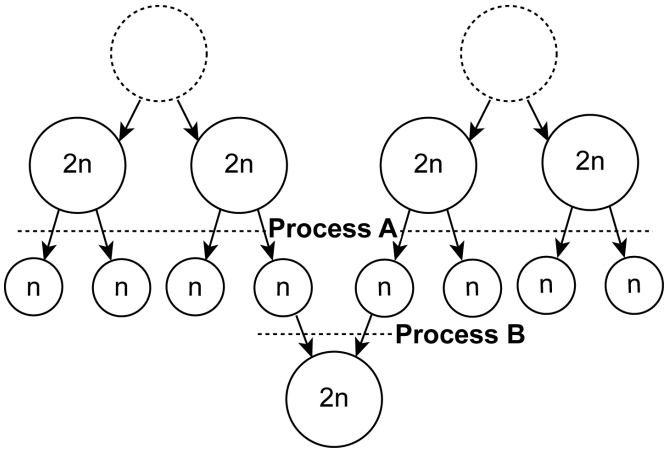
1. The diagram below shows two processes (A and B) involved in sexual reproduction in plants and animals.



Which statement **best** explains how these processes often produce offspring that have traits not present in the parents?

(A) New traits are often observed in offspring because chromosomal nondisjunction often occurs during process A, and this results in extra or missing genes in the offspring, which results in new phenotypes.

(B) New traits are often observed in offspring because homologous chromosomes are separated during process A and then combined during process B, resulting in the expression of recessive genes in the offspring.

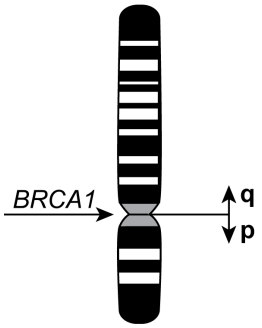
(C) New traits are often observed in offspring because crossing over occurs during process A, and this results in genetic recombination, in which new genes are introduced into the offspring during process B.

(D) New traits are often observed in offspring because, directly following process B, many chromosomes are inactivated, which prevents the expression of many parental genes and results in new traits in the offspring.

Go to next page

2. The diagram below shows the location of the *BRCA1* allele, of which humans possess two copies, one on each homologous pair of chromosome 17.

Chromosome 17



Carrying a harmful *BRCA1* allele greatly increases the risk of breast and uterine cancer. If such an allele is detected in a developing embryo, which prediction **best** explains its transmission to future cells?

(A) The *BRCA1* allele will be passed on to all body cells through mitotic divisions and will be passed on to half of the sex cells during meiosis, because homologous chromosomes are segregated during meiosis.

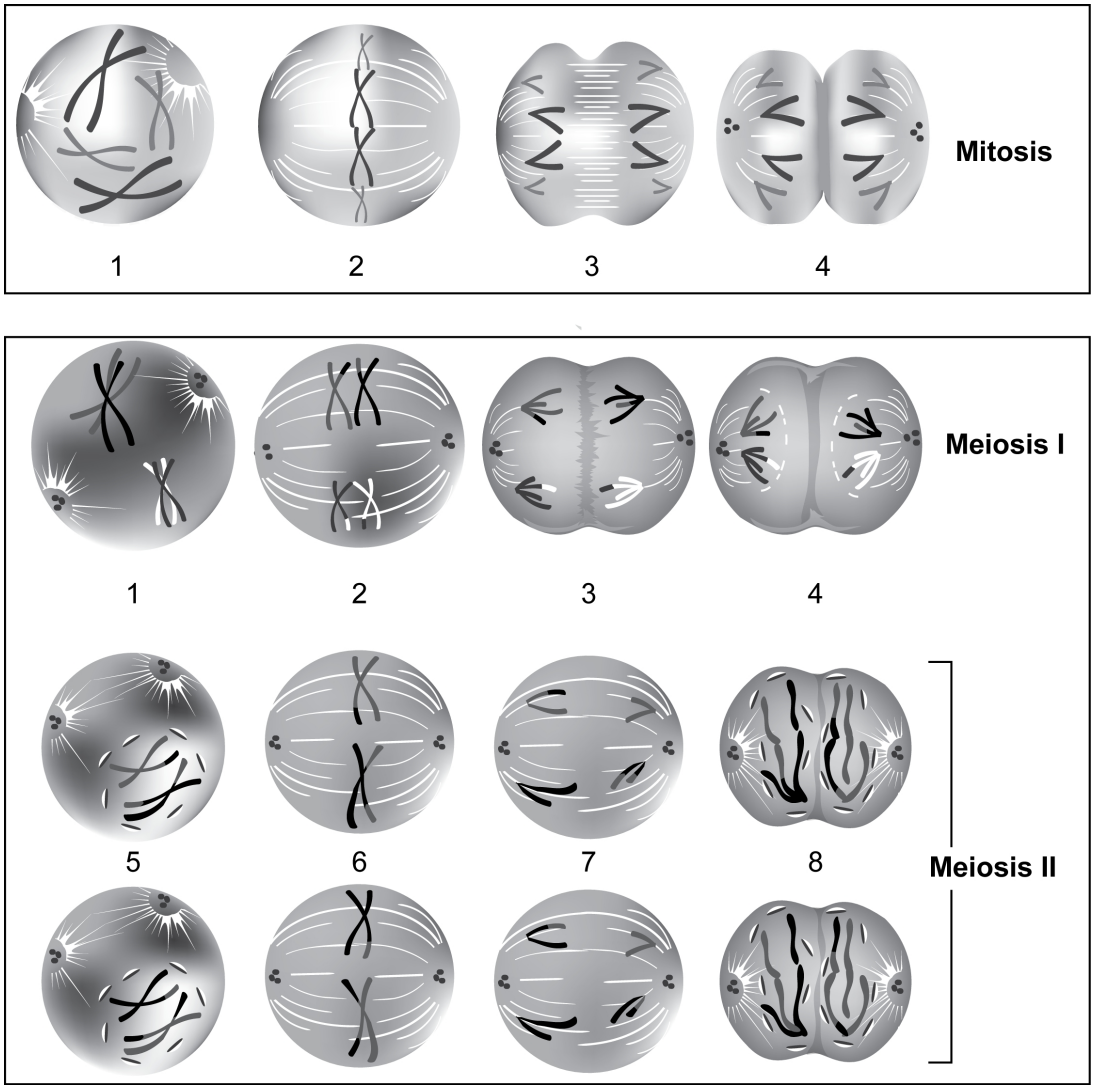
(B) The *BRCA1* allele will be passed on to half of the body cells and one quarter of the sex cells, because half of the daughter cells receive the allele during mitosis and one quarter of the sex cells receive the cell during meiosis.

(C) The *BRCA1* allele will be passed on to cells that develop into breast and uterine tissue through mitotic divisions, but will not be passed on to sex cells, because sex cells are derived from cells in the ovaries.

(D) The *BRCA1* allele will be passed on to half of the body cells through mitotic divisions and will be passed on to half of the sex cells during meiosis, because homologous chromosomes are segregated during cell division.

Go to next page

3. The diagrams below show cells during stages of mitosis and meiosis.



Go to next page

Which statement **best** explains where variation is introduced into daughter cells?

(A) Variation is introduced at stage 1 and stage 2 of meiosis I, because during stage 1, crossing over occurs, and during stage 2, chromosomes are randomly arranged in the middle of the cell and independent assortment occurs.

(B) Variation is introduced at stage 1 of mitosis and meiosis, because during stage 1 of mitosis and meiosis, crossing over of homologous chromosomes occurs.

(C) Variation is introduced at stage 2 of mitosis and meiosis and stage 6 of meiosis, because during these stages, homologous chromosomes are randomly arranged in the middle of the cell and independent assortment occurs.

(D) Variation is introduced at stage 3 and stage 7 of meiosis, because during these stages, different chromosomes are being separated into genetically unique daughter cells.

4. The diagram below shows the karyotype of an insect (2n=10).

The reproductive organs of the insect are exposed to two chemicals that have the following effects on cells:

- DNA replication is prevented.
- Meiosis II is blocked.

Which prediction explains how meiosis will **most likely** be altered in the insect's sex cells when its reproductive organs are exposed to the chemicals?

(A) The insect will produce four diploid sex cells that are genetically identical to the parent cell.

(B) The insect will produce four haploid sex cells that are genetically different from the parent cell.

(C) The insect will produce two diploid sex cells that are genetically identical to the parent cell.

(D) The insect will produce two haploid sex cells that are genetically different from the parent cell.