

**Assessment Schedule – 2012**

**Earth and Space Science: Demonstrate understanding of stars and planetary systems (91192)**

**Evidence Statement**

<b>QUESTION ONE</b>			
<b>Expected Coverage</b>	<b>Achievement</b>	<b>Merit</b>	<b>Excellence</b>
<p>The features of the stages in the <b>life cycle</b> of Alpha Mensae include:</p> <ul style="list-style-type: none"> <li>• giant molecular cloud (GMC)</li> <li>• GMC condensing under gravity</li> <li>• protostar</li> <li>• main sequence</li> <li>• Alpha Mensae spends most of its life as a main sequence star using hydrogen as fuel. The fuel source is hydrogen fusing to helium</li> <li>• Red Giant</li> <li>• Planetary Nebulae</li> <li>• White Dwarf.</li> </ul> <p>The <b>birth stage</b> is explained: GMC condenses under gravity. As it condenses, the particles become hotter (due to friction) and eventually become hot enough to become a protostar.</p> <p>Star birth explained with associated energy changes: GMC collapsing changes gravitational potential energy into heat energy. When this heat energy temperature reaches about 1 000 000 K, nuclear fusion of hydrogen into helium occurs.</p> <p>Alpha Mensae is a main sequence star; this is where Alpha Mensae spends most of its <b>life</b>. Main sequence stars use hydrogen gas as their fuel. Hydrogen fuses together (by nuclear fusion) to form helium and release energy.</p> <p>As Alpha Mensae <b>runs out</b> of hydrogen as the fuel source, the star becomes a red giant where Alpha Mensae has enough mass to fuse helium to form carbon, but Alpha Mensae does not have enough gravity (mass) to fuse carbon. The centre of Alpha Mensae collapses under gravity and the outer layers are puffed-off, forming a planetary nebulae and the dying core eventually forms a white dwarf.</p>	<p>Identifies and describes a feature associated with each of the three stages in the life cycle of the Alpha Mensae.</p>	<p>Explains in depth each of birth, life, death in terms of characteristic energy changes, mass, fuel use and gravity.</p>	<p>Explains comprehensively stages during the life cycle of the Alpha Mensae, with reference to energy changes, fuel use, mass, and gravity.</p>

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Makes one correct (either direct or indirect) statement about the life cycle of a star.	Makes one correct statement about the life cycle of a main sequence star.	Describes two of the stages in the life cycle of Alpha Mensae.	Describes the key features of Alpha Mensae's life cycle with regards to birth, life and death of the star.	Explains the key features of the life cycle of Alpha Mensae by referring to fuel use or gravity or mass.	Explains the key features of the life cycle of Alpha Mensae by referring to TWO of: <ul style="list-style-type: none"> <li>• fuel use</li> <li>• gravity</li> <li>• mass.</li> </ul>	As for E8, but with a minor error – energy changes must be explained in detail.	Explains in detail the key features of Alpha Mensae's life cycle by referring to energy changes and two of fuel use/mass/gravity.

<b>QUESTION TWO</b>			
<b>Expected Coverage</b>	<b>Achievement</b>	<b>Merit</b>	<b>Excellence</b>
<p>Adhara is a bright giant star and Sirius A is a main sequence star. Adhara is a massive star that is very hot and has high luminosity. Because of its large mass, Adhara is using fuel at a very high rate and so has a shorter life expectancy than Sirius A.</p> <p>Adhara has a larger mass than Sirius A and so moved off the main sequence to a bright giant earlier in its life cycle. Sirius A is using hydrogen as its fuel source, while Adhara is fusing heavier elements to get its fuel.</p> <p>Sirius A is a main sequence star that is seen as very bright (luminous) in the night sky, because it is very close to Earth (in space terms). Adhara is actually a more luminous star but is further away from Earth and so its absolute magnitude is higher than Sirius A on the Hertzsprung-Russell diagram, but as viewed in the night sky, Sirius A is far more luminous.</p>	<p>Describes TWO characteristics of both stars from the HR diagram.</p>	<p>Explains the positions of BOTH of the stars on the HR diagram in terms of TWO characteristics, ie star type, size, mass, luminosity and fuel usage.</p>	<p>Compares the characteristics of stars and links these to their positions on the HR diagram.</p>

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Describes one characteristic of each star from the HR diagram.	Describes two characteristics of one star and partially describes other star from HR diagram.	Describes two characteristics of each star from the HR diagram.	Describes location of one star on the HR diagram in terms of characteristics, ie star type, size, mass, luminosity and fuel usage.	Explains the position of BOTH of the stars on the HR diagram in terms of TWO characteristics, ie star type, size, mass, luminosity and fuel usage.	Compares characteristics of stars but does not link to the position on the HR diagram.	Explains in detail the position of BOTH of the stars on the HR diagram in terms of their characteristics, ie star type, size, mass, luminosity and fuel usage and links this to their positions on the HR diagram.	Compares the characteristics of stars and links these to their positions on the HR diagram.

<b>QUESTION THREE</b>			
<b>Expected Coverage</b>	<b>Achievement</b>	<b>Merit</b>	<b>Excellence</b>
<p>Earth: Not long after Earth had been formed, about 4.5 billion years ago, a collision is thought to have happened with a smaller planetary body that was in the same orbit round the sun. The collision occurred because the smaller planetary body was travelling faster than Earth. This collision caused both planets to melt and the outer layers of both planets to be ejected into space. A disk of orbiting material was formed and this matter eventually stuck together and formed the moon that now orbits around Earth. The ejected rock (the moon) stayed close, due to Earth's gravitational pull.</p> <p>Mars: Mars's moons were not formed from an impact. They have been captured. Mars orbits around the sun and comes in relatively close contact with the asteroid belt. Because the asteroid belt does not orbit the sun uniformly, over the past 4.6 billion years Mars's orbit and the orbit of some of the asteroids has crossed. When an asteroid gets too close to a larger planetary body, it can be captured by the bigger object's gravitational field. Therefore Mars has captured two of the asteroids, and they have now become its moons, Deimos and Phobos.</p>	<p>Describes the formation of the Moon AND the formation of Mars's moons.</p>	<p>Explains in detail the formation of the Moon AND the formation of Mars's moons.</p> <p>Earth's moon formed after a big collision. It caused layers of Earth to be thrown into space and this rock became the moon.</p> <p>Mars's moons were captured due to objects in the asteroid belt coming into Mars's orbit and being unable to escape the gravitational pull.</p>	<p>Explain comprehensively the formation of both Earth's moon and Mars's moons in terms of one (the Moon) was formed by collision whereas Mars's moons were captured.</p>

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Provides a reasonable but incorrect explanation of the formation of the Moon.	Partially describes formation of either the Moon or Mars's moons.	Describes the formation of the Moon OR the formation of Mars's moons.	Describes the formation of the Moon AND the formation of Mars's moons.	Explains the formation of the Moon OR the formation of Mars's moons.	Explains the formation of the Moon AND Mars's moons.	Explains comprehensively the formation of both Earth's moon and Mars's moons.	Explain comprehensively the formation of both Earth's moon and Mars's moons in terms of one (the Moon) was formed by collision whereas Mars's moons were captured.

**Judgement Statement**

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
<b>Score range</b>	0 – 6	7 – 13	14 – 18	19 – 24