(1) On a cold winter day, your employer sends you out to make some photographs of an inhabited house that can be used to determine where the house has poor heat-isolation. He offers you to take one of four tools. Which one do you pick: a radio telescope, an infrared camera, an off-the-shelf digital camera, or an UV camera? Justify your answer.

(2) William Hershel scanned a large fraction of the sky and catalogued stars. He used his observations to come up with a 3-D model of the Milky Way based on his observational data. Hershel did not know the absolute distances of the stars from us, but he estimated relative distances based on his observations (e.g. "Star A is two times further away from us than star B").
(a) How did he estimate such relative distances? Please describe the method he used in your own words.
(b) What limits the accuracy of the relative distances estimated with this method? Explain your answer.

(3) In class, we discussed four fundamental forces that physicists and astronomers presently use to explain all phenomena in the Universe. Make a list of these four forces. For each force, describe a system or object in which the force plays an important role. (Please use the lecture handouts and notes, your textbook, or the internet to answer this question).

(4) Which process powers the Sun?
What is the fuel of this process and what is the waste? Where does the energy come from that drives this process? One of your answers should mention Einstein's famous equation $E = m\,c^2$.

(5) (a) In order to make a Hertzsprung-Russel diagram of a globular cluster, which properties do you have to measure for each star of the cluster?

(b) The graphs below show the Hertzsprung-Russel diagrams of three real star clusters. Which cluster is the youngest, a, b, or c? Justify your answer.