1. In a 100 g sample:

$$\text{K: } 41.02\,\text{g} \times \frac{1\,\text{mol}}{39.10\,\text{g}} = 1.049\,\text{mol} \div 1.049\,\text{mol} = 1.000 \times 2 = 2.000 \simeq 2$$

$$\text{S: } 33.69\,\text{g} \times \frac{1\,\text{mol}}{32.07\,\text{g}} = 1.051\,\text{mol} \div 1.049\,\text{mol} = 1.002 \times 2 = 2.004 \simeq 2$$

$$\text{O: } 25.29\,\text{g} \times \frac{1\,\text{mol}}{16.00\,\text{g}} = 1.581\,\text{mol} \div 1.049\,\text{mol} = 1.507 \times 2 = 3.014 \simeq 3$$

$\therefore$ The Empirical Formula is $K_2S_2O_3$

2. There is no reason why you cannot use a 3.00 g sample.
The use of a 100 g sample is strickly for convenience. Therefore:
In a 3.00 g sample:

$$\text{Na: } 0.853\,\text{g} \times \frac{1\,\text{mol}}{22.99\,\text{g}} = 0.03710\,\text{mol} \div 0.01850\,\text{mol} = 2.005 \simeq 2$$

$$\text{Cr: } 0.962\,\text{g} \times \frac{1\,\text{mol}}{52.00\,\text{g}} = 0.01850\,\text{mol} \div 0.01850\,\text{mol} = 1.000 \simeq 1$$

$$\text{O: } 1.185\,\text{g} \times \frac{1\,\text{mol}}{16.00\,\text{g}} = 0.07406\,\text{mol} \div 0.01850\,\text{mol} = 4.003 \simeq 4$$

$\therefore$ The Empirical Formula is Na_2CrO_4

3. In a 100 g sample:

$$\text{C: } 49.48\,\text{g} \times \frac{1\,\text{mol}}{12.01\,\text{g}} = 4.120\,\text{mol} \div 1.030\,\text{mol} = 4.000 \simeq 4$$

$$\text{H: } 5.190\,\text{g} \times \frac{1\,\text{mol}}{1.01\,\text{g}} = 5.139\,\text{mol} \div 1.030\,\text{mol} = 4.989 \simeq 5$$

$$\text{N: } 28.85\,\text{g} \times \frac{1\,\text{mol}}{14.01\,\text{g}} = 2.059\,\text{mol} \div 1.030\,\text{mol} = 1.999 \simeq 2$$

$$\text{O: } 16.48\,\text{g} \times \frac{1\,\text{mol}}{16.00\,\text{g}} = 1.030\,\text{mol} \div 1.030\,\text{mol} = 1.000 \simeq 1$$

$\therefore$ The Empirical Formula is $C_4H_5N_2O$

4. In a 100 g sample:

$$\text{Pb: } 68.3\,\text{g} \times \frac{1\,\text{mol}}{207.2\,\text{g}} = 0.330\,\text{mol} \div 0.330\,\text{mol} = 1.000 \simeq 1$$

$$\text{S: } 10.6\,\text{g} \times \frac{1\,\text{mol}}{32.07\,\text{g}} = 0.331\,\text{mol} \div 0.330\,\text{mol} = 1.003 \simeq 1$$

$$\text{O: } 21.1\,\text{g} \times \frac{1\,\text{mol}}{16.00\,\text{g}} = 1.319\,\text{mol} \div 0.330\,\text{mol} = 3.997 \simeq 4$$

$\therefore$ The Empirical Formula is $PbSO_4$

5. In a 100 g sample:

$$\text{C: } 40.00\,\text{g} \times \frac{1\,\text{mol}}{12.01\,\text{g}} = 3.331\,\text{mol} \div 3.331\,\text{mol} = 1.000 \simeq 1$$

$$\text{H: } 6.71\,\text{g} \times \frac{1\,\text{mol}}{1.01\,\text{g}} = 6.664\,\text{mol} \div 3.331\,\text{mol} = 1.995 \simeq 2$$

$$\text{O: } 53.29\,\text{g} \times \frac{1\,\text{mol}}{16.00\,\text{g}} = 3.331\,\text{mol} \div 3.331\,\text{mol} = 1.000 \simeq 1$$

$\therefore$ The Empirical Formula is CH_2O

Empirical Mass:

C:	1	x	12.01 g	= 12.01 g
H:	2	x	1.01 g	= 2.02 g
O:	1	x	16.00 g	= 16.00 g
				30.03 g

Number of Empirical Units:

$$\frac{\text{Moler Mass}}{\text{Empirical Mass}} = \frac{90\,\text{g}}{30.03\,\text{g}} \simeq 3$$

$\therefore$ The Molecular Formula is 3 x (CH_2O) = $C_3H_6O_3$

6. In a 100 g sample:

$$\text{C: } 10.06\,\text{g} \times \frac{1\,\text{mol}}{12.01\,\text{g}} = 0.8376\,\text{mol} \div 0.8317\,\text{mol} = 1.007 \simeq 1$$

$$\text{Cl: } 89.10\,\text{g} \times \frac{1\,\text{mol}}{35.45\,\text{g}} = 2.5134\,\text{mol} \div 0.8317\,\text{mol} = 3.022 \simeq 3$$

$$\text{H: } 0.84\,\text{g} \times \frac{1\,\text{mol}}{1.01\,\text{g}} = 0.8317\,\text{mol} \div 0.8317\,\text{mol} = 1.000 \simeq 1$$

$\therefore$ The Empirical Formula is CCl_3H

Empirical Mass:

C:	1	x	12.01 g	= 12.01 g
Cl:	3	x	35.45 g	= 106.35 g
H:	1	x	1.01 g	= 1.01 g
				119.37 g

Number of Empirical Units:

$$\frac{\text{Moler Mass}}{\text{Empirical Mass}} = \frac{119.60\,\text{g}}{119.37\,\text{g}} = 1$$

$\therefore$ The Molecular Formula is 1 x (CCl_3H) = CCl_3H

7. In a 100 g sample:

$$\text{C: } 63.20\,\text{g} \times \frac{1\,\text{mol}}{12.01\,\text{g}} = 5.2623\,\text{mol} \div 1.9750\,\text{mol} = 2.664 \times 3 = 7.991 \simeq 8$$

$$\text{H: } 5.26\,\text{g} \times \frac{1\,\text{mol}}{1.01\,\text{g}} = 5.2079\,\text{mol} \div 1.9750\,\text{mol} = 2.637 \times 3 = 7.911 \simeq 8$$

$$\text{O: } 31.60\,\text{g} \times \frac{1\,\text{mol}}{16.00\,\text{g}} = 1.9750\,\text{mol} \div 1.9750\,\text{mol} = 1.000 \times 3 = 3.000 \simeq 3$$

$\therefore$ The Empirical Formula is $C_8H_8O_3$

8. In a 100 g sample:

$$\text{C: } 49.0\,\text{g} \times \frac{1\,\text{mol}}{12.01\,\text{g}} = 4.080\,\text{mol} \div 1.363\,\text{mol} = 2.994 \simeq 3$$

$$\text{H: } 2.72\,\text{g} \times \frac{1\,\text{mol}}{1.01\,\text{g}} = 2.693\,\text{mol} \div 1.363\,\text{mol} = 1.977 \simeq 2$$

$$\text{Cl: } 48.3\,\text{g} \times \frac{1\,\text{mol}}{35.45\,\text{g}} = 1.363\,\text{mol} \div 1.363\,\text{mol} = 1.000 \simeq 1$$

$\therefore$ The Empirical Formula is C_3H_2Cl

Empirical Mass:

C:	3	x	12.01 g	= 36.03 g
H:	2	x	1.01 g	= 2.02 g
Cl:	1	x	35.45 g	= 35.45 g
				73.50 g

Number of Empirical Units:

$$\frac{\text{Moler Mass}}{\text{Empirical Mass}} = \frac{147.00\,\text{g}}{73.50\,\text{g}} = 2$$

$\therefore$ The Molecular Formula is 2 x $(C_3H_2Cl) = C_6H_4Cl_2$

9. Formual Mass:

C:	7	x	12.01 g	=	84.07 g
H:	5	x	1.01 g	=	5.05 g
N:	1	x	14.01 g	=	14.01 g
O:	3	x	16.00 g	=	48.00 g
S:	1	x	32.07 g	=	32.07 g
					183.20 g

$$\% \text{ C} = \frac{\text{mass C}}{\text{mass } C_7H_5NO_3S} \times 100\,\%$$

$$\% \text{ C} = \frac{84.07\text{ g}}{183.20\text{ g}} \times 100\,\%$$

$$\% \text{ C} = 45.89\,\%$$

$$\% \text{ H} = \frac{\text{mass H}}{\text{mass } C_7H_5NO_3S} \times 100\,\%$$

$$\% \text{ H} = \frac{5.05\text{ g}}{183.20\text{ g}} \times 100\,\%$$

$$\% \text{ H} = 2.757\,\%$$

$$\% \text{ N} = \frac{\text{mass N}}{\text{mass } C_7H_5NO_3S} \times 100\,\%$$

$$\% \text{ N} = \frac{14.01\text{ g}}{183.20\text{ g}} \times 100\,\%$$

$$\% \text{ N} = 7.647\,\%$$

$$\% \text{ O} = \frac{\text{mass O}}{\text{mass } C_7H_5NO_3S} \times 100\,\%$$

$$\% \text{ O} = \frac{48.00\text{ g}}{183.20\text{ g}} \times 100\,\%$$

$$\% \text{ O} = 26.20\,\%$$

$$\% \text{ S} = \frac{\text{mass S}}{\text{mass } C_7H_5NO_3S} \times 100\,\%$$

$$\% \text{ S} = \frac{32.07\text{ g}}{183.20\text{ g}} \times 100\,\%$$

$$\% \text{ S} = 17.51\,\%$$

10. Formual Mass Li_2CO_3:

Li:	2	x	6.94 g	=	13.88 g
C:	1	x	12.01 g	=	12.01 g
O:	3	x	16.00 g	=	48.00 g
					73.89 g

$$\% \text{ Li} = \frac{\text{mass Li}}{\text{mass } Li_2CO_3} \times 100\,\%$$

$$\% \text{ Li} = \frac{13.88\text{ g}}{73.89\text{ g}} \times 100\,\%$$

$$\% \text{ Li} = 18.76\,\%$$

Formual Mass Li_2CO_3:

Li:	2	x	6.94 g	=	13.88 g
S:	1	x	32.07 g	=	32.07 g
O:	4	x	16.00 g	=	64.00 g
					109.95 g

$$\% \text{ Li} = \frac{\text{mass Li}}{\text{mass } Li_2SO_4} \times 100\,\%$$

$$\% \text{ Li} = \frac{13.88\text{ g}}{109.95\text{ g}} \times 100\,\%$$

$$\% \text{ Li} = 12.62\,\%$$

Therefore the compound with the higher percentage of lithium and greater medical effectiveness is Li_2CO_3

11. Formual Mass of $C_{16}H_{28}O_4N_2S$:

C:	16	x	12.01 g	=	192.16 g
H:	28	x	1.01 g	=	18.28 g
O:	4	x	16.00 g	=	64.00 g
N:	2	x	14.01 g	=	28.02 g
S:	1	x	32.07 g	=	32.07 g
					334.53 g

$$\% C = \frac{\text{mass C}}{\text{mass } C_{16}H_{28}O_4N_2S} \times 100\%$$

$$\% C = \frac{192.16\text{ g}}{334.53\text{ g}} \times 100\%$$

$$\% C = 57.41\%$$

$$\% H = \frac{\text{mass H}}{\text{mass } C_{16}H_{28}O_4N_2S} \times 100\%$$

$$\% H = \frac{18.28\text{ g}}{334.53\text{ g}} \times 100\%$$

$$\% H = 5.434\%$$

$$\% O = \frac{\text{mass O}}{\text{mass } C_{16}H_{28}O_4N_2S} \times 100\%$$

$$\% O = \frac{64.00\text{ g}}{334.53\text{ g}} \times 100\%$$

$$\% O = 19.13\%$$

$$\% N = \frac{\text{mass N}}{\text{mass } C_{16}H_{28}O_4N_2S} \times 100\%$$

$$\% N = \frac{28.02\text{ g}}{334.53\text{ g}} \times 100\%$$

$$\% N = 8.376\%$$

$$\% S = \frac{\text{mass S}}{\text{mass } C_{16}H_{28}O_4N_2S} \times 100\%$$

$$\% S = \frac{32.07\text{ g}}{334.53\text{ g}} \times 100\%$$

$$\% S = 9.587\%$$