For these questions, use the simulation "Wave function shapes" and work through the simulation, including the step-by-step exploration (click on the "Step-by-step Exploration" tab).

1) For each of the potential wells, the particle is in an energy eigenstate E_{10} with quantum number $n = 10$. Explain what this means. Does the total energy of the particle vary across the well? Does the particle's kinetic energy vary across the well?

2) For each of the different potential wells shown in the simulation,
a) describe qualitatively how a classical particle with energy E_{10} would move. In particular, specify where it speeds up, where it slows down and where the turning points are. Explain qualitatively the shape of the classical probability density curves given your explanations of the classical particle trajectories.
b) describe the position dependence of the amplitude and the wavelength of the energy eigenfunction $\psi_{10}(x)$. Interpret the shape of the wave function in terms of the kinetic energy of the quantum particle and the probability of finding it in different parts of the well.

3) The image shows a potential well $V(x)$, with energy E being an allowed energy (the energy of an energy eigenstate) for this well. Three positions are marked on the x-axis. Rank in order, from largest to smallest,
a) the classical kinetic energy of the particle at these three positions
b) the amount of time a classical particle spends traversing an interval of width dx at each of these three points.
c) the spacing between the zeros of the wavefunction in the regions near each of these three points (assume that quantum number $n \gg 1$)
d) the amplitude of the wave function in the regions near each of these three points.
Briefly justify your answers.