1. How many moles of calcium (Ca) are in 77.4 g of it?

A) 3.86 B) 0.52 C) 1.93 D) 0.97

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2. The urea $CO(NH_2)_2$ is used as a fertilizer. How many hydrogen atoms are present in 25.6 g of it?

A) 1.54×10^{25} B) 1.03×10^{24} C) 2.41×10^{23} D) 1.20×10^{23}

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3. Tin(II) fluoride (SnF_2) is often added to toothpaste as an ingredient to prevent tooth decay. What is the mass of " F " in grams in 24.6 g of the compound?

A) 6.37 B) 1.54 C) 4.12 D) 5.97

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4. The aluminum sulfate hydrate $[Al_2(SO_4)_3 \cdot xH_2O]$ contains 8.10 percent "Al" by mass. What is the value of x ?

A) 2 B) 5 C) 18 D) 10

$$\%Al = 0.081 = \frac{2 * 26.98}{342.17 + X(18)}$$

$X = 18$

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5. The empirical formulas of a compound with the following composition: 40.1 % C, 6.6 % H and 53.3 % O is:

A) CH_2O B) $C_{10}H_{20}O_{10}$ C) $C_3H_7O_3$ D) $C_5H_{10}O_5$

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6. Hydrogen fluoride HF is prepared by the reaction:

$$CaF_2 + H_2SO_4 \longrightarrow CaSO_4 + 2HF$$

In one process, 6.00 kg of CaF_2 are treated with an excess of H_2SO_4 and 2.86 kg of HF are produced. What is the percent yield of HF?

A) 82% B) 96% C) 93% D) 87%

7. What is the theoretical yield of disulfide chloride S_2Cl_2 in grams when 4.06 g of S_8 are heated with 6.24 g of Cl_2 according to:

$$S_8(l) + 4Cl_2(g) \longrightarrow 4S_2Cl_2(l)$$

A) 6.85 B) 7.45 C) 8.56 D) 9.37

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8. Pure acetic acid, CH_3COOH, known as glacial acetic acid, is liquid with density of 1.049 g/ mL at 25 °C. What is the molarity of a solution of acetic acid made by dissolving 20.00 mL of glacial acetic acid at 25 °C in enough water to make 250.0 mL of solution?

A) 1.40 B) 0.08 C) 1.33 D) 1.20

$1.049\ \frac{g}{mL} \times 20\ mL = 20.98\ g$ $Mwt = 60\ \frac{g}{mol}$ $mol = 0.35\ mol$

$0.35 / 0.25 = 1.4M$

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9. Commercial aqueous solution of nitric acid, HNO_3, has a density of 1.42 g/mL and a molarity of 16 M. What is the mass percentage of nitric acid in the solution?

A) 91 B) 71 C) 63 D) 85

$\% = \frac{mass\ HNO_3}{mass\ soln} = \frac{16 * 63}{1420} = \frac{1008}{1420} \times 100\% = 71\%$

$1.42\ \frac{g}{mL}$ solution $= 1420\ \frac{g}{L}$

$M = 16\ \frac{mol}{L\ soln}$ $Mwt = 63\ \frac{g}{mol}$

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10. Under constant-pressure conditions, a sample of hydrogen gas initially at 88 °C and 9.6 L is cooled until its final volume is 3.4 L. What is its final temperature?

A) 106.2 K B) 304.2 K C) 299.2 K D) 127.9 K

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11. If 6.9 moles of carbon monoxide gas "CO", are present in a container of volume 30.4 L. What is the pressure of the gas (in atm) if the temperature is 62 °C?

A) 1.2 B) 9.6 C) 6.2 D) 5.4

12. What is the approximate volume (in liters) of 88.4 g of CO_2 at STP?

A) 38 B) 49 C) 45 D) 42

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13. A mixture containing 0.765 mol He (*g*), 0.330 mol Ne (*g*), and 0.110 mol Ar (*g*) is confined in a 10.00 L vessel at 25 °C. What is the partial pressure (in atm) of Ne gas?

A) 0.27 B) 1.87 C) 1.11 D) 0.81

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14. What is the density of hydrogen bromide (HBr) gas in grams per liter, at 733 mmHg and 46 °C?

A) 3.67 B) 2.35 C) 2.98 D) 3.24

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15. Nickel forms a gaseous compound of the formula $Ni(CO)_x$. What is the value of x, given the fact that under the same conditions of temperature and pressure, methane (CH_4) effuses 3.3 times faster than the compound?

A) 5 B) 2 C) 3 D) 4