# Beyond Earth (H)

**1.** The average temperature on the Earth has increased over the last century.

Which statement explains why?

**A** Radiation absorbed by the Earth has decreased.
**B** Radiation absorbed is less than radiation emitted.
**C** Radiation absorbed is greater than radiation emitted.
**D** Radiation emitted by the Earth has increased.

Your answer ☐ **[1]**

**2.** Which statement about a star that explodes into a supernova is correct?

**A** The star has more mass than the sun.
**B** The star is older than the sun.
**C** The star will become a white dwarf.
**D** The star's core expands.

Your answer ☐ **[1]**

**3.** Which statement about nuclear **fusion** is correct?

**A** Energy is released because mass is converted to energy.
**B** Helium is converted into hydrogen.
**C** It is the main way in which nuclear power generates electricity.
**D** It is the splitting of a heavy nucleus into smaller nuclei.

Your answer ☐ **[1]**

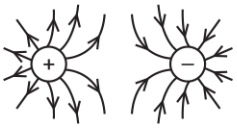
**4.** Which statement about geostationary satellites is correct?

**A** They appear to be in a fixed position relative to a point on the Earth.
**B** They are in a polar orbit.
**C** They are positioned 400 km above the Earth's surface.
**D** They take 2 hours to orbit the Earth.

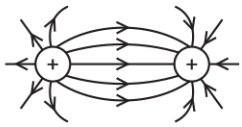
Your answer ☐ **[1]**

**5.** Look at the field line diagrams for positive and negative charges.

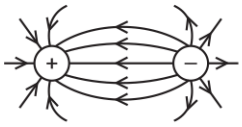
**A**



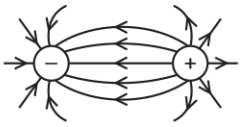
**B**



**C**



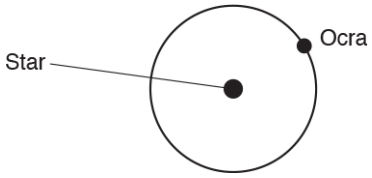
**D**



Which field line diagram is correct?

Your answer ☐ **[1]**

**6.** Planet Ocra is in a circular orbit around a star.




Which statement is correct?

**A** The acceleration of Ocra is zero.
**B** The speed of Ocra is changing.
**C** The velocity of Ocra is changing.
**D** The velocity of Ocra is zero.

Your answer ☐ **[1]**

**7.** An artificial satellite orbits the Earth in a circular path.

The satellite is moved further away from Earth to another orbit.

Which row in the table is correct?

| | Force of gravity | Speed in orbit | Time period |
|---|---|---|---|
| **A** | decreases | decreases | decreases |
| **B** | decreases | decreases | increases |
| **C** | decreases | increases | increases |
| **D** | increases | increases | increases |

Your answer ☐ **[1]**

**8.** The table contains statements about red-shift and galaxies.

Which row in the table is correct?

| | Statement 1 | Statement 2 |
|---|---|---|
| **A** | All galaxies move apart at the same speed. | They show both red-shift and blue-shift. |
| **B** | Distant galaxies show more red-shift. | The distant galaxies are moving apart faster than nearby ones. |
| **C** | Distant galaxies show more red-shift. | The distant galaxies are moving apart slower than nearby ones. |
| **D** | There are no galaxies that show blue-shift. | All galaxies are moving away from each other. |

Your answer ☐ **[1]**

**9.** All bodies emit electromagnetic radiation.

Body **R** is at a higher temperature than body **S**.

Which statement is correct?

**A** **R** emits radiation with a mean higher frequency.
**B** **R** emits radiation with a mean longer wavelength.
**C** **S** emits radiation with a higher intensity.
**D** **S** emits radiation with a mean shorter wavelength.

Your answer ☐ **[1]**

**10.** An artificial satellite is kept in its low polar orbit by a gravity force from a planet.

The satellite is moved to a higher orbit above the planet.

Which statement is correct about the satellite in this higher orbit?

**A** The force of gravity is greater and its speed decreases.
**B** The force of gravity is greater and its speed increases.
**C** The force of gravity is less and its speed decreases.
**D** The force of gravity is less and its speed increases.

Your answer ☐ **[1]**

**11.** Which row **A**, **B**, **C** or **D**, describes what has happened to light that has undergone red shift?

| | **Wavelength** | **Frequency** |
|---|---|---|
| **A** | Decreases | Decreases |
| **B** | Decreases | Increases |
| **C** | Increases | Decreases |
| **D** | Increases | Increases |

Your answer ☐ **[1]**

**12.** A planet moves in a circular orbit around its star.

Which statement is correct?

**A** The planet travels at changing speed and changing velocity.
**B** The planet travels at changing speed but constant velocity.
**C** The planet travels at constant speed and velocity.
**D** The planet travels at constant speed but changing velocity.

Your answer ☐ **[1]**

**13.** How was the Sun formed?

**A.** From dust and gas pushed together by gravity leading to a fission reaction.

**B.** From dust and gas pulled together by gravity leading to a fusion reaction.

**C.** From dust and gas pushed together by gravity leading to a fusion reaction.

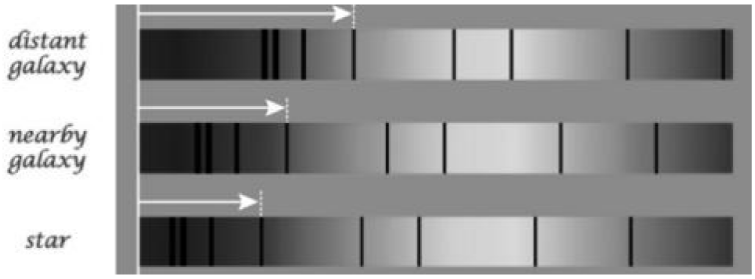
**D.** From dust and gas pulled together by gravity leading to a fission reaction.

Your answer ☐

**[1]**

**14.** * Scientists collect evidence from the universe and develop theories to explain their observations.

Here are three absorption spectra showing red shift. The white arrows show the relative position of the same band in the absorption spectra of a star, a nearby galaxy and a distant galaxy.




Using your knowledge of red shift, describe how the information in the diagrams supports the idea of the Big Bang model.

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_____ **[6]**

**15.** State **two** features of a satellite in a **polar orbit**?

Suggest a use for a satellite in a polar orbit.

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**[3]**

**16.** Nuclear **fusion** is a reaction that happens in stars. This equation for fusion is incomplete.


**i.** What else is produced in this reaction?

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**[1]**

**ii.** Stars are formed from dust and gas.

What causes the dust and gas to undergo fusion?

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**[1]**

**17.** *The Earth contains a crust, mantle and core as shown in **Fig. 22.1**.

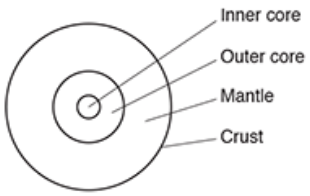


**Fig. 22.1**

**Table 22.1** gives some data about seismic waves and the Earth.

| | **Density (g / cm$^3$)** | **P wave speed (km / s)** | **S wave speed (km / s)** |
|---|---|---|---|
| **Top of crust** | 2.2 | 5.55 | 3.25 |
| **Top of mantle** | 3.4 | 7.97 | 4.55 |
| **Top of outer core** | 9.9 | 8.10 | - |
| **Bottom of outer core** | 12.2 | 10.30 | - |

**Table 22.1**

Describe what information the data in **Table 22.1** gives about the structure of the Earth.

In your answer you should explain any trends in the data in **Table 22.1**.

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**[6]**

**18 (a).** Edwin Hubble discovered that all distant galaxies were moving away from the Earth.

Explain how he could tell that all distant galaxies were moving away from the Earth.

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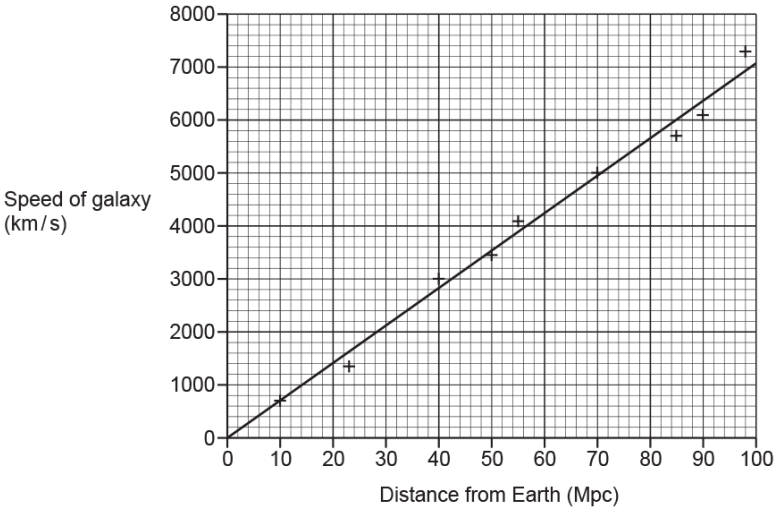
**(b).** This graph shows how the speed of a galaxy changes with distance from the Earth.




**i.** Use data from the graph to show that the speed of the galaxy is proportional to the distance from the Earth.

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---**[2]**

**ii.** Explain how data from the graph provides evidence for the Big-Bang.

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**(c).** Before Edwin Hubble could publish his results, his work was peer reviewed.

Suggest why peer review is important.

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_____ **[1]**

**(d).** The parsec (pc) is a unit used for measuring large distances in the Universe.

i. A galaxy is at a distance of 82 Mpc from the Earth.

Use the graph to determine the speed of this galaxy.

Give your answer in metres per second (m / s).

Speed = ..... m / s **[2]**

ii. Calculate the time it takes for the galaxy to travel $2.53 \times 10^{24}$ m.

Use your answer to **(i)** to help you.

Time = ..... s **[3]**

**END OF QUESTION PAPER**