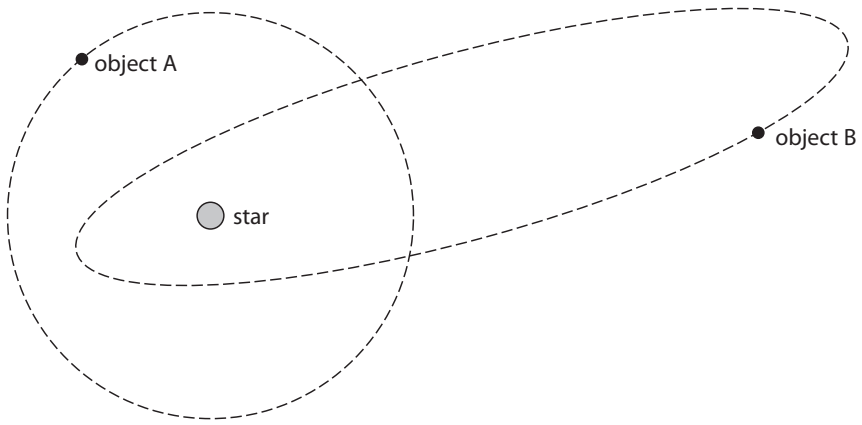
IGCSE (EDEXCEL) Physics : Stars 2

Q1. This question is about stars.

(a) The diagram shows the orbits of two astronomical objects around a star.



(i) Add a labelled arrow to the diagram to show the type of force from the star acting on object A.

(2)

(ii) What is object A?

(1)

A a comet
B a galaxy
C a moon
D a planet

(iii) What is object B?

(1)

A a comet
B a galaxy
C a moon
D a planet

(b) Name the force that keeps the comet in orbit around the sun.

(1)

(c) Physicists classify stars according to their colour. Each group of stars of similar colour is called a spectral class.
The table gives information about colour and surface temperature for three spectral classes of stars. The Sun belongs to spectral class G.

Spectral class	Colour	Surface temperature in kelvin
B	blue-white	
G	yellow	5600
M	orange-red	

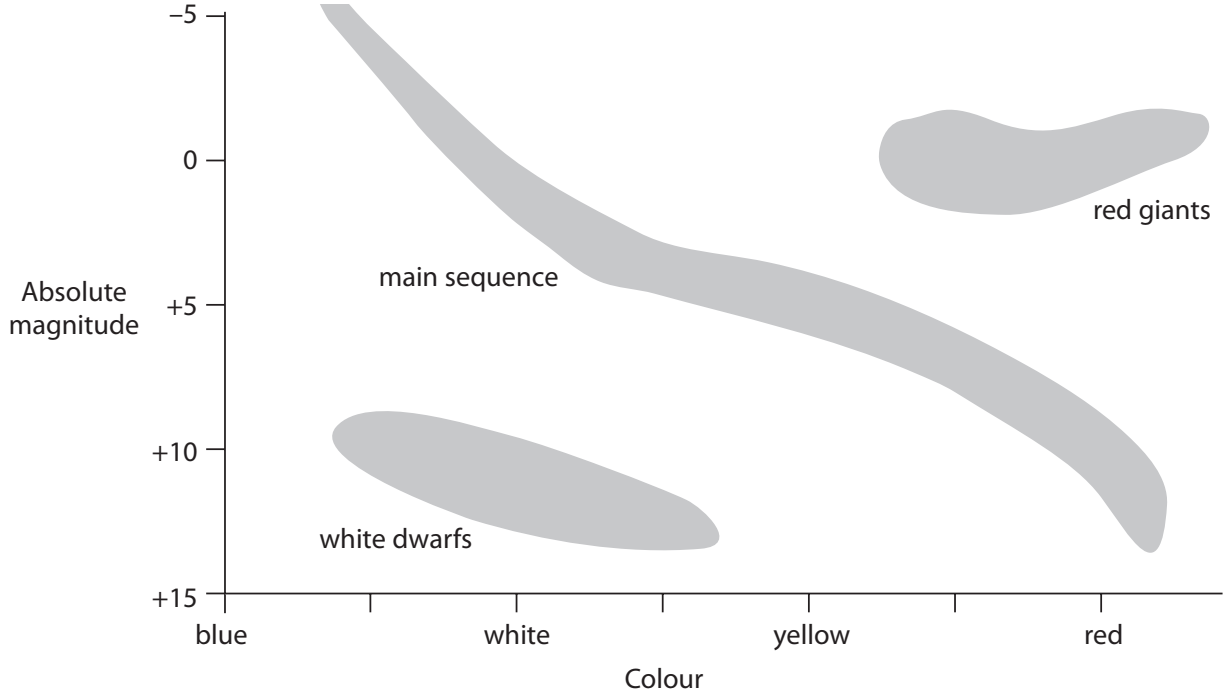
Complete the table by suggesting values for the missing surface temperatures.

(2)

(d) There are stars in the universe with masses much greater than the mass of the Sun. Describe what happens to these high-mass stars when they leave the main sequence stage of their evolution.

(3)

Q2. A Hertzsprung–Russell diagram shows how different astronomical objects may be classified according to their colour and absolute magnitude.



The diagram shows three stages of evolution for stars of similar mass to the Sun.
Describe the evolution of stars of similar mass to the Sun.
You should refer to the temperature and brightness of the stars in your answer.

(6)

Q3. (a) Give two pieces of evidence for the Big Bang theory.

(2)

(b) Explain how this evidence supports the Big Bang theory.

(4)

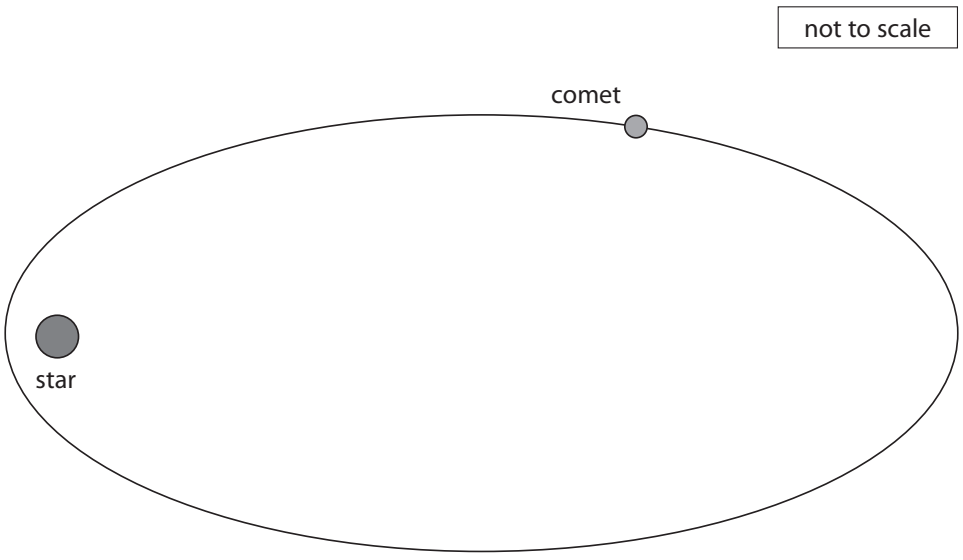
The Big Bang theory suggests that the Universe is approximately 14 billion years old.

(c) Describe the evolution of the Universe from the Big Bang until the present day.

(3)

Q4. The diagram shows the orbit of a comet around a star.
Draw a labelled arrow to show the force acting on the comet due to the star.

(2)



Q5. This question is about stars.

(a) Astronomers measure the absolute magnitude of stars.
State what is meant by the term **absolute magnitude**.

(2)

_____

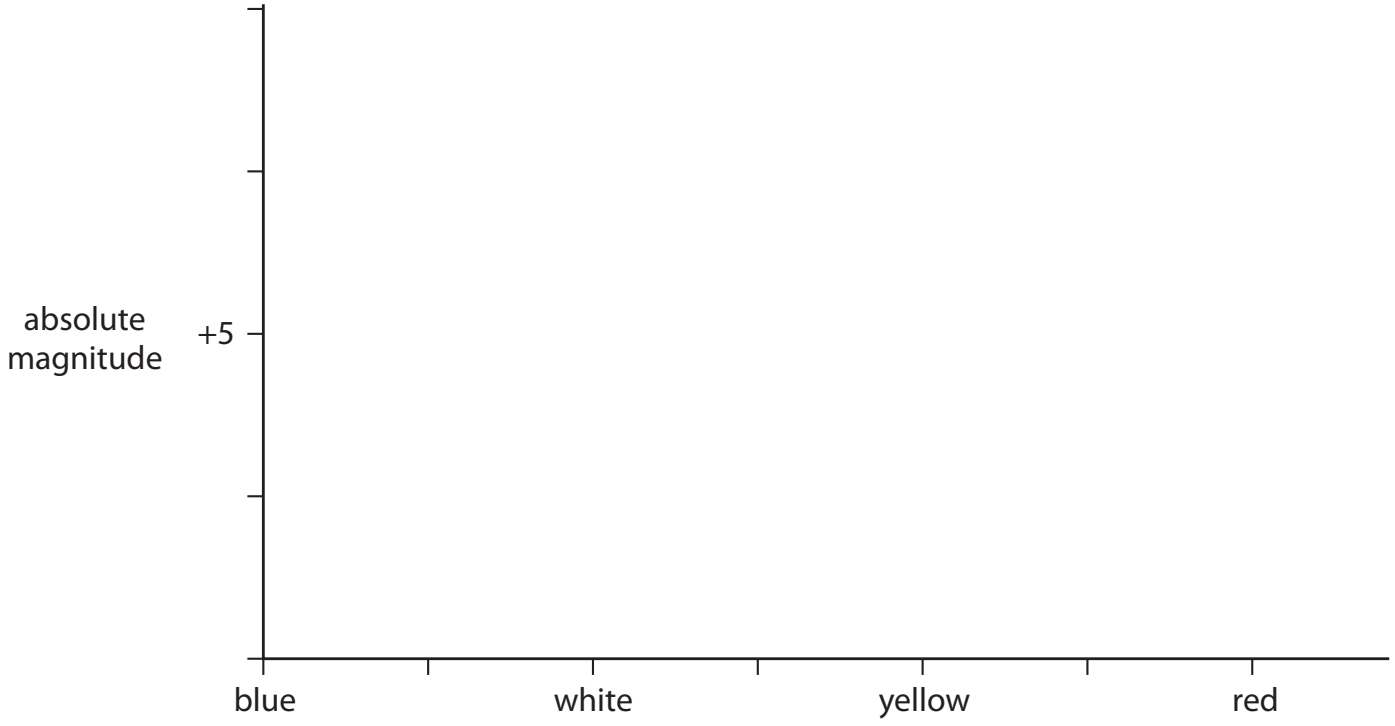
_____

_____

(b) The evolution of stars can be shown on a Hertzsprung–Russell diagram (HR diagram). Complete the HR diagram by,

1. **labelling the x–axis**
2. **completing the absolute magnitude scale**
3. **drawing the main sequence, red giant and white dwarf regions**

(5)



Q6. The Sun will become a red giant star when it leaves the main sequence.
Which row correctly describes how the surface temperature and brightness of the Sun will change when it becomes a red giant?

(1)

	Surface temperature	Brightness
☒ **A**	decreases	decreases
☒ **B**	decreases	increases
☒ **C**	increases	decreases
☒ **D**	increases	increases

Q7. Diagram 3 shows two distant galaxies and the Earth.

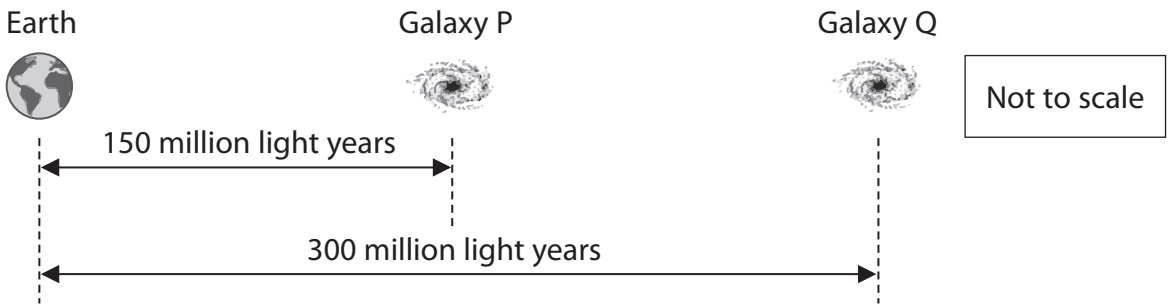


Diagram 3

Light emitted from a nearby star has a wavelength of 590 nm.
The light from an identical star in galaxy P arrives at the Earth.
The wavelength of the light from the star in galaxy P is 600 nm.

(i) Calculate the change in wavelength for light from the star in galaxy P.

(1)

change in wavelength = _____ nm

(ii) Galaxy Q is twice as far away from the Earth as galaxy P.
Suggest how the speed of galaxy Q relates to the speed of galaxy P.

(1)

_____

_____

_____

(iii) Suggest a value for the change in wavelength of light from an identical star in galaxy Q when the light arrives at the Earth.

(1)

change in wavelength = _____ nm

(iv) Explain how comparing the speeds of the two galaxies provides evidence for the Big Bang theory.

(4)

_____

_____

_____

_____

Q8. Betelgeuse is a red supergiant star.
Betelgeuse has a mass that is much larger than the Sun.
Describe the evolution of Betelgeuse through its entire life cycle.

(5)

Q9. (a) (i) Which of these coloured stars has the highest surface temperature?

(1)

A orange
B red
C white
D yellow

(ii) Which of these is a stage in the life cycle of the Sun?

(1)

A black hole
B neutron star
C supernova
D white dwarf

(iii) Which of these is the stage nearest the end of the life cycle of a star with a mass much greater than the Sun?

(1)

A main sequence
B protostar
C supernova
D white dwarf

(iv) Which of these represents the brightness of stars at a standard distance?

(1)

A absolute magnitude
B colour
C diameter
D temperature

Q10. This question is about astrophysics.

(a) Complete the sentences by writing a suitable word or phrase in each blank space.

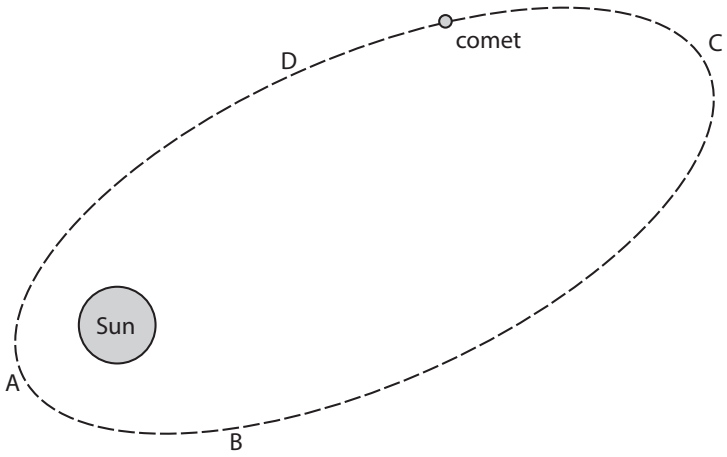
(3)

Space and all the galaxies in it is called the _____

A large collection of billions of stars is called a _____

The Sun and its collection of planets and moons is called the _____

(b) The diagram shows the orbit of a comet around the Sun.



At which point in its orbit is the comet moving fastest?

(1)

A

B

C

D

(c) The boxes give some units of time and some definitions.
Draw a straight line from each unit of time to its correct definition.

(2)

Unit of time	**Definition**
	the time for the Moon to orbit the Earth
1 day	the time for the Earth to rotate once
	the time for the Sun to rotate once
1 year	the time for the Earth to orbit the Sun

Q11. This question is about Rigel, a very large star with a high surface temperature.

(a) Stars can appear as different colours because of their different surface temperatures.
Which of these colours shows the highest surface temperature for a star?

(1)

A blue-white

B orange

C red

D yellow

(b) Describe how a star is formed in a nebula.

(2)

(c) Rigel is a main sequence star.
A star joins the main sequence when nuclear fusion of hydrogen starts in its core.
Describe the process of nuclear fusion in a star.

(3)

(d) (d) Astronomers think that Rigel will become a supernova in the future.

(i) Which property of a star determines whether it will become a supernova?

(1)

A colour

B distance from Earth

C mass

D temperature

(ii) Describe the evolution of Rigel after it leaves the main sequence.

(3)

Q12. This question is about stars.

(a) Describe the stages in the evolution of a star similar in mass to the Sun.

(4)

(b) The process of energy release in the core of a star is different to the process of energy release in a nuclear reactor in a power station.
Describe how these processes of energy release are different.

(3)

Q13. This question is about astrophysics.

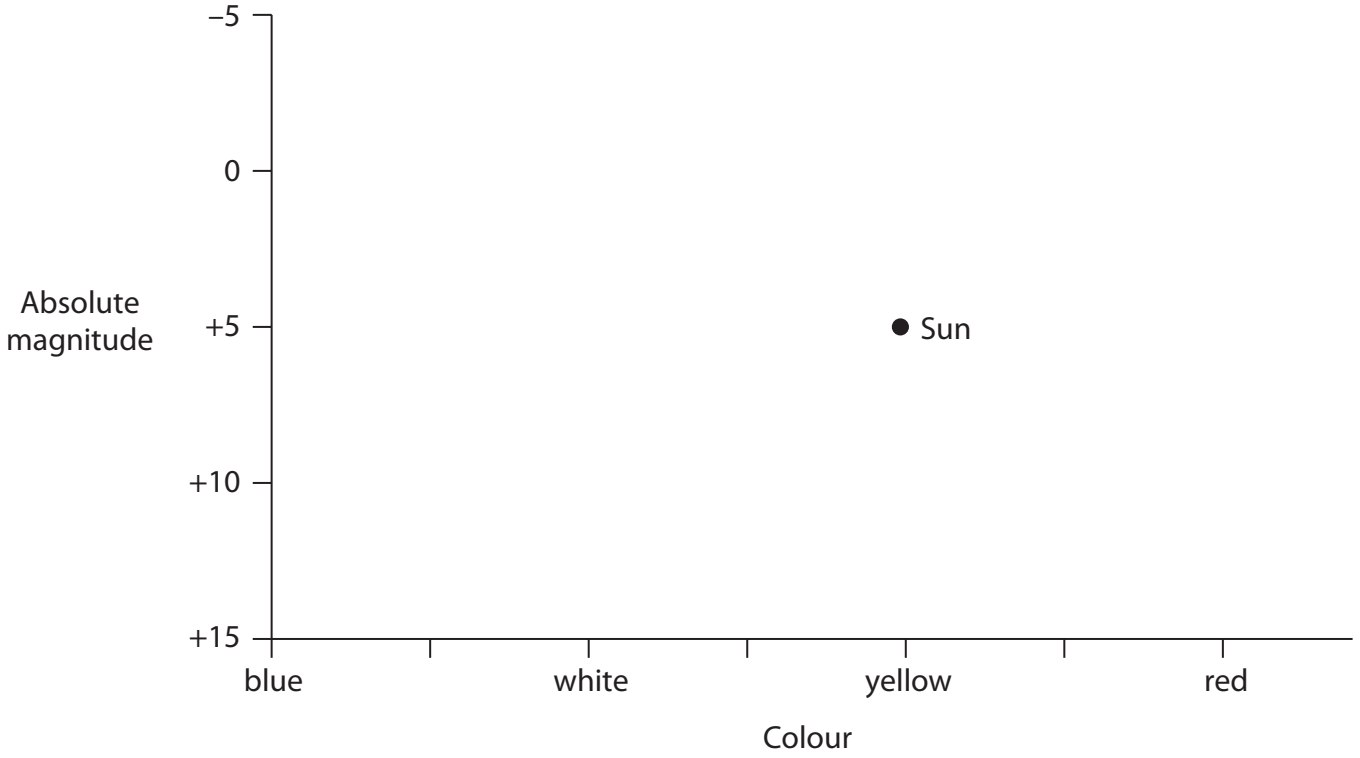
(a) The table lists some statements about the universe.

Place ticks (✓) in the table to show which statements support the Big Bang theory.

(2)

Statement	Supports the Big Bang theory
black holes are formed from extremely massive stars	
cosmic microwave background radiation is detected in all directions	
cosmic rays from space are detected at the Earth's surface	
each galaxy contains billions of stars	
most galaxies show a red-shift in the light detected from them	

Q14. The Hertzsprung-Russell diagram shows the relationship between the absolute magnitude and colour of stars.



The position of the Sun is shown on the Hertzsprung-Russell diagram.

(a) Star W is a white dwarf.
Add a W to the Hertzsprung-Russell diagram to show the position of star W.

(1)

(b) Star X is a red giant.
Add an X to the Hertzsprung-Russell diagram to show the position of star X.

(1)

(c) Star Y is a main sequence star that is much larger than the Sun.
Add a Y to the Hertzsprung-Russell diagram to show the position of star Y.

(1)

d) Star Z has the same surface temperature as the Sun, but would be dimmer than the Sun if it were the same distance away from Earth as the Sun.
Add a Z to the Hertzsprung-Russell diagram to show the position of star Z.

(1)

(e) The Moon is the brightest object in the night sky.
Suggest why the Moon cannot be shown on the Hertzsprung-Russell diagram.

(1)

_____

_____

_____