

Craig Maclellan

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

90

Observations:

unknown metal salt	flame colour		intensity		duration	
	H ₂ O	HCl	H ₂ O	HCl	H ₂ O	HCl
A	Orange ✓	orange/red	strong	Stronger	Average	long
B	purple ✓	purple	weak	Stronger	Short	very long
C	Orange ✓	red/orange ✓	Strong	Strong	long	long
D	orange/red ✓	red ✓	weak	very intense	Short	short
E	blue/green ✓	blue/green ✓	average	quite intense	long	long

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, Ca^{2+} ✓	670 nm
B	Potassium, K^+ ✓	400 nm
C	~~Lithium, Li^+~~ Sr^{2+}	660 nm
D	Strontium, Sr^{2+} ✓	700 nm
E	Copper, Cu^{2+} ✓	490 nm

FINAL QUESTIONS

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

Chloride ion, Cl^- made the duration of the burn time longer and increased the intensity.

why?

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

Colour 1:	Colour 2:	Colour 3:
Red	Blue/Green	Purple
$\frac{3 \times 10^8}{700 \times 10^{-9}} = 4.29 \times 10^{14}$ $6.63 \times 10^{-34} \times 4.29 \times 10^{14}$ $= 2.84 \times 10^{-19} \text{ J}$	$\frac{3 \times 10^8}{490 \times 10^{-9}} = 6.12 \times 10^{14}$ $6.12 \times 10^{14} \times 6.63 \times 10^{-34}$ $= 4.06 \times 10^{-19}$	$\frac{3 \times 10^8}{400 \times 10^{-9}} = 7.5 \times 10^{14}$ $7.5 \times 10^{14} \times 6.63 \times 10^{-34}$ $= 4.97 \times 10^{-19} \text{ J}$

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

yes it can give you a rough estimate of the unknowns in a mixture but it won't give a definite result because it is all subjective.

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 - produces photons at different wavelengths to produce a different colour.

What metals are used in LED

END

Consideration / ways to improve

- Labelling H_2O and HCl containers as not to confuse the two of them.
- New rod yeh test / contamination issue
- Quantities measured - fair test
- own chemicals for tests / not sharing
- Timing duration of test.

② Style of analysis

- final report for product
- accident/incident report (work out what item is)
- corroborate report with evidence/discussions.

③ Advantages / limitations of technique

- cheap & easy
- loss of sample (destructive technique)
- subjective test (colour difference)
- quick test with minimal equipment.

extra credit
x5p