STARS

Light: Visible light from a star is a small piece of the complete electromagnetic spectrum of radiation. Stars emit light in both the visible and invisible portions of the electromagnetic spectrum:

gamma rays	most energetic
X-rays	
ultraviolet	
visible light	
infrared	
microwaves	
radiowaves	least energetic

Brightness: When stars are viewed from earth, they appear to differ in brightness. This apparent brightness is called the stars **apparent magnitude or visible magnitude.** There are two factors involved here: how bright the star is and how far away the star is.

Stars vary in brightness from 0.0001 to 30 000 times as bright as the sun.

Visible Magnitude: The magnitude scale used today is a backwards scale with the dimmer objects receiving larger magnitude values and brighter objects receiving small values or even negative values:

Sun	−26.5
Full Moon	−12
Planet Venus	−4
Sirius (Brightest Star)	−1.5
Bright Star	1.0
Dimmer Star	3.0
Naked Eye Limit	6.0
Large Telescope Limit	20.0
Large Telescope with Film	25.0

Each division in magnitude represents a factor of 2.512 in brightness.

Absolute Magnitude: This is the visible magnitude that a star would have if it were a distance of ten parsecs away. (One parsec = 3.26 light years, therefore 10 parsecs = 32.6 light years.) The absolute magnitude of a star is more useful for determining the properties of stars. To calculate the absolute magnitude, the distance to the star from earth must be known.

Temperature/Colour Relationship for Stars:

Stars have a colour that ranges from red to violet. This colour is a direct result of the surface temperature of the star. Just like any hot object, the colour of the object depends on the temperature of the object.

COLOUR	TEMPERATURE (°C)
Violet	28 000 – 50 000
Blue	10 000 – 28 000
White	7 500 – 10 000
Yellow-White	6 000 – 7 500
Yellow	5 000 – 6 000
Orange	3 500 – 5 000
Red	2 500 – 3 500

From this information it is possible to deduce the surface temperature of distant stars.

The colour of the star can be used to determine the temperature of the star.

Why Are Stars Warm? – (what is a star)

A star is a massive ball of gas (mostly hydrogen and helium). The force of gravity pulls the content of the star inwards, creating tremendous pressure in the centre of the star. The pressure forces the atoms of hydrogen so close

together that the nuclei can touch and combine together to form new larger nuclei (helium nuclei).

$4{}_1^1\mathrm{H} \rightarrow {}_2^4\mathrm{He}$ Nuclear Fusion Reaction

The fusion reaction produces a huge amount of heat such that the centre of a star such as our sun achieves temperatures of 15 million degrees Celsius! As a rule, more massive stars burn hotter and brighter.

Hertzsprung – Russell Diagrams: By placing stars on a graph of absolute magnitude (how bright the star really is) versus colour (what surface temperature the star has) valuable insight in to the nature of stars can be obtained. 90% of all stars are located on a curved line through the centre of the Hertzsprung/Russell diagram and are called Main Sequence stars. The bigger

the main sequence star, the brighter and bluer the star will be. This leads to the conclusion that bigger stars burn hotter. The other 10% of stars are either in a red giant phase or a white dwarf stage.