AP Biology Practice

Use this key to check answers and read the explanations.

1. A cell model follows a protein from the rough endoplasmic reticulum toward the outside of the cell. Which organelle usually sorts the protein on this route?

A. Golgi apparatus
B. Nucleolus
C. Mitochondrion
D. Central vacuole

Correct answer: A. Golgi apparatus

The Golgi apparatus receives proteins from the endoplasmic reticulum and sorts them for their destinations. Some are sent to the cell surface for release.

2. A membrane diagram shows water on both faces of a phospholipid bilayer. Where do the phospholipids’ water-attracting heads face?

A. Toward the water on the outer face only
B. Toward the middle of the bilayer on both faces
C. Toward the water on both faces
D. Toward the water on the inner face only

Correct answer: C. Toward the water on both faces

The hydrophilic heads face water on each side. The hydrophobic tails point inward and meet in the middle of the bilayer.

3. A mitosis model shows sister chromatids separating and moving toward opposite poles. Which stage does it show?

A. Prophase
B. Anaphase
C. Metaphase
D. Telophase

Correct answer: B. Anaphase

Sister chromatids move apart during anaphase. During metaphase, duplicated chromosomes first line up near the middle of the cell.

4. In a fictional shrub, BB flowers show blue pigment and GG flowers show gold pigment. BG flowers display both pigments in separate bands. Which inheritance pattern fits both pigments appearing?

A. Polygenic inheritance
B. Incomplete dominance
C. Complete dominance
D. Codominance

Correct answer: D. Codominance
Both alleles show distinct effects in the heterozygote. Incomplete dominance would give an intermediate phenotype.

5. A windstorm knocks down most trees in a fictional woodland and leaves the soil in place. Grasses and shrubs spread, and young trees appear over time. What process does this describe?

A. Primary succession
B. Secondary succession
C. Seasonal migration
D. Resource partitioning

Correct answer: B. Secondary succession
Secondary succession follows a disturbance to an existing community when the soil remains. Primary succession begins where developed soil is absent.

6. Model cells A and B are rectangular boxes. A measures 2 × 2 × 4 µm and B measures 4 × 4 × 1 µm. Count all six faces. Which comparison of membrane area per unit volume is correct?

A. B has the higher ratio because it has more surface area at the same volume.
B. A has the higher ratio because it has more surface area at the same volume.
C. The ratios match because the volumes match.
D. The ratios match because both boxes have six faces.

Correct answer: A. B has the higher ratio because it has more surface area at the same volume.
Both volumes are 16 µm³. A has 40 µm² of surface area and B has 48 µm², so B has more area per unit volume.

7. A model shows small dissolved molecules moving directly between the cytoplasm of two neighboring plant cells through their cell walls. Which structure provides that route?

A. Stomata
B. Tight junctions
C. Desmosomes
D. Plasmodesmata

Correct answer: D. Plasmodesmata
Plasmodesmata are channels through plant cell walls. They connect neighboring cells and allow some substances to pass directly between them.

8. A fictional diploid cell starts meiosis with eight chromosomes. How many chromosomes and chromatids does each daughter cell have immediately after a typical meiosis I?

A. 8 chromosomes and 8 chromatids
B. 4 chromosomes and 4 chromatids
C. 4 chromosomes and 8 chromatids
D. 8 chromosomes and 16 chromatids

Correct answer: C. 4 chromosomes and 8 chromatids
Homologous chromosomes separate in meiosis I. Each daughter cell gets four chromosomes, and each chromosome still consists of two sister chromatids.

9. A fictional plant has genotype RrTt. The two genes assort independently, and each allele in a pair is equally likely to pass on. What fraction of its gametes should carry exactly one uppercase allele?

A. 1/2
B. 1/4
C. 3/4
D. 0

Correct answer: A. 1/2
The four equally likely combinations are RT, Rt, rT, and rt. Two combinations, Rt and rT, have exactly one uppercase allele.

10. In a fictional model, a few seeds start an island population. An allele is rare on the mainland and common among those seeds. The model gives it no survival or reproductive advantage. Which mechanism explains the initial difference?

A. New mutations that arose on the island
B. Ongoing gene flow between established populations
C. Natural selection favoring the allele
D. Founder effect

Correct answer: D. Founder effect

A few founders can carry allele frequencies very different from those of their source population. This chance difference is the founder effect, a form of genetic drift.

11. At four equally spaced ages, a fictional graph records 125, 100, 80, and 64 survivors from one cohort. Which survivorship pattern best describes the intervals shown?

A. A Type III pattern because the first interval loses the largest fraction.
B. A Type I pattern because the fraction lost increases with age.
C. A Type II pattern because each interval loses 20% of those alive at its start.
D. A Type II pattern because each interval loses the same number.

Correct answer: C. A Type II pattern because each interval loses 20% of those alive at its start.

The losses are 25 out of 125, 20 out of 100, and 16 out of 80. Each is 20%, consistent with a Type II pattern over the observed intervals.

12. Two fictional plots of equal area start with 20 and 40 plants of the same species. All survive. They produce 50 and 60 flowers, respectively. What do these observations support?

A. The denser plot produced more flowers per plant. This pattern favors competition.
B. The denser plot produced fewer flowers per plant. This pattern is consistent with competition.
C. The two plots produced the same number of flowers per plant.
D. The flower counts show that density is the only cause of the difference.

Correct answer: B. The denser plot produced fewer flowers per plant. This pattern is consistent with competition.

The low-density plot averaged 2.5 flowers per plant and the high-density plot averaged 1.5. The lower per-plant count fits a possible effect of crowding, and these two observations alone leave other causes open.

13. In a fictional population at Hardy–Weinberg equilibrium, one gene has two alleles, A and a. The frequency of genotype aa is 0.16. What frequency is expected for genotype Aa?

A. 0.64
B. 0.24
C. 0.36
D. 0.48

Correct answer: D. 0.48
If q^2 equals 0.16, then the frequency q of allele a is 0.40. The frequency p of A is 0.60, and the heterozygote frequency is $2pq = 2 \times 0.60 \times 0.40 = 0.48$.

14. In a fictional plant cell model, solute potential is −0.75 MPa and pressure potential is +0.45 MPa. Add these to get the cell’s water potential. If each surrounding solution is considered separately, where does net water movement initially go for X at −0.10 MPa and Y at −0.50 MPa?

A. Into the cell with X and out of the cell with Y.
B. Out of the cell with X and into the cell with Y.
C. Into the cell with both X and Y.
D. Out of the cell with both X and Y.

Correct answer: A. Into the cell with X and out of the cell with Y.
The cell is at −0.30 MPa. Water moves from higher to lower water potential, so it enters from X and leaves toward Y.

15. A fictional data set has 84 red and 36 cream flowers. A model predicts a 3 red to 1 cream ratio. Calculate chi-square as the sum of $(\text{observed} - \text{expected})^2 / \text{expected}$. Using the critical value 3.84, which conclusion follows?

A. 3.84 with insufficient evidence to reject the 3 to 1 model.
B. 1.60 with sufficient evidence to reject the 3 to 1 model.
C. 1.60 with insufficient evidence to reject the 3 to 1 model.
D. 6.00 with sufficient evidence to reject the 3 to 1 model.

Correct answer: C. 1.60 with insufficient evidence to reject the 3 to 1 model.
The predicted counts out of 120 are 90 and 30. The statistic is 36/90 + 36/30 = 1.60. It is below 3.84, so this test does not give sufficient evidence to reject the model.