Time: 3Hours

JEE MAINS SAMPLE PAPER - 2018

CLASS: 12th (PCM)

Maximum Marks: 360

Topics Covered:

Physics	**: Full Syllabus**
Chemistry	**: Full Syllabus**
Mathematics	**: Full Syllabus**

Important Instruction:

1. Attempting all the questions are compulsory.
2. Use **Blue / Black Ball** point pen only.
3. There are three sections of equal weightage in the question paper A, B, C (**Physics, Chemistry and Mathematics**) Having 30 questions each.
4. For marking scheme, +4 marks for each correct answer and -1 marks for each incorrect answer.
5. Use of calculator and other electronic devices is not allowed during the exam.
6. No extra sheets will be provided for any kind of work.

Name of the Student: ..... Class: .....

Father's Name: ..... Signature: .....

Branch Name: ..... Contact No: .....

Rough Space

PART – A (PHYSICS)

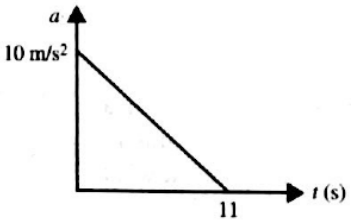
1. The mass of the liquid flowing per second per unit area of cross section of a tube is proportional of P^x and v^y, where P is the pressure difference and v is the velocity. Then the relation between x and y if proportional constant is dimensionless is

(a) x = y (b) x = – y (c) $y^2 = x$ (d) $y = -x^2$

2. An elevator in which a man is standing is moving upwards with a speed of 10 m/s. If the man drops a coin from a height of 2.45 m from the floor of the elevator, it reaches the floor of the elevator after a time (g = 9.8 m/s2)

(a) $\sqrt{2}$ (b) $\frac{1}{\sqrt{2}}$ (c) 2 s (d) 1/2 s

3. A particle starts from rest. Its acceleration (a) versus time (t) graph is as shown in the figure. The maximum speed of the particle will be



(a) 11 m/s (b) 55 m/s

(c) 550 m/s (d) 66 m/s

4. Two thin equi – convex lenses each of focal length f and made of glass $\left(\mu_g = \frac{3}{2}\right)$ are placed in contact. The space between them is filled with water $\left(\mu_w = \frac{4}{3}\right)$. The focal length of the combination is

(a) $\frac{f}{2}$ (b) $\frac{2f}{3}$ (c) $\frac{3f}{4}$ (d) $\frac{4f}{7}$

5. The coefficient of linear expansion of an inhomogeneous rod changes linearly from α_1 to α_2 from one end to the other end of the rod. The effective coefficient of linear expansion of rod is

(a) $\alpha_1 + \alpha_2$ (b) $\frac{\alpha_1+\alpha_2}{2}$ (c) $\sqrt{\alpha_1\alpha_2}$ (d) $\alpha_1 - \alpha_2$

6. A series combination of 0.1 MΩ resistor and a 10μF capacitor is connected across a 1.5 V source of negligible resistance. The time (in seconds) required for the capacitor to get charge up to 0.75 V is approximately

(a) ∞ (b) $\log_e 2$ (c) $\log_e 3$ (d) zero

7. When a monochromatic source of light is at a distance of 0.2 m from a photocell, the stopping potential (cut off voltage) and the saturation current are found to be respectively 1 volt and 27 mA. If the same source is placed at a distance 0.6 m from the cell then

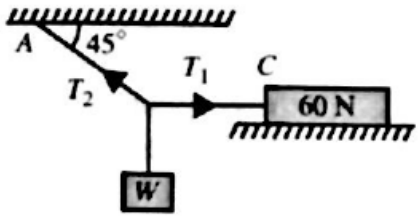
(a) the stopping potential will be 0.25 V and current will be 27 mA
(b) the stopping potential will be 1 volt and current will be 3 mA
(c) the stopping potential will be 1 volt and current will be 9 mA
(d) the stopping potential will be 1 volt and current will be 12 mA

Rough Space

8. In Young's double slit experiment, the 10th maximum of wavelength λ_1 is at a distance y_1 from its central maximum and the 5th maximum of wavelength λ_2 is at a distance y_2 from its central maximum. The ratio of $\frac{\lambda_1}{\lambda_2}$ will be

(a) $\frac{2y_1}{y_2}$ (b) $\frac{2y_2}{y_1}$ (c) $\frac{y_1}{2y_2}$ (d) $\frac{y_2}{2y_1}$

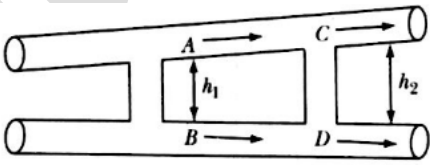
9. In the figure below, a block of weight 60 N is placed on a rough surface. The coefficient of friction between the block and the surface is 0.5. What should be the weight W such that the block does not slip on the surface?



(a) 60 N (b) $\frac{60}{\sqrt{2}}$ N

(c) 30 N (d) $\frac{30}{\sqrt{2}}$ N

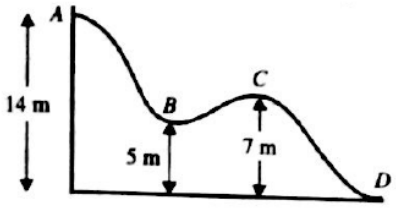
10. An ideal liquid is flowing in two pipes one is inclined and second is horizontal. Both the pipes are connected by two vertical tubes of length h_1 and h_2 as shown in fig. The flow is streamline in both the pipes. If velocity of liquid at A, B and C are 2 m/s, 4 m/s and 4 m/s respectively, the velocity at D will be



(a) 4 m/s (b) $\sqrt{14}\,m/s$

(c) $\sqrt{28}$ m/s (d) 2 m/s

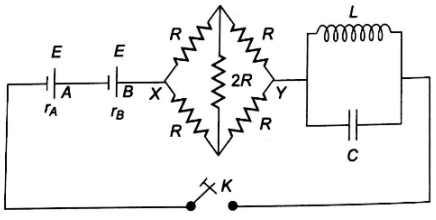
11. Figure shows the vertical section of a frictionless surface. A block of mass 2 kg is released from rest from position A; its KE as it reaches position C is (g = 10 m/s2)



(a) 140 J (b) 180 J

(c) 120 J (d) 280 J

12. In the circuit shown in fig. A and B are two cells of the same emf E and of internal resistances rA and rB respectively. L is an ideal inductor and C is an ideal capacitor. The key K is closed. When the current in the circuit becomes steady, what should be the value of R so that the potential difference across the terminals of cell A is zero.



(a) $R = r_A - r_B$ if $r_A > r_B$

(b) $R = \sqrt{r_A r_B}$

(d) $R = \frac{1}{2}(r_A + r_B)$

(d) For no value of R will the potential difference between the terminals of cell A be equal to zero

Rough Space

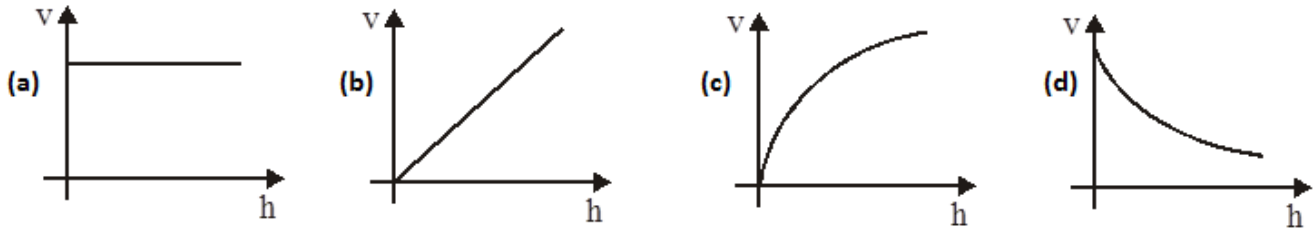
13. A charged particle enters a uniform magnetic field with velocity vector making an angle of 30^0 with the magnetic field. The particle describes a helical trajectory of pitch x. The radius of the helix is

(a) $\frac{x}{2\pi}$ (b) $\frac{x}{2\sqrt{2}\pi}$ (c) $\frac{x}{2\sqrt{3}\pi}$ (d) $\frac{\sqrt{3}x}{2\pi}$

14. An alternating current (in ampere) varies with time t as I = 3 sin ωt + 4 cos ωt The rms value of the current is

(a) $\frac{3}{\sqrt{2}}A$ (b) $\frac{4}{\sqrt{2}}A$ (c) $\frac{5}{\sqrt{2}}A$ (d) $\frac{7}{\sqrt{2}}A$

15. A uniform rope having some mass hangs vertically from a rigid support. A transverse wave pulse is produced at the lower end. The speed (v) of the wave pulse varies with height (h) from the lower end as:



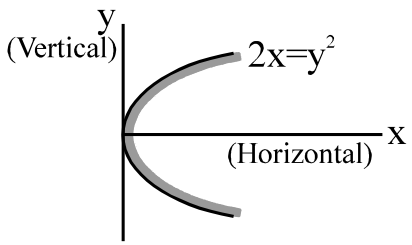
16. When electrons in a hydrogen atom jumps from first orbit to one of the higher energy orbits, the orbital velocity is reduced to (1/3)rd the initial value. If the radius of the first orbit is r, the radius of the higher energy orbit is

(a) 9r (b) 4r (c) 3r (d) 2r

17. The introduction of a metal plate between the plates of a parallel plate capacitor increases its capacitance by 4.5 times. If d is the separation of the two plates of the capacitor, the thickness of the metal plate introduced is

(a) $\frac{d}{3}$ (b) $\frac{5d}{9}$ (c) $\frac{7d}{9}$ (d) d

18. The convex reflecting surface is represented by the equation $2x = y^2$ as shown in figure. A ray travelling horizontally along positive x-axis becomes vertical after reflection.
The co-ordinates of the point of incidence can be

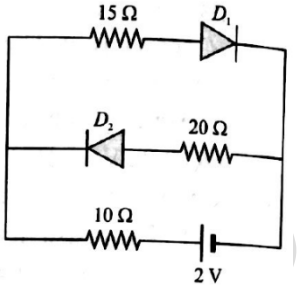


(a) (1/2, 1) (b) (1, 1/2)

(c) (1/2, 1/2) (d) (–1/2, –1)

Rough Space

19. The current I through 10 Ω resistor in the circuit with ideal diodes shown in the figure is



(a) 50 mA

(b) 20 mA

(c) 40 mA

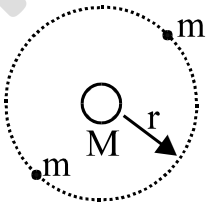
(d) 80 mA

20. From a given sample of uniform wire, two circular loops P and Q are made, P of radius r and Q of radius nr. If the moment of inertia of Q about it axis is four times that of P about its axis (assuming wire diameter much smaller, than either radius), the value of n is

(a) $(4)^{2/3}$ (b) $(4)^{1/3}$ (c) $(4)^{1/2}$ (d) $(4)^{1/4}$

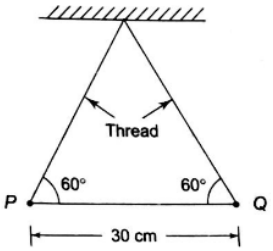
21. An isolated triple star system consists of two identical stars, each of mass m and a fixed star of mass M. The identical masses revolve around the central star in the same circular orbit of radius r. The two orbiting stars are always at opposite ends of a diameter of the orbit. The time period of revolution of each star around the fixed star is equal to :

(a) $\frac{4\pi r^{3/2}}{\sqrt{G(4M+m)}}$ (b) $\frac{2\pi r^{3/2}}{\sqrt{GM}}$



(c) $\frac{2\pi r^{3/2}}{\sqrt{G(M+m)}}$ (d) $\frac{4\pi r^{3/2}}{\sqrt{G(M+m)}}$

22. Two small identical balls P and Q, each of mass $\sqrt{3}/10$ gram, carry identical charges and are suspended by threads of equal lengths. At equilibrium, they position themselves as shown in fig. What is the charge on each ball? Given $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 Nm^2C^{-2}$ and take g = 10 ms–2



(a) 10^{-3}C (b) 10^{-5}C (c) 10^{-7}C (d) 10^{-9}C

23. One mole of an ideal gas with heat capacity at constant pressure C_p undergoes the process $T = T_0 + \alpha V$, where T_0 and α are constants, T is temperature and V is volume of the gas. The heat specific capacity of the gas as a function of its volume is: (if C_p and C_V denote specific heat at constant pressure and constant volume respectively)

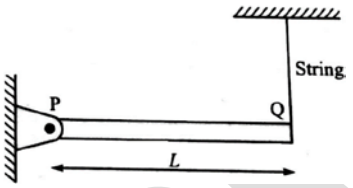
(a) $C = C_p + RT_0/\alpha V$ (b) $C = C_p$ (c) $C = C_V + RT_0/\alpha V$ (d) $C = RT_0/\alpha V$

Rough Space

24. A uniform rod PQ of length L is hinged at one end P. The rod is kept in the horizontal position by a massless string tied to point Q as shown in the figure. If the string is cut, the initial angular acceleration of the rod will be

(a) $\frac{g}{L}$ (b) $\frac{2g}{L}$

(c) $\frac{2g}{3L}$ (d) $\frac{3g}{2L}$



25. A rigid body rotates about a fixed axis with variable angular velocity equal to (α – βt) at the time t where α, β are constants. The angle through which it rotates before it stops is

(a) $\frac{\alpha^2}{2\beta}$ (b) $\frac{\alpha^2-\beta^2}{2\alpha}$ (c) $\frac{3\alpha^2}{2\beta}$ (d) $\frac{(\alpha-\beta)\alpha}{2}$

26. During an experiment with a meter bridge, the galvanometer shows a null point when the jockey is pressed at 40.0 cm using a standard resistance of 90 Ω. The least count of the scale used in the meter bridge is 1 mm. The unknown resistance is

(a) (60 ± 0.15) Ω (b) (135 ± 0.50) Ω (c) (60 ± 0.25) Ω (d) (135 ± 0.23) Ω

27. Three point charges q_1, q_2 and q_3 are taken such that when q_1 and q_2 are placed close together to form a single point charge, the force on q_3 at distance L from this combination is a repulsive one and of 2 units in magnitude. When q_2 and q_3 are so combined the force on q_1 at distance L is an attractive force of magnitude 4 units. Also q_3 and q_1 when combined exert an attractive force on q_2 of magnitude 18 unit at same distance L. The algebraic ratio of charges q_1, q_2 and q_3 is :

(a) 1: 2: 3 (b) 2: –3: 4 (c) 4 : –3 : 1 (d) 4: –3 : 2

28. Four waves are described by equations as follow

$$Y_1 = A\cos(\omega t - kx) \qquad Y_3 = \frac{A}{4}\cos(\omega t - kx + \pi)$$

$$Y_2 = \frac{A}{2}\cos\left(\omega t - kx + \frac{\pi}{2}\right) \qquad Y_4 = \frac{A}{8}\cos\left(\omega t - kx + \frac{3\pi}{2}\right)$$

and their resultant wave is calculated as $Y = Y_1 + Y_2 + Y_3 + Y_4$ such as $Y = A^1\cos(\omega t - kx + \phi)$ then: (symbols have their usual meanings)

(a) $A^1 = \frac{\sqrt{5}A}{8}$ $\phi = \tan^{-1}\left(\frac{1}{4}\right)$ (b) $A^1 = \frac{2\sqrt{5}A}{8}$ $\phi = \tan^{-1}\left(\frac{1}{3}\right)$

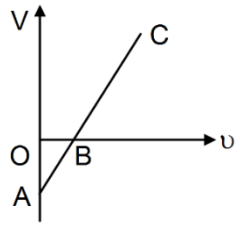
(c) $A^1 = \frac{3\sqrt{5}A}{8}$ $\phi = \tan^{-1}\left(\frac{1}{2}\right)$ (d) $A^1 = \frac{4\sqrt{5}A}{8}$ $\phi = \tan^{-1}(1)$

Rough Space

29. Particle A of mass m experiences a perfectly elastic collision with a stationary particle B of mass M. After the collision (head-on) the particles fly apart in opposite directions with equal velocities. Then:

(a) $\frac{m}{M}=1$ (b) $\frac{m}{M}=3$ (c) $\frac{m}{M}=2$ (d) $\frac{m}{M}=\frac{1}{3}$

30. The stopping potential V for photoelectric emission from a metal surface is plotted along Y–axis and frequency of incident light along X–axis. A straight line is obtained as shown. Planck's constant is given by



(a) slope of the line
(b) product of slope of the line and charge on the electron
(c) intercept along Y–axis divided by charge on the electron
(d) product of intercept along X–axis and mass of the electron

PART – B (CHEMISTRY)

31. If E_1, E_2 and E_3 represents the kinetic energy of an electron, an alpha particle and a proton each having same de-Broglie's wavelength then

(a) $E_1 > E_2 > E_3$ (b) $E_2 > E_1 > E_3$ (c) $E_1 > E_3 > E_2$ (d) $E_1 = E_2 = E_3$

32. The radioactive isotope ($T_{1/2}$ = 3days) sample was received after 12 days. It was found that 3g of the isotope is present in the sample. The initial weight of the isotope when packed is _____

(a)12g (b) 24g (c) 36g (d) 48g

33. Which equilibrium can be described as Lewis acid-base reaction but not Bronsted acid-base reaction?

(a) $H_2O + CH_3COOH \rightleftharpoons H_3O^+ + CH_3COO^-$

(b) $2NH_3 + H_2SO_4 \rightleftharpoons 2NH_4^+ + SO_4^{2-}$

(c) $NH_3 + HCl \rightleftharpoons NH_4^+ + Cl^-$

(d) $[Cu(H_2O)_4]^{2+} + 4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+} + 4H_2O$

34. When one mole of a monoatomic ideal gas at T K undergoes adiabatic change under constant external pressure of 1atm changes from 1L to 2L volume. The final temperature of the gas in Kelvin is

(a) $T + \frac{2}{3\times 0.0821}$ (b) $T - \frac{2}{3\times 0.0821}$ (c) $\frac{T}{(2)^{2/3}}$ (d) T

Rough Space

35. In the following reaction reactant (A) cannot be

$$A \xrightarrow[H_3O^+]{RMgX} 3^0 \text{ alcohol}$$

(a) Acetyl chloride (b) Acetaldehyde (c) Ethyl acetate (d) Acetone

36. Which of the following is not correctly matched?

(a) $\text{Phenol} + CHCl_3 \xrightarrow{NaOH} \text{Salicylaldehyde}$

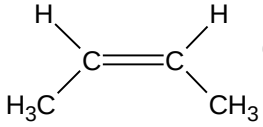
(b) $\text{Terephthalic acid} + \text{Ethylene glycol} \xrightarrow{H^+} \text{Glyptal}$

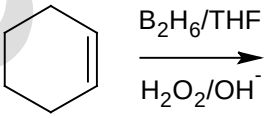
(c) $\text{p-aminophenol} \xrightarrow[Py]{CH_3COCl} \text{Paracetamol}$

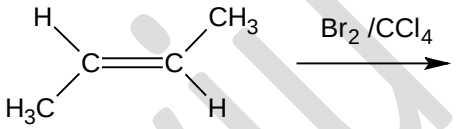
(d) $\text{Resorcinol} + \text{Phthalic acid} \xrightarrow[Heat]{H_2SO_4} \text{Fluoroscein}$

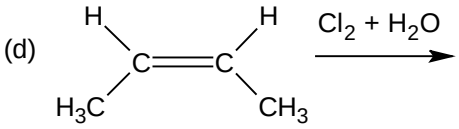
37. Equal volumes of 20vol H_2O_2, 25vol H_2O_2 and 50vol H_2O_2 are mixed. The normality of the resultant solution is
(a) 5.65 (b) 2.68 (c) 4.5 (d) 8.0

38. Which of the following reactions give resolvable products?

(a) 

(b) 

(c) 

(d) 

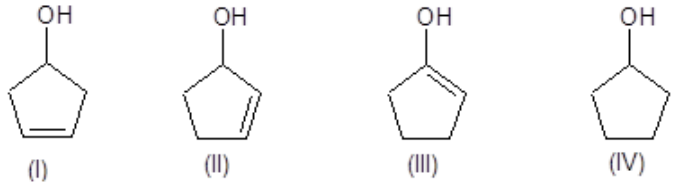
39. An acidic solution of 'X' does not give precipitate on passing H_2S gas. 'X' gives a white precipitate when NH_4OH is added to it. The white precipitate dissolves in excess of NaOH solution. Pure 'X' fumes in air and dense white fumes are obtained when a glass rod dipped in NH4OH is held in the fumes. The compound 'X' is
(a) $SnCl_2$ (b) $ZnCl_2$ (c) $FeCl_3$ (d) $AlCl_3$

40. The diffraction of a crystal of Barium with X-rays of wavelength 2.29angstroms gives a first order reflection at 27.8^0. What is the distance between the diffracting planes (In angstroms)? (Sin 27.8 = 0.4561)
(a) 1.46 (b) 1.59 (c) 2.51 (d) 5.46

41. The vapour pressure of pure water at 26^0C is 25.21torr. What is the vapour pressure of a solution which contains 20.0g of glucose in 70g of water?
(a) 27.9torr (b) 25.9torr (c) 24.5torr (d) 32.0torr

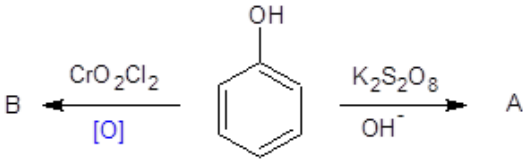
Rough Space

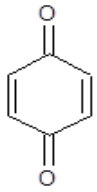
42. What is the correct order of dehydration of the following compounds in presence of acidic medium?

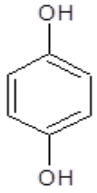


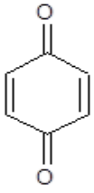
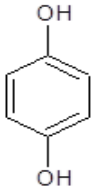
(a) I > II > III > IV (b) II > I > IV > III (c) I > II > IV > III (d) IV > II > I > III

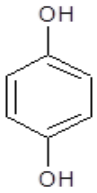
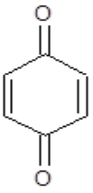
43. Identify A and B in the following reaction.



(a) Both are 

(b) Both are 

(c) A =  B = 

(d) A =  B = 

44. A deliquescent white crystalline solid hydroxide 'X' reacts with nitrate 'Y' to form another hydroxide which decomposes to give an insoluble brown layer of its oxide. X is a powerful cautery and breaks down the proteins of skin flesh to a pasty mass. X and Y are

(a) NaOH and $AgNO_3$ (b) NaOH and $Zn(NO_3)_2$

(c) $Ca(OH)_2$ and $Al(NO_3)_3$ (d) $Mg(OH)_0$ and $HgNO_3$

45. The composition of common glass is

(a) $Na_2O.CaO.6SiO_2$ (b) $Na_2O.Al_2O_3.2SiO_2$

(c) $CaO.Al_2O_3.SiO_2$ (d) $Na_2O.CaOAl_2O_3.6SiO_2$

46. The critical temperatures of CO, CH_4, HCl and SO_2 are 134K, 190K, 324K and 430K respectively. The order of extension of adsorption of these gases on charcoal is

(a) SO_2 > HCl > CH_4 > CO (b) CO > CH_4 > HCl > SO_2

(c) HCl > SO_2 > CO > CH_4 (d) CH_4 > CO > SO_2 > HCl

47. Select the incorrect statement about liquid junction potential.

(a) LPJ is an additional source of potential difference across the interface of two electrolytes

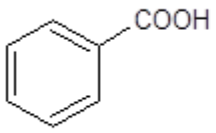
(b) LPJ arises due to differing ionic mobility of ions in two electrolyte solutions.

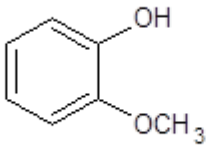
(c) LPJ is essential part of electrolyte concentration cell

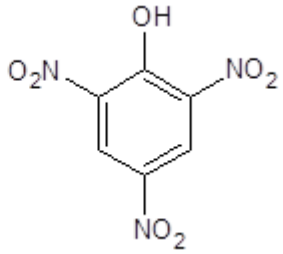
(d) Usage of salt bridge increases the liquid junction potential

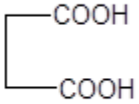
Rough Space

48. Which of the following can be distinguished from an aliphatic carboxylic acid using sodium bicarbonate solution?

(a) 

(b) 

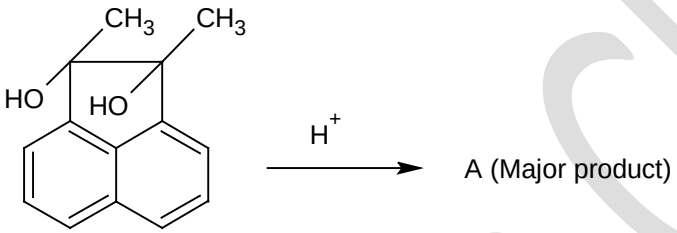
(c) 

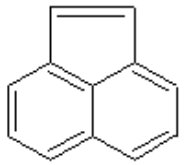
(d) 

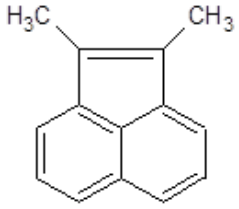
49. A first order reaction in aqueous solution was too fast to be detected by a procedure that could have followed a reaction having a half life of at least 2.0ns. The minimum value of the rate constant of the reaction is

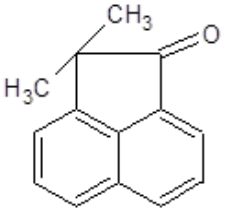
(a) $3.5\times10^{8}\,s^{-1}$ (b) $1.2\times10^{8}\,s^{-1}$ (c) $1.9\times10^{8}\,s^{-1}$ (d) $2.7\times10^{8}\,s^{-1}$

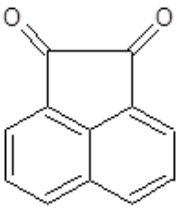
50. Identify the major product in the following reaction.



(a) 

(b) 

(c) 

(d) 

51. The emf of the following cells are:

$Ag\,|\,Ag^{+}(1M)\,\|\,Cu^{2+}(1M)\,|\,Cu \quad E_{cell} = -0.46V$ and

$Zn\,|\,Zn^{2+}(1M)\,\|\,Cu^{2+}(1M)\,|\,Cu \quad E_{cell} = +1.10V$.

Then the emf of the cell $Zn\,|\,Zn^{2+}(1M)\,\|\,Ag^{+}(1M)\,|\,Ag$ is

(a) 0.64V (b) 1.1V (c) 1.56V (d) – 0 .64V

52. When a CS_2 layer containing Bromine and Iodine is shaken with excess of chlorine water, the violet colour due to iodine disappears and orange colour of bromine appears. The disappearance of violet colour is due to the formation of

(a) I_3^- (b) HIO_3 (c) ICl_2 (d) I^-

Rough Space

53. To 50ml of a HCl solution, 25ml of 0.5N Na_2CO_3 solution is added. The remaining acid required 20cc of 0.5N NaOH solution for complete neutralization. The normality of the acid solution is

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

54. The gold number of certain lyophillic colloids is given below. Which of the following is most effective in protection of lyophobic colloids against coagulation?
Gelatine – 0.01, Haemoglobin – 0.07, Albumen – 0.2, Potato starch – 25

(a) Gelatine (b) Haemoglobin (c) Albumen (d) Potato starch

55. A radioactive material emits 20 β particles per minute at 283K. If the temperature is raised to 293K, the number of β particles emitted by the sample per minute is

(a) 40 (b) 20 (c) 60 (d) 10

56. A compound 'X' was boiled under reflux for some time with a solution of sodium hydroxide. The solution is cooled and acidified with dilute nitric acid and then silver nitrate is added. A white precipitate is formed. Which compound is not a possibility for 'X'?

(a) Acetyl chloride (b) chlorobenzene (c) Benzyl chloride (d) Chloroacetic acid

57. A small amount of NH_4HS solid is placed in a flask containing ammonia at 0.5atm pressure. The NH_4HS will decompose to give NH_3 and H_2S. The reaction attains equilibrium and the total equilibrium pressure is 0.84atm. The equilibrium constant for the decomposition of NH_4HS is

(a) 0.11 (b) 0.17 (c) 0.18 (d) 0.30

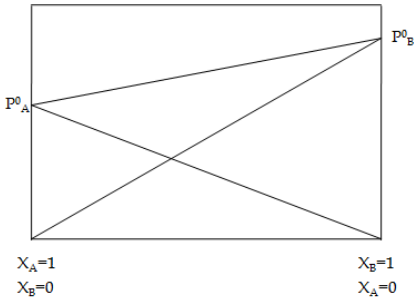
58. Which of the following statement is correct about the following graph for the solution of two liquids A and B?

(a) As X_B increases net vapour pressure decreases

(b) Azeotropic mixture consists of equimolar A and B

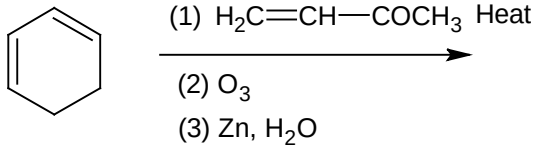
(c) The mole fraction of B in vapour phase will be higher than that of A for an equimolar mixture of A and B in liquid phase.

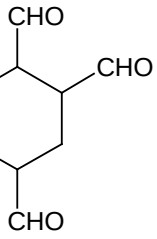
(d) A and b both form non-ideal solution.

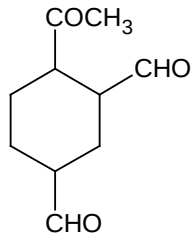


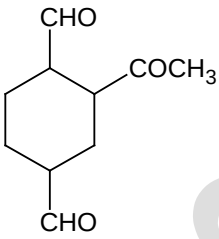
Rough Space

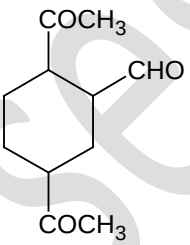
59. Identify the product of the following reaction.



(a) 

(b) 

(c) 

(d) 

60. 3.7g of oxide of a metal was heated with charcoal. The liberated carbon dioxide was absorbed in NaOH solution and weighed 1.0g. If the specific gravity of the metal is 0.095cal/g the exact atomic mass of the metal is

(a) 170.8 (b) 32.7 (c) 67.37 (d) 65.4

PART – C (MATHS)

61. If area of a triangle whose vertices in argand plane are z, iz, z+iz is 16 square units, find |z|

(a) $\sqrt{2}$ (b)$2\sqrt{2}$ (c) 4 (d) $4\sqrt{2}$

62. Let the maximum and minimum distance from origin to the curve $(z\ \bar{z})$ - $\frac{3}{2\sqrt{2}}\ [(z+\bar{z})-i\ (z-\bar{z})]-\sqrt{2}=0$ are $r_1\ and\ r_2$ respectively then $r_1+\ r_2$ =

(a) 1 (b) 2 (c) 3 (d)4

63. Evaluate $\int_{-a}^{a}\sqrt{\frac{a-x}{a+x}}\,dx$

(a) πa (b) πa^2 (c) 2a (d) $\frac{\pi}{2}a$

64. If the derivative of f(x) with respect to x is $\frac{\frac{1}{2}-\sin^2 x}{f(x)}$ then period of f(x) is

(a) π (b) 2π (c) 3π (d) 4π

65. If the roots of the equation x^2 – (p+1)x +p^2 + p – 8 = 0 are on opposite sides with respect to the line x = 2 then the range of 'p' is

(a) $\left(-\frac{11}{3},3\right)$ (b) (-2, 3) (c) $(-\infty,-2)\cup(3,\infty)$ (d) ϕ

Rough Space

66. The area enclosed between the curves $y = ax^2$ and $x = ay^2$ ($a > 0$) is 1 sq. unit. Then the value of 'a' is

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

67. The total number of ways of selecting 10 balls out of an unlimited number of identical white, red and blue balls is

(a) 55 (b) 66 (c) 77 (d) 11

68. The sum of the series $3\ {}^{n}C_0 - 8\ {}^{n}C_1 + 13\ {}^{n}C_2 - 18.\ {}^{n}C_3 +$ --- is

(a) 0 (b) 1 (c) -5 (d) -27

69. The co-efficent of $a^8b^4c^9d^9$ in $(abc+abd+acd+bcd)^{10}$ is

(a) 10! (b) 2520 (c) $\frac{10!}{8!4!9!9!}$ (d) $\frac{10!}{7!3!8!8!}$

70. The sub-tangent at any point of the curve $x^m.y^n = a^{m+n}$ varies as

(a) $(\text{abscissa})^2$ (b) $(\text{abscissa})^3$ (c) abscissa (d) $(\text{ordinate})^2$

71. Number of non-differentiable Points of the curve $f(x) = \min.\{|\log|x||, |\text{Tan } x|\}$ in $[-\frac{\pi}{2}, \frac{\pi}{2}]$

(a) 3 (b) 4 (c) 5 (d) 7

72. Ortho centre of the triangle formed by the vertices $\left(\sqrt{13}, \sqrt{5}\right), \left(\sqrt{7}, -\sqrt{11}\right)$ *and* $(-\sqrt{18}, 0)$ is

(a) (0, 0) (b) $(\sqrt{11}, 5)$

(c) $(\sqrt{13} + \sqrt{7} - \sqrt{18}, \sqrt{5} - \sqrt{11})$ (d) $(\sqrt{17} + \sqrt{7}, \sqrt{5} - 5)$

73. Equation of the common tangent to the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and the circle $x^2 + y^2 = 12$ is

(a) $2y = \sqrt{3}x + \sqrt{21}$ (b) $\sqrt{3}y = 2x + \sqrt{21}$ (c) $\sqrt{3}y = 2x - \sqrt{21}$ (d) $y = 3x - 21$

74. Equation of the plane passing through the point (1,2,3) and containg the line $\overline{r} = (2 + \lambda)\,\hat{\imath} - (1 + 2\lambda)\hat{\jmath} + (1 - 3\lambda)\hat{k}$ is

(a) 5x-y+z = 6 (b) x + 5y – 3z = 2 (c) x – 5y + 3z = 0 (d) 5x + y + z = 10

75. Find the shortest distance between the skew – lines $\overline{r} = (2 + \lambda)\hat{\imath} - (1 + 2\lambda)\hat{\jmath} + (1 - 3\lambda)\hat{k}$ and $\overline{r} = \left(\hat{\imath} + 2\hat{\jmath} + 3\hat{k}\right) + \mu\,(3\hat{\imath} - 2\hat{\jmath} - \widehat{k})$

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

76. If (1, 2, –1), (2, 3, 0) and (–3, 1, –2) are three vertices of a parallelogram then fourth vertex may be

(a) (–2, 2, –1) (b) (–4, 0, –1) (c) (6, 4, –1) (d) (2, –3, 0)

77. Shortest distance from origin to the curve $y = \frac{e^x + e^{-x}}{2}$

(a) 1 (b) $\sqrt{2}$ (c) $3\sqrt{2}$ (d) $4\sqrt{2}$

Rough Space

78. The two curves $y^2 = 4x$ and $x^2 + y^2 - 6x + 1 = 0$ at the point (1, 2):

(a) intersect orthogonally (b) intersect at an angle $\frac{\pi}{3}$

(c) touch each other (d) intersect at an angle $\frac{\pi}{6}$

79. The order of the differential equation whose general solution is given by $y = (c_1 + c_2)\cos(x + c_3) - c_4.e^{x+c_5}$ is

(a) 2 (b) 3 (c) 4 (d) 5

80. Three different numbers are selected at random from the set A = {1, 2, 3, ---- 10}. The probability that the product of two of the numbers is equal to the third is

(a) $\frac{3}{4}$ (b) $\frac{1}{40}$ (c) $\frac{1}{8}$ (d) $\frac{1}{4}$

81. If A is uni modular square matrix, then which of the following is not necessarily unimodular .

(a) A^{-1} (b) adjA (c) –A (d) All the above

82. $\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} =$

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

83. Number of solutions of the equation $\sin^{-1}(1 - x) - 2\sin^{-1}x = \frac{\pi}{2}$ is

(a) 0 (b) 1 (c) 2 (d) ∞

84. In $\Delta ABC, r = 1, r_1 = 7 \; and \; R = 3$ then $\Delta ABC \; is$

(a) equilateral (b) acute angled (not equilateral)

(c) obtuse angled (d) right angled

85. If the equation $a\sin x + \cos 2x = 2a - 7$ possesses a solution then $a \in$

(a) (0, 4) (b) (2, ∞) (c) [2, 11) (d) [2, 6]

86. If $\lim_{x \to a}(f(x) + g(x)) = 2$ and $\lim_{x \to a}(f(x) - g(x)) = 1$ then $\lim_{x \to a} f(x).g(x) =$

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{1}{2}$ (d) 1

87. $\lim_{x \to 0} \frac{27^x - 9^x - 3^x + 1}{\sqrt{2} - \sqrt{1 + \cos x}} =$

(a) $8\sqrt{2}(\log 3)^2$ (b) $\sqrt{2}(\log 3)^2$ (c) $16\sqrt{2}(\log 3)$ (d) $(\log 3)(\log 2).3\sqrt{2}$

88. The Mean and variance of 7 observations are 8 and 16 respectively. If 5 observations are 2,4,10,12,14 find the remaining two observations

(a) 3,4 (b) 6,8 (c) 5, 13 (d) 3,8

Rough Space

89. A Market research group conducted a survey of 2000 consumers and reported that 1720 consumers liked product p_1 and 1450 consumers liked product p_2. Then the least number that must have liked both the products is

(a) 1070 (b) 930 (c) 420 (d) 1170

90. f is a real function defined by f(x) = $\frac{x-1}{x+1}$; x ≠ –1 then f(2x) =

(a) $\frac{3f(x)-1}{f(x)+3}$ (b) $\frac{3f(x)+1}{f(x)+3}$ (c) $\frac{2f(x)+1}{f(x)-2}$ (d) $\frac{2f(x)+1}{f(x)+2}$

Rough Space