Chemistry 20 – Lesson 5
The mole

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Part A

1. $M_{FeSO_4} = 55.85 + 32.07 + 4(16.00)$ ✓

/2 $M_{FeSO_4} = 151.92\ ^{g}/_{mol}$ ✓

2. $M_{MgSO_4} = 24.31 + 32.07 + 4(16.00)$ ✓

/2 $M_{MgSO_4} = 120.38\ ^{g}/_{mol}$ ✓

3. $M_{CaCO_3} = 40.08 + 12.01 + 3(16.00)$ ✓

/2 $M_{CaCO_3} = 100.09\ ^{g}/_{mol}$ ✓

4. $M_{MgSiO_3} = 24.31 + 28.09 + 3(16.00)$ ✓

/2 $M_{MgSiO_3} = 100.40\ ^{g}/_{mol}$ ✓

5. $M_{NaClO} = 22.99 + 35.45 + 16.00$ ✓

/2 $M_{NaClO} = 74.44\ ^{g}/_{mol}$ ✓

6. $M_{K_2Cr_2O_7} = 2(39.10) + 2(52.00) + 7(16.00)$ ✓

/2 $M_{K_2Cr_2O_7} = 294.20\ ^{g}/_{mol}$ ✓

7. $M_{Al(OH)_3} = 26.98 + 3(16.00) + 3(1.01)$ ✓

/2 **or**

$M_{Al(OH)_3} = 26.98 + 3(16.00 + 1.01)$

$M_{Al(OH)_3} = 78.01\ ^{g}/_{mol}$ ✓

8. $M_{NaCl} = 22.99 + 35.45$ ✓

/2 $M_{NaCl} = 58.44\ ^{g}/_{mol}$ ✓

9. $M_{Na_2CO_3 \bullet 10H_2O} = 2(22.99) + 12.01 + 3(16.00) + 10(2 \times 1.01 + 16.00)$ ✓

/2 $M_{Na_2CO_3 \bullet 10H_2O} = 286.19\ ^{g}/_{mol}$ ✓

10. $M_{N_2O} = 2(14.01) + 16.00$ ✓

/2 $M_{N_2O} = 44.02\,{}^{g}\!/_{mol}$ ✓

11. $M_{Na_2S_2O_3 \bullet 5H_2O} = 2(22.99) + 2(32.07) + 3(16.00) + 5(2 \times 1.01 + 16.00)$ ✓

/2 $M_{Na_2S_2O_3 \bullet 5H_2O} = 248.22\,{}^{g}\!/_{mol}$ ✓

12. $M_{NH_4H_2PO_4} = 14.01 + 6(1.01) + 30.97 + 4(16.00)$ ✓

/2 $M_{NH_4H_2PO_4} = 115.04\,{}^{g}\!/_{mol}$ ✓

Part B

1. $m = 100\,g$ ✓

/3 $M_{NaHCO_3} = 84.01\,{}^{g}\!/_{mol}$

$n = ?$

$$n = \frac{m}{M}$$ ✓

$$n = \frac{100\,g}{84.01\,{}^{g}\!/_{mol}}$$

$$\boxed{n = 1.19\,mol}$$ ✓

2. $m = 120\,g$ (1 gram of water = 1 mL) ✓

/3 $M_{H_2O} = 18.02\,{}^{g}\!/_{mol}$

$n = ?$

$$n = \frac{m}{M}$$ ✓

$$n = \frac{120\,g}{18.02\,{}^{g}\!/_{mol}}$$

$$\boxed{n = 6.66\,mol}$$ ✓

3. $m = 50\,g$ ✓

/3 $M_{Na_3PO_4} = 163.94\,{}^{g}\!/_{mol}$

$n = ?$

$$n = \frac{m}{M}$$ ✓

$$n = \frac{50\,g}{163.94\,{}^{g}\!/_{mol}}$$ ✓

$$\boxed{n = 0.30\,mol}$$

4. $m = ?$ ✓

/3 $M_{K_2Cr_2O_7} = 294.20\,{}^{g}\!/_{mol}$

$n = 0.042\,mol$

$$m = n \cdot M$$

$$m = 0.042\,mol(294.20\,{}^{g}\!/_{mol})$$ ✓

$$\boxed{m = 12.4\,g}$$ ✓

5. $m = 10\,g$ ✓

/3 $M_{MgSO_4 \cdot 7H_2O} = 246.52\,{}^{g}\!/_{mol}$

$n = ?$

$$n = \frac{m}{M}$$ ✓

$$n = \frac{10\,g}{246.52\,{}^{g}\!/_{mol}}$$ ✓

$$\boxed{n = 0.041\,mol}$$

6. /3

$m = ?$ ✓
$M_{SnF_2} = 156.69\,{}^{g}/_{mol}$
$n = 0.025\,mol$

$m = n \cdot M$
$m = 0.025\,mol(156.69\,{}^{g}/_{mol})$ ✓
$\boxed{m = 3.9\,g}$ ✓

7. /3

$m = ?$ ✓
$M_{SiO_2} = 60.09\,{}^{g}/_{mol}$
$n = 25.0\,mol$

$m = n \cdot M$
$m = 25.0\,mol(60.09\,{}^{g}/_{mol})$ ✓
$\boxed{m = 1.5 \times 10^3\,g}$ ✓

8. /3

$m = 1.50\,kg = 1.50 \times 10^3\,g$
$M_{Ca(OH)_2} = 74.10\,{}^{g}/_{mol}$ ✓
$n = ?$

$n = \dfrac{m}{M}$
$n = \dfrac{1.50 \times 10^3\,g}{74.10\,{}^{g}/_{mol}}$ ✓
$\boxed{n = 20.2\,mol}$ ✓

9. /7

$m = 250\,g$
$M_{H_2O} = 18.02\,{}^{g}/_{mol}$ ✓
$n = ?$

$n = \dfrac{m}{M}$
$n = \dfrac{250\,g}{18.02\,{}^{g}/_{mol}}$ ✓
$\boxed{n_{H_2O} = 13.9\,mol}$ ✓

$m = 70\,g$ ✓
$M_{He} = 4.00\,{}^{g}/_{mol}$
$n = ?$

$n = \dfrac{m}{M}$
$n = \dfrac{70\,g}{4.00\,{}^{g}/_{mol}}$ ✓
$\boxed{n = 17.5\,mol}$ ✓

$\therefore$ 70 g of helium contains a greater number of moles than 250 g of water ✓

10. /3

If we calculate the molar mass of the gas we can use the periodic table to identify it.

$m = 1.05\,g$
$M_? = ?$
$n = 0.0125\,mol$

$M = \dfrac{m}{n}$
$M = \dfrac{1.05\,g}{0.0125\,mol}$ ✓
$\boxed{M = 84.0\,{}^{g}/_{mol}}$ ✓

The inert gas with a molar mass of 84 g/mol is **krypton**. ✓