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JEE (Main) 2015 Model Paper

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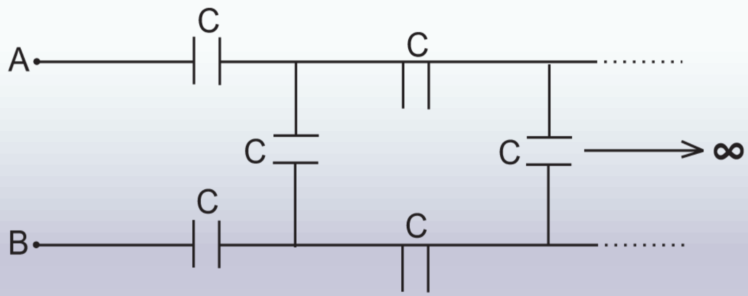
1. Assuming that about 200 MeV energy is released per fission of ${}_{92}U^{235}$ nuclei, what would be the mass of U^{235} consumed per day in the fission of reactor of power 1 MW approximately?

a. 10 kg
b. 100 kg
c. 1 g
d. 10^{-2} g

2. A parallel plate capacitor is charged and the charging battery is then disconnected. If the plates of the capacitor are moved further apart by means of insulating handles then

a. the charge on the capacitor increases
b. the voltage across the plate increases
c. the capacitance increases
d. the electrostatic energy stored in the capacitor increases

3. The equivalent capacitance between points A and B is



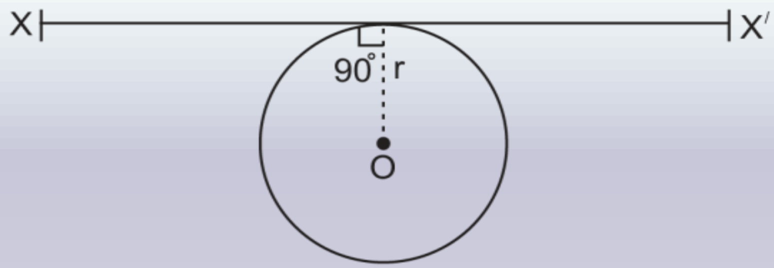
(a) $\dfrac{2}{C\left(\sqrt{3}-1\right)}$

(b) $\dfrac{2C}{\sqrt{3}-1}$

(c) $\dfrac{C\left(\sqrt{5}+1\right)}{2}$

(d) None of these

4. A thin wire of length l and uniform linear mass density ρ is bent into a circular loop with centre O and radius r as shown in figure. The moment of inertia of the loop about the axis XX' is



(a) $\frac{3\rho l^3}{8\pi^2}$

(b) $\frac{\rho l^3}{16\pi^2}$

(c) $\frac{3\rho l^3}{8\pi^2 r}$

(d) $\frac{\rho l^3}{8\pi^2 r}$

5. Two cells of e.m.f.s 1.5 V and 2.0 V and internal resistances 2 ohm and 1 ohm respectively have their negative terminals joined by a wire of 6 ohm and positive terminals by a wire of 7 ohm resistance. A third resistance wire of 8 ohm connects middle points of these wires. Find the potential difference at the end of the third wire.

a. 2.25 V

b. 1.36 V

c. 1.26 V

d. 2.72 V

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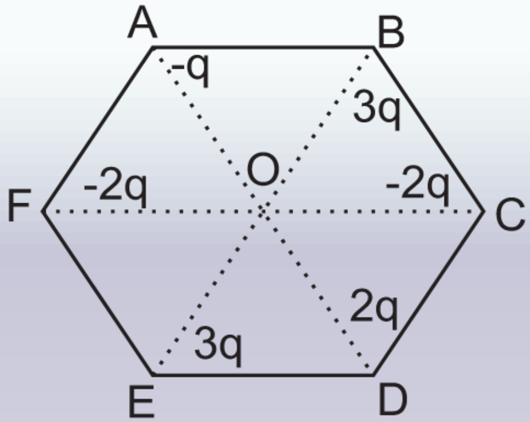
6. Six charges are placed at the corner of a regular hexagon as shown. If an electron is placed at its centre O, then the force on it will be :



a. Zero
b. Along OF
c. Along OC
d. None of these

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7. An inductance of (100/π) mH, a capacitance of $\left(\frac{10^{-2}}{\pi}\right)$ F and a Resistance of 6.75 Ω are connected in series with an AC source 220 V, 40 Hz. The phase angle of the circuit is

a. π/2
b. π/3
c. π/4
d. π/6

8. A photon of energy hv and momentum hv/c collides with an electron at rest. After the collision, the scattered electron and the scattered photon each make an angle of 45° with the initial direction of motion. The ratio of frequency of scattered and incident photon is

a. $\sqrt{2}$
b. $\sqrt{2} - 1$
c. 2
d. $1/\sqrt{2}$

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9. Two spherical soap bubbles of radii R_1 and R_2 combine under isothermal condition to form a single bubble. The radius of the resultant bubble is

a. $R = \sqrt{R_1^2 + R_2^2}$

b. $R = R_1^2 + R_2^2$

c. $R = \dfrac{R_1 + R_2}{2}$

d. $R = R_1 R_2$

10. If the distance between the earth and the sun were one third of its present value, the no. of days in a year would have been

a. 75 days
b. 70 days
c. 67 days
d. 68.5 days

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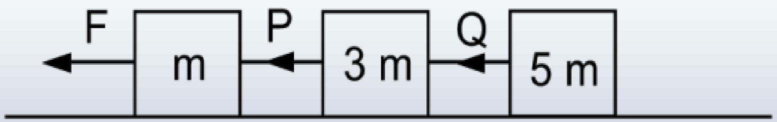
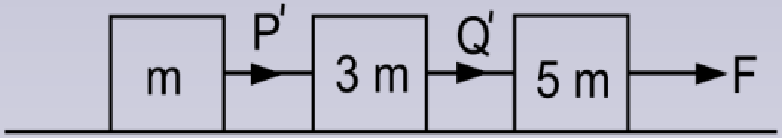
11. Three blocks of masses m, 3m and 5m are connected by mass less strings and pulled by a force F on a frictionless surface as shown in the figure below. The tension P in the first string is 16 N



If the point of application of F is changed as given below,



the values of P' and Q' will be

a. 16 N, 10N

b. 10 N, 16 N

c. 2 N, 8 N

d. 10 N, 6 N

12. A conducting ring of radius 1 metre is placed in an uniform magnetic field B of 0.01 Tesla oscillating with frequency 100 Hz with its plane at right angle to B. What will be the induced electric field?

a. π volt/m
b. 2 volt/m
c. 10 volt/m
d. 62 volt/m

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13. If 10% of the radioactive material decays in 5 days, what would be percentage of amount of original material left after 20 days?

a. 56.61%
b. 65.61%
c. 55.61%
d. 55.16%

14. The displacement of a particle moving in a straight line depends on time as $x = \alpha t^3 + \beta t^2 + \gamma t + \delta$. The ratio of initial acceleration to its initial velocity depends

a. only on α and γ
b. only on β and γ
c. only on α and β
d. only on α

15. A student is standing at a distance of 50 metre from the bus. As soon as the bus begins its motion with an acceleration of 1 ms^{-2}, the student starts running towards the bus with a uniform velocity u. Assuming the motion to be along a straight road, the minimum value of u, so that the student is able to catch the bus is

a. 8 ms^{-1}
b. 5 ms^{-1}
c. 12 ms^{-1}
d. 10 ms^{-1}

16. Power P is related to distance x and time t as $P = \frac{a - x^2}{bt}$. The dimension of a is

a. $[M^0 L^1 T^{-2}]$
b. $[M^0 L^2 T^2]$
c. $[M^0 L^2 T^{-2}]$
d. $[M^0 L^2 T^0]$

17. Calculate the increase in energy of a brass bar of length 0.2 m and cross sectional area 1 cm^2 when compressed with a load of 5 kg weight along its length. Young's modulus of brass = 1.0×10^{11} Nm^{-2}.

a. 1.2×10^{-5} J
b. 1.4×10^{-5} J
c. 2.4×10^{-5} J
d. 2.8×10^{-5} J

18. The apparent depth of water in cylindrical water tank of diameter 2R cm is reducing at the rate of x cm/minute when water is being drained out at a constant rate. The amount of water drained in c.c per minute is: (n_1 = refractive index of air, n_2 = refractive index of water)

a. $\dfrac{x\pi R^2 n_1}{n_2}$

b. $\dfrac{x\pi R^2 n_2}{n_1}$

c. $\dfrac{2\pi R n_1}{n_2}$

d. $\pi R^2 x$

19. A lens is made of flint glass (refractive index = 1.5). When the lens is immersed in a liquid of refractive index 1.25, the focal length:

a. increases by a factor of 1.25
b. increases by a factor of 2.5
c. increases by a factor of 1.2
d. decreases by a factor of 1.2

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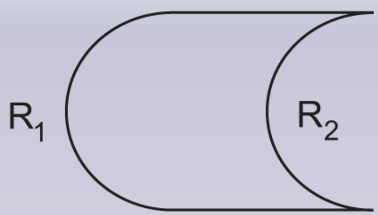
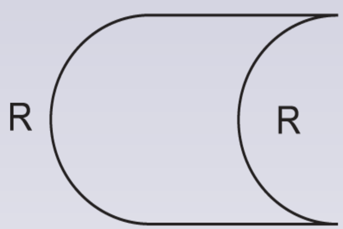
20. Which of the following spherical lenses doesn't exhibit dispersion? The radii of curvature of the surfaces of the lenses are given in the diagrams?

a. 

b. 

c. 

d. 

21. A particle executes simple Harmonic motion in a line of 5 cm long. When it passes through the centre of line, its velocity is 15 cm/s. Find its frequency.

a. 0.72 Hz
b. 0.36 Hz
c. 0.96 Hz
d. 0.48 Hz

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22. Water from a tap emerges vertically downward with an initial speed of 1 m/s. The cross-sectional area of the tap is 10^{-4} m^2. Assume that the pressure is constant throughout the stream of water and the flow is steady. What is the cross-sectional area of the stream 0.15m below the tap?

a. 2.5×10^{-5} m^2
b. 5.0×10^{-5} m^2
c. 4.0×10^{-4} m^2
d. 3.5×10^{-5} m^2

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23. A rectangular film of liquid is extended from 7cm × 5 cm to 9 cm × 8 cm. If the work done is 4×10^{-4}J. Find the surface tension of liquid.

a. 0.11 N
b. 1.4 N
c. 0.25 N
d. 2.5 N

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24. The maximum velocity of a particle executing S.H.M with an amplitude 14 mm is 4.4 m/s. The period of oscillation is

a. 0.05s
b. 0.02s
c. 0.03s
d. 0.04s

25. Where is the centre of mass of a binary system with a white dwarf star of mass (M) and a Red – giant star (m) separated by a distance (p)?

a. At $R_1 = P \times (1\text{-}m/(m + M))$ from m and
$R_2 = m \times P/(m + M)$ from M

b. At $R_2 = P \times (1\text{-}m/(m + M))$ from m and
$R_1 = m \times P/(m + M)$ from M

c. At $R_1 = P^2 \times (1\text{-}m/(m + M))$ from m and
$R_2 = m \times P^2/(m + M)$ from M

d. At $R_1 = P \times (1\text{-}m/(m - M))$ from m and
$R_2 = m \times P/(m - M)$ from M

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26. A bimetallic strip is formed out of two identical strips, one of copper and the other of brass. The coefficients of linear expansion of the two metals are α_c and α_B. On heating, the temperature of the strip increases by ΔT and the strip bends to form an arc of radius R. Then R is proportional to

a. ΔT

b. $\frac{1}{\Delta T}$

c. $\sqrt{\Delta T}$

d. $\frac{1}{\sqrt{\Delta T}}$

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27. A tank is filled with water upto height H. When a hole is made at a distance h below the level of water. What will be the horizontal range of water jet ?

a. $2\sqrt{h(H-h)}$

b. $4\sqrt{h(H+h)}$

c. $4\sqrt{h(H-h)}$

d. $2\sqrt{h(H+h)}$

28. L, C and R represent the physical quantities inductance, capacitance and resistance respectively. The combinations of time are

a. 1/RC
b. C/L
c. $1/\sqrt{LC}$
d. L/R

29. In the diffraction from a single slit of width 2.5 λ, the total number of minimas and secondary maximum (maxima) on either side of the central maximum are

a. 4 minimas, 2 secondary maximas
b. 2 minimas, 2 secondary maximas
c. 2 minimas, 4 secondary maximas
d. 2 minimas, 3 secondary maximas

30. A coil of inductance 8.4 mH and resistance 6 Ω is connected to a 12 V battery. The current in the coil is 1.0 A at approximately the time

a. 500 s
b. 20 s
c. 35 s
d. 1 s

31. The compound ‘X’ in the sequence of the reactions is

$$X \xrightarrow{CH_3MgBr} Y \xrightarrow{H_2O/H^+} \text{Tertiary butyl alcohol}$$

a. Acetaldehyde

b. Propanal

c. Propanone

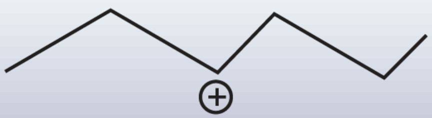
d. None of these

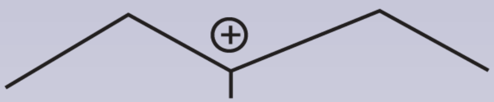
32. Which of the following is a correct statement?

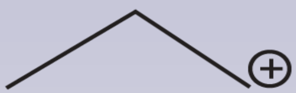
a. Clemmensen's reagent is used for the reduction of aldehyde to alcohol.
b. Acetaldehyde undergoes aldol condensation to from 4-hydroxy butanal.
c. Propanal undergoes iodoform reaction to form iodoform and sodium propionate with I_2 and NaOH.
d. Propanone undergoes aldol condensation in presence of dilute NaOH.

33. The most stable carbocation among the following is

a. 

b. 

c. 

d. 

34. Which of the following statement is wrong?

a. Diborane reacts with NH_3(excess) at low temperature to form an ionic substance.
b. Diborane reacts with excess of NH_3 at high temperature to form boron nitride.
c. Boron nitride is a white slippery solid and having layer structure just like graphite.
d. None of these

35. Which of the following is heated with silica at high temperature to form carborundum ?

a. Nitrogen

b. Carbon

c. Carbon monoxide

d. None of these

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36. What is the product in the reaction $C_2H_5-Mg-Cl \xrightarrow[\text{(ii) } H^+/H_2O]{\text{(i) } CO_2}$

a. Acetaldehyde
b. Propanal
c. Acetic acid
d. Propanoic acid

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37. The bond order of is

a. 1.5
b. 2.0
c. 2.5
d. 3.0

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38. For the equilibrium reaction $2HBr \rightleftharpoons H_2 + Br_2$, K_c is 4.0×10^{-7}. If the equilibrium concentration of H_2 and Br_2 are 1.6×10^{-5} M and 1.6×10^{-4}M respectively then the concentration of HBr will be

a. 8×10^{-1}
b. 0.8×10^{-1}
c. 0.8×10^{-2}
d. 1.6×10^{-1}

39. Hexaaquairon (III) cation shows the hybridisation of

a. sp^3
b. d^2sp
c. d^2sp^3
d. sp^3d^2

40. The highest magnetic moment shown by the transition metal of the following is

a. Cu^{+}
b. Zn^{++}
c. Cr^{3+}
d. Ni^{2+}

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41. The emf of the cell Pt(H_2)| $HCl_{(aq)}$ ||AgCl |Ag is 0.275 V at 298 K and 0.255 at 308 K. Calculate the enthalpy change in the reaction at 298 K.

a. 320 kJ
b. 175 kJ
c. 155 kJ
d. 168 kJ

42. How many sigma and pi bonds are there in the P_4O_{10} molecule?

a. 6π, 10 σ
b. 4π, 10σ
c. 4π, 16σ
d. 4π, 14 σ

43. The rate of diffusion of two gases ‘A’ and ‘B’ under similar condition of temp and pressure is 3:1. What is the ratio of root mean square velocity of these gases if the temperature of these gases is in the ratio of 4:3?

a. $6\sqrt{2}:1$
b. $3\sqrt{2}:1$
c. $6:\sqrt{2}$
d. $2\sqrt{3}:1$

44. Which of the following reactions is not feasible?

a. $2KI + Cl_2 \rightarrow 2KCl + I_2$
b. $2KBr + F_2 \rightarrow 2KF + Br_2$
c. $2KCl + Br_2 \rightarrow 2KBr + Cl_2$
d. $2KI + F_2 \rightarrow 2KF + I_2$

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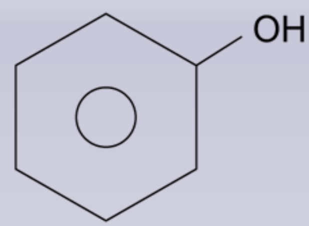
45. The order of dehydration of the following compounds in presence of conc. H_2SO_4 is

(1) $\begin{array}{c} CH_3-CH-CH_3 \\ | \\ OH \end{array}$

(2) CH_3-CH_2-OH

(3) $\begin{array}{ccc} & CH_3 & \\ & | & \\ CH_3- & C & -OH \\ & | & \\ & C_2H_5 & \end{array}$

(4) 

a. I > II > III > IV

b. II > I > III > IV

c. III > I > II > IV

d. IV > III > I > II

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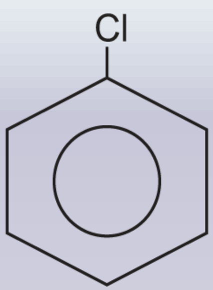
46. The pH of following solution of the given salts decreases in the order of

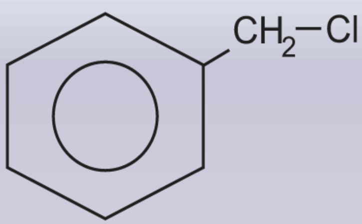
a. $NaOH > HCl > NaHCO_3 > AlCl_3$
b. $KOH > NaHCO_3 > AlCl_3 > HCl$
c. $NaOH > NaHCO_3 > HCl > AlCl_3$
d. $HCl > AlCl_3 > NaOH > NaHCO_3$

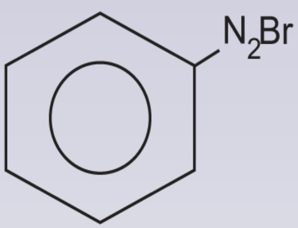
47. What is the shape of $XeOF_4$ molecule?

a. Square planar
b. Square pyramidal
c. Trigonal pyramidal
d. None of these

48. A $\xrightarrow[AgNO_3]{\text{dil}\,HNO_3}$ white ppt or yellow ppt. Which of the following cannot be 'A'?

a. 

b. 

c. 

d. $(C_2H_5)_3CBr$

49. Gabriel phthalimide reaction is used for the preparation of

a. 1° amine
b. 1° alcohol
c. Acid amide
. d. 2° amine

50. Which of the followings shows maximum catenation properties?

a. O
b. S
c. Se
d. Te

51. Which of the following statements is incorrect?

a. Sublimation energy of Li is highest in alkali group.
b. Lattice energy of CsCl is less than KCl.
c. Lattice energy depends on electrostatic attraction between Ions.

d. Ionization energy of K is less than Cs.

52. Benzene reacts with CH_3Cl in presence of anh. $AlCl_3$ and forms a compound (A). This on partial oxidation in presence of CrO_2Cl_2 and CS_2 forms a compound (B). The compound (B) reacts with acetic anhydride in presence of sodium acetate to form (C). Identify the compound "C".

a. Cinnamic acid

b. Cinnamaldehyde

c. Benzoic anhydride

d. Salicylic acid

53. 80% of a first order reaction is completed in 30 minutes. Find the time in which 90% of the reaction will be completed.

a. 35
b. 28
c. 45
d. 43

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54. The standard enthalpy of formation of hydrazine is + 52.3 kJ mol^{-1}. The standard enthalpy of formation of water is – 286 kJ mol^{-1}. What will be the enthalpy change of the reaction

$$\underset{(l)}{N_2H_4} + \underset{(g)}{O_2} \rightarrow \underset{(g)}{N_2} + \underset{(l)}{2H_2O}?$$

a. −624.3 kJ
b. + 624.3 kJ
c. 520.3 kJ
d. −520.3 kJ

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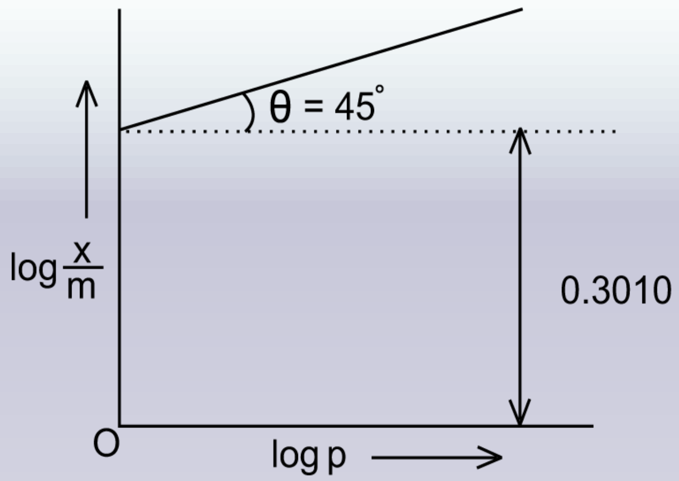
55. Match the following column:

Column-I	Column-II
(A) Acidic flux	(P) Sodium carbonate decahydrate
(B) Cassiterite	(Q) Silica
(C) Washing Soda	(R) Extraction of Sn
(D) Partial oxidation of sulphide ore	(S) Extraction of Cu

	A	B	C	D
a.	P	Q	R	S
b.	R	S	P	Q
c.	R	P	S	Q
d.	R	Q	P	S

56. A graph is plotted between log x/m Vs log p, as shown below. What will be the value of x/m when pressure is 0.2 atm?



a. 0.3

b. 0.4

c. 0.6

d. 0.8

57. A carbohydrate contains five alcoholic group. Out of which one is primary group and four are secondary groups. It reacts with acetic anhydride to form pentaacetate. If the mol. wt of carbohydrate is 180 then the mol. wt of pentaacetate will be

a. 210
b. 395
c. 390
d. 410

58. In the Lassaigne's test, the blood red coloration is due to the formation of

a. Sodium ferrocyanide
b. Sodium thiocyanate
c. Ferric thiocyanate
d. Ferrous thiocyanate

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59. A 10% solution of a substance ‘X’ is isotonic with a 16.5% solution of glucose in the same solution of density 1.0 g/cc. What will be the molecular mass of the substance ‘X’?

a. 109
b. 112
c. 115
d. 107

60. A 4 : 1 mixture of helium and methane is contained in a vessel at 10 bar pressure. Due to a hole in the vessel, the gas mixture leaks out. The composition of mixture effusing out initially is

a. 8 : 1
b. 8 : 3
c. 4 : 1
d. 2 : 1

61. The area enclosed $y=\sqrt{4-x^2}, y \geq \sqrt{2}\sin\left(\frac{x\pi}{2\sqrt{2}}\right)$.

by and x – axis is divided by y – axis in ratio

a. $\frac{\pi^2-8}{\pi^2+8}$

b. $\frac{\pi^2-4}{\pi^2+4}$

c. $\frac{\pi-4}{\pi+4}$

d. $\frac{2\pi^2}{\pi^2+2\pi-8}$

62. S – 1 – If $\sin^2\theta_1 + \sin^2\theta_2 + \ldots\ldots + \sin^2\theta_n = 0$, then the different sets of values of $(\theta_1, \theta_2 \ldots\ldots \theta_n)$ for which $\cos\theta_1 + \cos\theta_2 + \ldots.. + \cos\theta_n = n - 4$ is $n(n-1)$.

S – 2 – If $\sin^2\theta_1 + \sin^2\theta_2 + \ldots\ldots + \sin^2\theta_n = 0$, then $\cos\theta_1 . \cos\theta_2 . \ldots.. \cos\theta_n = \pm 1$

a. Both the statements are true & S – 2 is the correct explanation of S - 1

b. Both the statements are true but S – 2 is not the correct explanation of S −1

c. S – 1 is true and S – 2 false

d. S – 1 is false and S – 2 is true

63. If f be any one of the six trigonometric functions. Let A, B $\in$ R satisfying f(2A) = f(2B)

S -1 − A = nπ + B, $\forall$ n $\in$ R

S -2 − 2π is one of the period of f.

a. Both the statements are true & S – 2 is the correct explanation of S - 1

b. Both the statements are true but S – 2 is not the correct explanation of S −1

c. S – 1 is true and S – 2 false

d. S – 1 is false and S – 2 is true

64. S –1 – If diagonals of the quadrilateral formed by the lines px + qy + r = 0 & p'x + q'y + r = 0 are at right angles, then $p^2 + q^2 = q'^2 + p'^2$.

S –2− Diagonals of a rhombus bisect perpendicularly each other.

a. Both the statements are true & S – 2 is the correct explanation of S - 1

b. Both the statements are true but S – 2 is not the correct explanation of S −1

c. S – 1 is true and S – 2 false

d. S – 1 is false and S – 2 is true

65. Consider circles $x^2 + y^2 - 4x - 6y - 8 = 0$ & $x^2 + y^2 - 2x - 3 = 0$

S -1− Both the circles intersect each other at two distinct points.

S-2−Sum of two radii of the circles is greater than distance between centres of circles.

a. Both the statements are true & S – 2 is the correct explanation of S – 1
b. Both the statements are true but S – 2 is not the correct explanation of S −1
c. S – 1 is true and S – 2 false
d. S – 1 is false and S – 2 is true

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66. If x > 0 & the 4^{th} term in the expansion $\left(2+\frac{3x}{8}\right)^{10}$ of has maximum value then

a. 2 < x < 3
b. 2 < x < (10/3)
c. 4 < x < 5
d. 5 < x < 7

67. $\left(am_1, \frac{a}{m_1}\right), \left(am_2, \frac{a}{m_2}\right), \left(am_3, \frac{a}{m_3}\right) \& \left(\frac{a}{m_1 m_2 m_3}, am_1 m_2 m_3\right)$

are four points such that they are

a. collinear

b. equidistant from a fixed point

c. form a parallelogram

d. None of these

68. If A, G & H are A.M, G.M & H.M of a, b, c then the equation with roots a, b, c is

a. $\Rightarrow x^3 - 3Ax^2 + \frac{3G^3}{H}x - G^3 = 0$

b. $Ax^3 + 3Gx^2 - 2H = 0$

c. $Hx^3 - 3Ax^2 + 3G^2x - G^3 = 0$

d. $G^3x^3 - 3A^2x^2 + 3H = 0$

69. If α, β, γ are roots of $px^3 + qx^2 + r = 0$ then

a. p
b. q
c. 0
d. r

70. Three persons work independently on a problem. If respective probabilities of solving problem is 1/3, 1/4, & 1/5. Then the probability that the problem is unsolved

a. 1/3
b. 2/3
c. 2/5
d. 2/7

71. Given that $X = A \cap B$ & $Y = A \cup B$. The no. of subsets of B is 4 times the no. of subsets of A and no of subsets of A is 4 times the no. of subsets of X. It is given that $n(X) = 5$. Let p, q, r, s be the no. of subsets of A, B, X & Y respectively. Then from the following statements

(i) $n(A) = 7$ (ii) $n(B) = 9$

(iii) $n(Y) = 11$ (iv) $pq = rs$

the no. of correct statements is/are

a. 1
b. 2
c. 3
d. 4

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72. If $x^2 + 3x + 5 = 0$ & $ax^2 + bx + c = 0$ have a root in common, a, b, c ϵ N, then least value of a + b + c is

a. 3
b. 6
c. 9
d. 12

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73. The 100th place digit of the number 17^{256} is

a. 1
b. 8
c. 6
d. 3

74. The equation $x^2 + ax + b = -1$ has roots which are positive integers, then $a^2 + b^2$ may be equal to

a. 50

b. 37

c. 61

d.19

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75. If $\lim_{x\to\infty}\left(\frac{x^2+1}{x+1}-ax-b\right)=\infty$ then value of b is

a. $\neq 0$

b. $= 4/3$

c. $\in R$

d. $> 9/4$

76. Number of distinct normals can be drawn from (–2, 1) to the parabola $y^2 - 4x - 2y - 3 = 0$ is

a. 1
b. 2
c. 3
d. None of the above

77. If $x = \sec\theta - \tan\theta$ & $y = \text{cosec}\theta + \cot\theta$ then

a. $x(y+1) = y - 1$
b. $x(y - 1) = y + 1$
c. $y(x+1) = x - 1$
d. $y(x - 1) = y - 1$

78. The number of ordered triples of non-negative integers those are solutions of the equation $3x + y + z = 24$ are

a. 117

b. 119

c. 123

d. 97

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79. If $x \in (0, 7\pi/2)$ and , then f has

a. local maximum at $\pi/2$ and local minimum of $3\pi/2$
b. local minimum at $\pi/2$ and local maximum at $3\pi/2$
c. local maximum at $3\pi/2$
d. local minimum at $\pi/2$

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80. In the expression $x\left(\frac{x}{2}-\frac{3}{x^2}\right)^{10}$, the coefficient of x^5 is

a. $\frac{9}{64}\,{}^{10}C_4$

b. $\frac{9}{256}\,{}^{10}C_2$

c. $-\frac{25}{128}\,{}^{10}C_5$

d. $-\frac{25}{256}\,{}^{10}C_3$

81. For what value of λ, the following system of linear equations have a non trivial solution?

$(3 + \lambda) x + 3y + 4z = 0$

$x - y + 4z = 0$

$\lambda x + y + 3z = 0$

a. 23/9

b. −4/9

c. 26/9

d. −16/9

82. Equation of the circle having centre at (3, −1) and cutting intercept of length 6 unit on the line $2x - 5y + 18 = 0$ is

a. $x^2 + y^2 - 6x + 2y - 18 = 0$

b. $x^2 + y^2 - 6x + 2y - 38 = 0$

c. $x^2 + y^2 - 6x + 2y - 28 = 0$

d. None of the above

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83. If $\sum_{r=1}^{\infty} \frac{1}{(2r)^2} = \frac{\pi^2}{24}$ then $\sum_{r=1}^{\infty} \frac{1}{r^2} = ?$

a. $\frac{\pi^2}{6}$

b. $\frac{2\pi^2}{5}$

c. $\frac{\pi^2}{8}$

d. $\frac{3\pi^2}{8}$

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84. The function $f(x) = \max\{(2 - x), (2 + x), 4\}, x \in (-\infty, \infty)$ is

a. continuous at all points
b. differentiable at all points
c. differentiable at all point except $x = 1$ and $x = -1$
d. continuous at all points except $x = 1$ & $x = -1$

85. The $f(x) = \sin\frac{\pi x}{2} + 2\cos\frac{\pi x}{3} - \cot\frac{\pi x}{4}$ function is periodic with period

a. 6
b. 3
c. 4
d. 12

86. Let A = {1, 2, 3, 4}, B = {5, 6, 7, 8}, then which of the followings is a relation from A to B?

a. $R_1 = \{(1, 5), (2, 7), (3, 8)\}$
b. $R_2 = \{(6, 2), (3, 8), (4, 7)\}$
c. $R_3 = \{(4, 5), (6, 3), (2, 7)\}$
d. $R_4 = \{(5, 4), (6, 3), (7, 8), (4, 5), (3, 8)\}$

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87. $\int \frac{x^2-1}{\left(x^2+1\right)\sqrt{1+x^4}}dx =$

a. $\tan^{-1}\left(\frac{\sqrt{x^2+\frac{1}{x^2}}}{\sqrt{2}}\right)+c$

b $\tan^{-1}\left(\frac{\sqrt{x^2+\frac{1}{x^2}}}{2}\right)+c$

c. $\frac{1}{2}\tan^{-1}\frac{\sqrt{x^2+\frac{1}{x^2}}}{\sqrt{2}}+c$

d. $\frac{1}{2}\tan^{-1}\frac{\sqrt{x^2+\frac{1}{x^2}}}{2}+c$

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88. The shortest distance of the line x-y-2=0 from the curve $y = x^2 + 3x + 2$ is

a. $\sqrt{2}/3$
b. $3/\sqrt{2}$
c. $\sqrt{2}$
d. $1/\sqrt{2}$

89. If 1 is a twice repeated root of the equation $ax^3 + bx^2 + bx + d = 0$ then

a. $a + b = 0$
b. $b + d = 0$
c. $a = d$
d. All of these

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90. The eccentricity of the conjugate hyperbola of the hyperbola $x^2 - 3y^2 = 1$ is

a. 2
b. $2/\sqrt{3}$
c. 4
d. 4/5

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