Competishun

52/6, Opposite Metro Mas Hospital, Shipra Path, Mansarovar

Date: 28/10/2024

Time: 3 hours **Max. Marks:** 300

PRAVEEN-2_MCT-4 (24-25)

Physics

Single Choice Question

Q1 A circular loop of radius r is carrying current I A. The ratio of magnetic field at the centre of circular loop and at a distance r from the center of the loop on its axis is :

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

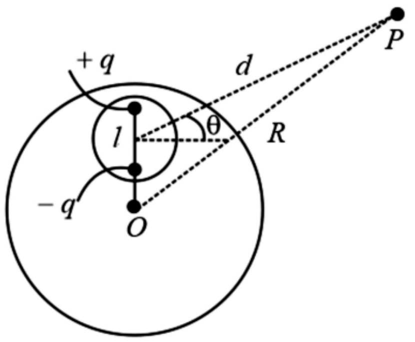
Q2 A coil is placed perpendicular to a magnetic field of 5000 T. When the field is changed to 3000 T in 2 s, an induced emf of 22 V is produced in the coil. If the diameter of the coil is 0.02 m, then the number of turns in the coil is :

a) 7 b) 70 c) 35 d) 140

Q3 An inductance coil has a reactance of 100 Ω. When an AC signal of frequency 1000 Hz is applied to the coil, the applied voltage leads the current by 45°. The self-inductance of the coil is :

a) 6.7×10^{-7} H b) 5.5×10^{-5} H c) 1.1×10^{-1} H d) 1.1×10^{-2} H

Q4 A spherical cavity is created in a neutral solid conducting sphere. Inside the cavity, a dipole is placed as shown in the figure. Electrostatic potential at point P only due to charge induced on the inner surface of the cavity is. (assume that ℓ <<d)



a) $\frac{q\ell}{4\pi\varepsilon_0}\frac{\sin\theta}{d^2}$ b) $\frac{-q\ell\sin\theta}{4\pi\varepsilon_0 d^2}$ c) $\frac{-q\ell}{4\pi\varepsilon_0}\frac{\sin\theta}{d}$ d) $\frac{q\ell\sin\theta}{4\pi\varepsilon_0 d}$

Q5 The threshold frequency of a metal with work function 6.63 eV is:

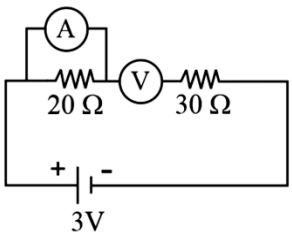
a) 16×10^{15} Hz b) 16×10^{12} Hz c) 1.6×10^{12} Hz d) 1.6×10^{15} Hz

Q6 The ratio of the density of oxygen nucleus $\left({}^{16}_{8}O\right)$ and helium nucleus $\left({}^{4}_{2}He\right)$ is

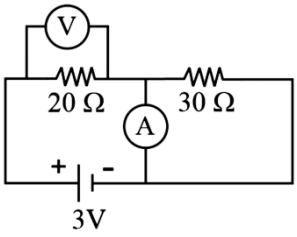
a) 4 : 1 **b)** 8 : 1 **c)** 1 : 1 **d)** 2 : 1

Q7 Resistors of resistance 20Ω and 30Ω are joined in series with a battery of emf 3V. It is desired to measure current and voltage across the 20Ω resistor with the help of an ammeter and a voltmeter. Identify the correct arrangement of ammeter (A) and voltmeter (V) out of four possible arrangements shown in the figure given below.

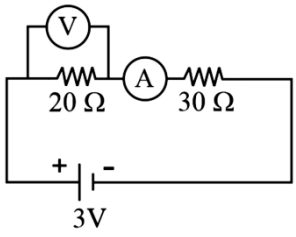
a)



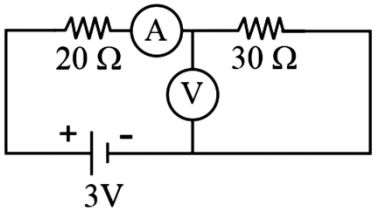
b)



c)



d)



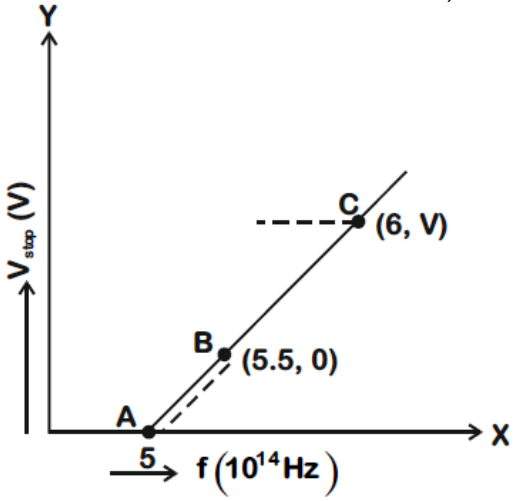
Q8 The threshold frequency of metal is f_0. When the light of frequency $2f_0$ is incident on the metal plate, the maximum velocity of photoelectron is vi. When the frequency of incident radiation is increased to $5f_0$. the maximum velocity of photoelectrons emitted is v_2. The ratio of v_1 to v_2 is:

a) $\frac{v_1}{v_2}=\frac{1}{2}$ **b)** $\frac{v_1}{v_2}=\frac{1}{8}$ **c)** $\frac{v_1}{v_2}=\frac{1}{16}$ **d)** $\frac{v_1}{v_2}=\frac{1}{4}$

Q9 A monochromatic neon lamp with wavelength of 670.5 nm illuminates a photo-sensitive material which has a stopping voltage of 0.48 V. What will be the stopping voltage if the source light is changed with another source of wavelength of 474.6 nm?

a) 0.96 V **b)** 1.25 V **c)** 0.24 V **d)** 1.5 V

Q10 Given figure shows few data points in a photo electric effect experiment for a certain metal. The minimum energy for ejection of electron from its surface is (Plancks constant h = 6.62×10^{-34} J.s)



a) 2.59 eV **b)** 2.27 eV **c)** 1.93 eV **d)** 2.10 eV

Q11 Nucleus A is having mass number 220 and its binding energy per nucleon is 5.6 MeV. It splits in two fragments 'B' and 'C' of mass numbers 105 and 115. The binding energy of nucleons in 'B' and 'C' is 6.4 MeV per nucleon. The energy Q released per fission will be :

a) 0.8 MeV **b)** 275 MeV **c)** 220 MeV **d)** 176 MeV

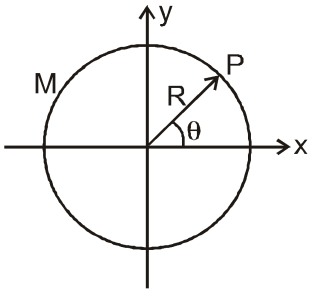
Q12 The momentum of an electron revolving in n^{th} orbit is given by : (Symbols have their usual meanings)

a) $\frac{nh}{2\pi r}$ **b)** $\frac{nh}{2r}$ **c)** $\frac{nh}{2\pi}$ **d)** $\frac{2\pi r}{nh}$

Q13 Find the binding energy per nucleon for $^{120}_{50}Sn$. Mass of proton $m_p = 1.00783$ U, mass of neutron $m_n = 1.00867$ U and mass of tin nucleus $m_{Sn} = 119.902199$ U. (take 1U = 931 MeV)

a) 9.0 MeV **b)** 8.5 MeV **c)** 8.0 MeV **d)** 7.5 MeV

Q14 A ring of mass M and radius R lies in x-y plane with its centre at origin as shown. The mass distribution of ring is non uniform such that, at any point P on the ring, the mass per unit length is given by $\lambda = \lambda_0 \cos^2\theta$ (where λ_0 is a positive constant). Then the moment of inertia of the ring about z-axis is :



a) MR^2 **b)** $\frac{1}{2}MR^2$ **c)** $\frac{1}{2}\frac{M}{\lambda_0}R$ **d)** $\frac{1}{\pi}\frac{M}{\lambda_0}R$

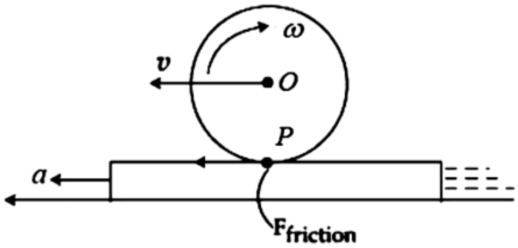
Q15 An alternating voltage of amplitude $40\ V$ and frequency $4kHz$ is applied directly across the capacitor of $12\mu F$. The maximum displacement current between the plates of the capacitor is nearly:

a) 13 A **b)** 8 A **c)** 10 A **d)** 12 A

Q16 In a radioactive decay chain, the initial nucleus is $^{232}_{90}$th at the end there are 6 α-particles and 4 β^- particles which are emitted. If the end nucleus is $^{A}_{Z}X$, A and Z are given by:

a) A = 200; Z = 81 **b)** A = 202; Z = 80 **c)** A = 208; Z = 80 **d)** A = 208; Z = 82

Q17 Consider a cylinder of mass M resting on a rough horizontal rug that is pulled out from under it with acceleration ‘a’ perpendicular to the axis of cylinder. What is $F_{friction}$ at point P? It is assumed that the cylinder does not slip.

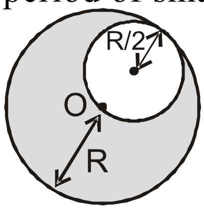


a) Ma **b)** $\frac{Ma}{2}$ **c)** $\frac{Ma}{3}$ **d)** Mg

Q18 The amplitude of magnetic field in an electromagnetic wave propagating along y-axis is 6.0×10^{-7} T. The maximum value of electric field in the electromagnetic wave is:

a) 5×10^{14} Vm^{-1} **b)** 180 Vm^{-1} **c)** 2×10^{15} Vm^{-1} **d)** 6.0×10^{-7} Vm^{-1}

Q19 A uniform disc of mass m & radius R is pivoted at its centre O with its plane vertical as shown in figure A circular portion of disc of radius $\frac{R}{2}$ is removed from it. The time period of small oscillations of remaining portion about O is -



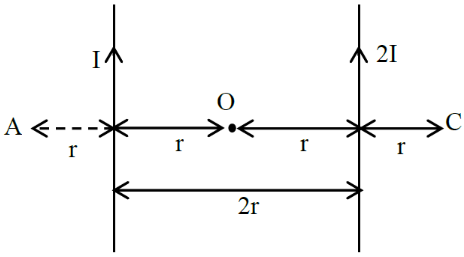
a) $3\pi\sqrt{\frac{R}{g}}$ **b)** $\pi\sqrt{\frac{13R}{g}}$ **c)** $2\pi\sqrt{\frac{39R}{16g}}$ **d)** $2\pi\sqrt{\frac{7R}{6g}}$

Q20 A series LCR circuit is subjected to an AC signal of 200 V, 50 Hz. If the voltage across the inductor $(L = 10 mH)$ is 31.4 V, then the current in this circuit is

a) 68 A **b)** 63 A **c)** 10 A **d)** 10 mA

Numerical

Q21 Two parallel long current carrying wire separated by a distance 2r are shown in the figure. The ratio of magnetic field at A to the magnetic field produced at C is $\frac{x}{7}$. The value of x is ______.



Q22 A alternating current at any instant is given by $i = \left[6 + \sqrt{56}\sin\left(100\pi t + \frac{\pi}{3}\right)\right]A$. The rms value of the current is________ A.

Q23 A parallel plate capacitor with width 4 cm, length 8 cm and separation between the plates of 4 mm is connected to a battery of 20 V. A dielectric slab of dielectric constant 5 having length 1 cm, width 4 cm and thickness 4 mm is inserted between the plates of parallel plate capacitor. The electrostatic energy of this system will be............ϵ_0 J, (Where ϵ_0 is the permittivity of free space)

Q24 A proton with a kinetic energy of 2.0 eV moves into a region of uniform magnetic field of magnitude $\frac{\pi}{2} \times 10^{-3}$ T. The angle between the direction of magnetic field and velocity of proton is 60°. The pitch of the helical path taken by the proton is_______cm.
(Take, mass of proton = 1.6×10^{-27} kg and Charge on proton = 1.6×10^{-19} C).

Q25 The current density in a cylindrical wire of radius r = 4.0 mm is 1.0×10^6 A/m^2. The current through the outer portion of the wire between radial distances r/2 and r is xπ A; where x is _______ .

Chemistry

Single Choice Question

Q26 Dissolution of white precipitate of Hg_2Cl_2 in aquaregia evolved the gas

a) Cl_2 **b)** NO **c)** NO_2 **d)** HCl

Q27 In the complex $[SbF_5]^{2-}$, sp^3d hybridisation is present. Geometry of the complex is :

a) Square pyramidal **b)** Square bipyramidal **c)** Tetrahedral **d)** Square planar

Q28 Crystal field stabilization energy for high spin d^4 octahedral complex is :

a) $-0.6\ \Delta_0$ **b)** $-1.8\ \Delta_0$ **c)** $-1.6\ \Delta_0 + P$ **d)** $-1.2\ \Delta_0$

Q29 The values of $\frac{K_p}{K_c}$ for the following reactions at 300 K are, respectively (At 300 K, RT = 24.62 dm^3 atm mol^{-1})

$$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$$

$$N_2O_4(g) \rightleftharpoons 2NO_2(g)$$

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

a) 24.62 dm^3 atm mol^{-1}, 606.0 dm^6 atm^2 mol^{-2}, 1.65×10^{-3} dm^{-6} atm^{-2} mol^2

b) 124.62 dm^3 atm mol^{-1}, 1.65×10^{-3} dm^{-6} atm^{-2} mol^2

c) 124.62 dm^3 atm mol^{-1}, 606.0 dm^6 atm^2 mol^{-2}

d) 14.1×10^{-2} dm^{-3} atm^{-1} mol, 606 dm^6 atm^2 mol^{-2}

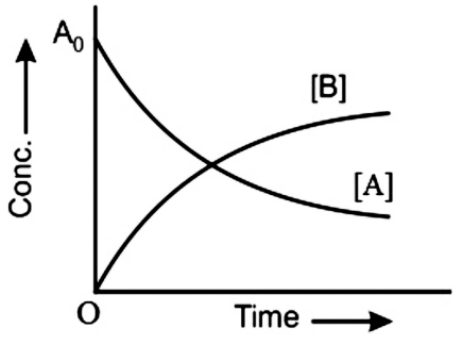
Q30 But-1-ene may be converted to butane by reaction with :

a) Zn – HCl **b)** Sn – HCl **c)** Zn – Hg **d)** Pd / H_2

Q31 16 g oxygen gas expands at STP to occupy double of its original volume. The magnitude of work done during the process is:

a) 260 cal **b)** 180 cal **c)** 130 cal **d)** 271.6 cal

Q32 At the point of intersection of the two curves shown, the concentration of B is given by …….. for the first order reaction $A \rightarrow nB$.



a) $\frac{nA_0}{2}$ **b)** $\frac{A_0}{n-1}$ **c)** $\frac{nA_0}{n+1}$ **d)** $\left(\frac{n-1}{n+1}\right)A_0$

Q33 At what minimum pressure (in terms of kPa) of given volume of an ideal gas $\left(C_{p,m} = \frac{7}{2}R\right)$, originally at 400 K and 100 kPa pressure, be irreversibly adiabatically compressed in order to raise its temperature to 600 K?

a) 362.5 kPa **b)** 275.0 kPa **c)** 437. 5 kPa **d)** 550.0 kPa

Q34 At 500 K, the half life period of a gasesous reaction at an initial pressure gaseous reaction at an initial pressure of 80 kPa is 350 s. What the pressure is 40 kPa, the half life period is 175 s; the order of the reaction is:

a) zero **b)** one **c)** two **d)** three

Q35 The rate constant (k') of one reaction is double the rate constant (k'') of another reaction. Then the relationship between the corresponding activation energies of the two reactions.

$\left(E_a^{'} \text{and} E_a^{''}\right)$ will be-

(Assume the pre – exponential factor & temperature to be same)

a) $E_a^{'} > E_a^{''}$ **b)** $E_a^{'} = E_a^{''}$ **c)** $E_a^{'} < E_a^{''}$ **d)** $E_a^{'} < 4E_a^{''}$

Q36 The reduction potential of a half-cell consisting of a Pt electrode immersed in 1.5 M Fe^{2+} and 0.015 M Fe^{3+} solution at 25°C is $\left(E^0_{Fe^{3+}/Fe^{2+}} = 0.770\ V\right)$.

a) 0.652 V **b)** 0.88 V **c)** 0.710 V **d)** 0.850 V

Q37 Pink colour of acidified $KMnO_4$ is decolourised but there is no evolution of any gas. This may happen with the compound containing the following acid radical.

a) SO_3^{2-} **b)** NO_2^- **c)** S^{2-} **d)** All of these

Q38 When KI is added to acidified solution of sodium nitrite :

a) NO gas is liberated and I_2 is set free **b)** N_2 gas is liberated and HI is produced

c) N_2O gas is liberated and I_2 is set free **d)** N_2 gas is liberated and HOI is produced

Q39 Given below are two statements :
Statement I : Bohr's theory accounts for the stability and line spectrum of Li^+ ion.
Statement II : Bohr's theory was unable to explain the splitting of spectral lines in the presence of a magnetic field.
In the light of the above statements, choose the most appropriate answer from the options given below :

a) Both statement I and statement II are true.

b) Statement I is false but statement II is true.

c) Both statement I and statement II are false.

d) Statement I is true but statement II is false.

Q40 Which one of the following about an electron occupying the 1s orbital in a hydrogen atom is incorrect? (The Bohr radius is represented by a_0)

a) The probability density of finding the electron is maximum at the nucleus

b) The electron can be found at a distance $2a_0$ from the nucleus

c) The magnitude of the potential energy is double that of its kinetic energy on an average

d) The total energy of the electron is maximum when it is at a distance a_0 from the nucleus

Q41 Match List I and with List II

List-I (Molecule)		List-II(Shape)	
A	NH_3	I.	Square pyramid
B.	BrF_5	II.	Tetrahedral
C.	PCl_5	III	Trigonal pyramidal
D.	CH_4	IV	Trigonal bipyramidal

Choose the correct answer from the option below :

a) A→IV, B→ III, C→I, D→II

b) A→II, B→IV, C→I, D→III

c) A→III, B→I, C→IV, D→II

d) A→III, B→IV, C→I, D→II

Q42 If a substance 'A' dissolves in solution of a mixture of 'B' and 'C' with their respective number of moles as n_A, n_B and n_C, mole fraction of C in the solution is:

a) $\frac{n_C}{n_A \times n_B \times n_C}$ **b)** $\frac{n_C}{n_A + n_B + n_C}$ **c)** $\frac{n_C}{n_A - n_B - n_C}$ **d)** $\frac{n_B}{n_A + n_B}$

Q43 $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

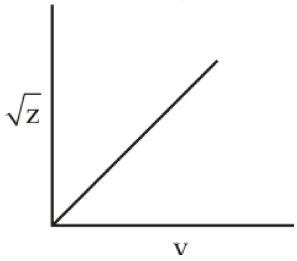
20 g 5 g

Consider the above reaction, the limiting reagent of the reaction and number of moles of NH_3 formed respectively are:

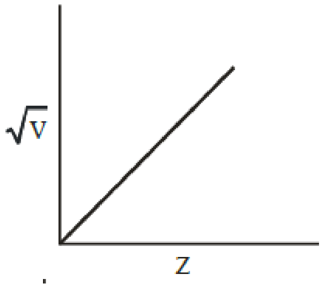
a) H_2, 1.42 moles **b)** H_2, 0.71 moles **c)** N_2, 1.42 moles **d)** N_2, 0.71 moles

Q44 Henry Moseley studied characteristic X-ray spectra of elements. The graph which represents his observation correctly is : (Given v = frequency of X-ray emitted; Z = atomic number)

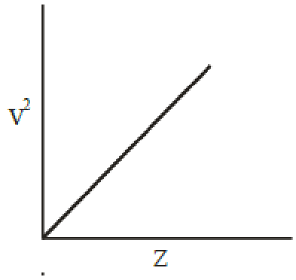
a)



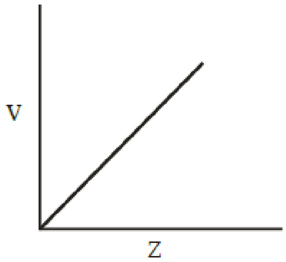
b)



c)



d)



Q45 When the hydrogen ion concentration $[H^+]$ changes by a factor of 1000, the value of pH of the solution ________.

a) increases by 1000 units **b)** decreases by 3 units **c)** decreases by 2 units

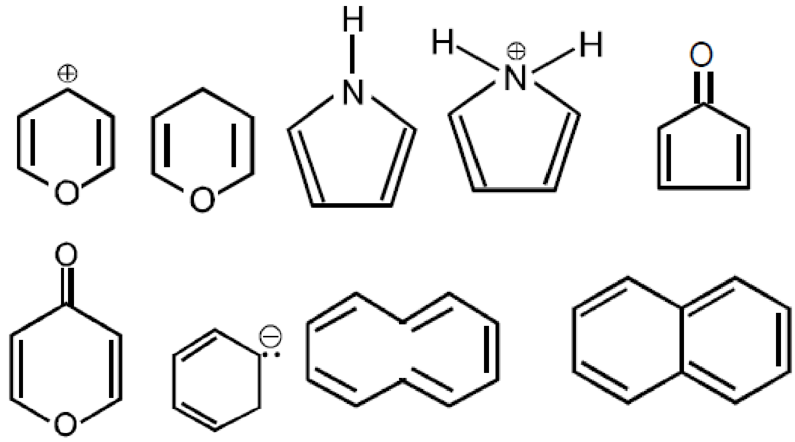
d) increases by 2 units

Numerical

Q46 A 1 molal $K_4Fe(CN)_6$ solution has a degree of dissociation of 0.4. Its boiling point is equal to that of another solution which contains 18.1 weight percent of a non electrolytic solute A. The molar mass of A is______ u. (Round off to the Nearest Integer).
[Density of water = 1.0 g cm^{-3}]

Q47 How many of the following compound will give positive test with ammonical silver nitrate ?
(I) Ethyne
(II) Formic acid
(III) Formaldehyde
(IV) Benzaldehyde
(V) Fructose
(VI) Acetal
(VII) Sucrose
(VIII) Maltose

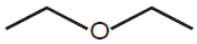
Q48 Consider the following compounds :

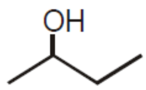


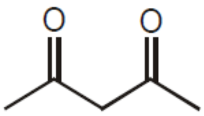
How many species are aromatic.

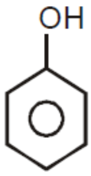
Q49 How many of the following compounds give benzene on reaction with PhMgBr?

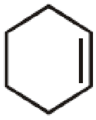
(1) $CH_3 - C \equiv CH$

(2) 

(3) 

(4) 

(5) 

(6) 

(7) CH_3NH_2

(8) $CH_3–CH_2–SH$

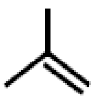
(9) $CH_3–C≡C–CH_3$

Q50 In how many reactions 3° alcohol will be major product ?

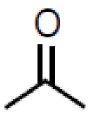
(I) $CH_3 - \overset{O}{\overset{\|}{C}} - CH_3 \xrightarrow[H^{\oplus}]{CH_3MgBr/ether/excess}$

(II) $CH_3 - \overset{O}{\overset{\|}{C}} - Cl \xrightarrow[H^{\oplus}]{CH_3MgBr/ether/excess}$

(III) $Cl - \overset{O}{\overset{\|}{C}} - Cl \xrightarrow[H^{\oplus}]{CH_3MgBr/ether/excess}$

(IV)  $\xrightarrow{H_2O/H^{\oplus}}$

(V)  $\xrightarrow[H_2O_2/OH^{\ominus}]{B_2H_6/T.H.F.}$

(VI)  $\xrightarrow{LiAlH_4}$

Mathematics

Single Choice Question

Q51 For the system of linear equations
$2x + 4y + 2az = b$
$x + 2y + 3z = 4$
$2x - 5y + 2z = 8$
Which of the following is **NOT** correct?

a) It has infinitely many solutions if $a = 3$, $b = 6$
b) It has unique solution if $a = b = 6$
c) It has unique solution if $a = b = 8$
d) It has infinitely many solution if $a = 3$, $b = 8$

Q52 Let α and β be two roots of the equation $x^2 + 2x + 2 = 0$, then $\alpha^{15} + \beta^{15}$ is equal to-

a) -512 **b)** 512 **c)** 256 **d)** -256

Q53 If $A + B + C = \pi$, then $\cos A + \cos B - \cos C =$

a) $-1 + 4 \sin A/2 \cos B/2 \sin C/2$
b) $-1 + 4 \cos A/2 \sin B/2 \sin C/2$
c) $4 \cos A/2 \sin B/2 \sin C/2$
d) $-1 + 4 \cos A/2 \cos B/2 \sin C/2$

Q54 Let A and B be two 3×3 real matrices such that $(A^2 - B^2)$ is invertible matrix. If $A^5 = B^5$ and $A^3B^2 = A^2B^3$, then the value of the determinant of the matrix A^3+B^3 is equal to :

a) 2 **b)** 4 **c)** 1 **d)** 0

Q55 Let $A = [a_{ij}]$ be a square matrix of order 3 such that $a_{ij} = 2^{j-i}$, for all $i, j = 1, 2, 3$. Then, the matrix $A^2 + A^3 + \ldots + A^{10}$ is equal to :

a) $\left(\frac{3^{10}-3}{2}\right)A$ **b)** $\left(\frac{3^{10}-1}{2}\right)A$ **c)** $\left(\frac{3^{10}+1}{2}\right)A$ **d)** $\left(\frac{3^{10}+3}{2}\right)A$

Q56 Let a_n be the n^{th} term of a G.P. of positive terms. If $\sum_{n=1}^{100} a_{2n+1} = 200$ and $\sum_{n=1}^{100} a_{2n} = 100$,

then $\sum_{n=1}^{200} a_{2n}$ is equal to :

a) 300 **b)** 150 **c)** 175 **d)** 225

Q57 If $|x| < 1$, $|y| < 1$ and $x \neq y$, then the sum to infinity of the following series $(x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \ldots$ is :

a) $\frac{x+y+xy}{(1+x)(1+y)}$ **b)** $\frac{x+y-xy}{(1-x)(1-y)}$ **c)** $\frac{x+y-xy}{(1+x)(1+y)}$ **d)** $\frac{x+y+xy}{(1-x)(1-y)}$

Q58 If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$, then the vector $\vec{c}$ such that $\vec{a} \cdot \vec{c} = 2$ and $\vec{a} \times \vec{c} = \vec{b}$ is-

a) $\frac{1}{3}(\hat{i} - 2\hat{j} + \hat{k})$ **b)** $\frac{1}{3}(-\hat{i} + 2\hat{j} + 5\hat{k})$ **c)** $\frac{1}{3}(\hat{i} + 2\hat{j} - 5\hat{k})$ **d)** $\frac{1}{3}(-\hat{i} + 2\hat{j} - 5\hat{k})$

Q59 The three vectors $\hat{i} + 2 + \hat{j} + \hat{k}$, $a\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} + 2\hat{j} + a\hat{k}$ are coplanar-

a) for no real value of a **b)** for all real values of a **c)** for one real value of a
d) for two real values of a

Q60 Let z_1 and z_2 be two complex numbers satisfying $|z_1| = 9$ and $|z_2 - 3 - 4i| = 4$. Then the minimum value of $|z_1 - z_2|$ is_____

a) 0 **b)** $\sqrt{2}$ **c)** 1 **d)** 2

Q61 Let $z \in C$ be such that $|z| < 1$. If $\omega = \frac{5+3z}{5(1-z)}$, then_____

a) $5\,\mathrm{Re}(\omega) > 4$ **b)** $5\,\mathrm{Re}(\omega) > 1$ **c)** $4\,\mathrm{Im}(\omega) > 5$ **d)** $5\,\mathrm{Im}(\omega) < 1$

Q62 If $y = (x + \sqrt{1+x^2})^n$, then $(1 + x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx}$ is -

a) n^2y **b)** $-n^2y$ **c)** $-y$ **d)** $2n^2y$

Q63 The solution of the equation $(2x + y + 1)\,dx + (4x + 2y - 1)\,dy = 0$ is -

a) $\log|2x + y - 1| = C + x + y$ **b)** $\log(4x + 2y - 1) = C + 2x + y$
c) $\log(2x + y + 1) + x + 2y = C$ **d)** $\log|2x + y - 1| + x + 2y = C$

Q64 $\int_0^{\pi/4} \left(\frac{x}{x\sin x + \cos x}\right)^2 dx =$

a) $\frac{3+\pi}{4-\pi}$ **b)** $\frac{4-\pi}{3+\pi}$ **c)** $\frac{4-\pi}{4+\pi}$ **d)** $\frac{4+\pi}{4-\pi}$

Q65 Which of the following is not correct ?

a) $\int_{-a}^{a} x.(f(\cos x))^2.dx = 0$ **b)** $\int_0^{n\pi} f(\cos^2 x)\,dx = n\int_0^{\pi} f(\cos^2 x)\,dx \quad n \in N$

c) $\int_0^{b-c} f(x+c)\,dx = \int_b^c f(x)\,dx$ **d)** $\int_a^{\pi-a} x.f(\sin x)\,dx = \frac{\pi}{2}\int_a^{\pi-a} f(\sin x)\,dx$

Q66 The straight line joining any point P on the parabola $y^2 = 4ax$ to the vertex and perpendicular from the focus to the tangent at P, intersect at R, then the equation of the locus of R is -

a) $2x^2 + y^2 - 2ay = 0$ **b)** $2x^2 + y^2 - 2ax = 0$ **c)** $2x^2 + 2y^2 - ay = 0$
d) $x^2 + 2y^2 - ax = 0$

Q67 PQ is a double ordinate of the ellipse $x^2 + 9y^2 = 9$, the normal at P meets the diameter through Q at R, then the locus of midpoint of PR is–

a) a circle b) a parabola c) an ellipse d) a hyperbola

Q68 If $P(\theta)$, $Q\left(\theta+\frac{\pi}{2}\right)$ are points on ellipse and α is angle between normals at P and Q then -

a) $2\sqrt{1-e^2} = e\sin^2 2\theta \tan\alpha$

b) $2\sqrt{1-e^2} = e\sin^2\theta.\tan 2\alpha$

c) $\sqrt{1-e^2} = 2e^2\sin^2 2\theta.\tan\alpha$

d) $2\sqrt{1-e^2} = e^2\sin^2 2\theta.\tan\alpha$

Q69 Equation of a common tangents to the curves $y^2 = 8x$ and $xy = -1$ is

a) $3y = 9x + 2$ b) $y = 2x + 1$ c) $2y = x + 8$ d) $y = x + 2$

Q70 If $\sum_{i=1}^{9}(x_i - 5) = 9$ and $\sum_{i=1}^{9}(x_i - 5)^2 = 45$, then the standard deviation of the 9 items $x_1, x_2, \ldots, x_9$ is :

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

Numerical

Q71 Let A_1, A_2, A_3 be the three A.P. with the same common difference d and having their first terms as A, A + 1, A + 2, respectively. Let a, b, c be the 7^{th}, 9^{th}, 17^{th} terms of A_1, A_2, A_3, respectively such that $\begin{vmatrix} a & 7 & 1 \\ 2b & 17 & 1 \\ c & 17 & 1 \end{vmatrix} + 70 = 0$

If a = 29, then the sum of first 20 terms of an AP whose first term is c – a – b and common difference is $\frac{d}{12}$, is equal to _______ .

Q72 If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + \hat{k}$, $\vec{c} = \hat{i} + 2\hat{j} - \hat{k}$, then the value of $\begin{vmatrix} \bar{a}.\bar{a} & \bar{a}.\bar{b} & \bar{a}.\bar{c} \\ \bar{b}.\bar{a} & \bar{b}.\bar{b} & \bar{b}.\bar{c} \\ \bar{c}.\bar{a} & \bar{c}.\bar{b} & \bar{c}.\bar{c} \end{vmatrix}$ is

Q73 The rate at which a substance cools in moving air is proportional to the difference between the temperatures of the substance and that of the air. If the temperature of the air is 290° K and the substance cools from 370° K to 330°K in 10 minutes, After how many minutes will the temperature be 295°K -

Q74 A circle has the same centre as an ellipse & passes through the foci F_1 & F_2 of the ellipse, such that the two curves intersect in 4 points. Let 'P' be any one of their point of intersection. If the major axis of the ellipse is 17 & the area of the triangle PF_1F_2 is 30, then the distance between the foci is -

Q75 The value of $\lim\limits_{x\to 0}\left\{\left[\dfrac{100x}{\sin x}\right]+\left[\dfrac{99\sin x}{x}\right]\right\}$ where [ ] represents the greatest function is-

Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**C**	**B**	**D**	**B**	**D**	**C**	**C**	**A**	**B**	**B**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**D**	**A**	**B**	**A**	**D**	**D**	**C**	**B**	**B**	**C**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**5**	**8**	**240**	**40**	**12**	**B**	**A**	**A**	**B**	**D**
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	**D**	**C**	**B**	**A**	**C**	**A**	**D**	**A**	**B**	**D**
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	**C**	**B**	**C**	**B**	**B**	**85**	**6**	**4**	**6**	**3**
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	**A**	**D**	**D**	**D**	**A**	**B**	**B**	**B**	**D**	**A**
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	**B**	**A**	**D**	**C**	**C**	**B**	**C**	**D**	**D**	**A**
Que.	71	72	73	74	75					
Ans.	**495**	**16**	**40**	**13**	**198**					