AP Bio FRQ Fridays

2020 CED #5
Meiosis & Pedigrees

NOTES

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In humans, the gene that determines a particular condition has only two alleles, one of which (*B*) is completely dominant to the other (*b*). The phenotypes of three generations of a family with respect to the condition are shown in the pedigree in Figure 1. Individuals are numbered.

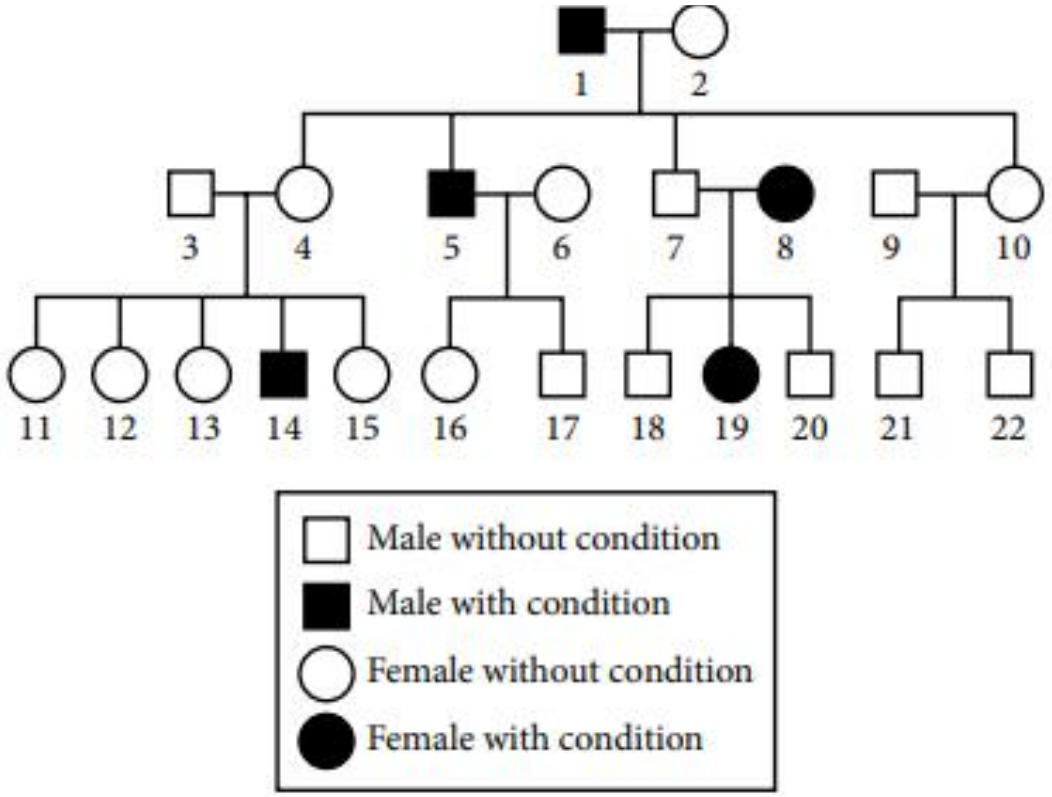

Figure 1. Inheritance of a particular condition over three generations of a family

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(a) **Describe** the process in eukaryotes that ensures that the number of chromosomes will not double from parent to offspring when gametes fuse during fertilization.

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- Homologous pairs of chromosomes separate in meiosis I, so the gametes are haploid (n), and each gamete receives only one member of each chromosome pair.

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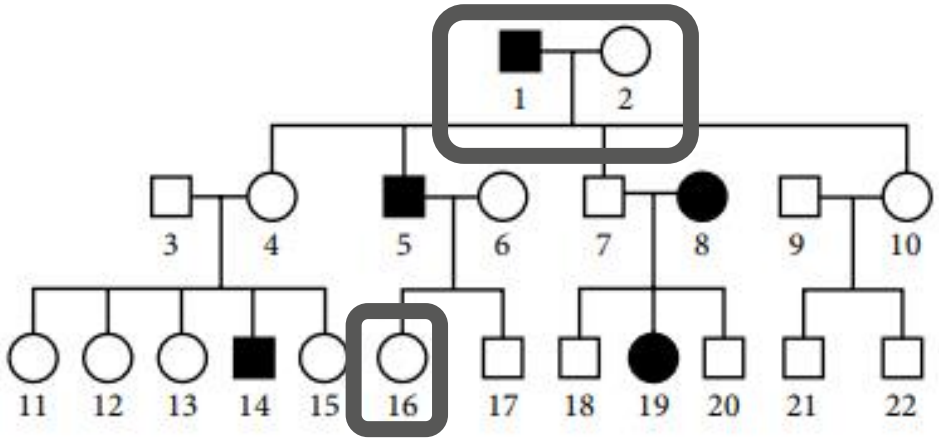
(b) **Explain** how any <u>one</u> chromosome in individual 16 contains DNA that came from <u>both</u> individuals 1 and 2.



Individual 5 inherited one member of each homologous pair of chromosomes from individuals 1 and 2. During gamete formation in individual 5, crossing over occurred between nonsister chromatids in each homologous pair. Thus each chromosome formed and passed on to individual 16 contains DNA from both 1 and 2.

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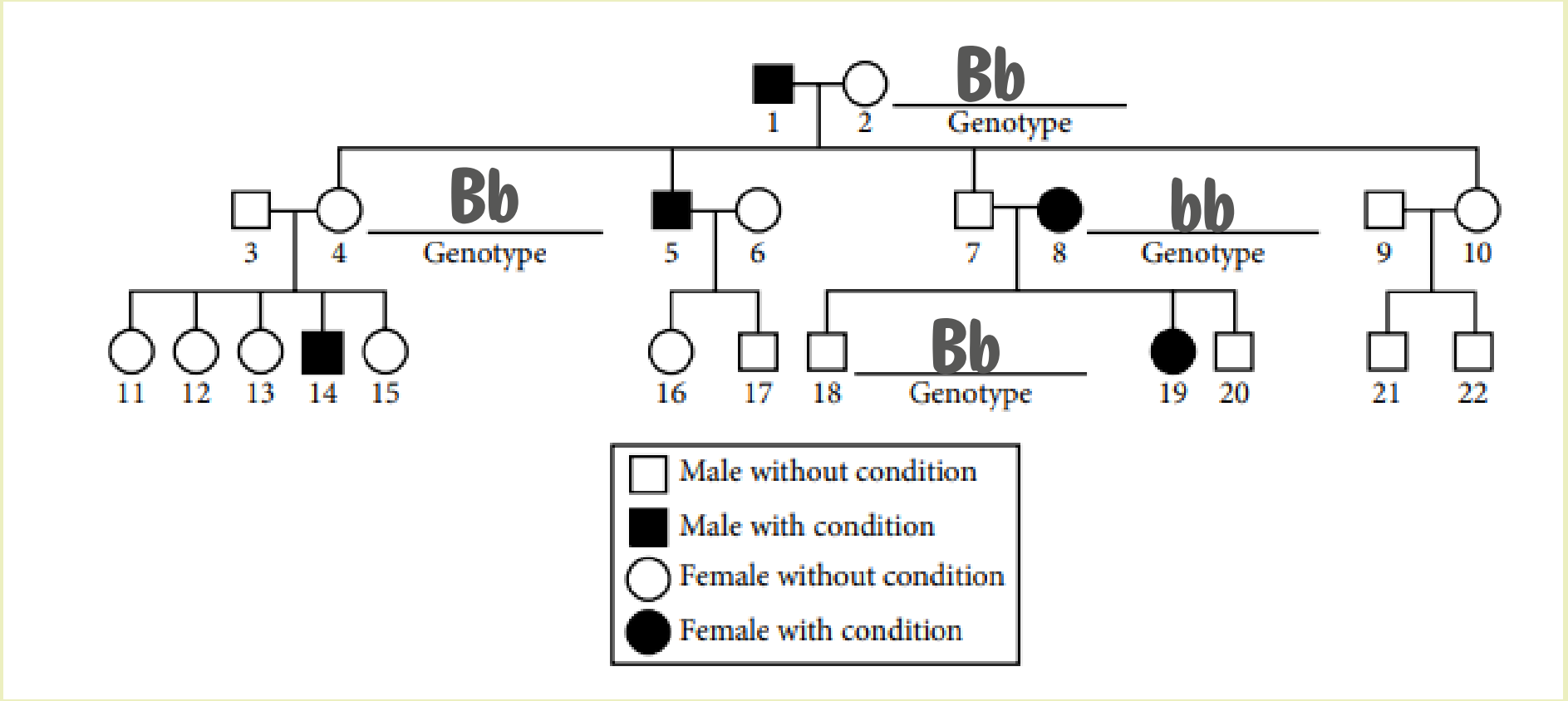
(c) **Use the template** figure of the pedigree and the allele designations *B* and *b* to **indicate** the genotypes of individuals 2, 4, 8, and 18.



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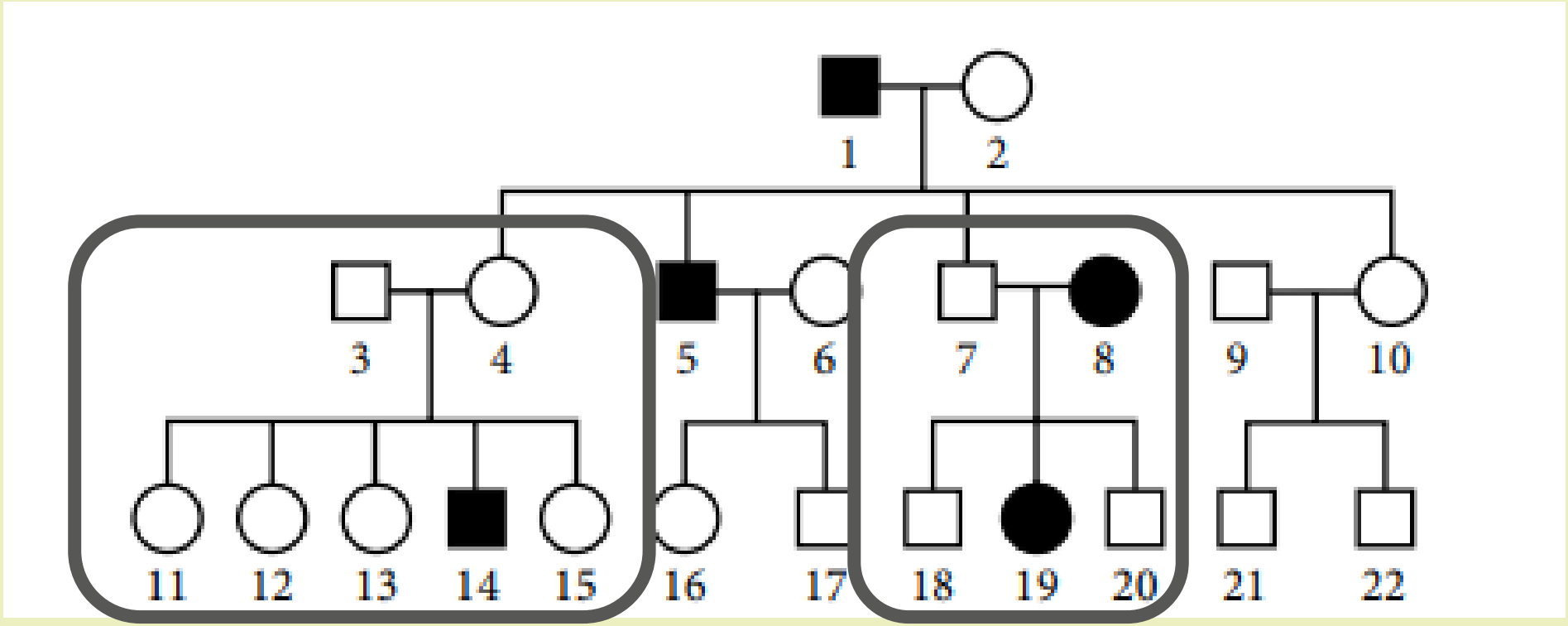
(d) Based on the pedigree, **explain** whether the inheritance pattern of the condition is sex-linked or autosomal and dominant or recessive.



The disease phenotype is recessive and is autosomal/not sex-linked. It cannot be dominant because individuals 3 and 4 do not have it, but their offspring 14 does. It is not sex-linked because if it was Y-linked, all male offspring of males with the disease phenotype would have the trait, and they do not.