Station 1: Fossils

Fossils are preserved evidence of prehistoric life. Fossils are either body fossils, like bones, teeth, or shells, or trace fossils, like footprints or burrows. Scientists study fossils to understand the evolutionary history of life.

Since the shape of an animal's teeth depends on what it eats, studying fossil teeth can tell you about a prehistoric animal's food and habitat. Herbivores that eat grasses have a high crown above the root of the tooth. This adaptation is an advantage because the teeth of grass-eating herbivores constantly get worn down by abrasive silica particles in the cells of grass leaves. Herbivores that eat the relatively soft leaves of trees and shrubs have a low crown above the root.

Looking at the pattern of change in horse teeth over the past 50 million years, paleontologists have hypothesized that today's grassland herds of zebra and other horses evolved from forest-dwelling animals that ate the leaves of trees or shrubs.

Questions:

1. Do you think the pattern of change shown by the horse teeth supports this hypothesis? Why or why not?
2. How would you test this hypothesis?
Figure 1. *Hyracotherium* (approx. 52 million years old)
Figure 2. *Mesohippus* (approx. 32–24 million years old)
Figure 3. *Merychippus* (approx. 1.5 million years old)
Figure 4. *Equus* (approx. 5 million years old to present)
Biogeography is the study of species distribution patterns across geographical areas. With the introduction of new technologies, biogeography now also includes the study of gene distribution patterns across geographical regions.

Sickle cells are abnormally shaped red blood cells caused by a recessive mutant gene that codes for an abnormal form of the hemoglobin protein. People who inherit a copy of the mutated gene from each parent develop sickle cell disease, which causes fatigue, pain, stroke, organ damage, and often death before adulthood. People who only have one copy or no copies of the mutant hemoglobin gene are generally healthy.

Since the disease caused by the homozygous condition is deadly, doctors working in Africa were puzzled by the abnormally high rate of the mutant gene found there compared to the rest of the world.

(go to next card)
Station 2: Biogeography (continued)

Working in the 1950s, British doctor Anthony Allison noticed a pattern: populations with elevated rates of the mutant sickle-cell gene are located in the same geographical areas as the organism that causes severe malaria. Malaria is an infectious disease caused by a parasite transmitted by mosquitos. Severe malaria often causes coma and death.

Dr. Allison hypothesized that the evolution of this gene must provide an advantage in regions where malaria is present.

Questions:
1. Do you think the information and map data support Allison's hypothesis? Why or why not?
2. How would you test this hypothesis?
Station 3

After arranging the cards on the phylogenetic tree before, complete the chart in your student book indicating the characteristic that you used in placing the cards.
Station 3 Continued

Key Feature Cards

**Bony Fishes**
- Internal bony skeleton with jaws
- Skin covered with scales
- Release unshelled eggs in water

**Birds**
- Internal bony skeleton with jaws and four limbs
- Fossil members have two extra openings on each side of skull behind eyes
- Skin covered with feathers
- Members lay amniotic eggs

**Lizards**
- Internal bony skeleton with jaws and four limbs
- Fossil members have two openings on each side of skull behind eyes
- Skin covered with scales
- Members lay amniotic eggs

**Mammals**
- Internal bony skeleton with jaws and four limbs
- Skin covered with hair
- Two members produce amniotic eggs, all others bear live young

**Amphibians**
- Internal bony skeleton with jaws and four limbs
- Thin, smooth skin
- Release unshelled eggs in water