

## Keystone Biology Cram Sheet: MODULE 2

1. All living things reproduce.
2. Reproduction is either *asexual* (identical copying) or *sexual* (mixing DNA from 2 sources).
3. Cells divide asexually in **mitosis**. Cells divide by **meiosis** to *set up* sexual reproduction.
4. Somewhere in the cell cycle (the life of a cell), the DNA in the nucleus copies itself. This may be referred to as synthesis or replication.
5. DNA is the molecule that contains the code for building living things out of proteins.
6. DNA is built from 2 complementary strands. Every time more DNA is copied, one of the “old” strands becomes complement to the new. This maintains the correct order of the code (usually).
7. DNA may coil up into more visible structures called chromosomes. This occurs when the nucleus/cell is preparing to divide.

8. From smallest to largest:

**nucleotide** → **gene** → **chromosome** → **genome**  
*letter* → *word* → *chapter* → *instruction manual*

9. The human genome is divided into 46 chromosomes (23 types; 2 versions of each)
10. In mitosis, the copied DNA is divided into two new daughter cells, each an *identical copy* of the other. This is how you produce skin cells, for example.
11. In meiosis, the copied DNA is divided twice so that the cells produced have *half the original DNA*, and only one of each of the versions.

### Mitosis

Asexual  
Simple cell division  
Produces 2 identical cells  
The term “diploid” or “2n” may be used to describe these cells  
In us, produces cells w/ 46 chromosomes

### Meiosis

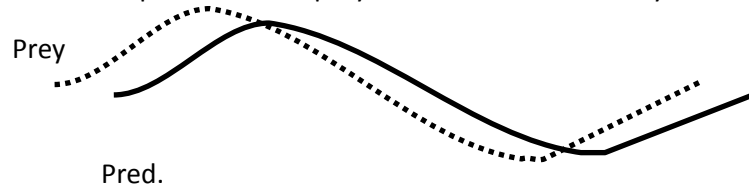
allows sexual reproduction  
“reduction” division  
produces 4 non-identical eggs or sperm  
the term “haploid” or “n” may be used to describe these cells  
In us, produces cells w/ 23 chromosomes

12. If chromosomes or parts of chromosomes **do not separate correctly** during any form of cell division, the cells produced may have too much or too little genetic information.
13. When the similar chromosomes line up early in meiosis, they may swap portions. This is “**crossing over**” and makes the product of meiosis (and sex) more varied and unpredictable.
14. If an egg or sperm has too many or too few chromosomes, the entire organism formed from it will usually not develop. Down syndrome (with an extra 21<sup>st</sup> chromosome) is one of very few survivable situations.
15. What do cells do with their chromosomes?
  - a. Uncoil them when necessary to access a portion of DNA.
  - b. Rewrite the DNA portion as mRNA (transcription; in the nucleus)
  - c. Convert the mRNA message into protein (translation; at the ribosomes)
16. DNA : NUCLEOTIDE (C,T,A, or G) as PROTEIN : AMINO ACID (20 different ones)
17. Different letter = different gene = different protein = **MUTATION**
18. Different protein usually doesn’t function, so **MUTATION = BAD** (usually)
19. Rare good mutations make new functional proteins that give life new characteristics.
20. If nature gives the advantage to organisms with new characteristics they live. If not, they die.  
This is **NATURAL SELECTION**.

21. The accumulation of traits through natural selection creates different organisms.  
This is **SPECIATION**.
22. The big picture combining natural selection and speciation is **EVOLUTION**.
23. A *change in allele frequency* shows evolution.
24. Alleles determine winners in the **competition for resources and mates**; survivors and successful maters pass those alleles on.
25. If an organism has DNA, proteins or structures that are in even a very different organism, they are considered to have evolved from a **common ancestor**.
26. From smallest to largest:

**Organisms → populations → communities → ecosystems** (includes abiotic elements)

27. **Producers** (plants, algae, some bacteria) provide food for ecosystems through photosynthesis.
28. **Consumers** eat producers and other producers creating a food chain or food web.
29. **Decomposers** (other bacteria and fungi) return building blocks of life to the ecosystem.
30. *Succession*- ecosystems change over time until they become a stable community of organisms.
31. As energy (food) moves through each transfer in a food web, **less (10%)** is available.
32. The populations of predators and prey follow each other in a cycle like so:



33. As substances move through a food web, if they aren't broken down they may accumulate in the bodies of the animals near the top. This is called **BIOMAGNIFICATION**.
34. Organisms interact in long-term symbiotic relationships such as:

**Parasitism**- one is harmed

**Mutualism**-both benefit

**Commensalism**- one benefits

35. Sometimes organisms that are brought into a new ecosystem are too successful and displace native organisms.
36. **SOME CHEMICALS MAY ACT AS POLLUTANTS IF THEY:**
  - trap heat in the atmosphere causing the **greenhouse effect**.
  - fertilize water, causing an increase in algae and a decrease in O<sub>2</sub>. (**nutrient/nitrogen pollution**)
  - mess up the hormones of organisms. (**endocrine disrupters**)
  - lower the pH of rain. (**acid rain**)