Competishun

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

Date: 16/09/2024

Time: 3 hours **Max. Mark**

PRAVEEN-2_(24-25)_ACT-3_PAPER-1

Physics

Single Choice Question

Q1 Two particles execute SHM on same straight line with same mean position, same t period 6 second and same amplitude 5 cm. Both the particles start SHM from their mean position (in same direction) with a time gap of 1 second. Find the maximum separation between the two particles during their motion :

a) 2 cm **b)** 3 cm **c)** 4 cm **d)** 5 cm

Q2 A particle is subjected to two simple harmonic motions along x and y directions according to, $x = 3 \sin 100\pi t$; $y = 4 \sin 100 \pi t$. (x, y are in meter and t is in sec.)

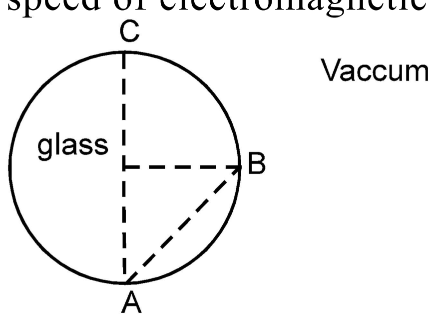
a) Motion of particle will be on ellipse traversing it in clockwise direction.

b) Motion of particle will be on a straight line with slope 4/3.

c) Motion will be a simple harmonic motion along x − axis with amplitude 5.

d) Phase difference between two motions is $\pi/2$.

Q3 It is found that all electromagnetic signals sent from A towards B reach point C. Tl speed of electromagnetic signals in glass can not be :



a) 1.0×10^8 m/s **b)** 2.4×10^8 m/s **c)** 2×10^7 m/s **d)** 4×10^7 m/s

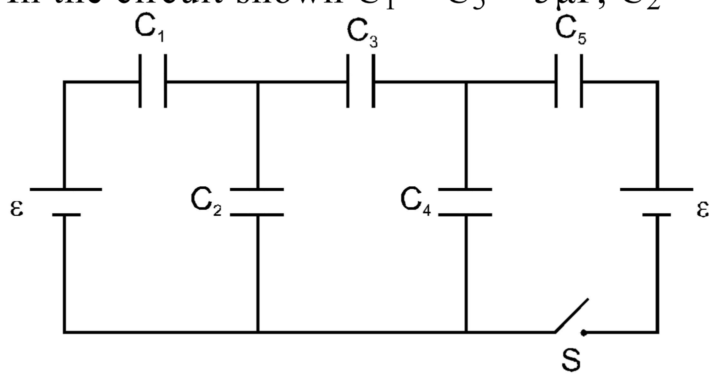
Q4 The image of the sun is obtained on a screen with a convex lens of diameter 3π cm and focal length 45 cm. How many times will the intensity produced by sun's imag be greater than that coming directly from the sun if the angular diameter of the sur 30 minutes ?

a) 450 b) 288 c) 576 d) None

Q5 One plate of a parallel plate capacitor(5 μF) has a fixed charge 10 μC. The charge μC)on the other plate is varied with time t(in seconds) as q = 2t. The potential difference (in volts) between the plates will vary as

a) $|1-0.2t|$ b) $|1+0.2t|$ c) 0.5t d) 0.2t

Q6 In the circuit shown $C_1 = C_5 = 5\mu F$, $C_2 = C_4 = 3\mu F$, $C_3 = 6\mu F$, $\varepsilon = 20$ v.



Choose the **incorrect** option :

a) Charge on C_1 is equal to charge on C_5 when switch S is closed and each is equa to 37.5 μC

b) Charge on C_1 is equal to 50μC when switch S is open

c) Charge on C_4 is equal to 30μC when switch S is open

d) Charge on C_3 is zero when switch S is closed

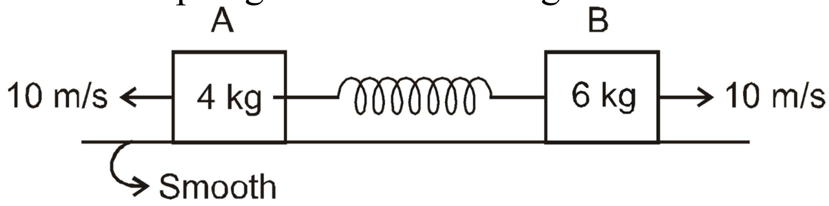
Q7 Two long coaxial and conducting cylinders of radius a and b are separated by a material of conductivity σ and a constant potential difference V is maintained betw them, by a battery. Then the current, per unit length of the cylinder flowing from o cylinder to the other is :

a) $\frac{4\pi\sigma}{\ell n\ (b/a)}V$ b) $\frac{4\pi\sigma}{(b+a)}V$ c) $\frac{2\pi\sigma}{\ell n(b/a)}V$ d) $\frac{2\pi\sigma}{(b+a)}V$

Q8 Two masses, 800 kg and 450 kg are at a distance 25 m apart. The magnitude of gravitational field intensity at a point 20 m distant from the 800 kg mass and 15 m distant from the 450 kg mass will be (in N/kg)– (G is universal gravitational const :

a) 2G b) $2\sqrt{2}G$ c) 4G d) zero

Q9 Velocity of block A & B (of mass 4kg and 6 kg) 10 m/s for each shown in figure at this time spring in its nature length. Then choose **incorrect** options :



a) total momentum of the system in the centre of mass frame at any time is zero.

b) maximum velocity of block A is 14 m/s and for block B is 10 m/s

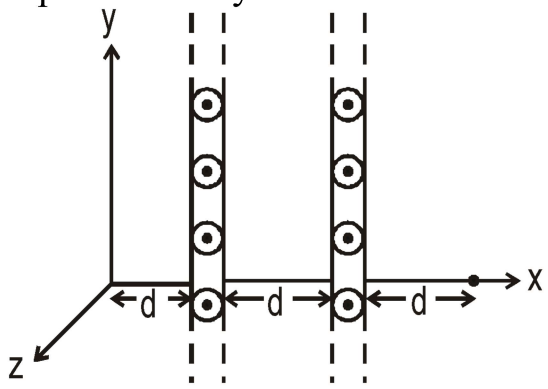
c) minimum velocity of block A and B are 10 m/s and zero respectively

d) work done by the spring force on system is zero in any interval of time

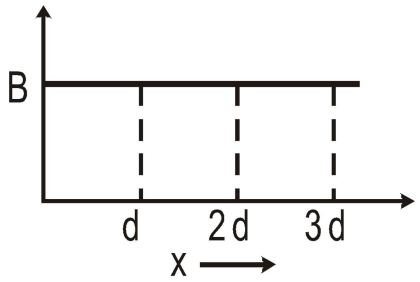
Q10 Altitude at which acceleration due to gravity decreases by 0.1% approximately: (Radius of earth = 6400 km)

a) 3.2 km **b)** 6.4 km **c)** 2.4 km **d)** 1.6 km

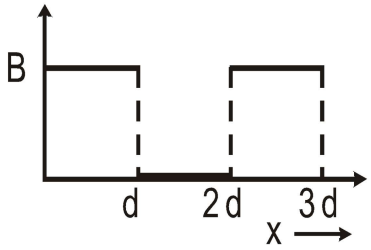
Q11 Two large conducting planes carrying current perpendicular to x-axis are placed at 0) and (2d, 0) as shown in figure. Current per unit width in both the planes is same and current is flowing in the outward direction. The variation of magnetic inductio (taken as positive if it is in positive y-direction) as function of 'x' ($0 \le x \le 3d$) is b represented by :



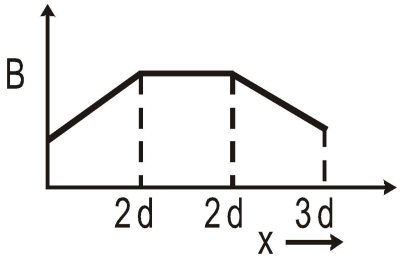
a)



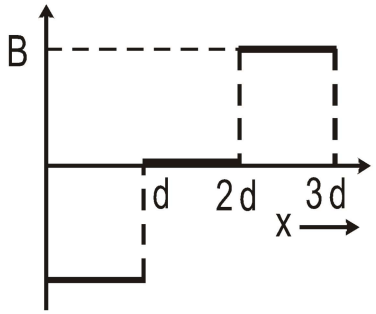
b)



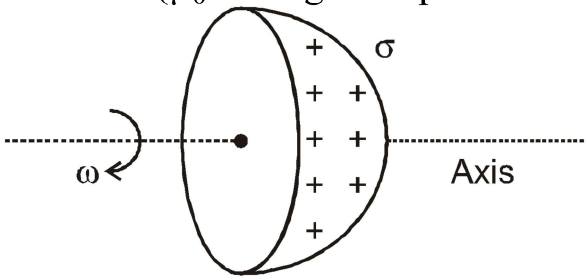
c)



d)



Q12 A hemispherical shell of radius R, having uniform charge density σ rotated about i axis of symmetry with constant angular velocity ω, then magnetic field strength at centre is (μ_0 = magnetic permeability of free space)



a) $\frac{1}{3}\omega\sigma\mu_0 R$ **b)** zero **c)** $\frac{2}{3}\omega\sigma\mu_0 R$ **d)** $\omega\sigma\mu_0 R$

Multiple Choice Question

Q13 The acceleration of a particle is, $a = -100x + 50$. It is released from $x = 2$. Here ' & ' x ' are in S.I. units.

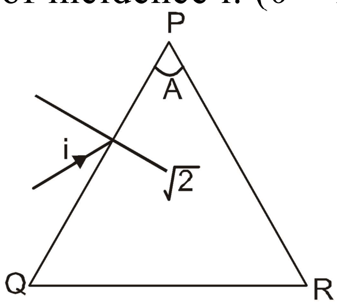
a) the particle will perform SHM of amplitude 2 m

b) the particle will perform SHM of amplitude 1.5 m

c) the particle will perform SHM of time period 0.63 seconds

d) the particle will have a maximum velocity 15 m/s

Q14 A prism of R.I. $\sqrt{2}$ and apex angle A is shown. Light is incident from PQ side at aı of incidence i. $(0 < i \le 90^\circ)$



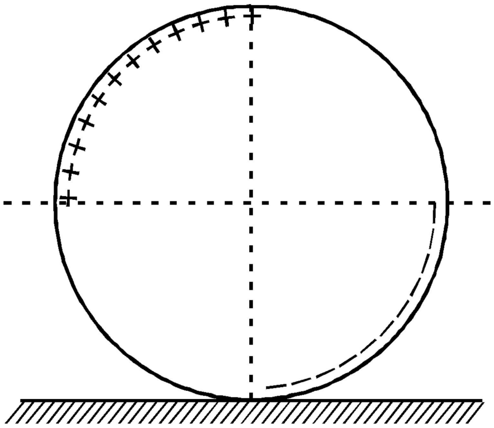
a) If $A = 40^\circ$ then light incident at all angles will be refracted from surface PR.

b) If $A = 80^\circ$ then light incident at some angles will be refracted and at some other angles light will be reflected.

c) If $A = 92^\circ$ then light incident at all angles will be reflected back.

d) Whatever is the value of A, light definitely emerge from the surface PR.

Q15 A non–conducting uniform ring of mass m and radius R is charged with uniform charge density λ as shown placed at rest on a rough non–conducting horizontal surface. A uniform electric field of magnitude E_0 is switched on towards right in horizontal direction. Choose the correct options if ring start rolling without sliding



a) Centre of mass of the ring will not move if surface is frictionless

b) Net torque of electric force on the ring will be clockwise and $2\lambda R^2 E_0$

c) Friction will increase speed of centre of mass of the ring but decrease the angul speed of the ring

d) Frictional force on the ring will be right and magnitude will be $2\lambda R E_0$

Q16 A uniform wire of resistance R and length L is cut into four equal parts, each of le l/4, which are then connected in parallel. Then the effective resistance of the combination will be :

a) R/4 **b)** R/16 **c)** 2R **d)** 8R

Q17 A proton is fired from origin with velocity $\vec{v} = v_0\hat{j} + v_0\hat{k}$ in a uniform magneti field $\vec{B} = B_0\hat{j}$

In the subsequent motion of the proton

a) its z-coordinate can never be negative

b) its x-coordinate can never be positive

c) its x-and z-coordinates cannot be zero at the same time

d) its y-coordinate will be proportional to its time of flight

Q18 A coil of radius R carries a current I. Another concentric coil of radius r (r << R) carries current $\frac{I}{2}$. Initially planes of the two coils are mutually perpendicular and l the coils are free to rotate about common diameter. They are released from rest fro this position. The masses of the coils are M and m respectively (m < M). During tl subsequent motion let K_1 and K_2 be the maximum kinetic energies of the two coils respectively and let U be the magnitude of maximum potential energy of magnetic interaction of the system of the coils. Choose the correct options.

a) $\frac{K_1}{K_2}=\frac{M}{m}\left(\frac{R}{r}\right)^2$

b) $K_1 = \frac{Umr^2}{mr^2+MR^2}$ $K_2 = \frac{UMR^2}{mr^2+MR^2}$

c) $U = \frac{\mu_0 \pi I^2 r^2}{4R}$

d) $K_2 >> K_1$

Chemistry

Single Choice Question

Q19 The correct statements among I to III are
(I) Valence bond theory cannot explain the color exhibited by transition metal complexes.
(II) Valence bond theory can predict quantitatively the magnetic properties of transition metal complexes.
(III) Valence bond theory cannot distinguish ligands as weak and strong field ones

a) (II) and (III) only
b) (I), (II) and (III)
c) (I) and (II) only
d) (I) and (III) only

Q20 The number of geometrical isomers for octahedral $[Co(NH_3)_2Cl_4]^-$, square planar $AuCl_2Br_2^-$ are :

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

Q21 Given below are two statements : One is labelled as Assertion (A) and the other is labelled as Reason (R)
Assertion (A): Enthalpy of neutralisation of strong monobasic acid with strong monoacidic base is always -57 kj mol^{-1}
Reason (R): Enthalpy of neutralisation is the amount of heat liberated when one m of H^+ ions furnished by acid combine with one mole of ^-OH ions furnished by bas form one mole of water. In the light of the above statements, choose the correct answer from the options given below.

a) (A) is true but (R) is false
b) Both (A) and (R) are true and (R) is the correct explanation of (A)
c) (A) is false but (R) is true
d) Both (A) and (R) are true but (R) is not the correct explanation of (A)

Q22 For a reaction scheme $A \xrightarrow{k_1} B \xrightarrow{k_2} C$, if the rate of formation of B is set be zero then the concentration of B is given by :

a) $k_1k_2[A]$
b) $(k_1 - k_2)[A]$
c) $\left(\frac{k_1}{k_2}\right)[A]$
d) $(k_1 + k_2)[A]$

Q23 Van der Waals' constants of two gases X and Y are as given :

	a(litre-atm mol^{-2})	b(litre mol^{-1})
Gas X	5.6	0.065
Gas Y	5.1	0.012

What is correct about the two gases?

a) $T_c(X) < T_c(Y)$ **b)** $T_c(X) = T_c(Y)$ **c)** $V_c(X) < V_c(Y)$ **d)** $V_c(Y) = V_c(X$

Q24 The complex $K_4[Zn(CN)_4(O_2)_2]$ is oxidised into $K_2[Zn(CN)_4(O_2)_2]$, then which the following is correct ?

a) Zn (II) is oxidised into Zn (IV)

b) Paramagnetic moment decreases

c) O – O bond length increases

d) Paramagnetic moment increases

Q25 Correct order of increasing basicity:

a) $NH_3 < C_6H_5NH_2 < (C_2H_5)_2NH < C_2H_5NH_2 < (C_2H_5)_3N$

b) $C_6H_5NH_2 < NH_3 < (C_2H_5)_3N < (C_2H_5)_2NH < C_2H_5NH_3$

c) $C_6H_5NH_2 < NH_3 < (C_2H_5)_3N < (C_2H_5)\ NH_2 < (C_2H_5)_2NH$

d) $C_6H_5NH_2 < (C_2H_5)_3N < NH_3 < C_2H_5NH_2 < (C_2H_5)_2NH$

Q26 For a first order reaction, the time required for completion of 90% reaction is 'x' ti the half life of the reaction. The value of 'x' is
(Given: ln 10 = 2.303 and log 2 = 0.3010)

a) 1.12 **b)** 2.43 **c)** 3.32 **d)** 33.31

Q27 The incorrect statement is:

a) Cl_2 is more reactive than ClF.

b) F_2 is more reactive than ClF.

c) On hydrolysis ClF froms HOCl and HF.

d) F_2 is a stronger oxidizing agent than Cl_2 in aqueous solution

Q28 The number of stereoisomers possible for 1,2- dimethyl cyclopropane is :

a) One **b)** Four **c)** Two **d)** Three

Q29 Which among the following molecules/species is/are aromatic?

a) Cyclobutadienyl dianion

b) Cyclooctatetraenyl dianion

c) Cycloheptatrienyl cation

d) All are aromatic

Q30 In which of the following molecules, the substituent does not exert its resonance effect?

a) $C_6H_5NH_2$ **b)** $C_6H_5\overset{\oplus}{N}H_3$ **c)** C_6H_5OH **d)** C_6H_5Cl

Multiple Choice Question

Q31 Select the correct statement:

a) The value of compressibility factor 'Z' for H_2 gas is greater than one at room temperature and pressure

b) The real gas behaves as an ideal gas at Boyle's temperature.

c) For a real gas following van der Waals' equation of state, the expression of criti temperature is $\frac{8a}{27R.b}$

d) At low pressure, the compressibility factor 'Z' = $1 + \frac{P.b}{RT}$ for a van der Waal's ga

Q32 Which of the following may act as buffer in aqueous solution ?

a) $NH_4Cl + NH_4OH$ **b)** $CH_3COOH + CH_3COONa$

c) $CH_3COONa + NaCl$ **d)** Borax + Boric acid

Q33 In an experiment, 50 ml of 0.05M solution of an oxoacid of phosphorous neutralis exactly 100 ml of solutlion of NaOH containing 2.0 gram per litre of the base -

a) The acid can form three types of salt with NaOH

b) The molecular formula of the acid is H_3PO_3

c) The acid can act as a reducing agent

d) The acid has three –OH group

Q34 In the following case (s), hybridisation of the underlined atom is affected –

a) $\underline{P}Cl_5$ (solid) dissociates into PCl_4^+ and PCl_6^-

b) LiH reacts with $\underline{Al}H_3$ forming $LiAlH_4$

c) $\underline{N}H_3$ is protonated

d) $H_3\underline{P}O_2$ is heated forming PH_3 and H_3PO_3

Q35 The quantities which do not change with temperature is :

a) Molarity **b)** Mass percentage **c)** Molality **d)** Mole fraction

Q36 Which of the following statements are most appropriate about Zn, Cd and Hg ?

a) They exhibit high enthalpy of atomization as the d-subshell is full.

b) Zn and Cd do not show variable oxidation state while Hg shows +I and +II.

c) Compounds of Zn, Cd and Hg are paramagnetic in nature.

d) Zn, Cd and Hg are called soft metals.

Mathematics

Single Choice Question

Q37 If α, β, γ are the roots of the equation $y^3 - (\sin[\alpha + \beta + \gamma]\,\pi)\, y^2 - ky + 2014 = 0$ the $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ equals (where [.] denotes greatest integer function)

a) 0 b) 1 c) 2 d) 5

Q38 If the line $3x - 4y - k = 0$, $(k > 0)$ touches the circle $x^2 + y^2 - 4x - 8y - 5 = 0$ at (a then k + a + b is equal to-

a) 20 b) 22 c) -30 d) -28

Q39
If $f(x) = \cos^{-1}\left(\frac{\sqrt{2x^2+1}}{x^2+1}\right)$, then range of f(x) is

a) $[0, \pi]$ b) $\left(0, \frac{\pi}{4}\right]$ c) $\left(0, \frac{\pi}{3}\right]$ d) $\left[0, \frac{\pi}{2}\right)$

Q40 Set of all values of x satisfying the inequality $x - 3 < \sqrt{x^2 + 4x - 5}$

a) $(-\infty, -5] \cup [1, \infty)$ b) $(-5, 3]$
c) $[3, 5)$ d) $(-5, 3)$

Q41 Let 1, abc, $a^2b^2c^2$ are in A.P. (a, b, c > 0), then minimum value of 27a + 8b + 125c

a) 30 b) 60 c) 90 d) 100

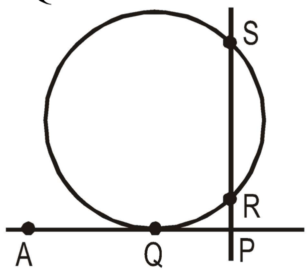
Q42 If $\sqrt{\alpha}$ and $\sqrt{\beta}$ are the roots of the equation $x^2 + qx + p = 0$ $(p \neq 0, p, q \in R)$ then t equation $x(x + q^3) + (p^3 - 3pqx) = 0$ has roots –

a) $\alpha^{\frac{3}{2}}$ and $\beta^{\frac{3}{2}}$ b) $\alpha\beta^{\frac{1}{2}}$ and $\alpha^{\frac{1}{2}}\beta$ c) $\sqrt{\alpha\beta}$ and $\alpha\beta$ d) $(\alpha\beta)^{\frac{1}{4}}$ and $(\alpha\beta$

Q43 If sinA . cosB = 1/4 and 3tanA = tanB, then sin(A + B) is

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

Q44 In the adjoining figure, PR = 2, RS = 6, AP is tangent to the circle at Q, then lengt PQ is



a) 16 **b)** 4 **c)** 8 **d)** 32

Q45 If n– arithmetic means are inserted between 1 and 31 such that the 7^{th} mean : the (1)th mean = 5 : 9, then ‘n’ is equal to –

a) 12 **b)** 13 **c)** 14 **d)** None of these

Q46 The value of the integral $\int_0^1 \frac{\sqrt{x}dx}{(1+x)(1+3x)(3+x)}$ is :

a) $\frac{\pi}{8}\left(1-\frac{\sqrt{3}}{2}\right)$ **b)** $\frac{\pi}{4}\left(1-\frac{\sqrt{3}}{6}\right)$ **c)** $\frac{\pi}{8}\left(1-\frac{\sqrt{3}}{6}\right)$ **d)** $\frac{\pi}{4}\left(1-\frac{\sqrt{3}}{2}\right)$

Q47 Let three matrices $A = \begin{bmatrix} 2 & 1 \\ 4 & 1 \end{bmatrix}$; $B = \begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 3 & -4 \\ -2 & 3 \end{bmatrix}$ then $t_r(A) + t_r\left(\frac{ABC}{2}\right) + t$ $\left(\frac{A(BC)^2}{4}\right) + t_r\left(\frac{A(BC)^3}{8}\right) + ... + \infty =$

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

Q48 If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ and det $(A^n - I) = 1 - \lambda^n$, $n \in N$, then λ is equal to :

a) 4 **b)** 5 **c)** 11 **d)** 2

Multiple Choice Question

Q49 The range of values of 'a' such that the angle θ between the pair of tangents drawn from (a, 0) to the circle $x^2 + y^2 = 1$ satisfies $\frac{\pi}{2} < \theta < \pi$, lies in :

a) $(1, 2)$ **b)** $(1, \sqrt{2})$

c) $(-\sqrt{2}, -1)$ **d)** $(-\sqrt{2}, -1) \cup (1, \sqrt{2})$

Q50 Let a function $f : \mathbb{R} \to \mathbb{R}$ be defined as :

$$f(x) = \begin{cases} \int_0^x (5 - |t-3|)\,dt, & x > 4 \\ x^2 + bx, & x \le 4 \end{cases}$$

where $b \in \mathbb{R}$. If f is continuous at x = 4, then which of the following which statements is true ?

a) f is not differentiable at x = 4

b) $f'(3) + f'(5) = \frac{35}{4}$

c) f is increasing in $\left(-\infty, \frac{1}{8}\right) \cup (8, \infty)$

d) f has a local minima at $x = \frac{1}{8}$

Q51 $a_1, a_2, a_3, \ldots$ are distinct terms of an A.P. We call (p, q, r) an increasing triad if a_p, a_r are in G.P. where p, q, r ∈ N such that p < q < r. If (5, 9, 16) is an increasing tria then which of the following option is/are correct?

a) If a_1 is a multiple of 4 then every term of the A.P. is an integer

b) (85, 149, 261) is an increasing triad

c) If the common difference of the A.P. is $\frac{1}{4}$, then its first term of A.P. is $\frac{1}{3}$

d) Common ratio of G.P. having terms a_p, a_q, a_r is $\frac{7}{4}$

Q52 Tangent is drawn at any point (x_1, y_1) other than vertex on the parabola $y^2 = 4ax$. tangents are drawn from any point on this tangent to the circle $x^2 + y^2 = a^2$ such th all the chords of contact pass through a fixed point (x_2, y_2) then

a) x_1, a, x_2 are in G.P.

b) $\frac{y_1}{2}, a, y_2$ are in G.P.

c) $-4, \frac{y_1}{y_2}, \frac{x_1}{x_2}$ are in G.P.

d) $x_1x_2 + y_1y_2 = a^2$

Q53 A circle 'S' is described on the focal chord of the parabola $y^2 = 4x$ as diameter. If t focal chord is inclined at an angle of 45^0 with axis of x, then which of the followin is/are true

a) radius of the circle is 4

b) centre of the circle is $(3, 2)$

c) the line $x + 1 = 0$ touches the circle

d) the circle $x^2 + y^2 + 2x - 6y + 3 = 0$ is orthogonal to 'S'

Q54 A focal chord of parabola $y^2 = 8(x+2)$ is inclined at an angle of 60^0 with positive x axis and intersects the parabola at P and Q. Let perpendicular bisector of the chord intersects the x-axis at R, then the distance of R from focus is

a) $\frac{8}{3}$ **b)** $\frac{16\sqrt{3}}{3}$ **c)** $\frac{16}{3}$ **d)** $8\sqrt{3}$

Answer Key

Que.	1	2	3	4	5	6	7	8	9	1
Ans.	**D**	**B**	**B**	**C**	**A**	**C**	**C**	**B**	**D**	**/**
Que.	11	12	13	14	15	16	17	18	19	2
Ans.	**D**	**A**	**B, C, D**	**A, B, C**	**A, B, C**	**B**	**B, D**	**B, C, D**	**D**	
Que.	21	22	23	24	25	26	27	28	29	3
Ans.	**B**	**C**	**A**	**D**	**D**	**C**	**A**	**D**	**D**	
Que.	31	32	33	34	35	36	37	38	39	4
Ans.	**A, B, C**	**A, B, D**	**B, C**	**A, B**	**B, C, D**	**B, D**	**A**	**A**	**D**	**/**
Que.	41	42	43	44	45	46	47	48	49	5
Ans.	**C**	**A**	**A**	**A**	**C**	**A**	**D**	**D**	**C, D**	**A,**
Que.	51	52	53	54						
Ans.	**A, B, C, D**	**B, C, D**	**A, B, C**	**C**						