JEE MAINS FULL TEST-3

Association of Coaching Institutes

PAPER CONTRIBUTOR : ICAD

Note : **1.** Please Check Your Question Paper. It Contain Pages **1 to 14**.
2. Also, please check that it contain total **90** Questions. (Physics – **30Q.**, Chemistry – **30Q.**, Mathematics – **30Q.**)
3. Fill Correct Roll Number and Write Correct Name, Test No. (Set Code) on OMR Sheet.
4. Attempt any **Five** Numerical Type Questions out of **Ten** Questions.
5. In case answer is not an integer calculate and write answer rounded off to two digits after decimal point, as given in following examples :
Example 1 - Answer is 9 write 9
Example 2 - Answer is 13.666 write 13.67
Example 3 - Answer is –0.234 write –0.23
Example 4 - Answer is 12.635 write 12.64
Example 5 - Answer is 15.665 write 15.66

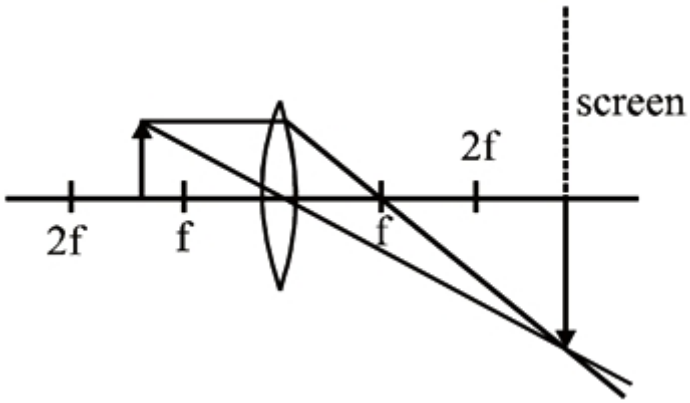
PHYSICS

NOTE: There are 30 questions in this part.

PART : A (20 × 4 = 80 Marks) (4R – 1W)

CHOOSE THE SINGLE CORRECT OPTION:

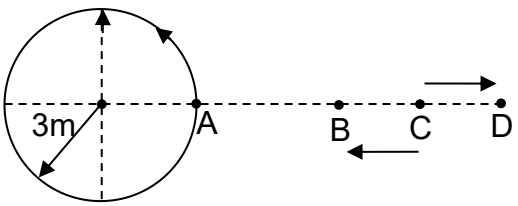
1. Formation of real image using a biconvex lens is shown below :



If the whole set up is immersed in water without disturbing the object and the screen position, what will one observe on the screen?
(A) Image disappears (B) No change (C) Erect real image (D) Magnified image

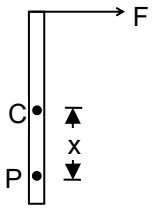
2. A source of sound is moving along a circular orbit of radius 3m with an angular velocity of 10 rad/s. A sound detector located for away from the source is executing SHM along the line BD with amplitude BC = CD = 6m. The frequency of oscillation of the detector is $\frac{5}{\pi}$ per second.

The source is at the point 'A' when the detector is at the point 'B'. If the source emits a continuous sound wave of frequency 340 Hz. Find the ratio of maximum to minimum frequencies recorded by the detector (velocity of sound = 330 m/s).



(A) $\frac{442}{255}$ (B) $\frac{225}{442}$ (C) $\frac{221}{89}$ (D) $\frac{442}{300}$

3. Find the point P of zero acceleration (value of x) of the rod of length ℓ when a force F acts at its end.

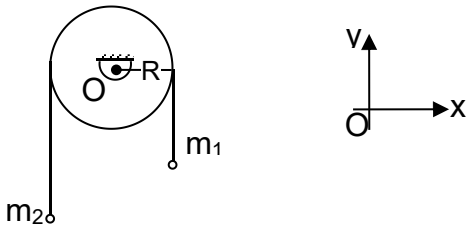


(A) $x = \frac{\ell}{8}$ (B) $x = \frac{\ell}{3}$ (C) $x = \frac{\ell}{6}$ (D) $x = \frac{\ell}{12}$

4. A 10 m long horizontal wire extends from North East to South West. It is falling with a speed of $5.0\,ms^{-1}$ at right angles to the horizontal component of the earth's magnetic field, of $0.3\times10^{-4}Wb/m^2$. The value of the induced emf in wire is :

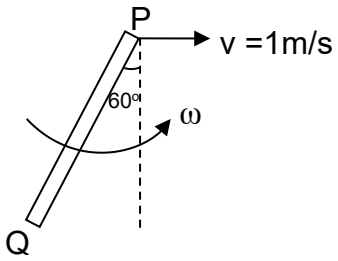
(A) $2.5\times10^{-3}V$ (B) $1.1\times10^{-3}V$ (C) $0.3\times10^{-3}V$ (D) $1.5\times10^{-3}V$

5. Two particles of mass m_1 and m_2 interconnected by an inextensible smooth string are released from rest in gravity as shown in the figure. Find the angular momentum of the system m_1+m_2 about O after a time t. (Assume $m_1 > m_2$)



(A) zero (B) $\frac{m_2gRt\hat{k}}{m_2-m_1}$ (C) $(m_2-m_1)gRt\hat{k}$ (D) $(m_1-m_2)gRt\hat{k}$

6. The rod of length $\ell = 1m$ rotates with an angular velocity $\omega = 2$ rad/s and the point P moves with velocity v = 1 m/s. The velocity of point Q at this moment is :



(A) $2\sqrt{3}\,m/s$ (B) $\sqrt{7}\,m/s$ (C) $\sqrt{6}\,m/s$ (D) $\frac{\sqrt{3}}{2}m/s$

7. A geostationary satellite is orbiting in circular orbit. Due to internal forces suppose rotating earth automatically shrinks to half the present radius. Assuming mass of the earth remains constant. With respect to a point on equator, now the satellite

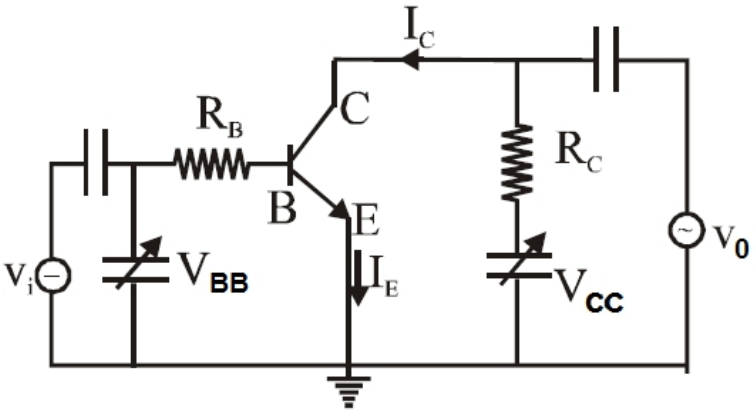
(A) will be seen at rest

(B) will be seen moving eastward with a period of 8 hours

(C) will be seen moving westward with a period of 8 hours

(D) will be seen moving westward with a period of 6 hours

8. In the figure, given that V_{BB} apply can vary from 0 to 5.0 V, $V_{CC} = 5V, \beta_{dc} = 200, R_B = 100\,k\Omega, R_C = 1K\Omega$ and $V_{BE} = 1.0$ V. The minimum base current and the input voltage at which the transistor will go to saturation, will be, respectively :



(A) 20μA and 3.5 V (B) 25μA and 3.5 V (C) 25μA and 2.5 V (D) 20μA and 2.8 V

9. In a Frank-Hertz experiment, an electron of energy 5.6 eV passes through mercury vapour and emerges with an energy 0.7 eV. The minimum wavelength of photons emitted by mercury atoms is closed to :

(A) 2020 nm (B) 220 nm (C) 250 nm (D) 1700 nm

10. A vertical closed cylinder is separated into two parts by a frictionless piston of mass m and of negligible thickness. The piston is free to move along the length of the cylinder. The length of the cylinder above the piston is ℓ_1, and that below the piston is ℓ_2, such that $\ell_1 > \ell_2$. Each part of the cylinder contains n moles of an ideal gas at equal temperature T. If the piston is stationary, its mass, m, will be given by : (R is universal gas constant and g is the acceleration due to gravity)

(A) $\frac{nRT}{g}\left[\frac{1}{\ell_2}+\frac{1}{\ell_1}\right]$ (B) $\frac{nRT}{g}\left[\frac{\ell_1-\ell_1}{\ell_1\ell_2}\right]$ (C) $\frac{RT}{g}\left[\frac{2\ell_1+\ell_2}{\ell_1\ell_2}\right]$ (D) $\frac{RT}{ng}\left[\frac{\ell_1-3\ell_1}{\ell_1\ell_2}\right]$

11. A galvanometer, whose resistance is 50 ohm, has 25 divisions in it. When a current of 4×10^{-4} A passes through it, its needle (pointer) deflects by one division. To use this galvanometer as a voltmeter of range 2.5 V, it should be connected to resistance of :

(A) 6250 ohm (B) 250 ohm (C) 200 ohm (D) 6200 ohm

12. Two satellites, A and B, have masses m and 2m respectively. A is in a circular orbit of radius R, and B is in a circular orbit of radius 2R around the earth. The ratio of their kinetic energies, T_A / T_B, is

(A) 2 (B) $\sqrt{\frac{1}{2}}$ (C) 1 (D) $\frac{1}{2}$

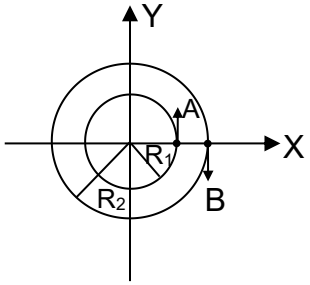
13. The mean intensity of radiation on the surface of the Sun is about $10^8\,W/m^2$. The rms value of the corresponding magnetic field is closest to :

(A) 10^2T (B) 10^{-4}T (C) 1T (D) 10^{-2}T

14. To double the converging range of a TV transimittion tower, its height should be multiplied by

(A) $\frac{1}{\sqrt{2}}$ (B) 4 (C) $\sqrt{2}$ (D) 2

15. Two particles A, B are moving on two concentric circles of radii R_1 and R_2 with equal angular speed ω. At t = 0. Their positions and direction of motion are shown in the figure.



The relative velocity $\vec{\upsilon}_A - \vec{\upsilon}_B$ at $t = \frac{\pi}{2\omega}$

(A) $-\omega(R_1 + R_2)\hat{i}$ (B) $\omega(R_1 + R_2)\hat{i}$ (C) $\omega(R_1 - R_2)\hat{i}$ (D) $\omega(R_2 - R_1)\hat{i}$

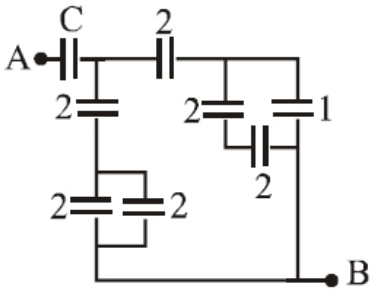
16. A resonance tube is old and has jagged end. It is still used in the laboratory to determine velocity of sound in air. A tuning fork of frequency 512 Hz produces first resonance when the tube is filled with water to a mark 11 cm below reference mark, near the open end of the tube. The experiment is repeated with another fork of frequency 256 Hz which produce first resonance when water reaches a mark 27 cm below the reference mark. The velocity of sound in air, obtained in the experiment, is close to

(A) $328\,ms^{-1}$ (B) $322\,ms^{-1}$ (C) $341\,ms^{-1}$ (D) $335\,ms^{-1}$

17. An ideal gas is enclosed in a cylinder at pressure of 2 atm and temperature, 300 K. The mean time between two successive collisions is 6×10^{-8}s. If the pressure is doubled and temperature is increased to 500 K, then mean time between two successive collisions will be close to

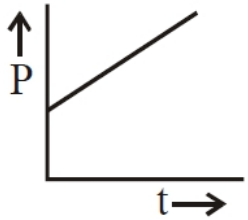
(A) 4×10^{-8}s (B) 3×10^{-6}s (C) 2×10^{-7}s (D) 0.5×10^{-8}s

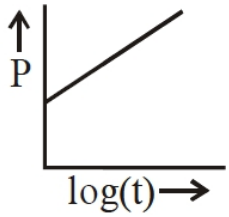
18. In the circuit shown, find C if the effective capacitance of whole circuit is to be 0.5 μF . All values in the circuit are in μF .

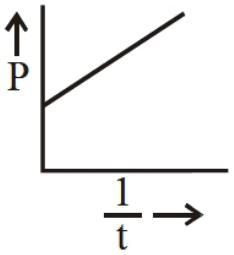


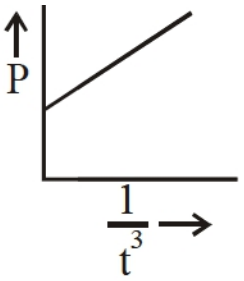
(A) $\frac{7}{10}\mu F$ (B) $\frac{7}{11}\mu F$ (C) $\frac{6}{5}\mu F$ (D) 4 μF

19. A soap bubble, below by a mechanical pump at the mough of a tube, increases in volume, with time, at constant rate. The graph that correctly depicts the time dependence of pressure inside the bubble is given by :

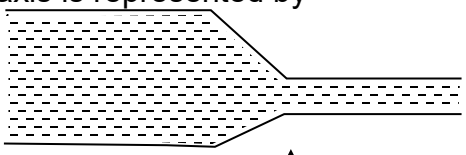
(A) 

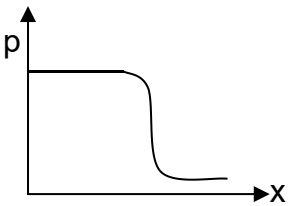
(B) 

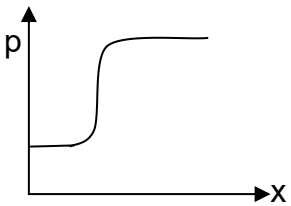
(C) 

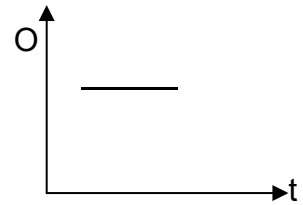
(D) 

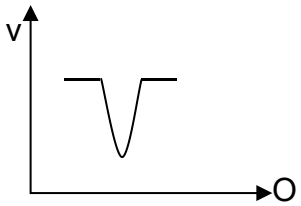
20. Water flows through a frictionless duct with a cross-section varying as shown in figure. Pressure p at points along the axis is represented by



(A) 

(B) 

(C) 

(D) 

PART : B (5 × 4 = 20 Marks) (4R – 0W)

NUMERICAL VALUE TYPE QUESTIONS :

(Attempt any Five Questions out of Ten Questions).

21. A gas (γ = 1.5) is suddenly compressed to one-fourth of its original volume. If the original temperature of the gas is $27^{o}C$, then find rise in temperature (in K) due to compression

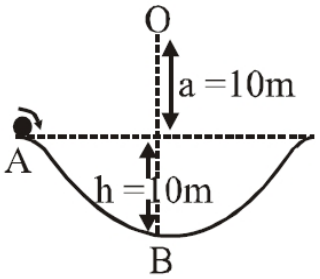
22. In an adiabatic change, the pressure P and temperature T of a diatomic gas are related by the relation $P \propto T^{C}$, where C is constant find value of C

23. The smallest division on the main scale of a vernier callipers is 1 mm and 10 vernier divisions coincide with 9 main scale divisions. While measuring the diameter of a ring the zero mark of the vernier scale lies between 5.0 cm and 5.1 cm and the eighth division of the vernier scale coincides with a main scale division. Find the diameter (in cm) of the ring :

24. A horizontal rod of length 1m is rotated about a vertical axis passing through one of its ends find the angular speed (rad/s), at which the rod breaks (Breaking stress of material of rod $3\times10^{9}\ N/m^{2}$ and density of material of rod = 6000 kg/m^{3})

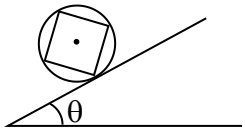
25. A load of mass M kg is suspended from a steel wire of length 2 m and radius 1.0 mm in Searle's apparatus experiment. The increase in length produced in the wire is 4.0 mm. Now the load is fully immersed in a liquid of relative density 2. The relative density of the material of load is 8. Find the new value of increases in length of the steel wire (in mm)

26. A particle of mass 20g is released with an initial velocity 5 m/s along the curve from the point A, as shown in the figure. The point A is at height h from point B. The particle slides along the frictionless surface. When the particle reaches point B, find its angular momentum (SI unit) about O : (Take g = 10 m/s^{2})

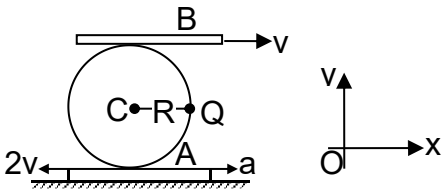


27. The temperatures of inside and outside of a refrigerator are 275 K and 300 K, respectively. Assuming that the refrigerator cycle is ideal reversible, for every joule of work done the heat delivered to the surroundings is nearly xJ. Find value of x.

28. Four identical rods of mass M = 6 kg each are welded at their ends to form a square and then welded to a massive ring having mass m = 4 kg having radius R = 1m. If the system is allowed to roll down the incline of inclination $\theta = 30^{o}$, assume there is no slipping. The acceleration of the system will be $\frac{ng}{24}$. Find value of n.



29. A cylinder rolls on the planks A and B without relative sliding. If the planks move with velocities $-2v\hat{i}, v\hat{i}$ respectively at a certain instant and the plank A has acceleration. $\vec{a}(=a\hat{i})$, then instantaneous axis of rotation of the cylinder at that instant will be at $\frac{nR}{3}$ from B. Find value of n.



30. A concrete sphere of radius R has a cavity of radius r which is packed with sawdust. The specific gravities of concrete and sawdust are respectively 2.4 and 0.3 for this sphere to float with its entire volume submerged under water. Find ratio of mass of concrete to mass of sawdust.

❐❐❐

CHEMISTRY

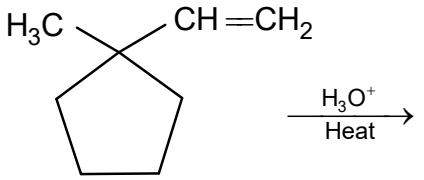
NOTE: There are 30 questions in this part.

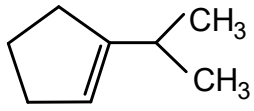
PART : A (20 × 4 = 80 Marks) (4R – 1W)

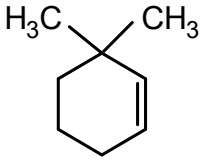
CHOOSE THE SINGLE CORRECT OPTION:

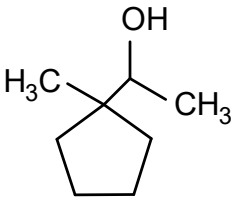
31. The statement that is not true about ozone is
(A) in the stratosphere, CFCs release chlorine free radicals (Cl), which reacts with O_3 to give chlorine dioxide radicals
(B) in the atmosphere, it is depleted by CFCs
(C) in the stratosphere, it forms a protective shield against UV radiation
(D) it is a toxic gas and its reaction with NO gives NO_2

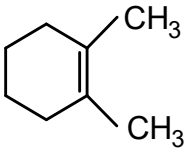
32. The major product in the following reaction is



(A) 

(B) 

(C) 

(D) 

33. What is DDT among the following ?
(A) Green house gas
(B) A fertilizer
(C) Biodegradable pollutant
(D) Non-biodegradable pollutant

34. The compound that is not a common component of photochemical smog is
(A) CF_2Cl_2
(B) $H_3C-\underset{\underset{O}{\|}}{C}-OONO_2$
(C) $CH_2=CHCHO$
(D) O_3

35. The group having isoelectronic species is
(A) $O^{2-}, F^-, Na^+, Mg^{2+}$
(B) O^-, F^-, Na, Mg^+
(C) O^{2-}, F^-, Na, Mg^{2+}
(D) O^-, F^-, Na^+, Mg^{2+}

36. The correct statement for the molecule CsI_3 is
(A) It is a covalent molecule
(B) It contains Cs^+ and I_3^-
(C) It contains Cs^{3+} and I^- ions
(D) it contains Cs^+, I^- and lattice I_2 molecule

37. Which of the following species is not paramagnetic?
(A) NO (B) CO (C) O_2 (D) B_2

38. A piston filled with 0.04 mole of an ideal gas expands reversibly from 50.0 mL to 375 mL at a constant temperature of 37.0ºC. As it does so, it absorbs 208 J of heat. The values of q and W for the process will be (R = 8.314 J/ mol K, ln 7.5 = 2.01)
(A) q = + 208 J, W = –208 J
(B) q = – 208 J, W = – 208 J
(C) q = – 208 J, W = + 208 J
(D) q = + 208 J, W = + 208 J

39. The molecule having smallest bond angle is
(A) NCl_3 (B) $AsCl_3$ (C) $SbCl_3$ (D) PCl_3

40. Given, $C_{(graphite)} + O_2(g) \longrightarrow CO_2(g); \Delta_r H^o = -393.5\ kJ\ mol^{-1}$

$H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(\ell); \Delta_r H^o = -285.8\ kJ\ mol^{-1}$

$CO_2(g) + 2\,H_2O(\ell) \longrightarrow CH_4(g) + 2O_2(g); \Delta_r H^o = +890.3\ kJ\ mol^{-1}$

Based on the above thermochemical equations, the value of $\Delta_r H^o$ at 298 K for the reaction, $C_{(graphite)} + 2H_2(g) \longrightarrow CH_4(g)$ will be

(A) + 78.8 kJ mol^{-1} (B) + 144.0 kJ mol^{-1} (C) – 74.8 kJ mol^{-1} (D) –144.0 kJ mol^{-1}

41. Molal depression constant for a solvent is 4.0 K kg mol^{-1}. The depression in the freezing point of the solvent for 0.03 mol kg^{-1} solution of K_2SO_4 is

(Assume complete dissociation of the electrolyte)

(A) 0.18 K (B) 0.36 K (C) 0.12 K (D) 0.24 K

42. If solubility product of $Zr_3(PO_4)_4$ is donoted by K_{sp} and its molar solubility is denoted by S, then which of the following relation between S and K_{sp} is correct?

(A) $S = \left(\frac{K_{sp}}{144}\right)^{1/6}$ (B) $S = \left(\frac{K_{sp}}{6912}\right)^{1/7}$ (C) $S = \left(\frac{K_{sp}}{929}\right)^{1/9}$ (D) $S = \left(\frac{K_{sp}}{216}\right)^{1/7}$

43. The reaction of zinc with dilute and concentrated nitric acid, respectively produce

(A) NO_2 and NO (B) NO and N_2O (C) NO_2 and N_2O (D) N_2O and NO_2

44. pK_a of a weak acid (HA) and pK_b of weak base (BOH) are 3.2 and 3.4, respectively. The pH of their salt (AB) solution is

(A) 7.2 (B) 6.9 (C) 7.0 (D) 1.0

45. According to Freundlich adsorption isotherm which of the following is correct?

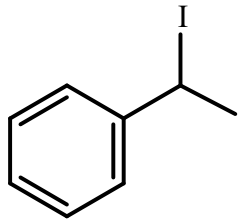
(A) $\frac{x}{m} \propto p^0$

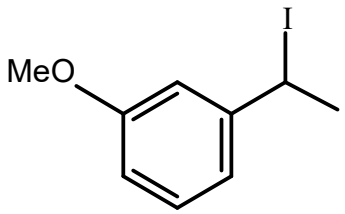
(B) $\frac{x}{m} \propto p^1$

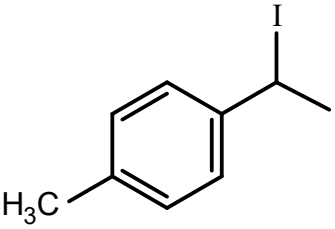
(C) $\frac{x}{m} \propto p^{1/n}$

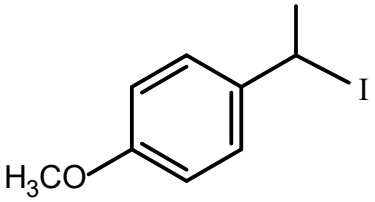
(D) All of the above are correct for different range of pressure

46. Increasing rate of S_N1 reaction in the following compounds is

(a) 

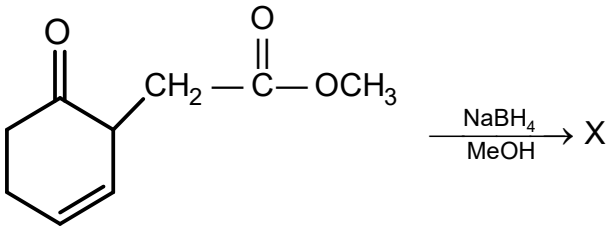
(b) 

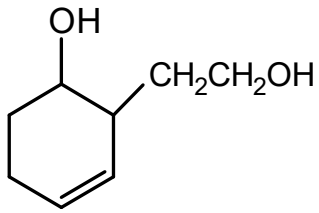
(c) 

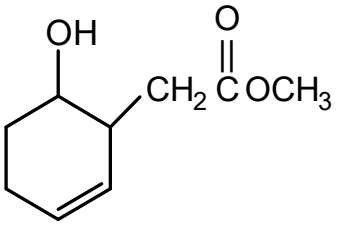
(d) 

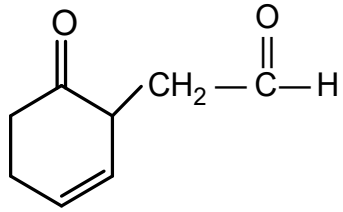
(A) (a) < (b) < (c) < (d)
(B) (b) < (a) < (c) < (d)
(C) (a) < (b) < (d) < (c)
(D) (b) < (a) < (d) < (c)

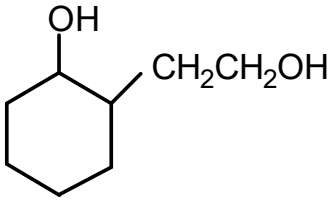
47. The major product 'X' formed in the following reaction is



(A) 

(B) 

(C) 

(D) 

48. Which of the following tests cannot be used for identifying amino acids ?

(A) Barfoed test (B) Ninhydrin test (C) Xanthoproteic test (D) Biuret test

49. Which one is classified as a condensation polymer ?

(A) Dacron (B) Neoprene (C) Teflon (D) Acrylonitrile

50. What is reason of temporary hardness of water ?

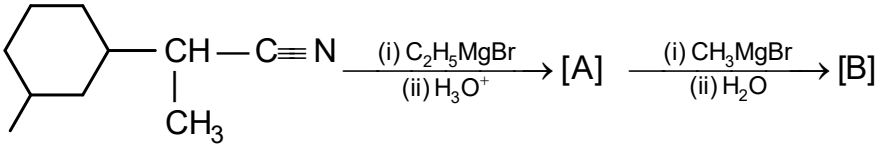
(A) Na_2SO_4 (B) $CaCl_2$ (C) NaCl (D) $Ca(HCO_3)_2$

PART : B (5 × 4 = 20 Marks) (4R – 0W)

NUMERICAL VALUE TYPE QUESTIONS :

(Attempt any Five Questions out of Ten Questions).

51. The number of chiral centres present in [B] is ……



52. The Gibbs energy change (inJ) for the given reaction at $[Cu^{2+}] = [Sn^{2+}] = 1M$ and 298 K is

$Cu\,(s) + Sn^{2+}\,(aq) \longrightarrow Cu^{2+}\,(aq) + Sn\,(s)$; $(E^{o}_{Sn^{2+}/Sn} = -0.16\ V, E^{o}_{Cu^{2+}/Cu} = 0.34\ V,$ Take, $F = 96500\ C\,mol^{-1}$)

53. The number of geometric isomers that can exist for square planar $[Pt(Cl)\,(py)\,(NH_3)\,(NH_2OH)]^{+}$ is (py = pyridine)

54. 1 moles of equimolar mixture of ferric oxalate and ferrous oxalate requires x mole of $KMnO_4$ in acidic medium for complete oxidation, x is :

55. When one litre of a saturated solution of $PbCl_2$ (mol. Mass = 278) is evaporated, the residue is found to weight 2.78 g. If K_{sp} of $PbCl_2$ is represented as $y \times 10^{-6}$ then find the value of y.

56. The rate of decomposition of NH_3 (g) at 10 atm on platinum surface is zero order. What is rate of formation (in M min^{-1}) of $H_2(g)$, if rate constant of reaction $2NH_{3(g)} \rightarrow N_2(g) + 3H_2(g)$ is 2.0 M min^{-1}?

57. During the electrolysis of a concentrated brine solution, calculate the moles of chlorine gas _____ produced by the passage of 4F electricity.

58. The ionic radii of A^+ and B^- are 1.7 Å and 1.8 Å respectively. Find the co-ordination number of A^+.

59. Under the identical conditions of temperature, the density of a gas X is two times to that of gas Y while molecular mass of gas Y is three times that of X. calculate the ratio of pressure of X and Y.

60. In a collection of H-atoms, all the electrons jump from n = 5 to ground level finally (directly or indirectly) without emitting any line in Balmer series. The number of possible different radiation is :

❐❐❐

MATHEMATICS

NOTE: There are 30 questions in this part.

PART : A (20 × 4 = 80 Marks) (4R – 1W)

CHOOSE THE SINGLE CORRECT OPTION:

61. If the sum of the squares of the roots of the equation $x^2-(\sin\alpha-2)x-(1+\sin\alpha)=2$ is least, then α is equal to

(A) $\pi/4$ (B) $\pi/2$ (C) $\pi/3$ (D) $\pi/6$

62. Let A and B be real matrices of the form $\begin{matrix}\alpha & 0\\ 0 & \beta\end{matrix}$ and $\begin{matrix}0 & \gamma\\ \delta & 0\end{matrix}$, respectively

Statement I : AB–BA is always an invertible matrix.

Statement II : AB–BA is never an identity matrix.

(A) Statement I is true, Statement II is true

(B) Statement I is false, Statement II is false

(C) Statement I is true but Statement II is false

(D) Statement I is false but Statement II is true

63. If $f'(x)=\sin(\log x)$ and $y=f\left(\frac{2x+3}{3-2x}\right)$, then $\frac{dy}{dx}$ equals

(A) $\frac{12}{(3-2x)^2}$ (B) $\sin\log\frac{2x+3}{3-2x}$

(C) $\frac{12}{(3-2x)^2}\sin\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$ (D) $\frac{12}{(3-2x)^2}\cos\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$

64. The integral of $\frac{x^2-x}{x^3-x^2+x-1}$ w.r.t x is

(A) $\log|x^2+1|+C$ (B) $\frac{1}{2}\log|x^2-1|+C$ (C) $\frac{1}{2}\log|x^2+1|+C$ (D) $\log|x^2-1|+C$

65. The area enclosed by the curves $y=x^2, y=x^3, x=0$ and $x=p$, where $p>1$, is $\frac{1}{6}$. Then p equals

(A) 8/3 (B) 16/3 (C) 4/3 (D) 2

66. A unit vector which is perpendicular to the vector $2\hat{i}-\hat{j}+2\hat{k}$ and is coplanar with the vectors $\hat{i}+\hat{j}-\hat{k}$ and $2\hat{i}+\hat{j}-\hat{k}$ is

(A) $\frac{3\hat{i}+2\hat{j}-2\hat{k}}{\sqrt{17}}$ (B) $\frac{3\hat{i}+2\hat{j}+2\hat{k}}{\sqrt{17}}$ (C) $\frac{2\hat{i}+2\hat{j}-\hat{k}}{3}$ (D) $\frac{2\hat{i}+\hat{k}}{\sqrt{5}}$

67. The logically equivalent proposition of $p\Leftrightarrow q$ is

(A) $p\wedge q$ (B) (p q) (q p)

(C) (p q) (q p) (D) (p q) (q p)

68. The coordinates of the foot of perpendicular from the point (1, 0, 0) to the line $\frac{x-1}{2}=\frac{y+1}{-3}=\frac{z+10}{8}$ are

(A) (3, –4, –2) (B) (1, –1, –10) (C) (5, –8, –4) (D) (2, –3, 8)

69. If the point (1, a) lies in between the straight lines $x+y=1$ and $2(x+y)=3$, then a lies in interval

(A) $(-\infty,0)$ (B) $(1,3/2)$ (C) $(0,1/2)$ (D) $(3/2,\infty)$

70. Box I contains 30 cards numbered 1 to 30 and Box II contains 20 cards numbered 31 to 50. A box is selected at random and a card is drawn from it. The number on the card is found to be a non-prime number. The probability that the card was drawn from Box I is

(A) $\frac{2}{3}$ (B) $\frac{2}{5}$ (C) $\frac{8}{17}$ (D) $\frac{4}{17}$

71. The domain of the function $f(x)=\sin^{-1}\left(\frac{|x|+5}{x^2+1}\right)$ is $(-\infty,-a]\cup[a,\infty)$. Then a is equal to

(A) $\frac{1+\sqrt{17}}{2}$ (B) $\frac{\sqrt{17}-1}{2}$ (C) $\frac{\sqrt{17}}{2}$ (D) $\frac{\sqrt{17}}{2}+1$

72. If z_1, z_2, z_3 are complex number, such that $|z_1|=2, |z_2|=3, |z_3|=4$ then maximum value of $|z_1-z_2|^2+|z_2-z_3|^2+|z_3-z_1|^2$ is :

(A) 58 (B) 29 (C) 87 (D) None of these

73. Let $y=f(x)$ be the solution of the differential equation, $\frac{2+\sin x}{y+1}\cdot\frac{dy}{dx}=-\cos x, y(0)=1, (y>0)$.

If $y(\pi)=a$ and $\frac{dy}{dx}$ at $x=\pi$ is b, then the ordered pair (a, b) is equal to

(A) $\left(2,\frac{3}{2}\right)$ (B) $(1,-1)$ (C) $(2,1)$ (D) $(1,1)$

74. Let $\alpha>0, \beta>0$ be such that $\alpha^3+\beta^2=4$. If the maximum value of the term independent of x in the binomial expansion of $(\alpha x^{1/9}+\beta x^{-1/6})^{10}$ is $10k$, then k is equal to :

(A) 176 (B) 336 (C) 352 (D) 84

75. If $p(x)$ be a polynomial of degree three that has a local maximum value 8 at x = 1 and a local minimum value 4 at x = 2; then $p(0)$ is equal to

(A) –24 (B) –12 (C) 6 (D) 12

76. A normal to the hyperbola $\frac{x^2}{4}-\frac{y^2}{1}=1$ has equal intercepts on positive x and positive y-axes. If this normal touches the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, then $3(a^2+b^2)$ is equal to

(A) 5 (B) 25 (C) 16 (D) None of these

77. If a function $f(x)$ defined by

$$f(x)=\begin{cases} ae^x+be^{-x} & , \quad -1\le x<1 \\ cx^2 & , \quad 1\le x\le 3 \\ ax^2+2cx & , \quad 3<x\le 4 \end{cases}$$

be continuous for some $a, b, c \in R$ and $f'(0)+f'(2)=e$, then the value of a is

(A) $\frac{1}{e^2-3e+13}$ (B) $\frac{e}{e^2-3e+13}$ (C) $\frac{e}{e^2-3e-13}$ (D) $\frac{e}{e^2+3e+13}$

78. Let the latus rectum of the parabola $y^2=4x$ be the common chord to the circles C_1 and C_2 each of them having radius $2\sqrt{5}$. Then, the distance between the centres of the circles C_1 and C_2 is

(A) 12 (B) 8 (C) $8\sqrt{5}$ (D) $4\sqrt{5}$

79. Let e_1 and e_2 be the eccentricities of the ellipse, $\frac{x^2}{25}+\frac{y^2}{b^2}=1(b<5)$ and the hyperbola, $\frac{x^2}{16}-\frac{y^2}{b^2}=1$ respectively satisfying $e_1e_2=1$. If α and β are the distances between the foci of the ellipse and the foci of the hyperbola respectively, then the ordered pair (α,β) is equal to :

(A) $(8,10)$ (B) $\left(\frac{20}{3},12\right)$ (C) $(8,12)$ (D) $\left(\frac{24}{5},10\right)$

80. $\lim\limits_{x\to a}\frac{(a+2x)^{1/3}-(3x)^{1/3}}{(3a+x)^{1/3}-(4x)^{1/3}}(a\neq 0)$ is equal to :

(A) $\left(\frac{2}{9}\right)\left(\frac{2}{3}\right)^{1/3}$ (B) $\left(\frac{2}{3}\right)^{4/3}$ (C) $\left(\frac{2}{9}\right)^{4/3}$ (D) $\left(\frac{2}{3}\right)\left(\frac{2}{9}\right)^{1/3}$

PART : B (5 × 4 = 20 Marks) (4R – 0W)

NUMERICAL VALUE TYPE QUESTIONS :

(Attempt any Five Questions out of Ten Questions).

81. Let $\vec{a},\vec{b}$ and $\vec{c}$ be three unit vectors such that $|\vec{a}-\vec{b}|^2+|\vec{a}-\vec{c}|^2=8$. Then $|\vec{a}+2\vec{b}|^2+|\vec{a}+2\vec{c}|^2$ is equal to

82. If the letters of the word 'MOTHER' be permuted and all the words so formed (with or without meaning) be listed as in a dictionary, then the position of the word 'MOTHER' is…….

83. If $\lim\limits_{x\to 1}\frac{x+x^2+x^3+....+x^n-n}{x-1}=820,(n\in N)$ then the value of n is equal to …….

84. The integral $\int_0^2||x-1|-x|\,dx$ is equal to ;

85. For a certain curve $\frac{d^2y}{dx^2}=6x-4$ and curve has local minimum value 5 at x = 1. Let the global maximum and global minimum values, where $0\le x\le 2;$ are M and m. Then the value of $(M-m)$ equals to

86. Let a plane P contain two lines
$\vec{r}=\hat{i}+\lambda(\hat{i}+\hat{j}),\lambda\in R$ and
$\vec{r}=-\hat{j}+\mu(\hat{j}-\hat{k}),\mu\in R$.
If $Q(\alpha,\beta,\gamma)$ is the foot of the perpendicular drawn from the point $M(1,0,1)$ to P , then $3(\alpha+\beta+\gamma)$ equals……

87. The coefficient of x^8 in the polynomial $(x-1)(x-2)(x-3).....(x-10)$ is

88. Let S be the set of all integer solutions, (x,y,z), of the system of equations
$x-2y+5z=0$
$-2x+4y+z=0$
$-7x+14y+9z=0$
Such that $15\le x^2+y^2+z^2\le 150$. Then, the number of elements in the set S is equal to…..

89. If the mean of 4, 7, 2, 8, 6 and a is 7, then the mean deviation from the median of these observations is

90. Consider a rectangle whose length is increasing at the uniform rate of 2 m/s, breadth is decreasing at the uniform rate of 3 m/s and the area is decreasing at the uniform rate of 5 m^2/s. If after some time the breadth of the rectangle is 2m, then the length of the rectangle is

❐❐❐

ANSWER KEY

	Physics		Chemistry		Maths
1.	**A**	31.	**A**	61.	**B**
2.	**A**	32.	**D**	62.	**D**
3.	**C**	33.	**D**	63.	**C**
4.	**D**	34.	**A**	64.	**C**
5.	**C**	35.	**A**	65.	**C**
6.	**B**	36.	**B**	66.	**A**
7.	**C**	37.	**B**	67.	**C**
8.	**B**	38.	**A**	68.	**A**
9.	**C**	39.	**C**	69.	**C**
10.	**B**	40.	**C**	70.	**C**
11.	**C**	41.	**B**	71.	**A**
12.	**C**	42.	**B**	72.	**C**
13.	**B**	43.	**D**	73.	**D**
14.	**B**	44.	**B**	74.	**B**
15.	**D**	45.	**D**	75.	**B**
16.	**A**	46.	**B**	76.	**B**
17.	**A**	47.	**B**	77.	**B**
18.	**B**	48.	**A**	78.	**B**
19.	**D**	49.	**A**	79.	**A**
20.	**A**	50.	**D**	80.	**D**
21.	**300**	51.	**2**	81.	**2**
22.	**3.5**	52.	**96500**	82.	**309**
23.	**5.08**	53	**3**	83.	**40**
24.	**1000**	54.	**0.9**	84.	**1.50**
25.	**3.0**	55.	**4**	85.	**2**
26.	**6**	56.	**6**	86.	**5**
27.	**12**	57.	**2**	87.	**1320**
28.	**7**	58.	**8**	88.	**8**
29.	**2**	59.	**6**	89.	**3**
30.	**4**	60.	**6**	90.	**3**