

Assessment Schedule – 2013

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

Evidence Statement

Question One:

Expected Coverage		Achievement	Merit	Excellence
<p>The features of the stages in the life cycle of the star Aldebaran includes:</p> <ul style="list-style-type: none"> • giant molecular cloud (GMC) • GMC condensing under gravity • protostar • main sequence • Aldebaran spends most of its life as a main sequence star using hydrogen as fuel. The fuel source is hydrogen fusing to helium • red giant • planetary nebula • white dwarf. <p>The birth stage 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>Aldebaran 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>Aldebaran was once a main sequence star; this is where Aldebaran spends most of its life. Main sequence stars use hydrogen gas as their fuel. Hydrogen fuses together (by nuclear fusion) to form helium and release energy.</p> <p>As Aldebaran ran out of hydrogen as the fuel source, the star becomes a red giant where Aldebaran has enough mass to fuse Helium to form carbon but Aldebaran does not have enough gravity (mass) to fuse carbon. The centre of Aldebaran collapses under gravity and the outer layers are puffed-off, forming a planetary nebula and the dying core will eventually form a white dwarf.</p>		<p>Identifies and describes a feature associated with each the three stages in the life cycle of Aldebaran.</p>	<p>Explains the birth of Aldebaran in terms of energy changes, mass, and gravity.</p> <p>OR</p> <p>Explains the life of Aldebaran in terms of TWO of energy changes, mass, fuel use, and gravity.</p> <p>OR</p> <p>Explains the death of Aldebaran in terms of TWO of energy changes, mass, fuel use, and gravity.</p>	<p>Explains in detail TWO stages during the life cycle of Aldebaran, with reference to TWO of energy changes, fuel use, mass, and gravity.</p>
Not Achieved	NØ	No response; no relevant evidence.		
	N1	States TWO characteristics of Aldebaran from the HR diagram, eg: <ul style="list-style-type: none"> • temperature approximately 4200°C 		

		<ul style="list-style-type: none"> • absolute magnitude almost -1 • spectral class K. <p>OR gives a feature in the life cycle of Aldebaran.</p>
	N2	<p>States THREE characteristics of Aldebaran from the HR diagram, eg:</p> <ul style="list-style-type: none"> • temperature approximately 4200°C • absolute magnitude almost -1 • spectral class K. <p>OR gives two features in the life cycle of Aldebaran.</p>
Achievement	A3	<p>States THREE features of stages in the life cycle of Aldebaran, eg THREE of:</p> <ul style="list-style-type: none"> • giant molecular cloud (GMC) • protostar • main sequence • Red Giant • Planetary Nebula • White Dwarf.
	A4	<p>Describes a feature for TWO stages in the life cycle of Aldebaran.</p>
Merit	M5	<p>Explains the birth of Aldebaran in terms of TWO of energy changes, mass, and gravity. OR Explains the life of Aldebaran in terms of TWO of energy changes, mass, fuel use, and gravity. OR Explains the death of Aldebaran in terms of TWO of energy changes, mass, fuel use, and gravity.</p>
	M6	<p>Explains the birth of Aldebaran in terms of TWO of energy changes, mass, and gravity. AND / OR Explains the life of Aldebaran in terms of TWO of energy changes, mass, fuel use, and gravity. AND / OR Explains the death of Aldebaran in terms of TWO of energy changes, mass, fuel use, and gravity.</p>
Excellence	E7	<p>Explains in detail TWO stages during the life cycle of Aldebaran, with reference to TWO of energy changes, fuel use, mass, and gravity.</p>
	E8	<p>Explains in detail ALL THREE stages during the life cycle of Aldebaran, with reference to TWO of energy changes, fuel use, mass, and gravity.</p>

Question Two:

Expected Coverage		Achievement	Merit	Excellence
<p>After the Sun had formed, there were leftover gas and dust particles. These particles began to rotate around the young sun and flattened into a disk shape called a protoplanetary disk. Inside the swirling disk, rocky particles began to collide and formed bigger masses. This increase in mass attracted even more particles due to an increase in gravitational field strength.</p> <p>The planets formed when these large masses (planetesimals) collided with each other.</p> <p>The planets that formed closer to the Sun had all of the gases blown off from the intense solar winds. The planets that were forming further away (at the same time) did not suffer the effect of these solar winds. This was due to their huge distance away from the sun, which diminished the effect of the powerful solar winds.</p> <p>The gas giants like Jupiter had the ability to accrete more and more dust and gases (still present due to diminished solar winds) which were pulled into their rocky core due to gravity. They became rocky cores surrounded by thick layers of gases. The terrestrial planets had no surrounding gases so therefore no layers of gases could form around them, leaving planets like Mercury with no atmosphere / surrounding gas clouds.</p> <p>Temperature also affected whether gases were present in different areas of the protoplanetary disks. Planets close to the Sun, like Mercury had most of their gases blown away, any gases left (e.g. H or He) would have been quickly evaporated due to the intense heat from the Sun. As you move away from the Sun, temperatures decrease so those planets forming further out would not have had their nearby volatile gases evaporated, meaning Jupiter could collect and accrete (collect) more gases due to gravity.</p>		<p>Describes stages in formation of either Mercury or Jupiter. OR Describes presence of absence of solar winds on either Mercury or Jupiter.</p>	<p>Explains stages in the formation of either Mercury or Jupiter. OR Explains presence of absence of solar winds on either Mercury or Jupiter.</p>	<p>Explains in detail the differences in the formation of Mercury and Jupiter due to TWO of: presence (or lack of) solar winds, temperature differences, accretion.</p>
Not Achieved	NØ	No response; no relevant evidence.		
	N1	Gives some stages in formation of one planet.		
	N2	Gives some stages in formation of two planets.		
Achievement	A3	Describes stages in formation of EITHER Mercury or Jupiter. OR Describes presence or absence of solar winds in EITHER Mercury or Jupiter.		
	A4	Describes stages in formation of BOTH Mercury and Jupiter.		

		OR Describes presence or absence of solar winds on BOTH Mercury and Jupiter.
Merit	M5	Explains stages in the formation of EITHER Mercury or Jupiter. OR Explains presence or absence (diminished) of solar winds on EITHER Mercury or Jupiter.
	M6	Explains stages in the formation of BOTH Mercury and Jupiter. OR Explains presence or absence (diminished) of solar winds on BOTH Mercury and Jupiter
Excellence	E7	Explains in detail the formation of Mercury OR Jupiter due to TWO of: presence (or lack of) solar winds, temperature differences, accretion.
	E8	Explains in detail the differences in the formation of Mercury OR Jupiter due to TWO of: <ul style="list-style-type: none"> • presence (or lack of) solar winds • temperature differences, and • accretion.

Question Three:

Expected Coverage	Achievement	Merit	Excellence
<p>Refers to position on HR diagram and how this provides information about the following: The features of the stages in the life cycle of Betelgeuse and Teide 1 including</p> <ul style="list-style-type: none"> • giant molecular cloud (GMC) • GMC condensing under gravity • protostar. <p>At this stage Teide 1 forms a brown dwarf whereas Betelgeuse goes onto:</p> <ul style="list-style-type: none"> • main sequence • Betelgeuse spends most of its life as a main sequence star using hydrogen as fuel. The fuel source is hydrogen fusing to helium. • red giant • supernova • black hole. <p>The birth stage of Betelgeuse and Teide 1 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>Teide 1 and Betelgeuse birth explained with associated energy changes: GMC collapsing changes Gravitational Potential Energy into heat energy.</p> <p>For Betelgeuse: When this heat energy temperature reaches about 1 000 000 K nuclear fusion of hydrogen into helium occurs.</p> <p>For Teide 1: The heat energy temperature is not high enough for Nuclear Fusion to occur due to low mass of GMC, so brown dwarf forms.</p> <p>Betelgeuse is a main sequence star; this is where Betelgeuse spends most of its life. Main sequence stars use hydrogen gas as their fuel. Hydrogen fuses together (by nuclear fusion) to form helium and release energy.</p>	<p>Identifies and describes a feature associated with each of the three stages in the life cycle of Betelgeuse or Teide 1.</p> <p>OR Identifies significance of positions on HR diagram.</p>	<p>Explains the birth of Betelgeuse or Teide 1 in terms of energy changes, mass and gravity.</p> <p>OR</p> <p>Explains the life of Betelgeuse or Teide 1 in terms of TWO of energy changes, mass, fuel use, and gravity.</p> <p>OR</p> <p>explains the death of Betelgeuse in terms of TWO of energy changes, mass, fuel use, and gravity.</p>	<p>Makes a detailed comparison about the differences in the life cycle of Betelgeuse and Teide 1 in terms of mass (Teide 1 forms brown dwarf due to very low starting mass compared to Betelgeuse ending as a Black Hole after going Super nova due to very high starting mass).</p>

Not Achieved	NØ	No response; no relevant evidence.
	N1	Identifies TWO features of stages in the life cycle of Betelgeuse or Teide 1. OR Identifies TWO characteristics of Betelgeuse or Teide 1 from the HR diagram.
	N2	Identifies THREE features of stages in the life cycle of Betelgeuse or Teide 1. OR Identifies THREE characteristics of Betelgeuse or Teide 1 from the HR diagram
Achievement	A3	Describes that Teide 1 is a failed star. OR Describes a feature for each of TWO of the three stages in the life cycle of Betelgeuse OR Identifies significance of position on HR diagram in determining life cycle and describes a feature of ONE of the three stages of either Betelgeuse or Teide 1.
	A4	Describes a feature for all stages in the life cycle of Betelgeuse AND describes Teide 1 as a failed star.
Merit	M5	Explains birth of Betelgeuse or Teide 1 in terms of TWO OF energy changes, mass, and gravity. OR Explains the life of Betelgeuse or Teide 1 in terms of TWO OF energy changes, mass, fuel use, and gravity. OR Explains the death of Betelgeuse or Teide 1 in terms of TWO OF energy changes, mass, fuel use, and gravity. OR Explains the differences in the life cycle of the two stars with reference to mass.
	M6	Explains birth of Betelgeuse or Teide 1 in terms of TWO OF energy changes, mass and gravity. OR Explains life of Betelgeuse or Teide 1 in terms of TWO OF energy changes, mass, fuel use, and gravity. AND / OR Explains death of Betelgeuse or Teide 1 in terms of TWO OF energy changes, mass, fuel use, and gravity. AND / OR Explains the differences in the life cycle of the two stars with reference to mass.
Excellence	E7	Compares the differences in life cycle of Teide 1 to Betelgeuse with reference to mass.
	E8	Makes a detailed comparison about the differences in the life cycle of Betelgeuse and Teide 1 in terms of mass (Teide 1 forms brown dwarf due to very low starting mass compared to Betelgeuse ending as a black hole after going supernova, due to very high starting mass).

Judgement Statement

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