1. We assume all the stars in the cluster formed at the same time. The age of the cluster is then the lifetime of the star that is currently leaving the main sequence. This is known as the "Main Sequence Turnoff." Hence, a short main sequence on a CMD indicates an old cluster, whereas a long main sequence indicates a young cluster (i.e. the O and B stars have not yet died).

2. Only the most massive stars can achieve the threshold temperature required for the nuclear reaction which produces iron. Each reaction requires a higher temperature to synthesize the next higher element, and iron is the highest-atomic mass element that can be created via fusion. [this is similar to question 4.]

3. Because star formation requires gas clouds to be converted into stars and because elliptical galaxies have very little gas, there can be no star formation now. Elliptical galaxies are full of old Pop II stars all of which are about equally old. Thus they must have very efficiently converted their gas into stars a long time ago and had very little gas left over.

4. Nuclear reactions have a threshold temperature. H to He starts at 10 million degrees K, He to C starts at 100 million degrees K, etc. The center of a star is the only place in a star where the temperature is above the threshold temperature. The surface of the Sun is only about 6000K but the Sun's center is 14.6 million degrees K.

(You don't need to remember all these numbers to get a perfect grade on this question.)

5. It is gas pressure that balances gravity and maintains hydrostatic equilibrium in normal gaseous stars.

6. a). We observed 3K CMB radiation, which is one of the predictions of big bang.
b) We found He in first stars, which was produced with big bang.
c) We see evolution of the universe, which indicates it is not steady. Evidence includes the fact that we see no nearby (i.e. recent) quasars, and metallicity changes in stars.