

Question 1:

Adrian's karyotype is 47, XXY (Klinefelter). His mother is green/red color blind; his father is not color blind. Adrian can distinguish red from green.

Adrian's abnormal karyotype is the result of

- A. a nondisjunction during meiosis I in the mother.
- B. a nondisjunction during meiosis II in the mother.
- C. a nondisjunction during meiosis I in the father.
- D. a nondisjunction during meiosis II in the father.
- E. one cannot tell in which parent a nondisjunction occurred

XX from mother + Y from father : impossible because Adrian would be color blind
X from mother + XY from father : nondisjunction in the father during meiosis I

Question 2:

Adrian's karyotype is 47, XXY (Klinefelter). He is color blind. Neither his mother nor his father is color blind.

Adrian's abnormal karyotype is the result of

- A. a nondisjunction in his mother.
- B. a nondisjunction in his father.
- C. one cannot tell in which parent a nondisjunction occurred

Father has not transmitted his normal X chromosome. He has transmitted only Y
B is excluded

Mother must be a carrier for color blindness. Adrian's color blindness indicates that 2
X chromosomes come from the mother.

Non-disjunction during meiosis II

Question 3:

Angelina has Turner syndrome (45, X0); she is green/red color blind.

Neither her mother nor her father is color blind.

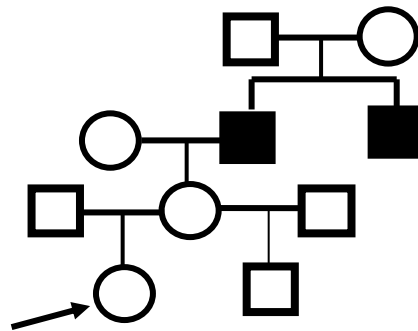
Angelina's abnormal karyotype is the result of

- A. a nondisjunction in her mother.
- B. a nondisjunction in her father.
- C. one cannot tell in which parent a nondisjunction occurred.

Angelina has not inherited her father's normal X chromosome → nondisjunction in the father
could be meiosis I or meiosis II

(The mother must be carrier for color blindness; she has transmitted a mutated X chromosome.)

Question 4: The family tree indicates that 2 brothers in generation II were affected with an X-linked recessive disease (hemophilia).



The woman indicated by the arrow is pregnant. She expects a male baby. The father is healthy. What is the probability that her first boy is affected? **1/4**

The pregnant woman is the grand-daughter of an affected man:

her mother is an obligate carrier

Her probability to be a carrier is $\frac{1}{2}$.

The probability for her son to be affected = prob. she is carrier x prob. she transmits

$$\frac{1}{4} = \frac{1}{2} \times \frac{1}{2}$$

Question 5:

An X-linked recessive gene produces red-green color blindness in humans. A woman with normal color vision whose father was color-blind marries a color-blind man.

5.1) What is the probability that their son will be color-blind?

- (A) 0
- (B) $\frac{1}{4}$
- (C) $\frac{1}{2}$**
- (D) $\frac{3}{4}$
- (E) $\frac{1}{1}$

The woman is an obligate carrier.

The probability for her son to be affected = prob. she is carrier x prob. she transmits

$$\frac{1}{2} = 1 \times \frac{1}{2}$$

(the father transmits Y, color blind or not makes no difference)

5.2) What is the probability that their daughter will be color-blind?

- (A) 0
- (B) $\frac{1}{4}$
- (C) $\frac{1}{2}$**
- (D) $\frac{3}{4}$
- (E) $\frac{1}{1}$

If the father was not color blind, the probability for the daughter would be 0 !