1. a) Photoconductors are used in photo-copiers to control where the toner is placed on the piece of paper. In the copier, the photoconductor sheet is connected to ground. The process starts by charging the surface of a photoconductor evenly with negative charge. The photoconductor is grounded. What happens to the negative charges (electrons) on its surface?

i. The electrons flow to ground.
ii. The electrons stay put.
iii. The electrons move around on the photoconductor to get as far away from the other electrons as possible.

b) The paper sheet you want to copy is then illuminated and imaged onto the photoconductor. What happens to the negative charges (electrons) on its surface during this exposure?

i. The electrons all flow to ground.
ii. The electrons flow from where the light from the image hits the surface to where the surface stays dark.
iii. The electrons flow from where the surface stays dark to where the light from the image hits the surface.
iv. Where the light from the image hits the surface, the electrons flow to ground. Where the surface remains dark, the electrons stays put.
v. Where the surface remains dark, the electrons flow to ground. Where the light from the image hits the surface, the electrons stays put.

Toner is then sprinkled onto the photoconductor and sticks to where the charge has build up. This toner is transferred to a new sheet of paper and your print is finished!

c) You have noticed that in many photocopiers, red letters on black background do not show up ... it appears as a completely black sheet of paper, but orangish-red on black is well distinguished by the copier. What is the approximate band gap energy difference (in eV) within the photoconductor?

Color	λ [nm]
Red	620 - 750
Orange	590 - 620

so the wavelength of orange-red is ~ 620nm

then

$$E = \frac{hc}{\lambda} = \frac{1240\ eV\,nm}{620nm} = 2\ eV$$