SOLUTIONS

WEEKLY TEST-5

GZPA-1901 & 1902

(JEE ADVANCED PATTERN)

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CHEMISTRY

1. (B)

Let 1mole of mixture has x mole N_2O_4

$2 \times 27.6 = x(92) + (1 - x)46$;

$x = 0.2$

2. (A)

Let mole % of ^{26}Mg be x

$$\therefore \quad \frac{(21 - x)25 + x(26) + 79(24)}{100} = 24.31$$

X = 10 %

3. (D)

Mass of S_8 in sample = 160 g;

Mole of $S_8 = \frac{160}{32 \times 8} = 0.625$

Number of moles of O_2 required =0.625×8

Volume of O_2 required = 22.4 × 5

$\therefore$ Vol. of air required $= 22.4 \times 5 \times \frac{100}{21} = 533.33$ L

4. (C)

$$2Fe(NO_3)_3 + 3Na_2CO_3 \longrightarrow Fe_2(CO_3)_3 + 6NaNO_3$$

	$2Fe(NO_3)_3$	$3Na_2CO_3$
mole	2.5	3.6
mole/stoichiometric coefficient	1.25	1.2

Limiting reagent is Na_2CO_3 so moles of $NaNO_3$ format = 3.6 × 2 = 7.2

$$\% \text{ yield} = \frac{6.3}{7.2} \times 100 = 87.5$$

5. (A)

$$\underset{0.1}{4Ca_5(PO_4)_3F} + \underset{0.36}{\overset{\text{L.R.}}{18SiO_2}} + \underset{0.9}{30C} \longrightarrow 3P_4 + 2CaF_2 + 18CaSiO_3 + 30CO$$

18 mole SiO_2 gives 3 mole P_4

0.36 mole SiO_2 will give $= \frac{3}{18} \times 0.36 = 0.06$ mole

6. (D)

CO_2 exhaled in 5 minutes =0.667 × 5 = 3.33 g

moles of CO_2 = 0.0756 mole

moles of KO_2 consumed = 0.0756 mole

mass of KO_2 consumed = 5.38 g

7. (C)

$$n_{O_2} = \frac{0.112}{32};\ n_{Ag_2O} = 0.112 \times \frac{2}{32} = 0.007$$

Mass of Ag_2O = 232 × 0.007 = 1.624

% of Ag_2O = 81.2

8. (A,B)

(A) 46g of $70\% \frac{W}{V} HCOOH (d_{Solution} = 1.4\,g/mL)$ $70\% \frac{W}{V} HCOOH \longrightarrow 70g\ HCOOH$ in 100 mL solution.

Mass of solution = 1.4×100=140g So, in 140g solution, mass of HCOOH = 70g in 46g, mass of $HCOOH = \frac{70}{140} \times 46 = 23g$

(B) $10M\ HCOOH \longrightarrow 10\,mole$ HCOOH in 1000 mL solution mass of solution=1000g

Mass of HCOOH = 10×46= 460g

So in 50g solution mass of $HCOOH = \frac{460}{1000} \times 50 = 23g$

(C) $25\% \frac{W}{W} HCOOH \longrightarrow 25g\,HCOOH$ in 100g solution.

So in 50g solution, mass of HCOOH = 12.5 g

9. (A, D)

10. (A,C,D)

11. (A), (B), (C), (D)

B_2 is limiting reagent.

12. (A)

1 litre of H_2O_2 9aq) provide 11.2 litre of O_2 at STP

moles of $O_2 = \frac{11.2}{22.4} = 0.5$

$n_{H_2O_2}$ required = 0.5 × 2

$$M_{H_2O_2} = \frac{n_{H_2O_2}}{V_{solution}} = 1M$$

13. (B)

Strength in percentage means how many g H_2O_2 present per 100 mL

$\because$ M $\Rightarrow$ 1 and mol. mass of H_2O_2 = 34

$\therefore$ 34g H_2O_2 present per litre of solution of 3.4 g H_2O_2 present per 100 mL of solution.

14. (B)

$H_2O + SO_3 \longrightarrow H_2SO_4;$

18g water combines with 80g SO_3

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

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

or 20% free SO_3.

15. (C)

Initial moles of free SO_3 present in oleum

$= \frac{12}{18} = \frac{2}{3}$moles

= moles of water that can combines with SO_3

moles of free SO_3 combined with water

$= \frac{9}{18} = \frac{1}{2}$moles

moles of free SO_3 left $= \frac{2}{3} - \frac{1}{2} = \frac{1}{6}$mole

$\therefore$ volume of free SO_3 at STP $= \frac{1}{6} \times 22.4 = 3.73L$

16. (C)

%labelling = 100 + 9 + 4.5 = 113.5

17. (3)

$n(H_1^1) = \frac{6}{1} = 6$

n_1(p+n+c) = 6 × 2

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

n_2 (p + n + c) = 1 × 4

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

18. (2)

Total moles of H_2SO_4 = 0.1 mole

$$\text{Total volume} = \frac{150+400}{1.25} = \frac{550}{1.25} = 440$$

$$\therefore \quad M = \frac{0.1}{440}\times 1000 = \frac{1}{4.4} = 0.227\,M$$

19. (3)

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2;$$

moles of H_2 evovled = 2

$\therefore$ moles of HCl required = 4

$$\therefore \quad \frac{V\times 1.2\times 0.365}{36.5} = 4; \quad V = 333.33\,mL$$

20. (6)

$$X = \frac{K\,Q,Q_2}{K.E}$$

$$\text{or, } \frac{x_1}{x_2} = \frac{60\times 8x}{80\times x} = 6$$

21. (1)

1000 mL solution contain 2 mole of ethanol or 1000×10.25 g solution contain 2 mole of ethanol

Mass of solvent = 1000×1.025 – 2 × 46

$$m = \frac{2}{1000\times 1.025 - 2\times 46}\times 1000$$

$$m = \frac{2}{933}\times 1000 = 2.143$$

22. (4)

Total Cl^- = 0.2+0.4 mole (from $BaCl_2$) = 0.6 mole

$$M_{Cl^-} - \frac{0.6}{500}\times 1000 = 1.2$$

23. (2)

Mass of solution =10 ×1.2 = 12g

$$\text{Mass of solute } = 12\times\frac{37}{100} = 4.44\,g$$

PHYSICS

24. (A)

Force is parallel to a line y = $\frac{3}{2}$ x + c

The equation of given line can be written as

y = $-\frac{k}{3}$ x + $\frac{5}{3}$

Work done will be zero, when force is perpendicular to the displacement i.e., the above two lines are perpendicular to each other

So, $m_1m_2 = -1$

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

or k = 2

25. (D)

26. (D)

Component of $3\hat{i}+4\hat{j}$ along $\hat{i}+\hat{j} = \frac{(3\hat{i}+4\hat{j})\cdot(\hat{i}+\hat{j})}{|\hat{i}+\hat{j}|^2}(\hat{i}+\hat{j})$

$= \frac{7}{2}(\hat{i}+\hat{j})$

27. (B) **28. (D)**

29. (A)

Use R = $\sqrt{a^2+b^2+2ab\cos\theta}$ and

S = $\sqrt{a^2+b^2-2ab\cos\theta}$

also $\tan\alpha = \frac{b\sin\theta}{a+b\cos\theta}$

30. (B)

$\frac{d\vec{r}}{dt} = 2bt\,\hat{i} + 3ct^2\,\hat{j}$

$\tan 60^\circ = \frac{2bt}{3ct^2}$

$\Rightarrow$ t = $\frac{2b}{3\sqrt{3}\,c}$

31. (A, C) **32. (A, C, D)**

33. (B, C)

Except F, resultant of rest four forces is 5N in fourth quadrant. Therefore F should be equal & opposite to this resultant or it should be 5 N in 2^{nd} quadrant.

34. (A, D)

35. (A)

$$\frac{dv}{dt} = (2t + 1)$$

$$\int_0^v dv = \int_0^t (2t+1)\, dt$$

$$v = t^2 + t$$

36. (C)

$$v\frac{dv}{dx} = 2x + 1$$

$$vdv = (2x + 1)\, dx$$

$$\int_0^v v\,dv = \int_0^x (2x+1)\,dx \quad \Rightarrow \frac{v^2}{2} = x^2 + x$$

37. (A)

$$\frac{dv}{dt} = 2v + 1$$

$$\int_0^v \frac{dv}{2v+1} = \int_0^t dt$$

$$\Rightarrow \left[\frac{\ln(2v+1)}{2}\right]_0^v = t \qquad \Rightarrow \frac{1}{2}\{\ln(2v+1) - \ln 1\} = t$$

$$\Rightarrow \ln(2v+1) = 2t \quad \Rightarrow 2v + 1 = e^{2t} \quad \Rightarrow 2v = e^{2t} - 1 \qquad \therefore v = \frac{e^{2t}-1}{2}$$

38. (B) **39. (A)**

40. (1)

$$P\sin 60^\circ = 4$$

$$P = \frac{8}{\sqrt{3}}$$

So; resultant $= P\cos 60^\circ = \frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{4}{3}\sqrt{3}$

So, $m - n = 4 - 3 = 1$

41. (8)

$$\vec{A}\times\vec{B}=\begin{vmatrix}\hat{i} & \hat{j} & \hat{k}\\ 3 & 1 & 2\\ 2 & -2 & 4\end{vmatrix}=\hat{i}(4+4)+\hat{j}(4-12)+\hat{k}(-6-2)=8\hat{i}-8\hat{j}-8\hat{k}$$

$$|\vec{A}\times\vec{B}|=8\sqrt{3}\text{ unit}$$

$$\vec{A}\cdot\vec{B}=6-2+8=12$$

$$\therefore\ \frac{|\vec{A}\times\vec{B}|}{\vec{A}\cdot\vec{B}}=\frac{8\sqrt{3}}{12}=\frac{2}{3}\sqrt{3}=\frac{2}{\sqrt{3}}$$

$$\therefore\ m^n=2^3=8$$

42. (2)

$$\frac{d}{dt}[A]=\frac{d}{dt}\left[t^2+\frac{2t}{3}+5\right]=2t+\frac{2}{3}$$

At t = 2/3 s, $\frac{dA}{dt}=2\times\frac{2}{3}+\frac{2}{3}=2\ m^2s^{-1}$.

43. (5)

44. (2)

$$\vec{v}_1.\vec{v}_2=0\Rightarrow t=2\sec$$

45. (4)

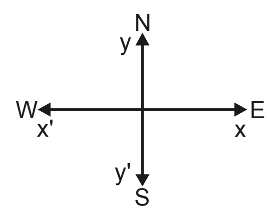
46. (2)

Here, $\vec{F}_1=3\hat{k}$

$$\vec{F}_2=5\sin37^\circ\,\hat{i}+5\cos37^\circ\,\hat{j}=3\hat{i}+4\hat{j}$$

and $\vec{F}_3=-4\sqrt{2}\cos45^\circ\,\hat{i}-4\sqrt{2}\sin45^\circ\,\hat{j}$

$$=-4\hat{i}-4\hat{j}$$



For equilibrium of the particle,

$$\vec{F}_1+\vec{F}_2+\vec{F}_3+\vec{F}_4=0$$

or $3\hat{k}+4\hat{j}+3\hat{i}-4\hat{i}-4\hat{j}+\vec{F}_4=0$

$$\therefore\ \vec{F}_4=\hat{i}-3\hat{k}$$

$$\therefore\ |\vec{F}_4|=\sqrt{1+9}=\sqrt{10}$$

$$\therefore\ n=2$$

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)

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

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

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

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

so only one solution lies in (–1, 0)

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

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

50. (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 $y = \frac{1}{2}$ or $y = 2$ and hence $x = 9$ or $x = \sqrt{3}$, which lies between 1 and 2.

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

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

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

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

51. (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]

52. (B)

It is obvious

53. (B)

LHS= $\frac{1}{2}$[sin A + sin B + sin C + sin D] = 2 $\Rightarrow$ $\sum \sin A = 4$

A = B = C = D = 90° $\Rightarrow$ result

54. (A,B,D)

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

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)

56. (A,B,D)

(C) in 'C' if the sign is (–) ve instead of (+) ve then the answer is 26]

57. (A, B, C, D)

$$\sin A = \frac{4}{5} \Rightarrow \cos A = \pm\frac{3}{5}$$

and $\sin B = \frac{5}{13} \Rightarrow \cos B = \pm\frac{12}{13}$

Hence, sin (A + B) = sinA cosB + cosA sinB has four possible values.

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)

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

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

$\log^2 x = 4$

$\log x = \pm 2$

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

$B = 2$

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. (D)

Angle subtended by two consecutive marks at centre = 30°

Hence at "half past 4", the angle is 45°

62. (A)

Distance covered in 1 second = $5\left(2\pi \cdot \frac{1}{2}\right) = 5\pi m$

Dirstance covered in 1 hour = $\frac{5\pi}{1000} \times 60 \times 60 = 56.52.$

63. (3)

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

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

64. (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 $f = 49$

$\therefore\ k + w + f = 96$

65. (3)

$3 \sin A \cos B = \sin B \cos A$

$\cos A \sin B = \frac{3}{4}$

$\sin(A + B) = 1 \qquad \Rightarrow \qquad C = \frac{\pi}{2}, B = \frac{\pi}{2} - A$

$3 \tan A = \tan\left(\frac{\pi}{2} - A\right)$

$3 = \cot^2 A$

66. (4)

Let $\theta = \frac{\pi}{16}$; $\qquad 8\theta = \frac{\pi}{2}$

$\therefore\ y = \tan\theta + \tan 5\theta + \tan 9\theta + \tan 13\theta$

$\therefore\ y = (\tan\theta - \cot\theta) + (\tan 5\theta - \cot 5\theta)$

[$\tan 13\theta = \tan(8\theta + 5\theta) = -\cot 5\theta$; $\tan 9\theta = \tan(8\theta + \theta) = -\cot\theta$]

$= (\tan\theta - \cot\theta) + (\cot 5\theta - \tan 5\theta)$

$$= \frac{\sin^2\theta - \cos^2\theta}{\sin\theta\cos\theta} + \frac{\cos^2 5\theta - \sin^2 5\theta}{\sin 5\theta\cos 5\theta}$$

$$y = -2 \cdot \frac{\sin 4\theta}{\cos 2\theta \sin 2\theta} = -4$$

Hence absolute value = 4 Ans.]

67. (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 $\log_2 x = t$

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

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)]

68. (1)

Using $\frac{a^2}{x} + \frac{b^2}{y} \ge \frac{(a+b)^2}{x+y}$; $x, y > 0$, where equality holds for $\frac{a}{x} = \frac{b}{y}$.

Hence $\frac{\sin^2 x}{16} = \frac{\cos^2 x}{81} \Rightarrow \tan^2 x = \frac{16}{81}$

$\therefore \sin^2 x = \frac{16}{97}$ and $\cos^2 x = \frac{81}{97}$, which gives $\lambda = 1$.

69. (1)