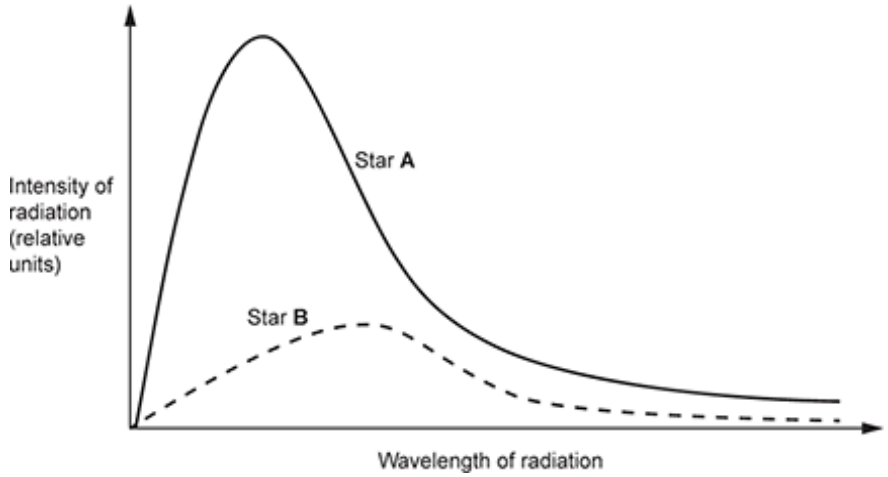
1(a). All objects emit radiation.

The graph shows how the intensity of the radiation emitted by star **A** and star **B** varies with the wavelength of the radiation.



Describe **two** differences between the graph for star **A** and the graph for star **B**.

1 _____

_____

2 _____

[2]

(b). Explain why the average temperature of the Earth is increasing.

In your answer, write about:

- the radiation absorbed and emitted by the Earth
- the effect of the Earth's atmosphere.

_____

_____

_____

_____

_____

_____

_____

_____

[6]

(c). The Earth orbits the Sun.

Which statement is correct?

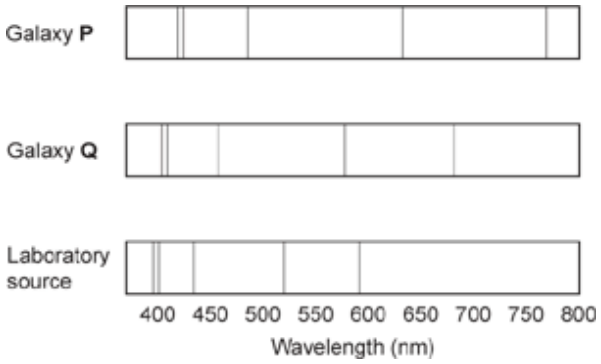
Tick (✓) **one** box.

- The direction of the velocity of the Earth is towards the Sun. ☐
- The Earth is accelerating. ☐
- The Earth's velocity is the same as its speed. ☐
- The velocity of the Earth stays constant. ☐

[1]

2. The diagram shows the emission spectra obtained from stars in two different galaxies.

The same spectrum is shown from a laboratory source on the Earth.



Which statement is correct?

A Galaxy **P** is further away from the Earth than galaxy **Q**.
B Galaxy **P** is moving away from the Earth more slowly than galaxy **Q**.
C Galaxy **P** is moving towards the Earth.
D Galaxy **P** shows a smaller red-shift than galaxy **Q**.

Your answer ☐ **[1]**

3. Line spectra give astronomers information about the motion of distant galaxies.

The table gives the wavelength of a line in the spectrum of hydrogen observed in a laboratory on the Earth.

The table also gives the wavelength of the **same** line in the spectrum of hydrogen observed from galaxy **A** and galaxy **B**.

Source	Wavelength of line (nm)
Laboratory on the Earth	656
Galaxy A	712
Galaxy B	739

Explain how the data in the table can be used to compare the motion of galaxy **A** with galaxy **B**.

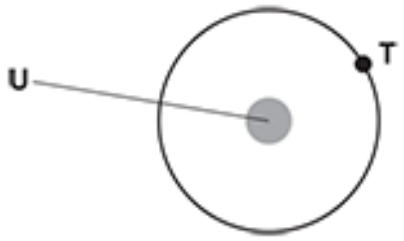
[4]

4. The Sun is a star.

Describe how the Sun was formed.

[3]

5. Object **T** moves at a constant speed in a circular orbit around object **U**.



Why does the velocity of **T** change?

A The force of gravity is at right angles to the velocity of **T**.
B The forces acting on **T** are balanced.
C The force of **U** on **T** equals the force of **T** on **U**.
D The forces acting on **U** are balanced.

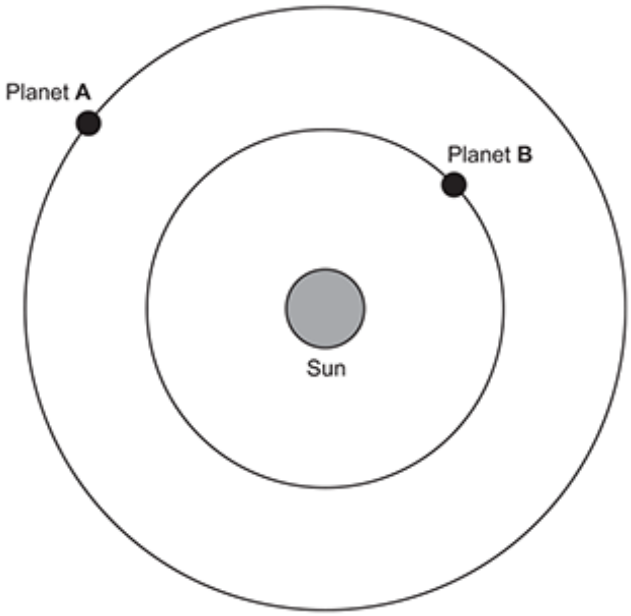
Your answer ☐ **[1]**

6. Which sentence about P seismic waves is correct?

A P waves are slower than S waves.
B P waves are transverse.
C P waves can travel through solids and liquids.
D P waves can travel through solids but not liquids.

Your answer ☐ **[1]**

7(a). The diagram shows two planets orbiting the Sun in our Solar System.



The table shows data for the planets.

	Radius of orbit (metres)	Time to orbit Sun (years)	Mean orbital speed (km / s)
Planet A	2.28×10^{11}	1.88	24
Planet B	1.08×10^{11}	0.62	35

i. Explain why the speed of a planet changes when the radius of orbit changes.

[2]

ii. Two students look at the data.

Student P says, 'The time to orbit the Sun is proportional to the radius of orbit.'

Student Q disagrees.

Use the data in the table to show that **Student Q** is correct.

[2]

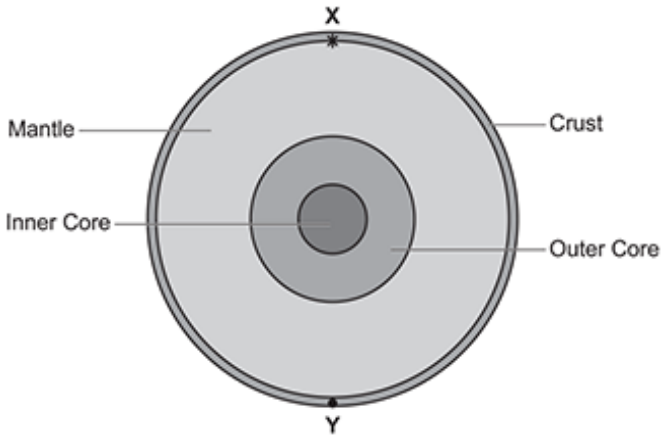
(b). Read the two statements about planet **A**:

- The speed of planet **A** is constant.
- The velocity of planet **A** is changing.

Explain why these two statements are correct. Write about forces.

[3]

8. The diagram shows a cross-section of the Earth.



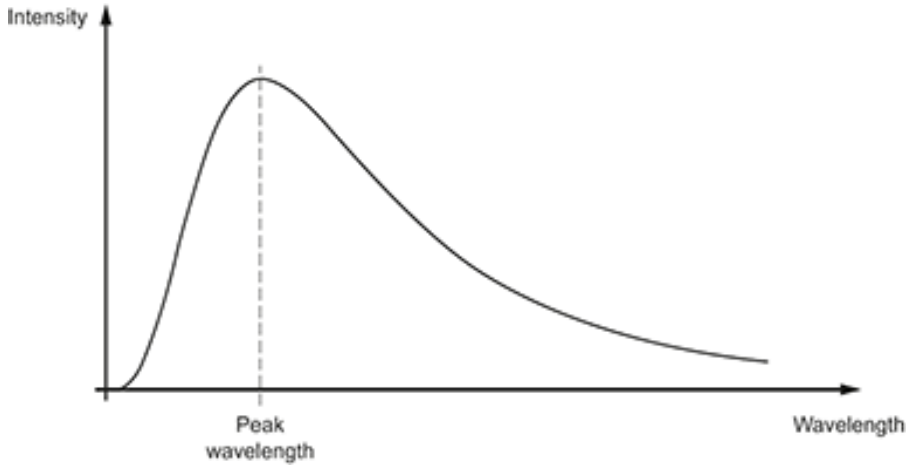
An earthquake takes place at point **X**.

Which type(s) of seismic waves would be detected at point **Y**?

	P-Waves	S-Waves
A	no	no
B	no	yes
C	yes	no
D	yes	yes

Your answer ☐ **[1]**

9. A hot object emits radiation.
The graph shows how the intensity of the radiation varies with wavelength.



The temperature of the object **increases**.

Which row describes what happens to the peak wavelength and intensity of the radiation?

	Peak Wavelength	Intensity of the radiation
A	decreases	increases for all wavelengths
B	decreases	increases for the peak wavelength only
C	increases	increases for all wavelengths
D	increases	increases for the peak wavelength only

Your answer ☐ **[1]**

END OF QUESTION PAPER