Study Guide - *Science*

Year: 5	**Subject:** Science	**Unit of Study:** Out of this World	**Linked Literature:** Cosmic by Frank Cottrell Boyce / DK Solar System (or similar non-fiction)

Out of this World → Material World → Circle of Life → Let's Get Moving → Growing Up and Growing Old → Amazing Changes

Vocabulary	
Sun	The star at the centre of our Solar System that other planets orbit around
Star	An astronomical body or giant ball of gas that produces its own energy and is held together by its own gravity.
Moon	A natural satellite (object or body in space) which orbits Earth or other planets
Solar System	A series of planets that orbit a star
Planet	A large object, round or nearly round, that orbits a star
Orbit	The path of a planet or moon around another celestial (space) object
Geocentric	(Earth-centred) the Earth is at the centre of the Solar System—belief that people used to have
Heliocentric	(Sun-centred) the Sun is at the centre of the Solar System. This belief is called **heliocentrism**
Axis	An imaginary line that a body rotates around eg: Earth's axis runs from North to South pole
Astronomer	Someone who studies or is an expert in astrology (space science)
Time-zone	A geographical region (place) where the same time is set
Asteroid Belt	Located in the far region of the Solar System between Mars and Jupiter and contains asteroids of all different sizes
Asteroid	A chunk of rock and metal , of varying size and shape, in outer space that is in orbit around the Sun.

I need to know (continued):

Our Solar System has a large star, the Sun, at its centre and **eight planets** and their moons, which orbit the Sun. All planets have almost circular orbits that lie within a nearly flat disc called the ecliptic plane. The majority of the Solar System's mass is in the sun, with most of the remaining mass contained in Jupiter.

The planets in order of their distance from the sun are: **Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.**

The four inner planets, Mercury, Venus, Earth and Mars, are mainly composed by rock (and metal). The four outer planets, called the 'gas giants', are substantially more massive. They are mostly made up of gases (helium and hydrogen) although they do have cores made up of rock and metal.

The Solar System contains many other objects such as the Asteroid Belt. This sits between the orbits of the planets Jupiter and Mars. It is made up of thousands of objects too small to be considered planets—some a small as a grain of dust, whilst others (Eros) are more than 160km across and others (Ida) even have their own moons. Large objects, like Pluto, are now classified as dwarf planets. Pluto was originally considered to be a planet but due to its size was reclassified as a dwarf planet in 2006.

The model of the Solar System has been refined over many centuries. **Aristotle (384BC-322BC)** proposed the **geocentric model**, with Earth at the centre of the Universe. The 5 known planets (Mercury, Venus, Mars, Jupiter and Saturn), the Moon, the Sun and the stars **moved around Earth in perfect spheres**. **Nicolaus Copernicus (1473-1543)** made accurate observations of the Moon and the planets. He used maths to show that their movements could be explained much better if he **put the Sun at the centre of the Solar System. Johannes Kepler (1571-1630)** used maths to show that the orbit of a planet is an ellipse with the Sun at its focus and that it moves faster when it is closer to the Sun than when further away. The work of many astronomers, including Copernicus and Kepler, combined over many years before the idea of the **heliocentric model** was developed. **Galileo Galilei (1564-1642)** championed the heliocentric model and used telescopes to show that Jupiter had moons. His work on gravity also allowed astronomers to understand how planets stayed in orbit.

In medieval times and before, it was commonly accepted that the Earth was flat. Nowadays, we have evidence to show that, like the Moon and other planets, Earth is spherical in shape.

Although it appears that the Sun is moving across the sky during the day, this is an illusion as the Sun does not move, however, the Earth and the Moon both move. The **Earth rotates** (spins) on its axis, **taking 24 hours to complete a full rotation**. The daily spinning of the Earth **causes night and day**. The part of the Earth facing the Sun is in daylight and the part that is not facing the Sun is in darkness. At the same time that Earth is rotating, it is also orbiting (revolving) around the Sun, in an oval shaped path. It takes **just over 365 days (a year) for Earth to orbit the Sun**.

Before modern calendars, people used to keep track of the days by watching the phases of the Moon. One full cycle of the Moon's phases is approximately 28 days, which is very close to the time that we know as one month. At various times in the month, the Moon appears to be different shapes. This is because as the Moon rotates round the Earth, the Sun lights up different parts of it—known as the phases of the Moon.

Nicolaus Copernicus **Galileo Galilei**

I need to do:

Describe the movement of the Earth and other planets relative to the Sun in the Solar System.

Describe the movement of the Moon relative to the Earth.

Describe the Sun, Earth and Moon as approximately spherical bodies.

Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.

Working scientifically skills:

Plan different types of scientific enquiries to answer questions, recognising controlling variables.

Use scientific equipment to take measurements.

Record data and results, using these findings to make predictions and set up further comparative and fair tests.

Report and present findings from enquiries.

Identify scientific evidence that has been used to support or refute ideas/arguments.

Prior knowledge:

Earth and Space are not covered prior to Year 5 but children should be aware of the following:

- The Sun is a star
- The name of some planets
- The Earth rotates
- Planets are roughly spherical

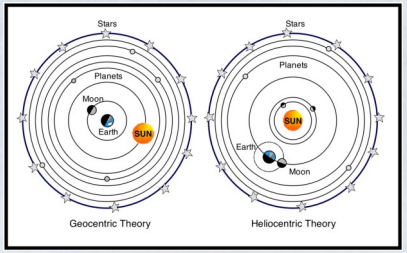
Common Misconceptions:

There is only one Solar System—there are lots.

That there are stars in our Solar System other than the Sun—the Sun is the only star in our Solar System

That planets can only be seen with a telescope—You can see Mercury, Venus, Mars, Jupiter and Saturn without.

Day and night are caused because the Sun moves—the spinning Earth causes it.



What is our Solar System? | What is at the centre of our Solar System? | Whose ideas shaped our understanding of our Solar System? | What causes day and night and why do variations occur? | Why does the Moon appear to change shape? | Investigation

Lesson content and skills	Learning in books	Evaluation
LO: Can I describe the movement of the Earth and other planets relative to the Sun in the Solar System? **Scientific skills: Report and present findings from enquiries.** See Unit 1.1: Session 1 of Switched on Science for more details. Discuss planets and what they already know. 'The Solar System' song. Fact cards game—add to 'Solar System' notes page/mind map. Quick Fire Quiz to check knowledge retention. Complete Interactive activity as a class. Write a mnemonic for the order of the planets—silly as they like! **Scientific skills: Take measurements and plan different types of scientific enquiries to questions.** Combine with Session 2: Fruit model of the Solar System—whole class/groups of 10. (toilet paper scale) Add planet labels. (Take photo of each group?) Chn create their own representation of the planets (pre-prepared for size?) - label (add any researched key facts about planets).	KWL grid—questions Mnemonic for order of planets Solar System model representation—labels (and key facts) - lift up planet flaps??	
LO: Can I describe the movement of the Earth and other planets relative to the Sun in the Solar System? **Scientific skills: Report and present findings from enquiries. Interpret scientific data.** See Session 3 for more details: Write their mnemonic and ask chn to add the Sun—where? Watch video clip showing how planets move around the Sun. Key vocab—orbit, heliocentric etc. Repeat video clip and focus on the speed that the different planets orbit the Sun. Ask questions to assess understanding. Data activity Resource 1.4: Use data to answer questions and look for patterns. Split chn into their previous groups (session 1) and move around the Sun—*take photo?* Chn write about the movement of their planet/ the planets using words like heliocentric and orbit, as well as drawing on the knowledge drawn from the earlier comprehension.	Comprehension—interpret data. Explain how a planet moves, include shape, using scientific vocabulary. (link to practical task)	
LO: Can I describe the movement of the Earth and other planets relative to the Sun in the Solar System? **Scientific skills: Identify scientific evidence that has been used to support or refute ideas.** See Unit 1.2 Session 1 for more details: Show the chn 2 video clips about Copernicus and Galileo (See useful websites resource online). Chn take notes as they watch (watch twice—first time to watch and second time to record notes) in a table. Establish that ideas about the world have changed over time. In Medieval times people thought the Solar System was like (geocentric) - different to Copernicus. *How do you think his observations helped change the idea that the earth was flat and was at the centre of the Universe?* What we know about the Solar System is based on scientific evidence that they used to refute the ideas that were incorrect about the Solar System. Discuss similarities and answer some key questions to assess understanding. Write a brief comparison of the two models.	Record notes from video Copernicus (1473-1543) Galileo (1564-1642) ***What is the difference between a heliocentric and geocentric model of the Solar System?*** Write a brief response to this, using the knowledge gained during this session.	
LO: Can I use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky? **Scientific skills: Report and present findings from enquiries.** Discuss 'apparent' movements of the Sun = east to west. Show diagram with suns on the window! *Mr Thomas thinks that this is evidence that the Sun moves across the sky in the daytime and disappears at night. Do you agree?* Use a globe, figure and torch to model day and night—scribe key words: orbit, 24 hours, rotation, rotate, day, night, darkness, light. Watch to further develop understanding https://www.youtube.com/watch?v=Em3TlqNOUsk (different length days/seasons). Making notes to support their response to Mr T and explain what is actually happening—include diagrams.	Letter to Mr T explaining why they agree/ disagree and providing an explanation of what causes day and night—include as much detail as possible. Challenge—to explain why days/nights are different lengths throughout the year.	Time Zone—Watch short CPD video and leave the globe and prepared grid for chn to access in class??
LO: Can I take measurements using a range of scientific equipment (taking repeat readings when necessary)? **Scientific skills:** Recap day and night learning and introduce key ideas about the Moon. *What takes approx. 27 days, 7 hours, 43 mins, 11 secs* (orbit of the Moon around the Earth) Watch video on Useful websites list OR https://www.youtube.com/watch?v=t6MCtB752AE and make notes on whiteboard. Use slide 18 to answer why this is good evidence for the Moon taking 28 days to orbit the Earth. (Moon watch homework for the month—bring in daily and look at the phase of the Moon) If time—In groups of 8, give chn a biscuit (jaffa cake) and phase of the Moon to create and label (and name) whiteboard with a serviette.	Response to: Why is this good evidence of the Moon taking 28 days to orbit the Earth?	
LO: Can I plan an enquiry to answer questions, making predictions, taking measurements, recording data and carrying out a fair test ? **Scientific skills: Plan enquiries to answer questions; Take measurements; Record and report data; Use test results to make predictions to set up further comparative and fair tests.** See Unit 1.3 Session 6: Show chn pictures of the surface of the Moon. ***How were they formed?*** Draw on the knowledge gained from watching previous videos of the Moon and own real-life experience. Moon has craters formed by asteroids or meteorites hitting the surface and the rock vaporising. Use slide 20 – Carry out the 'Crater Investigation'. Begin by asking chn to think of questions they could investigate eg: ***How does the height of the drop affect the size of the crater? If I keep the mass the same but change the shape of the falling object, what affect does it have on the size of the crater?*** Chn decide on the measurements needed and create a 'recording method eg: table. Record results in line graph/bar chart (LA).	Write up investigation—What we did? Results and conclusion. End of unit assessment	