DETERMINING THE MASS OF LITHIUM

METHOD 1

RESULTS

Mass of lithium used	0.12g
Amount of hydrogen gas produced	182cm³

TREATMENT OR RESULTS

$2Li(s) + 2H2O(l) \rightarrow 2LiOH(aq) + H2(g)$

Moles of hydrogen gas collected

Moles of H2	volume / 24000(cm³)
	82 / 24000
	0.007583333 moles
Moles of H2	0.0076 moles

Lithium that reacted

H2	:	Li
1	:	2
0.0076	:	2 × 0.0076
0.0076	:	0.0152

Moles of Li 0.0152 moles

Relative atomic mass of lithium

R.A.M	mass / moles
	0.12 / 0.0152
	7.894736842

R.A.M of Li 7.8947

METHOD 2

RESULTS

Titration of aqueous LiOH with 0.100 mol dm-3 HCl.

Start (cm³)	End (cm³)	Titre (cm³)
0	34.90	34.90
0	34.80	34.80
0	34.90	34.90

Average result

(34.80 + 34.90) / 2
= 69.7 / 2
= 34.85

TREATMENT OF RESULTS

$LiOH(aq) + HCl(aq) \rightarrow LiCl(aq) + H_2O(l)$

Moles of HCl used in titration

Moles of HCl	concentration × (volume / 1000)
	0.100 × (34.85 / 1000)
	0.003485 moles
Moles of HCl	0.0035 moles

LiOH used in titration

HCl	:	LiOH
1	:	1
0.0035	:	0.0035

Moles of LiOH 0.0035 moles

Number of moles of LiOH present in 100cm³ of solution from method 1

25cm³ of LiOH is pipette each time.
There's 100cm³ of LiOH, so it will be:
0.003485 × 4 = 0.01394

Moles present in 100cm³ of LiOH 0.0139 moles

Relative atomic mass of Lithium

R.A.M	mass / moles
	0.12 / 0.0139
	8.633093525

R.A.M of Li 8.633

HAZARD OF CHEMICALS IN THIS EXPERIMENT

Care must be taking when handling chemicals in this experiment. Safety goggles and lab coat must be worn at all times. Ensure room is well ventilated.
Li: Flammable, burns in air, react violently with water and oxygen.
LiOH: Extremely corrosive.
LiCl: Harmful if absorbed through skin and can cause severe skin irritant.
HCl: Corrosive, vapour irritates lungs, its irritant to eyes and skins, it causes burns.

EVALUATION

Overall, I think my experiment is slightly accurate, and that I carried out a fair test. The relative atomic mass of lithium in the periodic table is 6.941. I find method 1 to be more accurate than method 2 because it gave me a mass of 7.8947 which is slightly close answer to the R.A.M of lithium than method 2 with a mass of 8.633. This gives the evidence that method 1 is more consistent.
The titres was accurate all 3 titres within 0.1 of each other. Because I collected the hydrogen gas produced only once, I can't compare how accurate the result is. If I had used different mass of lithium and collected different hydrogen gas, then I would be able to choose the mass of lithium or the gas of hydrogen that would produce the most accurate R.A.M of lithium.

ERRORS IN PROCEDURE

Some errors, when carrying out the procedure in both methods, could have caused an inaccuracy in my final R.A.M for Lithium.
In method 1, lithium was found dipped in oil, because lithium is reacts with air to form an oxide layer, this oxide layer would have added to the weight of lithium, thereby resulting in the slightly inaccurate result I got.
Also the oil lithium was dipped in was hard to remove completely. This could have also affected my result. It was also hard to put the stopper quickly on the conical flask, and this could have lead to some of the gas escaping, making the hydrogen gas produced to be less, affecting the end result. Although, this could not have caused a great inaccuracy in the result because it's due to human error. In both methods, there may have been errors in the cleanliness of the equipment as reagents from other experiment may have been present in the glassware, which can cause potential errors in the experiment.
In method 2, taking the readings at eye level from the burette was not that accurate and the reading may have been in or out by 0.1

ERRORS IN MEASUREMENT

When measuring out for the experiment, inaccuracy in measurement may have affected my final result.
In method 2, when using the phenolphthalein, it's difficult to precisely use the same amount of drops when adding it to the LiOH.
Lithium was measured using a 2decimal place scale. The measurement may have been precise, but since an oxide layer may have formed on the lithium, there may be some oxygen measured with the lithium, meaning that it's not the accurate mass of lithium used, thereby affecting the final result.
Another error is the measuring out of LiOH. 25cm^3 is meant to be measured out to be pipette using a burette. When using a burette, we are subject to a measuring accuracy of $\pm 0.1 cm^3$, which is not very accurate to give an accurate result.

IDENTIFYING SIGNIFICANT ERRORS AND JUSTIFYING IT

Significant errors for this experiment are: the oxide layer forming on the lithium. It's difficult to obtain a 100% pure sample of lithium. Since lithium is very reactive with oxygen in the air, and there is no way to get oxygen not to react with lithium, the oxygen added to the mass of the lithium weighed thereby making lithium weigh more

than it actually is. To improve this, the weighing out the lithium and reacting lithium with water should be done in an inert cubicle.
Another significant error is using the burette and the pipette. It is difficult to get the precise volume required each time. And it will be difficult to minimise this error.

SUGGEST AND JUSTIFY IMPROVEMENTS TO THE PROCEDURE

To overcome errors in procedure, I will use lithium kept in an inert atmosphere to prevent the formation of oxide layer that will affect the experiment.
It's difficult to minimise gas loss, but I will hold the stopper close to the conical flask while another person drops the lithium metal into the flask, this will minimise gas loss.
I will ensure that I rinse every container before using it (even if it appears clean) with distilled water to remove traces of left over chemicals, doing this will make my result more accurate.

SUGGEST AND JUSTIFY IMPROVEMENTS TO THE MEASUREMENT

To overcome errors in measurement, I could have used a greater mass of lithium and increase the volume of water, which will increase the amount of LiOH produced; therefore I will be able to do the titration more, and get more results which I can then compare and use the best one to get the best result for the experiment. Also, greater mass of lithium means there will be a smaller margin of error when measuring it out.
I could have used a larger gas syringe perhaps a $200cm^3$. This will change the error margin from $\pm 1cm^3$ to $\pm 0.5cm^3$, thereby increasing the accuracy of the experiment.
I will also make sure that I use lithium from an inert atmosphere to prevent oxide layer forming, this will ensure that I'm only taking the mass of the lithium, and not the mass of lithium and the oxide layer. This will make my result more accurate.

CONCLUSION

From the evidence I have collected during this experiment, I have come to the conclusion that method 1 of finding the relative atomic mass of lithium is more reliable in comparison to method 2. This is because method 1 has the relative atomic mass which is close to the R.A.M of lithium, and more errors occur in method 2 than method 1.