SOLUTIONS

WEEKLY TEST-2

GZPS-1901 & 1902

(JEE ADVANCED PATTERN)

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CHEMISTRY

1. **(A)**

$$4Al \quad + \quad 3O_2 \longrightarrow 2Al_2O_3$$

12 mole 12 mole

(LR) –9 mole

Percent excess remaining = $\frac{3}{12} \times 100 = 25\%.$

2. **(B)**

$$2NO + O_2 \longrightarrow 2NO_2$$

$\leftarrow$ 2V 2V 0 Total = 4V

0 V 2V Total = 3V

Charge = 4V – 3V = V

$$\% = \frac{V}{4V} \times 100 = 25\%.$$

3. **(D)**

4. **(B)**

Given cond. is at, NTP moles of NH_3=5600/22400=.25mole = 250milimoles

5. **(C)**

$$\frac{w}{M} = \frac{1 \times 22.4 \times 10^{-3}}{22.4} \quad M = 78 \text{ g}$$

$$n = \frac{78}{13} = 6$$

$\therefore$ MF = $(CH)_6$ or C_6H_6

6. **(A)**

7. **(A)**

(I) Mass of one oxygen atom = $\frac{16}{6.023 \times 10^{23}} = 2.66 \times 10^{-23}$ gm

(II) Mass of one nitrogen atom = $\frac{14}{6.023 \times 10^{23}} = 2.32 \times 10^{-23}$ gm

(III) $\because$ 1 gm molecule of oxygen = 32 g

$\therefore$ 1×10^{-10} gm molecule of oxygen = $32 \times 1 \times 10^{-10} = 3.2 \times 10^{-9}$ gm

(IV) $\because$ 1 gm atom of Cu = 63.5 g.

$\therefore$ 1×10^{-7} gm atom of Cu = $63.5 \times 10^{-7} = 6.35 \times 10^{-6}$ gm

8. (B), (C)

9. (B,C)

C_2H_6 ; 3 mole

C_2H_6 (added) $= \frac{60}{30} = 2$ mole.

Total mole $C_2H_6 = 3 + 2 = 5$ mole.

Moles of C_2H_4 removed $= \frac{2.4 \times 10^{24}}{6 \times 10^{23}} = 4$ mole.

C_2H_6 left = 5 – 4 = 1 mole

$C_2H_6 + 7/2\ O_2 \longrightarrow 2\ CO_2 + 3\ H_2O$

1 mole	3.5 mole	2 mole	3 mole
		44.8 mole	54 gm
			54 ml

10. (B),(C),(D)

$3X + 4Y \longrightarrow X_3Y_4$

6 mole	6 mole	
6 – 4.5	0	1.5 mole
1.5 mole		
left		formed

11. (A), (B)

From the reaction : $Na_2CO_3 + 2HCl \longrightarrow 2\ NaCl + CO_2 + H_2O$

given mole of reactant	6	:	4
give molar ratio	3	:	2
Stoichiometric coefficient ratio	1	:	2

12. (B)

Moles of H_2 produced = $\frac{11.2}{22.4} = \frac{1}{2}$

mole of Fe needed = $\frac{3}{4} \times \frac{1}{2}$

mass of Fe needed = $\frac{3}{4} \times \frac{1}{2} \times 56 = 21$ g.

13. (B)

Total iron recovered = $\frac{3}{8}$ mole

it is equally recovered in (ii) and (iii) hence $\frac{3}{16}$ mole of Fe is produced in both the reaction.

$\therefore$ moles of CO needed = $\frac{4}{3}\times\frac{3}{16} = \frac{1}{4}$

14. (B)

Removed mass = $\frac{11.2}{22.4} \times 32 + \frac{6.02\times10^{23}}{6.02\times10^{23}}\times16 = 32$ g

mass left = 64 – 32 = 32 g.

15. (A)

Moles of P atom in $Ca_3(PO_4)_2$ = 4 × 2 = 8

Moles of P atom in P_4O_{10} = 5 × 4 = 20

Moles of P atom in H_3PO_3 = 6 × 1 = 6

total moles of P-atoms = 34

$\therefore$ no. of moles of P_4 molecule = $\frac{34}{4} = 8.5$

16. (D)

$\frac{\text{moles of 'O' atom}}{\text{moles of 'H' atom}} = \frac{9}{10}$

$\Rightarrow$ moles of H-atom = $\frac{10}{9}$ × moles of 'O' atom

$= \frac{10}{9} \times 3 \times 2 = \frac{20}{3}$

17. (6)

$$\text{Mg} \longrightarrow \text{MgCl}_2$$
$$\frac{144}{24} = 6\,\text{mole} \quad 6\text{mole}$$

18. (3)

$n(H_1^1) = \frac{6}{1} = 6$; $n_1(p+n+c) = 6 \times 2$;

$n(H_1^3) = \frac{3}{3} = 1$

$n_2\,(p + n + c) = 1 \times 4$

$$\frac{n_1}{n_2} = \frac{6 \times 2}{1 \times 4} = 3$$

19. (2)

20. (2)

21. (6)

22. (5)

23. (7)

Metal oxide = 2.74 g

Weight of vanadium = 1.53 g

$$\%\text{ of } V = \frac{1.53}{2.74} \times 100 = 55.83$$

Thus, % of O = 100 – 55.83 = 44.17

Simplest ratio of V and O = 1 : 2.5 or 2 : 5

PHYSICS

24. (A)

Given that $\left(\vec{F_1}+\vec{F_2}\right).\ \vec{F_1} = 0$

where $F_1 < F_2$

$\therefore\ F_1^2 + F_1 F_2 \cos\theta = 0$

Given that $F_2 = 2F_1$

$F_1^2 + 2F_1^2 \cos\theta = 0$

$\cos\theta = -\frac{1}{2}$

$\therefore\ \theta = 2\pi/3$

25. (B)

Component of $\vec{v}$ along $\vec{a} = (\vec{v}.\hat{a})\,\hat{a}$

$\vec{v}\cdot\hat{a} = (6\hat{i} + 2\hat{j} - 2\hat{k}).\ \frac{\left(\hat{i}+\hat{j}+\hat{k}\right)}{\sqrt{3}}$

$= \frac{6+2-2}{\sqrt{3}} = \frac{6}{\sqrt{3}} = 2\sqrt{3}$

In vector form $= (2\sqrt{3})\ \hat{a}$

$= 2\sqrt{3}\ \frac{\left(\hat{i}+\hat{j}+\hat{k}\right)}{\sqrt{3}}$

$= 2\left(\hat{i}+\hat{j}+\hat{k}\right)$

26. (B)

$$\vec{A}\times\vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 1 & 2 \\ 2 & -2 & 4 \end{vmatrix}$$

$= 8\hat{i} - 8\hat{j} - 8\hat{k}$

$\therefore$ Magnitude of

$\vec{A}\times\vec{B} = |\vec{A}\times\vec{B}| = \sqrt{(8)^2+(8)^2+(8)^2} = 8\sqrt{3}$

27. (A)

$$\frac{\vec{A}.\vec{B}}{|\hat{i}+\hat{j}|}=\frac{(2\hat{i}+3\hat{j})\cdot(\hat{i}+\hat{j})}{\sqrt{2}}=\frac{2+3}{\sqrt{2}}=\frac{5}{\sqrt{2}}$$

In vector form, $\vec{A}_{||}=\frac{5}{\sqrt{2}}\left(\frac{\hat{i}+\hat{j}}{\sqrt{2}}\right)$

$$\vec{A}_{\perp^r}=\vec{A}-\vec{A}_{||}=-\frac{\hat{i}}{2}+\frac{\hat{j}}{2}\Rightarrow\left|\vec{A}_{\perp^r}\right|=\frac{1}{\sqrt{2}}$$

28. (A)

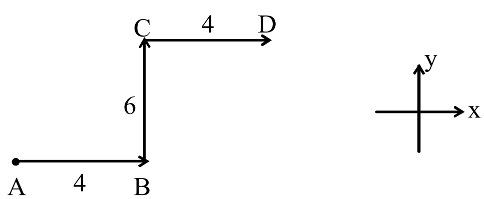
$(\vec{A}_1+2\vec{A}_2).\ (3\vec{A}_1-4\vec{A}_2)$

$= 3|\vec{A}_1|^2+2|\vec{A}_1||\vec{A}_2|\cos\theta-8|\vec{A}_2|^2$

$= (|\vec{A}_1|^2+2|A_1||\vec{A}_2|\cos\theta+|\vec{A}_2|^2)$ **+** $2|\vec{A}_1|^2-9|\vec{A}_2|^2$

$= 3^2+2\times 2^2-9\times 3^2$ $\quad$ **=** $9+8-81=-64$

29. (B)



$\vec{S}=\vec{S_1}+\vec{S_2}+\vec{S_3}$, $\vec{S}=(4\hat{i}+6\hat{j}+4\hat{i})$mile

or $\vec{S}=(8\hat{i}+6\hat{j})$ mile or $|\vec{S}|=10$ mile

30. (C)

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

31. (B,D) **32. (A,B,C)** **33. (A,B,D)** **34. (A,B,D)**

35. (A) **36. (A)** **37. (B)** **38. (B)**

39. (D) **40. (8)** **41. (9)**

42. (4)

$\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$

or $\cos^2 60^o+\cos^2 60^o+\cos^2\gamma=1$

or $\frac{1}{4}+\frac{1}{4}+\cos^2\gamma = 1$ or $\cos^2\gamma = 1-\frac{1}{2}=\frac{1}{2}$

or $\cos\gamma = \frac{1}{\sqrt{2}}$ $\Rightarrow \gamma = \frac{\pi}{4}$

$\therefore$ n = 4

43. (2)

When $\vec{A}$ and $\vec{B}$ are perpendicular to each other, $\vec{A}.\vec{B} = 0$

$\left(4\hat{i}+m\hat{j}+2\hat{k}\right).\left(-2\hat{i}+3\hat{j}+\hat{k}\right)=0$, $-8+3m+2=0$, $m=\frac{8-2}{3}=2$

44. (2)

Projection of $\vec{A}$ on $\vec{B}$ = $\frac{\vec{A}.\vec{B}}{B}=\frac{3}{\sqrt{6}}=\sqrt{\frac{9}{6}\times\frac{4}{4}}=\sqrt{\frac{6}{4}}=\frac{\sqrt{6}}{2}$

$\Rightarrow n = 2$

45. (2)

$\vec{F}_1+\vec{F}_2+\vec{F}_3=(P+1)\hat{i}+4\hat{j}$

A/C to question,

$\sqrt{(P+1)^2+16}=5$

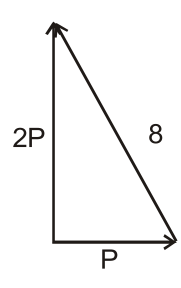
$\Rightarrow P^2+2P-8=0$

$\Rightarrow P=2,-4$

$\Rightarrow$ Positive value of P = 2

46. (5)

$64 = 4P^2+P^2$



$P^2=\frac{64}{5}$

$P=\frac{8}{\sqrt{5}}$

$\Rightarrow x = 5$

MATHEMATICS

47. **(C)** Since $x = 0$ is one of the solution so the product will be zero.

48. **(B)**

$\log(-2x) = 2\log(x+1)$

$-2x > 0 \quad \Rightarrow \quad x < 0 \quad$ ....(i)

$x + 1 > 0 \quad \Rightarrow \quad x > -1 \quad$ ....(ii)

from (i) & (ii), we get $x \in (-1, 0)$

$\therefore \; -2x = (x+1)^2 \quad \Rightarrow \quad x^2 + 4x + 1 = 0 \quad \Rightarrow \quad x = \dfrac{-4 \pm 2\sqrt{3}}{2}$

so only one solution lies in $(-1, 0)$

49. **(C)** $\log_{\frac{1}{3}}(x^2 + x + 1) > -1 \qquad \Rightarrow x^2 + x + 1 < 3$

$\Rightarrow x^2 + x - 2 < 0 \qquad \Rightarrow (x+2)(x-1) < 0 \;\Rightarrow x \in (-2, 1)$

50. **(D)**

$3x - 1 = \pm 5 \Rightarrow 3x = 1 \pm 5 \Rightarrow x = 2, -\dfrac{4}{3}$

51. **(B)**

It is obvious

52. **(C)**

Since $\log_x 9 = 2\log_x 3$ the equation may be written $2y^2 - 5y + 2 = 0$ where $y = \log_x 3$

By the quadratic equation $y = \dfrac{1}{2}$ or $y = 2$ and hence $x = 9$ or $x = \sqrt{3}$, which lies between 1 and 2.

$2(\log_x 3)^2 - 5\log_x 3 + 2 = 0 \left\langle \begin{matrix} t_1 \\ t_2 \end{matrix} \right.$

$t_1 t_2 = 1 \; ; \; t_1 + t_2 = \dfrac{5}{2}$

$\log_{x_1} 3 + \log_{x_2} 3 = \dfrac{5}{2}$

$\dfrac{1}{\log_3 x_1} + \dfrac{1}{\log_3 x_2} = \dfrac{\log_3(x_1 x_2)}{1} = \dfrac{5}{2} \qquad \Rightarrow \quad x_1 x_2 = 9\sqrt{3}$

53. (D)

If exactly one – ve than E = 1

exactly two – ve then E = – 1

all three – ve then E = – 3

all three + ve then E = 3]

54. (A,B,D)

$$\frac{\log x}{\log 3+(1/2)\log x} + \frac{(1/2)\log x}{\log 3+\log x} = 0; \qquad \therefore \qquad \frac{\log_3 x}{1+(1/2)\log_3 x}+\frac{1}{2}\frac{\log_3 x}{(1+\log_3 x)} = 0$$

let $\log_3 x = y$

$$\frac{y}{1+(y/2)} + \frac{y}{2(1+y)} = 0; \quad y\left(\frac{2}{2+y}+\frac{1}{2(1+y)}\right) = 0; \ y[4 + 4y + 2 + y] = 0$$

$\Rightarrow$ y = 0 or y = – 6/5

$\Rightarrow$ $\log_3 x = 0$ or $\log_3 x = -6/5$

x = 1 or $x = 3^{-6/5}$

$\Rightarrow$ A, B, D does not hold good.]

55. (C,D)

(A) $\sqrt{2}\left(\log_{27}\sqrt{3}\right) = \sqrt{2}\left(\log_{27}\sqrt{3}\right) = \sqrt{2}\frac{1}{6} = \frac{1}{\sqrt{6}} =$ irrational number.

(B) $\log_2 112 = \log_2 (2^4 \times 7) = 4 + \log_2 7$ = irrational number.

(C) $\log_3 2 \cdot \log_4 3 \cdot \log_8 4 = \frac{\log 2}{\log 3} \cdot \frac{\log 3}{\log 4} \cdot \frac{\log 4}{\log 8} = \log_8 2 = \frac{1}{3}$ = rational number

(D) $27^{-(\log_{125} 5)} = 27^{-(\log_{5^{-3}} 5)} = 27^{-\frac{1}{3}} = \frac{1}{3}$ = rational number

$\Rightarrow$ options (C) & (D) are correct

56. (A,C,D)

1, $\log_3(3^x - 2)$, $2\log_9(3^x - 8/3)$ are in A.P.

$2\log_3(3^x - 2) = 1 + 2\log 9(3^x - 8/3)$

$\Rightarrow (3^x - 2)^2 = 3(3^x - 8/3) \Rightarrow 3^{2x} - 7(3^x) + 12 = 0$

$\Rightarrow (3^x - 3)(3^x - 4) = 0 \quad \Rightarrow 3^x = 3, 4$

$\Rightarrow$ x = 1 or x = log4/log3 = $\log_3(4)$.

Ans. (A) (C) (D)

57. (A,C)

$N = \log_3(5 \times 3^3) . \log_3(5 \times 3) - \log_3 5 \log_3(81 \times 5)$

Let $\log_3 5 = y$,

$N = (3 + y)(1 + y) - y(4 + y) = 3 + 3y + y + y^2 - 4y - y^2 = 3$]

58. (C)

$\log(3^{1/2x} . 3) = \log(108 - 3^{1/x})$

$3^{1+\frac{1}{2x}} = 108 - 3^{1/x}$

Let $3^{1/2x} = t$

$3t = 108 - t^2$

On solving, we get

$t = 9 \Rightarrow 3^{1/2x} = 9 \Rightarrow \frac{1}{2x} = 2$

$\therefore x = 1/4 \Rightarrow A = 1/4$

59. (A)

$5^{\log x - \log^2 x} = 5^{-3} . 5^{\log x - 1}$

$\log x - \log^2 x = -3 + \log x - 1$

$\log^2 x = 4$

$\log x = \pm 2$

$x = 100, \frac{1}{100}$

$B = 2$

60. (B)

$\because 10^{(\ell n x)^2 + 6 \ell n x - 16} = 10^0$

Let $t = \ln x$

$t^2 + 6t - 16 = 0 \Rightarrow (t + 8)(t - 2) = 0$

$t = -8, t = 2; \ell n x = 2$

$x = e^2 = C$ [$\because C > 1; \ell n x = -8$ is rejected)

$\therefore d = \log \frac{1}{2} e^{-2 \ln 4} = 4$

61. **(C)**

62. **(B)**

$|x^2 - y^2| = 221$

63. **(6)**

$\log_8(kx^2 + wx + f) = 2 \Rightarrow kx^2 + wx + f = 64$

$\therefore\ kx^2 + wx + f - 64 = 0$ ....(1)

also (1) is identical to (3x – 1)(x + 15)

$\therefore\ kx^2 + wx + f - 64 = 3x^2 + 44x - 15$

k = 3; w = 44 and f – 64 = – 15

k = 3, w = 44 and f = 49

$\therefore$ k + w + f = 96

64. **(5)**

$$\frac{4\log_2\sqrt{x}}{\log_2(x/2)} + \frac{2\log_2(x^2)}{\log_2(4x)} = \frac{3\log_2(x^3)}{\log_2(2x)}$$

$$\frac{4\cdot\frac{1}{2}\log_2(x)}{\log_2 x - 1} + \frac{4\log_2(x)}{2+\log_2(x)} = \frac{9\log_2(x)}{1+\log_2(x)}$$

let $\log_2 x = t$

$$\frac{2t}{t-1} + \frac{4t}{t+2} = \frac{9t}{t+1}$$ (hence either t = 0)

or $\frac{2}{t-1} + \frac{4}{t+2} = \frac{9}{t+1} \Rightarrow \frac{2t+4+4t-4}{(t-1)(t+2)} = \frac{9}{t+1} \Rightarrow 6t(t+1) = 9(t^2 + t - 2)$

$\Rightarrow 6t^2 + 6t = 9t^2 + 9t - 18 \Rightarrow 3t^2 + 3t - 18 = 0 \Rightarrow t^2 + t - 6 = 0 \Rightarrow (t+3)(t-2) = 0$

hence t = 0, t = 2 & t = – 3,

x = 1, x = 4, x = 1/8 (rejected $\because$ it is not integral value)]

65. **(1)**

66. **(0)**

$x^2 - 3|x| + 2 = 0$

$\Rightarrow |x| = 1, 2 \Rightarrow x = \pm 1, \pm 2.$

67. **(3)**

Given, $t = \left(\frac{7+1}{\sqrt{7}}\right) \Rightarrow t = \frac{4}{\sqrt{7}} \Rightarrow t^2 = \frac{16}{7}$.

Now, $\dfrac{\sqrt{t^2-1}}{t-\sqrt{t^2-1}} = \dfrac{\sqrt{\dfrac{16}{7}-1}}{\dfrac{4}{\sqrt{7}}-\sqrt{\dfrac{16}{7}-1}}$

$= \dfrac{\dfrac{3}{\sqrt{7}}}{\left(\dfrac{4}{\sqrt{7}}-\dfrac{3}{\sqrt{7}}\right)} = 3$ **Ans.**

68. (1)

Let $x + |x-2| = y$

$\therefore$ Equation becomes $\log_x y^2 = \log_x(5y-6) \Rightarrow y^2 = 5y-6 \Rightarrow y^2 - 5y + 6 = 0$

$\Rightarrow y = 2$ or 3

If $y = 2$

then $x + |x-2| = 2 \Rightarrow 0 < x < 1 \cup 1 < x \le 2$

If $y = 3$

then $x + |x-2| = 3 \Rightarrow x = \dfrac{5}{2}$ only

Hence number of integral solutions is 1.

69. (1)

$p + \dfrac{1}{q+\dfrac{1}{r+\dfrac{1}{s}}} = 1 + \dfrac{21}{68}\left(=\dfrac{89}{68}\right)$

$\therefore$ $p = 1$ $\therefore q + \dfrac{1}{r+\dfrac{1}{s}} = \dfrac{68}{21} = 3 + \dfrac{5}{21}$

$q = 3$ $\therefore r + \dfrac{1}{s} = \dfrac{21}{5} = 4 + \dfrac{1}{5}$

$r = 4$ and $s = 5$

Hence $pq + rs = (3) + (20) = 23$.