BYJU'S Home Learning Program

Topic covered:

- **Mole Concept (Session - 1) - JEE**

Daily Practice Problems

1. Calculate the number of $FeSO_4.7H_2O$ formula units in 0.5 millimoles of pure $FeSO_4.7H_2O$.
   a. 0.5 N_A b. 0.0005 N_A
   c. 0.005 N_A d. 5000 N_A

2. Find the number of millimoles of CH_4 in a sample containing 1.2044×10^{21} CH_4 molecules.
   a. 2 b. 0.002
   c. 20 d. 0.02

3. Find the total number of oxygen atoms in 6×10^6 formula units of the complex $[Co(H_2O)_6]Cl_2$.
   a. 42×10^6 b. 6×10^6
   c. 3.6×10^7 d. 1.8×10^7

4. If we have a $CuSO_4.5H_2O$ sample and it contains a total of 1116 oxygen atoms, find the number of formula units of $CuSO_4.5H_2O$ present in the sample.
   a. 124 b. 9 N_A
   c. 0.124 N_A d. 279

5. Find the number of oxygen atoms in 10 millimoles of $[Fe(H_2O)_5NO]SO_4$.
   a. 0.01 N_A b. 0.1 N_A
   c. N_A d. 10 N_A

6. Find the number of moles of $MgSO_4.7H_2O$ in a pure sample that contains 0.0022 moles of oxygen atoms.
   a. 2 moles b. 0.2 moles
   c. 0.002 moles d. 0.2 millimoles

7. Find the total number of moles of electrons in 6.023×10^{23} NO_3^- ions.
   a. 32 b. 31
   c. 28 d. 30

8. Find the total number of electrons present in 20 millimoles of K_2SO_4.
   a. 2.03×10^{24} b. 6.02×10^{23}
   c. 1.04×10^{24} d. 1.20×10^{23}

9. If we have a have a pure $NaNO_3$ sample that contains a total of 8.4 kilomoles of electrons, find the number of moles of $NaNO_3$ present in the sample.
   a. 200 moles
   b. 2 moles
   c. 0.2 moles
   d. 400 moles

10. If we have a pure $CaCO_3$ sample that contains a total of 1.5055×10^{22} electrons, then the number of millimoles of $CaCO_3$ present in the sample is:
    a. 0.2
    b. 0.3
    c. 0.03
    d. 0.5

Answer Key

Question Number	1	2	3	4	5
Answer Key	(b)	(a)	(c)	(a)	(b)

Question Number	6	7	8	9	10
Answer Key	(d)	(a)	(c)	(a)	(d)

Solutions

1. (b)
   1 millimole = 10^{-3} moles
   1 mole of pure FeSO4 .7H2O contains NA number of formula units of FeSO4 .7H2O
   The number of formula units in 0.5 millimoles of pure FeSO4.7H2O will be:
   $= 0.5 \times 10^{-3} N_A$
   0.0005 NA

2. (a)
   1 mole CH_4 contains 6.022×10^{23} molecules of CH_4
   So, the number of moles that have 1.2044×10^{21} molecules of CH_4:
   $= \frac{1.2044 \times 10^{21}}{6.022 \times 10^{23}}$
   = 0.002
   = 2 millimoles

3. (c)
   Number of O-atoms present in one formula unit of $[Co(H_2O)_6]Cl_2$ = 6
   Number of O-atoms present in 6×10^6 formula units of $[Co(H_2O)_6]Cl_2$ are,
   $= 6 \times 6 \times 10^6$
   $= 3.6 \times 10^7$ atoms

4. (a)
   One formula unit of $CuSO_4.5H_2O$ has 9 O-atoms.
   So, 1116 O-atoms will be present in:
   $= \frac{1116}{9}$ formula units of $CuSO_4.5H_2O$
   = 124 formula unit of $CuSO_4.5H_2O$

5. (b)
   Number of O-atoms in one formula unit of $[Fe(H_2O)_5NO]SO_4$ = 10
   Therefore, number of O-atoms in one mole of $[Fe(H_2O)_5NO]SO_4 = 10\ N_A$
   So, number of O-atoms in 10 millimoles of $[Fe(H_2O)_5NO]SO_4$
   $= 10 \times 10^{-3} \times 10\ N_A$
   $= 0.1\ N_A$

6. (d)
   11 O-atoms are present in one formula unit of $MgSO_4.7H_2O$
   So, 11 moles of O-atoms are present in 1 mole of $MgSO_4.7H_2O$
   The number of moles of $MgSO_4.7H_2O$ that would have 0.0022 moles of O-atoms:
   $= \frac{0.0022}{11}$
   $= 0.0002$
   $= 0.2$ millimoles

7. (a)
   Total number of electrons in one NO_3^- ion= 7+(8×3) +1 = 32
   So, the number of electrons in 6.023×10^{23} NO_3^- ions:
   $= 6.023 \times 10^{23} \times 32$
   = 32 moles

8. (c)
   Total number of electrons in one formula unit of $K_2SO_4 = 19 \times 2 + 16 + 8 \times 4 = 86$
   So, total number of electrons present in one mole of $K_2SO_4 = 86 \times 6.022 \times 10^{23}$
   Hence, total number of electrons in 20 millimoles K_2SO_4:
   $= 20 \times 10^{-3} \times 86 \times 6.022 \times 10^{23}$
   $= 1.04 \times 10^{24}$

9. (a)
   Total number of electrons present in 1 formula unit of $NaNO_3$ = 11+7+24=42
   So, total number of electrons present in one mole of $NaNO_3 = 42 \times 6.022 \times 10^{23}$
   The moles of $NaNO_3$ that would have 8.4 kilomoles of electrons will moles of $CaCO_3$ moles of $CaCO_3$ be:
   $= \frac{8.4 \times 1000 \times 6.022 \times 10^{23}}{42 \times 6.022 \times 10^{23}}$
   = 200 moles

10. (d)
   Total number of electrons present in 1 formula unit of $CaCO_3 = 20 + 6 + 8 \times 3 = 50$
   So, $50 \times 6.022 \times 10^{23}$ electrons are present in 1 mol of $CaCO_3$
   Hence, the number of moles of CaCO3 that would have 1.5055×10^{22} electrons will be:
   $= \frac{1.5055 \times 10^{22}}{50 \times 6.022 \times 10^{23}}$
   $= 0.0005$
   = 0.5 millimoles