

8La GATHERING THE EVIDENCE

1a Tick (✓) the boxes to show which model of the Solar System these statements refer to. Some statements apply to more than one model.

	Ptolemy	Copernicus	Kepler Modern	
i contains five planets	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	☹
ii planets orbit around the Sun	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	☹
iii Sun orbits around the Earth	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	☹
iv planets move in elliptical orbits	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	☹
v planets move in circular orbits	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	☹
vi the Moon orbits the Earth	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	☹

b Draw a smile on the face next to each statement to show how confident you are about your answer—the bigger the smile, the more confident you are.

2 Why did Kepler have more accurate information about the movements of the planets than Ptolemy?

He had information observed using telescopes / better instruments

3 Describe *three* different ways of investigating the planets that were not available to scientists in Kepler's time.

Telescopes in space, space probes landing on planets, moons. Space probes

flying past planets, moons. Bring back Moon rocks to study. Astronauts visiting the moon

4 Why do scientists today think that the modern model of the Solar System is better than Ptolemy's model?

The modern model is best at explaining all the observations we have.

5a Explain how we can see the Moon and the other planets.

They reflect light from the Sun

b Look at the diagrams of the Moon. What is this series of shapes called? Phases of the moon.



Explain why we see phases of the moon.

The lit-up half is always facing the Sun, so we see different parts of the lit up half as the moon moves around the Earth.

8Lb SEASONS

- 1 Label the diagram using words and phrases from the box.



Equator North Pole northern hemisphere southern hemisphere

- 2 Look at the drawing of the Earth.



Tick (✓) the boxes to show which statements apply to places X and Y.

- a It is daytime.
- b It is summer.
- c The nights are longer than the days.
- d The weather is cold.
- e The Sun is high in the sky at midday.
- f The days are longer than the nights.
- g It is winter.

X

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☐

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Y

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SB

- 3 Look at the diagram in question 2. Describe the difference between summer and winter in place Y in terms of:

- a the length of daylight daylight lasts longer in the the summer than in the winter
- b the temperature. it is warmer in the summer than in the winter.

8Lb SEASONS

- 4 Look at the diagram in question 2. Explain why days are longer than nights in summer in place Y.

When it is summer in a particular place, that place spends more time in the zone lit by the Sun

- 5 Look at the diagram in question 2. Explain how the Sun feels at different times of year in place Y. To answer this, tick (✓) one box for each of parts a and b.

a The Sun feels:

- ☒ A hotter in summer.
☐ B hotter in winter.
☐ C hotter in autumn.
☐ D the same all year round.

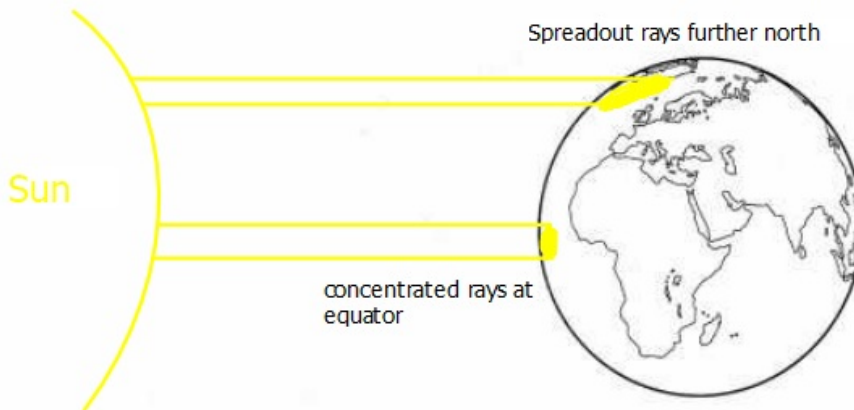
b This is because in the summer:

- ☐ A the Earth is closer to the Sun.
☐ B the Earth is further from the Sun.
☐ C days are longer than nights.
☒ D the Sun's rays are more concentrated.

- 6 If you live near the Equator, the Sun always feels hotter than it does in countries away from the Equator. Add lines and labels to the diagram to help you to explain why.

Two beams of light, one hitting the equator and one further north or south.

The beam hitting the equator has a smaller area (more concentrated)



- 7 Why does the length of daylight affect the temperature?

The longer the Sun is shining on a place, the more time it has to warm up,
 so longer days lead to warmer temperatures.

8Ld GRAVITY IN SPACE

1a Tick (✓) the boxes to show if these statements are true or false.

Statement

True

False

- i The force of gravity on an object depends on its mass.
- ii On Earth, 'down' is always towards the centre of the Earth.
- iii Weight is measured in kilograms.
- iv Gravity is the same everywhere in the Solar System.
- v Only large objects like the Earth have gravitational fields.
- vi Your weight is the force of the Earth's gravity acting on you.



b Draw a smile on the faces to show how confident you are about each answer – the bigger the smile, the more confident you are.

2 Why is a motorbike heavier than a bicycle?

It has a larger mass because there is more matter in it

3a Add the correct units to the equation for calculating the weight of an object.

weight (N) = mass (kg) × gravitational field strength (N/kg)

b On Earth, the value of g is 10 N/kg. What does the symbol g stand for?
gravitational field strength

4a Calculate the weight of a 2 kg mass on the Earth.

$$\begin{aligned} \text{weight} &= \text{mass} \times g \\ &= 2\text{kg} \times 10 \text{ N/kg} \end{aligned}$$

weight = 20 unit N

b The gravitational field strength on the Moon is 1.6 N/kg. Calculate the weight of the 2 kg mass on the Moon.

$$\begin{aligned} \text{weight} &= \text{mass} \times g \\ &= 2\text{kg} \times 1.6 \text{ N/kg} \end{aligned}$$

weight = 3.2 N

8Ld GRAVITY AND ORBITS

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1a What stops the Earth from moving away from the Sun?

The force of gravity between the Sun and the Earth

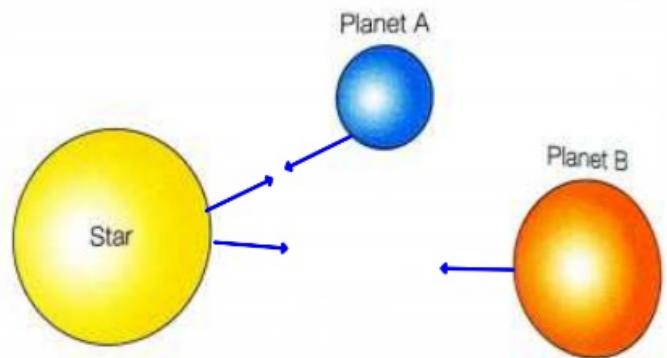
b What stops the Moon from moving away from the Earth?

The force of gravity between the moon and the Earth

2 The diagram shows two planets orbiting a star. The planets are kept in their orbits by the force of gravity between the planets and the star.

a Give *one* reason why the greatest force might be between the star and:

i Planet A is closer to the star than planet B



ii Planet B has more mass than planet A

b Draw arrows on the diagram to show the forces between the star and Planet B.

3 If you climbed to the top of Mount Everest, you would weigh about 1 N less than you do now. Explain why this is so.

On top of Everest you are further away from the **centre** of the Earth

4a Explain why the Moon is called a natural satellite of the Earth.

It is a satellite because it orbits the Earth;

and it is a natural satellite because it was not made by humans

b Give two uses for artificial satellites.

photographing the Earth;

transmitting TV programmes; observing weather

SB

5 Neptune is about 4.5 billion kilometres from the Sun. Explain how this shows that the Sun's gravitational field extends at least that far.

If the Sun's gravitational field did not extend that far, Neptune would fly off

into space instead of staying in orbit around the Sun.

8Le BEYOND THE SOLAR SYSTEM

- 1 Write the objects in the box in order of size, starting with the smallest.

moon --> planet --> star --> galaxy --> universe

galaxy moon planet star Universe

- 2 What is a star? a huge ball of gas that gives off a large amount of energy

- 3 Write down two differences between a star and a planet.

A star gives off light, a planet does not. A planet orbits around a star.

A star is bigger than a planet.

- 4 Why does the Sun look much brighter than the other stars?

it is much closer

- 5 Why can't we see stars during the day?

they are not bright enough compared with the Sun

- 6 What is a light year? Tick (✓) one box.

- ☐ A The distance light travels from the Sun to the Earth.
☐ B The time it takes light to travel from the Sun to the Earth.
☐ C The time it takes light to travel from the nearest star to the Earth.
☒ D The distance light travels in a year.

- 7 Explain what the Milky Way is and why we cannot see its shape directly.

It is our galaxy, a collection of millions of stars. We cannot see its shape directly because we are inside it.

- 8 Share your answer to question 7 with a group. Discuss ways in which you could improve your answers.

Write down one improvement you could make to your answer.

- 9 Astronomers today can study millions of other galaxies. Explain why modern astronomers know about many more galaxies than observers 200 years ago.

Astronomers today have much more powerful telescopes than they had 200 years ago, so they can see many more galaxies.