Time: 3Hours

JEE MAIN SAMPLE PAPER-2

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. A block of mass m moving with speed v compresses a spring through distance x before its speed is halved. The value of spring constant is

(a) $\frac{3mv^2}{4x^2}$ (b) $\frac{mv^2}{4x^2}$ (c) $\frac{mv^2}{2x^2}$ (d) $\frac{2mv^2}{x^2}$

2. A cord is used to lower vertically a block of mass M a distance d at a constant downward acceleration of $\frac{g}{4}$.
Then the work done by the tension in the cord on the block is

(a) $Mg\frac{d}{4}$ (b) $3Mg\frac{d}{4}$ (c) $-3Mg\frac{d}{4}$ (d) Mgd

3. Power applied to a particle varies with time as $P=\left(3t^2-2t+1\right)$ watt, where t is in second. Find the change in its kinetic energy between time $t=2s$ and $t=4s$

(a) $32J$ (b) $46J$ (c) $61J$ (d) $102J$

4. A ball moving with a velocity $\bar{u}_1$ collides elastically with another ball of equal mass, in a one-dimensional collision. Which of the following is not possible?

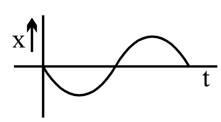
(a) Fist ball will come to rest (b) Second ball will move with a velocity $\bar{u}_1$

(c) Both balls will move with velocity $\bar{u}_1$ after collision (d) The first ball will move with a velocity less than $\bar{u}_1$

5. A lighter body and heavier body both are moving with same momentum and are being applied the same retarding force. Their stopping distances and stopping times are S_1, S_2 and t_1, t_2 respectively. Then

(a) $S_1 > S_2$ (b) $S_1 < S_2$ (c) $t_1 > t_2$ (d) $t_1 < t_2$

6. If position time graph of a particle is sine curve as shown, what will be its velocity-time graph.



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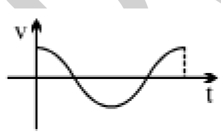

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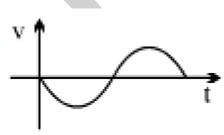

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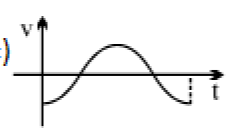

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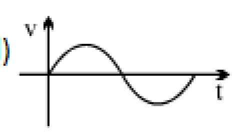
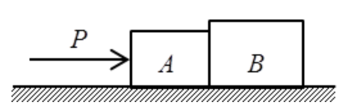


7. Block A and B have masses of $2kg$ and $3kg$ respectively. The ground is smooth. P is an external force of $10N$. The force exerted by B on A is



(a) 4N (b) 6N

(c) 8N (d) 10N

Rough Space

8. Two projectiles A and B are thrown with the same speed such that A makes angle θ with the horizontal and B makes angle θ with the vertical, then

(a) Both must have same time of flight
(b) Both must achieve same maximum height
(c) A must have more horizontal range than B
(d) Both may have same time of flight

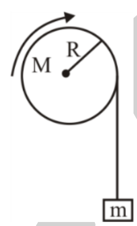
9. Two trains, each 50m long are travelling in opposite direction with velocity 10m/s and 15 m/s. The time of crossing is

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

10. A body starts from rest from the origin with an acceleration of $6m/s^2$ along the $x-$ axis and $8m/s^2$ along the $y-$ axis. Its distance from the origin after 4seconds will be

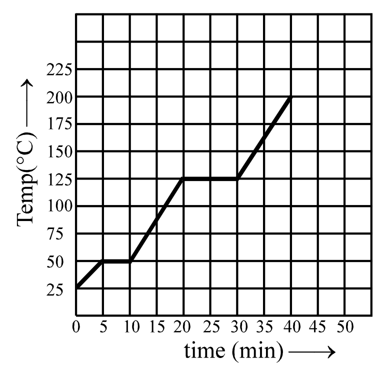
(a) 56m (b) 64m (c) 80m (d) 128m

11. A block of mass 2kg hangs from the rim of a wheel of radius 0.5m. On releasing from rest the block falls through 5m height in 2s. The moment of inertia of the wheel will be



(a) 1 kg – m^2
(b) 3.2 kg – m^2
(c) 2.5 kg – m^2
(d) 1.5 kg – m^2

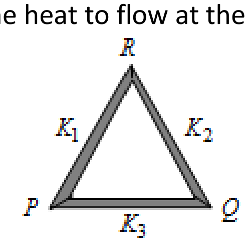
12. The graph shown in the figure represent change in the temperature of 5 kg of a substance as it abosrbs heat at a constant rate of 42 kJ min^{-1}. The latent heat of vapourazation of the substance is :



(a) 630 kJ kg^{-1} (b) 126 kJ kg^{-1}

(c) 84 kJ kg^{-1} (d) 12.6 kJ kg^{-1}

13. Three rods of same dimensions are arranged as shown in the figure. They have thermal conductivities K_1, K_2 and K_3. The points P and Q are maintained at different temperatures for the heat to flow at the same rate along PRQ and PQ. Which of the following option is correct?



(a) $K_3 = \frac{1}{2}(K_1 + K_2)$
(b) $K_3 = K_1 + K_2$
(c) $K_3 = \frac{K_1 K_2}{K_1 + K_2}$
(d) $K_3 = 2(K_1 + K_2)$

14. An ideal diatomic gas is expanded so that the amount of heat transferred to the gas is equal to the decrease in its internal energy. The process can be represented by the equation $TV^n =$ constant, where the value of n is

(a) $n=\frac{7}{5}$ (b) $n=\frac{1}{5}$ (c) $n=\frac{3}{2}$ (d) $n=\frac{3}{5}$

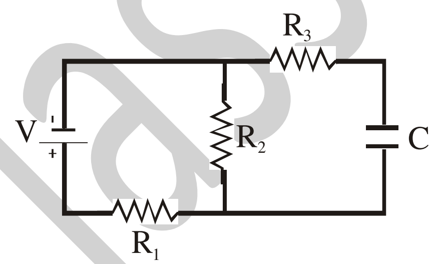
15. If two soap bubbles of different radii are connected by a tube,

(a) air flows from the bigger bubble to the smaller bubble till the sizes become equal
(b) air flows from bigger bubble to the smaller bubble till the sizes are interchanged
(c) air flows from the smaller bubble to the bigger
(d) there is no flow of air.

16. In the circuit shown in figure, the steady state voltage drop across the capacitor is :

(a) $\frac{VR_1}{R_2+R_3}$ (b) $\frac{VR_2}{R_1+R_3}$

(c) $\frac{VR_1}{R_1+R_2}$ (d) $\frac{VR_2}{R_1+R_2}$



17. For a coil, inductive reactance is equal to its resistance, at certain frequency. Then the phase difference between voltage and current in radian is

(a) $\pi/3$ (b) $\pi/6$ (c) $\pi/2$ (d) $\pi/4$

18. Six metallic plates each with area A, are placed at a distance d from each other. The alternate plates are connected to points P and Q as shown in figure. The capacitance of the system is $\frac{n\varepsilon_0 A}{d}$. Find the value of n.

(a) 4 (b) 5 (c) 2.5 (d) 3

19. Velocity and acceleration vector of a charged particle moving in a magnetic field at some instant are $\vec{v}=6\hat{i}+3\hat{j}$ and $\vec{a}=2\hat{i}-2x\,\hat{j}$. Find the value of x.

(a) 1 (b) 3 (c) 2 (d) none of these.

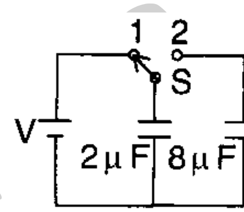
20. A given length of wire carries a steady current. It is bent first to form a circular plane coil of one turn. If a loop of same length is now bent more sharply to give a double loop of smaller radius, the magnetic field at the centre caused by the same current is

(a) a quarter of its first value (b) twice of its first value
(c) four times of its first value (d) half of its first value

Rough Space

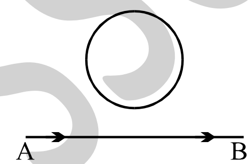
21. A concave mirror is used to form image of the Sun on a white screen. If the lower half of the mirror were covered with an opaque card, the effect on the image on the screen would be
(a) negligible
(b) to make the image less bright than before
(c) to make the upper half of the image disappear
(d) to make the lower half of the image disappear

22. A $2\mu F$ capacitor is charged as shown in the figure. The percentage of its stored energy dissipated after the switch S is turned to position 2 is (The $8\mu F$ capacitor is initially uncharged)



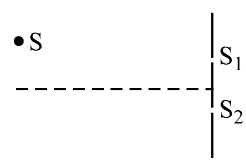
(a) 0%   (b) 20%   (c) 75%   (d) 80%

23. In the arrangement shown in given figure current from A to B is increasing in magnitude. Induced current in the loop will
(a) have clockwise direction
(b) have anticlockwise direction
(c) be zero
(d) oscillate between clockwise and anticlockwise

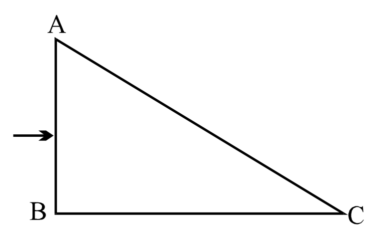


24. Electric field in a region is $E = 5\times10^5 NC^{-1}$ making an angle of 37° with x-axis. The magnitude of the potential difference between origin and point $(6,4)$ cm is
(a) $24V$ (b) $36kV$ (c) $34kV$ (d) $20kV$

25. In YDSE, the source placed symmetrically with respect to the slit is now moved parallel to the plane of the slits so that it is closer to the upper slit, as shown. Then,
(a) the fringe width will increase and fringe pattern will shift down
(b) the fringe width will remain same but fringe pattern will shift up.
(c) the fringe width will decrease and fringe pattern will shift down.
(d) the fringe width will remain same but fringe pattern will shift down.



26. A ray of light is incident normally on a prism of refractive index 1.5, as shown. The prism is immersed in a liquid of refractive index μ . The largest value of the angle ACB, so that the ray is totally reflected at the face AC is 30°. Then the value of μ must be:



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

27. In a YDSE apparatus, two identical slits are separated by 1 mm and the distance between slits and screen is 1 m. The wavelength of light used is 6000 Å. The minimum distance between two points on the screen having 75% intensity of the maximum intensity is:
(a) 0.45 mm   (b) 0.40 mm   (c) 0.30 mm   (d) 0.20 mm

Rough Space

28. A point source of light is used in a photoelectric effect. If the source is removed farther from the emitting metal, the stopping potential :
(a) will increase (b) will decrease (c) will remain constant (d) will either increase or decrease.

29. The radioactive sources A and B of half-lives of 2 hr and 4 hr respectively, initially contain the same number of radioactive atoms. At the end of 2 hours, their rates of disintegration are in the ratio :
(a) 4 : 1 (b) 2 : 1 (c) $\sqrt{2}$: 1 (d) 1 : 1

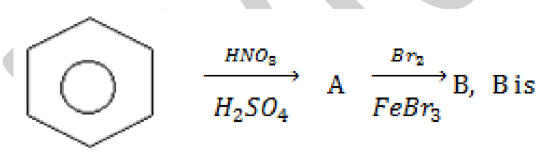
30. The electron in a hydrogen atom makes a transition from an excited state to the ground state. Which of the following statement is true ?
(a) Its kinetic energy increases and its potential and total energies decrease
(b) Its kinetic energy decreases, potential energy increases and its total energy remains the same.
(c) Its kinetic and total energies decrease and its potential energy increases.
(d) its kinetic potential and total energies decreases.

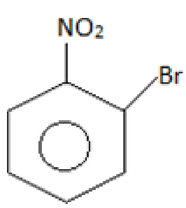
PART – B
CHEMISTRY

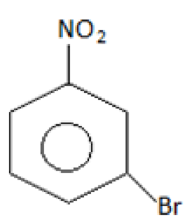
31. Successive alkanes differ by
(a) CH (b) CH_2 (c) CH_3 (d) CH_4

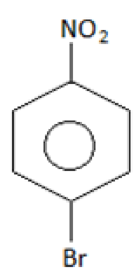
32. A molecule 'x' has
(i) four sigma bonds formed by the overlap of sp^2 and s orbitals
(ii) one sigma bond formed by sp^2 and sp^2 orbitals
(iii) one bond formed by p_x and p_y orbitals.
Which of the following is 'x'?

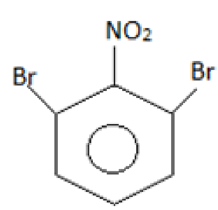
(a) C_2H_6 (b) C_2H_3Cl (c) $C_2H_2Cl_2$ (d) C_2H_4

33. 

(a) 

(b) 

(c) 

(d) 

34. Which of the following is the correct order of decreasing SN^2 reactivity

(a) $R_2CHX > R_3CX > RCH_2X$ (b) $RCH_2X > R_3CX > R_2CHX$

(c) $RCH_2X > R_2CHX > R_3CX$ (d) $R_3CX > R_2CHX > RCH_2X$

(X = halogen)

35. Which of the following applies in the reaction

$CH_3CHBrCH_2CH_3$ + KOH (alc.) $\rightarrow$ (i) $CH_3CH = CHCH_3$ (major product)

(ii) $CH_2 = CHCH_2CH_3$ (minor product)

(a) Markovnikov's rule (b) saytzeff's rule

(c) Kharasch effect (d) Hoffmann's rule

36. Ethers on hydrolysis yield

(a) Alcohol (b) Aldehyde (c) Acid (d) Ketone

37. Compounds showing cannizaro's reaction are

(i) CH_3CH_2CHO (ii) $CHCl_2CHO$ (iii) $(CH_3)_3$ C – CHO (iv) C_6H_5CHO

(a) i, ii, iii (b) iii, iv (c) i, iii, iv (d) i, ii, iii, iv

38. In the reaction $CH_3CN + 2H \rightarrow X \xrightarrow[\text{water}]{\text{Boiling}} Y$, the term 'Y' is

(a) Acetone (b) Ethanamine (c) Acetaldehyde (d) Dimethyl amine

39. $C_6H_5C \equiv N + 2(H) \xrightarrow[H_2O]{SnCl_2/HCl} C_6H_5CHO + NH_3$ the above reaction is

(a) Mendius reaction (b) schmidt reaction

(c) Rosenmund reaction (d) stephen's reaction

40. The rate of reaction increases by the increase of temperature because

(a) Collision frequency is increased

(b) Energy of products decreases

(c) Fraction of molecules possessing energy $\geq E_T$(threshold Energy) increases

(d) Mechanism of a reaction is changed

41. If Nacl is doped with $10^{-3} mol\% GacI_3$, what is the concentration of the cation vacancies?

(a) 1.204×10^{-19} (b) $1.9 \times 10^{-19} mole^{-1}$

(c) $3.6 \times 10^{-19} mole^{-1}$ (d) $6.2 \times 10^{-19} mole^{-1}$

42. The molar heat capacity for a gas at constant T& P is

(a) $\frac{3}{2}$R (b) $\frac{5}{2}$R (c) dependent on the atomicity of the gas (d) Infinity

Rough Space

43. Which of the following changes requires a reducing agent?
(a) $H_3AsO_3 \longrightarrow HAsO_4^{2-}$ (b) $BrO_3^{\ominus} \longrightarrow BrO^{\ominus}$
(c) $CrO_4^{2-} \longrightarrow Cr_2O_7^{2-}$ (d) $AI(OH)_3 \longrightarrow [Al\ (OH)_4]^{\ominus}$

44. The Oxidation potential of hydrogen electrode at P^H=10 and P_{H_2} at 1atm is :
(a) 0.51 V (b) 0.00V (c) +0.59 V (d) 0.059 V

45. The antiseptic action of Dettol is due to
(a) Chlorobenzene (b) Chloroxylenol (c) Chloroquine (d) Chloramphenicol.

46. If the Kinetic Energy of an electron is increased 4 times, the Wavelength of the de Broglie wave associated with it would become
(a) 4 times (b)2 times (c) $\frac{1}{2}$ times (d) $\frac{1}{4}$ times

47. Four species are listed below
(i) Hco_3^- (ii) $H_3o^{\oplus}$ (iii) $Hso_4^{\ominus}$ (iv)Hso_3F
Which one of the following is the correct sequence of their acid Strength?
(a) (iii) < (i) < (iv) < (ii) (b) (iv) < (ii) < (iii) < (i) (c) (ii) < (iii) < (i) < (iv) (d) (i) < (iii) < (ii) < (iv)

48. The compressibility factor of gases is less than Unity at STP Therefore,
(a) V_m>22.4L (b) V_m<22.4L (c)V_m=22.4L (d) V_m = 4.8L

49. Vapour pressure of pure liquid A (P_A°) = 100 mm Hg
Vapour pressure of pure liquid B (P_B°) = 150 mm Hg
2 moles of liquid A and 3 moles of liquid B are mixed to form an ideal solution. The vapour pressure of solution will be
(a) 185 mm (b) 130 mm (c) 148 mm (d) 145 mm

50. Which of the following is not correct order regarding hydrogen halides?
(a) HF >HCl>HBr> HI :Stability of hydrogen halides
(b) HF <HCl<HBr< HI :Reducing nature order
(c) HF >HCl>HBr> HI :Acidic nature order
(d) HF >HI >HBr>HCl :Boiling point order

51. Match List I with List II and select the correct answer

List-I	List-II
A.Mond's process	1. Purification of Ag containing Pb
B. Van Arkel method	2. Purification of Ge
C. Cupellation	3. Purification of Nickel
D. Zone refining	4. Purification of Titanium

(a) A-1 , B-2 ,C-3 ,D-4 (b)A-2 , B-3 ,C-4 ,D-1 (c)A-3 , B-4 ,C-1 ,D-2 (d)A-4 , B-1 ,C-2 ,D-3

Rough Space

52. Which of the following is incorrect statement about interstitial compounds ?
(a) They have high melting points , higher than those of pure metals.
(b) They are very hard .
(c) They retain metallic conductivity.
(d) They are chemically highly reactive than those of pure metals

53. The correct representation of tris(ethane-1,2-diammine)cobalt(III) sulphate is
(a) $[CO(en)_3]SO_4$
(b) $[Co(H_2NCH_2CH_2NH_2)_3]_2SO_4$
(c) $[Co(H_2NCH_2CH_2NH_2)_3]_2(SO_4)_3$
(d) $[Co(H_2NCH_2CH_2NH_2)_3](SO_4)_3$

54. Which of the following does not contain P-O-P bond?
(a) $H_4P_2O_7$
(b) $H_3P_3O_9$
(c) $H_4P_2O_6$
(d) P_4O_6

55. The correct order of second ionization potential of carbon, nitrogen, oxygen and fluorine is
(a) C $> N > O > F$
(b) O $> N > F > C$
(c) O$> F > N > C$
(d) F $> O > N > C$

56. The correct formula of exhausted permuititis :
(p) $\mathrm{Na_2AI_2Si_2O_8.xH_2O}$ (q) $\mathrm{K_2AI_2Si_2O_8.xH_2O}$ (r) $\mathrm{MgAI_2Si_2O_8.xH_2O}$ (s) $\mathrm{K_2AI_2Si_2O_8.xH_2O}$
(a) P
(b) r
(c) q
(d) s

57. How many of the following molecules contain dative bond?

$\mathrm{N_2O, O_3, N_2O_5, NH_4^+, HNO_2HNO_3, CO_3^{-2}, B_3N_3H_6}$

(a) 5
(b) 6
(c) 7
(d) 8

58. The flocculation values of KCl, $MgCl_2$, $CrCl_3$ and $SnCl_4$ for a negatively charged sol are in the order
(a) KCl< $MgCl_2$<$CrCl_3$<$SnCl_4$
(b)KCl= $MgCl_2$ =$CrCl_3$ =$SnCl_4$
(c) $MgCl_2$<KCl<$CrCl_3$<$SnCl_4$
(d) $SnCl_4$<$CrCl_3$<$MgCl_2$<KCl

59. 50 ml of 1 M oxalic acid is shaken with 0.5 g wood charcoal. The final concentration of the solution after adsorption is 0.5 M. What is the amount of oxalic acid absorbed per gm of carbon?
(a) 3.15g
(b) 3.45g
(c)6.30g
(d) None

60. Guttapercha is
(a) Trans-polyisoprene
(b) A synthetic polymer
(c) A veryhardmaterial
(d) All statements are correct.

Rough Space

PART – C
MATHEMATICS

61. A (p, 0), B(4, 0), C(5, 6), D(1, 4) are the vertices of a quadrilateral ABCD. If ∠ADC is obtuse, the maximum integral value of p is

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

62. If the circle $x^2 + y^2 + 6x - 2y + k = 0$ bisects the circumference of the circle $x^2 + y^2 + 2x - 6y - 15 = 0$, then k _______

(a) – 23 (b) 23 (c) 21 (d) – 21

63. The chord joining the points of contact of tangents drawn from any point on $x - 1 = 0$ to $y^2 - 6y + 4x + 9 = 0$ passes through the point

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

64. If the mode of the data is 18 and the mean is 24, then median is

(a) 18 (b) 24 (c) 22 (d) 21

65. Equation of latus rectum of hyberbola
$(10x - 5)^2 + (10y - 2)^2 = 9(3x + 4y - 7)^2$ is

(a) $y - \frac{1}{5} = -\frac{3}{4}\left(x - \frac{1}{2}\right)$ (b) $y - \frac{1}{5} = \frac{3}{4}\left(x - \frac{1}{2}\right)$

(c) $y + \frac{1}{5} = -\frac{3}{4}\left(x + \frac{1}{2}\right)$ (d) $y + \frac{1}{5} = \frac{3}{4}\left(x + \frac{1}{2}\right)$

66. The negation of $P \to (\sim p \vee q)$ is

(a) $p \wedge \sim q$ (b) $P \to q$ (c) $P \to \sim (P \vee q)$ (d) $P \vee (P \vee \sim q)$

67. $f(x) \begin{array}{ll} = ax^2 + 1, & x \leq 1 \\ = x^2 + ax + b, & x > 1 \end{array}$ is differentiable at x = 1, then (a, b) = ______

(a) (0, 2) (b) (2, 0) (c) (2, 2) (d) (0, 0)

68. f(x) and g(x) are inverse functions and differentiable at x = c, then $g^1(f(c))$ =

(a) $f^1(c)$ (b) $-f^1(c)$ (c) $\frac{1}{f^1(c)}$ (d) $-\frac{1}{f^1(c)}$

69. The perpendicular distance from (0, 0) to the normal to $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$ at 'θ' is

(a) $|a|$ (b) $\frac{1}{|a|}$ (c) a^2 (d) $|a\sin\theta\cos\theta|$

70. Area of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ is (in sq. units)

(a) 12 (b) 48 (c) 7 (d) 24

71. If f(x) is differentiable in [2, 5]where f(2) = 1/5, f(5) = 1/2 then there exists a number c,2 < c < 5 for which $f^1(c)$ = _____

(a) $\frac{1}{5}$ (b) $-\frac{1}{10}$ (c) $\frac{1}{10}$ (d) $\frac{3}{10}$

72. $\int \frac{\cos^8 x - \sin^8 x}{1 - 2\sin^2 x\cos^2 x} dx = K\sin 2x + c$ then K =

(a) $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) – 2 (d) 2

73. $\underset{x\to 0}{\mathrm{Lt}} \int_0^x \frac{\sin^2 t\cos t\,dt}{x^3} =$

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

74. The area enclosed by y = |x| and y = 1 – |x| is (in sq. units)

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

75. $\frac{dy}{dx} - \frac{2xy}{1+x^2} = 0$ and y(0) = 1 then y(1) =

(a) 1 (b) $\frac{1}{2}$ (c) 2 (d) 0

76. The three points with position vectors $\bar{a}+\bar{b}$, $\bar{a}-\bar{b}$ and $\bar{a}+\lambda\bar{b}$ are collinear for
(a) no value of λ (b) exactly one value of λ
(c) exactly two values of λ (d) many values of λ

77. ABC is a triangle. E and F are mid points of AC and AB respectively. If the area of ΔABC is λ times the area of ΔFCE, then λ =
(a) $\frac{1}{4}$ (b) 4 (c) $\frac{1}{2}$ (d) 2

78. If the angle between the planes 2x – y + z = 4 and x + λy + 2z = 11 is $\frac{\pi}{3}$, then the values of λ are
(a) – 1, 17 (b) 1, 17 (c) 1, –17 (d) –1, –17

Rough Space

79. A line with direction ratios (2, 1, 2) intersects the lines $\bar{r} = -j + \lambda(i + j + k)$ and $\bar{r} = -i + \mu(2i + j + k)$ at A and B, then AB =

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

80. The distance of the point (2, 3, 4) from the plane 3x + 2y + 2z + 5 = 0 measured parallel to the line $\frac{x+3}{3} = \frac{y-2}{6} = \frac{z}{2}$, is

(a) 5 (b) 3 (c) 7 (d) 11

81. Three dice are rolled and told that exactly two of them are showing the same number. The probability of getting a sum 16 on them is

(a) $\frac{1}{15}$ (b) $\frac{1}{5}$ (c) $\frac{1}{45}$ (d) $\frac{3}{5}$

82. The least number of times a coin must be tossed so that the probability of getting atleast one head is atleast 0.8 is

(a) 6 (b) 5 (c) 4 (d) 3

83. The co-efficient of X^n in the polynomial $(x + {}^{2n}C_0)(X + {}^{2n}C_2)\ldots\ldots.(x + {}^{2n}C_{2n})$ is

(a) 2^{2n-1} (b) $2^{2(n-1)}$ (c) 2^n (d) 2^{n-1}

84. The radius of the circle $\text{Re}\left(\frac{iz+1}{iz-1}\right)=2$ is

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

85. If a,b,c be positive and not all equal, then the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is

(a) $-ve$ (b) $+ve$

(c) Depends on a,b,c (d) None of these

86. A guard of 12 men is formed from a group of n soldiers in all possible ways. If the number of times two particular soldiers A and B are together on guard is thrice the number of times there particular soldiers C,D,E are together on gurard, then n =

(a)18 (b)24 (c)32 (d)36

87. Out of the two roots of $x^2 + (1-2\lambda)x + (\lambda^2 - \lambda - 2) = 0$ one root is greater than 3 and the other root is less then 3, then the limits of λ are

(a) $\lambda < 2$ (b) $2 < \lambda < 5$ (c) $\lambda > 5$ (d) $\lambda = \frac{5}{2}$

Rough Space

88. $\left(1+\tan 1^{\circ}\right)\left(1+\tan 2^{\circ}\right)\left(1+\tan 3^{\circ}\right)....\left(1+\tan 45^{\circ}\right)=$

(a) 2^{21} (b) 2^{22} (c) 2^{23} (d) 2^{24}

89. If maximum and minimum values of the determinant $\begin{vmatrix} 1+\cos^2 x & \sin^2 x & \cos 2x \\ \cos^2 x & 1+\sin^2 x & \cos 2x \\ \cos^2 x & \sin^2 x & 1+\cos 2x \end{vmatrix}$ are $\propto$ and β then

(a) $\alpha^2+\beta^{101}=10$ (b) $\alpha^3+\beta^{99}=26$ (c) $2\alpha^2+18\beta^{11}=0$ (d) All the above

90. The number of positive interger (x,y,z) of the equation xyz=24

(a)24 (b)20 (c)24 (d)30