

# MDCAT CHEMISTRY NUMERICAL

- How many sigma moles are there in 7gm of the ethene gas?  
A. 1 mole  
B. 2.5 moles  
C. 0.25 moles  
D. 1.2 moles
- Which of the following contains the same number of atoms as 12 g of Magnesium?  
A. 12g of carbon  
B. 20g of calcium  
C. 24 g of carbon  
D. 12 g of sodium
- The number of atoms present in 3gms of carbon are:  
A.  $15.05 \times 10^{23}$   
B.  $1.505 \times 10^{23}$   
C.  $6.02 \times 10^{23}$   
D.  $3.01 \times 10^{23}$
- Weight of single molecule of carbon dioxide is:  
A. 44 g  
B.  $7.305 \times 10^{-23}$  g  
C.  $6.023 \times 10^{24}$  g  
D.  $4.184 \times 10^{-22}$  g
- 1 a.m.u is equal to:  
A.  $6.02 \times 10^{23}$  g  
B.  $1.67 \times 10^{-24}$  g  
C.  $1.66 \times 10^{-23}$  g  
D.  $3.01 \times 10^{23}$  g
- Calculate the percentage of oxygen in heavy water:  
A. 80%  
B. 60%  
C. 50%  
D. 20%
- 15 litres of hydrogen combine with nitrogen to produce ammonia. The volume of ammonia in litre formed is:  
A. 10 litres  
B. 5 litres  
C. 8 litres  
D. 12 litres
- How many hydrogen atoms are present in 0.342g of  $\text{NH}_3$ ?  
A.  $6.02 \times 10^{22}$  H atoms  
B.  $3.6 \times 10^{22}$  H atoms  
C.  $6.02 \times 10^{22}$  H atoms  
D.  $6.02 \times 10^{21}$  H atoms
- An oxide of nitrogen contains 30.4% nitrogen. Its empirical formula is:  
A.  $\text{NO}_2$   
B.  $\text{N}_2\text{O}$   
C.  $\text{NO}$   
D.  $\text{NO}_3$
- No. of covalent bond in 4.4 gm of  $\text{CO}_2$   
A. 17.6  
B.  $6.02 \times 10^{22}$   
C.  $12.04 \times 10^{22}$   
D.  $24.08 \times 10^{22}$
- The density of  $\text{NH}_3$  at S.T.P  
A.  $1.5\text{gm}/\text{dm}^3$   
B.  $0.5\text{gm}/\text{dm}^3$   
C.  $0.75\text{gm}/\text{dm}^3$   
D.  $1.2\text{gm}/\text{dm}^3$
- Certain mass of a gas at STP occupies 1.5 litre. Keeping the pressure constant at what temperature, the volume of a gas would be 4.5 litres.  
A.  $819^\circ\text{C}$   
B. 456K  
C.  $546^\circ\text{C}$   
D.  $273^\circ\text{C}$
- The ratio of the rate of diffusion of two gases is 1 : 3, the ratio of their molecular weights is:  
A. 1 : 3  
B. 3 : 1  
C. 1 : 9  
D. 9 : 1
- Equal masses of  $\text{SO}_2$  and Oxygen are kept in a vessel at  $27^\circ\text{C}$ . the pressure of mixture is 2 atm. The Partial pressure of  $\text{SO}_2$  is:  
A. 0.44 atm  
B. 0.22 atm  
C. 0.66 atm  
D. 0.88 atm

15. The rate of diffusion of Helium when compared to that of Methane is  
 A. twice  
 B. half  
 C. thrice  
 D. 4 Times
16. A gas occupies a volume of 2 litres at 27°C and 1 atmospheric pressure. The expression for its volume at STP is:  
 A.  $\frac{2 \times 300}{273}$   
 B.  $\frac{273}{2 \times 300}$   
 C.  $3 \times 273 \times 300$   
 D.  $\frac{2 \times 273}{300}$
17. Keeping pressure constant, the volume of certain gas at 0 °C can be doubled at the temperature of:  
 A. 273 °C  
 B. 273K  
 C. 0K  
 D. 546 °C
18. Which of the following pairs has identical rates of diffusion?  
 A.  $N_2O$  &  $CO_2$   
 B.  $NO$  &  $CO$   
 C.  $NH_3$  &  $PH_3$   
 D.  $H_2O$  &  $CH_4$
19. One  $dm^3$  of any gas at STP occupies the number of molecules will be:  
 A.  $6.02 \times 10^{23}$   
 B.  $3.01 \times 10^{23}$   
 C.  $2.68 \times 10^{22}$   
 D.  $9.18 \times 10^{24}$
20. In the reaction;  ${}_{87}Fr^{223} \rightarrow {}_{88}Ra^{223} + X$ , Particle 'X' is:  
 A. A Proton  
 B. An Alpha Particle  
 C. A beta particle  
 D. A positron
21. Among the following, the electron with the highest energy is:  
 A.  $n = 3, l = 2, m = 0, s = \pm \frac{1}{2}$   
 B.  $n = 4, l = 0, m = 0, s = \pm \frac{1}{2}$   
 C.  $n = 4, l = 0, m = 1, s = \pm \frac{1}{2}$   
 D.  $n = 3, l = 0, m = 0, s = \pm \frac{1}{2}$
22. Mass of an electron in *amu* is:  
 A.  $5.7 \times 10^{-4}$   
 B.  $5.7 \times 10^4$   
 C.  $0.57 \times 10^4$   
 D.  $-5.7 \times 10^{-4}$
23. Emission spectrum obtained when transition of electrons occurs from:  
 A.  $n = 3$  to  $n = 1$   
 B.  $n = 1$  to  $n = 4$   
 C.  $n = 2$  to  $n = 3$   
 D.  $n = 2$  to  $n = 4$
24. The radius of 10<sup>th</sup> Bohr's orbit of hydrogen atom is:  
 A. 52.9 °A  
 B. 5.29 °A  
 C. 0.529 °A  
 D. None of the above
25. The missing part of the equation is  ${}_{13}^{27}Al + {}_2^4He \rightarrow {}_1^1H + ?$   
 A.  ${}_{13}^{30}Al$   
 B.  ${}_{14}^{31}Si$   
 C.  ${}_{14}^{22}Si$   
 D.  ${}_{14}^{30}Si$
26. The correct equation for the formation of Radium -228 from Thorium -232 is:  
 A.  ${}_{90}^{232}Th \rightarrow {}_{88}^{228}Ra + {}_2^4He$   
 B.  ${}_{90}^{232}Th \rightarrow {}_{84}^{228}Ra + {}_1^3H$   
 C.  ${}_{90}^{232}Th \rightarrow {}_{88}^{228}Ra + {}_1^2D$   
 D.  ${}_{90}^{232}Th + {}_0^1n \rightarrow {}_{88}^{228}Ra + {}_1^1H$
27. When HCl is formed, heat is evolved as  $H_2 + Cl_2 \rightarrow 2HCl + 44K \text{ cal}$ . The intrinsic energy of HCl is:  
 A. -22K cal  
 B. 44K.cals  
 C. -44Kcals  
 D. 22K.cals

28. A gas does 234J of work while expanding and at the same time it absorbs 324J of heat the change in the internal energy is;
- A. 98  
B. 90  
C. 558  
D. 320
29. What is the change in the internal energy of a system that absorbs 455J of heat and does work 325J of work?
- A. 130J  
B. 30J  
C. 425J  
D. 780J
30. Use the following equations:
- $$\text{N}_{2(\text{g})} + 2\text{O}_{2(\text{g})} \rightarrow \text{N}_2\text{O}_4 \quad \Delta H_0 = +9.2 \text{ KJ}$$
- $$\text{N}_{2(\text{g})} + 2\text{O}_{2(\text{g})} \rightarrow 2\text{NO}_2 \quad \Delta H_0 = +33.2 \text{ KJ}$$
- The enthalpy change of the system is
- $$2\text{NO}_{2(\text{g})} \rightarrow \text{N}_2\text{O}_4 \quad \Delta H_0 = ?$$
- A. -24KJ  
B. +24KJ  
C. 42.4KJ  
D. -42.4KJ
31. The heat of formation of CO from the following data:
- $$\text{C} + \text{O}_2 \rightarrow \text{CO}_2 \quad \Delta H = +94000 \text{ cal}$$
- $$2\text{CO} + \text{O}_2 \rightarrow 2\text{CO}_2 \quad \Delta H = +136000 \text{ cal is:}$$
- A. 26K.cal  
B. 24K.cal  
C. 22K.cal  
D. 20K.cal
32. What is the concentration of an HNO<sub>3</sub> acid solution with a pH of 3?
- A. 3  
B. -3  
C. 10<sup>-3</sup>  
D. 10<sup>3</sup>
33. What is the normality of 1M solution of H<sub>2</sub>SO<sub>4</sub>?
- A. 4N  
B. 2N  
C. 1N  
D. none of the above
34. If the solubility of AB<sub>2</sub> is 2 x 10<sup>-4</sup> mole lit<sup>-1</sup>. The solubility product of AB<sub>2</sub> is:
- A. 4 x 10<sup>-8</sup>  
B. 4 x 10<sup>-12</sup>  
C. 32 x 10<sup>-12</sup>  
D. 8 x 10<sup>-12</sup>
35. In the reaction A + B ↔ C + D. 4 moles of A reacts with 4 moles of B and form 2 moles each of C and D value of K<sub>c</sub> for reaction is :
- A. 1  
B. 2  
C. 3  
D. 1.56
36. K<sub>c</sub> expression of following reaction
- $$\text{N}_2\text{O}_{4(\text{aq})} \rightleftharpoons 2\text{NO}_2$$
- A.  $K_c = \frac{4x^2}{(a-x)V}$   
B.  $K_c = \frac{2x^2}{(a-x)V}$   
C.  $K_c = \frac{2x}{(a-x)V}$   
D.  $K_c = \frac{4x^2V}{(a-x)}$
37. To dissolve an excess of BaSO<sub>4</sub> in pure water at 25°C. if its K<sub>sp</sub> = 1 x 10<sup>-10</sup>. What is the concentration of the Barium in the water?
- A. 10<sup>-4</sup> M  
B. 10<sup>-5</sup> M  
C. 10<sup>-6</sup> M  
D. 10<sup>-10</sup> M

38. Which of the following reaction does not involve either oxidation or reduction?
- A.  $\text{VO}^{-2} \rightarrow \text{V}_2\text{O}_3$                       B.  $\text{Na} \rightarrow \text{Na}^+$   
 C.  $\text{CrO}_4^{-2} \rightarrow \text{Cr}_2\text{O}_7^{-2}$                       D.  $\text{Zn}^{+2} \rightarrow \text{Zn}$
39. Balancing the following equation,  $\text{MnO}_4^- + \text{H}^+ + \text{Fe}^{+2} \rightarrow \text{Mn}^{+2} + \text{Fe}^{+3} + \text{H}_2\text{O}$ , the number of H ions required will be:
- A. 8    B. 10  
 C. 16    D. 4
40. The oxidation number of Cl in  $\text{KClO}_3$  is equal to:
- A. -1    B. -5  
 C. +5    D. -6
41. The standard reduction potential for Fe & Sn electrodes are -0.44V and 0.14V respectively. Electrode potential of the cell reaction:
- A. +0.30V    B. -0.58V  
 C. +0.58V    D. -0.30V
42. In reaction  $2\text{NO} + \text{O}_2 \leftrightarrow 2\text{NO}_2$ , its rate law is: rate  $\propto$  [NO] or Rate = K [NO], the unit of rate constant is:
- A.  $\text{S}^{-1}$     B.  $\text{MS}^{-1}$   
 C.  $\text{mole}^{-2} \text{S}^{-1}$                                     D.  $\text{mole}^{-1} \text{lit. S}^{-1}$

43. The reaction  $2\text{NO}_{(g)} + \text{Cl}_{2(g)} \leftrightarrow 2\text{NOCl}$  was studied at  $-10^\circ\text{C}$  and the following data were obtained:

Experiment number	[NO] (mole/dm <sup>3</sup> )	[Cl <sub>2</sub> ] (mole/dm <sup>3</sup> )	Rate of Reaction (mole/dm <sup>3</sup> s)
1	0.10	0.10	0.18
2	0.10	0.20	0.36
3	0.20	0.20	1.40

The order of reaction with respect to NO is:

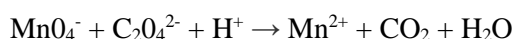
- A. zero order reaction                            B. first order reaction  
 C. Second order reaction                        D. third order reaction
44. The table given data for reaction between X and Y at constant temperature.

Experiment number	[X] (mole/dm <sup>3</sup> )	[Y] (mole/dm <sup>3</sup> )	Rate of Reaction (mole/dm <sup>3</sup> s)
1	0.3	0.2	$4.0 \times 10^{-4}$
2	0.6	0.4	$1.6 \times 10^{-3}$
3	0.6	0.8	$6.4 \times 10^{-3}$

What is the rate equation for the reaction?

- A. rate = K[X][Y]<sup>2</sup>                                B. rate = K[X]<sup>2</sup>[Y]  
 C. rate = K[X]<sup>2</sup>                                    D. rate = K[Y]<sup>2</sup>
45. A substance react according to the first order reaction and the specific rate constant for the reaction is  $1.0 \times 10^{-2} \text{S}^{-1}$ . If the initial concentration is 1.0 M. its initial rate is:
- A. 0.549    B.  $1.0 \times 10^{-4}$   
 C.  $2.0 \times 10^{-2}$                                     D.  $1.0 \times 10^{-2}$
46. Rate = K [A][B]<sup>2</sup>. Keeping the other conditions same, if the concentration of A is increased by four times and B is increased by two times, then the initial rate of reaction X will be
- A. 9 X     B. 16 X  
 C. 32 X    D. 8 X
47. Balancing the following equation,  $\text{MnO}_4^- + \text{H}^+ + \text{Fe}^{+2} \rightarrow \text{Mn}^{+2} + \text{Fe}^{+3} + \text{H}_2\text{O}$ , the number of H ions required will be:
- A. 8    B. 10  
 C. 16    D. 4

48. Which of the following represents a redox reaction?
- A.  $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$       B.  $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HCl}$   
 C.  $\text{CuSO}_4 + 2\text{H}_2\text{O} \rightarrow \text{Cu}(\text{OH})_2 + \text{H}_2\text{SO}_3$       D.  $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
49. To balance the oxygen atom in the given reaction in acidic medium  
 $\text{Cr}_2\text{O}_7^{2-}(\text{aq}) \rightarrow \text{Cr}^{3+}(\text{aq})$  we
- A. Add water ( $\text{H}_2\text{O}$ ) on right side      B. Add water ( $\text{H}_2\text{O}$ ) on left side  
 C. Add  $\text{OH}^-$  on right side      D. Add  $\text{OH}^-$  on left side
50. The oxidation half reaction for following reaction is  
 $\text{Fe}^{2+}(\text{aq}) + \text{Cr}_2\text{O}_7^{2-}(\text{aq}) \rightarrow \text{Fe}^{3+}(\text{aq}) + \text{Cr}^{3+}(\text{aq})$
- A.  $\text{Fe}^{3+}(\text{aq}) \rightarrow \text{Fe}^{2+}(\text{aq})$       B.  $\text{Cr}_2\text{O}_7^{2-}(\text{aq}) \rightarrow \text{Cr}^{3+}(\text{aq})$   
 C.  $\text{Cr}^{3+}(\text{aq}) \rightarrow \text{Cr}_2\text{O}_7^{2-}(\text{aq})$       D.  $\text{Fe}^{2+}(\text{aq}) \rightarrow \text{Fe}^{3+}(\text{aq})$
51. For the redox reaction



The correct coefficients of the reactants for the balanced reaction are:

- A.  $\text{MnO}_4^-$   $\text{C}_2\text{O}_4^{2-}$   $\text{H}^+$  16 5 2      B.  $\text{MnO}_4^-$   $\text{C}_2\text{O}_4^{2-}$   $\text{H}^+$  2 16 5  
 C.  $\text{MnO}_4^-$   $\text{C}_2\text{O}_4^{2-}$   $\text{H}^+$  2 5 16      D.  $\text{MnO}_4^-$   $\text{C}_2\text{O}_4^{2-}$   $\text{H}^+$  5 16 2

ANSWERS			
1	D	26	A
2	B	27	A
3	B	28	B
4	B	29	A
5	B	30	A
6	A	31	A
7	A	32	C
8	B	33	B
9	A	34	C
10	D	35	A
11	C	36	A
12	C	37	B
13	D	38	C
14	C	39	A
15	A	40	C
16	D	41	C
17	A	42	A
18	A	43	C
19	C	44	D
20	C	45	D
21	A	46	B
22	A	47	A
23	A	48	D
24	A	49	A
25	D	50	D
		51	C