5. **Combining Proportions**

(a) 12 grains of Sb give 14.4 grains of oxide
12 grains Sb combine with 2.4 grains of oxygen
suppose conversion factor for grains to grams = k

moles of Sb = 12k / 121.8 ⟶ if used **(1)**
moles of O = 2.4k / 16.0

molar ration Sb : O = (12/121.8) : (2.4/16.0) = 0.9852 : 0.15 = 1:1.5 = 2:3

Formula = **Sb_2O_3**   **(2 marks if answer alone given)**   **(1)**

(b) 1 mol Zn forms 1 mol ZnO
65.4g Zn forms (65.4 + 16.0) g ZnO = 81.4g
increase in mass by 81.4 / 65.4
so 60 grains should produce (60 x 81.4) / 65.4 grains = **74.5(8) grains**   **(2)**

(c) Total mass at end = unreacted Zn + ZnO
60 grains Zn should give 74.58 grains ZnO

If fraction of Zn reacting is a, amount of Zn used is 60 a grains which forms 74.58 a grains of ZnO.
Amount of Zn left = 60 – 60 a
Total mass at end = 60 – 60 a + 74.58 a = 65 grains = 60 + 14.58 a

a = (66 – 60) / 14.58 = **0.41(15)**   **(2)**

Mass of unreacted Zn = 60 - 60 a = **35(.31) grains**   **(1)**

Mass of ZnO = 74.58 a = **30(.69) grains**   **(1)**

Total 8