

**Extension**

1. Write **T** next to the statements that are true. Write **F** next to the statements that are false.
  - a. The Big Bang theory says that the Universe expanded 14 billion years ago from something smaller than an atom. ....
  - b. The Earth is the centre of the Universe. ....
  - c. When astronomers look at galaxies, they are all moving towards us. ....
  - d. The Solar System formed about 10 billion years ago. ....
  - e. An alternative to the Big Bang theory is the Solid State theory. ....

2. A student is making a timeline about the history of the Universe. He takes a strip of paper that is 1 m long.

What's happening	Time (million years ago)
the Big Bang	14 000
Solar System formed	5000
Earth cooled	4200
first single-celled organisms	3900
oldest rock	3100
first multicellular organisms	630
first land plants	550
first dinosaurs	200
dinosaurs died out	65
first humans	0.5
today	0

a. Explain which events the student will find it difficult to separate on his timeline.

.....

.....

.....

b. Another student says that she can solve the problem by having a piece of paper that is twice as long. Is she correct? Explain your answer.

.....

.....

.....

3. A student wants to make a model of the expanding Universe. He takes an elastic band and cuts it so that he has a long piece of elastic.

a. Explain how he can use the elastic to model the expanding Universe.

.....

.....

b. Describe how he could use the elastic band to show that galaxies that are further away are moving faster.

.....

.....

c. Describe the evidence that the Universe is expanding.

.....

.....

1. Use the words from the box to complete the sentences below. Use each word once, more than once, or not at all.

craters Sun Mars evaporates dinosaurs Jupiter extinction vaporises

Asteroids can be pulled out of orbit because of the gravitational pull of ..... The evidence that Earth has been hit by asteroids is that there are ..... all over the surface of Earth.

When a crater forms, the asteroid ..... The material is thrown into the atmosphere and can block out the ..... This can cause a mass ..... event, such as the one that killed the .....

2. Match the size of an asteroid with the frequency and the effect. Draw lines between the boxes in the three columns.

Size of asteroid (m)
400
100
5

Frequency
once a year
once every 100 000 years
once every 5000 years

Effect
a fireball
tsunami, crater
climate change, impact winter

3. A student models crater impacts by dropping objects into a tray of flour. They cover the flour with a thin layer of chocolate powder. When an object is dropped into the tray it forms a crater and jets of flour are seen on the surface. The student investigates this question:

How does the material of the object affect the depth of the crater?

- a. Write down the independent variable. ....
- b. Write down the dependent variable. ....
- c. Write down one control variable. ....
- d. Describe and explain the type of graph the student should plot from their data.

.....  
 .....

**Extension**

There are impact craters on objects other than the Earth. Telescopes enable astronomers to examine the craters on objects such as the Moon.

Suggest and explain the differences in appearance between craters on the Moon, as shown in the image, and craters on Earth.



1. Circle the correct word or phrase in each bold pair in the paragraph below.

The Earth formed about **4.5 / 15** billion years ago from the dust from extinct **planets / stars**. Like many objects formed in the Solar System, it had a core of **iron / rock**. Its surface was **molten / solid** because of debris raining down on it. In one theory an object collided with the Earth and the molten **cores / surfaces** combined, and lighter rock was ejected. In another theory, the Moon and Earth formed by gravity pulling in gas and dust at **different times / the same time**.

2. Here are some pieces of evidence that scientists have about the formation of the Moon.

- A. The composition of the Moon is very similar to the composition of the Earth.
- B. The Earth has a heavy iron core.
- C. The Moon is less dense than the Earth.
- D. The Moon does not have a heavy iron core.
  - a. Give a letter of one of the pieces of evidence that supports the giant-impact hypothesis. ....
  - b. Give a letter of one of the pieces of evidence that supports the co-formation hypothesis. ....
  - c. Give a letter of one of the pieces of evidence that supports both hypotheses. ....

3. a. Describe another hypothesis that has not been mentioned in question 2.  
 .....  
 .....  
 b. Write down a piece of evidence that suggests that this is *not* the correct theory for the formation of the Moon.  
 .....  
 .....

**Extension**

Here is some information about the composition of Saturn and one of its moons, Titan.

Object	Atmosphere	Core	Density (g/cm <sup>3</sup> )
Titan	97% nitrogen 2.7% methane 0.3% other	rock	1.9
Saturn	96% hydrogen 3.3% helium 0.7% other	iron	0.7

Based on the data in the table, suggest and explain which of the theories about the formation of the Earth's moon could apply to Titan.

1. Write **T** next to the statements that are true. Write **F** next to the statements that are false.

- a. The Sun was formed from other planets. ....
- b. The process that releases energy in the Sun is nuclear fusion. ....
- c. Our star, the Sun, is the biggest star. ....
- d. Our star will become a black hole. ....
- e. The atoms that make us come from stardust. ....

2. Here is a list of statements that describe how stars like the Sun was formed. Stars are made from massive clouds of dust and gas.

- A. As the nebula collapses it gets hot.
- B. A star starts to shine when it is hot enough for nuclear fusion of the hydrogen fuel to start.
- C. It then explodes as a supernova.
- D. A supernova throws hot gas and dust into space, and may shrink to become a black hole or neutron star.
- E. Gravity pulls the dust and gas together to form nebulae.
- F. Then the small core contracts under the pull of gravity. It becomes a white dwarf, which fades and changes colour as it cools.
- G. When all the hydrogen has been used up, the star expands to become a red giant, the outer layers of which are thrown off into space.
- H. When a larger star's hydrogen runs out, it will go on getting hotter and expanding until it becomes a red supergiant.
  - a. In the table below put the letters in the correct order to describe how small and large stars are formed, and what happens to them. You will need to use some letters more than once. The first one has been done for you.

Small stars (like our Sun)	Larger stars
E,	E,

b. Look at statement G. What does the outer layer become when it has been thrown off into space?

.....

**Extension**

This is the constellation Orion.

a. Suggest where in Orion stars are being formed. Explain your answer.

The stars are different colours. Betelgeuse is red, Rigel is white-blue, and Bellatrix is white.

b. Suggest which of the three stars is the oldest. Explain your answer.

