

# Key Stage 4

## Worksheet 1 / Planet Pavilion



CENTRE FOR ENGAGEMENT



## Welcome to the Planet Pavilion – here are some questions to answer!

### The Jodrell Bank Orrery

This is a moving model of our Solar System (if it is not moving, turn the handle)

The Orrery planets orbit faster than the planets in real life:

**1 minute for the Orrery = 1 Earth year**

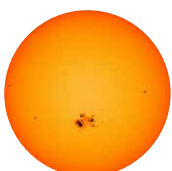
1. Which planet is orbiting the Sun the quickest?

2. Which planet is orbiting the Sun the slowest?

3. What force is keeping the planets in their orbits?

### Our orrery is not to scale

Use the data below to calculate some correct measurements for the Orrery.



Real diameter of the Sun:  
**1,391,000 km**



Real diameter of the Earth:  
**12,756 km**

4. Approximately how many times wider is the real Sun than the real Earth?

*Hint: Round the diameters to one or two significant figures.*

5. In the Jodrell Bank Orrery, the model Sun has a diameter of 15 cm.

If the Orrery were to scale, how big should the model Earth be?

6. The real Earth is approximately 150,000,000 km from the real Sun.

$$\frac{\text{Real Earth Diameter}}{\text{Model Earth Diameter}} = \frac{\text{Real Distance}}{\text{Model Distance}}$$

If the Orrery were to scale, how far should the model Earth be from the model Sun?

# Key Stage 4

## Worksheet 2 / Planet Pavilion

For these questions, look at the space pictures around the room...

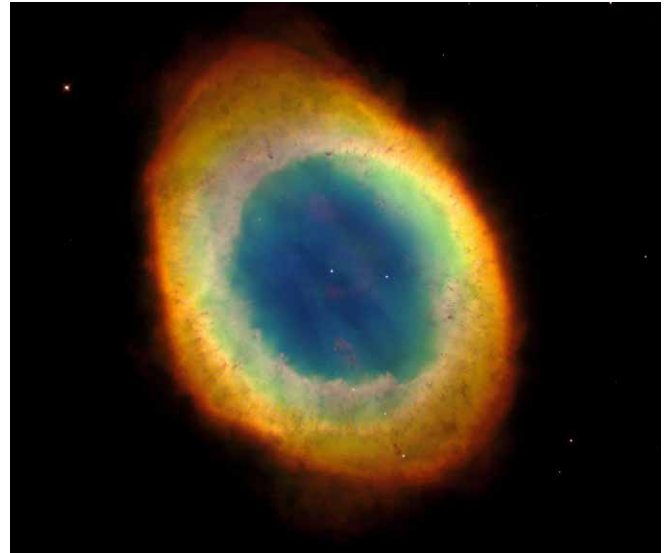
7. Find these objects and answer the questions:



A 3 light-year tall pillar, where new stars are forming.

Name

What is it made from?



A planetary nebula formed when a star like the Sun runs out of fuel.

Name

What is at the centre?

8. The Orion nebula is the closest star-forming region to our Solar System. How far away is it?

 lightyears

*(A light year is the distance a beam of light will travel in a year: about 10 trillion kilometres)*

9. Which nebula is the remnant of a star which was seen to explode in 1054 AD?

 Nebula

10. Our Solar System is part of the Milky Way galaxy. What is the name of our nearest large spiral galaxy?

How far away is it?

 lightyears

11. At the centre of our Milky Way galaxy is a supermassive black hole called Sagittarius A\*. How many times heavier than the Sun is this black hole?

# Key Stage 4

## Worksheet 3 / Space Pavilion



# Welcome to the Space Pavilion – here are some questions to answer!

### Start around the wooden model of the Lovell telescope

1. The telescopes at Jodrell Bank don't collect visible light. What do they collect?

2. The dish of the Lovell telescope is a **paraboloid** shape (a bowl shape). Why is this shape important?

3. What is the diameter of the Lovell telescope?

*The Lovell telescope is the third largest moveable telescope in the world!*

### Enter the Big Bang cone

Hit the button to hear the 'sound' of the expansion of space over the first 100 million years.

*This is not really a sound – it has been created from observations of the cosmic microwave background radiation.*

4. How many years after the Big Bang did the first **atoms** form?

5. How many years after the Big Bang did the **Solar System** form?

### Find the Electromagnetic Spectrum wall

6. Which animal can see infrared?

7. What part of the spectrum can a bee see?

### Find the Heat Vision camera

**If you can't see yourself, you're too close! Move backwards from the screen!**

8. What type of light does this camera see?

9. a) Find the props near the screen. Which material is the worst insulator of heat? How can you tell?

- b) Place your hand on something at room temperature (like a piece of paper) for a few seconds. What form of heat transfer is occurring?

**Conduction      Convection      Radiation**

- c) Remove your hand from the object and show it to the camera. After a while, the heat will fade. What form of heat transfer is occurring?

**Conduction      Convection      Radiation**

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## Worksheet 4 / Space Pavilion

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### Find the black hole

10. Roll a ball into the black hole. Write down the main energy transfer occurring as it falls.

11. List any forms of wasted energy as the ball falls.

### Find the plasma ball (the glass ball with electricity inside).

Stars (like the Sun) are made of plasma.

*Plasma is the 4th state of matter. Atomic nuclei and electrons are not bound together; they move around freely.*

12. Describe what happens in terms of a flow of charge when you touch the sphere.

### Find the area about pulsars

13. Which astronomer first discovered pulsars?

*Pulsars are sometimes left over after giant stars explode. They are extremely dense - around the size of a city, but containing as much matter as the Sun. They spin very fast, shooting out radiation like cosmic lighthouses.*

### Find the dome with two planets orbiting a star

14. The amount of light from the star is measured by a camera (in the red circle) and shown on screen. What happens to the light level when a planet passes between the star and camera?

15. This shows one way of detecting exoplanets. Exoplanets are planets outside our solar system, orbiting around other stars. Which exoplanet (small or large) is easier to detect? Why?

16. How many exoplanets have astronomers discovered so far?

### Find the world map of big telescopes.

17. Choose two telescopes. Fill in the details, including what part of the EM spectrum they observe.

Name
Location
Size
EM spectrum

Name
Location
Size
EM spectrum