FIITJEE PET – VII (REG_2ND YEAR)

MAINS_SET–A

DATE: 04.08.2018

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. The eccentricity of an ellipse, with its centre at the origin, is $\frac{1}{2}$. If one of the directrices is x = 4, then the equation of the ellipse is
(A) $3x^2 + 4y^2 = 1$ (B) $4x^2 + 3y^2 = 1$ (C) $4x^2 + 3y^2 = 12$ (D) $3x^2 + 4y^2 = 12$

2. The ellipse $x^2 + 4y^2 = 4$ is inscribed in a rectangle aligned with the coordinate axes, which in turn is inscribed in another ellipse that passes through the point (4, 0). Then the equation of the ellipse is
(A) $x^2 + 12y^2 = 16$ (B) $4x^2 + 48y^2 = 48$ (C) $4x^2 + 64y^2 = 48$ (D) $x^2 + 16y^2 = 16$

3. Equation of the ellipse whose axes are the axes of coordinates and which passes through the point (–3, 1) and has eccentricity $\sqrt{\frac{2}{5}}$ is
(A) $3x^2 + 5y^2 - 15 = 0$ (B) $5x^2 + 3y^2 - 32 = 0$ (C) $3x^2 + 5y^2 - 32 = 0$ (D) $5x^2 + 3y^2 - 48 = 0$

4. An ellipse drawn by taking a diameter of the circle $(x - 1)^2 + y^2 = 1$ as its semiminor axis and a diameter of the circle $x^2 + (y - 2)^2 = 4$ as its semi-major axis. If the centre of the ellipse is at the origin and its axes are the coordinate axes, then the equation of the ellipse is
(A) $4x^2 + y^2 = 8$ (B) $x^2 + 4y^2 = 16$ (C) $4x^2 + y^2 = 4$ (D) $x^2 + 4y^2 = 8$

5. The eccentricity of the conic $36x^2 + 144y^2 - 36x - 96y - 119 = 0$ is
(A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{2}$ (C) $\frac{\sqrt{3}}{4}$ (D) $\frac{1}{\sqrt{3}}$

6. S and T are the foci of an ellipse and B is an end of the minor axis. If STB is an equilateral triangle then the eccentricity of the ellipse is
(A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{2}{3}$

7. A circle is described with minor axis of an ellipse as a diameter. If the foci lie on the circle the eccentricity of the ellipse is
(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{3}$ (D) $\frac{1}{\sqrt{3}}$

8. Equations of the latus recta of the ellipse $9x^2 + 4y^2 - 18x - 8y - 23 = 0$ are
(A) $y = \pm\sqrt{5}$ (B) $x = \pm\sqrt{5}$ (C) $y = 1\pm\sqrt{5}$ (D) $x = -1 \pm \sqrt{5}$

Space for rough work

9. The sum of the slopes of the tangents to the ellipse $\frac{x^2}{9}+\frac{y^2}{4}$ = 1 drawn from the point (6, –2) is

(A) 0 (B) $\frac{3}{4}$ (C) $-\frac{6}{7}$ (D) $-\frac{8}{9}$

10. The product of the perpendiculars from the foci on any tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}$ = 1 is

(A) a^2 (B) $a^2 - b^2$ (C) b^2 (D) $\sqrt{a^2+b^2}$

11. Tangents are drawn through the point $\left(4,\sqrt{3}\right)$ to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}$ = 1. The point at which these tangents touch the ellipse are

(A) $\left(2,\frac{3\sqrt{3}}{2}\right)$, (4, 0) (B) $\left(2,\frac{\sqrt{3}}{\sqrt{2}}\right),\left(4,\frac{\sqrt{3}}{2}\right)$ (C) $\left(4,\frac{3\sqrt{3}}{\sqrt{3}}\right)$, (2, 0) (D) (2, 0), (4, 0)

12. The sum of the squares of the perpendicular on any tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}$ = 1 from two points on the minor axis each at a distance $\sqrt{a^2-b^2}$ from the centre is

(A) $2a^2$ (B) $2b^2$ (C) $a^2 + b^2$ (D) $a^2 - b^2$

13. The equation of the ellipse whose focus is (3, –2), eccentricity $\frac{3}{4}$ and directrix 2x – y + 3 = 0 is

(A) $14x^2 + 33xy + 17y^2 - 255x + 74y + 159 = 0$ (B) $44x^2 + 36xy + 71y^2 - 588x + 374y + 959 = 0$
(C) $4x^2 + 56xy + 271y^2 - 188x + 274y + 359 = 0$ (D) $44x^2 - 36xy - 71y^2 - 588x - 374y - 959 = 0$

14. The equation of the ellipse whose vertices are (4, 1), (6, 1) whose focus lies on the line x – 2y = 2 is

(A) $\frac{(x-1)^2}{25}+\frac{(y-1)^2}{16}=1$ (B) $\frac{(x-1)^2}{16}+\frac{(y-1)^2}{25}=1$

(C) $\frac{(x+1)^2}{25}+\frac{(y+1)^2}{16}=1$ (D) $\frac{(x+1)^2}{16}+\frac{(y+1)^2}{25}=1$

Space for rough work

15. If the latusrectum of the ellipse $x^2 \tan^2\alpha + y^2 \sec^2\alpha = 1$ is $\frac{1}{2}$, then $\alpha =$

(A) $\frac{\pi}{12}$ (B) $\frac{\pi}{6}$ (C) $\frac{5\pi}{12}$ (D) none of these

16. Shortest distance between the parabolas $y^2 = 4x$ and $y^2 = 2x - 6$ is

(A) 2 (B) $\sqrt{5}$ (C) 3 (D) none of these

17. If the 4th term in the expansion of $\left(px + \frac{1}{x}\right)^n$, $n \in N$ is $\frac{5}{2}$ and three normals to the parabola $y^2 = x$ are drawn through a point (q, 0), then

(A) q = p (B) q > p (C) q < p (D) pq = 1

18. The mirror image of the parabola $y^2 = 4x$ in the tangent to the parabola at the point (1, 2) is

(A) $(x - 1)^2 = 4(y + 1)$ (B) $(x + 1)^2 = 4(y + 1)$ (C) $(x + 1)^2 = 4(y - 1)$ (D) $(x - 1)^2 = 4(y - 1)$

19. The set of points on the axis of the parabola $y^2 - 4x - 2y + 5 = 0$ from which all the three normals to the parabola are real is

(A) (k, 0); k > 1 (B) (k, 1); k > 3 (C) (k, 2); k > 6 (D) (k, 3); k > 8

20. The locus of the point of intersection of tangents to the parabola $y^2 = 4(x + 1)$ and $y^2 = 8(x + 2)$ which are perpendicular to each other is

(A) x + 7 = 0 (B) x – y = 4 (C) x + 3 = 0 (D) y – x = 12

21. A line L passing through the focus of the parabola $y^2 = 4(x - 1)$ intersects the parabola in two distinct points. If 'm' be the slope of the line L, then

(A) $m \in (-1, 1)$ (B) $m \in (-\infty, -1) \cup (1, \infty)$
(C) $m \in R$ (D) none of these

22. Radius of the largest circle which passes through the focus of the parabola $y^2 = 4x$ and contained in it, is

(A) 8 (B) 4 (C) 2 (D) 5

23. A ray of light moving parallel to the x-axis gets reflected from a parabolic mirror whose equation is $(y - 2)^2 = 4(x + 1)$. After reflection, the ray must pass through the point

(A) (–2, 0) (B) (–1, 2) (C) (0, 2) (D) (2, 0)

24. The equation of the line touching both the parabolas $y^2 = 4x$ and $x^2 = -32y$ is

(A) x + 2y + 4 = 0 (B) 2x + y – 4 = 0 (C) x – 2y – 4 = 0 (D) x – 2y + 4 = 0

Space for rough work

25. The coordinates of the point on the parabola $y^2 = 8x$, which is at minimum distance from the circle $x^2 + (y + 6)^2 = 1$, are
(A) (2, –4) (B) (18, –12) (C) (2, 4) (D) none of these

26. If the normal to the parabola $y^2 = 4ax$ at the point $(at^2, 2at)$ cuts the parabola again at $(aT^2, 2aT)$, then
(A) $-2 \le T \le 2$ (B) $T \in (-\infty, -8) \cup (8, \infty)$
(C) $T^2 < 8$ (D) $T^2 \ge 8$

27. The length of latus-rectum of the parabola whose parametric equation is $x = t^2 + t + 1$, $y = t^2 - t + 1$, where $t \in R$ is equal to
(A) 2 (B) 4 (C) 8 (D) none of these

28. A parabola is drawn with focus at (3, 4) and vertex at the focus of the parabola $y^2 - 12x - 4y + 4 = 0$. The equation of the parabola is
(A) $x^2 - 6x - 8y + 25 = 0$ (B) $y^2 - 8x - 6y + 25 = 0$
(C) $x^2 - 6x + 8y - 25 = 0$ (D) $x^2 + 6x - 8y - 25 = 0$

29. Two perpendicular tangents PA and PB are drawn to $y^2 = 4ax$, minimum length of AB is equal to
(A) a (B) 4a (C) 8a (D) 2a

30. The x-coordinate of points on the axis of the parabola $4y^2 - 32x + 4y + 65 = 0$ from which all three normals to the parabola are real is
(A) > 2 (B) > 4 (C) > 5 (D) > 6

31. Which of the following particles will experience maximum magnetic force (magnitude) when projected with the same velocity perpendicular to a magnetic field ?
(A) Electron (B) Proton (C) He^{+} (D) Li^{++}

32. An electron is projected with velocity v_0 in a uniform electric field E perpendicular to the field. Again it is projected with velocity v_0 perpendicular to a uniform magnetic field B. If r_1 is initial radius of curvature just after entering in the electric field and r_2 is initial radius of curvature just after entering in magnetic field then the ratio r_1/r_2 is equal to
(A) $\frac{Bv_0^2}{E}$ (B) $\frac{B}{E}$ (C) $\frac{Ev_0}{B}$ (D) $\frac{Bv_0}{E}$

Space for rough work

33. An electron having kinetic energy T is moving in a circular orbit of radius R perpendicular to a uniform magnetic induction B. If kinetic energy is doubled and magnetic induction tripled, the radius will become

(A) $\frac{3R}{2}$ (B) $\sqrt{\frac{3}{2}}R$ (C) $\sqrt{\frac{2}{9}}R$ (D) $\sqrt{\frac{4}{3}}R$

34. An electron is moving along positive x–axis. A uniform electric field exists towards negative y–axis. What should be the direction of magnetic field of suitable magnitude so that net force on electron is zero ?

(A) positive z–axis (B) negative z–axis
(C) positive y–axis (D) negative y–axis

35. Assertion : A charged particle is moving in a circle with constant speed in uniform magnetic field. If we increase the speed of particle to twice, its acceleration will become four times.

Reason : In circular path with constant speed, acceleration is given by $\frac{v^2}{R}$. If speed is doubled centripetal acceleration will become four times.

(a) If both A and R are true and R is the correct explanation of A.
(b) If both A and R are true but R is not correct explanation of A.
(c) If A is true but R is false.
(d) If both A and R are false

(A) a (B) b (C) c (D) d

36. Velocity of a charged particle can remain changed. If

(A) it is moving only in electric field
(B) it is moving only in magnetic field
(C) it is moving both in electric and magnetic fields
(D) neither in electric in magnetic fields

37. **Assertion:** A charged particle is accelerated by a potential difference of V volts. It then enters perpendicularly into a uniform magnetic field. It rotates in a circle. Its angular momentum about center is say L. Now if V is doubled, L also becomes two times.

Reason: If V is doubled, kinetic energy will become two times and therefore, L also becomes two times.

(a) If both A and R are true and R is the correct explanation of A.
(b) If both A and R are true but R is not correct explanation of A.
(c) If A is true but R is false.
(d) If both A and R are false

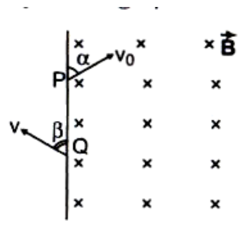
(A) a (B) b (C) c (D) d

Space for rough work

38. **Assertion:** The electron passing through crossed magnetic and electric field is always deflected from its path
Reason: If path remains undeflected then velocity of electrons is equal to the ratio of electric and magnetic fields. Given that $\vec{v}, \vec{B}$ and $\vec{E}$ are mutually perpendicular
(a) If both A and R are true and R is the correct explanation of A.
(b) If both A and R are true but R is not correct explanation of A.
(c) If A is true but R is false.
(d) If both A and R are false
(A) a (B) b (C) c (D) d

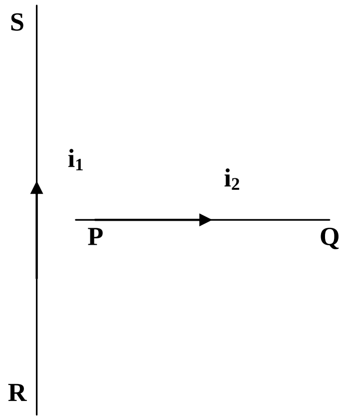
39. Two identical charged particles enter a uniform magnetic field with same speed but at angles 30° and 60° with field. Let a,b and c be the ratio of their time periods, radii and pitches of the helical paths then
(A) abc = 2 (B) abc >1 (C) abc < 1 (D) a = bc

40. A particle of charge –q and mass m enters a uniform magnetic field $\vec{B}$ (perpendicular to paper inwards) at P with a velocity v_0 at an angle α and leaves the field at Q with velocity v at angle β as shown in figure. Then



(A) $\alpha = \beta$ (B) $v = v_0$
(C) $PQ = \dfrac{2mv_0 \sin\alpha}{Bq}$ (D) All

41. A current carrying wire PQ is placed near an another long current carrying wire RS. If free to move, wire PQ will have:
(A) translational motion only
(B) rotational motion only
(C) translational as well as rotational motion
(D) neither translational nor rotational motion



Space for rough work

42. A metallic wire is folded to form a square loop of side a. It carries a current i and is kept perpendicular to a uniform magnetic field. If the shape of the loop is changed from square to a circle without changing the length of the wire and current, the amount of work done in doing so is:
(A) i Ba^2 (π + 2) (B) i Ba^2 (π - 2)
(C) i Ba^2(4/π - 1) (D) i $Ba^2\left(1-\frac{4}{\pi}\right)$

43. Dimensions of magnetic flux are:
(A) [$MLT^{-3}A^2$] (B) [$ML^2T^{-2}A^{-1}$] (C) [$ML^{-2}T^2A$] (D) [$ML^{-2}TA^{-1}$]

44. A charge q moves with a velocity 2 m/s along X-axis in a uniform magnetic field $\vec{B} = (\hat{i} + 2\hat{j} + 3\hat{k})$ tesla.
(A) Charge will experience a force in z-y plane
(B) Charge will experience a force along –y axis
(C) Charge will experience a force along +z axis
(D) Chargé will experience a force along - z axis

45. A charged particle is projected with velocity v_0 along positive x-axis. The magnetic field B is directed along negative z-axis between x = 0 and x = L. The particle emerges out (at x = L) at an angle of 60° with the direction of projection. Find the velocity with which the same particle is projected (at x =0) along positive x-axis so that when it emerges out (at x = L), the angle made by it is 30° with the direction of projection:
(A) 2 v_0 (B) v_0/2 (C) $v_0/\sqrt{3}$ (D) $v_0\sqrt{3}$

46. The dimensions of $\frac{B^2R^2C^2}{2\mu_0}$ (where B is magnetic field, and μ_0 is permeability of free space, R is resistance and C is capacitance) is:
(A) [ML^{-1}] (B) [MLT^{-1}] (C) [ML^2T^{-2}] (D) [MLT^2]

47. A conducting rod of length ℓ and mass m is moving down a smooth inclined plane of inclination θ with constant velocity v. A current i is flowing in the conductor in a direction perpendicular to paper inwards. A vertically upward magnetic field $\vec{B}$ exists in space. Then magnitude of magnetic field $\vec{B}$ is:
(A) $\frac{mg}{il}\sin\theta$ (B) $\frac{mg}{il}\tan\theta$ (C) $\frac{mg\cos\theta}{il}$ (D) $\frac{mg}{il\sin\theta}$

Space for rough work

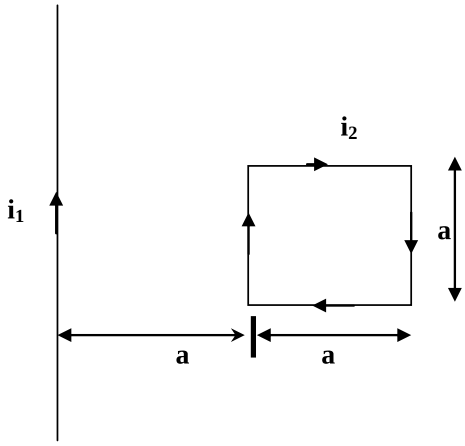
48. A rigid circular loop of radius r and mass m lies in the x-y plane on a flat table and has a current i flowing in it. At this particular place, the earth's magnetic field is $\vec{B} = B_x\hat{i} + B_z\hat{k}$. The value of i so that one edge of the loop lifts from the table is :

(A) $\frac{mg}{\pi r\sqrt{B_x^2 + B_z^2}}$ (B) $\frac{mg}{\pi r B_z}$ (C) $\frac{mg}{\pi r B_x}$ (D) $\frac{mg}{\pi r\sqrt{B_x B_z}}$

49. A current carrying square loop is placed near an Infinitely long current carrying wire as shown in figure. The torque acting on the loop is:

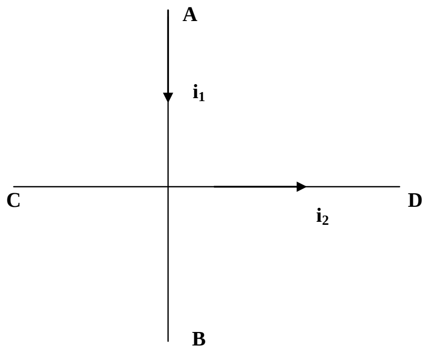
(A) $\frac{\mu_0}{2\pi}\left(\frac{i_1 i_2 a}{2}\right)$ (B) $\frac{\mu_0 i_1 i_2 a}{2\pi}$

(C) $\frac{\mu_0 i_1 i_2 a}{2\pi}$ ln (2) (D) zero



50. Two long wires AB and CD carry currents i1 and i2 in the directions shown in figure:

(A)force on wire AB is towards left
(B) force on wire AB is towards right
(C) torque on wire AB is clockwise
(D) torque on wire AB is anticlockwise



Space for rough work

51. A conducting rod of mass m and length l is placed over a smooth horizontal source. A uniform magnetic field B is acting perpendicular to the rod. Charge q is suddenly passed through the rod and it acquires an initial velocity v on the surface, then q is equal to:

(A) $\frac{2mv}{Bl}$ (B) $\frac{Bl}{2mv}$ (C) $\frac{mv}{Bl}$ (D) $\frac{Blv}{2m}$

52. A particle of charge per unit mass α is released from origin with velocity $\vec{v} = v_0\hat{i}$ in a magnetic field

$\vec{B} = -B_0\hat{k}$ for $x \le \frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}$

and $\vec{B} = 0$ for $x > \frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}$

The x-co-ordinates of the particle at time $t\left(>\frac{\pi}{3B_0\alpha}\right)$ would be :

(A) $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}+\frac{\sqrt{3}}{2}v_0\left(t-\frac{\pi}{B_0\alpha}\right)$ (B) $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}+v_0\left(t-\frac{\pi}{3B_0\alpha}\right)$

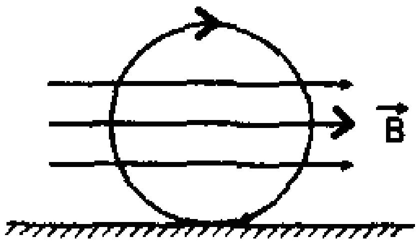
(C) $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}+\frac{v_0}{2}\left(t-\frac{\pi}{3B_0\alpha}\right)$ (D) $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}+\frac{v_0 t}{2}$

53. A particle of charge per unit mass α is released from origin with a velocity $\vec{v} = v_0\hat{i}$ in a uniform magnetic field $\vec{B} = -B_0\hat{k}$. If the particle passes through (0, y, 0), then y Is equal to:

(A) $-\frac{2v_0}{B_0\alpha}$ (B) $\frac{v_0}{B_0\alpha}$ (C) $\frac{2v_0}{B_0\alpha}$ (D) $-\frac{v_0}{B_0\alpha}$

54. A conducting ring of mass 2 kg and radius 0.5 m is placed on a smooth horizontal plane. The ring carries a current i = 4A. A horizontal magnetic field B = 10 T is switched on at time t = 0 as shown in figure. The initial angular acceleration of the ring will be:

(A) 40 π rad/s^2 (B) 20 π rad/s^2
(C) 5 π rad/s^2 (D) 15 π rad/s^2

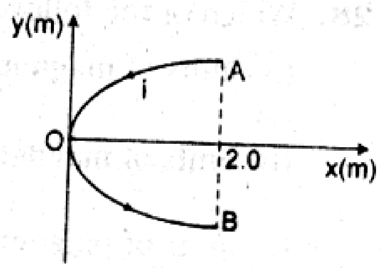


Space for rough work

55. Two very long straight parallel wires carry steady currents i and 2i in opposite directions. The distance between the wires is d. At a certain instant of time a point charge q is at a point equidistant from the two wires in the plane of the wires. Its instantaneous velocity $\vec{v}$ is perpendicular to this plane. The magnitude of the force due to the magnetic field acting on the charge at this instant is:

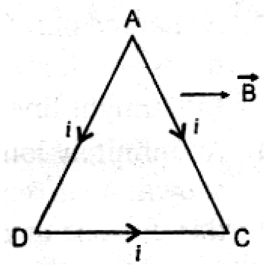
(A) $\frac{\mu_0 iqv}{2\pi d}$ (B) $\frac{\mu_0 iqv}{\pi d}$ (C) $\frac{3\mu_0 iqv}{2\pi d}$ (D) zero

56. A conducting wire bent in the form of a parabola $y^2 = 2x$ carries a current i = 2A as shown in figure. This wire is placed in a uniform magnetic field $\vec{B} = -4\hat{k}$ tesla. The magnetic force on the wire is: (in newton)



(A) $-16\hat{i}$ (B) $32\hat{i}$
(C) $-32\hat{i}$ (D) $16\hat{i}$

57. An equilateral triangular loop ACD of side ℓ carries a current I in the directions shown in figure. The loop is kept in a uniform horizontal magnetic field $\vec{B}$ as shown in fig. Net force on the loop is



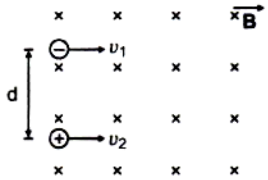
(A) zero
(B) $\frac{\sqrt{3}}{2} i\ell B$
(C) Perpendicular to paper inwards
(D) perpendicular to paper outwards

58. A proton, a deutron and an α-particle having the same kinetic energy. are moving in circular trajectories in a constant magnetic field. If r_p, r_d and r_α denote respectively the radii of the trajectories of these particles, then:

(A) $r_\alpha = r_p < r_d$ (B) $r_\alpha > r_p > r_d$
(C) $r_\alpha = r_d > r_p$ (D) $r_p = r_d = r_\alpha$

Space for rough work

59. Two identical particles having the same mass m and charges +q and –q separated by a distance d enters in a uniform magnetic field B directed perpendicular to paper inwards with speeds v_1 and v_2 as shown in figure. The particle will not collide if (Ignore electrostatic force)



(A) $d > \frac{m}{Bq}(v_1 + v_2)$
(B) $d < \frac{m}{Bq}(v_1 + v_2)$
(C) $d > \frac{2m}{Bq}(v_1 + v_2)$
(D) $v_1 = v_2$

60. A particle of mass m and charge q moves with a constant velocity v along the positive x-direction. It enters a region containing a uniform magnetic field B directed along the negative z-direction, extending from x = a to x = b. The minimum value of v required so that the particle can just enter the region x > b is:
(A) $\frac{qbB}{m}$
(B) $\frac{q(b-a)B}{m}$
(C) $\frac{qaB}{m}$
(D) $\frac{q(b+a)B}{2m}$

61. In the reaction, A + 2B $\longrightarrow$ products, doubling the concentration of B (keeping the concentration of A unchanged) increases the rate of reaction by ……………………..time
(rate $\propto$ to [A] $[B]^2$
(A) 2
(B) 3
(C) 4
(D) 5

62. In the elementary reaction A + B $\longrightarrow$ products, if B is taken in excess, then it follows
(A) second order kinetics
(B) zero order kinetics
(C) third order kinetics
(D) first order kinetics

63. For the reaction A $\longrightarrow$ C, it is found that the rate of the reaction doubles when the concentration of A is increased four times the order of the reaction is
(A) 1
(B) 1 ½
(C) 1/2
(D) 2

Space for rough work

64. For a complex reaction $X_2 + Y_2 \rightarrow 2XY$, following reaction mechanism is given

(I) $X_2 \rightleftharpoons 2X$

(II) $X + Y_2 \longrightarrow XY + Y\,(\text{slow})$

(III) $X + Y \longrightarrow XY$

What is order with respect to Y_2 and overall order of reaction.

(A) 1, 2 (B) 1, 1.5 (C) 1.5, 1 (D) 1, 1

65. The half life of a first order reaction is 1 hour. What is the time taken for 87.5% completion of the reaction?

(A) 1 Hour (B) 2 Hours (C) 3 Hours (D) 4 Hours

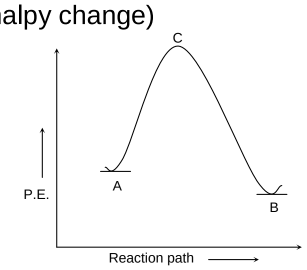
66. For a first order reaction, 40% of the reaction completes in 40 minutes. Calculate the time taken for 64% completion.

(A) 40 min (B) 80min (C) 70 min (D) 95 min

67. For a reaction A + B $\longrightarrow$ products, the rate of the reaction was doubled when the concentration of A was doubled. When the concentrations of A & B were doubled, the rate was again doubled, the order of the reaction with respect to A & B are

(A) 1, 1 (B) 2, 0 (C) 1, 0 (D) 0, 1

68. With respect to the figure given which of the following statement is correct? (E = activation energy, ΔH = enthalpy change)



(A) Δ H for the forward reaction is C – B (B) Δ H for the forward reaction is B – A

(C) E_a (forward) = E_a (backward) (D) E_a for backward reaction = C – A

69. For a first-order reaction, the half life period is

(A) dependent on the square of the initial concentration

(B) dependent on first power of initial concentration

(C) dependent on the square root of initial concentration

(D) independent on initial concentration

70. The half life of a first order reaction is 10 sec. What is its rate constant (in sec^{-1})?

(A) 0.0693 (B) 0.693 (C) 6.93 (D) 69.3

Space for rough work

71. The rate of the reaction for
$A \longrightarrow$ Products (order is greater than zero)
is 10 mol. litre^{-1} min^{-1} at time t_1 = 2 minutes. What will be the rate (in mol. lit^{-1} min^{-1}) at time t_2 = 12 minutes?
(A) more than 10 (B) less than 10 (C) 10 (D) 20

72. Consider the following reaction, $A \longrightarrow$ products.
This reaction is completed in 100 minutes. The rate constant of this reaction at t_1 = 10 min is 10^{-2} min^{-1}. What is the rate constant (in min^{-1}) at t_2 = 20 minutes?
(A) 2×10^{-2} (B) 10^{-2} (C) 5×10^{-3} (D) 0.1

73. Rate constant 'k' depends on
(A) Temperature (B) catalyst
(C) both Temperature & catalyst (D) None of the above

74. Rate of a reaction depends on
(A) temperature (B) catalyst (C) pressure or concentration (D) all the above

75. Consider the reaction, $2A + B \longrightarrow$ Products
When concentration of B alone was doubled, the half life did not change. When the concentration of A alone was doubled, the rate increased by two times. The unit of rate constant for the reaction is
(A) L mol^{-1} s^{-1} (B) no unit (C) mol L^{-1} s^{-1} (D) s^{-1}

76. The rate of decomposition of N_2O_5 according to the equation $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$ is 2.4×10^{-4} mol L^{-1} min^{-1}. The rate of formation of O_2 during that interval is
(A) 4.8×10^{-2} mol L^{-1} min^{-1} (B) 1.2×10^{-4} mol L^{-1} min^{-1}
(C) 2.4×10^{-4} mol L^{-1} min^{-1} (D) 1.2×10^{-4} mol L^{-1} s^{-1}

77. The volume of the reacting system
$2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$
is suddenly reduced to half of its value. If the reaction is second order with respect to NO and first order with respect to O_2, the rate of reaction will
(A) diminish to one–fourth of its initial value (B) diminish to one–eighth of its initial value
(C) increase eight times of its initial value (D) decrease four times of its initial value

Space for rough work

78. For the reaction, NO + $O_3 \rightarrow$ products, the rate law expression is given by $r = k \times P_{NO} \times P_{O_3}$. The unit of the rate of the reaction is
(A) $atm^{-1}\ s^{-1}$ (B) $atm\ s^{-1}$ (C) $atm^2\ s^{-1}$ (D) $atm^{-1}\ s$

79. The unit of rate constant for the following reaction at high pressure is
$2NH_3(g) \xrightarrow{\text{Mo or } h\upsilon} N_2(g) + 3H_2(g)$
(A) $time^{-1}$ (B) $mol^{-1}\ L\ time^{-1}$ (C) $mol^{1/2}\ L^{1/2}\ time^{-1}$ (D) $mol\ L^{-1}\ time^{-1}$

80. The bromination of acetone that occurs in acid solution is represented by this equation.
CH_3COCH_3 (aq.) + Br_2(aq.) $\rightarrow$ CH_3COCH_2Br (aq.) + H^+ (aq) + Br^- (aq)
These kinetic data were obtained for given reaction concentrations.

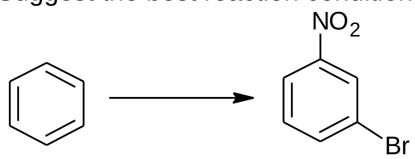
Initial concentrations, *M*			
$[CH_3COCH_3]$	$[Br_2]$	$[H^+]$	Initial rate, disappearance of Br_2, $M\ s^{-1}$
0.30	0.05	0.05	5.7×10^{-5}
0.30	0.10	0.05	5.7×10^{-5}
0.30	0.10	0.10	1.2×10^{-4}
0.40	0.05	0.20	3.1×10^{-4}

The order with respect to Br_2 is
(A) 0 (B) 1 (C) 2 (D) 3

81. The activation energy of the forward reaction of A + B $\rightarrow$ C + D is 50 Kcals. ΔH of the backward reaction is 30 Kcals. The activation energy of the backward reaction is
(A) 80 Kcals (B) 20 Kcals (C) –20 Kcals (D) 30 Kcals

82. The rate constant for an isomerisation reaction A $\rightarrow$ B is $4.5 \times 10^{-3}\ min^{-1}$. If the initial concentration of A is 1 M calculate the rate of reaction after 1 hour.
(A) 3.454×10^{3} (B) 2.454×10^{-3} (C) 1.454×10^{-3} (D) 3.454×10^{-3}

83. Suggest the best reaction conditions for the synthesis shown below :



(A) (1) HNO_3, H_2SO_4; then (2) Br_2
(B) (1) Br_2; then (2) HNO_3, H_2SO_4
(C) (1) CH_3Br, $AlBr_3$; then (2) HNO_3, H_2SO_4
(D) HNO_3, H_2SO_4, then (2) Br_2, $FeBr_3$

Space for rough work

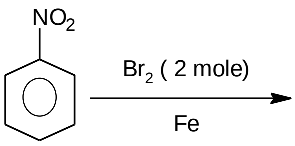
84. Which gives offensive smell with $CHCl_3$ and KOH ?
(A) 1° amine (B) 2° amine (C) 3° amine (D) all of these

85. Ethyl amine can be prepared by the action of Br_2 and NaOH on :
(A) acetamide (B) propionamide (C) methylamine (D) methyl cyanide

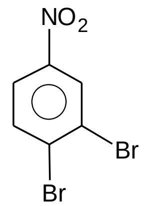
86. Gas evolved during the reaction of sodium metal on ethyl amine is
(A) N_2 (B) C_2H_2 (C) H_2 (D) CO_2

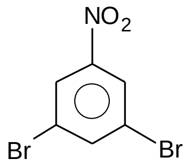
87. Which of the following reactions does not yield an amine ?
(A) $R-X + NH_3$
(B) $R-C(H)=N-OH+[H]\xrightarrow[C_2H_5OH]{Na}$
(C) $R--CN+H_2O\xrightarrow{H^+}$
(D) $R-CO=NH_2+4[H]\xrightarrow{LiAlH_4}$

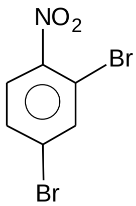
88. Reaction of primary amine with aldehydes gives :
(A) amide (B) aldimine (C) nitrile (D) None of these

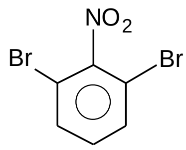
89.


(P) major ; Product (P) will be :

(A)


(B)


(C)


(D)


90. Which of the following arylamines undergo diazotization most readily
(A) p–nitro aniline (B) p–chloro aniline (C) p–methoxy aniline (D) p–methyl aniline

Space for rough work

FIITJEE PET – VII (REG_2ND YEAR)

MAINS_SET–A_ANSWERS

DATE: 04.08.2018

MATHEMATICS

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

PHYSICS

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

CHEMISTRY

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

FIITJEE PET – VII (REG_2ND YEAR)

MAINS_SET–B

DATE: 04.08.2018

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. The set of points on the axis of the parabola $y^2 - 4x - 2y + 5 = 0$ from which all the three normals to the parabola are real is
(A) (k, 0); k > 1 (B) (k, 1); k > 3 (C) (k, 2); k > 6 (D) (k, 3); k > 8

2. The locus of the point of intersection of tangents to the parabola $y^2 = 4(x + 1)$ and $y^2 = 8(x + 2)$ which are perpendicular to each other is
(A) $x + 7 = 0$ (B) $x - y = 4$ (C) $x + 3 = 0$ (D) $y - x = 12$

3. A line L passing through the focus of the parabola $y^2 = 4(x - 1)$ intersects the parabola in two distinct points. If 'm' be the slope of the line L, then
(A) $m \in (-1, 1)$ (B) $m \in (-\infty, -1) \cup (1, \infty)$
(C) $m \in R$ (D) none of these

4. Radius of the largest circle which passes through the focus of the parabola $y^2 = 4x$ and contained in it, is
(A) 8 (B) 4 (C) 2 (D) 5

5. A ray of light moving parallel to the x-axis gets reflected from a parabolic mirror whose equation is $(y - 2)^2 = 4(x + 1)$. After reflection, the ray must pass through the point
(A) (–2, 0) (B) (–1, 2) (C) (0, 2) (D) (2, 0)

6. The equation of the line touching both the parabolas $y^2 = 4x$ and $x^2 = -32y$ is
(A) $x + 2y + 4 = 0$ (B) $2x + y - 4 = 0$ (C) $x - 2y - 4 = 0$ (D) $x - 2y + 4 = 0$

7. The equation of the ellipse whose focus is (3, –2), eccentricity $\frac{3}{4}$ and directrix $2x - y + 3 = 0$ is
(A) $14x^2 + 33xy + 17y^2 - 255x + 74y + 159 = 0$ (B) $44x^2 + 36xy + 71y^2 - 588x + 374y + 959 = 0$
(C) $4x^2 + 56xy + 271y^2 - 188x + 274y + 359 = 0$ (D) $44x^2 - 36xy - 71y^2 - 588x - 374y - 959 = 0$

8. The equation of the ellipse whose vertices are (4, 1), (6, 1) whose focus lies on the line $x - 2y = 2$ is
(A) $\frac{(x-1)^2}{25} + \frac{(y-1)^2}{16} = 1$ (B) $\frac{(x-1)^2}{16} + \frac{(y-1)^2}{25} = 1$
(C) $\frac{(x+1)^2}{25} + \frac{(y+1)^2}{16} = 1$ (D) $\frac{(x+1)^2}{16} + \frac{(y+1)^2}{25} = 1$

Space for rough work

9. If the latusrectum of the ellipse $x^2 \tan^2\alpha + y^2 \sec^2\alpha = 1$ is $\frac{1}{2}$, then α =
(A) $\frac{\pi}{12}$ (B) $\frac{\pi}{6}$ (C) $\frac{5\pi}{12}$ (D) none of these

10. Shortest distance between the parabolas $y^2 = 4x$ and $y^2 = 2x - 6$ is
(A) 2 (B) $\sqrt{5}$ (C) 3 (D) none of these

11. If the 4^{th} term in the expansion of $\left(px + \frac{1}{x}\right)^n$, $n \in N$ is $\frac{5}{2}$ and three normals to the parabola $y^2 = x$ are drawn through a point (q, 0), then
(A) q = p (B) q > p (C) q < p (D) pq = 1

12. The mirror image of the parabola $y^2 = 4x$ in the tangent to the parabola at the point (1, 2) is
(A) $(x - 1)^2 = 4(y + 1)$ (B) $(x + 1)^2 = 4(y + 1)$ (C) $(x + 1)^2 = 4(y - 1)$ (D) $(x - 1)^2 = 4(y - 1)$

13. The coordinates of the point on the parabola $y^2 = 8x$, which is at minimum distance from the circle $x^2 + (y + 6)^2 = 1$, are
(A) (2, –4) (B) (18, –12) (C) (2, 4) (D) none of these

14. If the normal to the parabola $y^2 = 4ax$ at the point $(at^2, 2at)$ cuts the parabola again at $(aT^2, 2aT)$, then
(A) $-2 \le T \le 2$ (B) $T \in (-\infty, -8) \cup (8, \infty)$
(C) $T^2 < 8$ (D) $T^2 \ge 8$

15. The length of latus-rectum of the parabola whose parametric equation is $x = t^2 + t + 1$, $y = t^2 - t + 1$, where $t \in R$ is equal to
(A) 2 (B) 4 (C) 8 (D) none of these

16. A parabola is drawn with focus at (3, 4) and vertex at the focus of the parabola $y^2 - 12x - 4y + 4 = 0$. The equation of the parabola is
(A) $x^2 - 6x - 8y + 25 = 0$ (B) $y^2 - 8x - 6y + 25 = 0$
(C) $x^2 - 6x + 8y - 25 = 0$ (D) $x^2 + 6x - 8y - 25 = 0$

17. Two perpendicular tangents PA and PB are drawn to $y^2 = 4ax$, minimum length of AB is equal to
(A) a (B) 4a (C) 8a (D) 2a

18. The x-coordinate of points on the axis of the parabola $4y^2 - 32x + 4y + 65 = 0$ from which all three normals to the parabola are real is
(A) > 2 (B) > 4 (C) > 5 (D) > 6

Space for rough work

19. A circle is described with minor axis of an ellipse as a diameter. If the foci lie on the circle the eccentricity of the ellipse is

(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{3}$ (D) $\frac{1}{\sqrt{3}}$

20. Equations of the latus recta of the ellipse $9x^2 + 4y^2 - 18x - 8y - 23 = 0$ are

(A) $y = \pm\sqrt{5}$ (B) $x = \pm\sqrt{5}$ (C) $y = 1\pm\sqrt{5}$ (D) $x = -1 \pm \sqrt{5}$

21. The sum of the slopes of the tangents to the ellipse $\frac{x^2}{9}+\frac{y^2}{4} = 1$ drawn from the point (6, –2) is

(A) 0 (B) $\frac{3}{4}$ (C) $-\frac{6}{7}$ (D) $-\frac{8}{9}$

22. The product of the perpendiculars from the foci on any tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2} = 1$ is

(A) a^2 (B) $a^2 - b^2$ (C) b^2 (D) $\sqrt{a^2+b^2}$

23. Tangents are drawn through the point $\left(4,\sqrt{3}\right)$ to the ellipse $\frac{x^2}{16}+\frac{y^2}{9} = 1$. The point at which these tangents touch the ellipse are

(A) $\left(2,\frac{3\sqrt{3}}{2}\right)$, (4, 0) (B) $\left(2,\frac{\sqrt{3}}{\sqrt{2}}\right),\left(4,\frac{\sqrt{3}}{2}\right)$ (C) $\left(4,\frac{3\sqrt{3}}{\sqrt{3}}\right)$, (2, 0) (D) (2, 0), (4, 0)

24. The sum of the squares of the perpendicular on any tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2} = 1$ from two points on the minor axis each at a distance $\sqrt{a^2-b^2}$ from the centre is

(A) $2a^2$ (B) $2b^2$ (C) $a^2 + b^2$ (D) $a^2 - b^2$

25. The eccentricity of an ellipse, with its centre at the origin, is $\frac{1}{2}$. If one of the directrices is x = 4, then the equation of the ellipse is

(A) $3x^2 + 4y^2 = 1$ (B) $4x^2 + 3y^2 = 1$ (C) $4x^2 + 3y^2 = 12$ (D) $3x^2 + 4y^2 = 12$

Space for rough work

26. The ellipse $x^2 + 4y^2 = 4$ is inscribed in a rectangle aligned with the coordinate axes, which in turn is inscribed in another ellipse that passes through the point (4, 0). Then the equation of the ellipse is
(A) $x^2 + 12y^2 = 16$ (B) $4x^2 + 48y^2 = 48$ (C) $4x^2 + 64y^2 = 48$ (D) $x^2 + 16y^2 = 16$

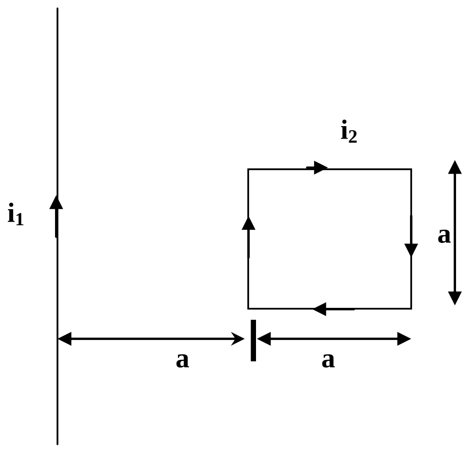
27. Equation of the ellipse whose axes are the axes of coordinates and which passes through the point (–3, 1) and has eccentricity $\sqrt{\frac{2}{5}}$ is
(A) $3x^2 + 5y^2 - 15 = 0$ (B) $5x^2 + 3y^2 - 32 = 0$ (C) $3x^2 + 5y^2 - 32 = 0$ (D) $5x^2 + 3y^2 - 48 = 0$

28. An ellipse drawn by taking a diameter of the circle $(x - 1)^2 + y^2 = 1$ as its semiminor axis and a diameter of the circle $x^2 + (y - 2)^2 = 4$ as its semi-major axis. If the centre of the ellipse is at the origin and its axes are the coordinate axes, then the equation of the ellipse is
(A) $4x^2 + y^2 = 8$ (B) $x^2 + 4y^2 = 16$ (C) $4x^2 + y^2 = 4$ (D) $x^2 + 4y^2 = 8$

29. The eccentricity of the conic $36x^2 + 144y^2 - 36x - 96y - 119 = 0$ is
(A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{2}$ (C) $\frac{\sqrt{3}}{4}$ (D) $\frac{1}{\sqrt{3}}$

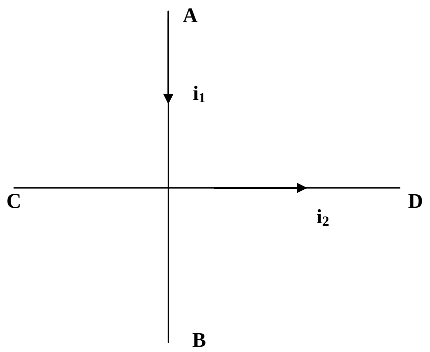
30. S and T are the foci of an ellipse and B is an end of the minor axis. If STB is an equilateral triangle then the eccentricity of the ellipse is
(A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{2}{3}$

31. A current carrying square loop is placed near an Infinitely long current carrying wire as shown in figure. The torque acting on the loop is:
(A) $\frac{\mu_0}{2\pi}\left(\frac{i_1 i_2 a}{2}\right)$ (B) $\frac{\mu_0 i_1 i_2 a}{2\pi}$
(C) $\frac{\mu_0 i_1 i_2 a}{2\pi}$ In (2) (D) zero



Space for rough work

32. Two long wires AB and CD carry currents i1 and i2 in the directions shown in figure:
(A)force on wire AB is towards left
(B) force on wire AB is towards right
(C) torque on wire AB is clockwise
(D) torque on wire AB is anticlockwise



33. A conducting rod of mass m and length *l* is placed over a smooth horizontal source. A uniform magnetic field B is acting perpendicular to the rod. Charge q is suddenly passed through the rod and it acquires an initial velocity v on the surface, then q is equal to:

(A) $\frac{2mv}{Bl}$ (B) $\frac{Bl}{2mv}$ (C) $\frac{mv}{Bl}$ (D) $\frac{Blv}{2m}$

34. A particle of charge per unit mass α is released from origin with velocity $\vec{v} = v_0 \hat{i}$ in a magnetic field

$$\vec{B} = -B_0\hat{k} \quad \text{for} \quad x \le \frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}$$

and $$\vec{B} = 0 \quad \text{for} \quad x > \frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}$$

The x-co-ordinates of the particle at time $t\left(>\frac{\pi}{3B_0\alpha}\right)$ would be :

(A) $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha} + \frac{\sqrt{3}}{2}v_0\left(t - \frac{\pi}{B_0\alpha}\right)$ (B) $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha} + v_0\left(t - \frac{\pi}{3B_0\alpha}\right)$

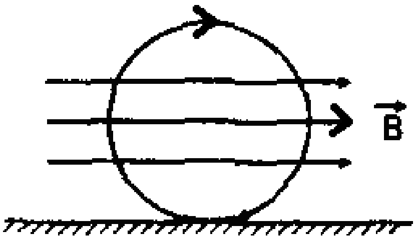
(C) $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha} + \frac{v_0}{2}\left(t - \frac{\pi}{3B_0\alpha}\right)$ (D) $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha} + \frac{v_0 t}{2}$

Space for rough work

35. A particle of charge per unit mass α is released from origin with a velocity $\vec{v} = v_0\hat{i}$ in a uniform magnetic field $\vec{B} = -B_0\hat{k}$. If the particle passes through (0, y, 0), then y Is equal to:

(A) $-\frac{2v_0}{B_0\alpha}$ (B) $\frac{v_0}{B_0\alpha}$ (C) $\frac{2v_0}{B_0\alpha}$ (D) $-\frac{v_0}{B_0\alpha}$

36. A conducting ring of mass 2 kg and radius 0.5 m is placed on a smooth horizontal plane. The ring carries a current i = 4A. A horizontal magnetic field B = 10 T is switched on at time t = 0 as shown in figure. The initial angular acceleration of the ring will be:



(A) 40 π rad/s^2 (B) 20 π rad/s^2
(C) 5 π rad/s^2 (D) 15 π rad/s^2

37. Dimensions of magnetic flux are:
(A) $[MLT^{-3}A^2]$ (B) $[ML^2T^{-2}A^{-1}]$ (C) $[ML^{-2}T^2A]$ (D) $[ML^{-2}TA^{-1}]$

38. A charge q moves with a velocity 2 m/s along X-axis in a uniform magnetic field $\vec{B} = (\hat{i} + 2\hat{j} + 3\hat{k})$ tesla.
(A) Charge will experience a force in z-y plane
(B) Charge will experience a force along –y axis
(C) Charge will experience a force along +z axis
(D) Chargé will experience a force along - z axis

39. A charged particle is projected with velocity v_0 along positive x-axis. The magnetic field B is directed along negative z-axis between x = 0 and x = L. The particle emerges out (at x = L) at an angle of 60° with the direction of projection. Find the velocity with which the same particle is projected (at x =0) along positive x-axis so that when it emerges out (at x = L), the angle made by it is 30° with the direction of projection:

(A) 2 v_0 (B) $v_0/2$ (C) $v_0/\sqrt{3}$ (D) $v_0\sqrt{3}$

40. The dimensions of $\frac{B^2R^2C^2}{2\mu_0}$ (where B is magnetic field, and μ_0 is permeability of free space, R is resistance and C is capacitance) is:
(A) $[ML^{-1}]$ (B) $[MLT^{-1}]$ (C) $[ML^2T^{-2}]$ (D) $[MLT^2]$

Space for rough work

41. A conducting rod of length ℓ and mass m is moving down a smooth inclined plane of inclination θ with constant velocity v. A current i is flowing in the conductor in a direction perpendicular to paper inwards. A vertically upward magnetic field $\vec{B}$ exists in space. Then magnitude of magnetic field $\vec{B}$ is:

(A) $\frac{mg}{il}\sin\theta$ (B) $\frac{mg}{il}\tan\theta$ (C) $\frac{mg\cos\theta}{il}$ (D) $\frac{mg}{il\sin\theta}$

42. A rigid circular loop of radius r and mass m lies in the x-y plane on a flat table and has a current i flowing in it. At this particular place, the earth's magnetic field is $\vec{B} = B_x\hat{i} + B_z\hat{k}$. The value of i so that one edge of the loop lifts from the table is :

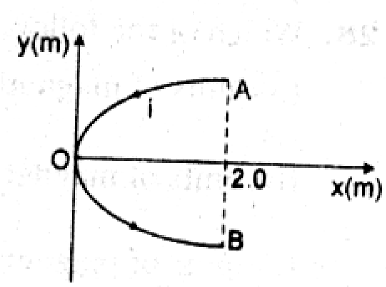
(A) $\frac{mg}{\pi r\sqrt{B_x^2 + B_z^2}}$ (B) $\frac{mg}{\pi r B_z}$ (C) $\frac{mg}{\pi r B_x}$ (D) $\frac{mg}{\pi r\sqrt{B_x B_z}}$

43. Two very long straight parallel wires carry steady currents i and 2i in opposite directions. The distance between the wires is d. At a certain instant of time a point charge q is at a point equidistant from the two wires in the plane of the wires. Its instantaneous velocity $\vec{v}$ is perpendicular to this plane. The magnitude of the force due to the magnetic field acting on the charge at this instant is:

(A) $\frac{\mu_0 iqv}{2\pi d}$ (B) $\frac{\mu_0 iqv}{\pi d}$ (C) $\frac{3\mu_0 iqv}{2\pi d}$ (D) zero

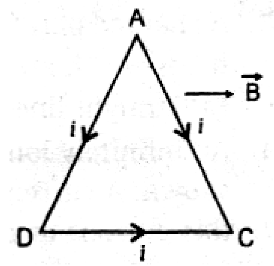
44. A conducting wire bent in the form of a parabola $y^2 = 2x$ carries a current i = 2A as shown in figure. This wire is placed in a uniform magnetic field $\vec{B} = -4\hat{k}$ tesla. The magnetic force on the wire is: (in newton)

(A) – 16 $\hat{i}$ (B) 32 $\hat{i}$
(C) – 32 $\hat{i}$ (D) 16 $\hat{i}$



Space for rough work

45. An equilateral triangular loop ACD of side ℓ carries a current I in the directions shown in figure. The loop is kept in a uniform horizontal magnetic field $\vec{B}$ as shown in fig. Net force on the loop is

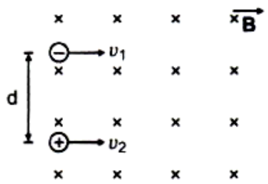


(A) zero
(B) $\frac{\sqrt{3}}{2} i\ell B$
(C) Perpendicular to paper inwards
(D) perpendicular to paper outwards

46. A proton, a deutron and an α-particle having the same kinetic energy. are moving in circular trajectories in a constant magnetic field. If r_p, r_d and r_α denote respectively the radii of the trajectories of these particles, then:

(A) $r_\alpha = r_p < r_d$
(B) $r_\alpha > r_p > r_d$
(C) $r_\alpha = r_d > r_p$
(D) $r_p = r_d = r_\alpha$

47. Two identical particles having the same mass m and charges +q and –q separated by a distance d enters in a uniform magnetic field B directed perpendicular to paper inwards with speeds v_1 and v_2 as shown in figure. The particle will not collide if (Ignore electrostatic force)



(A) $d > \frac{m}{Bq}(v_1 + v_2)$
(B) $d < \frac{m}{Bq}(v_1 + v_2)$
(C) $d > \frac{2m}{Bq}(v_1 + v_2)$
(D) $v_1 = v_2$

48. A particle of mass m and charge q moves with a constant velocity v along the positive x-direction. It enters a region containing a uniform magnetic field B directed along the negative z-direction, extending from x = a to x = b. The minimum value of v required so that the particle can just enter the region x > b is:

(A) $\frac{qbB}{m}$
(B) $\frac{q(b-a)B}{m}$
(C) $\frac{qaB}{m}$
(D) $\frac{q(b+a)B}{2m}$

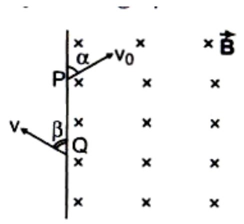
Space for rough work

49. **Assertion:** A charged particle is accelerated by a potential difference of V volts. It then enters perpendicularly into a uniform magnetic field. It rotates in a circle. Its angular momentum about center is say L. Now if V is doubled, L also becomes two times.
Reason: If V is doubled, kinetic energy will become two times and therefore, L also becomes two times.
(a) If both A and R are true and R is the correct explanation of A.
(b) If both A and R are true but R is not correct explanation of A.
(c) If A is true but R is false.
(d) If both A and R are false
(A) a (B) b (C) c (D) d

50. **Assertion:** The electron passing through crossed magnetic and electric field is always deflected from its path
Reason: If path remains undeflected then velocity of electrons is equal to the ratio of electric and magnetic fields. Given that $\vec{v},\vec{B}$ and $\vec{E}$ are mutually perpendicular
(a) If both A and R are true and R is the correct explanation of A.
(b) If both A and R are true but R is not correct explanation of A.
(c) If A is true but R is false.
(d) If both A and R are false
(A) a (B) b (C) c (D) d

51. Two identical charged particles enter a uniform magnetic field with same speed but at angles 30° and 60° with field. Let a,b and c be the ratio of their time periods, radii and pitches of the helical paths then
(A) abc = 2 (B) abc >1 (C) abc < 1 (D) a = bc

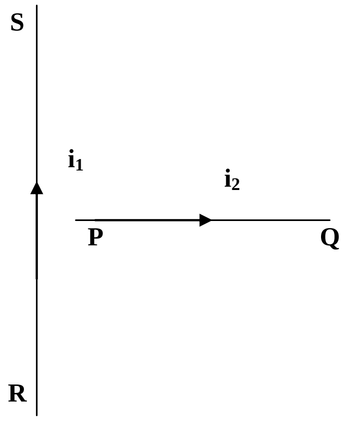
52. A particle of charge –q and mass m enters a uniform magnetic field $\vec{B}$ (perpendicular to paper inwards) at P with a velocity v_0 at an angle α and leaves the field at Q with velocity v at angle β as shown in figure. Then



(A) $\alpha = \beta$ (B) $v = v_0$
(C) $PQ = \dfrac{2mv_0 \sin\alpha}{Bq}$ (D) All

Space for rough work

53. A current carrying wire PQ is placed near an another long current carrying wire RS. If free to move, wire PQ will have:
(A) translational motion only
(B) rotational motion only
(C) translational as well as rotational motion
(D) neither translational nor rotational motion



54. A metallic wire is folded to form a square loop of side a. It carries a current i and is kept perpendicular to a uniform magnetic field. If the shape of the loop is changed from square to a circle without changing the length of the wire and current, the amount of work done in doing so is:
(A) $i Ba^2 (\pi + 2)$ (B) $i Ba^2 (\pi - 2)$
(C) $i Ba^2(4/\pi - 1)$ (D) $i Ba^2\left(1 - \frac{4}{\pi}\right)$

55. Which of the following particles will experience maximum magnetic force (magnitude) when projected with the same velocity perpendicular to a magnetic field ?
(A) Electron (B) Proton (C) He^+ (D) Li^{++}

56. An electron is projected with velocity v_0 in a uniform electric field E perpendicular to the field. Again it is projected with velocity v_0 perpendicular to a uniform magnetic field B. If r_1 is initial radius of curvature just after entering in the electric field and r_2 is initial radius of curvature just after entering in magnetic field then the ratio r_1/r_2 is equal to
(A) $\frac{Bv_0^2}{E}$ (B) $\frac{B}{E}$ (C) $\frac{Ev_0}{B}$ (D) $\frac{Bv_0}{E}$

57. An electron having kinetic energy T is moving in a circular orbit of radius R perpendicular to a uniform magnetic induction B. If kinetic energy is doubled and magnetic induction tripled, the radius will become
(A) $\frac{3R}{2}$ (B) $\sqrt{\frac{3}{2}}R$ (C) $\sqrt{\frac{2}{9}}R$ (D) $\sqrt{\frac{4}{3}}R$

Space for rough work

58. An electron is moving along positive x–axis. A uniform electric field exists towards negative y–axis. What should be the direction of magnetic field of suitable magnitude so that net force on electron is zero ?
(A) positive z–axis
(B) negative z–axis
(C) positive y–axis
(D) negative y–axis

59. Assertion : A charged particle is moving in a circle with constant speed in uniform magnetic field. If we increase the speed of particle to twice, its acceleration will become four times.
Reason : In circular path with constant speed, acceleration is given by $\frac{v^2}{R}$. If speed is doubled centripetal acceleration will become four times.
(a) If both A and R are true and R is the correct explanation of A.
(b) If both A and R are true but R is not correct explanation of A.
(c) If A is true but R is false.
(d) If both A and R are false
(A) a
(B) b
(C) c
(D) d

60. Velocity of a charged particle can remain changed. If
(A) it is moving only in electric field
(B) it is moving only in magnetic field
(C) it is moving both in electric and magnetic fields
(D) neither in electric in magnetic fields

61. The unit of rate constant for the following reaction at high pressure is
$$2NH_3(g) \xrightarrow{\text{Mo or } h\upsilon} N_2(g) + 3H_2(g)$$
(A) $time^{-1}$
(B) $mol^{-1}\ L\ time^{-1}$
(C) $mol^{1/2}\ L^{1/2}\ time^{-1}$
(D) $mol\ L^{-1}\ time^{-1}$

62. The bromination of acetone that occurs in acid solution is represented by this equation.
CH_3COCH_3 (aq.) + Br_2(aq.) $\rightarrow$ CH_3COCH_2Br (aq.) + H^+ (aq) + Br^- (aq)
These kinetic data were obtained for given reaction concentrations.

Initial concentrations, *M*			
$[CH_3COCH_3]$	$[Br_2]$	$[H^+]$	Initial rate, disappearance of Br_2, M s^{-1}
0.30	0.05	0.05	5.7×10^{-5}
0.30	0.10	0.05	5.7×10^{-5}
0.30	0.10	0.10	1.2×10^{-4}
0.40	0.05	0.20	3.1×10^{-4}

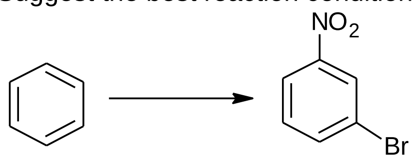
The order with respect to Br_2 is
(A) 0
(B) 1
(C) 2
(D) 3

Space for rough work

63. The activation energy of the forward reaction of A + B $\rightarrow$ C + D is 50 Kcals. ΔH of the backward reaction is 30 Kcals. The activation energy of the backward reaction is
(A) 80 Kcals (B) 20 Kcals (C) –20 Kcals (D) 30 Kcals

64. The rate constant for an isomerisation reaction A $\rightarrow$ B is 4.5×10^{-3} min^{-1}. If the initial concentration of A is 1 M calculate the rate of reaction after 1 hour.
(A) 3.454×10^{3} (B) 2.454×10^{-3} (C) 1.454×10^{-3} (D) 3.454×10^{-3}

65. Suggest the best reaction conditions for the synthesis shown below :



(A) (1) HNO_3, H_2SO_4; then (2) Br_2
(B) (1) Br_2; then (2) HNO_3, H_2SO_4
(C) (1) CH_3Br, $AlBr_3$; then (2) HNO_3, H_2SO_4
(D) HNO_3, H_2SO_4, then (2) Br_2, $FeBr_3$

66. Which gives offensive smell with $CHCl_3$ and KOH ?
(A) 1° amine (B) 2° amine (C) 3° amine (D) all of these

67. Rate constant 'k' depends on
(A) Temperature
(B) catalyst
(C) both Temperature & catalyst
(D) None of the above

68. Rate of a reaction depends on
(A) temperature (B) catalyst (C) pressure or concentration (D) all the above

69. Consider the reaction, $2A + B \longrightarrow$ Products
When concentration of B alone was doubled, the half life did not change. When the concentration of A alone was doubled, the rate increased by two times. The unit of rate constant for the reaction is
(A) L mol^{-1} s^{-1} (B) no unit (C) mol L^{-1} s^{-1} (D) s^{-1}

70. The rate of decomposition of N_2O_5 according to the equation $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$ is 2.4×10^{-4} mol L^{-1} min^{-1}. The rate of formation of O_2 during that interval is
(A) 4.8×10^{-2} mol L^{-1} min^{-1}
(B) 1.2×10^{-4} mol L^{-1} min^{-1}
(C) 2.4×10^{-4} mol L^{-1} min^{-1}
(D) 1.2×10^{-4} mol L^{-1} s^{-1}

Space for rough work

71. The volume of the reacting system
$2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$
is suddenly reduced to half of its value. If the reaction is second order with respect to NO and first order with respect to O_2, the rate of reaction will
(A) diminish to one–fourth of its initial value
(B) diminish to one–eighth of its initial value
(C) increase eight times of its initial value
(D) decrease four times of its initial value

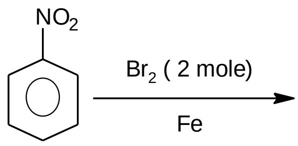
72. For the reaction, $NO + O_3 \rightarrow$ products, the rate law expression is given by $r = k \times P_{NO} \times P_{O_3}$. The unit of the rate of the reaction is
(A) $atm^{-1}\ s^{-1}$
(B) $atm\ s^{-1}$
(C) $atm^2\ s^{-1}$
(D) $atm^{-1}\ s$

73. Ethyl amine can be prepared by the action of Br_2 and NaOH on :
(A) acetamide
(B) propionamide
(C) methylamine
(D) methyl cyanide

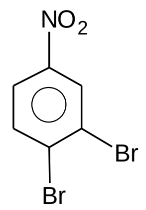
74. Gas evolved during the reaction of sodium metal on ethyl amine is
(A) N_2
(B) C_2H_2
(C) H_2
(D) CO_2

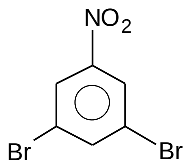
75. Which of the following reactions does not yield an amine ?
(A) $R– X + NH_3$
(B) $R-C(H)=N-OH+[H]\xrightarrow[C_2H_5OH]{Na}$
(C) $R--CN+H_2O\xrightarrow{H^+}$
(D) $R-CO=NH_2+4[H]\xrightarrow{LiAlH_4}$

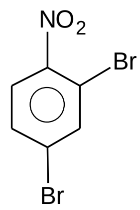
76. Reaction of primary amine with aldehydes gives :
(A) amide
(B) aldimine
(C) nitrile
(D) None of these

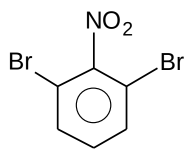
77.


(P) major ; Product (P) will be :

(A)


(B)


(C)


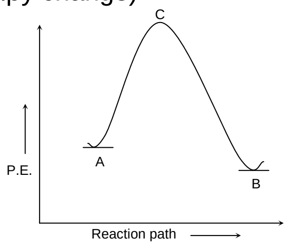
(D)


Space for rough work

78. Which of the following arylamines undergo diazotization most readily
(A) p–nitro aniline (B) p–chloro aniline (C) p–methoxy aniline (D) p–methyl aniline

79. For a reaction A + B $\longrightarrow$ products, the rate of the reaction was doubled when the concentration of A was doubled. When the concentrations of A & B were doubled, the rate was again doubled, the order of the reaction with respect to A & B are
(A) 1, 1 (B) 2, 0 (C) 1, 0 (D) 0, 1

80. With respect to the figure given which of the following statement is correct? (E = activation energy, ΔH = enthalpy change)



(A) Δ H for the forward reaction is C – B (B) Δ H for the forward reaction is B – A
(C) E_a (forward) = E_a (backward) (D) E_a for backward reaction = C – A

81. For a first-order reaction, the half life period is
(A) dependent on the square of the initial concentration
(B) dependent on first power of initial concentration
(C) dependent on the square root of initial concentration
(D) independent on initial concentration

82. The half life of a first order reaction is 10 sec. What is its rate constant (in sec^{-1})?
(A) 0.0693 (B) 0.693 (C) 6.93 (D) 69.3

83. The rate of the reaction for
A $\longrightarrow$ Products (order is greater than zero)
is 10 mol. $litre^{-1}$ min^{-1} at time t_1 = 2 minutes. What will be the rate (in mol. lit^{-1} min^{-1}) at time t_2 = 12 minutes?
(A) more than 10 (B) less than 10 (C) 10 (D) 20

Space for rough work

84. Consider the following reaction, A $\longrightarrow$ products.
This reaction is completed in 100 minutes. The rate constant of this reaction at t_1 = 10 min is 10^{-2} min^{-1}. What is the rate constant (in min^{-1}) at t_2 = 20 minutes?
(A) 2 x 10^{-2} (B) 10^{-2} (C) 5 x 10^{-3} (D) 0.1

85. In the reaction, A + 2B $\longrightarrow$ products, doubling the concentration of B (keeping the concentration of A unchanged) increases the rate of reaction by ……………………..time
(rate $\propto$ to [A] $[B]^2$
(A) 2 (B) 3 (C) 4 (D) 5

86. In the elementary reaction A + B $\longrightarrow$ products, if B is taken in excess, then it follows
(A) second order kinetics (B) zero order kinetics
(C) third order kinetics (D) first order kinetics

87. For the reaction A $\longrightarrow$ C, it is found that the rate of the reaction doubles when the concentration of A is increased four times the order of the reaction is
(A) 1 (B) 1 ½ (C) 1/2 (D) 2

88. For a complex reaction $X_2 + Y_2 \rightarrow 2XY$, following reaction mechanism is given
(I) $X_2 \rightleftharpoons 2X$
(II) $X + Y_2 \longrightarrow XY + Y(\text{slow})$
(III) $X + Y \longrightarrow XY$
What is order with respect to Y_2 and overall order of reaction.
(A) 1, 2 (B) 1, 1.5 (C) 1.5, 1 (D) 1, 1

89. The half life of a first order reaction is 1 hour. What is the time taken for 87.5% completion of the reaction?
(A) 1 Hour (B) 2 Hours (C) 3 Hours (D) 4 Hours

90. For a first order reaction, 40% of the reaction completes in 40 minutes. Calculate the time taken for 64% completion.
(A) 40 min (B) 80min (C) 70 min (D) 95 min

Space for rough work

FIITJEE PET – VII (REG_2ND YEAR)
MAINS_SET–B_ANSWERS
DATE: 04.08.2018

MATHEMATICS

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

PHYSICS

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

CHEMISTRY

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