Quick Quizzes

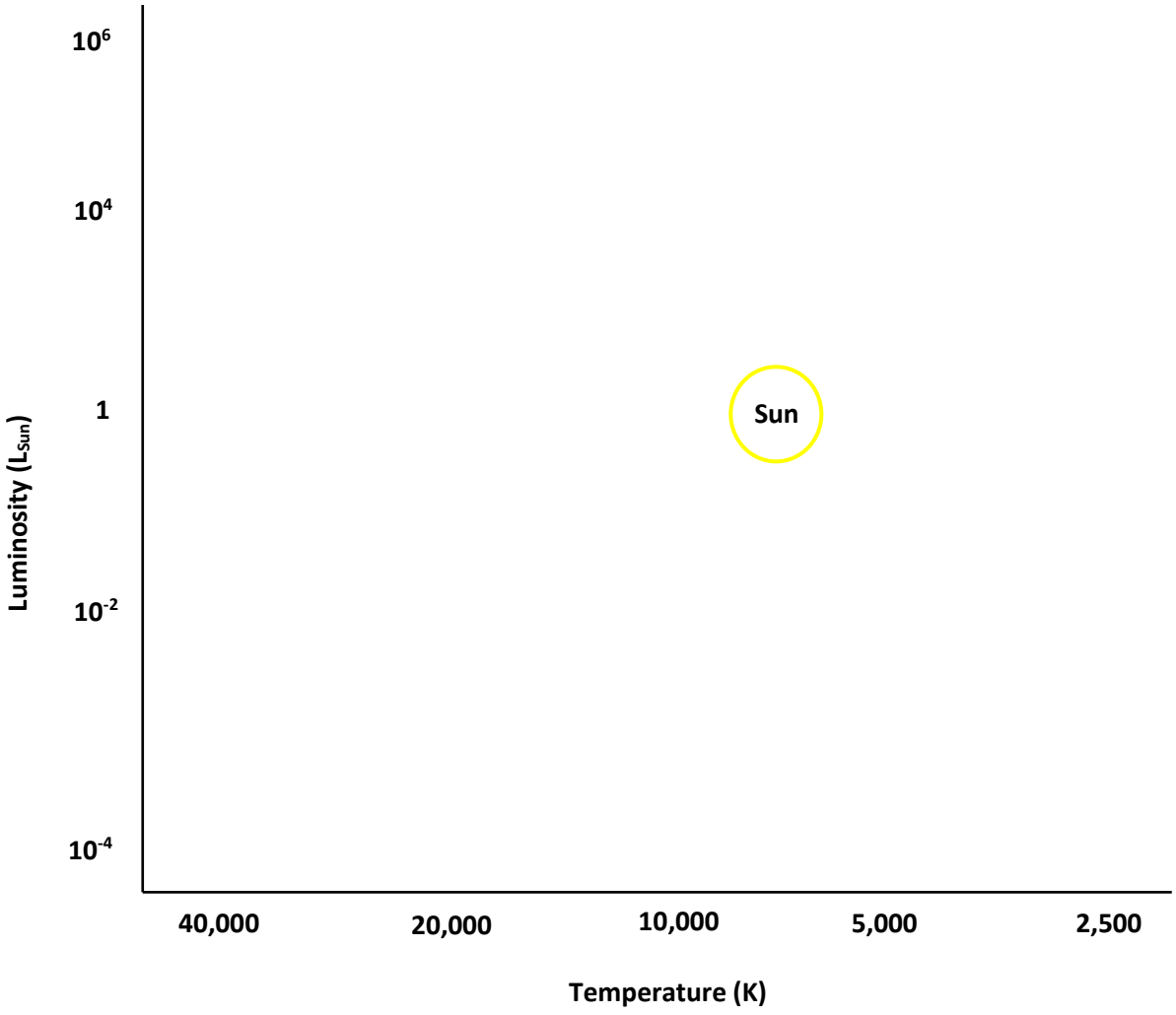
A series of quick quizzes to check student understanding of the concepts outlined in the background information

Quick Quiz 1

Figure 1 shows an empty plot of a HR diagram. Below are examples of stars, all of different classifications and in stages in the stellar lifecycle.

Step 1: See if you place the six stars on their correct regions on the HR Diagram in Figure 1.

Note: The Sun has been placed on the diagram as a benchmark and luminosity values are given in solar luminosity, where 1 solar luminosity (L_{Sun}) is equal to 3.846 x 10^{26} Watts.



Procyon B	
Temperature:	~ 6,550 K
Luminosity:	6.93 L_{Sun}

Barnard's Star	
Temperature:	~ 3,150 K
Luminosity:	0.0035 L_{Sun}

Sirius	
Temperature:	9,940 K
Luminosity:	25.4 L_{Sun}

Betelgeuse	
Temperature:	~ 3,500 K
Luminosity:	~ 140,000 L_{Sun}

Spica	
Temperature:	22,400 K
Luminosity:	12,100 L_{Sun}

Arcturus	
Temperature:	~ 4,290 K
Luminosity:	170 L_{Sun}

Step 2: Now see if you can place the stellar classifications listed below on the correct regions on the HR diagram:

White Dwarf
Red Supergiant
Red Giant
Main Sequence Strip

Quick Quiz 2

Step 1: Can you fill in the empty boxes in Table 1?

Table 1 – The Magnitude Scale		
Magnitude difference between 2 stars	**Calculation of difference in apparent brightness**	**Difference in apparent brightness**
1	$(2.512)^1$	2.512
2	$(2.512)^2$	6.310
3	$(2.512)^3$	15.85
4	$(2.512)^4$	39.82
5	$(2.512)^5$	100.0
6	$(2.512)^6$	251.3
7	$(2.512)^7$	631.2
8	$(2.512)^8$	1585

Step 2: How much brighter is a magnitude 3 star than a magnitude 5 star?

As there is a magnitude difference of 2, this difference in brightness is calculated according to:

$(2.512)^2 = 6.310$

Quick Quiz 3 - Understanding Brightness

You have been presented with a lot of new and unfamiliar terms and definitions. Let's check to see you have understood some of the fundamental difference.

Complete the table below by ticking the columns that present statements that are true to each of the definitions.

Definition	Dependent on Distance	Independent of Distance	Influenced by the Inverse Square Law
Apparent Brightness	X		X
Apparent Magnitude	X		X
Absolute Magnitude		X	

Quick Quiz 4 - Understanding Photometry

Step 1: When taking multiple images of the same object over time in order to detect changes in brightness, what is your independent variable?

The independent variable is what you want to change in order to see how it influences the dependent variable. In photometry, the independent variable is therefore the time and date of observation.

Step 2: What is your dependent variable?

This is what you want to measure as a result of changing your independent variable. In photometry this is the number of counts recorded by the CCD for your target star.

Step 3: What do you plan to use as your controlled variables?

These are the variables that must be kept the same throughout the investigation. In photometry you will need to be consistent in the following:

The telescope that is used
Exposure time
Filter
Aperture radius

These don't necessarily have to be kept the same but would require further calibration if they were changed.

Step 4: What do you think is the purpose of using comparison stars?

Comparison stars are used in order to check for true variability in your target star and to account for any variability caused by instrumentation.

Step 5: Can any star be used as a comparison star? What features must they portray?

No, comparison stars in order to be used in the data analysis must not be variable stars. Any variation they show should only be due to instrumentation influence and atmospheric conditions.

Step 6: What is meant by the term aperture and what is it used for?

This is a circle of a given radius that is used to measure the pixel counts and the intensity of the target star within it.

Step 7: Why do you think it is so important to set an appropriate aperture radius when performing photometry to measure stellar brightness?

It is important because it defines the area in which the intensity of the target star is measured. It must therefore be the right size to measure all of the light from the star.

Step 8: What would be the effects of using an aperture that was too large or too small?

If the aperture radius is too large, it will measure too much background light in the image or if there is a nearby object, it may measure the light from this as well. If the radius is too small, it will not measure all of the light from the star. (This is illustrated in Figure 2 in the “Photometry in Astronomy” worksheet).