Oxford Cambridge and RSA

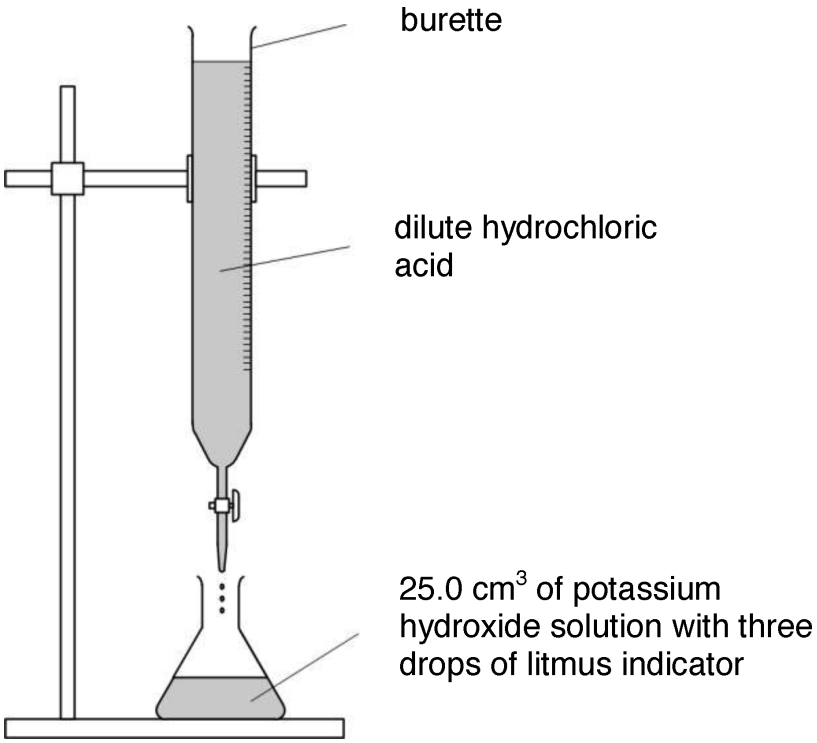
GCSE Chemistry A (Gateway Science)

J248/02 C4-C6 and C7 Foundation (Foundation Tier)

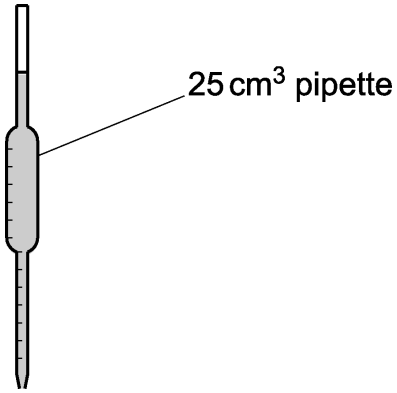
Question Set 12

1 A student does three titrations with dilute hydrochloric acid and potassium hydroxide solution.

Look at the apparatus she uses.



(a) She uses a pipette to measure out the 25.0 cm^3 of potassium hydroxide solution.



Describe and explain **one** safety precaution that she should use with the pipette.

[2]

Pipette filler should be used because potassium hydroxide can cause burn skin

(b) In her first titration the student measures the initial volume of hydrochloric acid in the burette.

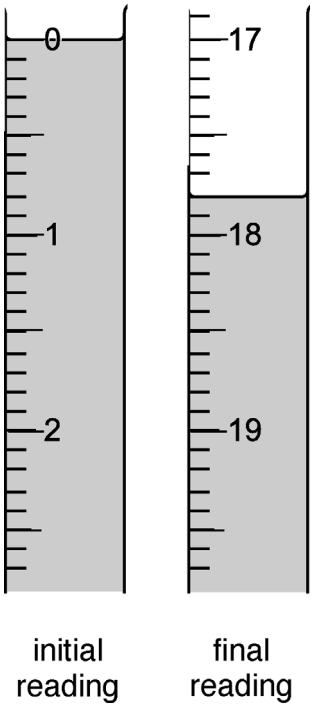
She slowly adds the acid until the potassium hydroxide is just neutralised. She then measures the volume of the hydrochloric acid again.

Describe how she can tell when the potassium hydroxide solution is just neutralised.

when one last drop makes the litmus change colour from blue to red **[2]**

(c) Look at the diagrams. They show parts of the burette during the first titration.

first titration



Here is the student's results table.

Titration number	1	2	3
final reading in cm^3	17.8	37.5	32.1
initial reading in cm^3	0.0	20.4	15.0
titre (volume of acid added) in cm^3	17.8	17.1	17.1

(i) **Complete** the table by recording the burette readings from the diagrams. **[2]**

(ii) The student thinks the mean titre is 17.1 cm^3. Is she correct?

Explain your answer.

titration 2 + titration 3 / 2 = 17.1

[1]

(d) The student does another titration to make a fertiliser called potassium nitrate, KNO_3.

Look at the equation for the reaction she uses.

$KOH + HNO_3 \rightarrow KNO_3 + H_2O$

The relative formula masses, M_r, of each compound are shown in the table.

Compound	Formula	Relative formula mass
potassium hydroxide	KOH	56.1
nitric acid	HNO_3	63.0
potassium nitrate	KNO_3	101.1
water	H_2O	18.0

What is the atom economy for the reaction to make potassium nitrate?

Assume that water is a waste product.

Atom economy = Mr of desired products / Mr of all products x 100

= 101.1 / 119.1 x 100

= 84.9%

Answer = 84.9 %

[2]

Total Marks for Question Set 12: 9