10 The Milky Way is one of many billions of galaxies. Each galaxy contains many billions of stable stars.

(a) Stable stars transfer energy into space by emitting electromagnetic radiation from their surfaces.

Describe what happens in the core of a stable star to release energy that is eventually transferred into space.

.....

.....

.....

..... [3]

(b) On the Earth, light from a distant galaxy is observed and analysed by astronomers. This information is used to determine the speed at which the galaxy is moving away from the Earth.

(i) Describe how the observed light is different from when it was emitted.

.....

.....

..... [2]

(ii) State the quantity that astronomers use to determine the speed at which the galaxy is moving away.

..... [1]

(c) The Hubble constant H_0 is equal to 2.2×10^{-18} per second.

(i) Calculate the distance from the Earth of a galaxy that is moving away at a speed of 1.3×10^7 m/s.

distance = ... [2]

(ii) Calculate an estimate for the age of the Universe. Give your answer in years.

age of the Universe = ... years [2]

[Total: 10]