0$

17. If the lengths of the tangents from the point (1, 2) to the circles $x^2 + y^2 + x + y - 4 = 0$ and $3x^2 + 3y^2 - x - y - \lambda = 0$ are in the ratio 4 : 3, then λ =

(A) $\frac{23}{4}$ (B) $\frac{21}{4}$ (C) $\frac{17}{4}$ (D) $\frac{19}{4}$

18. A circle with centre at (2, 4) is such that the line x + y + 2 = 0 cuts a chord of length 6. The radius of the circle is

(A) $\sqrt{11}$ (B) $\sqrt{21}$ (C) $\sqrt{31}$ (D) $\sqrt{41}$

19. Given that for the circle $x^2 + y^2 - 4x + 6y + 1 = 0$, the line with equation 3x – y = 1 is a chord. The midpoint of the chord is

(A) $\left(\frac{2}{5}, \frac{11}{5}\right)$ (B) $\left(-\frac{2}{5}, \frac{11}{5}\right)$ (C) $\left(-\frac{2}{5}, -\frac{11}{5}\right)$ (D) $\left(\frac{2}{5}, -\frac{11}{5}\right)$

Space for rough work

20. From the origin chords are drawn to the circle $x^2 + y^2 - 2y = 0$. The locus of the middle points of these chords is
(A) $x^2 + y^2 - y = 0$ (B) $x^2 + y^2 - x = 0$ (C) $x^2 + y^2 - 2x = 0$ (D) $x^2 + y^2 - x - y = 0$

21. The equation to the side BC of ΔABC is $x + 5 = 0$. If (–3, 2) is the orthocenter of ΔABC. The point where the altitude through A meets the circumcircle of the triangle is
(A) (2, 7) (B) (2, –7) (C) (–7, 2) (D) (7, –2)

22. The radius of the circle which has the lines $x + y - 1 = 0$, $x + y - 9 = 0$ as tangents is
(A) $\sqrt{2}$ (B) $2\sqrt{2}$ (C) $3\sqrt{2}$ (D) $4\sqrt{2}$

23. If the equation of one tangent to the circle with centre (2, –1) from the origin is $3x + y = 0$, then the equation of the other tangent through the origin is
(A) $3x - y = 0$ (B) $x + 3y = 0$ (C) $x - 3y = 0$ (D) $x + 2y = 0$

24. Let A be the centre of the circle $x^2 + y^2 - 2x - 4y - 20 = 0$. Suppose that the tangent at the points B(1, 7) and D(4, –2) on the circle meet at the point C. The area of the quadrilateral ABCD is
(A) 75 sq. unit (B) 145 sq. unit (C) 150 sq. unit (D) 50 sq. unit

25. If a tangent drawn from the point (4, 0) to the circle $x^2 + y^2 = 8$ touches it at a point A in the first quadrant, then the coordinates of another point B on the circle such that AB = 4 are
(A) (2, –2) or (–2, 2) (B) (1, –2) or (–2, 1) (C) (–1, 1) or (1, –1) (D) (3, –2) or (–3, 2)

26. Three distinct points A, B and C are given in the 2–dimensional coordinate plane such that the ratio of the distance of any one of them from the point (1, 0) to the distance from the point (–1, 0) is equal to $\frac{1}{3}$. Then the circumcentre of the triangle ABC is at the point
(A) $\left(\frac{5}{4},0\right)$ (B) $\left(\frac{5}{2},0\right)$ (C) $\left(\frac{5}{3},0\right)$ (D) (0, 0)

27. The equation to the circle of radius 5, which pass through the two points on the x-axis which are at a distance of 4 from the origin is
(A) $x^2 + y^2 - 6x - 16 = 0$ (B) $x^2 + y^2 - 6y - 25 = 0$ (C) $x^2 + y^2 + 6y - 16 = 0$ (D) none of these

28. A circle is inscribed in an equilateral triangle and a square is inscribed in the circle. The ratio of the area of the triangle to the area of the square is
(A) $\sqrt{3} : \sqrt{2}$ (B) $\sqrt{3} : 1$ (C) $3\sqrt{3} : 2$ (D) $3 : \sqrt{2}$

Space for rough work

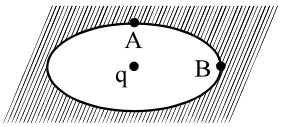
29. The farthest point on the circle $x^2 + y^2 - 4x + 6y - 12 = 0$ from (–13, 17) is
(A) (5, –7) (B) (–1, 1) (C) (–1, 2) (D) (–2, 2)

30. The circle $x^2 + y^2 - 4x - 4y + 4 = 0$ is inscribed in a triangle which has two of its sides along the coordinate axes. The locus of the circumcentre of the triangle is $x + y - xy + k(x^2 + y^2)^{1/2} = 0$. Then k =
(A) 0 (B) 1 (C) –1 (D) 2

31. A solid sphere of radius R is charged uniformly. At what distance from its surface is the electrostatic potential half of the potential at the centre?
(A) R (B) R/2 (C) R/3 (D) 2R

32. Two identical small conducting spheres, having charges of opposite sign, attract each other with a force of 0.108 N when separated by 0.5 m. The spheres are connected by a conducting wire, which is then removed, and thereafter, they repel each other with a force of 0.036 N. The initial charges on the spheres are
(A) $\pm 5 \times 10^{-6}$ C and 15×10^{-6} C (B) $\pm 1.0 \times 10^{-6}$ C and 3.0×10^{-6} C
(C) $\pm 2.0 \times 10^{-6}$ C and 6.0×10^{-6} C (D) $\pm 0.5 \times 10^{-6}$ C and 1.5×10^{-6} C

33. An ellipsoidal cavity is carved within a perfect conductor. A positive charge q is placed at the center of the cavity. The points A & B are on the cavity surface as shown in the figure. Then:
(A) electric field near A in the cavity = electric field near B in the cavity
(B) charge density at A = charge density at B
(C) potential at A = potential at B
(D) total electric field flux through the surface of the cavity is $q/\in_0$.

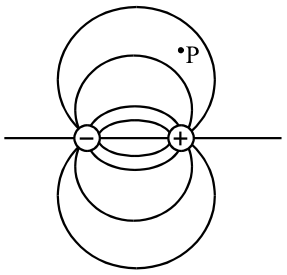


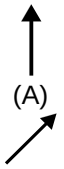
34. There are four concentric shells A, B, C and D of radii a, 2a, 3a and 4a respectively. Shells B and D are given charges +q and –q respectively. Shell C is now earthed. The potential difference $V_A - V_C$ is.
(A) $\frac{Kq}{2a}$ (B) $\frac{Kq}{3a}$ (C) $\frac{Kq}{4a}$ (D) $\frac{Kq}{6a}$

35. Under the influence of the Coulomb field of charge +Q, a charge –q is moving around it in an elliptical orbit. Find out the correct statement(s).
(A) The angular momentum of the charge –q is constant
(B) The linear momentum of the charge –q is constant
(C) The angular velocity of the charge –q is constant
(D) The linear speed of the charge –q is constant

Space for rough work

36. Figure shows the electric field lines around an electric dipole. Which of the arrows best represents the electric field at point P ?




(A)

(C)

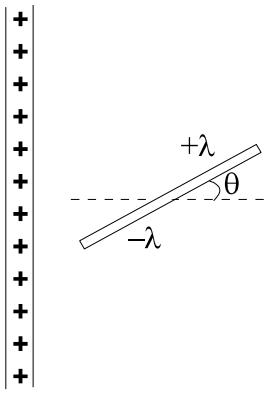

(B)


(D)

37. A large sheet carries uniform surface charge density σ. A rod of length 2l has a linear charge density λ on one half and $-\lambda$ on the second half. The rod is hinged at mid point O and makes an angle θ with the normal to the sheet. The torque experienced by the rod is

(A) 0 (B) $\frac{\sigma\lambda\ell^2}{2\varepsilon_0}\sin\theta$

(C) $\frac{\sigma\lambda\ell^2}{\varepsilon_0}\sin\theta$ (D) $\frac{\sigma\lambda\ell}{2\varepsilon_0}$



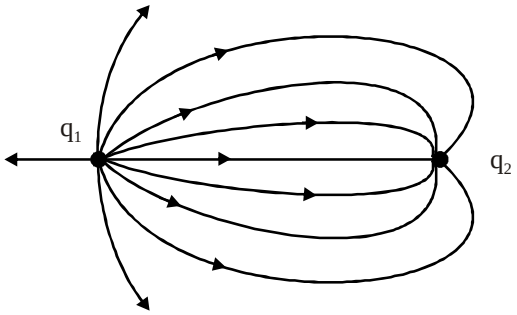
38. The figure shows the electric field lines in the vicinity of two point charges. Which one of the following statements concerning this situation is true?

(A) Both q_1 and q_2 have the same sign of charge

(B) The magnitude of the ratio (q_2/q_1) is less than one.

(C) The electric field is strongest midway between the charges.

(D) The magnitude of the ratio (q2/q1) is more than one.

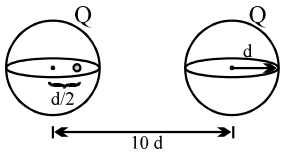


Space for rough work

39. Electric flux through a surface of area 100 m^2 lying in the xy plane is (in V-m) if $\vec{E} = \hat{i} + \sqrt{2}\hat{j} + \sqrt{3}\hat{k}$

(A) 100 (B) 141.4 (C)173.2 (D)200

40. Two spherical, nonconducting, and very thin shells of uniformly distributed positive charge Q and radius d are located a distance 10d from each other. A positive point charge q is placed inside one of the shells at a distance d/2 from the center, on the line connecting the centers of the two shells, as shown in the figure. What is the net force on the charge q?



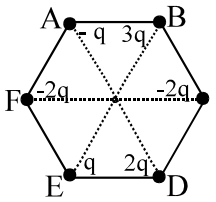
(A) $\frac{qQ}{361\pi\varepsilon_0 d^2}$ to the left (B) $\frac{qQ}{361\pi\varepsilon_0 d^2}$ to the right

(C) $\frac{362qQ}{361\pi\varepsilon_0 d^2}$ to the left (D) $\frac{360qQ}{361\pi\varepsilon_0 d^2}$ to the right

41. A point charge 50μC is located in the XY plane at the point of position vector $\vec{r}_0 = 2\hat{i} + 3\hat{j}$. What is the electric field at the point of position vector $\vec{r} = 8\hat{i} - 5\hat{j}$

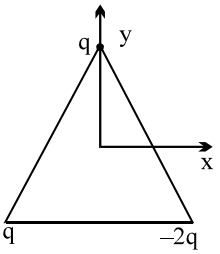
(A) 1200V/m (B) 0.04V/m (C)900V/m (D) 4500 V/m

42. Six charges are placed at the corner of a regular hexagon as shown. If an electron is placed at its centre O, force on it will be:



(A) Zero
(B) Along OF
(C) Along OC
(D) None of these

43. An equilateral triangle wire frame of side L having 3 point charges at its vertices is kept in x-y plane as shown. Component of electric field due to the configuration in z direction at (0, 0, L) is [origin is centroid of triangle]



(A) $\frac{9\sqrt{3}kq}{8L^2}$ (B) zero

(C) $\frac{9kq}{8L^2}$ (D) None

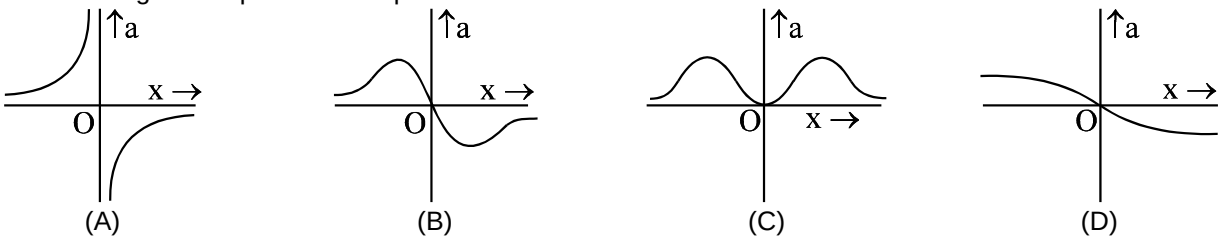
Space for rough work

44. Two free positive charges 4q and q are a distance l apart. What charge Q is needed to achieve equilibrium for the entire system and where should it be placed form charge q?

(A) Q = $\frac{9}{4}$ q (negative) at $\frac{\ell}{3}$ (B) Q = $\frac{4}{9}$ q (positive) at $\frac{\ell}{3}$

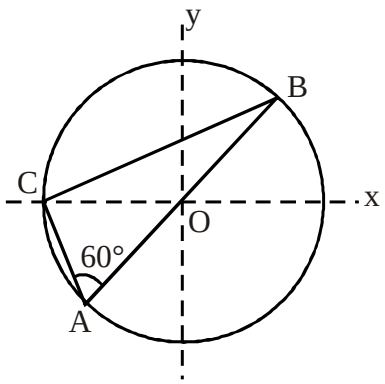
(C) Q = q (positive) at $\frac{\ell}{3}$ (D) Q = q (negative) at $\frac{\ell}{3}$

45. Two identical positive charges are fixed on the y-axis, at equal distances from the origin O. A particle with a negative charge starts on the x-axis at a large distance from O, moves along the + x-axis, passes through O and moves far away from O. Its acceleration a is taken as positive along its direction of motion. The particle's acceleration a is plotted against its x-coordinate. Which of the following best represents the plot?



(A) (B) (C) (D)

46. Consider a system of three charges q/3,q/3 and –2q/3 placed at points A, B and C, respectively, as shown in the figure. Take O to be the centre of the circle of radius R and angle CAB = 60°



(A) The electric field at point O is $\frac{q}{8\pi\varepsilon_0 R^2}$ directed along the negative x-axis

(B) The potential energy of the system is zero

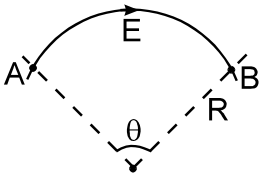
(C) The magnitude of the force between the charges at C and B is $\frac{q^2}{54\pi\varepsilon_0 R^2}$

(D) The potential at point O is $\frac{q}{12\pi\varepsilon_0 R}$

Space for rough work

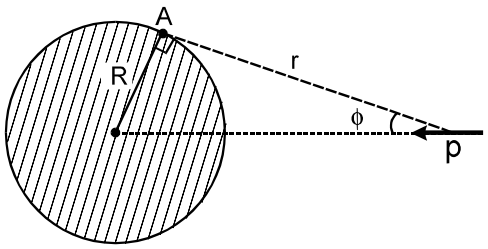
47. A long, hollow conducting cylinder is kept coaxially inside another long, hollow conducting cylinder of larger radius. Both the cylinders are initially electrically neutral.
(A) A potential difference appears between the two cylinders when a charge density is given to the inner cylinder
(B) A potential difference appears between the two cylinders when a charge density is given to the outer cylinder
(C) No potential difference appears between the two cylinders when a uniform line charge is kept along the axis of the cylinder
(D) No potential difference appears between the two cylinders when same charge density is given to both the cylinders

48. Figure shows an electric line of force which curves along a circular arc. The magnitude of electric field intensity is same at all points on this curve and is equal to E. If the potential at A is V, then the potential at B is



(A) $V - ER\theta$ (B) $V - 2ER\sin\frac{\theta}{2}$ (C) $V + ER\theta$ (D) $V + 2ER\sin\frac{\theta}{2}$

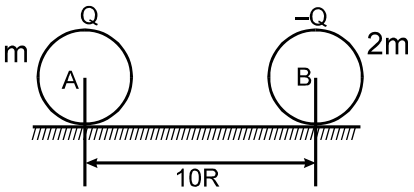
49. A dipole having dipole moment p is placed in front of a solid uncharged conducting sphere as shown in the diagram. The net potential at point A lying on the surface of the sphere is :



(A) $\frac{kp\cos\phi}{r^2}$ (B) $\frac{kp\cos^2\phi}{r^2}$ (C) zero (D) $\frac{2kp\cos^2\phi}{r^2}$

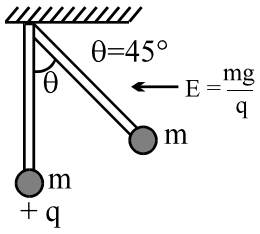
Space for rough work

50. Two smooth spherical non conducting shells each of radius R having uniformly distributed charge Q & -Q on their surfaces are released on a smooth non-conducting surface when the distance between their centres is 10 R. The mass of A is m and that of B is 2 m. The speed of A just before A and B collide is: [Neglect gravitational interaction]



(A) $\sqrt{\frac{2KQ^2}{15mR}}$ (B) $\sqrt{\frac{4KQ^2}{15mR}}$ (C) $\sqrt{\frac{8KQ^2}{15mR}}$ (D) $\sqrt{\frac{16KQ^2}{15mR}}$

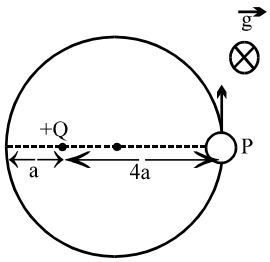
51. In space a horizontal Electric Field (E = (mg)/q) exists as shown in figure and a mass m attached at the end of a light rod. If mass m is released from the position shown in figure find the angular velocity of the rod when it passes through the bottom most position



(A) $\sqrt{\frac{g}{\ell}}$ (B) $\sqrt{\frac{2g}{\ell}}$

(C) $\sqrt{\frac{3g}{\ell}}$ (D) $\sqrt{\frac{5g}{\ell}}$

52. The diagram shows a small bead of mass m carrying charge q. The bead can freely move on the smooth fixed ring placed on a smooth horizontal plane. In the same plane a charge +Q has also been fixed as shown. The potential at the point P due to +Q is V. The velocity with which the bead should projected from the point P so that it can complete a circle should be greater than



(A) $\sqrt{\frac{6qV}{m}}$ (B) $\sqrt{\frac{qV}{m}}$

(C) $\sqrt{\frac{3qV}{m}}$ (D) None

53. A charged particle of charge Q is held fixed and another charged particle of mass m and charge q (of the same sign) is released from a distance r. The impulse of the force exerted by the external agent on the fixed charge by the time distance between Q and q becomes 2r is

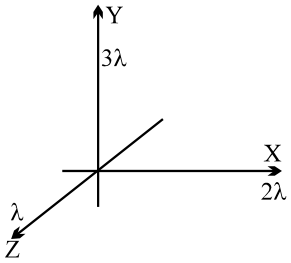
(A) $\sqrt{\frac{Qq}{4\pi \in_0 mr}}$ (B) $\sqrt{\frac{Qq}{4\pi \in_0 mr}}$

(C) $\sqrt{\frac{Qqm}{\pi \in_0 r}}$ (D) $\sqrt{\frac{Qqm}{2\pi \in_0 r}}$

Space for rough work

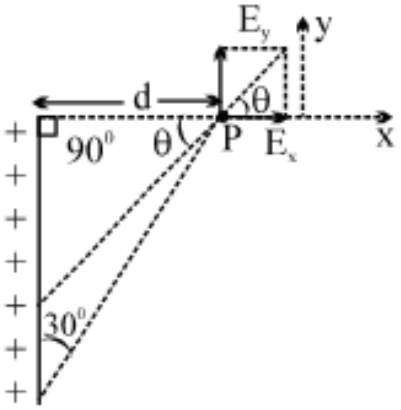
54. In a uniform electric field, the potential is 10V at the origin of coordinates, and 8V at each of the points (1, 0, 0), (0, 1, 0) and (0, 0, 1). The potential at the point (1, 1, 1) will be
(A) 0 (B) 4 V (C) 8 V (D) 10 V

55. The diagram shows three infinitely long uniform line charges placed on the X, Y and Z axis. The work done in moving a unit positive charge from (1, 1, 1) to (0, 1, 1) is equal to
(A) $(\lambda \ln 2) / 2\pi\in_0$
(B) $(\lambda \ln 2) /\pi\in_0$
(C) $(3\lambda \ln 2) / 2\pi\in_0$
(D) None



56. A non-conducting ring of radius R has uniformly distributed positive charge Q. A small part of the ring, of length d, is removed (d << R). The electric field at the centre of the ring will now be
(A) directed towards the gap, inversely proportional to R^3
(B) directed towards the gap, inversely proportional to R^2
(C) directed away from the gap, inversely proportional to R^3
(D) directed away from the gap, inversely proportional to R^2

57. The direction (θ) of field at point P due to uniformly charged finite rod will be
(A) at angle 30^0 from x-axis
(B) 45^0 from x - axis
(C) 60^0 from x-axis
(D) none of these



Space for rough work

58. A charged particle having some mass is resting in equilibrium at a height H above the centre of a uniformly charged non-conducting horizontal ring of radius R. The force of gravity acts downwards. The equilibrium of the particle will be stable

(A) for all values of H (B) only if $H > \frac{R}{\sqrt{2}}$ (C) only if $H < \frac{R}{\sqrt{2}}$ (D) only if $H = \frac{R}{\sqrt{2}}$

59. When a negative charge is released and moves in electric field, it moves toward a position of
(A) lower electric potential and lower potential energy
(B) lower electric potential and higher potential energy
(C) higher electric potential and lower potential energy
(D) higher electric potential and higher potential energy

60. Two identical thin rings, each of radius R meter are coaxially placed at distance R meter apart.If Q_1 and Q_2 coulomb are respectively the charges uniformly spread on the two rings, the work done in moving a charge q from the centre of one ring to that of the other is

(A) zero (B) $a(Q_1 - Q_2)\left(\sqrt{2}-1\right)/\left(\sqrt{2}\,4\pi\varepsilon_0 R\right)$

(C) $q\sqrt{2}(Q_1 + Q_2)/4\pi\varepsilon_0 R$ (D) $q\sqrt{2}(Q_1 + Q_2)/4\pi\varepsilon_0 R$

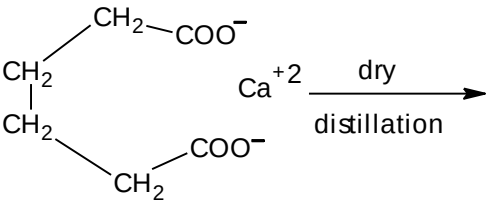
61. Which of the following reaction is used in preparation of carbonyl compound

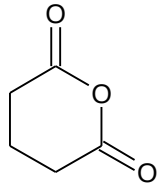
(A) $CH_3 - CH_2 - COO - CH_3 \xrightarrow{DIBAL-H}$ (B) $R - C \equiv C - H \xrightarrow{HBO}$

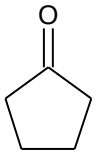
(C) $CH_3 - CH_2 - CH = CH_2 \xrightarrow[Zn/H_2O]{O_3}$ (D) All

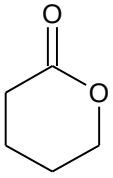
62. Which among the following cannot be prepared using Rosenmund reduction.
(A) HCHO (B) CH_3COCH_3 (C) CH_3CHO (D) both a & b

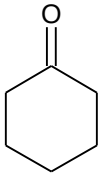
63.



(A) 

(B) 

(C) 

(D) 

Space for rough work

64. In the reaction, $PhCN \xrightarrow[2.\ H_2O,\ heat]{1.\ SnCl_2\ /HCl}$

The modification of the functional group and the change in hybridization of the functional carbon are, respectively :

(A) –CN to $–CH_2NH_2$, sp^2 to sp^2 (B) –CN to $–CONH_2$, sp to sp^2

(C) –CN to –COOH, sp^2 to sp^3 (D) –CN to –CHO, sp to sp^2

65. In the reaction, $CH_3CHO + HCN \rightarrow CH_3CHOHCN$, chiral centre is produced. The product is :

(A) meso compound (B) laevorotatory

(C) dextrorotatory (D) racemic mixture

66. The hybridization of C in CH_3CHO is

(A) sp (B) sp^2 (C) sp^3 (D) sp^2 & sp^3

67. Which of the following is most reactive towards nucleophilic addition reactions ?

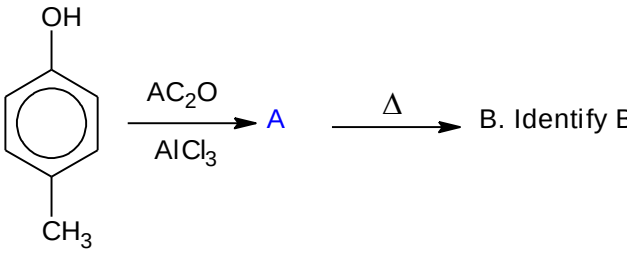
(A) HCHO (B) CH_3CHO (C) C_2H_5CHO (D) CH_3COCH_3

68. Which of the following is correct order of rate of HCN addition to compound A $\rightarrow$ D

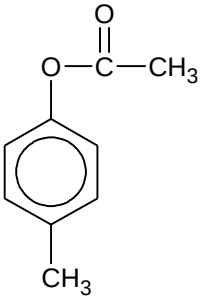
HCHO(A) , CH_3COCH_3(B) , $PhOCH_3$(C) , PhCOPh(D)

(A) A < B < C < D (B) D < C < B < A (C) D < B < C < A (D) D < C < A < B

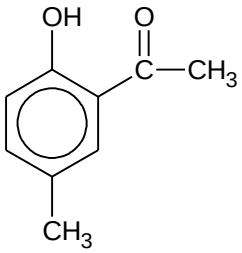
69.



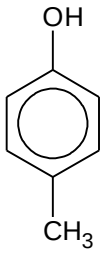
(A)



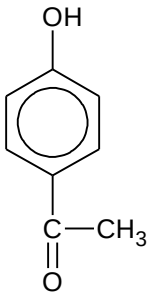
(B)



(C)



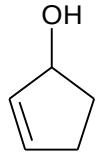
(D)

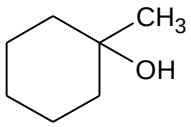


Space for rough work

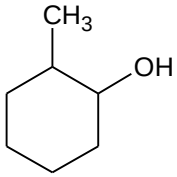
70. Which among the following is a gas ?
(A) HCHO (B) CH_3CHO (C) CH_3COCH_3 (D) $PhCOCH_3$

71. Compound which does not form aldehyde or ketone when treated with P.C.C. is

(A) 

(B) 

(C) $CH_3–CH(OH)–CH_3$

(D) 

72. The formation of cyanohydrin from ketone is an example of
(A) Electrophilic addition (B) Nucleophilic addition
(C) Nucleophilic substitution (D) Electrophilic substitution

73. Benzaldehyde can be formed by treating benzene with
(A) $CO/HCl/AlCl_3$ (B) $HCN/HCl/AlCl_3, H_2O/H^+$
(C) $CH_3-Cl/AlCl_3, CrO_2Cl_2/\Delta$ (D) All of these

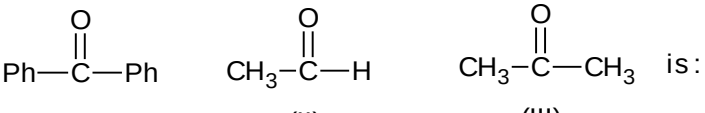
74. When 1–ethyl–2–methyl benzene is ozonised followed by Zn/H_2O, it does not give
(A) $C_2H_5–CHO$ (B) CH_3COCHO
(C) $C_2H_5–(CO)_2–CH_3$ (D) HCHO

75. On the hydrolysis of gem trihalides by aq. Alkali, it gives
(A) aldehyde (B) ketone
(C) carboxylic acid (D) all of these

76. The product(s) obtained via oxymercuration ($HgSO_4 + H_2SO_4$) of but–1–yne would be :
(A) $CH_3CH_2CH_2CHO$ (B) $CH_3CH_2COCH_3$
(C) $CH_3CH_2CHO + HCHO$ (D) $CH_3CH_2COOH + HCOOH$

Space for rough work

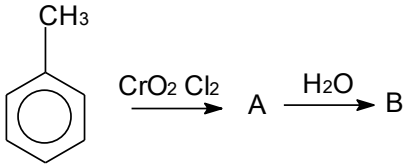
77. The correct order of reactivity of PhMgBr with,



(I) (II) (III)

(A) I > II > III (B) III > II > I (C) II > III > I (D) I > III > II

78.



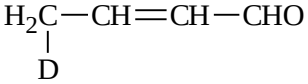
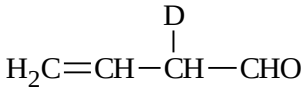
The functional group present in B and name of the reaction would be

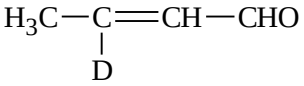
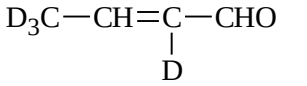
(A) -CHO, gattermann aldehyde synthesis

(B) -CHO, Etard reaction

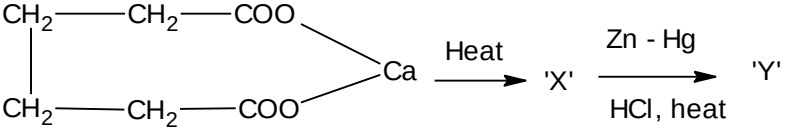
(C)  , Friedel Craft reaction (D) - CHO, OXO reaction

79. The compound CH_3—CH = CH—CHO is treated with sufficient OD^- in presence of D_2O. Which of the following is not likely to be present at all when equilibrium is reached?

(A)  (B) 

(C)  (D) 

80. Identify the product 'Y' in the following reaction sequence :



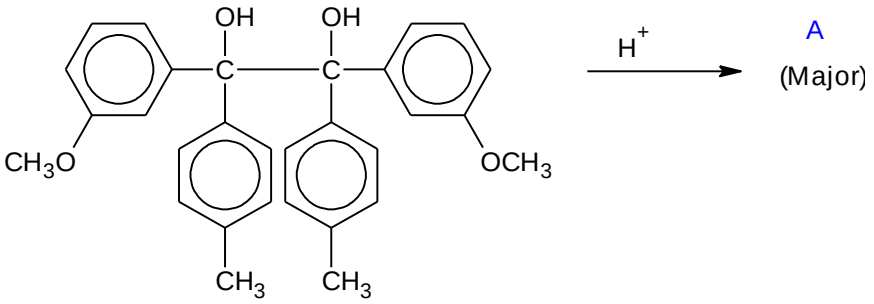
(A) pentane (B) cyclobutane (C) cyclopentane (D) cyclopentanone

Space for rough work

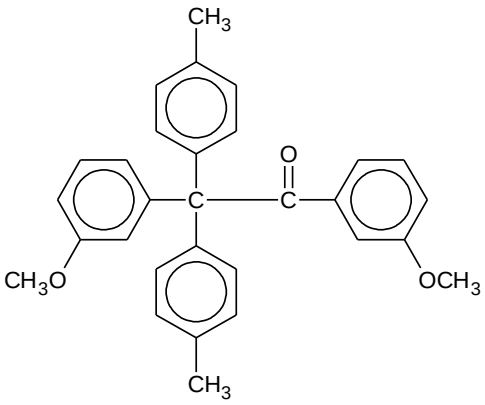
81. $H-C\equiv C-H+H_2O \xrightarrow[\Delta]{H^+,Hg^{2+}} A \xrightarrow{KMnO_4/H^+} B \xrightarrow{CaO} C$

(A) chloroform can be prepared from both A & C
(B) The reaction leading to the formation of A is electrophilic addition
(C) C is 2-propanone
(D) Both A & C are correct.

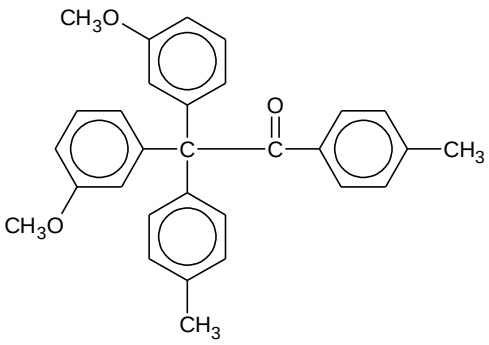
82.



(A)

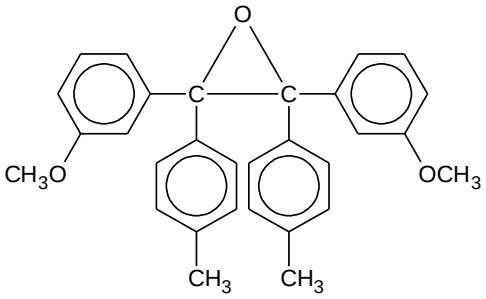


(B)



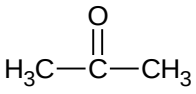
(C) Both 1 & 2

(D)

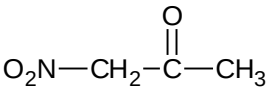


Space for rough work

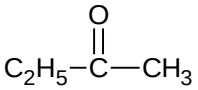
83. Reactivity order of the following >C=O group with respect to nucleophilic addition



(I)



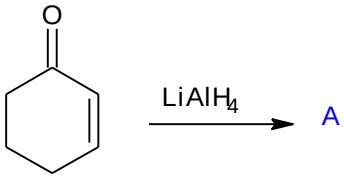
(II)



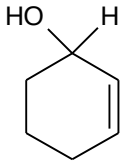
(III)

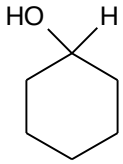
(A) I > II > III (B) III > II > I (C) II > I > III (D) II > III > I

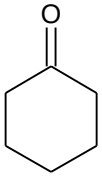
84.

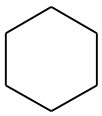


The product predominates is

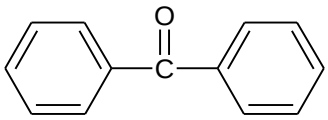
(A) 

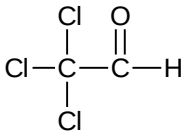
(B) 

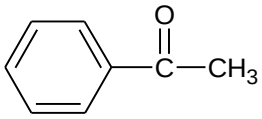
(C) 

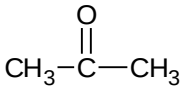
(D) 

85. Which of the following is the correct reactivity order of various carbonyl compounds towards cyanohydrin formation ?

(I) 

(II) 

(III) 

(IV) 

(A) I > III > II > IV (B) IV > II > III > I (C) III > I > II > IV (D) II > IV > III > I

Space for rough work

86. The reactivity order of the following towards Nucleophilic addition reaction is

$\underset{(I)}{HCHO},\ \underset{(II)}{CH_3CHO},\ \underset{(III)}{CH_3COCH_3}$

(A) I > II > III (B) III > II > I (C) I > III > II (D) II > III > I

87. $CH \equiv CH \xrightarrow[H_2O]{Hg^{2+}/H^+} A \xrightarrow{LiAlH_4} B \xrightarrow{P/Br_2} C$. The compound C is

(A) $CH_2(Br) - CH_2(Br)$ (B) C_2H_5Br

(C) BHC (D) C_2H_5OH

88. $CH_3CH_2 - COO - C_2H_5 \xrightarrow[(ii)H_3O^+]{(i)\ DIBAL-H(1eq)} A + B$

A and B are respectively

(A) $CH_3CH_2CH_2OH + C_2H_5OH$ (B) $CH_3CH_2CHO + C_2H_5OH$

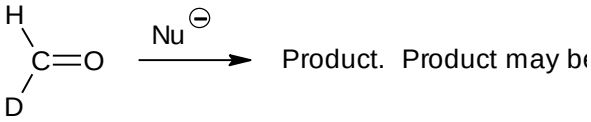
(C) $CH_3CH_2CHO + CH_3CHO$ (D) $CH_3CH_2CH_2OH + CH_3CHO$

89. $CH_3CHO + LiAlH_4 \longrightarrow CH_3CH_2OH$

Nucleophile added in this reaction is

(A) H (B) Li^+ (C) H^+ (D) H^-

90.



Product. Product may b

(A) Meso (B) Racemic (C) Inversion (D) All of these

Space for rough work

FIITJEE PET – IV (REG_2ND YEAR)

MAINS_SET–B_ANSWERS

DATE: 30.06.2018

MATHEMATICS

1.	**B**	2.	**B**	3.	**C**	4.	**A**
5.	**A**	6.	**A**	7.	**C**	8.	**B**
9.	**C**	10.	**A**	11.	**B**	12.	**B**
13.	**D**	14.	**A**	15.	**A**	16.	**A**
17.	**B**	18.	**D**	19.	**C**	20.	**A**
21.	**C**	22.	**B**	23.	**C**	24.	**A**
25.	**A**	26.	**A**	27.	**C**	28.	**C**
29.	**A**	30.	**B**				

PHYSICS

31.	**C**	32.	**B**	33.	**C**	34.	**D**
35.	**A**	36.	**B**	37.	**B**	38.	**B**
39.	**C**	40.	**A**	41.	**D**	42.	**D**
43.	**B**	44.	**Bonus**	45.	**B**	46.	**C**
47.	**A**	48.	**A**	49.	**B**	50.	**C**
51.	**B**	52.	**A**	53.	**Bonus**	54.	**B**
55.	**B**	56.	**A**	57.	**A**	58.	**B**
59.	**C**	60.	**Bonus**				

CHEMISTRY

61.	**D**	62.	**D**	63.	**B**	64.	**D**
65.	**D**	66.	**D**	67.	**A**	68.	**B**
69.	**B**	70.	**A**	71.	**B**	72.	**B**
73.	**D**	74.	A or **D**	75.	**C**	76.	**B**
77.	**C**	78.	**B**	79.	**C or D**	80.	**C**
81.	Bonus	82.	A or **B**	83.	**C**	84.	**A**
85.	**D**	86.	**A**	87.	**B**	88.	**B**
89.	**D**	90.	**B**				