IIT – JEE: 2022 **TW TEST (ZENITH ADV)** **DATE: 22/08/20**

TOPIC: VECTORS

Answer Key

1. (A)
2. (B)
3. (A)
4. (C)
5. (C)
6. (A)
7. (A)
8. (A)
9. (D)
10. (B)
11. (A)
12. (C)
13. (C)
14. (B)
15. (C)
16. (B)
17. (B)
18. (D)
19. (C)
20. (C)

SOLUTION

21. (B)

No. of moles of atom $= \frac{3}{1}$

No. of atoms $= 3N_A$

No. of deuterium atom $= \frac{1}{6001} \times 3N_A$

No. of neutron $= \frac{1}{6001} \times 3 \times 6.02 \times 10^{23}$

$= 3.01 \times 10^{20}$

22. (B)

No. of moles of $C_2O_4^{2-} = \frac{4.4}{88} = 0.05$

No. of ions = 0.05 N_A

No. of electrons in 1 ion = 12 + 32 + 2 = 46

No. of electrons in 0.05 N_A ions = 46 × 0.05 N_A = 2.3 N_A

23. (D)

No. of moles of O_2 in 1 gm dioxygen $= \frac{1}{32}$

No. of molecules of $O_2 = \frac{1}{32} N_A$

No. of atoms of $O = \frac{2N_A}{32} = \frac{N_A}{16}$

1 gm atomic oxygen

$= \frac{1}{16}$ moles of O atoms

$= \frac{N_A}{16}$ atoms of O

1 gm of Ozone

$= \frac{1}{48}$ moles of O_3

$= \frac{1}{48} N_A$ molecules of O_3

$= \frac{3}{48} N_A$ atoms of $O = \frac{N_A}{16}$

24. (A)

Volume of sea water $= 1.4 \times 10^{21}$ L

$= 1.4 \times 10^{24}$ ml

Wt. of sea water $= 1.4 \times 10^{24}$ gm

$= 1.4 \times 10^{21}$ kg

Wt. of chlorine $= 19 \times 1.4 \times 10^{21}$ gm

No. of moles of chlorine atoms $= \frac{19 \times 1.4 \times 10^{21}}{35.5} = 7.5 \times 10^{20}$

25. (A)

$2KClO_3 \rightarrow 2KCl + 3O_2$

2 moles 3 moles

$C_4H_8 + 6O_2 \rightarrow 4CO_2 + 4H_2O$

0.5 moles 3 moles

26. (D)

Wt. of pure NaCl $= 250 \times \frac{95}{100}$ gm $= 237.5$ gm

No. of moles of NaCl $= \frac{237.5}{58.5}$

$2NaCl \rightarrow Na_2SO_4$

$\frac{237.5}{58.5}$ mole $\frac{237.5}{58.5} \times \frac{1}{2}$ mole

Wt. of $Na_2SO_4 = \frac{237.5}{58.5} \times \frac{1}{2} \times 142$ gm $= 288.24$ gm

Wt. of impure sample $= \frac{100}{90} \times 288.24 = 320.3$ gm

27. (A)

CO & CO_2

$1 - a$ moles a moles

$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

2a moles a moles

$2a = \frac{20}{40}$

$a = \frac{1}{4}$ moles

$n_{CO} = 1 - \frac{1}{4} = \frac{3}{4}$ moles

$2CO + O_2 \rightarrow CO_2$

$\frac{3}{4}$ mole $\frac{3}{4}$ mole

$CO_2 + 2NaOH \rightarrow Na_2CO_3 + H_2O$

$\frac{3}{4}$ mole $\frac{3}{4} \times 2$ mole

$= \frac{3}{2}$ mole

$= \frac{3}{2} \times 40$ gm

$= 60$ gm

28. (A)

$[Cl^-] = 0.6\ M = \frac{(0.8)(V)(3)+(0.2)(50)(2)}{(V+50)}$

$0.6V + 30 = 2.4V + 20$

$1.8V = 10$

$V = \frac{100}{18} = 5.56$ ml

29. (A)

Wt. of HCl gas = x gm

$\frac{x}{50+x} \times 100 = 40$

$x = \frac{100}{3}$ gm

Wt. of solution $= \frac{100}{3} + 50 = \frac{250}{3}$ gm

Volume of solution = 75 ml

Density $= \frac{250/3}{75} = 1.11$ gm/ml

30. (C)

Assume 100 gm solution

$\%\frac{w}{w} = 20$

Wt. of glucose = 20 gm

$\%\frac{w}{v} = 25$

$\frac{20}{v} \times 100 = 25$

$v = 80$ ml

Density $= \frac{100}{800} = 1.25$ gm/ml

31. (C)

MnO & MnO_2

$\frac{200}{3}$ mole $\quad\quad$ $\frac{100}{3}$ mole

No. of moles of $Mn = \frac{200}{3} + \frac{100}{3} = 100$

$$\%Mn = \frac{100 \times 55}{\left(\frac{200}{3} \times 71\right) + \left(\frac{100}{3} \times 87\right)} \times 100 = 72.05$$

32. (D)

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

0.15 mole

$n_{H_2O} = \frac{4}{3} \times 0.15 = 0.2$ mole

No. of molecules of H_2O formed $= 0.2 \times 6 \times 10^{23}$

No. of drops of water formed $= \frac{0.2 \times 6 \times 10^{23}}{1.7 \times 10^{21}} = 70$

33. (D)

	C		H
Mass Ratio	8	:	1
Moles ratio	$\frac{8}{12}$	:	1
	2	:	3

$EF = C_2H_3O_x$

$$10.6 = \frac{16x}{24 + 3 + 16x} \times 100$$

$x = 0.2$

$EF = C_2H_3O_{0.2}$ or $C_{10}H_{15}O$

34. (C)

	A	+	2B	$\rightarrow$	I
Initial	5		6		0
Final	5 – 3 = 2		6 – 6 = 0		3

I + C $\rightarrow$ B + D

3 moles $\quad\quad$ 3 moles $\quad\quad$ 3 moles

Now 3 moles of B again react with unreacted A.

	A	+	2B	$\rightarrow$	I
Initial	2		3		0
Final	2 – 1.5 = 0.05		3 – 3 = 0		1.5

I + C $\rightarrow$ B + D

1.5 moles $\quad\quad$ 1.5 moles $\quad\quad$ 1.5 moles

Now again B reacts with unreacted A.

A + 2B $\rightarrow$ I

Initial	0.5	1.5	0
Final	0.5 – 0.5 = 0	1.5 – 1 = 0.5	0.5

$$\underset{0.5 \text{ moles}}{I} + C \rightarrow \underset{0.5 \text{ moles}}{B} + \underset{0.5 \text{ moles}}{D}$$

Total moles of D formed = 3 + 1.5 + 0.5 = 5 moles

35. (B)

$$\text{Final volume} = (V + 10V)\frac{98}{100} = (11V)\frac{98}{100}$$

$$\text{Molarity} = \frac{2.2V}{(11V)\frac{98}{100}} = \frac{220}{11 \times 98} = \frac{20}{98} = 0.204$$

36. (D)

No. of moles of glucose = a

Wt. of glucose = 180a gm

Wt. of water = 1000 – 180a gm

$$1 = \frac{a}{1000 - 180a} \times 1000$$

$$1000 - 180a = 1000a \Rightarrow a = \frac{1000}{1180}$$

Final wt. of water = 1000 – 180a + 4000 gm

$$= 5000 - 180\left(\frac{1000}{1100}\right) \text{gm}$$

$$= 4847 \text{ gm}$$

$$= 4.847 \text{ kg}$$

$$\text{Final molality} = \frac{1000/1180}{4.847} = 0.175 \text{ m}$$

37. (B)

Atomic mass of M = a

$$\underset{0.250 \text{ gm}}{M} + \underset{= \frac{0.250}{a} \text{ moles}}{3F_2} \rightarrow \underset{\frac{0.250}{a} \text{ mole}}{MF_6}$$

$$\frac{0.250}{a}(a + 114) = 0.547$$

$$0.250a + (114)(0.250) = 0.547a$$

$$a = \frac{28.5}{0.297} = 95.96$$

38. (B)

$$\text{Average molecular mass} = \frac{\text{total mass}}{\text{total moles}}$$

$$= \frac{100}{\frac{90}{2} + \frac{10}{4}} = 2.10$$

39. (A)

CH_4 & C_2H_6

a mole a mole

total no, of moles = 2a

total volume $= (22.4)(2a)\ell$

total wt. $= (16)(a) + (30)a = 46a$

density $= \frac{46a}{(22.4)(2a)} = 1.03\ \text{gm}/\ell$

40. (C)

Initial no. of moles of Ca atoms $= \frac{2\times10^{-3}}{40}$

Moles of Ca atoms removed $= \frac{1.2\times10^{19}}{6\times10^{23}}$

No. of moles of Ca atom left

$= \frac{2\times10^{-3}}{40} - \frac{1.2\times10^{19}}{6\times10^{23}}$

$= 0.5\times10^{-4} - 0.2\times10^{-4} = 3\times10^{-5}$