FIITJEE PET – IV (CHAMPIONS_2ND YEAR)
MAINS
DATE: 07.07.2018

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.

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ENROLLMENT NO.: ☐☐☐☐☐☐☐☐☐☐☐

1. If the straight line 4y – 3x + 18 = 0 cuts the parabola $y^2 = 64x$ in P and Q, then the angle subtended by PQ at the vertex of the parabola is

(A) $\cos^{-1}\left(\frac{87}{\sqrt{27409}}\right)$ (B) $\tan^{-1}\left(\frac{17}{\sqrt{22409}}\right)$ (C) $\sin^{-1}\left(\frac{28}{\sqrt{17309}}\right)$ (D) $\cos^{-1}\left(\frac{35}{\sqrt{15210}}\right)$

2. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x - a)$ is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

3. The slopes of the focal chords of the parabola $y^2 = 32x$ which are tangents to the circle $x^2 + y^2 = 4$ are

(A) $\frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}$ (B) $\frac{1}{\sqrt{15}}, \frac{-1}{\sqrt{15}}$ (C) $\frac{2}{\sqrt{5}}, \frac{-2}{\sqrt{5}}$ (D) $\frac{1}{2}, \frac{-1}{2}$

4. If the distances of two points P and Q from the focus of a parabola $y^2 = 4ax$ are 4 and 9 respectively, then the distance of the point of intersection of tangents at P and Q from the focus is

(A) 8 (B) 6 (C) 5 (D) 13

5. In the parabola $y^2 = 4ax$, the length of the chord passing through the vertex and inclined to the axis at $\frac{\pi}{4}$ is

(A) $4a\sqrt{2}$ (B) $2a\sqrt{2}$ (C) $a\sqrt{2}$ (D) none of these

6. The length of the chord of contact of tangents drawn from (x_1, y_1) to the parabola $y^2 = 4ax$ is

(A) $\frac{\sqrt{(y_1^2 - 4ax_1)(y_1^2 + 4a^2)}}{a}$ (B) $\sqrt{\frac{(y_1^2 - 4ax_1)}{a}}$

(C) $\frac{\sqrt{(y_1^2 + 4ax_1)(y_1^2 - 4a^2)}}{a}$ (D) $\frac{\sqrt{(y_1^2 - 4ax_1)(y_1^2 - 4a^2)}}{a}$

7. The area of the triangle formed by the tangents and the chord of contact from (x_1, y_1) to the parabola $y^2 = 4ax$ is

(A) $(y_1^2 - 4ax_1)^{3/2}$ (B) $2a(y_1^2 - 4ax_1)^{3/2}$ (C) $\frac{(y_1^2 - 4ax_1)^{3/2}}{(2a)}$ (D) none of these

8. The circumcircle of the triangle formed by any three tangents to a parabola passes through

(A) vertex (B) focus (C) foot of the directrix (D) none of these

Space for rough work

9. PSQ is a focal chord of a parabola whose focus is S and vertex A. PA and QA are produced to meet the directrix in R and T respectively. Then $\angle RST$ =
(A) 90° (B) 60° (C) 45° (D) 30°

10. If the normal to the parabola $y^2 = 4x$ at P(1, 2) meets the parabola again in Q, then Q =
(A) (–6, 9) (B) (9, –6) (C) (–9, –6) (D) (–6, –9)

11. The circle passing through three conormal points also passes through
(A) vertex (B) foor of the directrix (C) focus (D) none of these

12. If a circle cuts the parabola $y^2 = 4ax$ in four points, then the algebraic sum of ordinates of the four points is
(A) 0 (B) 1 (C) –1 (D) none of these

13. The locus of the middle point of the portion of a normal to the parabola $y^2 = 4ax$ intercepted between the curve and the axis is
(A) $y^2 = a(x - a)$ (B) $y^2 = a(x + a)$ (C) $y^2 = 2a(x - a)$ (D) $y^2 = 2a(x + a)$

14. If P(–3, 2) is one end of the focal chord PQ of the parabola $y^2 + 4x + 4y = 0$, then the slope of the normal at Q is
(A) $-\frac{1}{2}$ (B) 2 (C) $\frac{1}{2}$ (D) –2

15. The locus of a point that divides chords of slope 2 of the parabola $y^2 = 4x$ internally in the ratio 1 : 2 is a parabola. Then the vertex is
(A) $\left(\frac{2}{9}, \frac{8}{9}\right)$ (B) $\left(\frac{3}{7}, \frac{5}{7}\right)$ (C) $\left(-\frac{2}{9}, \frac{8}{9}\right)$ (D) $\left(\frac{1}{9}, \frac{4}{9}\right)$

16. A line bisecting the ordinate PN of a point P(at^2, 2at), t > 0, on the parabola $y^2 = 4ax$ is drawn parallel to the axis to meet the curve at Q. If NQ meets the tangent at the vertex at the point T, then the coordinates of T are
(A) $\left(0, \frac{4at}{3}\right)$ (B) (0, 2at) (C) $\left(\frac{at^2}{4}, at\right)$ (D) (0, at)

17. Equation of the common tangent touching the circle $(x - 3)^2 + y^2 = 9$ and the parabola $y^2 = 4x$ above the x-axis is
(A) $\sqrt{3}\,y = 3x + 1$ (B) $\sqrt{3}\,y = -(x + 3)$ (C) $\sqrt{3}\,y = x + 3$ (D) $\sqrt{3}\,y = -(3x + 1)$

Space for rough work

18. PQ is a double ordinate of a parabola $y^2 = 4ax$. If the locus of its points of trisection is another parabola length of whose latus rectum is k times the length of the latus rectum of the given parabola, then k =
(A) $\frac{1}{9}$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) none of these

19. Equation of the directrix of the parabola whose focus is (0, 0) and the tangent at the vertex is $x - y + 1 = 0$ is
(A) $x - y = 0$ (B) $x - y - 1 = 0$ (C) $x - y + 2 = 0$ (D) $x + y - 1 = 0$

20. If the point P(4, –2) is one end of the focal chord PQ of the parabola $y^2 = x$, then the slope of the tangent at Q is
(A) $-\frac{1}{4}$ (B) $\frac{1}{4}$ (C) 4 (D) –4

21. The range of values of λ for which the point $(\lambda, -1)$ is exterior to both the parabolas $y^2 = |x|$, is
(A) (0, 1) (B) (–1, 1) (C) (–1, 0) (D) none of these

22. The line, among the following, that touches the parabola $y^2 = 4ax$ is
(A) $x + my + am^3 = 0$ (B) $x - my + am^2 = 0$ (C) $x + my - am^2 = 0$ (D) $y + mx + am^2 = 0$

23. If the common tangent of the circle $x^2 + y^2 = c^2$ and the parabola $y^2 = 4ax$ subtends an angle θ with x-axis, then $\tan^2\theta$ =
(A) $\frac{\sqrt{c^2 + 4a^2} - c}{2c}$ (B) $\frac{\sqrt{c^2 + 4a^2} - c}{2}$ (C) $\frac{\sqrt{3c^2 + 4a^2} - c}{2c}$ (D) $\frac{\sqrt{c^2 + a^2} + 4c}{2c}$

24. The point of intersection of the tangents at the ends of latusrectum of the parabola $y^2 = 4x$ is
(A) (0, 0) (B) (0, 1) (C) (–1, 0) (D) (1, 0)

25. Two straight lines are perpendicular to each other One of them touches the parabola $y^2 = 4a(x + a)$ and the other touches $y^2 = 4b(x + b)$. The locus of the point of intersection of the two lines is
(A) $x + a = 0$ (B) $x + b = 0$ (C) $x + a + b = 0$ (D) $x - a - b = 0$

26. The equation of a tangent to the parabola $y^2 = 8x$ is $y = x + 2$. The point on this line from which the other tangent to the parabola is perpendicular to the given tangent is
(A) (–1, 1) (B) (0, 2) (C) (2, 4) (D) (–2, 0)

Space for rough work

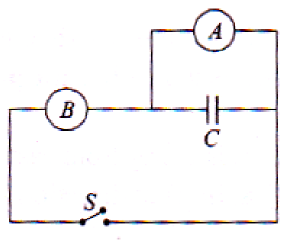
27. The length of the perpendicular from the focus S of the parabola $y^2 = 4ax$ on the tangent at P is
(A) $\sqrt{OS \cdot SP}$ (B) OS . SP (C) OS + OP (D) none of these

28. The midpoint of the chord $2x – y – 2 = 0$ of the parabola $y^2 = 8x$ is
(A) (1, 0) (B) (2, 2) (C) (3, 4) (D) (0, –2)

29. The locus of the midpoints of the focal chords of the parabola $y^2 = 4ax$ is
(A) $y^2 = 2a (x + a)$ (B) $y^2 = 2a (x – a)$ (C) $y^2 = a(2x + a)$ (D) $y^2 = a(2x – a)$

30. The area of the triangle inscribed in the parabola $y^2 = 4x$ the ordinates of whose vertices are 1, 2 and 4 is
(A) $\frac{7}{2}$ sq. units (B) $\frac{5}{2}$ sq. units (C) $\frac{3}{2}$ sq. units (D) $\frac{3}{4}$ sq. units

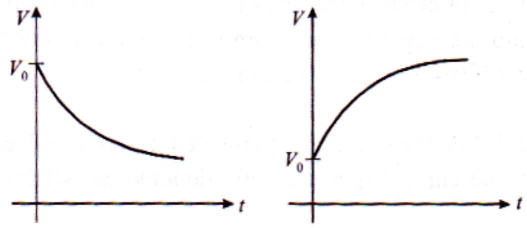
31. A capacitor of capacitance C is connected to two voltmeters A and B. A is ideal, having infinite resistance, while B has resistance R. The capacitor is charged and then the switch S is closed. The readings of A and B will be equal.
(A) at all times
(B) after time RC
(C) after time RC In 2
(D) only after a very long time



32. In a RC circuit, the time required for the charge on a capacitor to build up to a given fraction of its steady state value, is independent of
(A) The value of the applied EMF to the circuit
(B) The value of C
(C) The value of R
(D) None of the above

Space for rough work

33. A capacitor is charged up to a potential V_0. It is then connected to a resistance R and a battery of emf E. Two possible graphs of potential difference across capacitor with time are shown. What is the most reasonable explanation of these graphs?



(A) The first graph shows what happen when the capacitor has potential difference less than E initially and the second shows what happens when it has potential difference greater than E initially.
(B) The first graph shows what happens when the capacitors has potential difference greater than E initially and the second shows what happens when it has a less than E potential initially.
(C) The first graph is the correct qualitative shape for any initial potential across capacitor, but the second is not possible
(D) The second graph is the correct qualitative shape for any initial potential difference across capacitor, but the first is not possible.

34. Through an electrolyte an electrical current is due to drift of

(A) Free electrons
(B) Positive and negative ions
(C) Free electrons and holes
(D) Protons

35. An ammeter an a voltmeter are joined in series to a cell. Their readings are A and V respectively. If a resistance is now joined in parallel with the voltmeter.
(A) Both A and V will increase
(B) Both A and V will increase
(C) A will decrease, V will increase
(D) A will increase, V will decrease

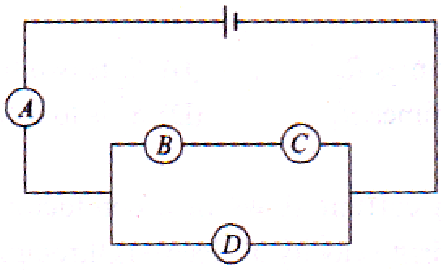
36. A voltmeter and an ammeter are joined in series to an ideal cell, giving reading V and A respectively. If a resistance equal to the resistance of the ammeter is now joined in parallel to the ammeter then.
(A) V will not change
(B) V will increase
(C) A will become exactly half of its initial value
(D) A will become slightly less than double of its initial value

37 A uniform wire of resistance 4Ω is bent into the form of a circle of radius r. A specimen of the same wire is connected along the diameter of the circle. What is the equivalent resistance across the ends of this wire ?

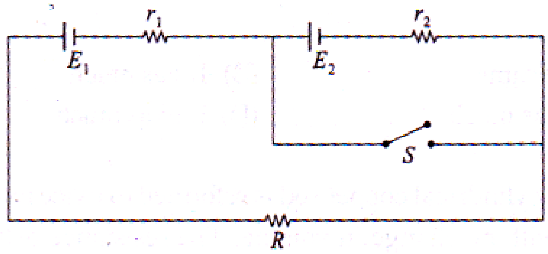
(A) $\frac{4}{(4+\pi)}\Omega$
(B) $\frac{3}{(3+\pi)}\Omega$
(C) $\frac{2}{(2+\pi)}\Omega$
(D) $\frac{1}{(1+\pi)}\Omega$

Space for rough work

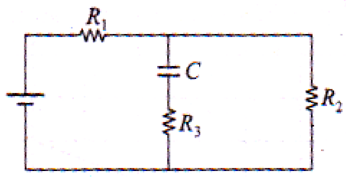
38. All bulbs in the circuit shown in figure are identical . Which bulb glows most brightly ?
(A) B (B) A
(C) D (D) C



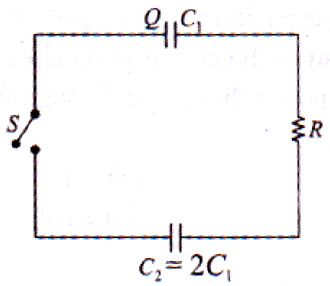
39. Switch S is closed at time t= 0. Which one of the following statements is correct ?
(A) Current in the resistance R increase if $E_1r_2 > E_2(R+r_1)$
(B) Current in the resistance R increase if $E_1r_2 < E_2(R+r_1)$
(C) Current in the resistance R decrease if $E_1r_2 > E_2(R+r_1)$
(D) Current in the resistance R decrease if $E_1r_2 = E_2(R+r_1)$



40. In the circuit here, the steady state voltage across capacitor C is a fraction of the battery EMF. The fraction is decided by
(A) R_1 only (B) R_1 and R_2 only
(C) R_1 and R_3 only (D) R_1, R_2 and R_3



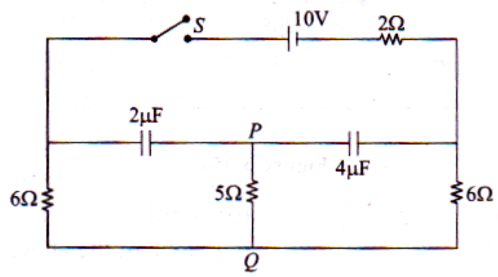
41. Two capacitors C_1 and $C_2 = 2C_1$ are connected in a circuit with a switch between them as shown in the figure. Initially the switch is open and C_1 holds charge Q. The switch is closed. In steady state, the charge on the two capacitors will be given as.
(A) Q,2Q (B) Q/3, 2Q/3
(C) 3Q/2,3Q (D) 2Q/3,4Q/3



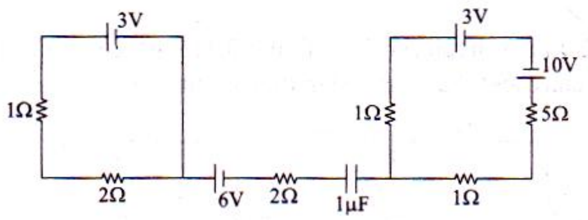
Space for rough work

42. When a potential difference is applied across a conductor the free electrons in the conductor are set into motion. Two velocities are associated with the moving electron – the drift velocity and average velocity. The fact is that the two are
(A) Entirely different
(B) Same
(C) Same in some conductors and different in others
(D) None of the above

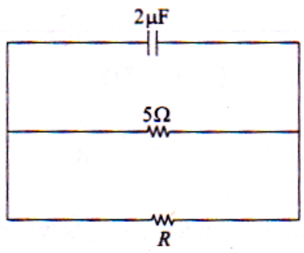
43. In the circuit shown in figure the capacitors are initially uncharged. The current through resistor PQ just after closing the switch is
(A) 2 A from P to Q (B) 2 A from Q to P
(C) 6 A from P to Q (D) zero



44. For the circuit shown in the figure, calculate the charge on capacitor in steady state ?
(A) 4μC (B) 6μC
(C) 1 μC (D) zero



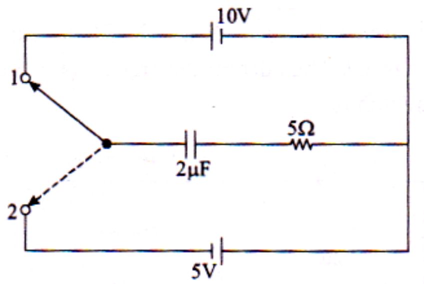
45. A capacitor of capacitance 2 μF is charged to a potential difference of 5 V. Now the charging battery is disconnected and the capacitor is connected in parallel to a resistor of 5Ω and another unknown resistor of resistance R as shown in figure. If the total heat produced in 5Ω resistance is 10μJ, then the unknown resistance R is equal to
(A) 10Ω (B) 15Ω
(C) $(10/3)\Omega$ (D) 7.5Ω



Space for rough work

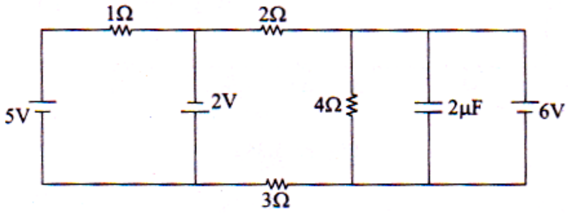
46. In the circuit shown in figure switch S is thrown at position 1 at t= 0. When the current in the resistor is 1 A switch is then shifted to position -2. The total heat generated in the circuit after switch is shifted to position – 2 is

(A) zero (B) 625 μJ
(C) 100 μJ (D) None of the above



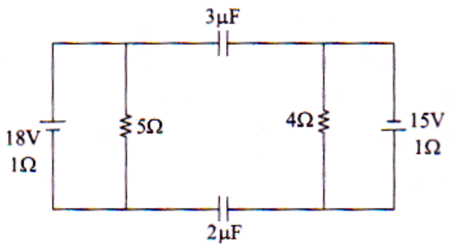
47. In the circuit shown in fig, the current in 1Ω resistance and charge stored in the capacitor are

(A) 4A, 6μC (B) 7A, 12μC
(C) 4A, 12μC (D) 7A, 6μC



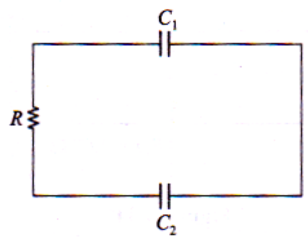
48. Two cells, two resistors and two capacitors are connected as shown in figure. The charge on 2μF capacitor is

(A) 30 μC (B) 20 μC
(C) 25 μC (D) 48 μC



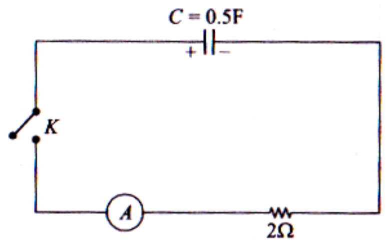
49. A capacitor C_1 is charged to a potential V and connected to another capacitor in series with a resistor R as shown. It is observed that heat H_1 is dissipated across resistance R, till the circuit reaches steady state. Same process is repeated using resistance of 2R, If H_2 is heat dissipated in this case then,

(A) $\frac{H_2}{H_1} = 1$ (B) $\frac{H_2}{H_1} = 4$
(C) $\frac{H_2}{H_1} = \frac{1}{4}$ (D) $\frac{H_2}{H_1} = 2$



Space for rough work

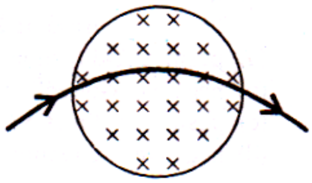
50. A charged capacitor is allowed to discharge through a resistor by closing the key at the instant t= 0. At the instant t = ln(4) μs, the reading of the ammeter falls half the initial value. The resistance of the ammeter is equal to



(A) 0.5Ω (B) 1Ω
(C) 2Ω (D) 4Ω

51. Which of the following cannot be deflected by a magnetic field ?
(A) Alpha rays (B) Beta rays
(C) Gamma rays (D) Cosmic rays

52. There is a magnetic field acting in a plane perpendicular to this sheet of paper downwards into the paper. Particles in vacuum move in the plane of the paper from left to right as shown in fig. The path indicated by the arrow could be due to



(A) Proton (B) neutron
(C) electron (D) alpha particle

53. A 2 MeV proton is moving perpendicular to a uniform magnetic field of 2.5 T. The force on the proton is
(A) 2.5×10^{-10}N (B) 8×10^{-11}N
(C) 2.5×10^{-11}N (D) 8×10^{-12}N

54. A proton, a deuteron 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) $r_\alpha > r_d < r_p$
(C) $r_\alpha = r_d < r_p$ (D) $r_p = r_d < r_\alpha$

55. A particle of charge '+q' and mass 'm', at t= 0, enters a uniform magnetic field $\vec{B} = B_0\hat{k}$ while moving with a velocity $\vec{V} = V_0\left(\hat{i}+\hat{k}\right)$, then
(A) it moves along a circular path of radius $\frac{mV_0}{qB}$ (B) it moves along a helical path of pitch $\frac{2\pi m}{qB_0}V_0$
(C) it moves along a helical path of pitch $\frac{2\sqrt{2}\pi m}{qB_0}V_0$
(D) it moves along a straight line path along the z – axis

Space for rough work

56. A particle of charge q and mass m starts moving from the $\vec{E}$ = E$\hat{i}$ and magnetic field $\vec{B}$ = B$\hat{i}$ wth a velocity $\vec{v}$ = $v_0\,\hat{j}$. The speed of the particle will become $2v_0$ after a time :

(A) $t = \frac{2mv_0}{qE}$ (B) $t = \frac{2Bq}{mv_0}$ (C) $t = \frac{\sqrt{3}Bq}{mv_0}$ (D) $t = \frac{\sqrt{3}mv_0}{qE}$

57. A particle of charge per unit mass a 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:

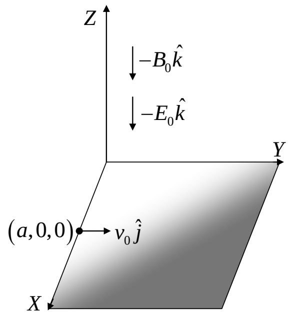
(A) $-\frac{2v_0}{B_0\alpha}$ (B) $\frac{v_0}{B_0\alpha}$ (C) $\frac{2v_0}{B_0\alpha}$ (D) $-\frac{v_0}{B_0\alpha}$

58. A charged particle of specific charge (charge/mass) α is released from origin at time t =0 with velocity $\vec{v} = v_0(\hat{i} + \hat{j})$ in uniform magnetic field $\vec{B} = B_0\hat{i}$. Co-ordinates of the particle at time t = $\frac{\pi}{B_a\alpha}$ are :

(A) $\left(\frac{v_0}{2B_0\alpha}, \frac{\sqrt{2}v_0}{\alpha B_0}, \frac{-v_0}{B_0\alpha}\right)$ (B) $\left(\frac{-v_0}{2B_a\alpha}, 0, 0\right)$

(C) $\left(0, \frac{2v_0}{B_0\alpha}, \frac{v_0\pi}{2B_0\alpha}\right)$ (D) $\left(\frac{v_0\pi}{B_0\alpha}, 0, \frac{-2v_0}{B_0\alpha}\right)$

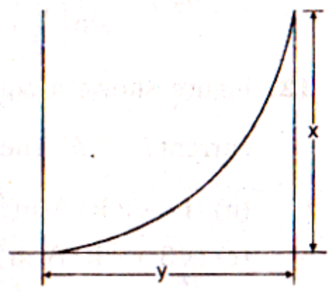
59. A charged particle of mass m and charge q is projected on a rough horizontal $x-y$ plane surface with $z-$axis in the vertically upward direction. Both electric and magnetic fields are acting in the region and given by $\vec{E} = -E_0\hat{k}$ and $\vec{B} = -B_0\hat{k}$ respectively. The particle enters into the field at $(a_0, 0, 0)$ with velocity $\vec{v} = v_0\hat{j}$. The particle starts moving into a circular path on the plane. If the coefficient of friction between the particle and the plane is μ, the time taken for the particle to come to rest is.



(A) $\frac{mv_0}{\mu(mg + qE_0)}$ (B) $\frac{mv_0}{\mu(mg - qE_0)}$ (C) $\frac{mv_0}{\mu(mg + B_0qv_0)}$ (D) $\frac{mv_0}{\mu(mg - B_0qv_0)}$

Space for rough work

60. A particle having charge q enters a region of uniform magnetic field $\vec{B}$ (directed inwards) and is deflected as shown. The magnitude of the momentum of the particle is:



(A) $\frac{qBy}{2}$ (B) $\frac{qBy}{x}$ (C) $\frac{qB}{2}\left(\frac{y^2}{x}+x\right)$ (D) $\frac{qBy^2}{2x}$

61. For the reaction A + B $\rightarrow$ C ; starting with different initial concentration of A and B, initial rate of reaction were determined graphically in four experiments.

S. No.	$[A]_0$/M (Initial conc.)	$[B]_0$/M (Initial conc.)	Rate /(M sec^{-1})
1	1.6×10^{-3}	5×10^{-2}	10^{-3}
2	3.2×10^{-3}	5×10^{-2}	4×10^{-3}
3	1.6×10^{-3}	10^{-1}	2×10^{-3}
4	3.2×10^{-3}	10^{-1}	8×10^{-3}

Rate law for reaction from above data is
(A) $r = k[A]^2 [B]^2$ (B) $r = k[A]^2[B]$ (C) $r = k[A] [B]^2$ (D) $r = k[A] [B]$

62. Which statement is not correct ?
(A) For endothermic reactions, heat of reaction is lesser than energy of activation
(B) For exothermic reaction, heat of reaction is more than energy of activation
(C) For exothermic reactions energy of activation is less in forward reaction than in backward reaction
(D) For endothermic reactions energy of activation is more in forward reaction than in backward reaction.

63. For the reaction, $H_2(g)+Br_2(g)\rightarrow 2HBr(g)$, the reaction rate = $K[H_2][Br_2]^{\frac{1}{2}}$. Which statement is true about this reaction :
(A) The reaction is second order
(B) Molecularity of the reaction is 3/2
(C) The unit of K is sec^{-1}
(D) Order of the reaction is 3/2

Space for rough work

64. For the decomposition of $N_2O_5(g)$, it is given that :

$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$; Activation energy E_a

$N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$; Activation energy $E_a^{'}$ then :

(A) $E_a = E_a^{'}$ (B) $E_a > E_a^{'}$ (C) $E_a < E_a^{'}$ (D) $E_a = 2E_a^{'}$

65. The rate law for a reaction between the substances A and B is given by : Rate = $K[A]^n[B]^m$. On doubling the concentration of A and halving the concentration of B, the ratio of the new rate to the earlier rate of the reaction will be as :

(A) (n – m) (B) 2^{n-m} (C) $2^{1/(m+n)}$ (D) 2^{m-n}

66. In a reaction the threshold energy is equal to

(A) average energy of the reactants (B) activation energy

(C) activation energy + average energy of the reactants

(D) activation energy – average energy of the reactants

67. For the first order reaction $A(g) \longrightarrow 2B(g) + C(g)$, the initial pressure is P_A = 90 mm Hg, the pressure after 10 minutes is found to be 180 mm Hg. The rate constant of the reaction is

(A) 1.15×10^{-3} sec^{-1} (B) 2.3×10^{-3} sec^{-1} (C) 3.45×10^{-3} sec^{-1} (D) 6×10^{-3} sec^{-1}

68. For a given reaction of first order, it takes 20 minutes for the concentration to drop from 1.0 mol $litre^{-1}$ to 0.6 mol $litre^{-1}$. The time required for the concentration to drop from 0.6 mol $litre^{-1}$ to 0.36 mol $litre^{-1}$ will be

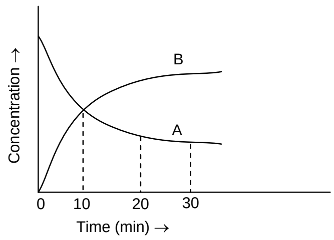
(A) more than 20 minutes (B) less than 20 minutes

(C) equal to 20 minutes (D) infinity

69. For a first order reaction: $A \rightleftharpoons B$, whose concentration vs. time curve is as shown in the figure. The rate constant is equal to

(A) 41.58 h^{-1} (B) 4.158 s^{-1}

(C) 1.155×10^{-3} s^{-1} (D) 6.93 min^{-1}



70. In the reaction; $A + 2B \rightarrow 3C + D$, which of the following expressions does not describe changes in the concentration of various species as a function of time:

(A) $\frac{d(C)}{dt} = \frac{-3d(A)}{dt}$ (B) $\frac{3d(D)}{dt} = \frac{d(C)}{dt}$ (C) $\frac{-3d(B)}{dt} = \frac{2d(C)}{dt}$ (D) $\frac{2d(B)}{dt} = \frac{d(A)}{dt}$

Space for rough work

71. The dependence of the rate constant for a reaction on temperature is given by the equation $k = Ae^{-E_a/RT}$. Under what conditions is the rate constant k the smallest ?
(A) High T and large E_a (B) High T and small E_a
(C) Low T and large E_a (D) Low T and small E_a

72. For the reaction, $3BrO^- \rightarrow BrO_3^- + 2Br^-$ in an aqueous alkaline medium at 80°C, the value of the rate constant in the rate law in terms of $\frac{-d\left[BrO^-\right]}{dt}$ is 0.056 litre mol^{-1} s^{-1}. What will be the rate constant when the rate law is started in terms of $\frac{-d\left[BrO_3^-\right]}{dt}$?
(A) 18.7×10^{-2} litre $mol^{-}s^{-1}$ (B) 3.74 x 10^{-3} litre mol^{-1} s^{-1}
(C) 0.0187 litre mol^{-1} s^{-1} (D) 18.7 x 10^{-2} litre mol^{-1} s^{-1}

73. The temperature coefficient for the reaction rate of a reaction is 2. The rate decreases if we decrease the temperature from 400K to 320 K is:
(A) $\frac{1}{2^8}$ (B) $\frac{1}{2^7}$ (C) 2^8 (D) 2^7

74. The time taken for completion of 87.5% of the first order reaction is 300 min. The half life is :
(A) 10 min (B) 100 min (C) 150 min (D) 200 min

75. The units of rate constant of a first order reaction are
(A) sec^{-1} (B) lit. mol^{-1} sec^{-1} (C) mole lit^{-1} sec^{-1} (D) No units

76. 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

77. The rate constant of first order reaction at 27°C is 10^{-3} min^{-1}. The temperature coefficient of this reaction is 2. What is the rate constant (in min^{-1}) at 17°C for this reaction?
(A) 10^{-3} (B) 5 x 10^{-4} (C) 2 x 10^{-3} (D) 10^{-2}

78. After how many seconds will the concentration of the reactant in a first order reaction be halved if the rate constant is 1.155 x 10^{-3} sec^{-1}?
(A) 600 (B) 100 (C) 60 (D) 10

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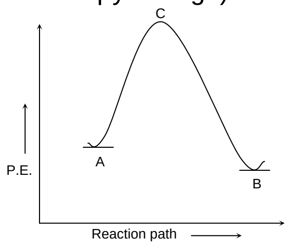
79. In a first order reaction, the concentration of the reactant, decreases from 0.8 M to 0.4 M in 15m minutes. The time taken for the concentration to change from 0.1 M to 0.025 M is
(A) 30 minutes (B) 15 minutes (C) 7.5 minutes (D) 60 minutes

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

81. The reaction $A(g) + 2B(g) \longrightarrow C(g) + D(g)$ is an elementary process. In an experiment, the initial partial pressure of A and B are $P_A = 0.60$ and $P_B = 0.80$ atm. When $P_C = 0.2$ atm the rate of reaction relative to the initial rate is
(A) 1/48 (B) 1/24 (C) 9/16 (D) 1/6

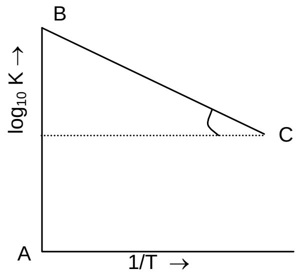
82. In the reaction $A + B \longrightarrow$ products, if B is taken in excess, then it follows
(A) second order kinetics (B) zero order kinetics
(C) third order kinetics (D) first order kinetics

83. 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 (forward) = E (backward) (D) E for backward reaction = C – A

84. Figure shows a graph in $\log_{10}$ K vs $\frac{1}{T}$ where K is rate constant and T is temperature. The straight line BC has slope, $\tan\theta = -\frac{1}{2.303}$ and an intercept of 5 on y–axis. Thus E_a, the energy of activation is :



(A) 2.303 x 2 cal (B) 2/2.303 cal (C) 2 cal (D) None of these

Space for rough work

85. 99% of the first order reaction was completed in 32 minutes. When will 99.9% of the reaction complete?
(A) 24 minutes (B) 8 minutes (C) 4 minutes (D) 48 minutes

86. The rate constant is numerically the same for three reactions of first, second and third order respectively. Which one is true for rate of three reactions, if concentration of reactant is greater than 1 M :
(A) $r_1 = r_2 = r_3$ (B) $r_1 > r_2 > r_3$ (C) $r_1 < r_2 < r_3$ (D) All of these

87. The rate equation for the reaction $2A + B \longrightarrow C$ is found to be : rate = k [A] [B]. The correct statement in relation to this reaction is that the
(A) unit of k must be s^{-1} (B) $t_{\frac{1}{2}}$ is a constant
(C) rate of formation of C is twice the rate of disappearance of A
(D) value of k is independent of the initial concentrations of A and B

88. $t_{1/4}$ can be taken as the time taken for the concentration of reactant to drop to 3/4 of its initial value. If the rate constant for a first order reaction is K, the $t_{1/4}$ can be written as
(A) 0, 75 / K (B) 0.69 / K (C) 0.10 / K (D) 0.29 / K

89. A reaction was found to be second order with respect to the concentration of carbon monoxide. If the concentration of carbon monoxide is doubled, with everything else kept the same, the rate of reaction will
(A) increase by a factor of 4 (B) double
(C) remain unchanged (D) triple

90. In the reaction $2N_2O_5 \longrightarrow 4NO_2 + O_2$, initial pressure is 500 atm and rate constant K is 3.38×10^{-5} sec^{-1}. After 10 minutes the final pressure of N_2O_5 is
(A) 490 atm (B) 250 atm (C) 480 atm (D) 420 atm

Space for rough work

FIITJEE PET – IV (CHAMPIONS_2ND YEAR)
MAINS_ANSWERS
DATE: 07.07.2018

MATHEMATICS

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

PHYSICS

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

CHEMISTRY

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