Practice Problems Related to Specific Intensity

Suppose that there are two intrinsically identical galaxies, one at redshift z_1 and the other at redshift z_2. Both are at rest relative to the local Hubble flow.

1. What do we measure to be the ratio of their surface brightnesses?

2. What do we measure to be the ratio of their bolometric fluxes?

3. What do we measure to be the ratio of their bolometric fluences?

Now suppose that those same two, intrinsically identical, galaxies are again at redshifts z_1 and z_2, but that the first galaxy has a net motion relative to the Hubble flow of v_1 with respect to us ($v_1 > 0$ means it moves away from us, relative to the Hubble flow, whereas $v_1 < 0$ means it moves toward us). Similarly, the second galaxy has a net motion relative to the Hubble flow of v_2 with respect to us. Answer the three previous questions in this case.