IGCSE (EDEXCEL) Physics : Stars

Q1. This question is about stars.

(a) Table 1 gives some information about four stars.

Star	Colour	Mass relative to the Sun
61 Cygni A	orange	0.7
Antares A	red	12
Sirius B	blue	1.0
Vega	blue-white	2.1

Table 1

(i) Stars can be classified using their surface temperature.
Complete Table 2 by giving the four stars in order of increasing surface temperature.

(3)

Coolest	→		Hottest

Table 2

(ii) Name the star in Table 1 that does not follow a similar evolutionary path to the Sun.

(1)

_____

(b) The life cycle of a star begins in a nebula.
Describe how a main sequence star is formed from a nebula.

(3)

_____

_____

_____

_____

(c) Describe how a main sequence star becomes a white dwarf.

(4)

_____

_____

_____

_____

Q2. Nuclear fusion is a process that occurs in the core of stars.

(a) Which is the best description of nuclear fusion?

A large nucleus splitting into two smaller nuclei

B nucleus emitting an electromagnetic wave

C nucleus releasing a beta particle

D two smaller nuclei joining together to form a larger nucleus

(1)

(b) Two nuclei are close together and stationary.

Explain why these nuclei will move apart.

(2)

_____

_____

_____

(c) Describe the conditions needed for fusion to occur in the core of a star.

(2)

_____

_____

_____

Q3. This question is about astrophysics.

(a) Which of these do planets orbit?

(1)

A an artificial satellite

B a comet

C a moon

D a star

(b) Which of these has the largest diameter?

(1)

A a galaxy

B the Solar System

C the Sun

D the universe

(c) Which of these has the smallest diameter?

(1)

A a galaxy

B the Moon

C a star

D the Solar System

Q4.

(a) (i) A galaxy moves away from the Earth at a speed of 3.9×10^4 km/s.
The speed of light is 3.0×10^5 km/s.
Light from the galaxy is emitted with a wavelength of 6.2×10^{-7} m.
Calculate the change in the wavelength of the light that is received by an observer on the Earth.

(3)

change in wavelength = _____ m

(ii) Calculate the wavelength of light that is received by an observer on the Earth.

(1)

wavelength = _____ m

(b) One of the pieces of evidence for the Big Bang theory is the red-shift of galaxies.
Explain how the red-shift of galaxies supports the Big Bang theory.

(3)

_____

_____

_____

_____

_____

_____

_____

Q5. The universe began with an event known as the Big Bang.

(a) Describe how the size and temperature of the universe have changed since the Big Bang.

(2)

_____

_____

_____

_____

Q6. (a) State what is meant by the astronomical term galaxy.

(1)

_____

_____

(b) Which of these is a large collection of billions of galaxies?

(1)

A a nebula

B a red giant

C the solar system

D the universe

(c) Hydrogen is an element that can emit visible light waves.

The table shows the wavelength of one of these waves when detected from a laboratory sample of hydrogen and when detected from the hydrogen in two different galaxies. The detected wavelengths from the galaxies are different from the detected wavelength from the laboratory sample because of the Doppler effect.

	Wavelength in nm
Laboratory sample	656.45
Galaxy A	656.21
Galaxy B	657.81

(i) Galaxy A and galaxy B are both moving relative to Earth. Compare the motions of galaxy A and galaxy B relative to Earth.

(3)

_____

_____

_____

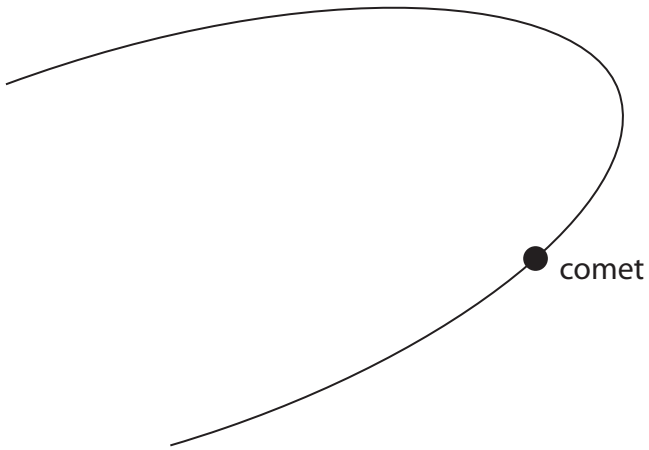
_____

(ii) Use data from the table to calculate the speed of galaxy B relative to Earth.
[speed of light, c = 3.0 × 108 m/s]

(4)

speed = _____ m/s

Q7. The diagram shows a comet as it moves through part of its orbit around the Sun.



(a) (i) Add an S to the diagram to show the position of the Sun.

(1)

(ii) Complete the diagram to show the orbit of the comet.

(2)

(iii) Add an X to the diagram to show the position where the comet is moving fastest.

(1)

(b) Describe how the orbit of a comet compares with the orbit of a planet.

(3)

Q8. Discuss two pieces of evidence that support the Big Bang theory.

(6)

Q9. Table 1 shows the colour of some stars.

Star	Colour
Sun	yellow
Rigel	blue
Betelgeuse	red
Arcturus	orange
Sirius	white

Table 1

(a) Complete table 2 by giving the stars in order of increasing surface temperature. The hottest star, Rigel, has been done for you.

Coolest → Hottest				
				Rigel

Table 2

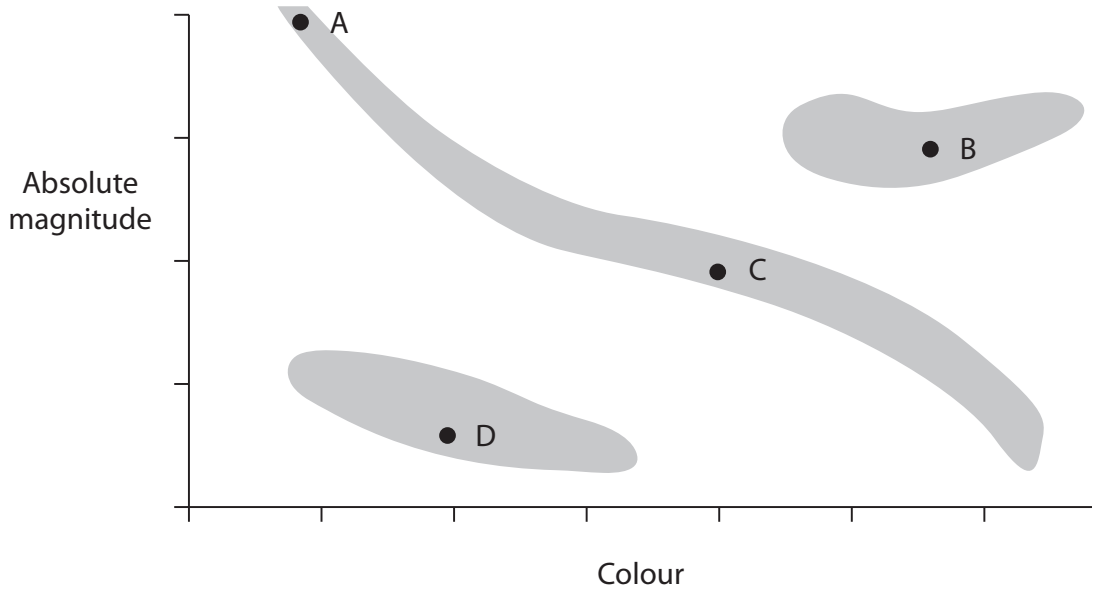
(b) A star has a much larger mass than the Sun.
Describe the evolution of this star after it has left the main sequence.

(3)

(c) (b) Describe what is meant by the term **absolute magnitude**.

(2)

Q10.(a) The Hertzsprung–Russell diagram shows stars classified into different regions.



(a) The boxes give four points, A, B, C and D, and four star classifications.

Draw lines connecting each point to the correct star classification.

(4)

Point	Star classification
A	star similar to the Sun
B	white dwarf
C	red giant
D	very bright blue star

(b) Which of these coloured stars has the lowest surface temperature?

(1)

A orange
B red
C white
D yellow

Q11. (a) The passage describes the evolution of a star with a mass that is much larger than the mass of the Sun.

Use words or phrases from the box to complete the passage.

Each word or phrase may be used once, more than once, or not at all.

(6)

chemical	contract	expand	gravitational
kinetic	main sequence	neutron star	nuclear
protostar	supernova	vibrate	white dwarf

Hydrogen atoms in a nebula move towards each other due to the force of gravity. As the atoms move towards each other, their _____ energy store increases, which increases the temperature. If the temperature becomes high enough, nuclear fusion of hydrogen will start and the star enters the _____ stage of its evolution.

When hydrogen fusion stops in the core of the star, the core of the star will start to _____ . This increases the temperature in a layer surrounding the core. Hydrogen fusion restarts in a layer surrounding the core. This causes the star to _____ and its surface temperature decreases.

The star is now a red super giant. Eventually nuclear fusion stops in the core of the star and the star explodes as a _____ . The core of the star collapses to form either a _____ or a black hole.

(b) 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

(c) 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