b) A pebble thrown upwards will reach a certain height then fall back to earth. A pebble catapulted upwards at speeds over around 11200 metres per second will never fall back to earth; such a speed is greater than the escape velocity, required to escape the earth's gravity. The analogy is useful for the future of the universe. All the galaxy clusters in the universe are moving away from each other, but are they moving fast enough for each to escape the gravitational attraction of all the others? The answer depends on the density of the Universe, which determines the escape velocity, and on the value of a quantity analogous to the escape velocity; Hubble's constant, H. We can form an equation to relate density and H, and define the critical density; if the density of the universe is less than or equal to critical, the universe expands forever. If the density of the universe is greater than critical, it will eventually collapse.

Unfortunately values for density and Hubble's constant are uncertain, and we don't know whether the universe will expand forever or one day collapse.

Rather technical

Acc. 3/3
~~Acc~~ Cl. 1½/3
Ad. 2/3

If continued expansion occurs the stars fade out (heat death)

↑
(Not covered)

Content 3/3

20/30

Really you are trying to cover too much — the word limit does not allow for more than the most basic ideas explained very simply