

William Young

5. When the wire is clean, dip it in the beaker with water and heat to remove any residue of HCl from the cleaning step.
6. Dip the wire in water and then use it to pick up a few grains of a metal salt A. Record your observation of the colour and approximate duration, intensity, etc. of the coloured flame in the table below.
7. Clean the wire in the 1 M HCl till no coloured flame is produced.
8. Repeat step 6 but this time using 1 M HCl instead of water to pick up a few grains of salt A. Try to use the same quantities of the solid sample as previously used in step 6. Record your observations as before.
9. Repeat steps 4-8 for all other unknown samples.

DATA SHEETS TO RECORD OBSERVATIONS AND RESULTS

Observations:

unknown metal salt	flame colour		intensity		duration	
	H ₂ O	HCl	H ₂ O	HCl	H ₂ O	HCl
A ✓	Orange Red/Orange	Red/Orange	Strong	Very strong	Short ~5 secs	Short ~3 secs
B ✓	Purple	Light Purple	Weak	Weak	Very long	Short
C ?	Orange	Orange	Very strong	Very strong	Long	Short
D ?	Orange	Red	Very strong	Very strong	Short	Short
E ✓	Purple, green, blue	Purple, green, blue	Very strong	Very strong	Very long ~3 min	Short

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Analysis and Conclusions:

Complete the table below. Based on the observed colour of the flame and Table 1, identify the metal ion in each unknown salt. Using the electromagnetic spectrum in Fig 2, estimate and report with the appropriate unit the wavelength for each observed colour:

Unknown metal salt	Identity of metal	Wavelength
A	Calcium Chloride ✓	600-700 nm
B	Potassium Chloride ✓	400 "
C	~~Calcium Chloride~~	620 "
D	~~Calcium Chloride~~	600-700 "
E	Copper Chloride ✓	450-550 "

FINAL QUESTIONS

1. Describe and explain the effect of the chloride ion, Cl^- , on the duration and intensity of the colour.

Cl^- ^{decreases} ~~increases~~ the duration of the reaction and ~~increases~~ the intensity of the colour.

why?

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2. Select three of the observed colours and calculate the energies of their photons.

Colour 1:	Colour 2:	Colour 3:
Red	?	?
$h = 6.6 \times 10^{-34}$ $E = h \times f$ $f = 4.5 \times 10^{14}$ $E = 6.6 \times 10^{-34} \times 4.5 \times 10^{14}$ $E = 2.97 \times 10^{-19} \text{ J}$	$E = 4.95 \times 10^{-19} \text{ J}$	$E = 3.96 \times 10^{-19} \text{ J}$

3. Do you think the flame test can be used to determine the identity of unknowns in a mixture? Why or why not?

Yes, to an extent. It can narrow down the potential identity but may not give a fully accurate result.

Why?

4. Colorful light emissions apply to everyday life. Where else, besides fireworks, have you observed colorful light emissions? Are these light emission applications related? Explain.

LED lights - produce photons at different wavelength, these emit different colours.

how is this related to fireworks?

what metals are responsible for colour?

END