# MOCK TEST PAPER 4

**General Instructions:** *Same as Mock Test Paper 1.*

## Physics

### Section A

**Q. 1.** When a body does not rotate or rotates with a constant angular velocity ( $\omega$ ), It is said to be in :

**(1)** Rotational Equilibrium

**(2)** Stable Equilibrium

**(3)** Translation Equilibrium

**(4)** Neutral Equilibrium

**Q. 2.** Photoelectrons are observed to just emit out of a material surface when the light of 620 nm falls on it with the intensity of 100 W $m^{-2}$. If the light of wavelength 400 nm is incident on the same material with an intensity of 1 W $m^{-2}$, what would be the minimum reverse potential needed to stop the outflow of the electrons?

**(1)** 1 V **(2)** 2 V

**(3)** 1.2 V **(4)** 1.9 V

**Q. 3.** Displacement Current is :

**(1)** Due to flow of free electrons.

**(2)** Due to flow of Positive Ions

**(3)** Due to flow of both Positive and Negative

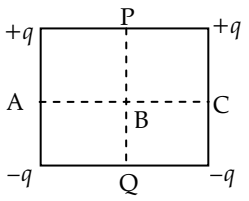
**(4)** Due to time Varying Electric field.

**Q. 4.** Find the binding energy of a H-atom in the state $n = 2$

**(1)** 2.1 eV **(2)** 3.4 eV

**(3)** 4.2 eV **(4)** 2.8 eV

**Q. 5.** Figure represents a square carrying charges $+q$, $+q$, $-q$, $-q$ at its four corners as shown. Then the potential will be zero at points




**(1)** A, B, C, P and Q **(2)** A, B and C

**(3)** A, P, C and Q **(4)** P, B and Q

**Q. 6.** The r.m.s. value of alternating current is 10 A, having frequency of 50 Hz. The time taken by the current to increase from zero to maximum and the maximum value of current will be

**(1)** $2 \times 10^{-2}$ s and 14.14 A

**(2)** $1 \times 10^{-2}$ s and 7.07 A

**(3)** $5 \times 10^{-3}$ s and 7.07 A

**(4)** $5 \times 10^{-3}$ s and 14.14 A

**Q. 7.** In a Young's double slit experiment, the fringe width is found to be 0.4 mm. If the whole apparatus is immersed in water of refractive index $\left(\frac{4}{3}\right)$, without disturbing the geometrical arrangement, the new fringe width will be :

**(1)** 0.30 mm **(2)** 0.40 mm

**(3)** 0.53 mm **(4)** 450 microns

**Q. 8.** A convex lens made of material of refractive index 1.5 and having a focal length of 10 cm is immersed in a liquid of refractive index 3.0. The lens will behave as

**(1)** converging lens of focal length 10 cm

**(2)** diverging lens of focal length 10 cm

**(3)** converging lens of focal length 10/3 cm

**(4)** diverging lens of focal length 30 cm.

**Q. 9.** Dispersive power of crown glass? Given that $\mu_v = 1.5230$, $\mu_r = 1.5145$

**(1)** 2° **(2)** 3°

**(3)** 0.0163° **(4)** 2.5°

**Q. 10.** An air bubble in glass slab ($\mu$ = 1.5) when viewed from one side, appears to be at 6 cm and from opposite side 4 cm. The thickness of glass slab is :

**(1)** 10 cm **(2)** 6.67 cm

**(3)** 15 cm **(4)** None of these

**Q. 11.** A copper block of mass 2.5 kg is heated in a furnace to a temperature of 500°C and then placed on large ice block. The maximum amount of ice that can melt is (Specific heat

of copper = 0.39 $Jg^{-1} \circ C^{-1}$, latent heat of fusion of water = 335 $Jg^{-1}$)

**(1)** 1.2 kg **(2)** 1.455 kg

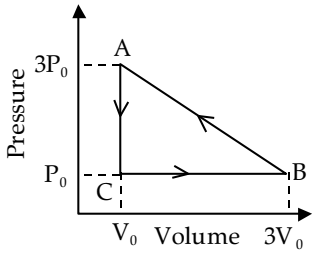
**(3)** 1 kg **(4)** 2.5 kg

**Q. 12.** The number of molecules in 1 $cm^3$ of an ideal gas at 0°C and at a pressure of $10^{-5}$ mm of mercury is :

**(1)** $2.7 \times 10^{11}$ **(2)** $3.5 \times 10^{11}$

**(3)** $6.0 \times 10^{23}$ **(4)** $6 \times 10^{12}$

**Q. 13.** In the figure shown here, the work done in the process ACBA is :




**(1)** $4P_0V_0$ **(2)** $6P_0V_0$

**(3)** $-2P_0V_0$ **(4)** $-4P_0V_0$

**Q. 14.** A slab consist of two parallel layers of copper and brass of the same thickness and having thermal conductivities in the ratio 1 : 4. If the free face of brass is at 100°C and that of copper at 0°C, the temperature of interface is :

**(1)** 80°C **(2)** 20°C

**(3)** 60°C **(4)** 40°C

**Q. 15.** If the length of a cylinder on heating increases by 2%, the area of its base will increase by :

**(1)** 0.5% **(2)** 2%

**(3)** 1% **(4)** 4%

**Q. 16.** A long string, having a cross-sectional area 0.80 $mm^2$ and density 12.5 g/$cm^3$ is subjected to a tension of 64 N along the $x$-axis. One end of the string is attached to a vibrator moving in transverse direction. At $t = 0$, the source is at maximum displacement $y = 1$ cm. Find the speed of wave travelling on the string.

**(1)** 40 m/s **(2)** 80 m/s

**(3)** 20 m/s **(4)** 100 m/s

**Q. 17.** If at same temperature and pressure, the densities for two diatomic gases are respectively $d_1$ and $d_2$, then the ratio of velocities of sound in these gases will be :

**(1)** $\sqrt{\frac{d_2}{d_1}}$ **(2)** $\sqrt{\frac{d_1}{d_2}}$

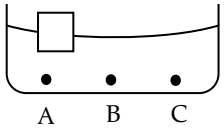
**(3)** $d_1d_2$ **(4)** $\sqrt{d_1d_2}$

**Q. 18.** The S.I. unit of displacement current is :

**(1)** Henry **(2)** Coulomb

**(3)** Ampere **(4)** Faraday

**Q. 19.** A wooden object floats in water kept in a beaker. The object is near a side of the beaker see (figure). Let $P_1$, $P_2$, $P_3$ be the pressures at the three points A, B and C of the bottom as shown in the figure :




**(1)** $P_1 = P_2 = P_3$ **(2)** $P_1 < P_2 < P_3$

**(3)** $P_1 > P_2 > P_3$ **(4)** $P_2 = P_3 \neq P_1$

**Q. 20.** The work done in bringing a 20 coulomb charge from point A to point B for distance 0.2 m is 2 joule. The Potential difference between two point will be (in volt):

**(1)** 8 **(2)** 0.2

**(3)** 0.1 **(4)** 0.4

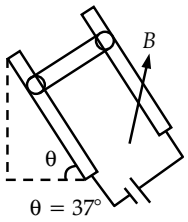
## Section B

**Q. 21.** A capacitor of capacity 2 μF is charged to a potential difference of 12 V. It is then connected across an inductor of inductance 0.6 mH. The current in the circuit at a time when the potential difference across the capacitor is 6.0 V is ……$\times 10^{-1}$A.

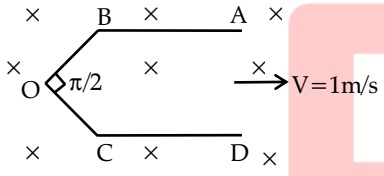
**Q. 22.** A 30 V storage battery is charged from 120 V direct current supply mains with a resistor being connected in series with battery to limit the charging current to 15 A. If all the heat produced in circuit, could be made available in heating water, the time it would take to bring 1 kg of water from 15°C to the 100°C is..... minutes [Neglect the internal resistance of the battery]

**Q. 23.** Two conducting rails are connected to a source of emf and form an incline as shown in figure. A bar of mass 50 g slides without

friction down the incline through a vertical magnetic field B. If the length of the bar is 50 cm and a current of 2.5 A is provided by battery. Value of B for which the bar slide at a constant velocity ……..$\times 10^{-1}$ Tesla. [g = 10 m/s$^2$]




**Q. 24.** A conductor ABOCD moves along its bisector with a velocity 1 m/s through a perpendicular magnetic field of 1 wb/m$^2$, as shown in figure. If all the four sides are 1 m length each, then the induced emf between A and D in approx. is ……. V.

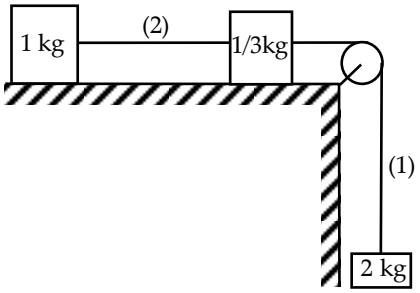



**Q. 25.** A capacitor has charge 50 μC. When the gap between the plates is filled with glass wool, then 120 μC charge flows through the battery to capacitor. The dielectric constant of glass wool is ……. .

**Q. 26.** A ball is thrown upwards from the foot of a tower. The ball crosses the top of tower twice after an interval of 4 seconds and the ball reaches ground after 8 seconds, then the height of tower is ……. m. ($g$ = 10 m/s$^2$)

**Q. 27.** The minimum speed in m/s with which a projectile must be thrown from origin at ground so that it is able to pass through a point P (30 m, 40 m) is : ($g$ = 10 m/s$^2$)

**Q. 28.** All the surfaces are frictionless. Strings are light and frictionless. The tension in string 1 is ……. N. (Take $g$ = 10 m/s$^2$)




**Q. 29.** A point P is located on the rim of wheel of radius R = 0.5 m which rolls without slipping along a horizontal surface then the total distance traversed by the point P in meters between two successive moments it touches the surface is ……. m.

**Q. 30.** An over head tank of capacity 10 k litre is kept at the top of building 15 m high. Water falls in tank with speed $5\sqrt{2}$ m/s. Water level is at a depth 5 m below ground. The tank is to be filled in $\frac{1}{2}$ hr. If efficiency of pump is 67.5% electric power used is ……. W.

# Chemistry

## Section A

**Q. 31.** A hydrated salt of $Na_2SO_3$ loses 22.22 % of its mass on strong heating. The hydrated salt is :

**(1)** $Na_2SO_3.4H_2O$ **(2)** $Na_2SO_3.6H_2O$

**(3)** $Na_2SO_3.H_2O$ **(4)** $Na_2SO_3.2H_2O$

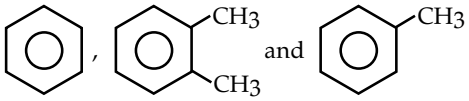
**Q. 32.** Which one of the following is the correct set of hybridisation and shape with respect to molecule?

**(1)** $BeCl_2A$ $sp^2$, linear

**(2)** $BeCl_2A$ $sp^2$, triangular planar

**(3)** $BCl_3A$ $sp^2$, triangular planar

**(4)** $BCl_3A$ $sp^3$, tetrahedral

**Q. 33.** 


Number of secondary carbon atoms present in the above compounds are respectively :

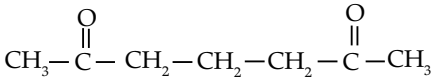
**(1)** 6, 4, 5 **(2)** 4, 5, 6

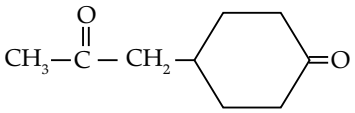
**(3)** 5, 4, 6 **(4)** 6, 2, 1

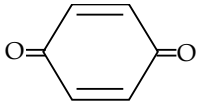
**Q. 34.** Which type of isomerism can be shown by benzaldoxime ?

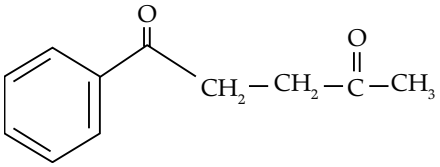
**(1)** Optical isomerism
**(2)** Functional group isomerism
**(3)** Geometrical isomerism
**(4)** Configuration isomerism

**Q. 35.** Which of the following is an example of conjugated diketone?

**(1)** 

**(2)** 

**(3)** 

**(4)** 

**Q. 36.** Match List I with List II.

| List I | List II |
|---|---|
| A. Zymase | I. Stomach |
| B. Diastase | II. Yeast |
| C. Urease | III. Malt |
| D. Pepsin | IV. Soyabean |

**Choose** the correct answer from the options given below:

**(1)** A-II, B-III, C-I, D-IV
**(2)** A-II, B-III, C-IV, D-I
**(3)** A-III, B-II, C-IV, D-I
**(4)** A-III, B-II, C-I, D-IV

**Q. 37.** The conversion of propan–1–ol to n–butylamine involves the sequential addition of reagents. The correct sequential order of reagents is

**(1)** (i) $SOCl_2$ (ii) KCN (iii) $H_2$/Ni, Na(Hg)/$C_2H_5OH$
**(2)** (i) HCl (ii) $H_2$/Ni, Na(Hg)/$C_2H_5OH$
**(3)** (i) $SOCl_2$ (ii) KCN (iii) $CH_3NH_2$
**(4)** (i) HCl (ii) $CH_3NH_2$

**Q. 38.** At 90°C pure water has $[H_3O^+] = 10^{-6}$M. What is the value of $K_w$ at this temperature?

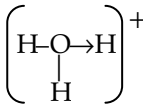
**(1)** $10^{-6}$ **(2)** $10^{-12}$
**(3)** $10^{-13}$ **(4)** $10^{-14}$

**Q. 39.** An equilibrium system for the reaction between hydrogen and iodine to give hydrogen iodide at 765K in a 5 litre volume contains 0.4 mole of hydrogen, 0.4 mole of iodine and 2.4 moles of hydrogen iodide. The equilibrium constant for the reaction is :

$H_2 + I_2 \rightleftharpoons 2HI$, is

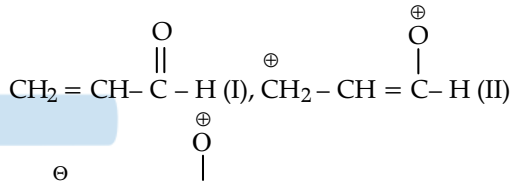
**(1)** 36.0 **(2)** 15.0
**(3)** 0.067 **(4)** 0.028

**Q. 40.** In which of the following species O.N. of the element (s) is equal to + 4 ?

**(1)** $[N = C = S]^-$ **(2)** 

**(3)** $NO_2^+$ **(4)** $C_2H_2$

**Q. 41.** The order of stability of the following resonating structures



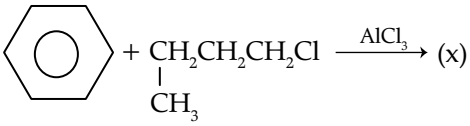
and  is :

**(1)** II > I > III **(2)** I > III > II
**(3)** I > II > III **(4)** III > II > I

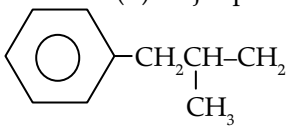
**Q. 42.** $CH \equiv CH \xrightarrow[Cu_4Cl_2]{NH_4Cl}$ product

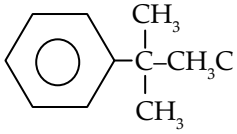
Product is:

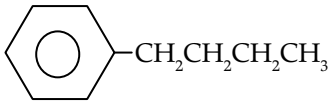
**(1)** Cu–C ≡ C–Cu **(2)** $CH_2 \equiv CH–C \equiv CH$
**(3)** CH=C–Cu **(4)** Cu–C ≡ C–$NH_4$

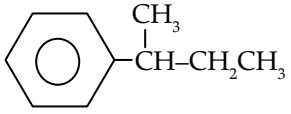
**Q. 43.** 

hydrocarbon (X) major product X is :

**(1)** 

**(2)** 

**(3)** 

**(4)** 

**Q. 44.** For $CH_3Br + OH^- \longrightarrow CH_3OH + Br^-$ the rate of reaction is given by the expression-

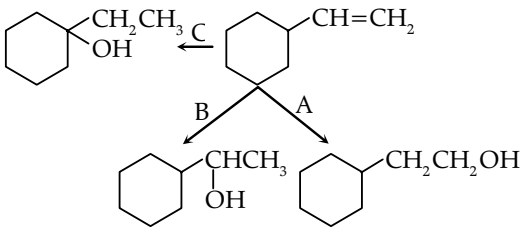
**(1)** rate = k $[CH_3Br]$

**(2)** rate = k $[OH^-]$

**(3)** rate = k $[CH_3Br]$ $[OH^-]$

**(4)** rate = k $[CH_3Br]^0$ $[OH^-]^0$

**Q. 45.**




What will be reagents A, B and C in the above given reactions?

**(1)** A = $H_2O/H^+$; B = $BH_3/H_2O_2$, NaOH; C = $Hg(OAc)_2/H_2O$, $NaBH_4$

**(2)** A = $BH_3/H_2O_2$, A = $H_2O/H^+$; C = $Hg(OAc)_2/H_2O$, $NaBH_4$

**(3)** A = B = C = $BH_3/H_2O_2$

**(4)** A = B = $BH_3/H_2O_2$; C = $H_2O/H^+$

**Q. 46.** An aldehyde isomeric with allyl alcohol gives phenyl hydrazone. Pick out a ketone that too gives a phenyl hydrazone containing the same percentage of nitrogen :

**(1)** Methyl ethyl ketone

**(2)** Dimethyl ketone

**(3)** 2–Butanone

**(4)** 2–Methyl propanone

**Q. 47.** The end product Y in the sequence of reaction :

$RX \xrightarrow{CN^-} X \xrightarrow{NaOH} Y$ is :

**(1)** An alkene

**(2)** A carboxylic acid

**(3)** Sodium salt of carboxylic acid

**(4)** A ketone

**Q. 48.** Methyl amine on reaction with chloroform in the presence of NaOH gives :

**(1)** Methyl isocyanide

**(2)** Methyl chloride

**(3)** N-Methylchloramine

**(4)** Chloramine

**Q. 49.** The major product for the following reaction is $CH_2 = CH - COOH \xrightarrow{LiAlH_4}$

**(1)** $CH_2 = CH - CH_2OH$

**(2)** $CH_3 CH_2 CHOH$

**(3)** $CH_3 CH CHO$

**(4)** $CH_3 CH_2 COOH$

**Q. 50.** Two solutions A and B are prepared by dissolving 1 g of non-volatile solutes X and Y, respectively in 1kg of water. The ratio of depression in freezing points for A and B is found to be 1:4. The ratio of molar masses of X and Y is

**(1)** 1:4 **(2)** 1:0.25

**(3)** 1:0.20 **(4)** 1:5

## Section B

**Q. 51.** The specific rate constant of the decomposition of $N_2O_5$ is 0.008 $min^{-1}$. The volume of $O_2$ collected after 20 minutes is 16 mL. The volume that would be collected at the end of reaction is ..... mL. The $NO_2$ formed is dissolved in $CCl_4$.

**Q. 52.** A sample of $U^{238}$ (half life = $4.5 \times 10^9$ years) ore is found to contain 23.8 g of $U^{238}$ and 20.6 g of $Pb^{206}$. The age of the ore is ..... $\times 10^9$ years.

**Q. 53.** The equilibrium constant at 25°C for the given cell is ..... .

$Zn\,|Zn^{2+}(1M)\,||\,Ag^+(1M)|\,Ag$ is .....$10^{26}$.

Given that

$E^0_{Zn/Zn^{2+}} = 0.76$ V

and $E^0_{Ag/Ag^+} = -0.80$ V

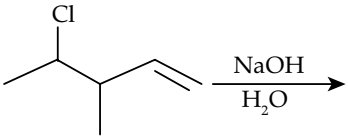
**Q. 54.** A solution of $Fe_2(SO_4)_3$ is electrolyzed for '$x$' min with a current of 1.5 A to deposit 0.3482 g of Fe. The value of $x$ is _____. [Nearest integer]

**Given :1F** = 96500 C $mol^{-1}$

**Atomic mass** of Fe = 56 g $mol^{-1}$

**Q. 55.** 1000 g of 1 m sucrose solution in water is cooled to –3.534°C. What weight of ice would be separated out at this temperature is ..... gm. $K_f(H_2O)$ = 1.86K $mol^{-1}$ kg)

**Q. 56.**




**Consider the** above reaction. The number of π electrons present in the product 'P' is_____

**Q. 57.** Total sodium ions which are present in one formula unit of sodium ethane-1, 2-diaminetetraacetatochromate (II) and sodium hexanitrito cobaltate (III) is ..... .

**Q. 58.** In an ore of iron, iron is present in two oxidation state. $Fe^{n+}$ and $Fe^{(n+1)+}$
Number of $Fe^{(n+1)+}$ is twice the number of $Fe^{n+}$. If empirical formula of ore is $Fe_xO$. The value of $[x \times 100]$ is ..... .

**Q. 59.** The wavelength in Å of the photon that is emitted when an electron in Bohr orbit with $n = 2$ returns to orbit with $n = 1$ in H atom is ..... Å. The ionisation potential of the ground state of H-atom is $2.17 \times 10^{-11}$ erg.

**Q. 60.** An element belonging to 3d series of modern periodic table has spin magnetic moment = 5.92 B.M. in +3 oxidation state. The atomic number of element is ..... .

# Mathematics

## Section A

**Q. 61.** If $z_1, z_2, z_3$ are complex numbers such that $|z_1| = |z_2| = |z_3| = \left|\frac{1}{z_1}+\frac{1}{z_2}+\frac{1}{z_3}\right| = 1$, then $|z_1 + z_2 + z_3|$ is :

**(1)** equal to 1 **(2)** less than 1

**(3)** greater than 3 **(4)** equal to 3

**Q. 62.** $\int (\log x)^2\, dx$ equals :

**(1)** $(x \log x)^2 - 2x \log x + 2x + c$

**(2)** $x (\log x)^2 - 2x \log x + 2x + c$

**(3)** $x (\log x)^2 + 2x \log x + 2x + c$

**(4)** $x (\log x)^2 + 2x \log x - 2x + c$

**Q. 63.** The probability, that in a randomly selected 3-digit number at least two digits are odd, is

**(1)** $\frac{19}{36}$ **(2)** $\frac{15}{36}$ **(3)** $\frac{13}{36}$ **(4)** $\frac{23}{36}$

**Q. 64.** The value of a for which the area between the curve $y^2 = 4ax$ and $x^2 = 4ay$ is 1 square unit is

**(1)** $\sqrt{3}$ **(2)** 4 **(3)** $4\sqrt{3}$ **(4)** $\frac{\sqrt{3}}{4}$

**Q. 65.** If $y = y(x)$ is the solution of the differential equation $2x^2\frac{dy}{dx} - 2xy + 3y^2 = 0$ such that $y(e) = \frac{e}{3}$, then $y(1)$ is equal to

**(1)** $\frac{1}{3}$ **(2)** $\frac{2}{3}$ **(3)** $\frac{3}{2}$ **(4)** 3

**Q. 66.** If the function $y = \frac{ax+b}{(x-4)(x-1)}$ has an extremum at P(2, –1), then the values of $a$ and $b$ are :

**(1)** $a = 0, b = 1$ **(2)** $a = 0, b = -1$

**(3)** $a = 1, b = 0$ **(4)** $a = -1, b = 0$

**Q. 67.** If $f(x) = x^3 + 4x^2 + \lambda x + 1$ ($\lambda \in R$) is a monotonically decreasing function of $x$ in the largest possible interval (–2, –2/3) then :

**(1)** $\lambda = 4$ **(2)** $\lambda = 2$

**(3)** $\lambda = -1$ **(4)** $\lambda$ has no real value

**Q. 68.** $\frac{d}{dx} x^{\log x} =$

**(1)** $x^{\log x}\left(\frac{2\log x}{x}\right)$ **(2)** $x^{\log x}(2 \log x)$

**(3)** $x^{\log x}\left(\frac{\log x}{x}\right)$ **(4)** $x^{\log x}(\log x)$

**Q. 69.** Number of values of $x$ where the function

$$f(x)\begin{cases}\frac{\tan x \log(x-2)}{x^2-4x+3}; & x \in (2, 4)-\{3, \pi\}\\ \frac{1}{6}\tan x; & x = 3, \pi\end{cases}$$

is discontinuous, is ..... .

**(1)** 2 **(2)** 1

**(3)** 0 **(4)** Infinitely many

**Q. 70.** $\lim\limits_{x\to\infty}\left(\frac{x+7}{x+2}\right)^{x+4}$

**(1)** $e^2$ **(2)** $e^3$ **(3)** $e^4$ **(4)** $e^5$

**Q. 71.** If $f(x) = x^3 - 1$ and domain of $f = \{0,1, 2, 3\}$, then domain of $f^{-1}$ is :

**(1)** $\{0, 1, 2, 3\}$ **(2)** $\{1, 0, -7, -26\}$

**(3)** $\{-1, 0, 7, 26\}$ **(4)** $\{0, -1, -2, -3\}$

**Q. 72.** The solution set of the inequation $\log_{1/3}(x^2 + x + 1) + 1 > 0$ is :

**(1)** $(-\infty, -2) \cup (1, +\infty)$

**(2)** $[-1, 2]$

**(3)** $(-2, 1)$

**(4)** $(-\infty, +\infty)$

**Q. 73.** The coefficient of $y^{49}$ in
$(y-1)(y-3)(y-5)\ldots\ldots(y-99)$ is ..... .

**(1)** 2500 **(2)** $-2500$

**(3)** $-99 \times 50$ **(4)** $99 \times 50$

**Q. 74.** If $\alpha, \beta$ are roots of the equation $x^2 + px - q = 0$ and $\gamma, \delta$ are roots of $x^2 + px + r = 0$, then the value of $(\alpha - \gamma)(\alpha - \delta)$ is :

**(1)** $p + r$ **(2)** $p - r$

**(3)** $q - r$ **(4)** $q + r$

**Q. 75.** If n AM's are inserted between 1 and 31 and ratio of $7^{th}$ and $(n-1)^{th}$ A.M. is 5 : 9, then $n$ equals :

**(1)** 12 **(2)** 13 **(3)** 14 **(4)** 15

**Q. 76.** The line segment joining the points (1, 2) and (–2, 1) is divided by the line $3x + 4y = 7$ in the ratio :

**(1)** 3 : 4 **(2)** 4 : 3

**(3)** 9 : 4 **(4)** 4 : 9

**Q. 77.** If the mean of the data 7, 7, 9, 7, 8, 7, $\lambda$, 8 is 7, then the variance of this data is :

(1) $\frac{5}{4}$ **(2)** $\frac{7}{4}$ (3) $\frac{1}{4}$ **(4)** $\frac{11}{4}$

**Q. 78.** If the normal at the point (1, 2) on the parabola $y^2 = 4x$ meets the parabola again at the point $(t^2, 2t)$, then t is equal to

**(1)** 1 **(2)** –1 **(3)** 3 **(4)** $-3$

**Q. 79.** An ellipse is described by using an endless string which is passed over two pins. If the axes are 6 cm and 4 cm, the necessary length of the string and the distance between the pins respectively in cms, are :

**(1)** $6, 2\sqrt{5}$ **(2)** $6, \sqrt{5}$

**(3)** $4, 2\sqrt{5}$ **(4)** $6 + 2\sqrt{5}, 2\sqrt{5}$

**Q. 80.** The foci of a hyperbola coincide with the foci of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$. Find the equation of the hyperbola, if its eccentricity is 2.

**(1)** $\frac{x^2}{4} - \frac{y^2}{12} = 1$ **(2)** $\frac{x^2}{4} - \frac{y^2}{12} = 2$

**(3)** $\frac{x^2}{9} - \frac{y^2}{45} = 1$ **(4)** $\frac{x^2}{2} - \frac{y^2}{10} = 1$

## Section B

**Q. 81.** Let $f(x) = \sin x.\cos^3 x$ and $g(x) = \cos x.\sin^3 x$, then the value of $7\left(\frac{f\left(\frac{\pi}{7}\right)+g\left(\frac{\pi}{7}\right)}{g\left(\frac{5\pi}{14}\right)+f\left(\frac{5\pi}{14}\right)}\right)$ is ..... .

**Q. 82.** Let $y = \sin^2\theta + \cos^2\theta + \tan^2\theta + \sec^2\theta + \text{cosec}^2\theta + \cot^2\theta$ attains its least value (where $\theta \in [0, 4\pi]$), then number of such possible values of $\theta$ is ..... .

**Q. 83.** In triangle ABC, $a = 4$, $b = 3$ and $\angle A = 60°$. If '$c$' is a root of the equation $c^2 - 3c - k = 0$. Then $k$ = ..... . (with usual notations)

**Q. 84.** If $\theta = \sin^{-1}\left(\frac{2x}{1+x^2}\right) + \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$, for $x \geq \frac{3}{2}$, then the absolute value of $\left(\frac{\cos\theta + \tan\theta + 4}{\sec\theta}\right)$ is ..... .

**Q. 85.** If number of arrangements of letters of the word "DHARAMSHALA" taken all at a time so that no two alike letters appear together is $(4^a.5^b.6^c.7^d)$, (where $a, b, c, d \in N$), then $a + b + c + d$ is equal to ..... .

**Q. 86.** A five digit number is formed by the digits 1, 2, 3, 4, 5 without repetition. If the probability that the number formed is divisible by 4, is P, then 5P is ..... .

**Q. 87.** The positive value of the determinant of the matrix A, whose $Adj(Adj(A)) = \begin{pmatrix} 14 & 28 & -14 \\ -14 & 14 & 28 \\ 28 & -14 & 14 \end{pmatrix}$, is ....

**Q. 88.** The number of ordered pairs $(a, b)$, (where $a, b \in R$) satisfying the equation $a^{2008} + b^{2008} = 2008|a||b| - 2006$ is equal to ..... .

**Q. 89.** Let $A(\hat{i} + 2\hat{j} + 3\hat{k})$, $B(\hat{j} + \hat{k})$ and $C(3\hat{i} + 2\hat{j} + 2\hat{k})$ are position vectors of vertices of $\Delta ABC$ and the circumradius of $\Delta ABC$ is R, then $\frac{4R^2}{11}$ is ..... .

**Q. 90.** An edge of variable cube is increasing at the rate of 3 cm/s. The volume of the cube increasing fast when the edge is 10 cm long is ..... $cm^3/s$.