

ACDB 4011: COLOUR CHEMISTRY**Risk Assessment**

Before starting the experiment, you need to carry out a safety check. Please note down additional health and safety information from the presentation here:

cover beards
 tie long hair back
 no eating, including chewing gum/pens/nails
 no drinking
 fully covered clothing + shoes
 remove notebooks away "transferable"

OK

POTENTIAL HAZARD:

Chemical	Hazards
Hydrochloric acid solution (1 M HCl)	 Causes severe skin burns and eye damage.  Harmful if swallowed.
Barium chloride (BaCl ₂)	 Acute toxicity (oral, dermal, inhalation), category 3.  Irritant.
Calcium chloride (CaCl ₂)	 Causes serious eye irritation.
Lithium chloride (LiCl)	 Causes serious eye irritation.  Harmful if swallowed.  Causes skin irritation.
Strontium chloride (SrCl ₂)	 Serious eye damage.
Strontium nitrate (Sr(NO ₃) ₂)	 May intensify fire; oxidiser  Harmful if swallowed. Causes serious eye irritation. Can cause respiratory irritation
Potassium chloride (KCl)	 Causes serious eye irritation.
Potassium nitrate (KNO ₃)	 May intensify fire; oxidiser

Lab Quiz

- The hazard(s) associated with the chemicals used in this experiment are:

harmful if swallowed
irritants
corrosive
toxic
oxidiser

OK

- Where would I find the hazard information for a chemical? (2 answers)

MSDS or SDS 3 MSDS COSHH

OK

- If there is a fire, what are my (your) responsibilities?

turn off burner burner
stop immediately and make safe
leave the lab
follow instructions from Mark/Ewa/Sergio.
Follow evaluation procedure

OK

- Why must glassware be labelled? (2 reasons):

to ensure contents is identifiable
avoid contamination

- Name 5 mandatory requirements for clothing and hair in the lab:

cover clothing with labcoat shirt
no open shoes
covered beards
wear goggles
long hair tied back

OK

- What is the procedure for disposal of reacted acidic reagents?

put waste acid in the waste acid
jar and it will be disposed of
by an outside chemical waste company.
collected at 1 week from experiment.

OK

Student name & number: ZOE CUMMINS 2114725

Student signature:



Lab Assistant:

Mark
Broadhead

- When the wire is clean, dip it in the beaker with water and heat to remove any residue of HCl from the cleaning step.
- 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.
- Clean the wire in the 1 M HCl till no coloured flame is produced.
- 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.
- 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	orangey red.	orangey red	↓ 1	↑ 1	↑	↓
B	l/a/c	l/a/c	↓	↑	↑	↓
C	orangey red (orange to red)	orangey red (orange to red)	↓	↑	↓	↑
D	red (to orange)	red (to orange)	↓	↑	↑	↓
E	Blue/green	Blue/green	↓	↑	↑	↓

crystals

(large crystal)

(small white)

Small white

Small white

(green crystals)

10p

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:

30p

Unknown metal salt	Identity of metal	Wavelength
A	Calcium	630 nm approx
B	Potassium	410 nm approx
C	Lithium	640 nm approx
D	Strontheim	700 nm approx
E	Copper	500 nm approx

FINAL QUESTIONS

5p

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

For all, apart from C, Chlorine increased the intensity of the colour however the duration of the colour decreased, compared to H_2O .

Chemical C, I found that the intensity decreased but the colour duration increased.

8

WHY???

$$\Delta E = h \times \nu$$

$$h = 6.63 \times 10^{-34}$$

$$c = \nu \lambda$$

$$c = 3 \times 10^8$$

30p

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

Colour 1: A	Colour 2: B	Colour 3: C
630nm $\nu = 4.7619 \times 10^{14} \text{ Hz}$ $\Delta E = h\nu$ $\Delta E = 3.12 \times 10^{-19} \text{ J}$	410nm $\nu = 7.3172 \times 10^{14} \text{ Hz}$ $\Delta E = h\nu$ $\Delta E = 4.85 \times 10^{-19} \text{ J}$	640nm $\nu = 4.6875 \times 10^{14} \text{ Hz}$ $\Delta E = h\nu$ $\Delta E = 3.12 \times 10^{-19} \text{ J}$

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

10p

No. Colours will mix and the most dominant colour would likely only show. It contaminates the experiment.

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

10p

Explain.

~~Tracers~~
 Tracers. Yes. They are required to have a specific wavelength and specific intensity, ~~to~~ to ensure that the tracer is visible and meets the target without burning out.

END

