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Subject: **CHEMISTRY, MATHEMATICS & PHYSICS**

Paper Code: **JEE_ Main_ Sample Paper - II**

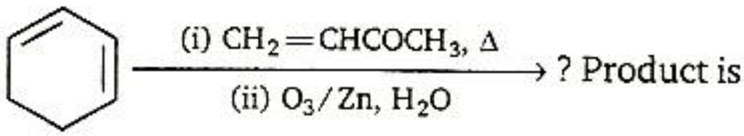
Duration: 3 hours

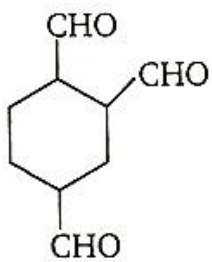
Maximum Marks: 360

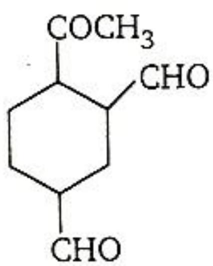
General Instructions:

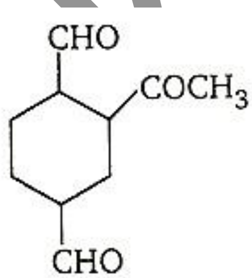
1. The test is of **3 hours duration.**
2. The Test consists of **90** questions. The maximum marks are **360.**
3. There are **three** parts in the question paper A, B, C consisting of **Chemistry, Mathematics** and **Physics** having 30 questions in each part of equal weightage. Each question is allotted **4 (four)** marks for correct response.
4. Candidates will be awarded marks as stated above in instruction No. 4 for correct response of each question. (1/4) (One fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
5. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instruction 4 above.

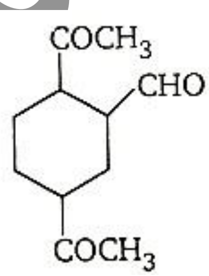
Part – A - Chemistry

1) 

A 

B 

C 

D 

2) A mixture of formic acid and oxalic acid is heated with conc. H_2SO_4. The gaseous product is passed into KOH solution where the volume decreases by 1/6th. The molecular proportion of the organic acids, formic acid and oxalic acid in the mixture is

A 4 : 1

B 1: 4

C 1: 2

D 2: 1

3) In the preparation of p-nitro acetanilide from aniline, nitration is not done by nitrating mixture (a mixture of conc. H_2SO_4 and conc. HNO_3) because

A on nitration it gives a-nitro acetanilide

B it gives a mixture of a-and p-nitro aniline

C $-NH_2$ group gets oxidized

D it forms a mixture of a-and p-nitro acetanilide

4) At 20°C and 1.00 arm partial pressure of hydrogen, 18 mL of hydrogen, measured at STP, dissolves in 1L of water. If water at 20°C is exposed to a gaseous mixture having a total pressure of 1400 Torr (excluding the vapour pressure of

water) and containing 68.5% Hz by volume find the volume of H_2, measured at STP, which will dissolve in 1L of water.

A 18 mL

B 12 mL

C 23 mL

D 121 mL

5) A mixture of 0.50 mole of H_2 and 0.50 mole of SO_2 is introduced into a 10.0 L container at 25°C, The container has a 'pinhole' leak. After a period of time the partial pressure of H_2 in the remaining mixture

A Exceeds that of SO_2

B is equal to that of SO_2

C is less than that of SO_2

D is the same as in the original mixture

6) 3.7g of an oxide of a metal was heated with charcoal. The liberated CO_2 was absorbed in caustic soda solution and weighed 1.0 g. If the specific gravity of the metalis 0.095, the exact atomic weight of the metal is

a) 170.B

b) 32.7

c) 67.37

d) 65.4

7) In a cubic closed packed Structure of mixed oxides, the lattice is made up of oxide ions, one eighth of tetrahedral voids are occupied by divalent ions (A^{2+}), while one half of the octahedral voids are occupied by trivalent ions (B^{3+}). What is the formula of the oxide?

a) $A_3B_2O_4$

b) $A_2B_2O_4$

c) AB_2O_5

d) AB_2O_4

8) The standard heat of combustion of carbon(s), sulphur (s) and carbon disulphide (l) are - 393.3, -293.72 and - 1108.76 kJ/mol respectively. The standard heat of formation of carbon disulphide (l) is

a) -128.02kJ

b) + 128.02kJ

c) - 218.42 kJ

d) + 218.42 kJ

9) The decomposition of N_2O into N_2 and O in the presence of gaseous argon follows second order kinetics with

$k = (5.0 \times 10^{11}\ L\ mol^{-1}s^{-1})\ e^{-29000k/T}$.

Activation energy of the reaction is

a) 121 kJ mol^{-1}
b) 241 kJ mol^{-1}
c) 201 kJ mol^{-1}
d) None of these

10) In which of the following case, increase in concentration of ion cause increase in E_{cell} ?

a) Pt (H_2) | H^+ (Ag)
b) Ag, AgCl| Cl^-(aq)
c) PtlQuinhydrone| H^+ (aq)
d) Ag | Ag^+(aq)

11) The empirical formula of the compound is

a) CH
b) C_2H_3
c) CH_2

d) CH_3

12) Molecular formula of the compound is

a) C_8H_{12}

b) C_7H_7

c) C_9H_{27}

d) C_8H_{16}

13) An electron travels with a velocity of v m s^{-1}.For a proton to have the same de-Broglie wavelength, the velocity will be approximately

a) $\frac{v}{1840}$

b) $\frac{1840}{v}$

c) 1840 v

d) v

14) The molecular mass of each N_2 and CO is 28. If 0.5 L of N_2 at 27°C and 700

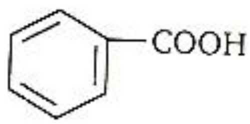
mm pressure contains n molecules, the number of molecules in 1.0 L of CO under identical conditions will be

a) n/2
b) n
c) 2n
d) None of these

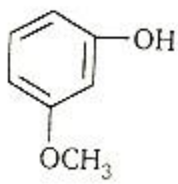
15) During the preparation of $H_2S_2O_8$ (perdisulphuric acid), O_2 gas also releases at anode as by product. When 9.72 L of H_2 releases at cathode and 2.35 LO_2 at anode, the weight of $H_ZS_2O_S$ produced is

a) 87.12
b) 43.65
c) 83.42
d) 40.74

16) Aqueous solution of sodium bicarbonate can fairly be useful to distinguish aliphatic carboxylic acid from



a)



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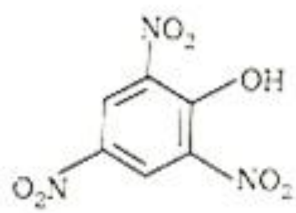

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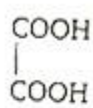

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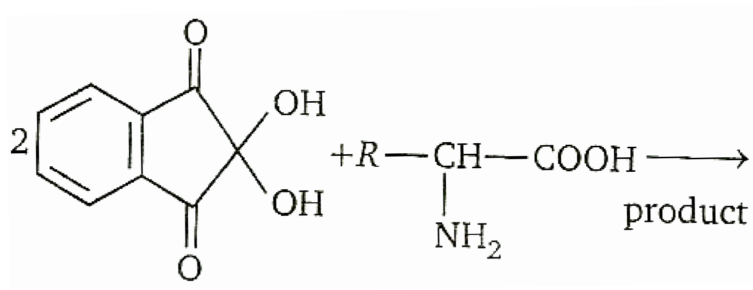
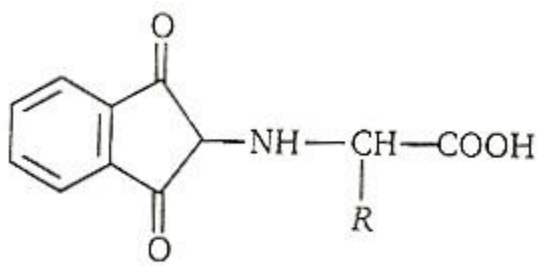
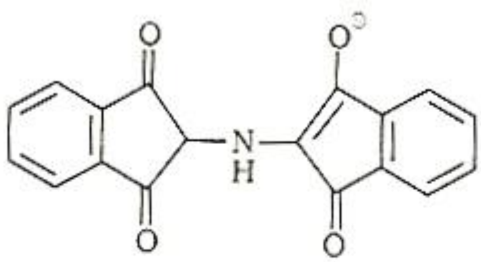
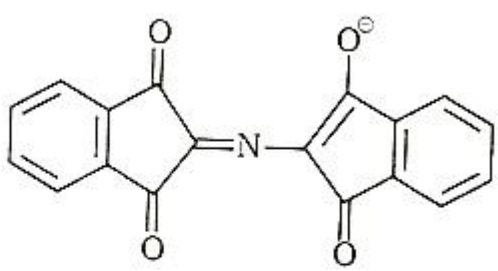
17) 

Product is purple complex having structure.

a) 

b) 

c) 

d) None of the above

18) Leveling bulb is used during experiment to study kinetics of the dissociation of hydrogen peroxide to ensure

a) uniform pressure difference between the room and the gases in the system
b) pressure within the reaction vessel is same as that in the room
c) same temperature as that of room
d) None of the above

19) In the reaction of $aA + bB + cC \rightarrow$ products

(i) if concentration of A is doubled, keeping concentration of B and C constant, the rate of reaction becomes double.

(ii) if concentration of B is halved, keeping concentration of A and C constant, the rate of reaction remains unaffected.

(iii) if concentration of C is made 1.5 times, the rate of reaction becomes 2.25 times.

The order of reaction is

a) 1
b) 2.5
c) 3

d) 3.5

20) A hydrogen gas electrode has potential of -0.118V when H_2 gas is bubbled at 298 K and 1 atm, in HCl solution. The pH of HCl solution is

a) 2
b) 1
c) 7
d) 2.7

21) To 50.0 mL of a hydrochloric acid solution, 25 mL of 0.5 N Na_2CO_3solution were added. The remaining acid required 20 mL of 0.5 N NaOH for complete neutralisation. The normality of the acid solution is

a) 0.9 N
b) 0.45 N
c) 0.225 N
d) 1.45 N

22) A metal crystallizes into two cubic phases, face centred cubic (FCC) and body centred cubic (BCC) whose unit cell lengths are 3.5 and 3.0 Å respectively. Calculate the ratio of the densities of FCC and BCC,

a) 1.67

b) 1.26

c) 6.23

d) 1.04

23) How much ethyl alcohol, C_2H_5OH, must be added to 1.00 L of water so that the solution will not freeze at - 4°F?

a) 211 g

b) 495 g

c) 85 g

d) 46 g

24) Consider the reaction

$A^- + H_3O^+ \rightarrow HA + H_2O$

The K_a value for the acid HA is 1.0×10^{-6}. The value of the K for this reaction is

a) 1.0×10^{-6}

b) 1.0×10^{6}

c) 1.8×10^{-5}

d) 3.3×10^{-3}

25) Transport number of Cl^- is least in

a) HCl

b) NaCl

c) KCl

d) CsCl

26) In the dichromate dianion

a) 4Cr-O bonds are equivalent

b) 6 Cr-O bonds are equivalent

c) all Cr-O bonds are equivalent

d) all Cr-O bonds are non-equivalent

27) 5.39 g of a mixture of $FeSO_4 \cdot 7H_2O$ and anhydrous ferric sulphate requires 80 mL of 0.125 N permanganate solution for complete conversion to the ferric sulphate. The individual weight of ferric sulphate in the original mixture is

a) 2.61 g

b) 5.22 g

c) 1.305 g

d) 2.78 g

28) The standard enthalpy change for the reaction $H_2(g)+\frac{1}{2}O_2(g) \rightarrow H_2O(g)$, is

ΔH° = - 248.8 kJ. It truly suggests, that

a) 248.8 kJ of energy is evolved when reaction is processed at 1 atm pressure and 298 K temperature.

b) 248.8 kJ of energy is evolved irrespective of reaction conditions (pressure and temperature)

c) the reaction $2H_2 + O_2 \rightarrow 2H_2O$ evolves same amount of energy 248.8 kJ

d) The reaction is

$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$

29) When 30.0 g of a non-volatile solute having the empirical formula CH_2O is dissolved in 800 g of water, the solution freezes at - 1.16°C. What is the molecular formula of the solute? (k_f = 1.86°C/m)

a) CH_2O

b) $C_2H_4O_2$

c) $C_3H_6O_3$

d) $C_4H_8O_8$

30) For the reaction $3BrO^- \rightarrow BrO_3^- + 2Br^-$, in alkaline solution, the value of the second order (in BrO^-) rate constant at 80°C in the rate law for $-(\Delta [BrO^-] / \Delta t)$ was found to be 0.056L mol^{-1} s^{-1}. Then, $\Delta[BrO_3^-]/ \Delta t$ is

a) 0.019 L mor^{1} s^{-1}
b) 0.112 L mol^{-1} s^{-1}
c) 0.168 Lmol^{-1} s^{-1}
d) 0.056 L mol^{-1} s^{-1}

Part – C – Physics

31) A balloon starts rising from the ground with an acceleration of 1.25m/s^2. After 8s, a stone is released from the balloon. The stone will

A cover a distance of 40m

B have a displacement of 50m

C reach the ground in 4s

D begin to move down after being released

32) A projectile is moving at 60m/s at its highest point, where it breaks into two equal parts due to an internal explosion. One part moves vertically up at 50m/s with respect to the ground. The other part will move at

A 110m/s

B 120m/s

C 130m/s

D $10\sqrt{(61)}$ m/s

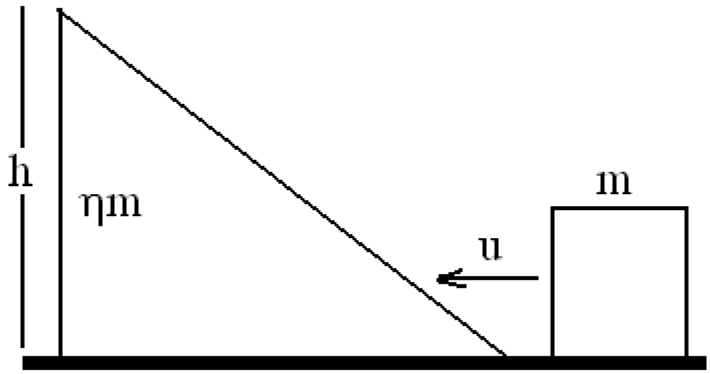
33) A particle strikes a horizontal frictionless floor with a speed u, at an angle θ with the vertical, and rebounds with a speed v, at an angle ϕ with the vertical. The coefficient of restitution between the particle and the floor is e. The magnitude of v is

A eu

B (1-e)u

C $u\sqrt{(\sin^2\theta + e^2\cos^2\theta)}$

D $u\sqrt{(e^2\sin^2\theta+\cos^2\theta)}$

34) 

A block of mass m is pushed towards a movable wedge of mass ηm and height h, with a velocity u. All surfaces are smooth. The minimum value of u for which the block will reach the top of the wedge is

A $\sqrt{2gh}$

B $\eta\sqrt{2gh}$

C $\sqrt{2gh(1+1/\eta)}$

D $\sqrt{2gh(1-1/\eta)}$

35) A force $\vec{F} = -k\left(y\hat{i} + x\hat{j}\right)$, where k is a positive constant, acts on a particle moving in the xy plane. Starting from the origin, the particle is taken along the positive x-axis to the point (a, 0), and then parallel to the y-axis to the point (a, a). The total work done by the force on the particle is

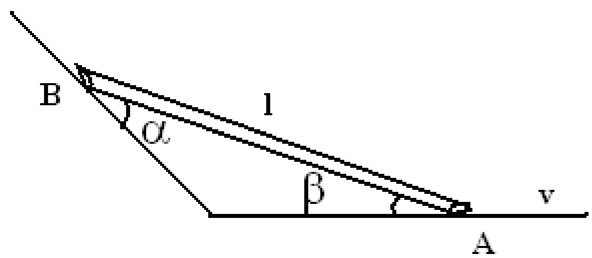
A $-2ka^2$

B $2ka^2$

C $-ka^2$

D ka^2

36) A rod of length l slides down along the inclined wall as shown in figure. At the instant shown in figure, the speed of end A is v, then the speed of B will be



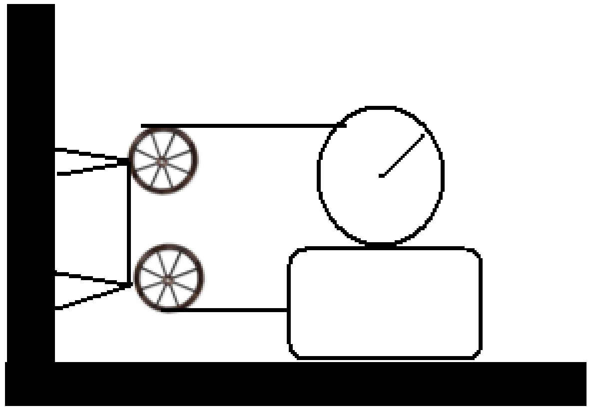
A (v sinβ)/cosα

B (v sinα)/sinβ

C (v cosβ)/cosα

D (v cosα)/cosβ

37) In the figure, shown the plank is being pulled to the right with a constant speed v. If the cylinder does not slip then



A the speed of the centre of mass of the cylinder is 2v

B the speed of the centre of mass of the cylinder is v

C the angular velocity of the cylinder is v/R

D the angular velocity of the cylinder is zero

38) Two point masses of 0.3kg and 0.7kg are fixed at the ends of a rod of length 1.4m and of negligible mass. The rod is set rotating about an axis perpendicular to its length with a uniform angular speed. The point on the rod through which the axis should pass in order that the work required for rotation of the rod is minimum, is located at a distance of

A 0.42 m from mass of 0.3kg

B 0.70m from mass of 0.7kg

C 0.98m from mass of 0.3kg

D 0.98m from mass of 0.7kg

39) Speed of a planet in an elliptical orbit with semi major axis a about sun of mass M at a distance r from sun is

A $\sqrt{GM\left(\frac{2}{r}-\frac{1}{a}\right)}$

B $\sqrt{GM\left(\frac{1}{r}-\frac{1}{a}\right)}$

C $\sqrt{GM\left(\frac{1}{r}-\frac{2}{a}\right)}$

D $\sqrt{\frac{GMr}{2a^2}}$

40) A uniform cylinder of length L and mass M having cross-sectional area A is suspended, with its length vertical, from a fixed point by a mass less spring, such that it is half-submerged in a liquid of density ρ at equilibrium position. When the cylinder is given a small downward push and released it starts oscillating vertically with small amplitude. If the force constant of the spring is k, the frequency of oscillation of the cylinder is

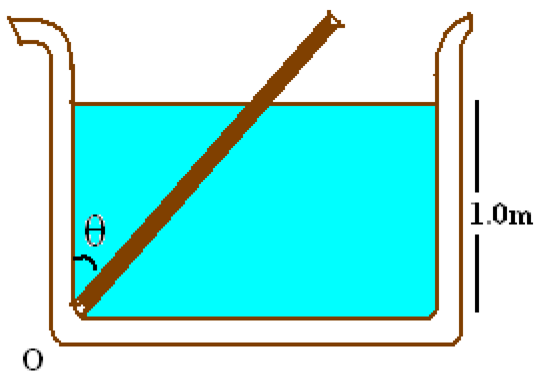
A $1/2\pi\ (k\text{-}A\rho g/M)^{1/2}$

B $1/2\pi\ (k+A\rho g/M)^{1/2}$

C $1/2\pi\ (k+\rho gL^2/M)^{1/2}$

D $1/2\pi\ (k+A\rho g/A\rho g)^{1/2}$

41) A uniform rod of length 2.0m specific gravity 0.5 and mass 2kg is hinged at one end to bottom of a tank of water (specific gravity = 1.0) filled up to a height of 1.0 m as shown in figure. Taking the case $\theta \neq 0^o$ the force exerted by the hinge on the rod is ($g = 10m/s^2$)



A 10.2 N upwards

B 4.2N downwards

C 8.3N downwards

D 6.2N upwards

42) A cylinder vessel of area of cross-section A is filled with water to a height H. It has capillary tube of length l and radius r fitted horizontally at bottom. If the coefficient of viscosity of water is η then time required in which the level will fall to a height H/2 is (density of water is ρ)

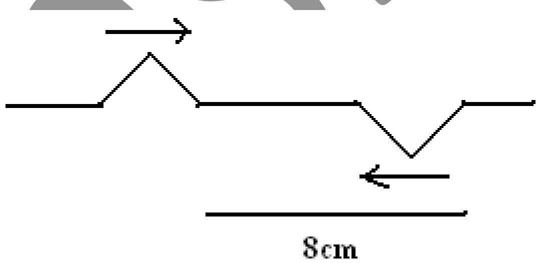
A $\eta l r^2/4A\rho \ln(2)$

B $4\eta l r^4/\pi g A\rho \ln(1/2)$

C $8\eta l A/\rho \pi g r^4 \ln(2)$

D $4H\eta l\rho/\pi g r^4 \ln(2)$

43) Two pulses in a stretched string, whose centres are initially 8cm apart, are moving towards each other as shown in the figure. The speed of each pulse is 2cm/s. After 2s total energy of the pulse will be



A zero

B purely kinetic

C purely potential

D partly kinetic and partly potential

44) First overtone frequency of a closed organ pipe is equal to the first overtone frequency of an open organ pipe. Further nth harmonic of closed pipe is also equal to the m^{th} harmonic of open pipe, where n and m are

A 5, 4

B 7, 5

C 9, 6

D 7, 3

45) The molar heat capacity in a process of a diatomic gas if it does a work of Q/4 when a heat of Q is supplied to it is

A 2/5 R

B 5/2 R

C 10/3 R

D 6/7 R

46) A ray of light incident on a slab of transparent material is partly reflected from the surface and partly refracted into the slab. The reflected and refracted rays are mutually perpendicular. The incident ray makes an angle i with the normal to the slab. The refractive index of the slab is

A $\tan^{-1}(i)$

B $\cot^{-1}(i)$

C $\sin^{-1}(i)$

D $\cos^{-1}(i)$

47) In a Young's double-slit experiment, let S_1 and S_2 be the two slits, and C be the centre of the screen. If $\angle S_1CS_2 = \theta$ and λ is the wavelength, the fringe with will be

A λ/θ

B $\lambda\theta$

C $2\lambda/\theta$

D $\lambda/2\theta$

48) In a regular polygon of n sides, each corner is at a distance r from the centre. Identical charges of magnitude Q are placed at (n – 1) corners. The field at the centre is

A $k\,Q/r^2$

B $(n-1)\,k\,Q/r^2$

C $n/(n-1)\,k\,Q/r^2$

D $(n-1)/n\,k\,Q/r^2$

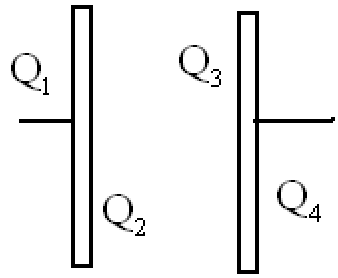
49) A large solid sphere with uniformly distributed positive charge has a smooth narrow tunnel through its centre. A small particle with negative charge, initially at rest far from the sphere, approaches it along the line of the tunnel, reaches its surface with a speed v, and passes through the tunnel. Its speed at the centre of the sphere will be

A 0

B v

C $\sqrt{2}v$

D $\sqrt{1.5}v$

50) 

In an isolated parallel-plate capacitor of capacitance C, the four surfaces have charges Q_1, Q_2, Q_3 and Q_4, as shown. The potential difference between the plates is

A $(Q_1+Q_2+Q_3+Q_4)/2C$

B $(Q_2+Q_3)/2C$

C $(Q_2-Q_3)/2C$

D $(Q_1+Q_4)/2C$

51) In a parallel-plate capacitor, the region between the plates is filled by a dielectric slab. The capacitor is connected to a cell and the slab is taken out.

A Some charge is drawn from the cell

B Some charge is returned to the cell

C The potential difference across the capacitor is reduced

D No work is done by an external agent in taking the slab out.

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

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

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 $t(> \pi/3B_0\alpha)$ would be

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

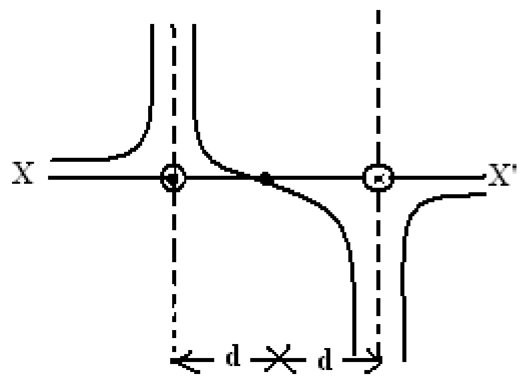
B $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha} + v_0\left(t - \frac{\pi}{3B_0\alpha}\right)$

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) Two long parallel wires are at a distance 2d apart. They carry steady equal currents flowing out of the plane of the paper as shown. The variation of the magnetic field B along the line XX' is given by

A



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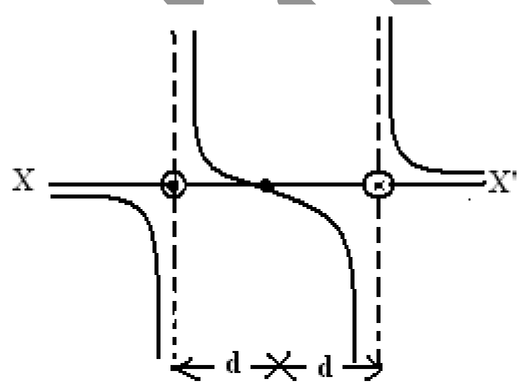
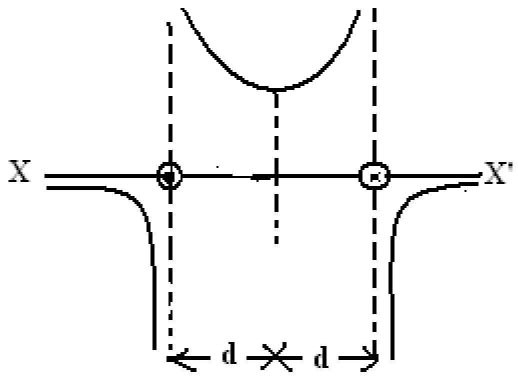
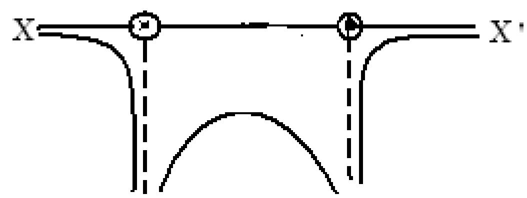
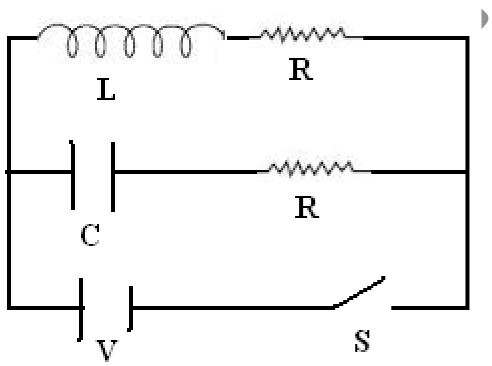


C 

D 

54) In the circuit shown in figure, R = √(L/C). Switch S is closed at time t = 0. The current through C and L would be equal after a time t equal to



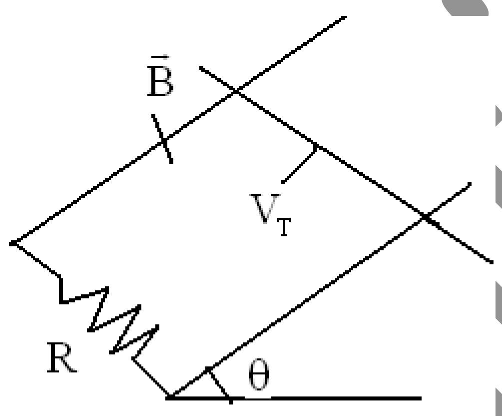
A CR

B CR *ln* (2)

C L/(R *ln* (2))

D LR

55) A copper rod of mass m slides under gravity on two smooth parallel rails l distance apart and set at an angle θ to the horizontal. At the bottom, the rails are joined by a resistance R. There is a uniform magnetic field perpendicular to the plane of the rails. The terminal velocity of the rod is



A $mgR\cos\theta/B^2l^2$

B $mgR\sin\theta/B^2l^2$

C $mgR\tan\theta/B^2l^2$

D $mgR\cot\theta/B^2l^2$

56) Binding energy per nucleon of $_1H^2$ and $_2He^4$ are 1.1eV and 7.0 MeV respectively. Energy released in the processes $_1H^2 + _1H^2 = _2He^4$ is

A 20.8MeV

B 16.6MeV

C 25.2MeV

D 23.6MeV

57) Difference between nth and $(n + 1)^{th}$ Bohr's radius of 'H' atom is equal to its (n – 1) Bohr's radius. The value of n is

A 1

B 2

C 3

D 4

58) Magnetic field at the centre (at nucleus) of the hydrogen like atoms (atomic number = Z) due to the motion of electron in nth orbit is proportional to

A n^3/Z^5

B n^4/Z

C Z^2/n^3

D Z^3/n^5

59) A star initially has 10^{40} deuterons. It produces energy via the processes $_1H^2 + {_1H^2} \rightarrow {_1H^3} + p$ and $_1H^2 + {_1H^3} \rightarrow {_2He^4} + n$.

If the average power radiated by the start is 10^{16} W, the deuteron supply of the star is exhausted in a time of the order of

A 10^6s

B 10^8s

C 10^{12}s

D 10^{16}s

60) A radioactive material of half-life T was produced in a nuclear reactor at different instants, the quantity time. If now their present activities are A_1 and A_2 respectively the their age difference equals

A $\dfrac{T}{\ln 2}\left|\ln \dfrac{2A_1}{A_2}\right|$

B $T\left|\ln\frac{A_1}{A_2}\right|$

C $\frac{T}{\ln 2}\left|\ln\frac{A_2}{2A_1}\right|$

D $T\left|\ln\frac{A_2}{2A_1}\right|$

Part – A - Mathematics

61) The equation of one of the planes through origin which is parallel to the line x-1/2 = y+3/-1 = z+1/-2 and at a distance 5/3 from it is

A 2x + 2y + z = 0

B 3x + 2y + 2z = 0

C x – 2y + 2z = 0

D None of these

62) An unbiased die is tossed to until a number greater than 4 appears. The probability that an even number of tosses is needed is

A ½

B 2/5

C 1/5

D 2/3

63) The minimum value of

$$\frac{\left(a^2+3a+1\right)\left(b^2+3b+1\right)\left(c^2+3c+1\right)}{abc}$$

Where a, b, c > 0 is

A 125

B 25

C 27

D None of these

64) Let |z – i| + |z + i| = k, if k = 0, then

A locus of z is ellipse for k ≠1

B locus of z is ellipse for k = 2

C locus of z is ellipse for k = 3

D locus of z is ellipse for k ∈ R

65) How many ways are there to arrange the letter of the word 'FATHER' with vowels in alphabetical order.

A 480

B 240

C 360

D 120

66) In a triangle ABC, a: b: c = 4:5:6. The ratio of radius of the circum circle to that of the in circle is

A 16:7

B 16:9

C 15:11

D 15:13

67) Tangents are drawn to the ellipse x2 + 2y2 = 2, then the locus of the mid-point of the intercept made by the tangents between the coordinate axes is

A $\frac{1}{2x^2}+\frac{1}{4y^2}=1$

B $\frac{1}{4x^2}+\frac{1}{2y^2}=1$

C $\frac{x^2}{2}+\frac{y^2}{4}=1$

D $\frac{x^2}{4}+\frac{y^2}{2}=1$

68) The slope of common tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ and the circle $x^2 + y^2 = r^2$ must be

A $\frac{\sqrt{r^2-a^2}}{r^2-b^2}$

B $\frac{\sqrt{r^2-b^2}}{r^2-a^2}$

C $\sqrt{\frac{r^2-a^2}{r^2-b^2}}$

D $\sqrt{\frac{r^2-b^2}{a^2-r^2}}$

69) If one of the diagonals of a square is along the lines x = 2y and one of its vertices is (3, 0), then its sides through this vertex are given by the equations

A $y + 3x + 9 = 0,\ 3y - x + 3 = 0$

B $y + 3x - 9 = 0,\ 3y - x - 3 = 0$

C $y - 3x + 9 = 0,\ 3y + x - 3 = 0$

D $y - 3x - 9 = 0,\ 3y + x + 3 = 0$

70) The solution of differential equation

$(1+y^2) + (x-e^{\tan^{-1}y})\, dy/dx = 0$ is

A $2xe^{\tan^{-1}y} = e^{2\tan^{-1}y} + k$

B $xe^{2\tan^{-1}y} = e^{2\tan^{-1}y} + k$

C $xe^{\tan^{-1}y} = e^{-1}y + k$

D $(x-2) = ke^{\tan^{-1}y}$

71) If f(x) is differentiable and strictly increasing function, then the value of $\lim_{x\to 0}\frac{f(x^2)-f(x)}{f(x)-f(0)}$ is

A 1

B 0

C -1

D 2

72) The equation of the circle having radius 3 and touching the circle $x^2 + y^2 - 4x - 6y - 12 = 0$ at (- 1, - 1) is

a) $5x^2+5y^2+8x-14y-16=0$

b) $5x^2+5y^2-8x-14y-32=0$

c) $5x^2+5y^2-8x-14y-4=0$

d) $5x^2+5y^2+8x+14y-4=0$

73) Let $\vec{r}x\vec{a}=\vec{b}x\vec{a}$ and $\vec{r}.\vec{c}=0,$ where $\vec{a}.\vec{b}\neq 0,$ then $\vec{r}$ is equal to

A $\vec{b}+t\vec{a}$ where t is a scalar

B $\vec{a}+\vec{c}$

C $\vec{a}-\vec{c}$

D None of these

74) Consider an A.P. with first term 'a' and the common difference d. Let S_k denote the sum of the first K terms. Let S_{kx}/s_x is independent of x, then

A a =d/2

B a =d

C a = 2d

D None

75) The equation of the line passing through the point (1, 2, -4) and perpendicular to the two lines x-8/3 = y+9/-16 = z-10/7 and x-15/3 = y-2/8 = z-8/-5 is

A x-1/2 = y-2/3 = z+4/6

B x-1/3 = y-2/2 = z+4/6

C x-1/2 = y-2/6 = z+4/3

D x-1/3 = y-2/6 = z+4/2

76) The points of contact Q and R of tangent from the point P (2, 3) on the parabola $y^2 = 4x$ are

A (9, 6) and (1, 2)

B (1, 2) and (4, 4)

C (4, 4) and (9, 6)

D (9, 6) and (1/4, 1)

77) The equation of bisector of that angle between the lines x + y + 1 = 0 and 2x – 3y – 5 = 0 which contains the point (10, -20) is

A $x(\sqrt{13} + 2\sqrt{2}) + y(\sqrt{13} - 3\sqrt{2}) + (\sqrt{13} - 5\sqrt{2}) = 0$

B $x(\sqrt{13} - 2\sqrt{2}) + y(\sqrt{13} + 3\sqrt{2}) + (\sqrt{13} + 5\sqrt{2}) = 0$

C $x(\sqrt{13} + 2\sqrt{2}) + y(\sqrt{13} + 3\sqrt{2}) + (\sqrt{13} + 5\sqrt{2}) = 0$

D None of these

78) Let g(x) = $\int_0^x f(t)\,dt$, where f is such that $\frac{1}{2} \le f(t) \le 1 \text{ for } t \in [0,1] \text{ and } 0 \le f(t) \le \frac{1}{2}$ for $t \in [1, 2]$. Then, g(2) satisfies the inequality

A $-\frac{3}{2} g(2) < \frac{1}{2}$

B $0 \le g(2) \le \frac{3}{2}$

C $\frac{3}{2} < g(2) \le \frac{5}{2}$

D $2 < g(2) < 4$

79) Eccentricity of the hyperbola conjugate to the hyperbola $x^2/4 - y^2/12 = 1$ is

A $2/\sqrt{3}$

B 2

C $\sqrt{3}$

D 4/3

80) A spherical iron ball 10cm in radius is coated with a layer of ice of uniform thickness that melts at a rate of $50 cm^3/min$. When the thickness of ice is 5cm, then the rate at which the thickness of ice decrease is

A $1/36\pi$ cm/min

B $1/18\pi$ cm/min

C $1/54\pi$ cm/min

D $5/6\pi$ cm/min

81) If P and Q are the points of intersection of the circles $x^2 + y^2 + 3x + 7y + 2p - 5 = 0$ and $x^2 + y^2 + 2x + 2y - p^2 = 0$, then there is a circle passing through P, Q and (1, 1) for

A all values of p

B all except one value of p

C all except two values of p

D exactly one value of p

82) The remainder left out when $8^{2n} - (62)^{2n+1}$ is divided by 9 is

A 0

B 2

C 7

D 8

83) Given $P(x) = x^4 + ax^3 + bx^2 + cx + d$ such that x = 0 is the only real root of P(x) = 0. If P(-1) < P(1), then in the interval [-1, 1]

A P(-1) is the minimum and P(1) is the maximum of P

B P(-1) is not minimum but P(1) is the maximum of P

C P(-1) is the minimum and P(1) is not the maximum of P

D neither P(-1) is the minimum nor P(1) is the maximum of P

84) If $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$

Such that $0 \le \theta \le \dfrac{\pi}{2}, then\, \theta\, is$

A $\dfrac{7\pi}{12}$

B $\dfrac{7\pi}{24}, \dfrac{11\pi}{24}$

C $\dfrac{7\pi}{12}, \dfrac{11\pi}{12}$

D None of these

85) If in a triangle ABC,

cos A cos B + sin A sin B sin C = 1,

then a : b : c is equal to

A 1: 1: $\sqrt{2}$

B 1: 1: $\sqrt{3}$

C 1: $\sqrt{2}$: 1

D 1: $\sqrt{3}$: 1

86) Which of the following sets of fraction is in increasing order?

A $\frac{7}{11}, \frac{5}{9}, \frac{3}{7}$

B $\frac{3}{7}, \frac{7}{11}, \frac{5}{9}$

C $\frac{3}{7}, \frac{5}{9}, \frac{7}{11}$

D $\frac{5}{9}, \frac{7}{4}, \frac{3}{7}$

87) Let a, b, c be such that $b(a+c) \neq 0$.

If $\begin{vmatrix} a & a+1 & a-1 \\ -b & b+1 & b-1 \\ c & c-1 & c+1 \end{vmatrix} + \begin{vmatrix} a+1 & b+1 & c-1 \\ a-1 & b-1 & c+1 \\ a(-1)^{n+2} & (-1)^{n+1} b & (-1)^n c \end{vmatrix} = 0,$

then the value of 'n' is

A 0

B any even integer

C any odd integer

D any integer

88) If the mean deviation of number 1, 1+d, 1+2d,……,1+100d from their mean in 255, then the d is equal to

A 10.0

B 20.0

C 10.1

D 20.2

89) From 6 different novels and 3 different dictionaries, 4 novels and 1 dictionary are to be selected and arranged in a row on the shelf so that the dictionary is always in the middle. Then the number of such arrangements is

A less than 500

B at least 500 but less than 750

C at least 750 but less than 1000

D at least 1000

90) For real x, let $f(x) = x^3 + 5x + 1$, then

A f is one –one but not onto R

B f is onto R but one-one

C f is one-one and onto R

D f is neither one-one nor onto R