Exploring Space

S3 Physics

Lesson Title: Spectra

Learning Intention:

Today we are learning about line and emission spectra.

Success Criteria:

✓I can describe how different parts of the electromagnetic spectrum are used to obtain information about astronomical objects.

✓I can identify continuous and line emission spectra.

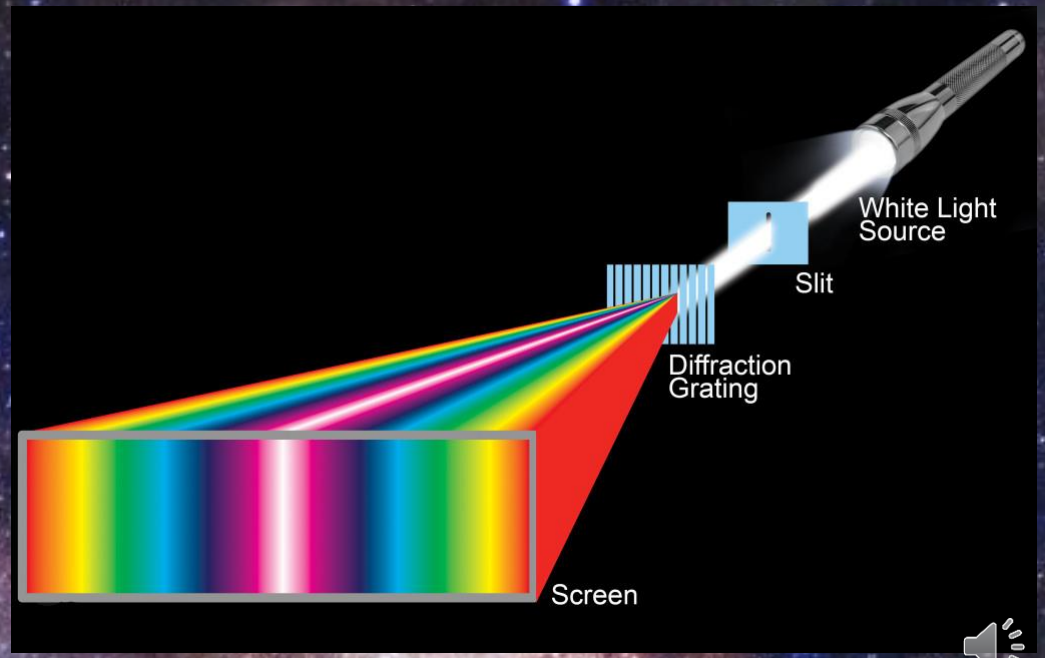
✓I can use spectral data for known elements, to identify the elements present in stars.

Employability skill(s):

Problem Solving

Splitting Light

Other than a prism, a spectroscope can be used to split a source of light into the individual wavelengths/frequencies which are present.
There is a narrow slit at one end to allow light to enter it.
It contains a piece of equipment known as a diffraction grating, which splits the light source into the different colours.
You see the divided light by looking through the eyepiece lens.



Emission Spectra

When light is given off from a source it can be split into its different colours by a prism or diffraction grating and forms a spectrum.

Emission spectra can be one of two types - continuous spectra or line spectra.

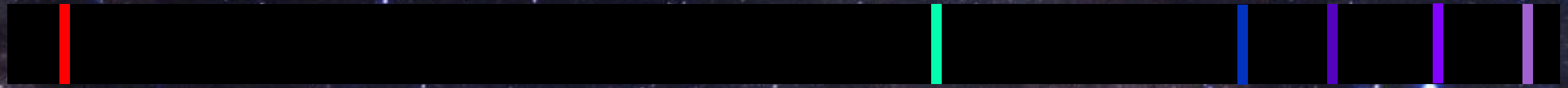
Continuous Spectrum

Line Spectrum

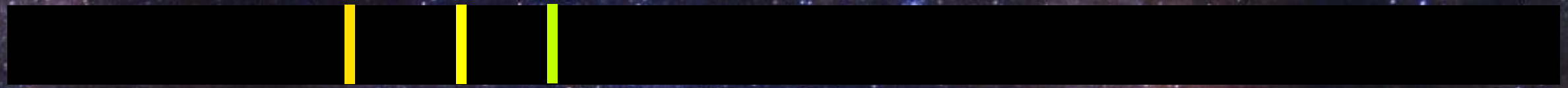
line spectrum for sodium light

Line Spectra

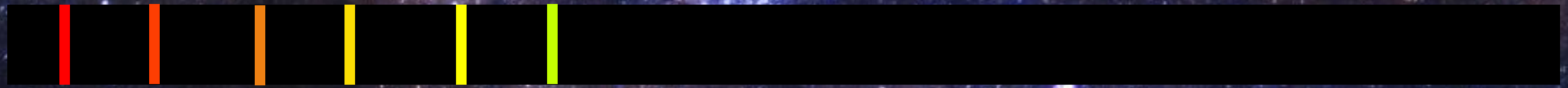
The atoms of elements give off radiation at certain wavelengths. As a result, the spectrum of that element has a few bright lines at those wavelengths – called spectral lines.



Hydrogen



Sodium



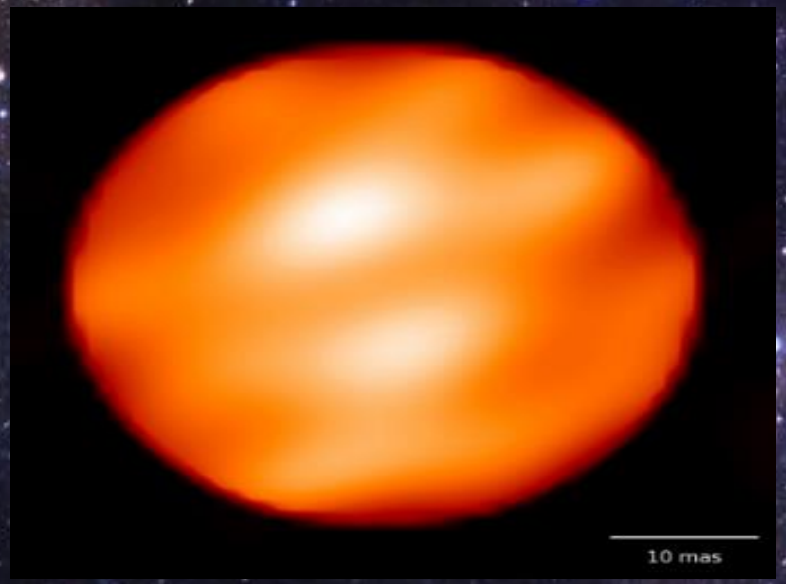
Neon

Each element has a pattern of spectral lines that differs from that of any other element.

Investigating Stars

By investigating the spectral lines of a star, astronomers can match these to the spectral lines of known elements.

This allows astronomers to identify the elements present within a star.



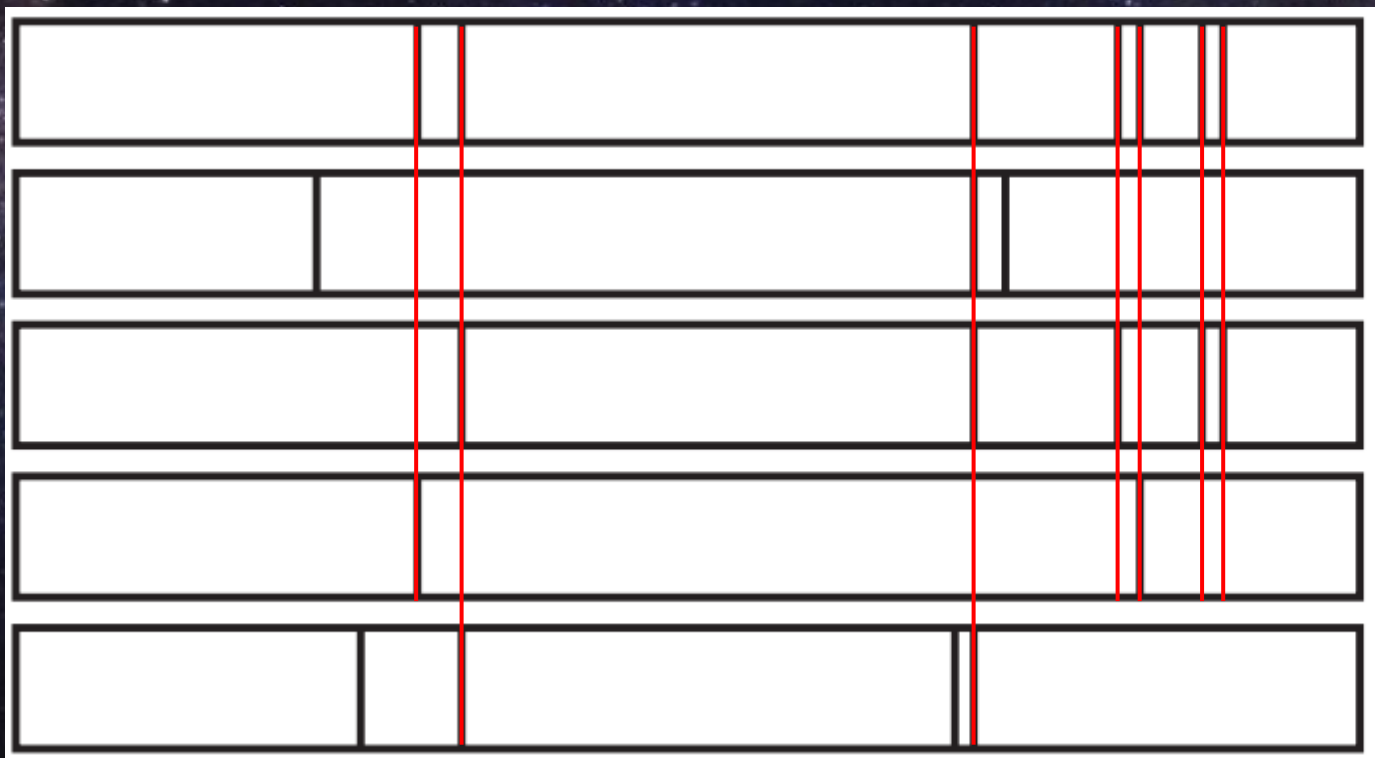
Betelgeuse

Vega

Sirius

By observing the light emitted by distant stars, we can determine the elements which are contained in their atmosphere because each different element has a characteristic line spectrum.

If the lines which are present in the spectrum of a star are matched up with the known line spectra of different elements, the composition of the star can be identified.



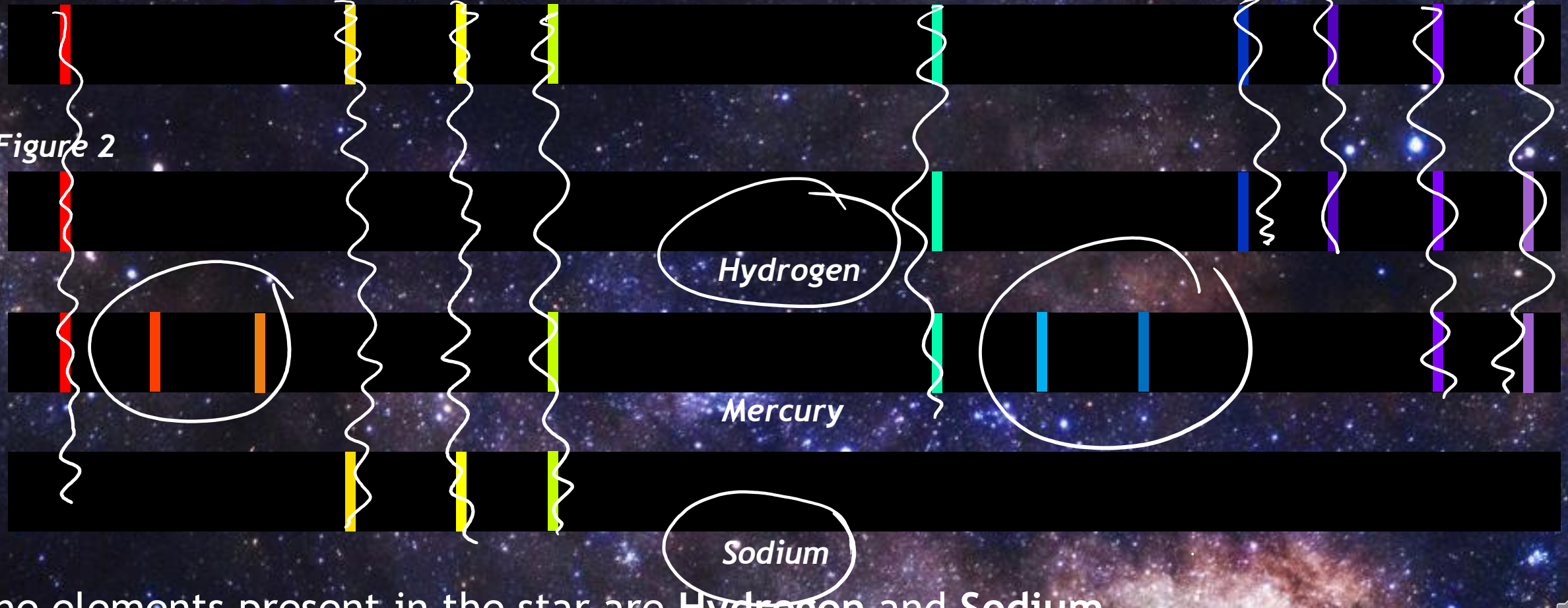
As all of the lines in **helium** and **hydrogen** have been accounted for in the spectrum from the star, only these two elements are present.

Question:

The spectral lines from a distant star are shown below in Figure 1.
Figure 2 shows the spectral lines of a number of elements.
Using the data, identify which elements are present in the star.

Figure 1

Figure 2



The elements present in the star are **Hydrogen** and **Sodium**.

Your task: Spectra Worksheet

Use the reference sheet which contains the spectra for seven elements to determine the elements present in the unknown spectra (a) – (e).

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