

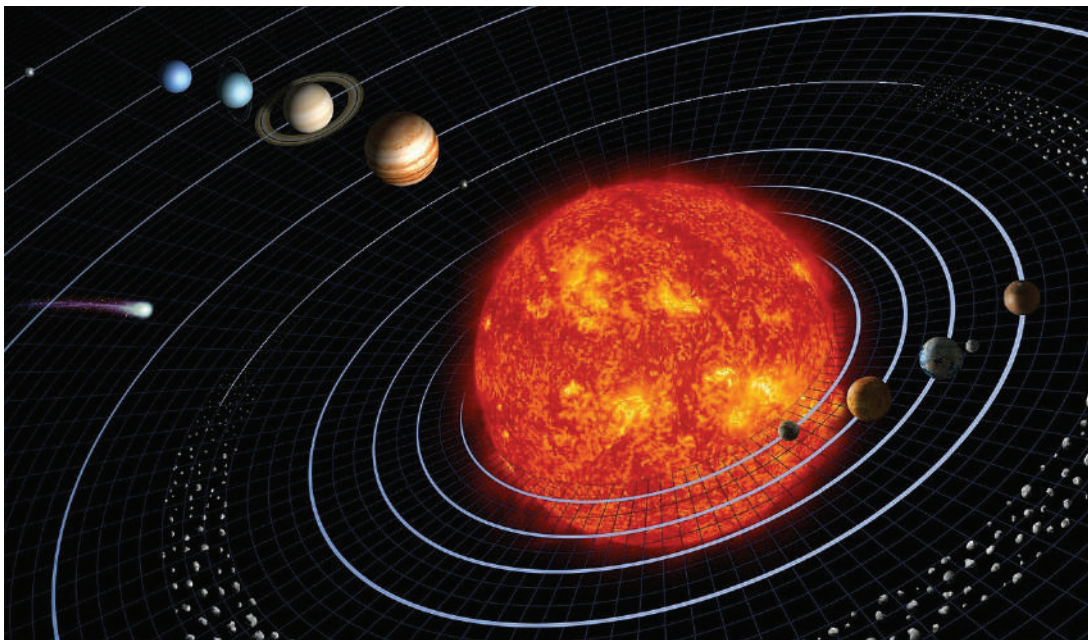
# Planets, dwarf planets and moons in a bottle

## Our Earth is just the right distance from the Sun and has the right mixture of chemicals to support life.

In this experiment, you will be representing life on Earth by mixing yeast with a nutrient broth consisting of water and sugar. As the yeast cells digest the sugar, they begin to divide, increase in number and produce carbon dioxide. As the colony size increases, more carbon dioxide is produced so long as there is a good supply of nutrients. A healthy sample of yeast can inflate a party balloon to a 30cm circumference in less than 30 minutes.

If other substances are added to the solution to represent conditions on other planets or moons, you can observe what happens to the rate of the production of carbon dioxide and life under these conditions.

You may need to do a little research about planets and moons in our Solar System.



## What you need

- 1 cup of luke-warm water
- 3 teaspoons of sugar
- 2 teaspoons of yeast
- 1 empty but clean 500ml or 600ml plastic soft drink bottle
- 1 party balloon
- 1 elastic band
- 1 flexible measuring tape
- acid (vinegar, orange juice or lemon juice)
- freezer
- boiling water
- microwave
- UV light (if available)



## What to do

This is your basic 'Earth in a bottle':

- 1 Add the warm water and the sugar to the bottle and shake the bottle until the sugar is dissolved.
- 2 Add the yeast to the sugar solution and gently swirl the mixture.
- 3 Stretch the balloon right over the mouth of the bottle.
- 4 Secure this with an elastic band.
- 5 Use the cloth measuring tape to measure the circumference of the balloon every 15 minutes.

Each group should choose or be allocated one other option below:

- Add 2 or 3 teaspoons of an acid like orange juice, lemon juice or vinegar to the nutrient to simulate acid environments like we see on Venus. You could also use boiling water instead of warm water, to simulate the immense heat on Venus.
- Irradiate the yeast in a microwave oven for a minute to simulate high radiation from the Sun on planets with no atmosphere.
- Place the yeast in a freezer for a few days before adding to the nutrient to simulate the cold environment of Pluto.
- If you have access to UV light, place the yeast under the light for a few hours to simulate high levels of UV from the Sun.
- Make your own suggestion.

## Class Results

Simulated planet	How simulated	Measured circumference (cm)
Earth		
Venus		
Neptune		

## Questions

- 1 What effect did the acid have on the production of carbon dioxide?
- 2 What effect did the radiation have on the production of carbon dioxide?
- 3 Why was radiation used to represent a planet with no atmosphere?
- 4 Find out which planet has no atmosphere.
- 5 Which planet is likely to be exposed to a high level of UV light radiation from the Sun? Why?
- 6 According to your results and the conditions simulated to represent Neptune, could life exist on Neptune? Discuss.

