Cells, Inheritance and Ecology

Use this key to check answers and read the explanations.

1. In a typical plant root cell, where is most of the cell’s DNA located?
   A. Nucleus
   B. Cell wall
   C. Central vacuole
   D. Cell membrane
   Correct answer: A. Nucleus
   Most of the cell’s DNA is organized into chromosomes in the nucleus. The cell wall, vacuole and membrane have other jobs.

2. Which part of an animal cell forms the boundary that regulates what enters and leaves it?
   A. Ribosome
   B. Nucleolus
   C. Cell membrane
   D. Mitochondrion
   Correct answer: C. Cell membrane
   The cell membrane separates the cell from its surroundings and helps control which substances can move across it.

3. Which structure on a cell diagram should be labeled as the place where proteins are assembled?
   A. Vacuole
   B. Ribosome
   C. Cell wall
   D. Centrosome
   Correct answer: B. Ribosome
   A ribosome links amino acids into a protein chain using information from messenger RNA.

4. Which group represents one biological population at a pond?
   A. All the species that visit any pond in the county
   B. All the turtles, frogs and fish in that pond
   C. All the water and sediment in that pond
   D. All the painted turtles living in that pond
   Correct answer: D. All the painted turtles living in that pond
   A population consists of individuals of the same species living in the same area. Several species living there make up part of a community.

5. A student writes that a pea plant has purple flowers. What does that observation describe?

A. Its exact genotype
B. Its phenotype
C. Its trophic level
D. Its carrying capacity

Correct answer: B. Its phenotype
Flower color is an observable characteristic, so it describes the plant’s phenotype. Color alone may leave more than one genotype possible.

6. A diagram compares a plant leaf cell and an animal cheek cell. Which feature normally surrounds the plant cell outside its membrane and is absent from the animal cell?

A. Cell wall
B. Cytoplasm
C. Nucleus
D. Ribosomes

Correct answer: A. Cell wall
A plant cell has a supporting cell wall outside its membrane. Both kinds of cells have cytoplasm, a nucleus in these typical examples, and ribosomes.

7. Two equal-size spaces contain 12 and 3 particles of the same substance. A barrier lets those particles move freely either way. Which net movement is expected at first?

A. No movement because the two spaces are equal in size
B. From the 3-particle side to the 12-particle side
C. No net movement because both sides have some particles
D. From the 12-particle side to the 3-particle side

Correct answer: D. From the 12-particle side to the 3-particle side
Both sides have the same volume, so 12 particles represent a higher concentration. More particles initially move toward the lower concentration than move in the opposite direction.

8. In a one-gene model, a plant’s genotype is written Bb. What does that tell you about its pair of alleles?

A. It has two copies of the lowercase allele.
B. It has two copies of the uppercase allele.
C. It has two different versions of the gene.
D. It has only one version of the gene and no second copy.

Correct answer: C. It has two different versions of the gene.
B and b mark two different alleles. A genotype with one of each is called heterozygous.

9. A survey already describes the plants and animals living in a marsh. Which addition would describe a nonliving part of the ecosystem?

A. How the water level changes with the seasons
B. How many frog species breed there
C. How many kinds of grass grow there
D. What the herons in the marsh eat

Correct answer: A. How the water level changes with the seasons
An ecosystem includes the living community and its physical setting. Seasonal water level is part of that setting.

10. A food chain goes from algae to a snail, then to a fish, then to a heron. Which organism is the secondary consumer in this chain?

A. Algae
B. Snail
C. Heron
D. Fish

Correct answer: D. Fish
The snail eats the producer and is the primary consumer. The fish eats that primary consumer, so it is the secondary consumer.

11. In a simple inheritance model, one parent is Aa and the other is aa. Each parent passes one of its two alleles at random. What percentage of offspring are expected to have genotype aa?

A. 75%
B. 25%
C. 50%
D. 100%

Correct answer: C. 50%
The aa parent always contributes a. The Aa parent contributes a in half of the equally likely outcomes. Both alleles are a in those outcomes.

12. Two seedlings with the same genotype grow to different heights in different light conditions. Which explanation is consistent with that observation?

A. A height difference proves the seedlings began with different genes.
B. Growing conditions can affect an observable trait.
C. A shared genotype forces both plants to grow to the same height.
D. Plant height describes a genotype directly.

Correct answer: B. Growing conditions can affect an observable trait.
Height is a phenotype. Environmental conditions can influence the height a plant reaches, even if the two plants share a genotype.

13. In a simplified food-chain model, producers store 1,200 units of energy. The primary consumers store 180 units derived from those producers. What percentage of the producers' stored energy ends up stored by those consumers?

A. 85%
B. 12%
C. 18%
D. 15%

Correct answer: D. 15%
Divide 180 by 1,200 to get 0.15, or 15%. The question gives the energy amounts, so there is no need to assume a fixed transfer percentage.

14. Two kinds of shorebirds share a beach. One feeds on small crustaceans near the water. The other takes insects among the dunes. What best explains why their food use may overlap less than their shared location suggests?

A. They feed in different places and use different prey.
B. Both species must eat all food found anywhere on the beach.
C. Sharing a beach gives both species identical feeding niches.
D. The first species must provide all the food for the second.

Correct answer: A. They feed in different places and use different prey.
The beach is shared, but the birds use different feeding areas and prey. Dividing resource use this way can reduce overlap.

15. In a population model, two habitats start with 10 animals each. Both initially gain 5 animals per year. Later Habitat A settles at 30 animals and Habitat B at 60. If those stable sizes reflect environmental limits, what differs between the habitats?

A. Habitat A had the faster initial growth.
B. Habitat B had the larger initial population.
C. The carrying capacity is higher in Habitat B.
D. Both habitats have the same carrying capacity.

Correct answer: C. The carrying capacity is higher in Habitat B.
The model starts both habitats at the same size and growth rate. Their long-term plateaus differ because Habitat B can support more animals under the modeled conditions.