

Space physics – GCSE Physics Paper 2

1. No.1

0 1

A group of stars is called a galaxy.

0 1

. 1

What is the name of our galaxy?

[1 mark]

Tick (✓) **one** box.

Black Eye

☐*- Is a spiral galaxy located approximately 17 million light-years away.*

Hockey Stick

☐*- No galaxy officially named Hockey stick.*

Milky Way

☒

Sculptor Dwarf

☐*- Is a dwarf spheroidal galaxy and a satellite of the milky way, not our galaxy itself.*

0 1

. 2

The Sun is one of the stars in our galaxy.

What was the Sun originally formed from?

[1 mark]

Tick (✓) **one** box.

Dust and gas

☒

Heavy elements

☐

Oxygen

☐

- The sun was originally formed from the gravitational collapse of a giant molecular clouds.*
- These giant molecular clouds composed primarily of dust and gas.*

0 1 . 3

Which of the following forces was involved in the formation of the Sun?

[1 mark]

Tick (✓) **one** box.

Electrostatic force

☐

Gravitational force

☒

Magnetic force

☐

- The formation of the sun, like other stars, is primarily driven by the gravitational force.
- This force causes the initial collapse of interstellar gas and dust clouds, leading to accretion of matter and the eventual ignition of nuclear fusion.

0 1 . 4

Stars produce light because they release energy.

Complete the sentence.

Choose the answer from the box.

[1 mark]

combustion

conduction

fusion

The process which releases energy inside stars is fusion.

- This process of fusion occurs in the core of stars, where immense pressure and temperature causes atomic nuclei to combine, releasing higher amount of heat.

0 1 . 5

Visible light and infrared radiation travel from the Sun to the Earth.

Which statement describes the time taken for visible light and infrared radiation to travel from the Sun to the Earth?

[1 mark]

Tick (✓) **one** box.

Visible light takes less time than infrared radiation

☐

Visible light takes the same time as infrared radiation

☒

Visible light takes more time than infrared radiation

☐

- Visible light and infrared radiation are both form of electro-magnetic radiation. Hence they travel at the same speed.

0 1 . 6 Infrared radiation has a longer wavelength than visible light.

Complete the sentence.

Choose the answer from the box.

[1 mark]

smaller

the same

greater

Compared with the frequency of infrared radiation, the frequency of

visible light is greater.

0 1 . 7 The Sun and the Earth both emit infrared radiation.

How does the rate of infrared radiation emitted by the Sun compare with the rate of infrared radiation emitted by the Earth?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

Lower rate than the Earth

☐

Same rate as the Earth

☐

Greater rate than the Earth

☒

Reason - The sun has a much higher
temperature than the Earth.

2. No.3

0 3

The Universe contains many stars.

0 3

1

The Sun is the star at the centre of our solar system.

Give **three** other types of object that form our solar system.

[3 marks]

1 - planets

2 - dwarf planets

3 - Moons or natural satellites

Some main sequence stars will eventually form black holes.

Table 3 gives the mass of four stars.

Table 3

Star	Mass in kg
Arcturus	2.2×10^{30}
Betelgeuse	2.2×10^{31}
Cygni A	1.4×10^{30}
The Sun	2.0×10^{30}

0 3

2

Which star in **Table 3** is most likely to form a black hole?

[1 mark]

- Betelgeuse. Since Betelgeuse is significantly more massive than the others, it is the most likely to form a black hole.

03.3

The distance from Cygni A to the Earth is 1.1×10^8 gigametres.Which distance is the same as 1.1×10^8 gigametres?

[1 mark]

Tick (✓) **one** box. 1.1×10^{11} m☐ 1.1×10^{14} m☐ 1.1×10^{17} m☒ 1.1×10^{20} m☐

gigametre = 10^9 metres.
 1.1×10^8 gigametres = ?

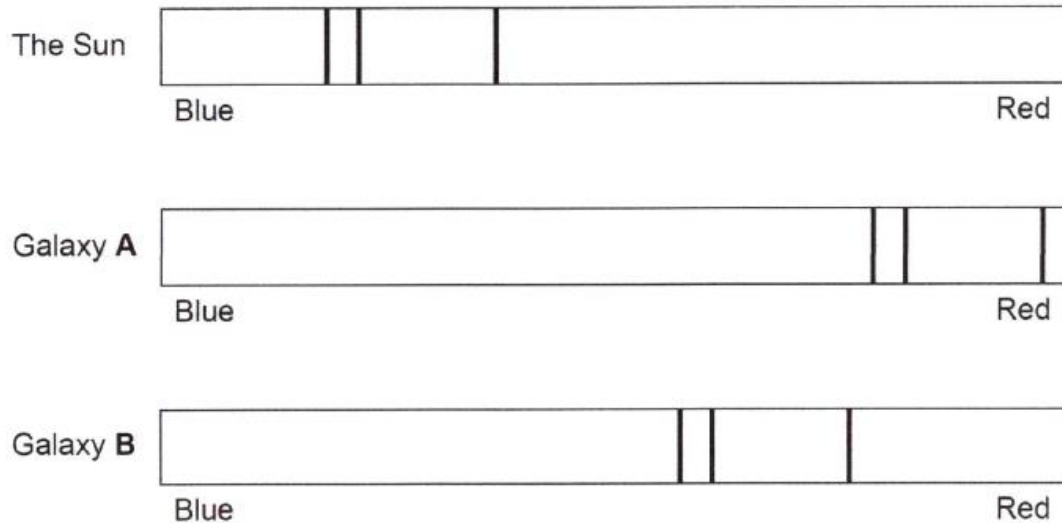
$$\frac{1.1 \times 10^8 \times 10^9}{1} = 1.1 \times 10^{17} \text{ m.}$$

0 3 . 4 The light spectrum from every galaxy includes dark lines.

The lines have the same pattern.

Figure 7 shows the position of dark lines in the visible spectra of light from the Sun and from two distant galaxies.

Figure 7



Explain what these light spectra tell us about the velocities of galaxy **A** and galaxy **B**.
[3 marks]

- Both show red-shift so both are moving away from the sun.

- The wavelength of the absorption lines has increased so both are moving away from the sun.

- A shows a greater red-shift than B so A is travelling faster than B.

0 3 . 5 The distance between Arcturus and the Earth is 3.6×10^{14} km.

speed of light = 3.0×10^8 m/s

Calculate the time taken for light from Arcturus to reach the Earth.

Use the Physics Equations Sheet.

[4 marks]

time taken = $\frac{\text{Distance}}{\text{speed of light}}$	- changing distance to metres
substituting	time taken = $\frac{3.6 \times 10^{17} \text{ m}}{3.0 \times 10^8 \text{ m/s}}$
time taken = $\frac{3.6 \times 10^{14} \text{ km}}{3.0 \times 10^8 \text{ m/s}}$	$t = 1.2 \times 10^9$ seconds
	Time taken = 1.2×10^9 s

0 3 . 6 When stars are formed, they contain mostly hydrogen.

Describe how stars produce all other naturally occurring elements.

[4 marks]

- stars produce energy and new elements through the process of nuclear fusion, where nuclei collide and join together.
- Hydrogen nuclei fuse to form helium. In later stages of a star's life, helium nuclei fuse to form heavier elements like carbon and oxygen.
- This continues up to iron.
- Some massive stars become supernovae creating elements heavier than iron