

## Chapter 14 Origins

### Short investigation 14.2: Colour versus temperature

Name: .....

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#### Aim

To relate the colour of a hot object to its temperature

#### Materials

12 V Mounted lamp, variable 12 V power supply, voltmeter, ammeter, hand spectroscope

#### Theory

Wien's law for black body radiation tells us that, as an object gets hotter, the dominant wavelength of the electromagnetic radiation it emits shifts towards the blue end of the spectrum. Therefore, hotter objects should appear bluer than cooler, 'red-hot' objects. The object in this investigation is a lamp filament. Voltage and current readings will be taken during the investigation so that the resistance of the filament can be calculated. This will be used as an indication of temperature, as the resistance of a filament is approximately proportional to its temperature.

#### Method

1. Set up a circuit with the power supply, ammeter and mounted lamp in series; place the voltmeter in parallel with the lamp.
2. Darken the room, set the power supply to its lowest setting and turn it on. Record the readings on the voltmeter and ammeter, then calculate the resistance of the filament using Ohm's Law.
3. Note the overall colour balance of the light. Use the spectroscope to examine this, looking directly at the dim light from the glowing filament. Again, look for the overall colour balance and then try to observe which colours are present in the spectrum.
4. Record this information in table 14.2A by shading in the section of spectrum observed.
5. Repeat this process for each successively higher setting on the power supply.

**Results**

Table 14.2A

Power supply setting	Voltmeter reading, $V$ (V)	Ammeter reading, $I$ (A)	Resistance $R = V/I$ ( $\Omega$ )	Spectrum						
				V	I	B	G	Y	O	R
A										
B										
Etc.										

**Analysis of results**

1. Does each successively higher setting on the power supply produce a higher resistance of the filament?
2. (a) For the lowest power supply setting, describe your impression of the filament colour as judged by eye.  
  
(b) By looking directly at it with the spectroscope, what colours were found to be present in the spectrum?
3. (a) For the highest power supply setting, describe your the filament colour as judged by eye.  
  
(b) What colours were found to be present in the spectrum when looking directly at it with the spectroscope?
6. Looking at your series of diagrams representing the spectra, what general change can be seen as temperature increases (aside from becoming brighter)?
7. Do your results agree with Wien's Law, as described in the theory section above?

**Conclusion**

Write an appropriate conclusion that responds to the stated aim of this investigation, incorporating the resistance calculation as part of your findings.

**Evaluation**

The quality of your results in this investigation will depend upon the technology that you have available to use. Write an evaluation of this procedure, indicating sources of error and how it could be improved.

**Notes:**