SOLUTIONS

PROGRESS TEST-4

GZR-1908 & 1909

GZRM-1901 & 1902

(JEE ADVANCED PATTERN)

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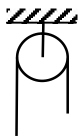
PHYSICS

01. **(A)** **02.** **(A)** **03.** **(B)**

04. **(C)**



Net acc. ↓ on chain, pulley exert force less than mg.

05. **(C)** **06.** **(C)** **7.** **(D)** **8.** **(B)**

9. **(D)**

$y = 10t - t^2$

y is maximum when $\frac{dy}{dt} = 0$

10. **(A)** **11.** **(A, D)** **12.** **(B,C,D)** **13.** **(A,D)**

14. **(B,D)**

15. **(A,B,C,D)**

$x = \alpha t^2 - \beta t^3$

for x = 0, $\alpha t^2 - \beta t^3 = 0$

$\therefore \quad t = \frac{\alpha}{\beta}$.

$\frac{dx}{dt} = 2\alpha t - 3\beta t^2$

Particle at rest v = 0

$2\alpha t - 3\beta t^2 = 0$

$t = \frac{2}{3}\frac{\alpha}{\beta}$

$\frac{d^2x}{dt^2} = 2\alpha - 6\beta t$

at t = 0 a = 2α, at t = 0, v = 0

for no net force, (a = 0)

$2\alpha - 6\beta t = 0$, $t = \frac{\alpha}{3\beta}$.

16. (1)

17. (6)

$h = ut - \frac{1}{2}gt^2$

or $gt^2 - 2ut + 2h = 0$

$t_1t_2 = \frac{2h}{g}$ and $t_1 + t_2 = \frac{2u}{g} = T$

$\therefore$ $(t_2 - t_1)^2 = (t_1 + t_2)^2 - 4t_1t_2$

$16 = 64 - 4 \times \frac{2h}{g} \Rightarrow h = 60$ m

18. (1)

$a = \frac{30-20}{1.5} = \frac{36.7-30}{\Delta t}$

$\Delta t = \frac{6.7\times1.5}{10} \approx 1s$

19. (8)

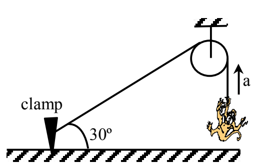
For equilibrium,

$10 = 8 + T$ …(i)

$T + f_2 = 20$ …(ii)

$\Rightarrow$ $f_2 = 18N$

20. (6)



Let T be the tension in the string. The upward force exerted on the clamp = T sin 30º = T/2

$T/2 = 40N \Rightarrow T = 80N, a = \frac{T - mg}{m} = \frac{80-50}{5} = 6m/s^2$

CHEMISTRY

21. **(D)**

22. **(A)**

I. Due to on moving from left to right in a period effective nuclear charge increases.

II. Order of S.E = S > P > d > f

III. Z_{eff} α Electronegativity

IV. Z_{eff} = $z-\sigma$ (if) σ increases Z_{eff} decreases)

23. **(A)**

24. **(A)**

Molality = $\dfrac{1000\,M}{(1000\,d - MM_1)} = \dfrac{1000 \times 2.05}{(1000 \times 1.02) - (2.05 \times 60)}$ = 2.28 mol kg^{-1}.

25. **(C)**

iso-electronic species

26. **(C)**

Height of aqs. soln, h soln. = hcm

$\rho_{hg}\, h_{hg} = \rho_{soln.}\, h_{soln}$.

$\Rightarrow$ 13.6 gm/cm^3 x h_{hg} = 2.7 gm/cm^3 x h $\Rightarrow$ $h_{hg} \simeq 0.2h$

Now, P_{atmp} = $P_{mixt.}$ + h_{hg}

= P_{gas} + aq. tension + 0.2 h

$\Rightarrow$ P_{gas} = P_{atmp} - [aq. tension + 0.2h]

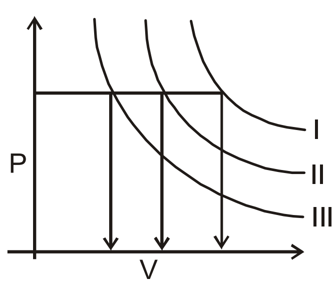
27. **(B)**

Ne is inert gas.

28. **(A)**

From Graph

29. **(D)**



At const. V & n

$P \alpha T$

$P_1 > P_2 > P_3$

$T_1 > T_2 > T_3$

30. (A)

$n_2 + n_1 = 4$

$n_2^2 - n_1^2 = 8$

$(n_2 - n_1)(n_2 + n_1) = 8$

$n_2 = 3$

$n_1 = 1$

$$\frac{1}{\lambda} = R_H \times 2^2 \left[\frac{1}{1^2} - \frac{1}{3^2}\right]$$

$$\frac{1}{\lambda} = \frac{R_H \times 32}{9}$$

$$\lambda = \frac{9}{32R_H}$$

31. (A), (C), (D)

32. (B), (C), (D)

33. (A), (C), (D)

34. (A), (C)

35. (B), (C)

Same ratio has same percentage composition.

36. (3)

1000 ml of 1 M = 1000 milimole

If 750 ml. is taken out remaining milimole is 1000 – 750 = 250 milimole

New molarity = .25 M $= \frac{1}{4}$

After n step $\Rightarrow 1 \times \left(\frac{1}{4}\right)^n = \frac{1}{64} = n = 3.$

37. (6)

38. (3)

39. (7)

40. (6)

T & V are constant

From PV = nRT

$$P = \frac{DRT}{M}$$

$$P_{(x)} = \frac{\rho_{(x)}}{M_{(x)}} \text{ and } P_{(y)} = \frac{\rho_{(y)}}{M_{(y)}}$$

$$P_{(x)} = 3\rho(y) \quad \text{and} \quad M_{(x)} = \frac{M(y)}{2}$$

$$\frac{P_{(x)}}{P_{(y)}} = 6$$

MATHEMATICS

41. (B)

$$x = \frac{b.(a\cos\beta) - a(b\cos\alpha)}{b-a} \qquad y = \frac{b.(a\sin\beta) - a(b\sin\alpha)}{b-a}$$

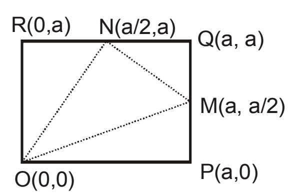
$$\Rightarrow \frac{x}{y} = \frac{\cos\beta - \cos\alpha}{\sin\beta - \sin\alpha} \quad \Rightarrow \frac{x}{y} = \frac{2\sin\left(\frac{\beta+\alpha}{2}\right)\sin\left(\frac{\alpha-\beta}{2}\right)}{2\cos\left(\frac{\beta+\alpha}{2}\right)\sin\left(\frac{\beta-\alpha}{2}\right)}$$

$$\Rightarrow x\cos\left(\frac{\alpha+\beta}{2}\right) = -y\sin\left(\frac{\alpha+\beta}{2}\right) \quad \therefore x\cos\left(\frac{\alpha+\beta}{2}\right) + y\sin\left(\frac{\alpha+\beta}{2}\right) = 0$$

42. (C)

Area of square = a^2

$$\text{Area of } \Delta OMN = \frac{1}{2}\left|a^2 - \frac{a^2}{4}\right| = \frac{3a^2}{8}$$



43. (B)

$$G = \left(-\frac{16}{3}, 2\right)$$

$$a = |BC| = 25, b = |CA| = 39, c = |AB| = 56,$$

Therefore $I = (-1, 0)$

$$G = \frac{25}{3}\sqrt{205}\,\lambda = \frac{\sqrt{205}}{3} \Rightarrow \lambda = \frac{1}{25}$$

44. (B)

$$\frac{\sqrt{\left(\sin\frac{x}{2}+\cos\frac{x}{2}\right)^2}+\sqrt{\left(\sin\frac{x}{2}-\cos\frac{x}{2}\right)^2}}{\sqrt{\left(\sin\frac{x}{2}+\cos\frac{x}{2}\right)^2}-\sqrt{\left(\sin\frac{x}{2}-\cos\frac{x}{2}\right)^2}}=\frac{\sin\frac{x}{2}+\cos\frac{x}{2}+\sin\frac{x}{2}-\cos\frac{x}{2}}{\sin\frac{x}{2}+\cos\frac{x}{2}-\sin\frac{x}{2}+\cos\frac{x}{2}}=\tan\frac{x}{2}$$

45. (A)

Let three numbers be a, ar, ar^2. It is given that

$a + ar + ar^2 = 52$;

$\therefore\ a(1 + r + r^2) = 52$ ...(1)

Also $a^2r(1 + r + r^2) = 624$ …(2)

From (1) and (2), we have $\frac{a^2r(1+r+r^2)}{a^2(1+r+r^2)^2}=\frac{624}{52\times 52}=\frac{3}{13}$

$\Rightarrow\ 13r = 3 + 3r + 3r^2$

$\Rightarrow\ r = 3, 1/3$

From (1),a = 4 when r = 3and a = 36 when r = 1/3

$\therefore$ Numbers are 4, 12, 36.

46. (B)

$$\left(\frac{2\cos\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)}{2\cos\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)}\right)^n+\left(\frac{2\sin\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)}{-2\sin\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)}\right)^n=2\cot^n\left(\frac{A-B}{2}\right)$$

47. (D)

We have ,

$$\tan(x+100^\circ)=\tan(x+50^\circ)\tan x\tan(x-50^\circ)$$

$$\Rightarrow \frac{\tan(x+100^\circ)}{\tan(x-50^\circ)}=\tan(x+50^\circ)\tan x$$

$$\Rightarrow \frac{\sin(x+100^\circ)\cos(x-50^\circ)}{\cos(x+100^\circ)\sin(x-50^\circ)}=\frac{\sin(x+50^\circ)\sin x}{\cos(x+50^\circ)\cos x}$$

$$\Rightarrow \frac{\sin(2x+50^\circ)}{\sin 150^\circ}=\frac{\cos 50^\circ}{-\cos(2x+50^\circ)}$$ [Applying componendo and dividendo]

$$\Rightarrow \sin(2x+50^\circ)\cos(2x+50^\circ)=-\sin 150^\circ\cos 50^\circ$$

$$\Rightarrow 2\sin(2x+50^\circ)\cos(2x+50^\circ)=-\cos 50^\circ$$

$\Rightarrow \sin(4x+100^\circ) = \sin(270^\circ - 50^\circ)$

$\Rightarrow \sin(4x+100^\circ) = \sin 220^\circ$

$\Rightarrow 4x + 100^\circ = 220^\circ$

$\Rightarrow$ x = 30°

48. (D)

Let d and A_j denote the common difference and j^{th} Arithmetic mean respectively ; then,

$d = \frac{31-1}{n+1} = \frac{30}{n+1}$

$A_7 = 1 + 7\frac{30}{n+1} = 1 + \frac{210}{n+1}$

$A_{n-1} = 1 + (n-1)\frac{30}{n+1}$

$\frac{A_7}{A_{n-1}} = \frac{5}{9} \Rightarrow 9 + \frac{1890}{n+1} = 5 + \frac{150(n-1)}{n+1}$

$\Rightarrow \frac{150n - 150 - 1890}{n+1} = 4 \Rightarrow$ 146 n = 2044 $\Rightarrow$ n = 14.

49. (A)

50. (A)

Let a and d be the first and common difference of corresponding A.P.

then $a + 9d = \frac{1}{21}$ and $a + 20d = \frac{1}{10}$

solve above two we get

$a = \frac{1}{210}$ & $d = \frac{1}{210}$

$\therefore t_{210}(\text{A.P.}) = a + 209d = 1 \Rightarrow t_{210}(\text{H.P.}) = 1$

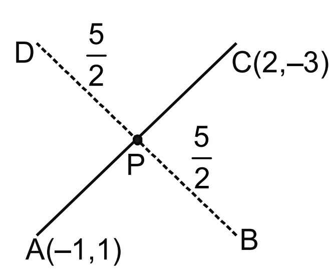
51. (C,D)

52. (A,B)

$AC = \sqrt{3^2 + 4^2} = 5$

The midpoint P of $AC = \left(\frac{1}{2}, -1\right)$

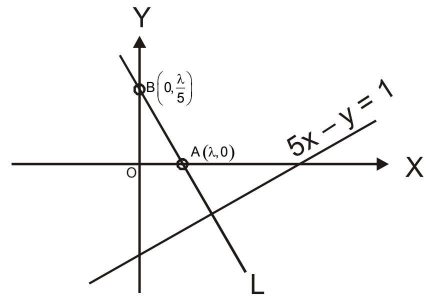
'm' of $AC = \frac{4}{-3}$ $\quad \therefore$ 'm' of $BD = \frac{3}{4} = \tan\theta$



$\therefore$ B or $D = \left(\frac{1}{2} \pm \frac{5}{2}\cos\theta, -1 \pm \frac{5}{2}\sin\theta\right)$

53. (A, B)

Equation of perpendicular line is x + 5y = λ



Area of $\Delta OAB \Rightarrow \frac{1}{2}\frac{\lambda^2}{5} = 5$

$\lambda = \pm 5\sqrt{2}$

54. (A, B)

a = a ; b = ar ; c = ar^2

also a, x, b in A.P and b y c in A.P.

$2x = a + b = a(1 + r)$ ....(1)

$2y = b + c = ar(1 + r)$ ....(2)

now $\frac{1}{x} + \frac{1}{y} = \frac{2}{a(1+r)} + \frac{2}{ar(1+r)} = \frac{2(1+r)}{ar(1+r)} = \frac{2}{ar} = \frac{2}{b}$

again $\frac{a}{x} + \frac{c}{y} = \frac{2}{1+r} + \frac{(ar^2)2}{ar(1+r)}$ [from 1 and 2]

$= \frac{2}{1+r} + \frac{2r}{(1+r)} = 2$

55. (A,B)

Let the point be (t,t)

So, $\left|\frac{\frac{t}{4} + \frac{t}{3} - 1}{\sqrt{\frac{1}{4^2} + \frac{1}{3^2}}}\right| = 4$

$\therefore\ t\left(\frac{1}{4} + \frac{1}{3}\right) = 1 \pm 4.\sqrt{\frac{1}{4^2} + \frac{1}{3^2}}$

56. (3)

$3\sin\theta = 5(1 - \cos\theta) = 5 \times 2\sin^2\theta/2 \Rightarrow \tan\theta/2 = 3/5$

$$5\sin\theta - 3\cos\theta = 5 \times \frac{2\tan\frac{\theta}{2}}{1+\tan^2\frac{\theta}{2}} - 3\frac{\left(1-\tan^2\frac{\theta}{2}\right)}{1+\tan^2\frac{\theta}{2}} = 5\times\frac{2\times\frac{3}{5}}{1+\frac{9}{25}} - \frac{3\times\left(1-\frac{9}{25}\right)}{1+\frac{9}{25}} = 3$$

57. (8)

58. (7)

Area of $\Delta ABC = \frac{1}{2}\begin{vmatrix} -3 & 5 & 1 \\ 4 & -2 & 1 \\ 6 & 3 & 1 \end{vmatrix} = \frac{49}{2}$

Area of ΔPBC is modulus of the determinant

$$\frac{1}{2}\begin{vmatrix} x & y & 1 \\ -3 & 5 & 1 \\ 4 & -2 & 1 \end{vmatrix} = \frac{7}{2}(x+y-2)$$

$$\therefore \quad \frac{\text{Area of } \Delta\, PBC}{\text{Area of } \Delta\, ABC} = \frac{|x+y-2|}{7}$$

59. (3)

$$y = \frac{3}{4}(x-9)+6$$

60. (1)

Gives (k + 1) x + 8y = 4k and

kx + (k + 3)y = 3k – 1 are coincident

$$\therefore \quad \frac{k+1}{k} = \frac{8}{k+3} = \frac{4k}{3k-1}$$

$\Rightarrow$ k = 1