SOLUTIONS

PROGRESS TEST-6

GZRM-1901 & 1902

GZR-1908 & 1909

JEE ADVANCED PATTERN

Test Date: 04-11-2017

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CHEMISTRY

1. **(C)**

Three functional groups are present in above compound.

(i) Phenolic OH (ii) Alcoholic OH (iii) Ester

2. **(A)**

$n_{N_2} = 53.57\,\text{mole}$

$\frac{p_1}{p_2} = \frac{n_1}{n_2}$

$n_2 = \frac{1.8}{200} = 0.009 \times 53.57 = 0.48213$

n_{N_2} escape = 53.087

volume = $\frac{nRT}{p}$ = 1264 L ~ 1260 lit

3. **(D)**

$\frac{3}{2}RT = Mgh$

$h = \frac{3}{2} \times \frac{8.314 \times 300}{4 \times 10^{-3} \times 9.8} = 9.53 \times 10^4\ \text{m}$

4. **(B)**

When the compound, on heating dissociate into its at least one compound then these solubility of that compound is decided by % ionic chr. higher the ionic chr. great will be thermal stability.

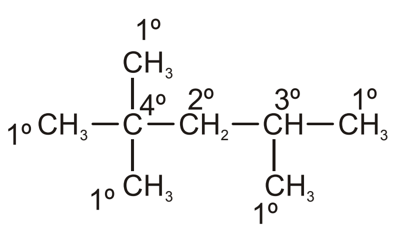
(A) $LiCO_3 < Na_2CO_3 < K_2CO_3$

(B) $Li_2O > Na_2O > K_2O$ | order of there stability

(C) HF > HCl > H Br

(D) $BeSO_4 < MgSo_4 < CaSO_4$

5. **(C)**



6. (C)

In $[\Delta H_{ion}]_{III}$ & $[\Delta H_{ion}]_{IV}$ has sudden jump so after removal of three electrons element acheived inert gas configuration.

7. (4)

Total node = Radial node + angular node

$= n - \ell - 1 + \ell = n - 1$

$5f = 5 - 1 = 4$

8. (2)

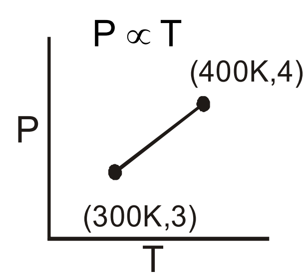
$$E_{abs} \times \frac{40}{100} = E_{Emitted}.$$

$$E_{ab} \times \frac{hc}{400} \times \frac{40}{100} = n_{em} \times \frac{hc}{500}$$

$$\frac{n_{ab}}{n_{em}} = \frac{400}{500} \times \frac{100}{40} = 2$$

9. (3)

$$T - 300 = \frac{4-3}{100}(P-3)$$



$$T - 300 = \frac{P}{100} - \frac{3}{100}$$

Multiply by 100

$$T \times 100 - 3 \times 10^4 = P - 3$$

$$P = 3 - 3 \times 10^4 + 100\,T$$

$$\frac{dp}{dT} = 0 + 100 = 1 \times 10^2$$

x + y = 3

10. (4)

Automic size

(1) Kr > Ne (2) $Na > Na^+$

(3) $I^- > Cl^-$ (4) $Li^+_{(aq)} > Na^+_{(a)}$

11. (3)

If OH group is attached with 2º carbon it is 2º alcohol.

So, Total 2º alcoholic OH = 3.

12. (B)

$$H_3C-\overset{\overset{\large O}{\|}}{C}-CH_3$$

13. (C)

$$H-\overset{\overset{\large O}{\|}}{C}-OH \quad H_3C-\overset{\overset{\large O}{\|}}{C}-OH$$

Gen. formula - $C_nH_{2n}O_2$

14. (C)

15. (B)

$H_2O + SO_3 \longrightarrow H_2SO_4$;

18g water combines with 80g SO_3

$\therefore$ 4.5 g of H_2O combines with 20g of SO_3.

$\therefore$ 100g of oleum contains 20g of SO_3

or 20% free SO_3.

16. (C)

$Na_2CO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O + CO_2$

L.R. is Na_2CO_3

moles of CO_2 formed = moles of Na_2CO_3 reacted = $\frac{5.3}{106} = 0.05$

volume of CO_2 formed at 1 atm pressure and 300 K = 0.05 × 24.63 = 1.23 L

17. (B)

eq. of H_2SO_4 + eq. of SO_3 = eq. of NaOH

$$\frac{x}{98} \times 2 + \frac{(1-x)\times 2}{80} = 54 \times 0.4 \times 10^{-3}$$

$$x = 0.74$$

$$\% \text{ of free } SO_3 = \frac{1-0.74}{1} \times 100 = 26\%$$

18. (A) — (R); (B) — (P); (C) — (S); (D) — (T)

19. (A) — (S); (B) — (P),(Q),(S); (C) — (P), (R); (D) — (R), (T)

MATHEMATICS

20. (A)

$$HM = \frac{2ab}{a+b} = \frac{2}{a^{-1}+b^{-1}} = \frac{a^n+b^n}{a^{n-1}+b^{n-1}},\ \text{where } n = 0$$

21. (A)

$$x = \frac{1}{1^4}+\frac{1}{3^4}+\frac{1}{5^4}+......\text{to } \infty$$

$$= \left(\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+.....\text{to } \infty\right) - \left(\frac{1}{2^4}+\frac{1}{4^4}+......\text{to } \infty\right)$$

$$= \frac{\pi^4}{90} - \frac{1}{16}\left(\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+.....\text{to } \infty\right) = \frac{\pi^4}{90} - \frac{1}{16}.\frac{x^4}{90}$$

22. (B)

Here $2\sin\frac{\alpha+\beta=b}{2}.\cos\frac{\alpha+\beta}{2} = a, 2\sin\frac{\alpha+\beta}{2}.\sin\frac{\beta-\alpha}{2}$

Now, divide and get the value

23. (D)

$\tan(180° - \theta) = \text{slope of } AB = -3$

$\therefore \quad \tan\theta = 3$

$\therefore \quad \frac{OC}{AC} = \tan\theta, \frac{OC}{BC} = \cot\theta \Rightarrow \quad \frac{BC}{AC} = \frac{\tan\theta}{\cot\theta} = \tan^2\theta = 9$

24. (3)

The two circles are

$x^2 + y^2 - 4x - 6y - 3 = 0$ and $x^2 + y^2 + 2x + 2y + 1 = 0$

Centre : $C_1 \equiv (2, 3)$, $C_2 \equiv (-1, -1)$ radii : $r_1 = 4$, $r_2 = 1$

We have $C_1 C_2 = 5 = r_1 + r_2$, therefore there are 3 common tangents to the given circles.

25. (C)

All the letters are different : ${}^{10}C_4 \cdot 4!$

3 same, 1 different : ${}^{9}C_1 \cdot \frac{4!}{3!}$

2 same, 2 different : ${}^{3}C_1 \cdot {}^{9}C_2 \cdot \frac{4!}{2!}$

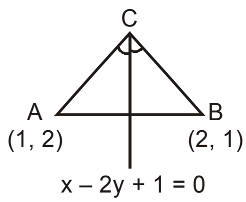
2 same, 2 same : ${}^{3}C_2 \cdot \frac{4!}{2!2!}$

Total number of words = 6390.

26. (4)

27. (2)

Image of A say A' w.r.t x – 2y + 1 = 0 lies on BC



Here, $\frac{x-1}{1}=\frac{y-2}{-2}=-2\frac{(1-4+1)}{1+2^2}=\frac{4}{5}\ \Rightarrow\ A'=\left(\frac{9}{5},\frac{2}{5}\right)$

$\therefore$ Equation of BC joining $A'=\left(\frac{9}{5},\frac{2}{5}\right)$ and B (2, 1) is

$$y-1=\frac{1-\frac{2}{5}}{2-\frac{9}{5}}(x-2)=\frac{3}{1}(x-2)$$

$3x - y - 5 = 0 \quad \Rightarrow a+b=3-1=2$

28. (6)

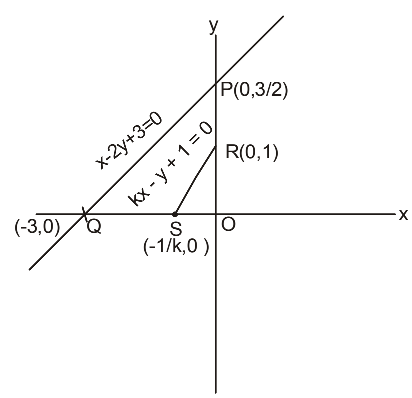
Distance between lines $3x-4y+4=0$ and $6x-8y-7=0$ (Which are parallel) is equal to diameter of the circle.

$$\therefore\ D=\frac{4+\frac{7}{2}}{\sqrt{3^2+4^2}}=\frac{3}{2}$$

$$\therefore\ 4D=\frac{3}{2}\times4=6$$

29. (2)

Points P,Q, S and R will be concyclic

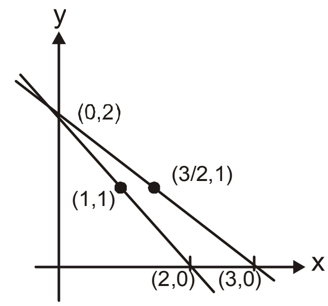


$\therefore OP\times OR=OQ\times OS$

$$\Rightarrow\frac{3}{2}\times1=3\times\frac{1}{k}$$

$\therefore$ k = 2

30. (1)



Therefore, equation of straight line

$$\Rightarrow \frac{y-1}{x-1} = \frac{1-1}{\frac{3}{2}-1}$$

$$\Rightarrow y = 1$$

31. (B)

32. (A, B, C)

33. (B)

Solution for [34 To 36]

Sol. Mirror image of point (1,2) in the line 3x + 4y = 12 if (α,β), then

$$\frac{\alpha-1}{3} = \frac{\beta-2}{4} = -2\left(\frac{3+8-12}{25}\right) \Rightarrow \alpha = \frac{31}{25}, \beta = \frac{58}{25}$$

34. (C)

Equation of reflected line passes through P is $y = \dfrac{\frac{58}{25}}{\frac{31}{25}-4}(x-4)$

$$\Rightarrow y\frac{58}{69}(x-4)$$

$$58x - 69y = 232$$

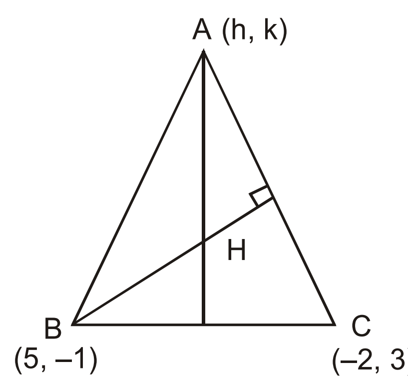
35. (A)

$$k = \frac{31}{25} - 2\left(\frac{58}{25}\right) = \frac{31-116}{25} = \frac{85}{25} = \frac{17}{5}$$

36. (B)

Since all the lines are always concurrent therefore given determinant is always $0 \forall$ position of P, Q, R.

37. (A $\rightarrow$ p, B $\rightarrow$ q, C $\rightarrow$ s, D $\rightarrow$ r)



(P) $AH \perp BC$

$$\text{ok} \left(\frac{k}{h}\right)\left(\frac{3+1}{-2-5}\right) = -1$$

$$\therefore 4k = 7h \qquad \text{(i)}$$

$BH \perp AC$

or $\left(\frac{0+1}{0-5}\right)\left(\frac{k-3}{h+2}\right)=-1$

$\therefore k-3=5(h+2)$ (ii)

or 7h – 12 = 20h + 40

or 13h = –52

or h = –4

$\therefore k=-7$

Hence, point A is (–4, 7)

(Q) x + y – = 0

4x + 3y – 10 = 0

Let (h, 4 – h) be the point on (i). Then,

$$\left|\frac{4h+3(4-h)-10}{5}\right|=1$$

or $h+2=\pm5$

or h =3, h = –7

Hence, the required point is either (3, 1) or (–7, 11)

(R) Since lines x + y – 1 = 0 and x – y + 3 = 0 are perpendicular, the orthocenter of the triangle is the point of intersection of these lines, i.e., (–1, 2)

(S) Since 2a, b, c are in AP, we have

$b=\frac{2a+c}{2}$ or 2a – 2b + c = 0

Comparing with the line ax + by + c = 0, we have x = 2 and y = –2. Hence, the lines are concurrent at (2, –2)

38. (A $\rightarrow$(p,q); B $\rightarrow$ (p,s); C $\rightarrow$ s , D $\rightarrow$q, r, s,t)

Passing though origin : c = 0

Touches x - axis : $g^2 = c$

Touches y - axis : $f^2 = c$

Centre at y = x : g = f

PHYSICS

39. **(C)**

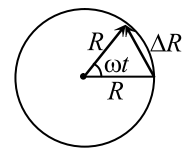
$a_t = 4R$

$a_N = \omega^2 R = (\alpha t)^2 R$

$a_t = a_N \Rightarrow 16\ t^2 = 4,\ t = \frac{1}{2}$ s

40. **(A)**

$$v_{av} = \frac{|\Delta\vec{R}|}{t} = \frac{\sqrt{R^2 + R^2 - 2R^2\cos\omega t}}{t} = \frac{2R}{t}\sin\left(\frac{\omega t}{2}\right)$$



41. **(B)**

$T_1 = \frac{mg}{\cos\theta}$, $T_2 = mg\cos\theta$

$$\frac{T_1}{T_2} = \sec^2\theta = 2$$

42. **(A)**

$$mv\frac{dv}{dx} = -Ax \quad \Rightarrow \int_v^0 mv\,dv = -\int_0^x Ax\,dx \Rightarrow m\frac{v^2}{2} = A\frac{x^2}{2} \quad \Rightarrow \quad x = v\sqrt{\frac{m}{A}}$$

43. **(B)**

$$\theta = \left(\frac{1200 + 4500}{2}\right) \times \frac{2\pi}{60} \times 10 = 950\pi \text{ radian}$$

Number of Revolutions = $\frac{950\pi}{2\pi} = 475$

44. **(B)**

$$\frac{\Delta T}{T} \times 100 = \frac{\frac{1}{5}}{25} \times 100 = 0.8\%$$

45. (2)

$$y = \frac{x^3}{3} - \frac{5}{2}x^2 + 6x + 4$$

$$\frac{dy}{dx} = x^2 - 5x + 6 \quad ....(1)$$

if $x^2 - 5x + 6 = 0$

$x = 2, 3$

Again diff. (1)

$$\frac{d^2y}{dx^2} = 2x - 5$$

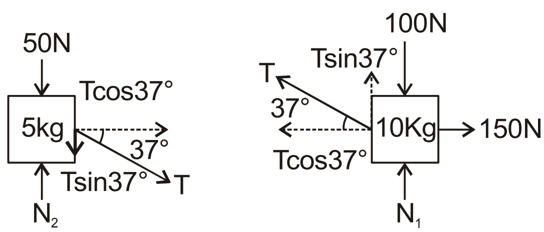
at x= 2 $\quad \frac{d^2y}{dx^2} = -1 < 0$

so maximum at x = 2.

46. (2)

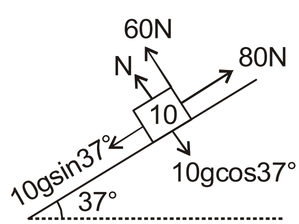
$\boxed{a = 10ms^{-2}}$

150 – Tcos37° = 10a



$\therefore \quad \boxed{T = \frac{125}{2} N}$

47. (2)



$$a = \frac{80N - 100\sin 37°}{10} = \frac{80 - 60}{10} = 2ms^{-2}$$

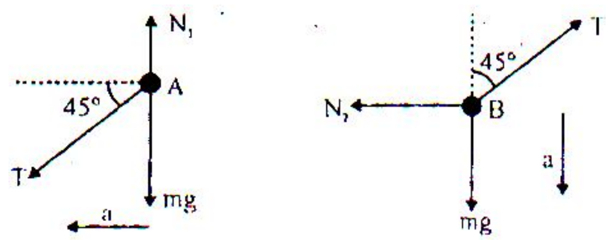
48. (1)

$\int_1^2 ydx =$ area under the graph = $\frac{1}{2}\times 2\times 1 = 1$

49. (5)

Just after the release B moves downwards and A moved horizontally leftwards with the same acceleration say a (because acceleration of both the ends of the sting along the length of string would be same for the string to remain tight).

Drawing free body diagram of both A and B :



For A,

T cos 45° = ma $\Rightarrow$ T = $\sqrt{2}$ ma

For B,

mg – T cos 45° = ma > mg $\Rightarrow$ ma = ma

$\Rightarrow$ a = $\frac{g}{2}$

Solving above equation, we get $T = \frac{mg}{\sqrt{2}} \quad = \frac{10}{\sqrt{2}\times\sqrt{2}} = 5N$

50. (A)

The tangential acceleration throughout the motion will be

$$a_t = -\frac{v_c^2 - v_A^2}{2s} = -\frac{(27)^2-(13)^2}{2\times 80} = -3.5 \text{ m/s}^2$$

At point *A*, $a_t = -3.5$ m/s², a_{net} = 4.5 m/s²

So, $a_r = \sqrt{(4.5)^2-(3.5)^2} = \sqrt{8}$ m/s²

$$r_A = \frac{27\times 27}{\sqrt{8}} = 257.6 \text{ m}$$

51. (A)

52. **(A)**

At point *B*, $r = \infty$.Hence, $a_{net} = a_t = -3.5$ m/s²

53. **(B)**

$\omega = \frac{v}{r}$, where *v* is linear velocity which is constant. *r* increases hence ω decreases.

54. **(B)**

At a certain angle θ, the radius is $r(\theta) = r_0 + \beta\theta$. The angle changes by small amount $d\theta$, then length of path travelled by the scanner is $r(\theta)\,d\theta$.

Total distance scanned $= \int_0^\theta r(\theta)d\theta,\ D = r_0\theta + \frac{\beta\theta^2}{2}$

55. **(B)**

The lesser the β, the more slowly the spiral moves out.

56. **(A – q) ; (B – q, s) ; (C – p, r) ; (D – p, r)**

$a = -\sqrt{v}$, $\frac{dv}{dt} = -\sqrt{v}$

$\int_4^v \frac{1}{\sqrt{v}}dv = -\int_0^t dt \Rightarrow 2\sqrt{v} - 4 = -t$

$2\sqrt{v} = 4 - t$ … (i)

$\Rightarrow \quad v = \frac{t^2}{4} - 2t + 4$ … (ii) (here, *v* is speed)

$\frac{ds}{dt} = v \quad \Rightarrow \int_0^s ds = \int_0^t v dt$

$\Rightarrow \quad s = \frac{t^3}{12} - t^2 + 4t$ … (iii) (here, *s* is distance travelled)

If $v = 0$, (i)

$\Rightarrow \quad t = 4$ s

Magnitude of displacement will be $\frac{16}{3}$ m, when distance travelled will be $\frac{16}{3}$ m and 16 m.

From equation (iii), for $s = \frac{16}{3}$ m, t = 4 s for s = 16 m, $t \approx 9$ s

Similarly magnitude of displacement will be $\frac{14}{3}$, when distance is $\frac{14}{3}$ m and 6 m.

From equation (iii), for $s = \frac{14}{3}$ m, t = 2 s

For s = 6 m, t = 6 s

If v = 1 m/s,(ii) $\Rightarrow t$ = 2 s and 6 s

57. **(A – p, q, s) ; (B – p, q, s) ; (C – p, q, r) ; (D – p, q, s)**