Answer to Problem 5-34:

a. The solutions manual gives the correct answer.

b. The solutions manual is incorrect - correct answer below:

If I = 0, then the expected dco chromosomes = .07 x .15 = .0105.

The dco chromosomes are 1/4 of everything that comes from E2 meioses. Therefore, to produce 0.0105 dco chromosomes, there must be 4 x 0.0105 E2 meioses. 1/4 of these are 2 strand, are PD, and produce 2 nco and 2 dco chromosomes; 1/2 are 3 strand, are T, and produce 1 nco, 2 sco 1 dco each; 1/4 are 4 strand, are NPD, and produce 4 sco.

So, E2 meioses produce 0.0105 PD, 0.021 T and 0.0105 NPD.

So far we have accounted for a map distance totalling 0.021/2 + 3x0.0105 = .042, or 4.2 map units, leaving 17.8 map units to be accounted for by E1 meioses. These are found in T asci, and must occur with a frequency of 2 x .178 = 0.356.

In sum: NDP = 0.0105, T = 0.377, PD = 0.6125.

So, double-checking ourselves, the map distance between the two genes can be calculated as T/2 + 3NPD = (0.356 + 0.021)/2 + 3 x 0.0105 = .22, or 22 m.u.

Another way to do this would be to realize that meioses with an exchange in region I represent 14% of all meioses (since only half the chromosomes produced by an exchange are recombinant), and meioses with an exchange in region II represent 30% of all meioses. Then, the chance of a meiosis with exchanges in both regions simultaneously is 0.3 x 0.14 = 0.042. This is the total frequncy of E2 meioses: 1/4 are PD, 1/2 are T and 1/4 NPD. This leads you to the same point as above. Then calculate frequency of E1 as above.