1.4 Cosmology Past Paper Questions

Q1. A light year is defined as the distance that light travels in one year. Show by calculation that 1 light year = 9.4608×10^{15}m.

(3)

Q2 Read the following passage about comets.

Halley's Comet is famous because it is visible to the naked eye, orbiting from beyond the planet Neptune and returning to the solar system on average once every 76 years.

Halley's Comet last visited the inner solar system in 1986. It will return again in 2061.

Comets are made of ice mixed with frozen methane; substances very similar to those found on a moon called Miranda.

Comets can only survive very far away from the Sun. Most comets reside in the Oort Cloud which contains many billions of comets. The Oort Cloud reaches a quarter of the distance from the Sun to the next nearest star called Proxima Centauri.

The Oort Cloud is easily affected by the gravitational pull of the Milky Way galaxy which causes comets to move into new orbits that carry them closer to the Sun.

a) Use information given in the passage to answer the following questions.
   - i) State the name of one object that orbits a planet. (1)
   - ii) State the name of one object that generates light. (1)
   - iii) State the name of the object furthest away from the Earth. (1)
   - iv) State the name of one object that orbits the Sun. (1)

b) State what is meant by the term galaxy. (1)

c) State what is meant by the term solar system. (1)

Q3 Discoveries in astronomy and physics have shown beyond reasonable doubt that our universe had a beginning and that it has been expanding ever since.

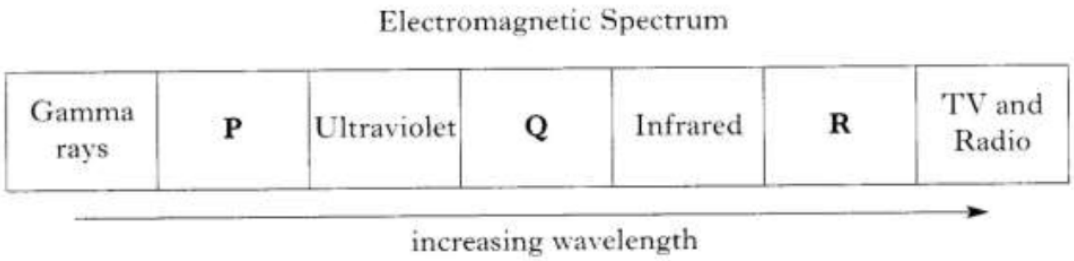
a) What is the name of this theory? (1)
b) State **two** pieces of scientific evidence that support this theory. (2)
c) How old do astronomers think the universe is? (1)
d) What evidence is there to suggest the age of the universe? (1)

4 An exo-planet is a planet orbiting a star other than the Sun. As telescopes have become bigger and more sensitive, astronomers have discovered over 770 exo-planets. State the conditions required for an exo-planet to be capable of supporting life. (3)

5 Explain how the cosmic microwave background radiation was formed. (2)

6 Visible light is part of a family of waves known as the electromagnetic spectrum. What is the speed of waves in the electromagnetic spectrum? (1)

7 The Diagram represents the electromagnetic spectrum in order of increasing wavelength. Some of the radiations have not been named.



a) Name radiation P, Q and R. (2)
b) Which radiation in the electromagnetic spectrum has the highest frequency? (1)
c) Stars emit ultraviolet and infrared radiation. Name a detector for each of these two radiations. (2)

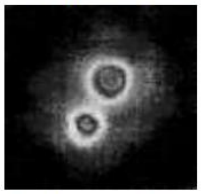
8 A team of astronomers observes a star 200 light years away.

a) State what is meant by the term "light year". (1)

b) Images of the star are taken with three different types of telescope as shown.

Telescope A
visible light

Telescope B
infrared



Telescope C
X-ray

i) Explain why different types of telescope are used to detect signals from space. (2)

ii) Place the telescopes in order of the increasing wavelength of the radiation which they detect. (1)

iii) State a detector that could be used in telescope C. (1)

9 Radio waves emitted by galaxies are detected and used to provide images of the galaxies.

a) How does the wavelength of radio waves compare with the wavelength of light? (1)

b) Name a detector for radio waves. (1)

c) Why are different kinds of telescope used to detect signals from space? (1)

10 The diagram represents the electromagnetic spectrum. Some of the radiations have not been named.

gamma	X-rays	P	Visible light	Q	microwaves	Radio and TV

Electromagnetic spectrum

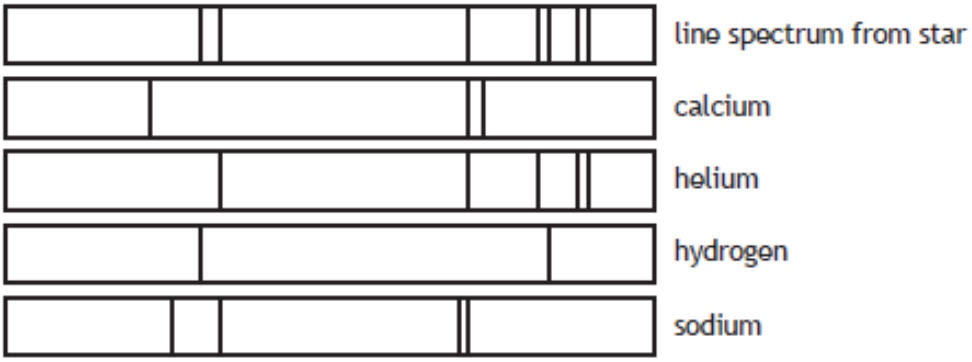
increasing frequency ←

a) Name radiations P and Q. (2)

b) Which radiation in the electromagnetic spectrum has the shortest wavelength? (1)

c) State one detector of X-rays. (1)

11 Light from a star is split into a line spectrum of different colours. The line spectrum from the star is shown, along with the line spectra of the elements calcium, helium, hydrogen and sodium.



The elements present in this star are

A sodium and calcium
B calcium and helium
C hydrogen and sodium
D helium and hydrogen
E calcium, sodium and hydrogen.

(1)

12 A student makes the following statements about the Universe.

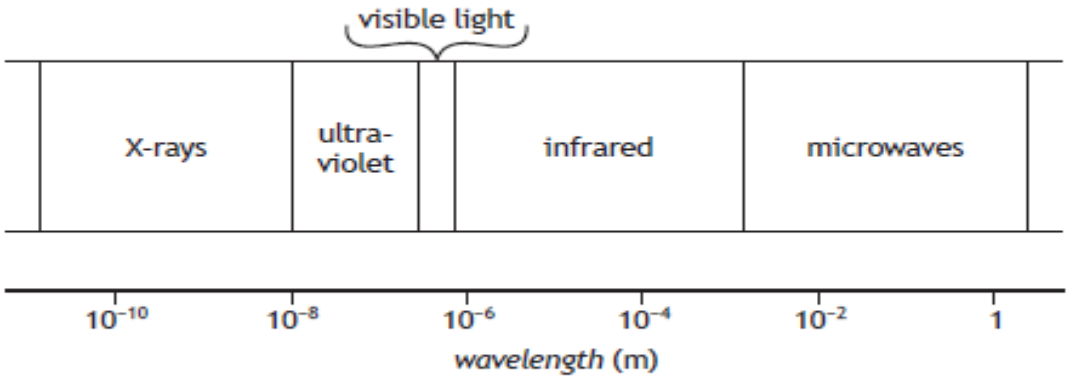
I The Big Bang Theory is a theory about the origin of the Universe.
II The Universe is approximately 14 million years old.
III The Universe is expanding.

Which of these statements is/are correct?

A I only
B II only
C I and II only
D I and III only
E I, II and III.

(1)

13 The diagram shows some parts of the electromagnetic spectrum in order of increasing wavelength.



(a) State a detector of infrared radiation. **1**

Total Marks 40