

Flame Test Exploration

Name: Karla

Block: B

Problem: What colours are characteristic of particular ions in a flame test?

Materials: solutions of the following salts: copper (II) nitrate, strontium nitrate, lithium nitrate, potassium nitrate, zinc nitrate & calcium nitrate



Equipment: Safety glasses, spray bottles with ions & Bunsen burner

Procedure:

1. Put on goggles.
2. Obtain a spray bottle with one of the compounds. Light the Bunsen burner and adjust the flame to a low clean burning blue flame.
3. Spray one pump of the solution into the flame. Record your observations of the colour produced with photographic evidence. Record your observations. Repeat until all solutions have been tested
4. Clean up. Wash hands.

Data:

Table 1: Colours of nitrated salts after heating.

	Salt	Colour
2	Copper (II) Nitrate	green / yellow
4	Strontium Nitrate	pink
1	Lithium Nitrate	pink
3	Potassium Nitrate	pink
6	Calcium Nitrate	red
5	Zinc Nitrate	orange

Application questions:

1. What particles are found in the chemicals that may be responsible for the production of colored light?
Because nitrate does not emit coloured light, the metals in the compound are responsible for emitting coloured light.
2. Why do different chemicals emit different colors of light?
Because it takes more energy to displace electrons on smaller atoms, they gain a higher state of excitement and, when they distributed that energy on the way down, they emit a colour with a higher frequency / shorter wavelength.

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3. Why do you think the chemicals have to be heated in the flame first before the colored light is emitted?

The electrons get excited when they are heated by an electric field.

4. Coloured light is emitted constantly around us during our everyday experiences. List 5 examples of coloured light emissions you have seen in the last week.

The 5 coloured emission I've seen in the last week is flashlight, sunset, LED lights in my room, street lights, stove fire (kitchen).

5. Write out the electronic configuration for each of the metallic ions to be investigated.

Copper ion: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10} / [Ar] 3d^{10}$

Strontium ion: $1s^2, 2s^2, 2p^2, 3s^2, 3p^6, 3d^{10}, 4s^2, 4p^6, 5s^2 / [Kr] 5s^2$

Lithium ion: $1s^2, 2s^1$

Potassium ion: $1s^2, 2s^2, 2p^6, 3p^2, 3p^6, 4s^1 / [Ar] 4s^1$

Calcium ion: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6 / [Ar] 4s^2$

Zinc ion: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^2 / [Ar] 3d^{10}, 4s^2$

6. Why are all the metallic ions paired with nitrate?

Metallic ions pair with nitrate to omit the coloured light. It is like it's control. It is required to keep the different metallic ions apart and it also helps to make the colour more noticeable because it is close to the colour white which is the colour nitrate emits.

7. What wavelengths correspond to the visible spectrum? Which colour has the shortest wavelength? The longest? What unit are wavelengths measured in?

Red has the highest wavelength with 620-750 nm (400-484 THz frequency). Violet has the shortest wavelength with 380-450 nm (680-750 THz frequency), using the unit of nanometers.