

Genetics

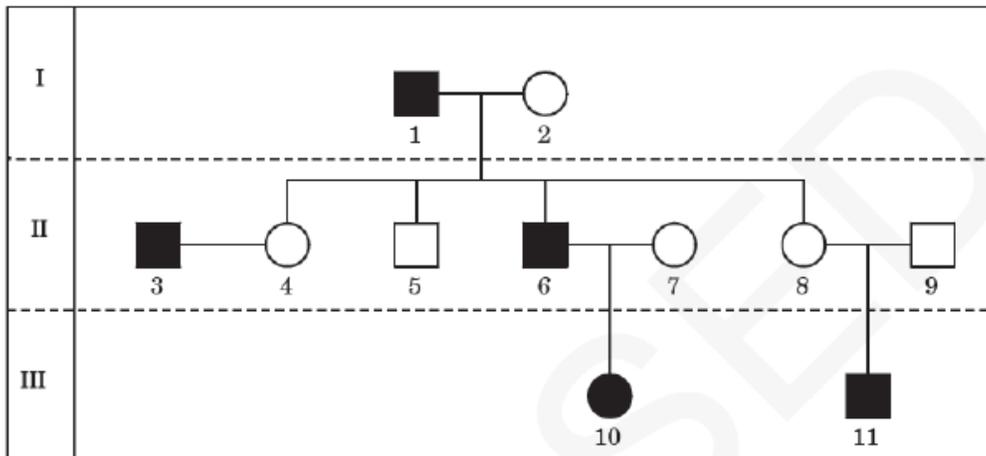
1. Which set of parents can most likely produce a child with type O blood?
 - a. One parent with type AB blood, and the other parent with type A blood.
 - b. One parent with type AB blood, and the other parent with type O blood.
 - c. One parent with heterozygous type A (AO) blood, and the other with type O blood.
 - d. One parent with homozygous type A (AA) blood, and the other parent with homozygous type B (BB) blood.
2. One of the parents of a child has with phenylketonuria (PKU), which is caused by recessive (pp) alleles. The other parent does not have PKU alleles (PP). What is the chance that the couple will have a child with PKU (pp)
 - a. 0%
 - b. 50%
 - c. 75%
 - d. 100%
3. This chart shows the results of several crosses with white-feathered chickens and dark-feathered chickens.

Cross	Parental Feather Colors	Offspring Feather Colors
1	White × White	100% White
2	White × White	75% White, 25% Dark
3	White × Dark	50% White, 50% Dark
4	Dark × Dark	100% Dark

Which cross would be represented by $Aa \times aa$, where (A) represents a dominant allele and (a) represents a recessive allele?

- a. Cross 1
- b. Cross 2
- c. Cross 3
- d. Cross 4

This diagram shows a pedigree for a recessive genetic disorder. Use it to answer questions 4-5



4. What is the mode of inheritance for this trait?
 - a. Autosomal dominant
 - b. X-linked dominant
 - c. Autosomal recessive
 - d. X-linked recessive

5. What is the genotype of individual 3?
 - a. $X^{h}Y$
 - b. $X^{H}Y$
 - c. $X^{H}X^{H}$
 - d. $X^{H}X^{h}$

6. Why do identical twins become less alike as they grow older?
 - a. Because the environment plays a role in influencing individuals.
 - b. Because the genetic makeup of the individuals' changes.
 - c. Because the individuals' cells undergo mitosis.
 - d. Because the number of recessive alleles exceeds the number of dominant alleles.

7. Hitchhiker's thumb (H) is dominant to no hitchhiker's thumb (h). A woman who does not have hitchhiker's thumb marries a man who is heterozygous for hitchhiker's thumb. What is the probable genotypic ratio of their children?
 - a. 0% Hh: 100% hh
 - b. 50% Hh: 50% hh
 - c. 25% Hh: 75% hh
 - d. 100% Hh: 0% hh

Evolution

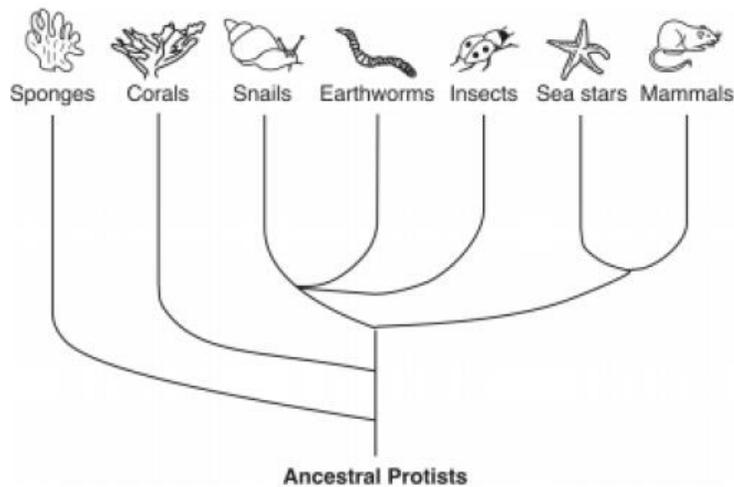
8. What types of organisms developed **first** due to early conditions on Earth?
 - a. Aerobic prokaryotes
 - b. Anaerobic prokaryotes
 - c. Aerobic eukaryotes
 - d. Anaerobic eukaryotes

9. Which gas was **absent** in primitive Earth's atmosphere?
 - a. Methane
 - b. Nitrogen
 - c. Ammonia
 - d. Oxygen

10. The idea that organisms evolve through a process called natural selection was proposed by:
 - a. James Watson
 - b. Gregor Mendel
 - c. Francis Crick
 - d. Charles Darwin

11. Which of these best illustrates natural selection?
 - a. An organism with favorable traits will survive and mate successfully.
 - b. The largest organism will be the one to have mating opportunities.
 - c. A population uses all the resources and forces others to migrate.
 - d. A group of organisms work together to share existing resources.

12. How is evolution of long necks in giraffes best explained?
 - a. Short neck giraffes were killed by long neck giraffes.
 - b. Giraffes with shorter neck did not mate with giraffes with longer necks.
 - c. Longer neck giraffes could reach food and survive better than those with shorter necks.
 - d. Giraffes could not reach food so they stretched their necks and over time they got longer.



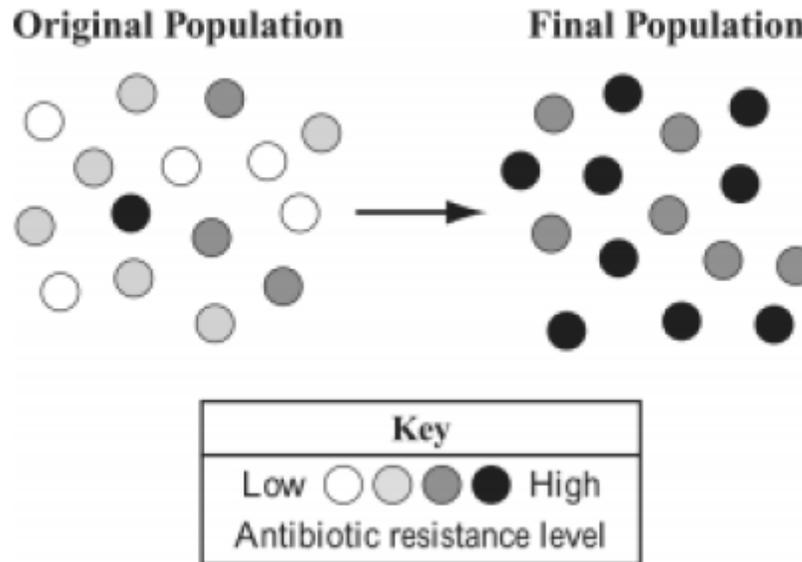
13. Based on the diagram above, which two organisms are most closely related?
- Sponges and Sea Stars
 - Corals and Insects
 - Insects and Sea Stars
 - Snails and Earthworms
14. Which of the following could be considered biochemical evidence of an evolutionary relationship?
- Similar anatomical structures
 - Absence of vestigial structures
 - Presence of identical proteins
 - Presence of embryonic gill slits
15. Rhinoceroses and horses are related. They have very similar digestive systems and an odd number of toes on their feet. Horses have one toe, and rhinoceroses have three. These facts BEST support which claim?
- Horses and rhinoceroses share a common ancestor.
 - Horses and rhinoceroses are genetically identical.
 - Horses are the ancestors of modern rhinoceroses.
 - Horses have descended from modern rhinoceroses.
16. The birds shown in the chart below are all in the same population. Which of these birds had the MOST reproductive success overall?

Bird Study

Female Bird	F ₁ generation	F ₂ generation
Bird 1	4	16
Bird 2	4	8
Bird 3	8	25
Bird 4	12	18

- Bird 1
- Bird 2
- Bird 3
- Bird 4

The diagram below represents the changes in a population of bacteria as a result of exposure to antibiotics over time.

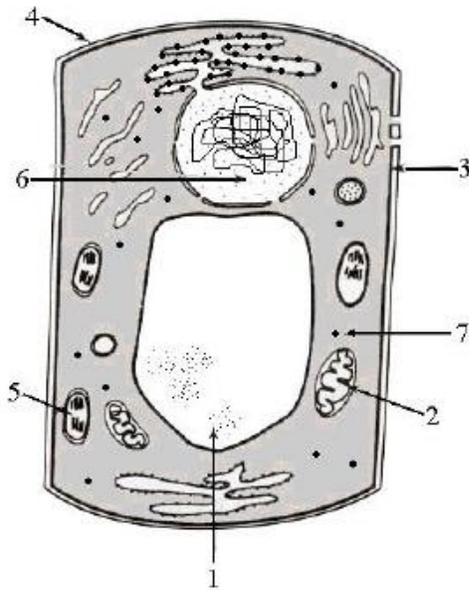


17. Over time, what has happened to the population of bacteria cells?
- The bacteria cells have a low level of resistance.
 - The bacteria cells have a medium level of resistance.
 - The bacteria cells have no resistance.
 - The bacteria cells have a high level of resistance.
18. **ALL** of the following is evidence for evolution **EXCEPT**:
- Comparing behavior
 - Comparing anatomy
 - Comparing biochemistry
 - Comparing fossils

Cells

19. Cells are either prokaryotic or eukaryotic, depending on whether they:
- Contain genetic material
 - Have a cell wall
 - Have a nucleus and membrane-bound organelles
 - Contain chloroplasts

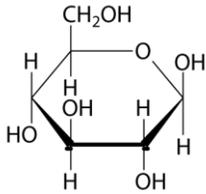
Use the numbered diagram of the cell to answer questions 20-25.



20. What is structure number 1?
- Central vacuole
 - Ribosome
 - Cell membrane
 - Cell wall
21. What is structure number 6?
- Central vacuole
 - Ribosome
 - Mitochondria
 - Nucleus
22. What is structure number 2?
- Nucleus
 - Central vacuole
 - Mitochondria
 - Lysosome
23. What is the function of structure number 2?
- Releases energy from food by respiration.
 - Moves food through the organism by transport.
 - Makes another copy of the organism by reproduction.
 - Removes waste by excretion.
24. What is structure number 7?
- Nucleus
 - Lysosome
 - Ribosome
 - Mitochondria
25. What types of cell have structure number 3?
- Plant cells
 - Animal cells
 - Bacterial cells
 - All of the above

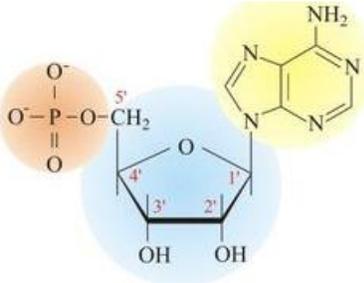
Macromolecules

26. What macromolecule does the image below belong to?



- a. Lipid
- b. Protein
- c. Nucleic acid
- d. carbohydrate

27. Look at the monomer below. To which macromolecule does it belong?



- a. DNA
- b. RNA
- c. Carbohydrate
- d. Glycogen

28. Many of the proteins in the human body are enzymes that catalyze chemical reactions. What is the relationship between enzymes and activation energy?

- a. When an enzyme catalyzes a reaction, it increases the activation energy of the reaction.
- b. When an enzyme catalyzes a reaction, it decreases the activation energy of the product.
- c. When an enzyme catalyzes a reaction, it increases the activation energy of the product.
- d. When an enzyme catalyzes a reaction, it decreases the activation energy of the reaction

29. Potatoes are root plants and as a result, they often act as glucose storage sites for plants and contain large amounts of

- a. Glycogen
- b. Chitin
- c. Starch
- d. Cellulose

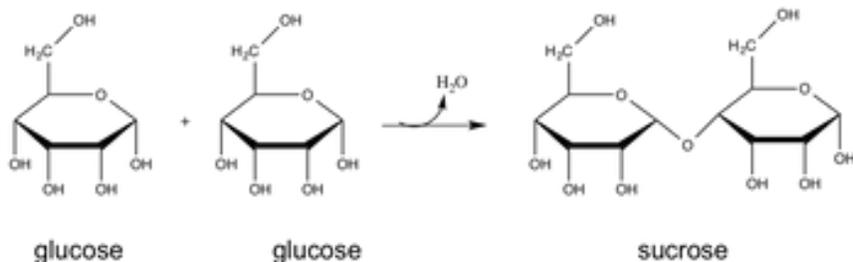
30. A DNA sample contains 30% thymine. What percentage of the sample contains cytosine?

- a. 20%
- b. 40%
- c. 70%
- d. 60%

31. Which statement about the cellular nucleic acids DNA and RNA is incorrect?

- a. DNA is double-stranded, and RNA is single-stranded.
- b. The sugar in DNA is deoxyribose, and in RNA the sugar is ribose.
- c. DNA has a helix shape; RNA does not.
- d. RNA and DNA have the same four nitrogen-containing bases.

32. Which reaction is taking place in the image below?



- a. Hydrolysis reaction
- b. Reproduction reaction
- c. Dehydration synthesis reaction
- d. A combination of hydrolysis and dehydration

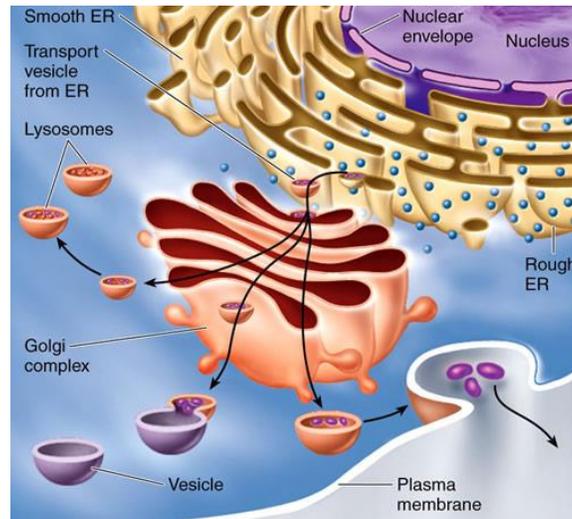
33. Group A and B in the table below contain molecular formulas of compounds.

Group A	Group B
$C_6H_{12}O_6$ $C_{12}H_{22}O_{11}$	$NaCl$ NH_3

How would the compounds in these groups be chemically classified?

- a. Group A- Inorganic; Group B-Organic
 - b. Group A- Organic; Group B-Inorganic
 - c. Group A- Monosaccharides; Group B-Disaccharides
 - d. Group A-Proteins; Group B-Lipids
34. Which of the following is CORRECT about the central dogma?
- a. It begins with generating a tRNA message from a DNA template.
 - b. Proteins are produced before a mRNA message is transcribed.
 - c. It begins with the generation of an mRNA message from a DNA template.
 - d. Proteins are generated directly from the DNA template
35. The sequence of amino acids is carried to the ribosome by mRNA in the form of
- a. The original DNA sequence
 - b. As a triplet codon found within the tRNA
 - c. As a triplet codon found within the DNA.
 - d. As a triplet codon found within the mRNA

36. The endomembrane system plays an important role the production and modification of a protein. Using the image below, describe how the endomembrane system is an example of organelles working together to perform a larger task. Your response should be written in CER format.



C:

E:

R:

37. Two linked botanical processes are represented in the table below. Different energy transformations take place during these processes.

Process	Reactants	Products	Type of Energy Transformation
1	A	B	Chemical to Mechanical
2	B	A	Radiant to Chemical

Suppose B is carbon dioxide and water. What are processes 1 and 2 and how are they linked?

Your answer should be in CER form and include the following in the Rationale:

- The process for each transformation
- The product and reactant for each transformation

C:

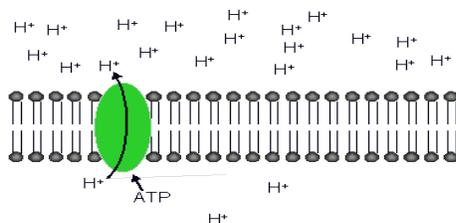
E:

R:

Above and Beyond

This section contains above and beyond questions to sharpen your skills when we return on April 7th. If we were to be out longer than through April 7th for any reason, these should be completed by all students." Fill in your answers on the bubble sheet below QUESTION #25!

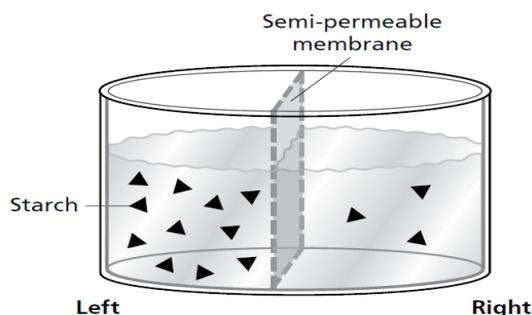
1. Look at the cross section of a cell membrane of a eukaryotic cell. H^+ ions are being pumped from a low concentration to a high concentration.



How do you describe this type of transport across the cell membrane?

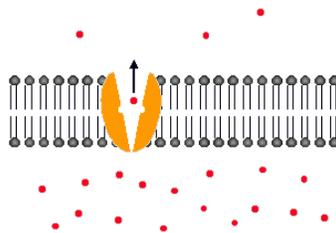
- a. active transport
 - b. passive transport
 - c. facilitated diffusion
 - d. co-transport
2. The diagram to the right shows a container divided into two compartments by a membrane permeable to water but not to starch. Two solutions containing different concentrations of dissolved starch were placed on each side of the membrane.

Which of the following describes what will happen to the water level during the process of osmosis?

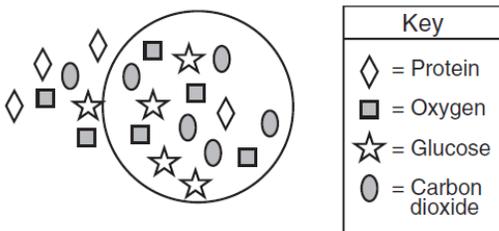


- a. The water level on both sides of the membrane will decrease.
 - b. The water level on the right side of the membrane will increase.
 - c. The water level on the left side of the membrane will increase.
 - d. The water level on both sides of the membrane will stay the same.
3. Describe a cell that is in an isotonic environment.
 - a. When the amount of water in a cell is higher than the amount of solute in a cell
 - b. Movement of water across a semi permeable membrane
 - c. A cell that has an equilibrium of water to solute.
 - d. When the amount of water and solute in a cell are at equilibrium.
 4. A semipermeable membrane sac filled with water and large molecules of potassium is suspended in a beaker of distilled water. What will happen?
 - a. The potassium will leave and the water will enter until both sides reach equal concentrations.
 - b. Water will enter the sac and it will swell.

- c. Because the potassium cannot leave, the water cannot enter.
 - d. We cannot determine the outcome unless we know the tonicity of the solutions.
5. What type of transport allows cells to move molecules from an area of low concentration to an area of high concentration?
- a. Osmosis
 - b. Simple diffusion
 - c. Facilitate diffusion
 - d. Active transport
6. In an emergency trauma room, a doctor accidentally gives a patient a large transfusion of distilled water directly into one of his veins instead of blood. Predict what might happen if distilled water was given to the patient instead of blood.
- a. have no unfavorable effect as long as the water was ~~sterile~~
 - b. have serious, perhaps fatal effects because there would be too much fluid for the heart to pump.
 - c. have serious, perhaps fatal effects because the red blood cells would tend to ~~shrink~~
 - d. have serious, perhaps fatal effects because the red blood cells would tend to ~~burst~~
7. The cell membrane controls movement of materials into and out of the cell. The following particles are moving from high concentration to low concentration and are using a carrier protein. How would you describe this type of movement across the membrane?

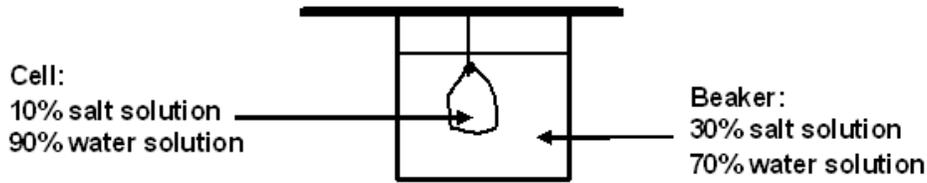


- a. simple osmosis
 - b. active transport
 - c. simple diffusion
 - d. facilitated diffusion
8. The diagram below shows the relative concentration of molecules inside and outside of a cell.



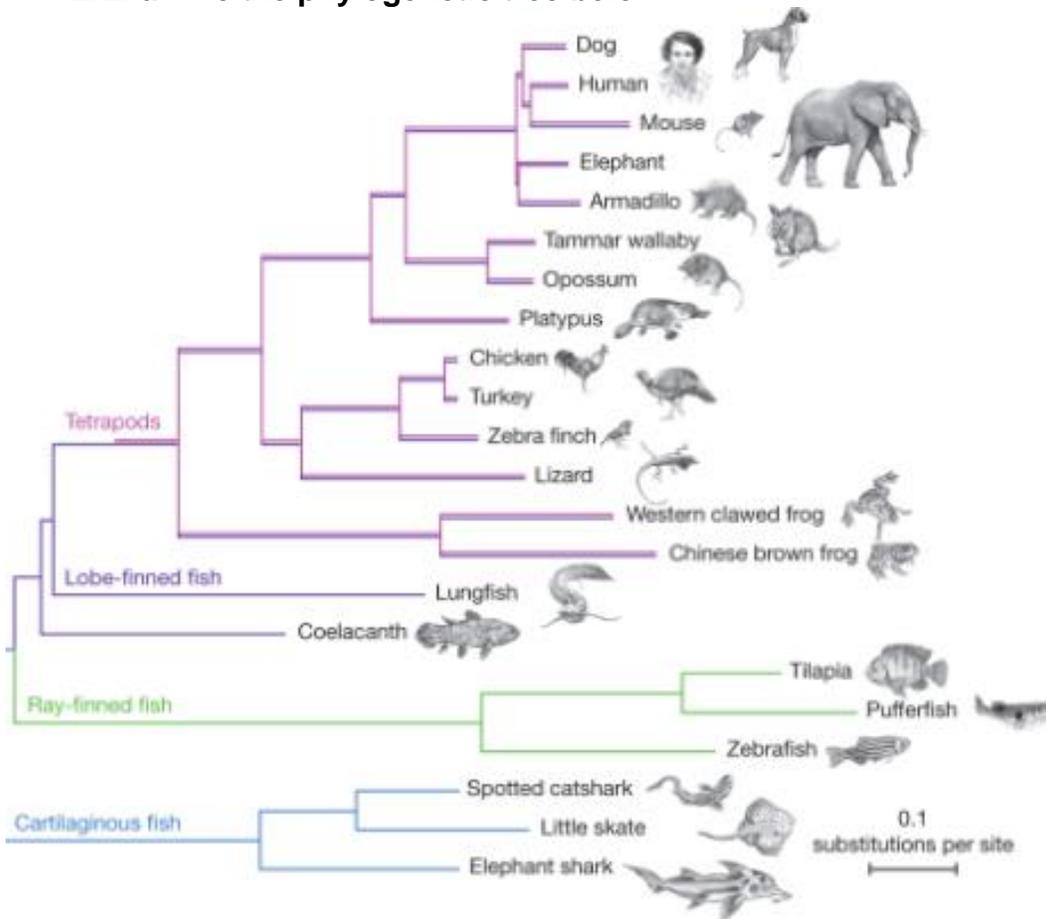
- Which statement best describes the general direction of diffusion across the membrane of this cell?
- a. Glucose would diffuse into the cell.
 - b. Protein would diffuse out of the cell.
 - c. Carbon dioxide would diffuse out of the cell.
 - d. Oxygen would diffuse into the cell.

11. Osmosis occurs when there is a different concentration of solute molecules on each side of the membrane. The drawing below shows a beaker containing a 30% salt solution and a suspended cell containing a 10% salt solution. What statement best describes the cell after 20 minutes?



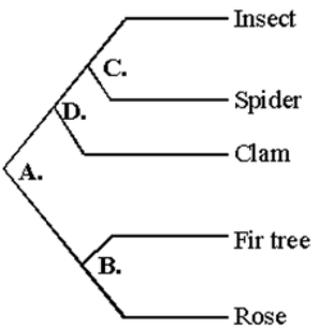
- A. Water will move from the cell into the beaker, resulting in a smaller cell.
- B. Water will move from the beaker into the cell, resulting in a larger cell.
- C. Salt will move from the cell into the beaker, resulting in a smaller cell.
- D. Salt will move from the beaker into the cell, resulting in a larger cell.

12. Examine the phylogenetic tree below.



What would be true of the tetrapods?

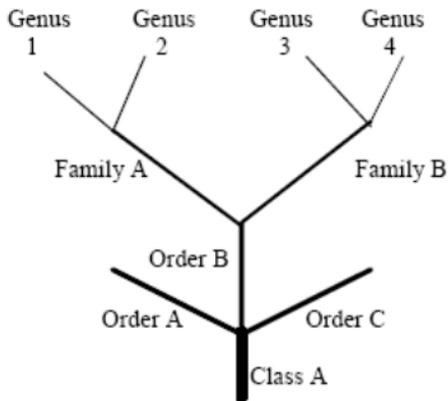
- a. Tetrapods are the most recent common ancestor of dogs and lizards
- b. Tetrapods are the most recent common ancestor of dogs, lizards, and lungfish
- c. Tetrapods are decedents of the Chinese brown frog and the dog
- d. Tetrapods are the most recent common ancestor of Coelacanth and lungfish



13. At which point do plants and animals diverge, according to the diagram above?

- a. **A**
- b. **B**
- c. **C**
- d. **D**

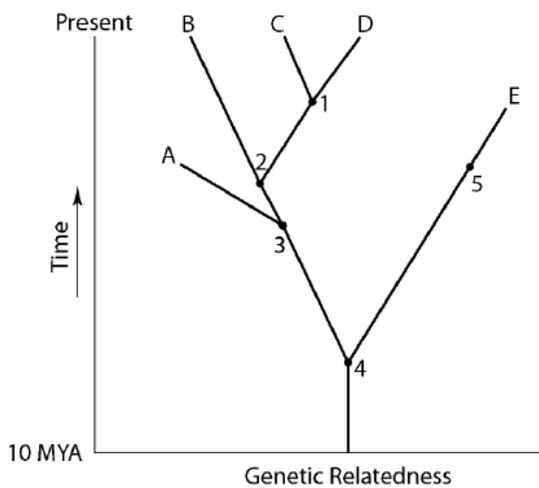
14. The diagram below shows the evolutionary relationships between several groups of organisms.



Which groups would be most similar in their biochemistry?

- a. Genus 1 and Genus 3
- b. Genus 3 and Genus 4
- c. Genus 2 and Genus 3
- d. Genus 1 and Genus 4

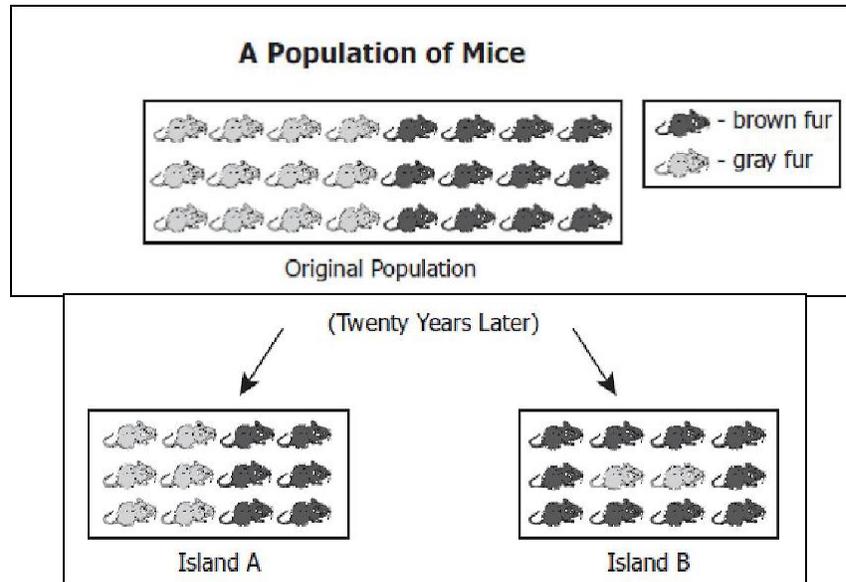
15. A common ancestor for both species C and E could be at position number



- a. 1
- b. 2
- c. 3
- d. 4
- e. 5

16. The two species that are most closely related to each other in the figure in question 2 are
- A and B
 - B and C
 - C and D
 - D and E
 - E and A

The population of mice below was split into two equal groups and sent to different islands (prior to this, there were no mice Island A or Island B). Initially there were an equal number of brown and gray mice on each island.



17. Which statement best explains why there is a difference in the mouse population on Island A and Island B after 20 years?
- More brown mice must have been sent to Island B than Island A.
 - The capturing of mice on Island A and Island B was done differently.
 - On island A the allele for brown fur was dominant, while on Island B the allele for gray fur was dominant.
 - Conditions on island B favored brown-furred individuals, while both fur colors were evenly favored on Island A.

18. The chart below compares the base sequences of DNA from three primates. Based on this information, how many differences would you expect to be in the sequence of amino acids of the human and the chimpanzee?

- 2
- 3
- 4
- 7

DNA Base Sequence Comparison

Human	AGG CAT AAA CCA ACC GAT TAA
Chimpanzee	AGG CCC CTT CCA ACC GAT TAA
Gorilla	AGG CCC CTT CCA ACC AGG CCA

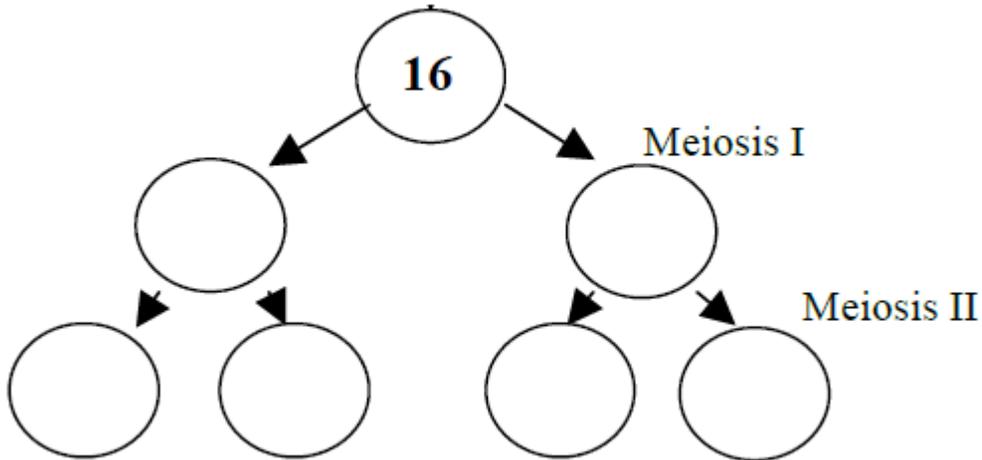
19. The theory of continental drift states that Africa and South America slowly drifted apart after once being a single landmass. The monkeys on the two continents, although similar, show numerous genetic differences. What factor is probably the most important in leading to these differences?
- similar embryos
 - similar structures
 - fossil records
 - geographic isolation

20. The table below shows the number of amino acid differences between the protein sequences of various organisms in relation to humans. Using the data, which two organisms are most related to humans?

Species	Number of Amino Acid Differences
Human	0
Frog	67
Gorilla	1
Horse	26
Pig	10

- frog and gorilla
 - gorilla and horse
 - gorilla and pig
 - pig and horse
21. Brandy knows that chromosomes behave differently in meiosis and mitosis. What do chromosomes do in meiosis but NOT in mitosis?
- Each chromosome makes a copy.
 - The homologous chromosomes form pairs.
 - Chromosomes line up in the middle of the cell.
 - Sister chromatids separate into different daughter cells.
22. Which of the following statements about meiosis is true?
- The resulting cells of meiosis are genetically identical to each other
 - Two cells result from the process of meiosis
 - The resulting cells of meiosis are diploid
 - Meiosis forms our sex cells
23. In humans, the **sex cells** contain:
- 44 autosomes and 2 sex chromosome
 - 2 autosome and 44 sex chromosomes
 - autosome and 22 sex chromosomes
 - 22 autosomes and 1 sex chromosome

24. What will the chromosome number be in each cell at level IV?



- A. 4
- B. 8
- C. 16
- D. 32

25. What chromosome should a sperm carry to produce a normal male offspring?

- A. X chromosome.
- B. chromosome.
- C. X and Y chromosome.
- D. none of the above

GradeCam ID

--	--	--	--

- | | | |
|-------------------------|-------------------------|-------------------------|
| 1. (A) (B) (C) (D) (E) | 11. (A) (B) (C) (D) (E) | 21. (A) (B) (C) (D) (E) |
| 2. (A) (B) (C) (D) (E) | 12. (A) (B) (C) (D) (E) | 22. (A) (B) (C) (D) (E) |
| 3. (A) (B) (C) (D) (E) | 13. (A) (B) (C) (D) (E) | 23. (A) (B) (C) (D) (E) |
| 4. (A) (B) (C) (D) (E) | 14. (A) (B) (C) (D) (E) | 24. (A) (B) (C) (D) (E) |
| 5. (A) (B) (C) (D) (E) | 15. (A) (B) (C) (D) (E) | 25. (A) (B) (C) (D) (E) |
| 6. (A) (B) (C) (D) (E) | 16. (A) (B) (C) (D) (E) | |
| 7. (A) (B) (C) (D) (E) | 17. (A) (B) (C) (D) (E) | |
| 8. (A) (B) (C) (D) (E) | 18. (A) (B) (C) (D) (E) | |
| 9. (A) (B) (C) (D) (E) | 19. (A) (B) (C) (D) (E) | |
| 10. (A) (B) (C) (D) (E) | 20. (A) (B) (C) (D) (E) | |

0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Form Identifier — DO NOT MARK

