1. Explain what “ultraviolet catastrophe” is and where it came from.
   Ultraviolet catastrophe refers to the classical prediction of blackbody radiation energy density, where we seemingly have infinite energy as we approach high frequency light.

2. Explain how the assumption that energy is quantized is brought up, and why it was an issue for classical physics.
   Max Planck, as he tried to reconcile two different equations describing the blackbody radiation, produced a result that requires an assumption that energies are stored in quantized units. This was an issue for classical physics because both Newton’s Law and Maxwell’s Equations treat the world as infinitely divisible and continuous everywhere.

3. Explain what the photoelectric effect is, and why the idea of a photon is helpful as an explanation.
   Photoelectric effect is the phenomenon where when light is shined onto certain materials, electrons will flow out of the material. The idea of photon is helpful because it explains how a certain color of light can only “knock out” electrons with a certain energy level. That is very similar to the intuition in classical physics when treating both photons and electrons as rigid balls.

4. Summarize the development of atomic theory in the early 20th century, and identify important names that contributed to the development.
   Answers may vary.

5. Explain Albert Einstein’s contributions to the establishment of quantum theory, and summarize his attitudes towards it.
   Answers may vary. Einstein contributed to the development of photons, but he did not believe that the world is fundamentally quantum and probabilistic.

6. Explain why we do not see energy quantizations in our everyday life.
   Energy quantization usually occurs only when we are looking near the ground state of a system. That only occurs under low temperature (less than 0.1K) or very low pressure (sometimes both, and sometimes with laser cooling). We are at a temperature of around 300K and 1 atmospheric pressure, so naturally quantizations are hidden from us.

7. Choose one interpretation of quantum mechanics and briefly explain how it works.
   Answers may vary.

8. For a mass m connected to an ideal spring with spring constant k, solve for the motion of this mass if I give it an initial displacement of x0. Ignore resistance (resistance is futile).
   Check out the first section of this page: https://en.wikipedia.org/wiki/Harmonic_oscillator