

1. A normal woman who has a colorblind (but otherwise normal) father, marries a man who has factor VIII hemophilia. Their first son has Duchenne's Muscular Dystrophy. (you may need to look up these diseases to see how they inherit)

Describe precisely what kind of event could cause each of the following in a child of theirs.

- a) An otherwise normal son with Klinefelter's syndrome
- b) A colorblind daughter with Turner syndrome.
- c) A daughter with Turner syndrome and factor VIII hemophilia
- d) A son with Klinefelter's syndrome who has Duchenne's muscular dystrophy.

2. In E. coli four Hfr strains donate the following markers in the following order

strain 1	smr, ysu, gen
strain 2	ysu, smr, wrk
strain 3	hrd, wrk, smr
strain 4	gen, ysu, smr, wrk

Draw a map of these genes and show Hfr insertion sites and directionality.

3. You are mapping three genes q , r , and s . You use a donor Hfr strain that is $q^+ r^+ s^+$, and a recipient strain that is $q^- r^- s^-$. When you do the experiment for a short period of time you get a very few Q^+ and/or S^+ colonies but all the rest are $Q^- R^-$ and S^- . When you let transduction go for a long period of time you get the following genotype numbers.

$Q^+ R^+ S^+$	310
$Q^+ R^+ S^-$	2
$Q^+ R^- S^+$	10
$Q^+ R^- S^-$	5
$Q^- R^+ S^+$	30
$Q^- R^+ S^-$	58
$Q^- R^- S^+$	1
$Q^- R^- S^-$	thousands

- What is the gene order?
- What is the distance between linked genes in map units?
- Which genotypes are irrelevant for calculating b) and why?

4. Fill in the following blanks:

Sex chromosomes	condition	# of Barr bodies
XY	<u>normal male</u>	<u>0</u>
X0	_____	_____
XYY	_____	_____
XXY	_____	_____
XX	_____	_____
XXX	_____	_____