Test on "Worlds, big and small"

I)   The microcosmos

1. a. The smallest distance visible to the naked eye is about a millimetre.
    b. The eye cannot distinguish a detail smaller than the distance between the sensitive cells on the retina.

2. a.

bodies	size or wavelength in metre	kind of wave
viruses	10^{-7}	UV
molecules	10^{-9}	X rays

b. The energy carried by gamma rays: $E = \dfrac{hc}{\lambda} = \dfrac{6.67 \times 10^{-34} \times 3.0 \times 10^{8}}{10^{-14}} = 2.0 \times 10^{-11}$ J

c. We need even larger energies to "see" even smaller things because, the smaller a body is, the smaller the wavelength of the radiation must be, and the smaller the wavelength, the larger the energy. Indeed, the energy is inversely proportional to the wavelength.

   3. a. Particle accelerators allowed studying deeper layers of matter than nuclei.
   b. In the nucleus, we discovered protons and neutrons.
   c. In the nucleons, we discovered quarks.
   d. But there are even smaller things, which scientists call "strings". They are about 10^{-33} m across.

II)   The macrocosmos

1. a. To express astronomic distances, we must use the light year (*or the astronomic unit*).
    b. The light year is the distance travelled by light in one year in empty space (*It is the distance between Sun and Earth*).
    c. It is about 10^{13} km (*150 million km*).

2. Put in the right order the following celestial bodies according to their distance from the Earth:

    1) the Sun 2) Alpha Centauri 3) the centre of the Milky Way 4) quasars