- In a linear molecule consisting of a carbon chain with alternating double and single bonds, the HOMO and LUMO are often extended over the whole length of the molecule. What will happen to the size of the HOMO-LUMO gap as the length of such a molecule is increased?

As the wavelength associated with an electron is given by $\lambda = h/mv$, a longer wavelength is associated with a lower velocity and hence a lower energy. The gap is reduced.

Assuming that the molecule absorbs in the visible range, how will its colour change as the molecule length increases? Give a reason for your answer.

The colour will become more blue.

The energy of the light *absorbed* decreases as the band gap decreases, so its wavelength increases and it becomes more red. The colour of the compound is *complementary* to the light absorbed.