



GCSE

4781/03-A

SCIENCE B

UNIT 1: Space, Energy and Life

P.M. THURSDAY, 16 January 2014

Resource Folder (Pre-Release Article)

For use with:

GCSE Science B (UNIT 1) **SECTION B** of the Foundation Tier

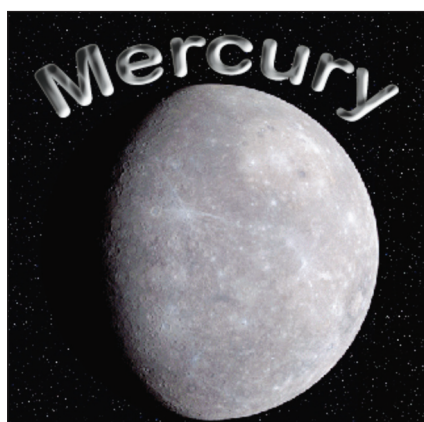
GCSE Science B (UNIT 1) **SECTION A** of the Higher Tier

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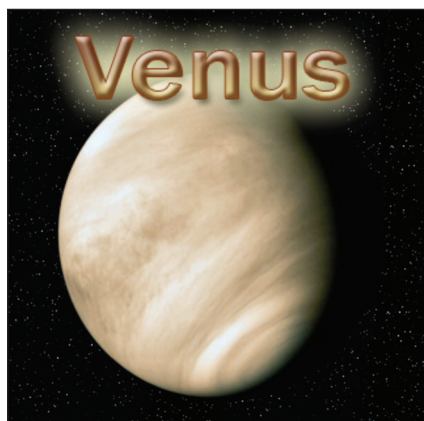
The Solar System

It is believed that the Solar System formed from a huge cloud of swirling gas and small rocky particles. Most of the cloud was attracted to the centre to form the Sun, whereas smaller amounts formed the gas giants and even smaller amounts formed the inner planets.

The Sun is a huge ball of gas which provides energy to its planets. It contains 99% of all of the matter in the Solar System and, at 4.5 billion years old, is about half way through its life. Without the Sun, life on Earth simply wouldn't exist. The Sun is just one of billions of stars in the Milky Way galaxy and is the closest star to Earth. Between the orbits of Mars and Jupiter is an area called the Asteroid Belt. Occasionally asteroids collide with each other, and may, one day, in millions of years, all join together to form another Earth-sized planet. The Solar System is constantly developing, and the Asteroid Belt may be a planet still in production.



Mercury has a rocky surface covered in craters, just like Earth's Moon, and has temperatures which can reach up to 350°C on its sunlit side and -170°C on its dark side. Mercury has no atmosphere, so the sky appears dark all the time.



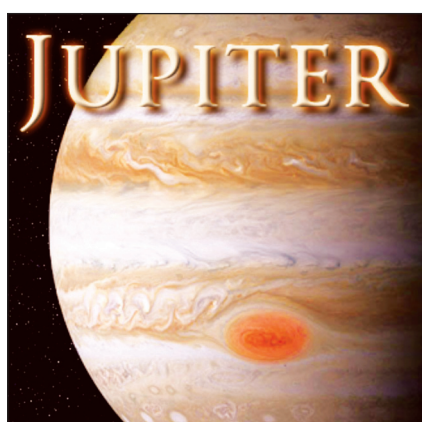
Venus is the only inner planet in the Solar System to turn in a clockwise direction on its axis. Venus is covered in poisonous clouds containing sulphuric acid, and an atmosphere containing mainly carbon dioxide. Venus' surface remained a mystery because of its thick cloud cover until 1990-1994 when radar imaging equipment on the Magellan space craft managed to look through the clouds to reveal a rocky and volcanic surface.



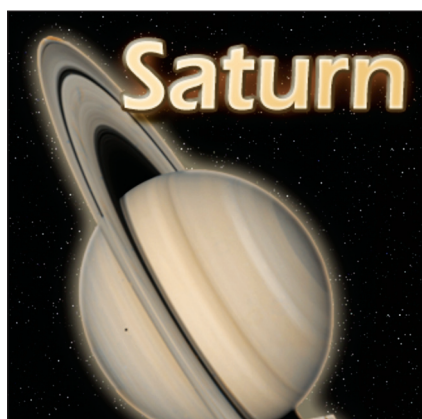
Earth is the only planet in the Solar System known to contain life. Earth is the only planet to contain water in its three forms, as a solid (ice), as a liquid (sea, rain, etc.) and as a gas (steam, clouds, atmosphere). It has a rocky surface.



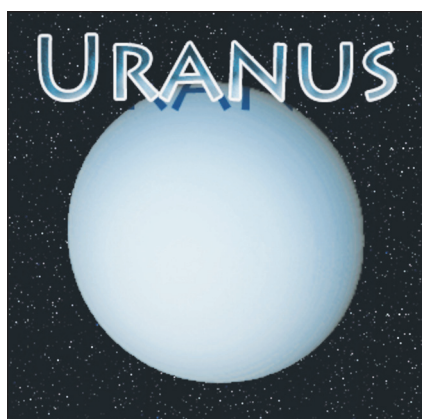
Mars is a small red, rocky planet with a very thin atmosphere of carbon dioxide. It is believed that it once had flowing water on its surface. The planet has a rusty surface and a pink sky. It is covered in rocks and impact craters.



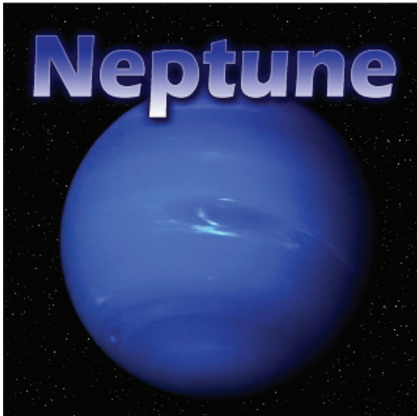
Jupiter is the biggest planet in the Solar System. The planet is a gas giant, made up mainly of hydrogen and helium. Its main feature is a Great Red Spot, which is a storm that has been going on for hundreds of years. It has a faint ring system around it.



Like Jupiter, Saturn is also made up mainly of hydrogen and helium. Saturn's most famous feature is its great rings. These are rings of small dust, rock and ice particles, probably what remains of a shattered moon which once orbited Saturn.



Uranus, a gas giant, has an atmosphere of hydrogen, helium and methane. The methane gives the planet a pale blue colour. The planet is tipped on its side, possibly from a collision with an object the size of Earth. It is so cold that some of the gas is frozen. Uranus has rings of ice and small rock particles. However, these rings are too faint to be seen from Earth.



Often considered to be a twin planet of Uranus, Neptune is a similar size and has similar composition. The winds on the planet are the strongest in the Solar System, with areas of high pressure shown by dark spots. Clouds of icy droplets of methane can also be seen in the upper atmosphere of Neptune. It also has a very faint ring system.



Comets are often described as dirty snowballs. Comets orbit the Sun in elliptical orbits, travelling from a great distance to become very close to the Sun. They spin around the Sun and are then flung back outwards. Some comets take thousands of years to orbit the Sun, some take a few years and some are thrown out of the Solar System for good after they spin around the Sun!

Table 1

Planet	Mean distance from Sun (AU)	Diameter (Mm or 10^6m)	Length of day i.e. time to spin once on axis (Earth days)	Length of year i.e. time to orbit Sun (Earth years)	Mean temperature ($^{\circ}\text{C}$)	Content of atmosphere	Known moons
Mercury	0.4	5	59	0.2	427	None	0
Venus	0.7	12	243	0.6	480	carbon dioxide (96%), nitrogen (3.5%)	0
Earth	1.0	13	1	1	14	nitrogen (77%), oxygen (21%)	1
Mars	1.5	7	1	2	-63	carbon dioxide (95.3%), argon	2
Jupiter	5.2	143	0.4	12	-130	hydrogen, helium	63
Saturn	9.5	120	0.4	29	-130	hydrogen, helium	61
Uranus	19.2	51	0.7	84	-200	hydrogen, helium, methane	27
Neptune	30.0	50	0.7	165	-200	hydrogen, helium, methane	13

Acknowledgements:

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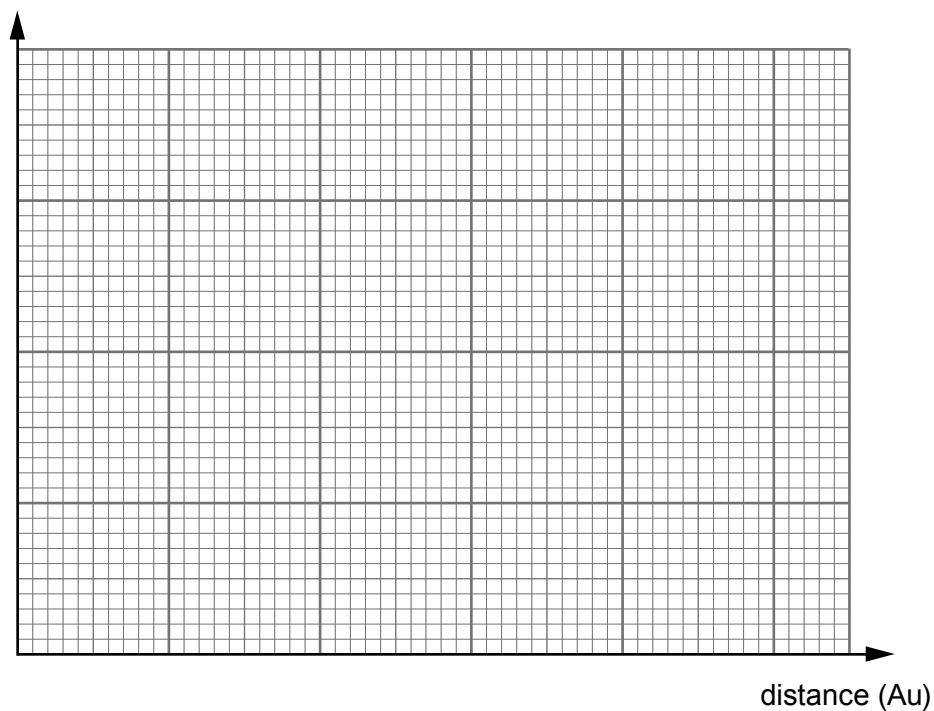
Answer all questions in the spaces provided.

Use the information in the separate Resource Folder to answer the following questions.

1. Use the information in **Table 1** to answer the questions that follow.

- (a) (i) Which planet is closest in size to Earth? [1]
- (ii) Which planet has a day length longer than its year? [1]
- (iii) Name the only planet that does not have an atmosphere. [1]
- (b) Suggest a relationship between the number of moons around a planet and **one other** factor in **Table 1**. [2]
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- (c) (i) Describe how the temperature on a planet depends on the distance from the Sun. [1]
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- (ii) Explain why Venus does not follow this trend. [2]
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- (d) Ceres is a dwarf planet found in the asteroid belt.
- (i) **Estimate** its temperature. °C [1]
- (ii) **Estimate** its orbital time around the Sun. Earth years [1]

- (e) (i) Plot a graph to show how the time it takes a planet to orbit the Sun depends on distance from the Sun.
Only include the planets **Earth, Mars, Jupiter** and **Saturn** in your graph. [4]



- (ii) It was once thought that the time of orbit would be proportional to distance from the Sun.

Does your graph agree with this statement? [1]

Give **one** reason for your answer.

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(f) Answer the following questions using **only** information from the Resource Folder.

- (i) Give **one** reason why an Earth-based telescope would not be able to see the surface of Venus. [1]

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- (ii) Give **one** reason why an Earth-based telescope may not be able to see the rings around Uranus. [1]

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(g) **Draw** a diagram to show the path of a comet as it orbits the Sun. [1]

● Sun

- [illegible]

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GCSE MARKING SCHEME

GCSE SCIENCE B

JANUARY 2014

SECTION B-Foundation Tier

Question	Marking detail	Mark
1	(a) (i) Venus	1
	(ii) Venus	1
	(iii) Mercury	1
	(b) The bigger (the diameter) [1] the more moons around a planet [1]	2
	(c) (i) The further from the Sun the lower the temperature	1
	(ii) Atmosphere is mainly carbon dioxide [1] which means there is a large global warming/greenhouse effect [1] <i>Second mark can only be awarded if it is coherently and correctly linked to the first marking point.</i>	2
	(d) (i) Accept value between -64 and -129°C	1
	(ii) Accept value between 3 and 11 years	1
	(e) (i) Scales [1] points (+/- square) [2] curve [1]	4
	(ii) (No) because line is curved (non-proportional)	1
	(f) (i) Surface covered in (thick)- clouds	1
	(ii) Rings too faint	1
	(g) Ellipse drawn (Not a circle, Sun not in the middle)	1

Question	Marking detail	Mark
2	<p>Indicative content:</p> <ul style="list-style-type: none"> • by comparison <ul style="list-style-type: none"> ○ terrestrial or rocky planets: Mercury, Venus, Earth and Mars: <ul style="list-style-type: none"> • rock and metal • have relatively high densities, slow rotation solid surfaces, no rings and few satellites. ○ jovian or, gas planets: Jupiter, Saturn, Uranus and Neptune: <ul style="list-style-type: none"> • hydrogen and helium • generally have low densities, rapid rotation, deep atmospheres, rings and lots of satellites. • by size ○ small planets: Mercury, Venus, Earth, Mars. <ul style="list-style-type: none"> • diameters less than 13000 km. ○ giant planets: Jupiter, Saturn, Uranus and Neptune. <ul style="list-style-type: none"> • diameters greater than 48000 km. <p>Marking Bands</p> <p>5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no relevant inclusions or significance omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3-4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1-2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>	6QWC