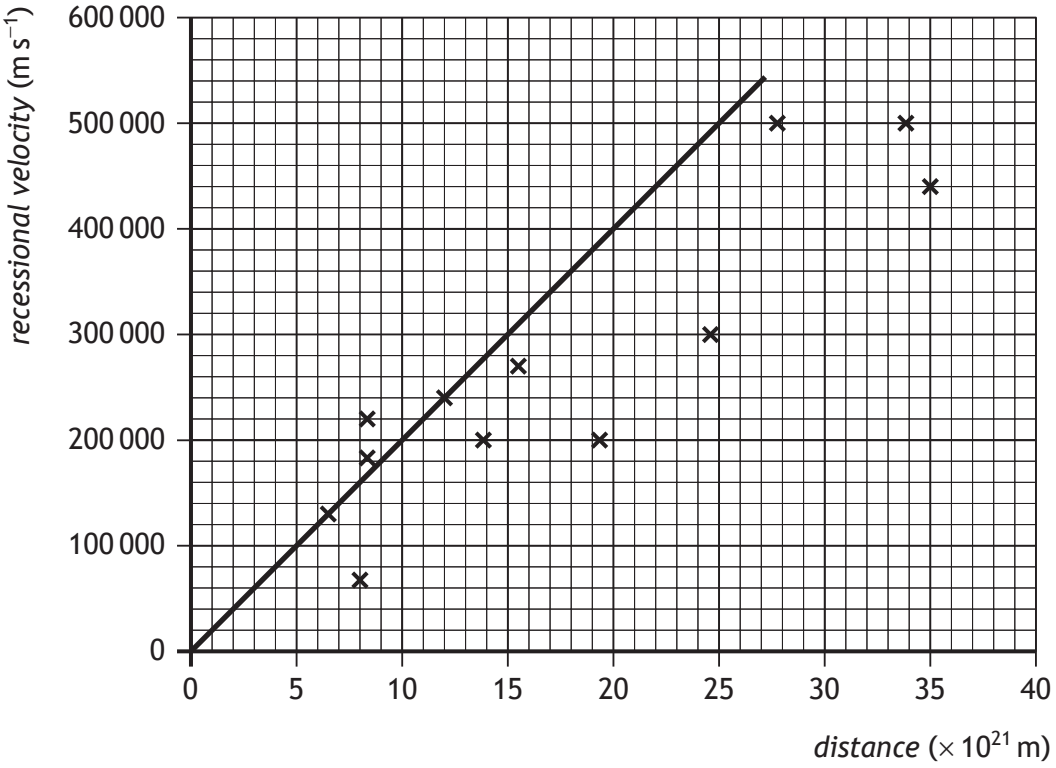
5. Hubble's Law states that the universe is expanding. The expanding universe is one piece of evidence that supports the Big Bang theory.

(a) State one other piece of evidence that supports the Big Bang theory. **1**

(b) A student plots some of the original data from the 1929 paper by Edwin Hubble and adds the line shown in order to determine a value for the Hubble constant H_0.



The student calculates the gradient of their line and obtains a value for the Hubble constant of $2{\cdot}0 \times 10^{-17}\,s^{-1}$.

The age of the universe can be calculated using the relationship

$$\text{age of universe} = \frac{1}{H_0}$$

5. (b) (continued)

(i) Calculate the age of the universe, in years, obtained when using the student's value for the Hubble constant. **2**

Space for working and answer

(ii) The current estimate for the age of the universe is $13{\cdot}8 \times 10^9$ years.

(A) State why the value obtained in (b)(i) is different from the current estimate for the age of the universe. **1**

(B) Suggest a change that the student could make to their graph to obtain a value closer to the current estimate for the age of the universe. **1**

(c) It has been discovered that the rate of expansion of the universe is increasing.

State what physicists think is responsible for this increase. **1**