AS PRACTICAL 1
Water of crystallisation (Model)

Aim

I am trying to find the value of n in the hydrated salt $MgSO_4.xH_2O$

Method

1) I will find the mass of a clean, dry boiling tube on a balance with resolution of 0.01 g or better.
2) I will add about 3 g of the hydrated salt to the tube and find the mass.
3) I will heat the hydrated salt in a hot Bunsen flame until no more water/steam appears to be being released and then find the mass.
4) I will keep heating until I reach constant mass, recording the mass each time.

Risk Assessment

- Hydrated magnesium sulfate is low risk.
- The main risk in this experiment is from burns. I will always hold the boiling tube with test tube holders and keep apparatus on a heat proof mat.
- I will move around the room carefully when carrying the tube to avoid bumping into other students.
- I will tie back long hair fire risks and wear my lab coat.
- I will wear eye protection.

References

1) KORUNOW S., Clark University, USA (2012) Water of hydration [online] available from http://wordpress.clarku.edu/mat13-skorunow/files/2012/01/Water-of-Hydration-Lab-SW.pdf [Accessed: 1-Nov-2015]
2) BROWN P. (2015) Water of crystallisation calculations [online] available from http://www.docbrown.info/page04/4_73calcs14other4.htm [Accessed: 1-Nov-2015]
3) Texas State Technical College, USA (2015) Water of hydration [online] available from http://chemtech.org/cn/cn1105/experiments/water_of_hydration.pdf [Accessed: 1-Nov-2015]
4) OCR (2015) A level Chemistry A: Determination of the formula of hydrated magnesium sulphate (Practical sheet)

Results

Item	Mass / g
Mass of empty boiling tube	29.255
Mass of boiling tube + hydrated salt	32.638
Mass of boiling tube + contents during experiment	31.325
	30.932
	30.912
	30.913
Mass of hydrated salt	3.383
Mass of anhydrous salt	1.657
Mass of water lost	1.726

Analysis

Moles of $MgSO_4 = \frac{1.657}{120.4} = 0.01376$

$\therefore$ Moles of $MgSO_4.xH_2O = 0.01376$

$\therefore$ M_r of $MgSO_4.xH_2O = \frac{3.383}{0.01376} = 245.9$

$\therefore$ M_r of $xH_2O = 245.9 - 120.4 = 125.5$

$\therefore$ $x = \frac{125.5}{18.0} = 6.97 = 7$ (nearest integer)

Evaluation

Apparatus Uncertainty: Balance: $2 \times \frac{0.005}{1.657} \times 100 = 0.60\%$

Experimental error = $\frac{(246.4-245.9)}{246.4} \times 100 = 0.20\%$

My experimental error is less than the total apparatus uncertainty and so my answer is accurate.

Questions

11) In a reaction where the mass of solid present changes on heating, when the reaction finishes the mass stops changing and stays constant. Therefore, if the mass of the reaction is found at intervals, when the mass stops changing the reaction has finished.

12) It would not be appropriate to use a balance with a resolution of 0.1 g (uncertainty in each reading ±0.05 g) as it would lead to a 6% uncertainty which is very high for one piece of apparatus.

13) I did not need to use a balance with a resolution of 0.001 g (uncertainty in each reading ±0.0005 g) as the final value of n is an integer and so 0.01 g (uncertainty in each reading ±0.005 g) with 0.6% uncertainty is sufficient.