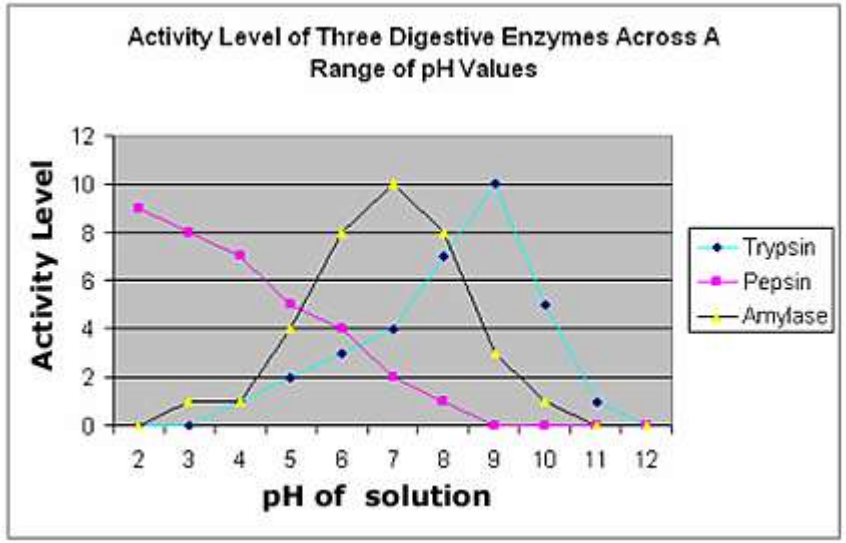
1) SB1a. A student is observing a group of cells under a microscope. What observation would help her conclude that they are plant cells?

A) The presence of nuclei can be clearly detected within each cell.
B) The cells appear well-defined, indicating the presence of cell walls.
C) The presence of mitochondria can be clearly detected within each cell.
D) The cytoplasm in which the cell organelles are embedded can be clearly seen.

B) The cells appear well-defined, indicating the presence of cell walls.

2. The graph illustrates the relative activity levels of three common enzymes. Which enzyme is most active at a neutral pH of 7?



A) pepsin
B) trypsin
C) amylase
D) pepsin and amylase

C) amylase

3) SB1c _____ are lipids that store energy and are typically composed of multiple building blocks containing three fatty acids attached to a glycerol molecule.

A) Fats

B) Phospholipids

C) Proteins

D) Steroids

A) Fats

4) SB1d. About two-thirds of a cell is composed of water. What is the name of the process in which water is moved into or out of the cell membrane to maintain homeostasis?

A) diffusion

B) endocytosis

C) exocytosis

D) osmosis

D) osmosis

5) SB2a. Changes in the DNA sequence, or mutations, help drive

A) amino acid coding.

B) deamination events.

C) evolutionary change.

D) environmental interaction.

C) evolutionary change.

6) SB2c. Each body cell of an octopus contains thirty-two chromosomes. The number of chromosomes in a octopus egg cell will be

- A) 8.
- B) 16.
- C) 32.
- D) 64.

B) 16.

7) SB2d. Parents can pass on chromosomes to their children that are different than their own when the new gene combinations are created by

- A) crossing over of sister chromatids during meiosis.
- B) crossing over of sister chromatids during mitosis.
- C) crossing over of homologous chromosomes during mitosis.
- D) crossing over of homologous chromosomes during meiosis

D) crossing over of homologous chromosomes during meiosis

8) SB2f. Which technique would be the most useful in determining the father of a child in a paternity suit?

- A) DNA fingerprinting
- B) karyotype of father and child
- C) polymerase chain reaction (PCR)
- D) computer-generated parental Punnett square

A) DNA fingerprinting

9) SB3a. The two main processes by which plant cells absorb, release, and use energy are

- A) fermentation and respiration.
- B) digestion and photosynthesis.
- C) photosynthesis and respiration.
- D) aerobic and anaerobic respiration

C) photosynthesis and respiration.

10) SB3b. Which group of organisms is most closely related to Archeabacteria?

- A) Animalia
- B) Fungi
- C) Plantae
- D) Protista

D) Protista

11) SB3c. Scientists use the binomial nomenclature to identify and name organisms. All BUT one statement is true about the binomial system of classification. Which statement is false?

- A) The family and species name are given.
- B) It is a system devised by Carolus Linnaeus.
- C) The name of the organism is written in Latin.
- D) The system is universally accepted so an organism has the same name to all biologists.

A) The family and species name are given.

12) SB3d. The protein coat that envelopes the viral genetic material is known as a:

- A) Virion
- B) Case
- C) Viroid
- D) Capsid

D) Capsid

13) SB4a. Most of the trees of Denali Park, Alaska, are evergreen spruce. The soil in this area is rich and acidic. What biome is Denali Park located in?

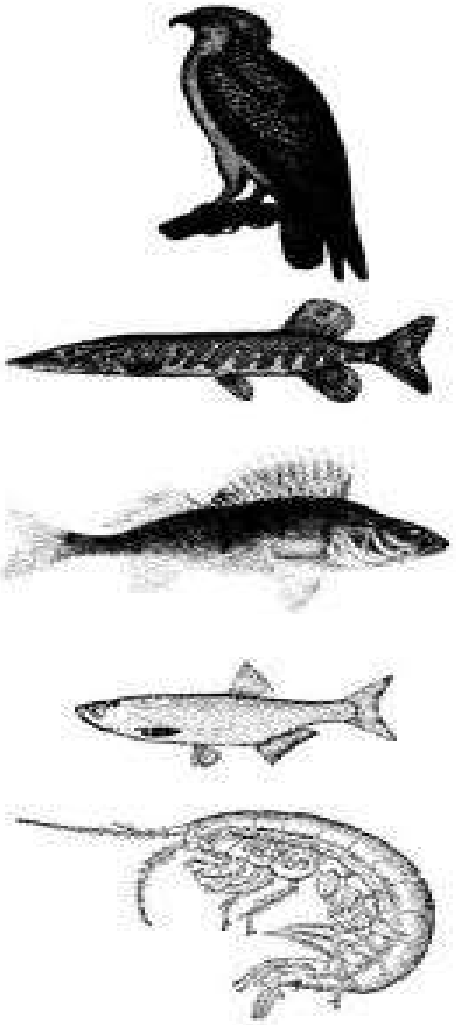
- A) taiga
- B) tundra
- C) arctic forest
- D) temperate forest

A) taiga

14)SB4b.

In this food chain, we could hypothetically assume that for every kilogram of biomass in the osprey eagle, it would require _____ kilograms of shrimp to keep the food chain balanced.

- A) 10
- B) 100
- C) 1,000
- D) 10,000



D) 10,000

15)SB4d Which is a reason for the rise of nitrate levels in ground water?

- A) overuse of fertilizers
- B) ammonification by animals
- C) soil erosion at grasslands
- D) nitrogen fixation by Azotobacter

A) overuse of fertilizers

16)SB5a. In order to support his theory of evolutionary change, Charles Darwin concentrated his studies on the many species of finches in the Galapagos Islands. Darwin noted that many of the birds had different shapes and styles of beak.
What is a possible explanation for what Darwin observed?

- A) The birds had beaks that were adapted for feeding differently.
- B) Some birds had been injured by predators and were poor competitors.
- C) People had bred the bird to have beaks with varied shapes and sizes.
- D) The birds had different beaks because females preferred certain beak shapes over others.

A) The birds had beaks that were adapted for feeding differently.

17)SB5b.
The pygmy hippo, shown in the photograph, typically weighs no more than 500 pounds and is about the size of a large pig. The much larger river hippopotamus usually weighs between 3,000 and 6,000 pounds. There are no living species of hippos that are medium-sized. Which term is used to describe evolutionary selection which results in greater numbers of individuals at the extremes of the distribution and few at the center of the distribution?

- A) adaptive
- B) directional
- C) disruptive
- D) validating

C) disruptive

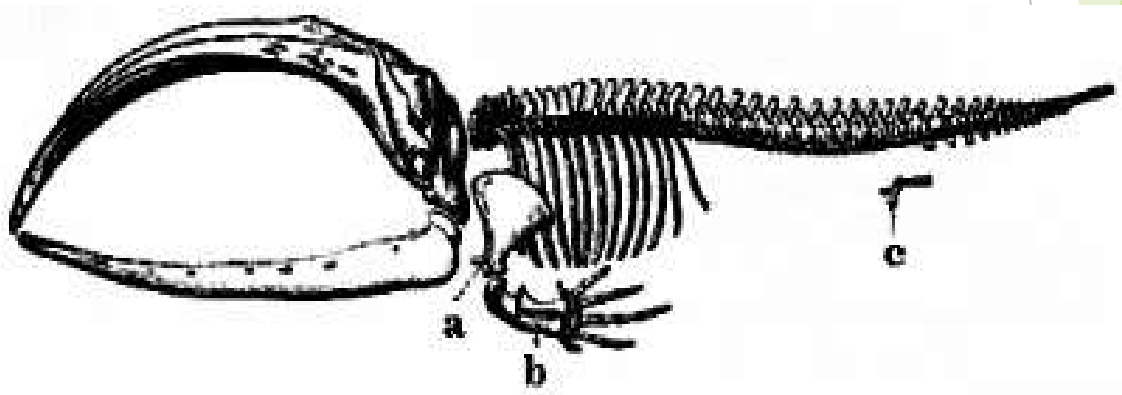
18)SB5c. About 96% of the information in human DNA is found in gorilla DNA. This evidence supports which statement?

- A) Humans evolved from gorillas.
- B) Gorillas and humans diverged from a common ancestor.
- C) As gorillas evolve, they will become more similar to humans.
- D) Gorillas and humans are too different for meaningful genetic comparisons

B) Gorillas and humans diverged from a common ancestor.

19) SB5c.
Whales are thought to have evolved from land animals similar to large otters. As evidence of this, whales have useless leg bones (structure C) that float inside their bodies. These leg bones are _____ structures.

- A) vestigial
- B) homologous
- C) analogous
- D) evolutionary



A) vestigial

20)SB5d) The snowshoe rabbit has white fur in winter and dark fur in summer. What is the main survival advantage of this fur color change to the rabbit?

- A) The light fur keeps the rabbit from getting sunburned in summer.
- B) The fur color is an adaptive form of camouflage to avoid predators.
- C) The dark fur absorbs more sunlight so the rabbit is warmer in winter.
- D) The white fur is more valuable to fur trappers, so the animal will be trapped and better fed in winter.

B) The fur color is an adaptive form of camouflage to avoid predators.

21) SB1a. Your science teacher has asked the class to make a cell city model. Which building or business in the city could represent the mitochondria, and why?

- A) city dump - waste storage
- B) city hall - control center
- C) roads - transportation system
- D) power company - produces energy

power company - produces energy

22) SB1b. In the lock-and-key model of enzyme action, the _____ fits into the _____ of the enzyme.

- A) product; substrate.
- B) active site; product.
- C) substrate; active site.
- D) active site; substrate.

C) substrate; active site.

23) SB1c. All BUT one of the following is a component of nucleic acids. Nucleic acids DO NOT contain

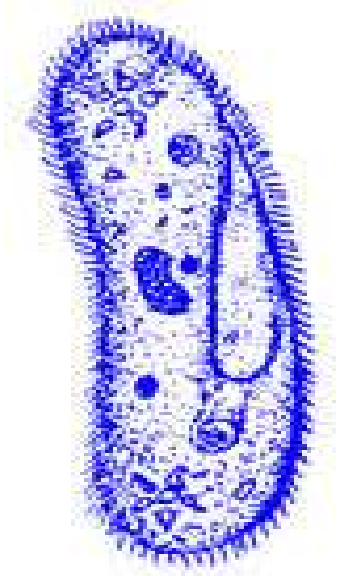
- A) phosphates.
- B) amino acids.
- C) ribose sugars.
- D) nitrogenous bases.

B) amino acids.

24)SB1d.

In some freshwater organisms there is a structure called a contractile vacuole that regulates water movement into and out of the cell. What explains the existence of the CV?

- A) The CV prevents the organism from drying out.
- B) The CV assists the organism in capturing prey.
- C) The CV helps the organism move through the water.
- D) The CV helps the organism maintain osmotic pressure.



D) The CV helps the organism maintain osmotic pressure.

25) SB2b. A single strand of DNA contains the following nine nucleotides in this order: ACT TAT GGA. What sequence of bases will be present on the complementary strand of DNA?

- A) UGA AUA CCT
- B) ACT TAT GGA
- C) ACU UAU GGA
- D) TGA ATA CCT

D) TGA ATA CCT

26) SB2c. In pigs, the allele for a wavy, rough coat (R) is dominant to the allele for a soft, fine coat (r). A rough coat boar and a soft coat sow mate. They produce several litters, 50% are rough coat and 50% are smooth coat. What were the genotypes of the parents?

- A) RR × rr
- B) Rr × rr
- C) RR × Rr
- D) Rr × Rr

B) Rr × rr

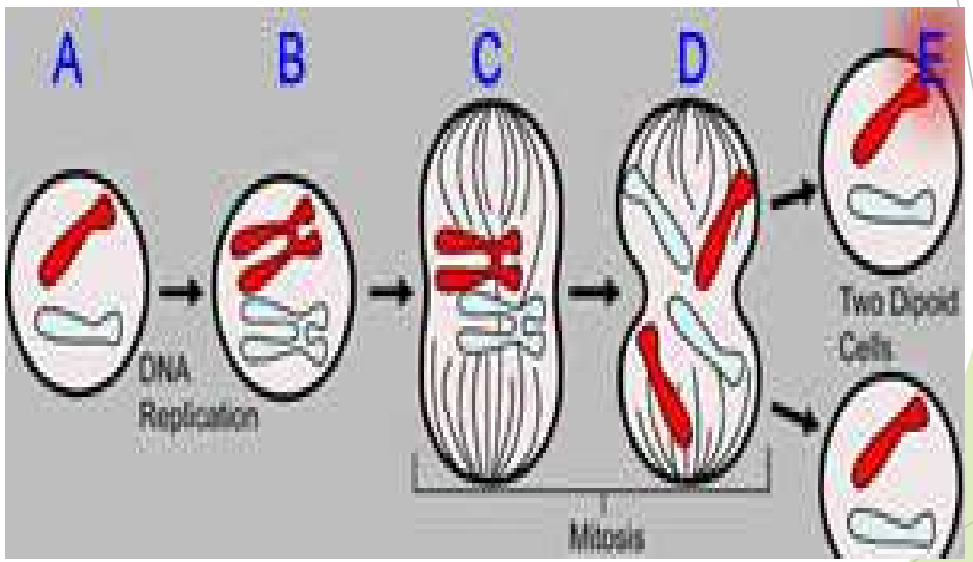
27)SB2d. Radiation ,Chemical Agents, Viruses. These may all cause

- A) cell growth.
- B) global warming.
- C) genetic mutations.
- D) increases in population.

C) genetic mutations.

28)SB2e.
Meiosis is different from the process shown because, during meiosis,

- A) chromosomes are not replicated.
- B) two gametes are made for every original cell.
- C) four gametes are produced for every original cell.
- D) four somatic cells are produced for every original cell.



C) four gametes are produced for every original cell.

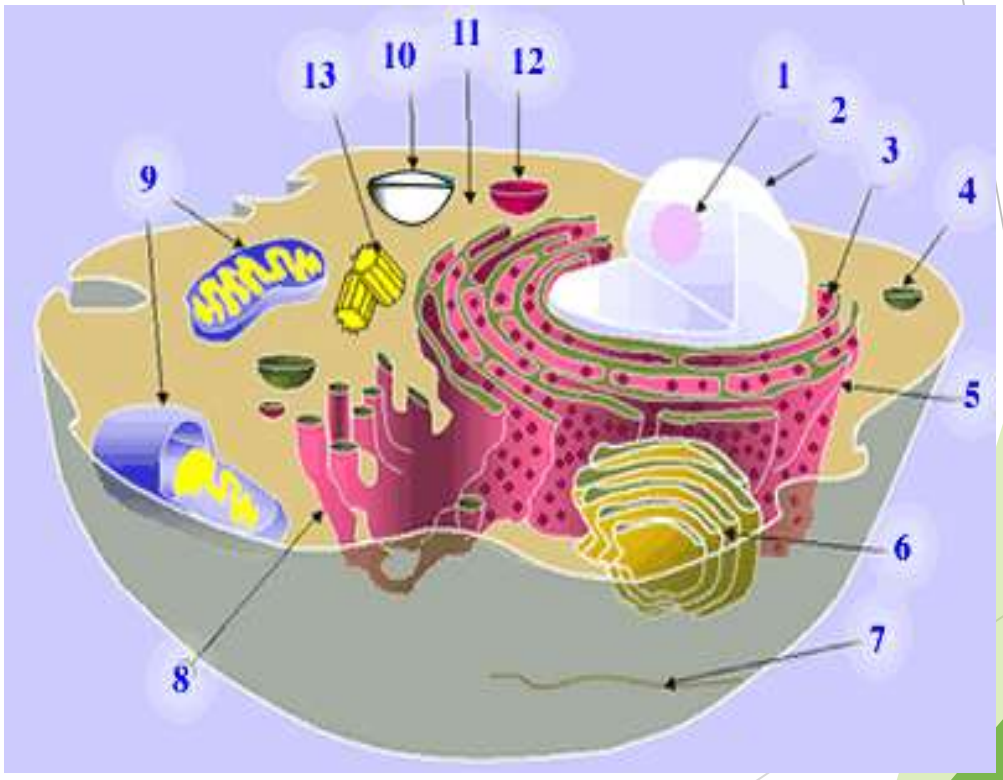
29) SB3a. Which would have the GREATEST effect on the rate of photosynthesis in a plant?

- A) oxygen level
- B) light intensity
- C) sugar concentration
- D) starch concentration

B) light intensity

30) SB3b.
Based on physical features, this cell is most likely a(n) _____ cell.

- A) eukaryotic plant
- B) eukaryotic animal
- C) prokaryotic fungus
- D) prokaryotic bacterial



B) eukaryotic animal

31) SB3c. One major difference between plant and animal cells is that plant cells are the only ones with

- A) cellulose.
- B) lysosomes.
- C) nuclei.
- D) vacuoles.

A) cellulose.

32) SB3d. How do viruses replicate?

- A) using the machinery of host cells
- B) divide through binary fusion
- C) undergo meiosis
- D) makes genetic proteins

A) using the machinery of host cells

33) SB4a. One parrot species that feeds on large seeds nests in the same tree as a parakeet that feeds on small seeds. How are the birds able to coexist?

- A) They occupy different niches.
- B) They occupy different habitats.
- C) They occupy different ecosystems.
- D) They occupy different communities.

A) They occupy different niches.

34) SB4b. Only part of the energy in one trophic level gets passed to the next level. In any energy pyramid, about _____ is passed from level to level.

- A) 10%
- B) 30%
- C) 50%
- D) 90%

A) 10%

35) SB4d. Burning fossil fuels increases the amount of carbon dioxide in the atmosphere. What is the LIKELY negative effect on Earth if extra carbon dioxide is added to our atmosphere?

- A) acid rain
- B) global warming
- C) increased plant
- D) a hole in the ozone layer

B) global warming

37) SB5a. Which is an example of using prior knowledge to gain more knowledge on a topic?

- A) Creating a hypothesis and accepting it without testing it.
- B) Throwing out results of an experiment that do not fit your hypothesis.
- C) Taking opinion as fact and basing your experimental procedures upon it.
- D) Using the knowledge you found while researching a topic to create a well-formed hypothesis to test.

D) Using the knowledge you found while researching a topic to create a well-formed hypothesis to test.

38)SB5b. _____ helps explain why there are a large number of marsupial mammal species in Australia and South America, two continents that were once connected.

- A) Ozone production
- B) Continental drift
- C) The fifth mass extinction
- D) The first mass extinction

B) Continental drift

39)SB5c. In 2001, scientists announced that they had discovered a species of dinosaur called *Albertaceratopsnesmoi* that they believed to be an ancestor of another better-known dinosaur species. How would scientists have determined that this newly discovered species was related to other known species of dinosaur?

- A) Scientists made careful observations of behavioral patterns.
- B) The DNA mutation rates for both species was calculated and compared.
- C) Scientists made a detailed analysis of the fossilized bones of each species.
- D) The enzyme activity of each species was studied to determine similarities in metabolism.

C) Scientists made a detailed analysis of the fossilized bones of each species.

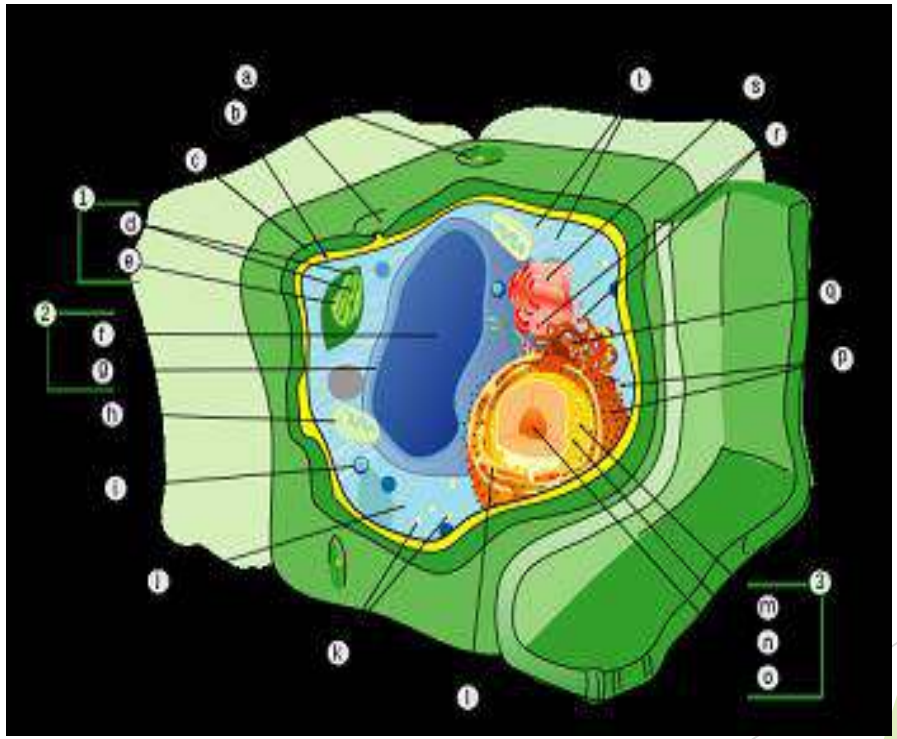
40) SB5d. Which statement is true, with regard to the theory of evolution?

- A) Evolution of an entire species can often occur in a single individual organism.
- B) The theory of evolution is proof that evolution occurs exactly as described, and cannot be revised.
- C) The theory of evolution offers an explanation of how competition for resources may lead a species to change.
- D) DNA sequences and protein similarities are the only reliable way to determine that an organism evolved from another.

C) The theory of evolution offers an explanation of how competition for resources may lead a species to change.

41) SB1a.
Which plant cell organelle helps maintain the shape of the cell by helping to maintain turgor pressure?

- A) b - cell membrane
- B) c - cell wall
- C) f- vacuole
- D) t – cytoskeleton



B) c - cell wall

42) SB1b. Pepsin, a common enzyme found in the stomach, is most active at pH values between 0.5 and 2.5. It works slowly between pH values of 2.6 and 3.4. Beyond a pH of about 3.5, it becomes completely inactive. Why does this happen?

- A) The enzyme inactivates because it melts into a liquid when it is not at the right pH.
- B) The protein chain in the enzyme is denatured, permanently inactivating it as the pH approaches 7.
- C) The enzymes slow down, because changing the pH changes the temperature as well, and affects the reaction.
- D) The enzyme's active site contracts into the wrong shape, but this is always reversible if the right pH is restored.

B) The protein chain in the enzyme is denatured, permanently inactivating it as the pH approaches 7.

43) SB1c. Breads and other whole grain foods are composed of very large polysaccharide molecules which contain hydrogen, oxygen, and which other element?

- A) carbon
- B) iron
- C) nitrogen
- D) water

A) carbon

44) SB1d. The sodium-potassium pump is an example of

- A) phagocytosis.
- B) passive transport.
- C) active transport.
- D) facilitated diffusion.

- The sodium-potassium pump regulates the amount of sodium and potassium inside of cells, particularly nerve and muscle cells. In this process, an ATP is burned, causing three sodium ions to be pumped out and exchanged for two potassium ions, which are pumped in by a membrane protein. Both ions go against their concentration gradients.

C) active transport.

45)SB2a. In the structure of DNA, which nucleotide always pairs with adenine?

- A) cytosine
- B) guanine
- C) thymine
- D) uracil

C) thymine

46) SB2c.Red flowers (dominant) crossed with white flowers (recessive) can yield pink flowers. Pink is the heterozygous condition in a trait that shows incomplete dominance. If pink flowers are crossed with white flowers, assuming random chromosome segregation, what percentage is expected to be red flowers?

- A) 0%
- B) 25%
- C) 50%
- D) 100%

A) 0%

47)SB2d. A mutation may be passed along to human offspring

- A) through mitosis only.
- B) through meiosis only.
- C) through both mitosis and meiosis.
- D) through neither mitosis nor meiosis.

B) through meiosis only.

48)SB2e.Suppose that the great green galoofus lizard has fifty-two chromosomes in the nucleus of its body or somatic cells. How many chromosomes will be in the unfertilized egg of a great green galoofus lizard?

- A) 13
- B) 26
- C) 52
- D) 104

B) 26

49)SB3a. The main result of photosynthesis is

- A) global warming.
- B) glucose production.
- C) carbon dioxide production.
- D) decreased atmospheric oxygen.

B) glucose production.

50)SB3b._____ are the oldest organisms and are divided into two groups, the archeabacteria and the eubacteria.

- A) Algae
- B) Eukaryotes
- C) Prokaryotes
- D) Viruses

C) Prokaryotes

51) SB3c.The name *Homo sapiens* is written in _____, according to the Linnean system of classification.

- A) Latin taxonomic
- B) Greek taxonomic
- C) Latin binomial nomenclature
- D) Greek binomial nomenclature

C) Latin binomial nomenclature

52)SB3d. Viruses are intracellular obligate parasites, which means that they cannot reproduce or express their genes without …

- a) enzymes
- b) a host cell
- c) another virus
- d) a cell wall

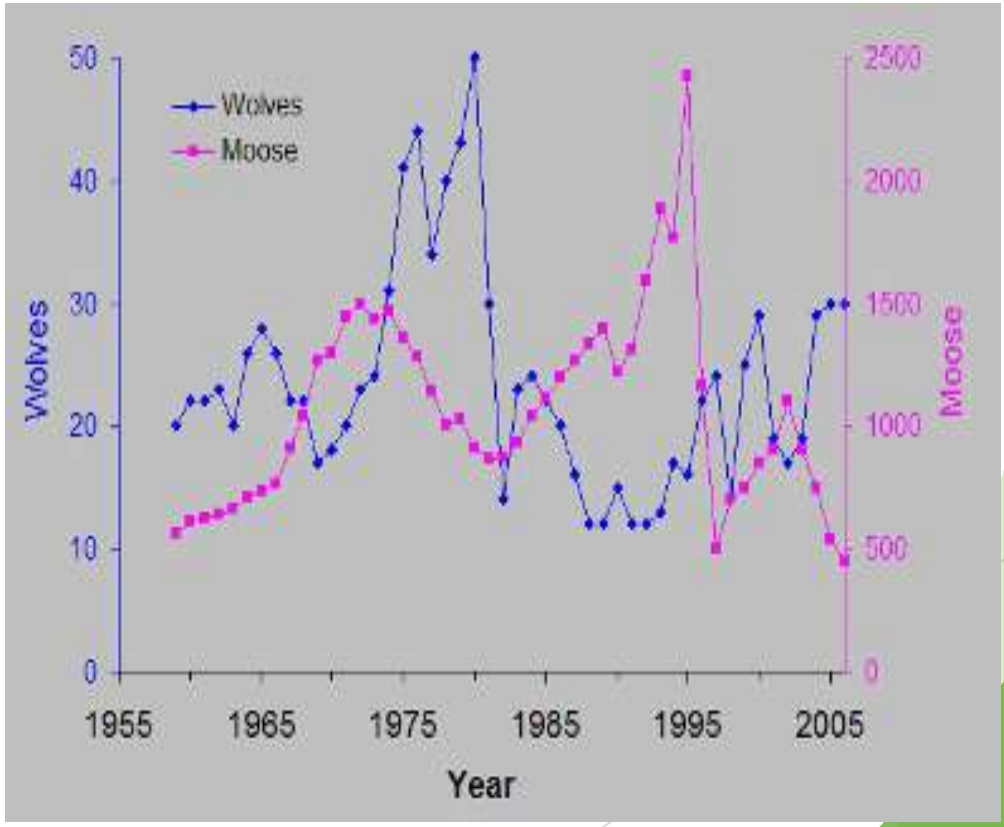
b) a host cell

53)SB4a.

The graph shown above is from one of the most well-known and on-going ecological studies ever performed. Isle Royal National Park, an island on Lake Superior, keeps data of populations of wolves and moose living there. The moose are a major food source for the wolves.

Based on the graph, how does the moose population affect the population of wolves?

- A) As moose populations increase, wolf populations immediately increase.
- B) As wolf population falls, moose populations fall with a delayed effect.
- C) Moose populations don't really show any relationship to wolf carrying capacity.
- D) The wolf carrying-capacity rises as moose populations increase, but with a delayed effect.



D) The wolf carrying-capacity rises as moose populations increase, but with a delayed effect.

54)SB4b.In the carbon cycle, carbon is transferred from animals to decomposers in all of the following ways EXCEPT

- A) as waste.
- B) in dead carcasses.
- C) as carbon dioxide.
- D) in scraps of discarded food.

C) as carbon dioxide.

55)SB4d. When deforestation occurs in an area, what immediate effect does this have on the water cycle?

- A) More water is returned to the atmosphere.
- B) There is less runoff water, but more transpiration.
- C) More precipitation is formed, because there is more evaporation.
- D) More runoff water is created, and less is returned to the atmosphere.

D) More runoff water is created, and less is returned to the atmosphere.

56)SB4f.Saltwater fish, like the squirrelfish, live in saltwater that contains 3.5% salt. Surprisingly, the cells in the squirrelfish contain only about 1% salt, like most other living things. What explains how the squirrelfish solve this problem?

- A) They never drink the saltwater around them.
- B) They constantly drink the saltwater around them.
- C) Their kidneys remove the salt in urine and retain water from what they drink.
- D) Their kidneys remove the water in urine and retain the salt from what they drink.

C) Their kidneys remove the salt in urine and retain water from what they drink.

57)SB5a. All of these factors influenced Darwin in his writing of the theory of evolution by natural selection EXCEPT one. Which factor did not influence Darwin's theory?

- A) He was strongly against creationism and set out to disprove it.
- B) He noticed similarities between animals and plants from different places in the world.
- C) Another author, Alfred Wallace, was competing against him, largely writing the same theory.
- D) He recognized similarities in Malthus's theory of food limitations, and with the rules of nature.

C) Another author, Alfred Wallace, was competing against him, largely writing the same theory.

58)SB5b. In 1831, Charles Darwin visited the Galapagos Islands. While observing the giant land tortoises that lived on these islands, Darwin noted that the shape of the tortoise shell varied depending on which island the tortoise lived. Tortoises on one island had round shells, for example, whereas tortoises on a neighboring island had more flattened, saddle-shaped shells. Which statement BEST summarizes Darwin's explanation for these differences?

- A) Random mutations caused the shape of the shells to fluctuate periodically.
- B) The shape of the tortoise shell varied because the predators on the islands were different.
- C) The particular shape of the shell was best suited for the island on which the tortoise was living.
- D) Tortoises who used their shells in special ways caused the shells to become larger, rounder, or flatter.

C) The particular shape of the shell was best suited for the island on which the tortoise was living.

60) SB5e.Why are many bacterial infections more difficult to treat now than they were fifty years ago?

- A) Because there are more types of bacteria now.
- B) Because bacteria have evolved resistance to antibiotics.
- C) Because bacteria reproduce at greater rates than in the past, since there are more people on earth.
- D) Because treatment of virus infections consumes many antibiotics that were formerly used only for bacteria.

B) Because bacteria have evolved resistance to antibiotics.

61)SB1a.Which organelle modifies cell products, packages them for distribution, and then may turn into vesicles and bubble off the surface of the cell?

- A) lysosome
- B) cell membrane
- C) Golgi apparatus
- D) endoplasmic reticulum

C) Golgi apparatus

62)SB2c.TaySach's disease is a fatal genetic condition, in which affected individuals cannot metabolize fats properly. Children who inherit the disease rarely live past the age of five. The disease is caused by the presence of a homozygous recessive gene.
If a child has TaySach's disease, what would her parents' genotypes be?

- A) Her father is heterozygous; her mother is heterozygous.
- B) Her father is heterozygous; her mother is homozygous dominant.
- C) Her father is homozygous dominant; her mother is homozygous dominant.
- D) Her father is homozygous dominant; her mother is homozygous recessive.

A) Her father is heterozygous; her mother is heterozygous.

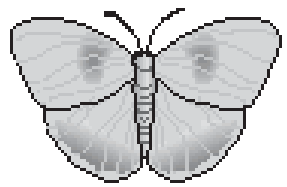
63)SB5b.The MOST accurate way to determine the evolutionary relationship between two animals is through the examination of

- A) common behaviors.
- B) similar physical features.
- C) DNA or protein sequences of shared genes.
- D) fossilized ancestors that they may have in common.

C) DNA or protein sequences of shared genes.

64)SB3c.
The correct scientific name of the orange-barred sulfur butterfly is

- A) *Phoebis*.
- B) *Insectaphoebis*.
- C) Lepidoptera Phoebis.
- D) unknown since the species name is missing.

	
Organism	1
Common Name	Orange-barred sulphur
Class	Insecta
Order	Lepidoptera
Family	Peridae
Genus	*Phoebis*

D) unknown since the species name is missing.

65)SB4b. Excessive nutrients in the Chesapeake Bay foster the growth of algae, which robs the aquatic life of sunlight and oxygen. The MAIN reason for the overabundance of nutrients is an increase in

- A) fishing.
- B) agriculture.
- C) the temperature.
- D) human population.

B) agriculture.

66)SB2e.In normal humans, sex cells contain the _____ number of chromosomes.

- A) diploid
- B) haploid
- C) multiploid
- D) tetraploid

B) haploid

67)SB4a.Wildebeests share the African plains with other grazing animals and predators. Which change would lead to a DECREASE in the wildebeest population?

- A) a reduction in the lion population
- B) an increase in the number of other grazing antelope
- C) an increase in restrictions on the hunting of wildebeests
- D) a reduction in the populations of other wildebeest predators

B) an increase in the number of other grazing antelope

68)SB1b. Which statement BEST describes what occurs to a molecule of the enzyme trypsin AFTER it binds to a molecule of protein?

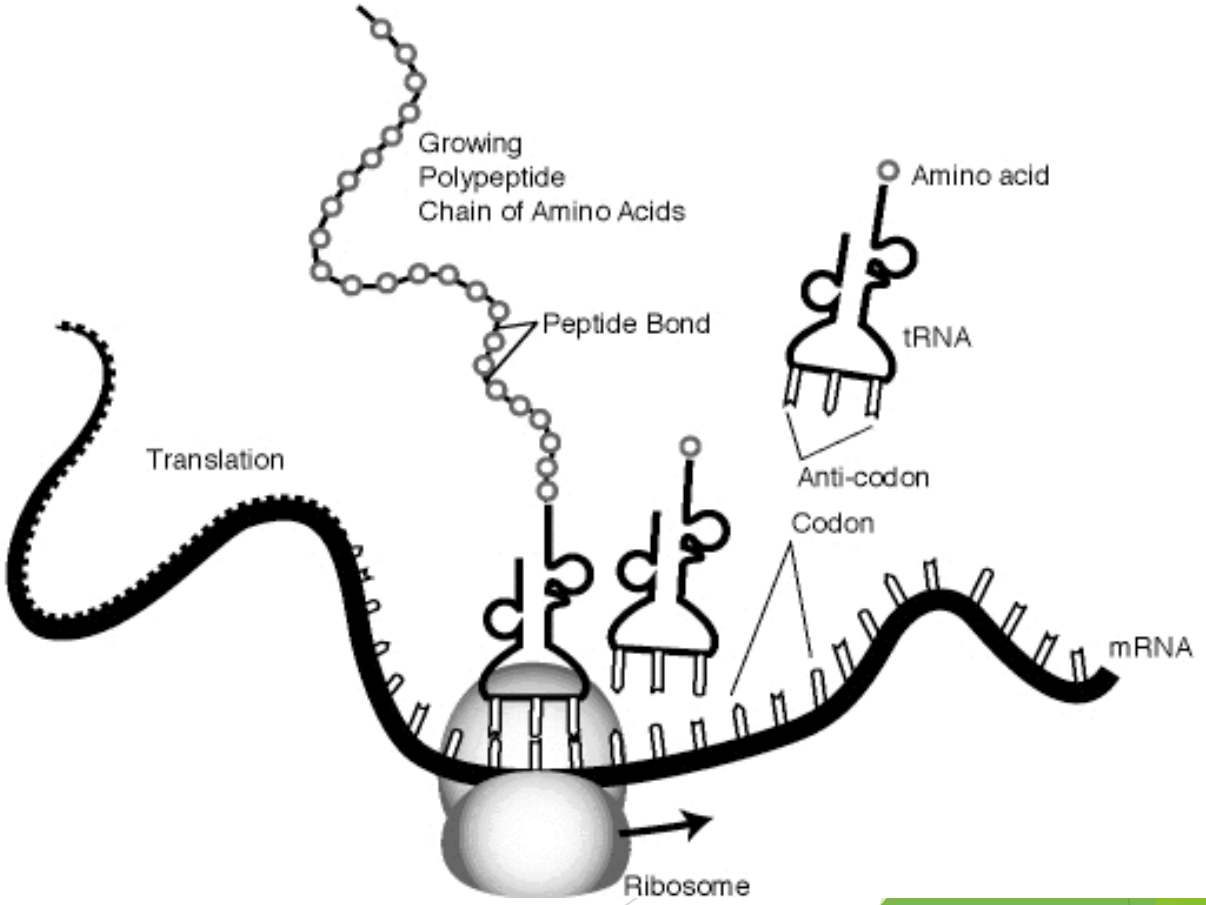
- A) After binding to a protein molecule, the trypsin molecule is destroyed and must be replaced.
- B) The combined trypsin and protein molecule is utilized for energy to power cellular functions.
- C) After binding to the protein molecule, trypsin is converted to a lipid and used for energy storage.
- D) The trypsin molecule is not chemically altered by the reaction with protein and may be used again.

- **The human pancreas is an organ that plays an important role in the process of digestion. The pancreas secretes an enzyme known as *trypsin* which helps to break down protein molecules.**

D) The trypsin molecule is not chemically altered by the reaction with protein and may be used again.

69)SB1c.
What type of biomolecule is being produced at the ribosome?

- A) lipid
- B) protein
- C) carbohydrate
- D) nucleic acid



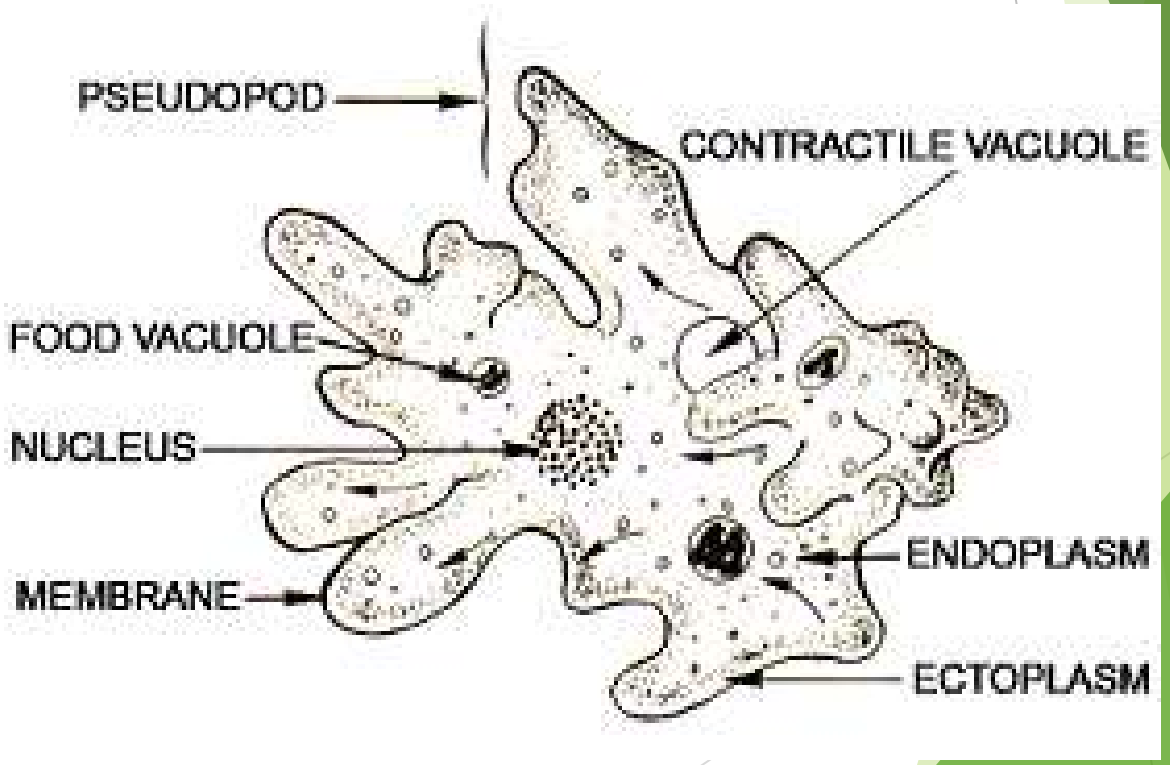
B) protein

70)SB4f.

An amoeba is a one-celled protist. Amoeba contain the all the organelles of a typical eukaryotic animal cell. It is a heterotroph and moves through an aquatic environment using cytoplasmic streaming and pseudopods.

What would you expect to happen FIRST if an amoeba senses prey present in its environment?

- A) It would move in the opposite direction.
- B) It would send out pseudopods to engulf the prey.
- C) It would inject the prey with digestive enzymes.
- D) The prey would be attacked by the amoeba's lysosome.



B) It would send out pseudopods to engulf the prey.

71)SB3b.Which kingdom includes autotrophic and heterotrophic organisms?

- A) Animalia
- B) Fungi
- C) Plantae
- D) Protista

D) Protista

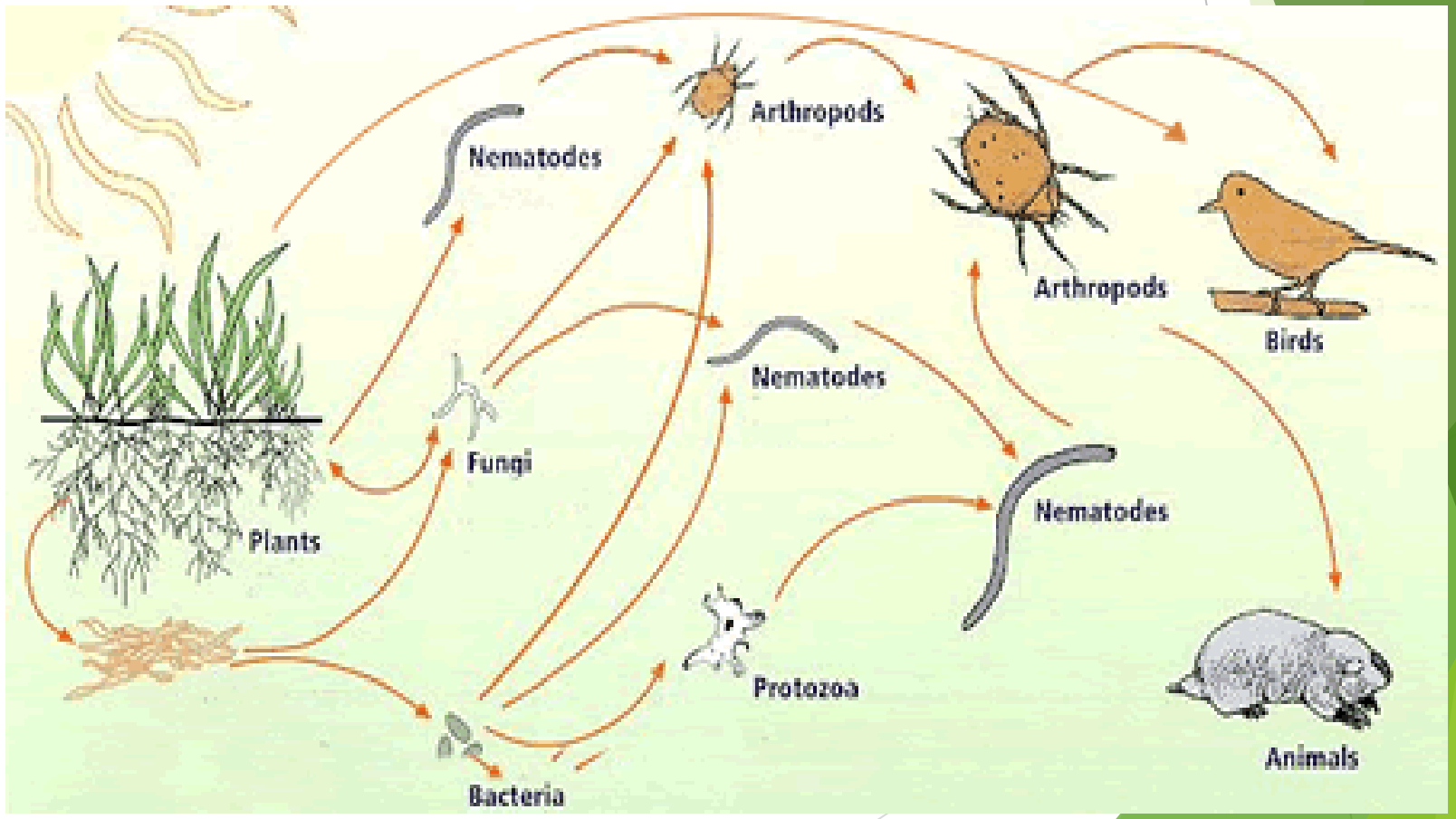
72)Many farmers now grow insect-resistant varieties of cotton. The gene for the favorable trait, in this case, insect resistance, is transferred to the cotton's DNA using

- A) viral vectors.
- B) tissue culture.
- C) bacterial plasmids.
- D) in vitro fertilization.

C) bacterial plasmids.

73)In the soil food web pictured here, we would classify nematodes as

- A) carnivores.
- B) decomposers.
- C) herbivores.
- D)
- omnivores.



D) omnivores.

74)What will be the effect of placing a plant cell in a hypotonic solution?

- A) The cell wall will dissolve.
- B) The cell will shrink in size.
- C) The cell will remain unaffected.
- D) The cell will expand and may burst.

C) The cell will remain unaffected.

75)Ultra Violet radiation, X-Rays, Nitrous acid,Viruses, Fungal-infected peanuts.All of the substances are _____, which cause inheritable changes in genetic material.

- A) agents
- B) mutagens
- C) pathogens
- D) vectors

B) mutagens

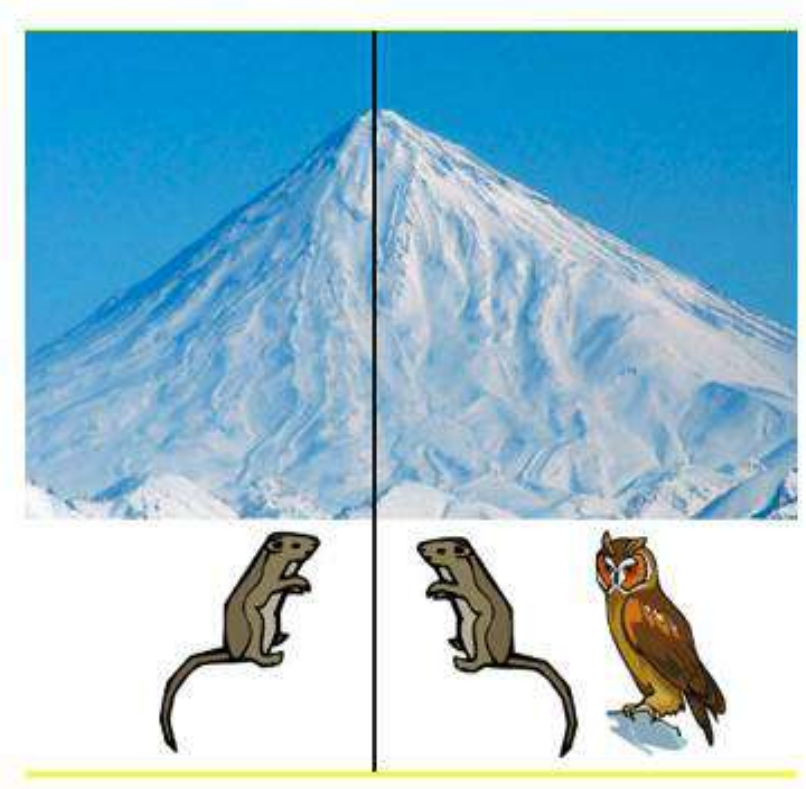
76)_____ helps explain why there are a large number of marsupial mammal species in Australia and South America, two continents that were once connected.

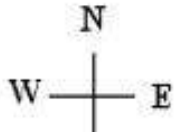
- A) Ozone production
- B) Continental drift
- C) The fifth mass extinction
- D) The first mass extinction

B) Continental drift

77) A mountain separates a population of mice into two distinct eastern and western populations. The eastern area is inhabited by owls, which hunt at night. No owls live in the western area. Over time, the eastern population of mice will MOST LIKELY

- A) become more active at night.
- B) remain identical with the western population.
- C) change over time and become less active at night.
- D) grow stronger claws and teeth to better fight the owls.





C) change over time and become less active at night.

78)Place the developments in evolutionary history in the proper time frame.

- A) IV, II, I, III
- B) I, II, IV, III
- C) II, I, IV, III
- D) II, I, III, IV

I) Charles Darwin writes 'On the Origin of Species'.

II) LaMarck writes about evolution through acquired traits, using a giraffe as his model.

III) DNA sequencing is developed, allowing the comparison of the genes of different organisms.

IV) Malthus, an economist, writes about the inevitability that people will exhaust a food supply by reproducing too often.

A) IV, II, I, III

79)Only part of the energy in one trophic level gets passed to the next level. In any energy pyramid, about _____ is passed from level to level.

- A) 10%
- B) 30%
- C) 50%
- D) 90%

A) 10%

80). SB1a. Some cells, such as human nerve and muscle cells, contain many more mitochondria than do other cells, such as skin cells. Why do some cells have more mitochondria than others?

- A. The cells use more energy.
- B. The cells store more nutrients.
- C. The cells degrade more proteins.
- D. The cells divide more frequently.

A. The cells use more energy.

81) SB1b.Which statement is correct, with regard to the catalase enzyme catalyzing the breakdown of hydrogen peroxide into water and oxygen?

- A. Water is a substrate in this reaction.
- B. Bonds in the hydrogen peroxide are weakened in catalase's active site, allowing the chemical reaction to occur.
- C. Hydrogen peroxide is produced by the catalase enzyme.
- D. The breakdown of hydrogen peroxide would still occur naturally, but occurs less rapidly with the catalase enzyme.

B. Bonds in the hydrogen peroxide are weakened in catalase's active site, allowing the chemical reaction to occur.

82) SB1c. Which of the following is released when ATP is converted to ADP and inorganic phosphate?

- A. energy
- B) oxygen
- C. tannic
- D). dihydrogen phosphate

A. energy

83). SB1d
A red blood cell is placed in a 0.9% salt solution. If the cell remains at equilibrium, neither gaining nor losing water, the solution is

- A. isotonic.
- B). hypotonic.
- C. hypertonic.
- D). hydrostatic.

A. isotonic.

84). SB2b. The function of mRNA is to

- A. carry genetic information from the nucleus to the site of protein synthesis.
- B. begin the "unzipping" of the DNA molecule.
- C. maintain homeostasis within the cell during mitosis.
- D. direct the movement of centrosomes during meiosis.

A. carry genetic information from the nucleus to the site of protein synthesis.

85) SB2c. Half of Wendy's chromosomes came from her mother and half from her father. Few of her chromosomes are identical to those of either parent because most of the genes on them have been exchanged with genes on other chromosomes. What process accounts for this?

- A. independent assortment
- B). crossing over
- C. nondisjunction
- D). segregation

B). crossing over

86). SB2d.A certain gene for albinism occurs in alligators. When the defective gene is present, the alligator's skin is white and the animal has blue eyes. The DNA gene sequences for the normal coloration gene and for the albino gene are shown.

- A. deletion
- B). Duplication
- C. insertion
- D.) substitution

Normal: AAC CAC GGT AGC CCC
Albino: AAC CAA GGT AGC CCC
What type of DNA point mutation leads to albino alligators?

D.) substitution

87) SB2f. Which describes a current use of genetic engineering?

- A. identifying hereditary diseases
- B). vaccinating a child for measles
- C. making human insulin using bacteria
- D). treating cancer with radiation therapy

C. making human insulin using bacteria

89). SB3b.A type of cell that can exist in a broad range of environmental conditions, can rapidly multiply, and lacks a nucleus is known as what type of cell?

- A). animal
- B). Eukaryotic
- C). plant
- D). prokaryotic

D). prokaryotic

90. SB3c .A microbiologist notices a strange organism growing on the leftover lasagna that he has left in the lab refrigerator for 2 months. He removes a sample of the organism and places it under an electron microscope. He notes that the organism has no nuclear membrane and no mitochondria in its cells. Though very small in size, a cell wall is present. He notes that the organism seems to be strictly single-celled. Based on the structure of the cells, what type of organism is this likely to be?

- A. a eukaryote in kingdom fungi
- B. a eukaryote in kingdom protista
- C. a prokaryote in kingdom plantae
- D. a prokaryote in kingdom eubacteria

D. a prokaryote in kingdom eubacteria

91. SB3d When a virus infects a bacterium, what does the virus inject into the cell?

- A. viral nucleic acid
- B. capsid proteins
- C. hormones
- D. tail fibers

A. viral nucleic acid

3. SB4b. Which of the following correctly explains how atmospheric nitrogen is converted to nitrogen compounds used by living organisms?

- A. Sunlight converts atmospheric nitrogen to a form usable by protists.
- B. Plant leaves convert atmospheric nitrogen to a form usable by animals.
- C. Bacteria in soil convert atmospheric nitrogen to a form usable by plants.
- D. Invertebrate animals in soil convert atmospheric nitrogen to a form usable by fungi.

C. Bacteria in soil convert atmospheric nitrogen to a form usable by plants.

94. SB4d..Humans have had a tremendous impact on the environment. What has caused an increase in the amount of acid rain?

- A. use of chlorofluorocarbons
- B. use of pesticides
- C. coal burning power plants
- D. nuclear power plants

C. coal burning power plants

95. SB4e.
Mimosa tree leaves wilt when they are touched. The firm small leaves shown here quickly droop and close up, even if an animal or person barely grazes them. To do this, the tree draws moisture out of the leaves and further into the stem. This adaptation is thought to make the leaves less appealing to animals that would try to eat them. Minutes later, after the animal has probably passed, the leaves regain water pressure and look normal. What type of tropism does the mimosa tree show?

- A. chemotropism
- B. gravotropism
- C. thermotropism
- D. thigmotropism

D. thigmotropism

96. SB5a. Scientists hypothesize that oxygen began to accumulate in Earth's atmosphere *after* the appearance of living things with the ability to —

- A. form tissues.
- B. reproduce sexually.
- C. photosynthesize.
- D. breathe air.

C. photosynthesize.

98. SB5c.Fossils help scientists classify extinct species and determine their relationships to current species.

Fossils provide the *most* information about extinct species' —

- A. habitats
- B. structures
- C. metabolism
- D. reproduction

B. structures

99. SB5e.In 1950, about 97% of Strep throat infections that doctors treated received a prescription of penicillin. By 2000, only about 12% of Strep throat infections were treated with penicillin. From an evolutionary standpoint, why might this be true?

- A. The penicillin made in 1950 was of better quality, due to changes in manufacturing processes.
- B. Over time, the use of penicillin killed off weaker Strep bacteria, and most of what survives is now resistant to penicillin.
- C. Over time, Strep bacteria have gradually learned how to defend themselves against penicillin.
- D. The mold that penicillin is made from has become less common, because Strep bacteria have out competed it.

B. Over time, the use of penicillin killed off weaker Strep bacteria, and most of what survives is now resistant to penicillin.

101. SB1b. Human tears contain the enzyme lysozyme, which damages the cell walls of bacteria. Which of the following statements about lysozyme is most accurate?

- A. Lysozyme causes mutations in bacterial cell wall molecules.
- B. Lysozyme is destroyed as it digests bacterial cell wall molecules.
- C. Lysozyme breaks a specific type of bond in a bacterial cell wall molecule.
- D. Lysozyme is converted to another chemical by a bacterial cell wall molecule.

C. Lysozyme breaks a specific type of bond in a bacterial cell wall molecule.

102. SB1c.Edgar, a biochemist, claims to have found a new variety of a type of small
biomolecule. Edgar notes that there are now 21 types of this biomolecule instead of the old
known 20. The molecule can also be combined with others in its class to produce a wide
variety of proteins, some liquid and others solid. What type of biomolecule did Edgar find?

- A. a nucleic acid
- B. a monosaccharide
- C. an amino acid
- D. a fatty acid

C. an amino acid

104. SB2b. Which best shows the proper code-structure sequence in protein synthesis?

- A. DNA, mRNA, mRNA, polypeptide, enzyme
- B. DNA, mRNA, tRNA, polypeptide, enzyme
- C. enzyme, polypeptide, mRNA, mRNA, DNA
- D. mRNA, DNA, mRNA, enzyme, polypeptide

B. DNA, mRNA, tRNA, polypeptide, enzyme

105. SB2c. Which condition is caused by a chromosome going the wrong way during genetic formation producing a zygote with an extra chromosome?

- A. color blindness
- B. Cooley's anemia
- C. Down's syndrome
- D. hemophilia

C. Down's syndrome

106. SB2d. A gene that is sex-linked is BEST described as which of the following?

- A. It results in all male offspring.
- B. It results in all female offspring.
- C. It is located on the X chromosome.
- D. It is located inside the mitochondria.

C. It is located on the X chromosome.

107. SB2f.Suppose that a gene for growth hormone is discovered in cats. If a drug company wanted to mass-produce the hormone by cloning the gene into bacteria, what would it need to do?

- A. place the cat gene into a plasmid and place the plasmid into bacteria
- B. make a DNA fingerprint of the cat gene and insert it into bacteria
- C. change the sequence of the bacteria's DNA so that it makes the cat hormone
- D. remove the nucleus of a cat cell and place it into bacteria

A. place the cat gene into a plasmid and place the plasmid into bacteria

109. SB3b.A certain kingdom contains heterotrophic, eukaryotic organisms with cell walls.
Organisms in this kingdom are usually multi-celled, but a few single-celled exceptions do
exist. No organism in this kingdom can photosynthesize or move on its own. What kingdom is this?

- A. plantae
- B. eubacteria
- C. fungi
- D. animalia

C. fungi

111. SB3d.An important difference between viruses and living cells is that viruses —

- A. cannot reproduce outside of cells.
- B. contain more nuclei than cells.
- C. cannot mutate but cells can.
- D. need an energy source but cells do not

A. cannot reproduce outside of cells.

114. SB4d. Which of the following practices is MOST likely to slow the buildup of CO2 in the atmosphere?

- A. increased use of tropical rain forest areas for agriculture
- B. increased use of genetically engineered plants
- C. decreased pesticide use in favor of biological controls
- D. decreased use of fossil fuels

D. decreased use of fossil fuels

115. SB4f.Bivalves, such as clams, are found in salt water. The clam captures food particles from water that flows over its gills. Which of these is the best classification of the clam?

- A. filter feeder
- B. grazer
- C. chunk feeder
- D. decomposer

A. filter feeder

116. SB5a.Which of these ideas is most correct, with regard to the way that giraffes came to have long necks?

- A. Giraffes with longer necks tend to have an easier time feeding, and survive at higher rates
  than those with shorter necks.
- B. Adult giraffes all have necks of the same length, and always have had. Giraffes with shorter
  necks are juvenile animals.
- C. Giraffes chose to stretch their necks to reach leaves on tall branches. They passed this change
  on to their offspring.
- D. Giraffes have long necks because all of the short-necked giraffes were not well-adapted to cold,
  and died in the last ice age.

A. Giraffes with longer necks tend to have an easier time feeding, and survive at higher rates than those with shorter necks.

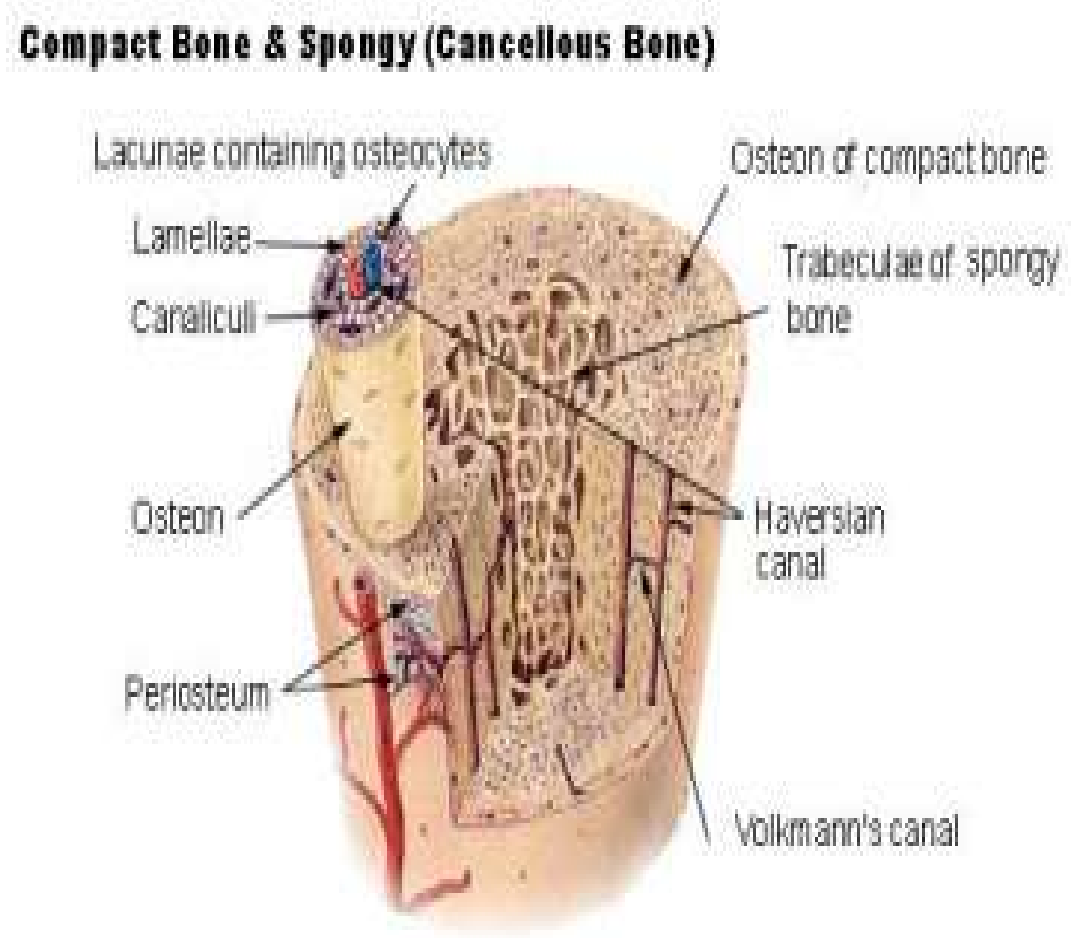
118. SB5c. It was only very recently determined that giant pandas are much more closely related to bears, than to raccoons. Before this, many scientists believed that they were large members of the raccoon family. What is the best piece of evidence that was probably used to re-classify giant pandas with bears?

- A. more behavioral similarities to bears than to raccoons
- B. more similarities in appearance to bears than to raccoons
- C. more similarities in bear DNA and giant panda DNA
- D. a more similar habitat to bears than to raccoons

C. more similarities in bear DNA and giant panda DNA

120)SB1a.Immature bone cells, or osteoblasts, manufacture a protein called osteoid as well as several hormones. Because of this, we would expect osteoblasts to contain numerous

- A) nuclei.
- B) ribosomes.
- C) lysosomes.
- D) Golgi bodies.



B) ribosomes.

121)SB1b. Enzymes

- A) are composed of long chains of fatty acids.
- B) can be destroyed by variations in temperature or pH.
- C) are used up, in the process of performing a chemical reaction.
- D) raise the amount of energy required to start a chemical reaction.

122)SB1c. Which type of molecule makes up the double layer of a cell membrane?

- A) carbohydrate
- B) lipid
- C) nucleic acid
- D) protein

123)SB1d.

Dense Denise is an emergency room nurse at Hopeless Hospital. She notices that the hospital is running short on blood, so she decides to dilute the blood with water to make it last longer. Later, Dr. Dingo, the attending physician gets ready to give a patient a transplant. As a precaution, he puts a sample under the microscope, sees this image. He immediately begins angrily barking at Denise. What happened to the blood cells?

- A) The blood cells burst because they were placed in water, a hypotonic solution.
- B) The blood cells burst because they were placed in water, an isotonic solution.
- C) The blood cells burst because they were placed in water, a hypertonic solution.
- D) Denise did not dilute the blood enough, causing the cell walls to collapse onto the blood cells andmake them burst.

124)SB2a. The cellular process of creating two new DNA molecules from one original copy is called replication. Which statement is the BEST description of this process?

- A) DNA opens up and RNA copies it.
- B) DNA opens up and completely unwinds to make two new molecules.
- C) DNA opens up and each strand is used as a template for a new strand.
- D) RNA opens up the DNA and uses each strand as a template for a new strand.

125)SB2c. In a cross between two heterozygous individuals (eg. Rr X Rr), the expected *phenotypic* ratio of the offspring would be

- A) 1:2:2:1.
- B) 1:2:1.
- C) 1:1.
- D) 3:1.

126)SB2d. A population of lizards lives in an isolated area where local rocks contain a high concentration of radioactive elements. A study of this population would MOST LIKELY show

- A) a lower than average mutation rate.
- B) a higher than average mutation rate.
- C) a higher survival rate than other lizard populations.
- D) an increase in size compared to other lizard populations

127)SB2f.Many farmers now grow insect-resistant varieties of cotton. The gene for the favorable trait, in this case, insect resistance, is transferred to the cotton's DNA using

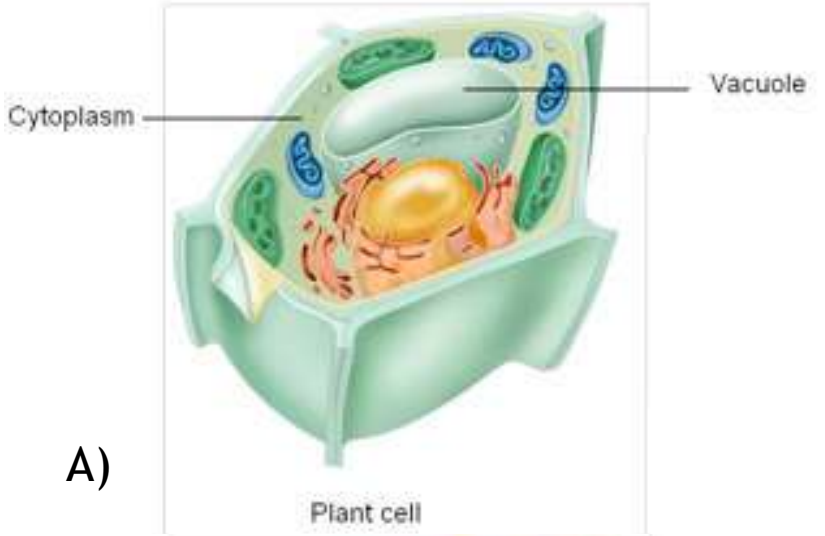
- A) viral vectors.
- B) tissue culture.
- C) bacterial plasmids.
- D) in vitro fertilization.

128) SB3a. The products of cellular respiration include

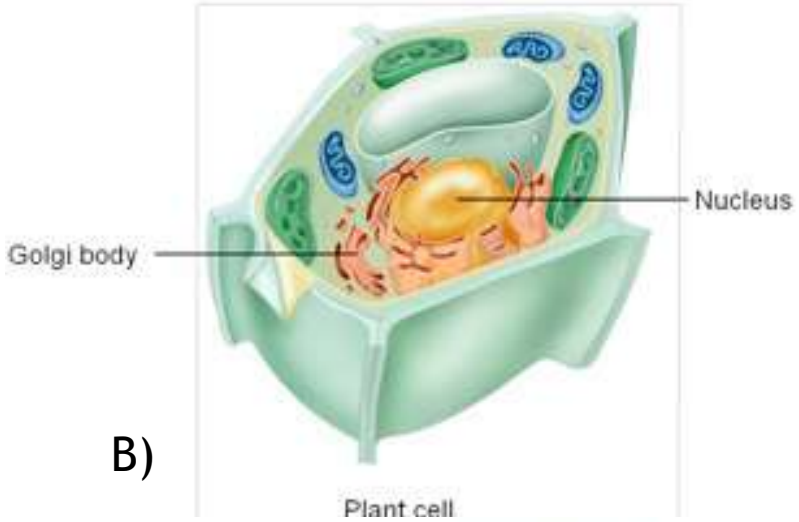
- A)energy and oxygen.
- B)glucose and oxygen.
- C)carbon dioxide and water.
- D)glucose and carbon dioxide.

129)SB3b. SB Which image shows labeled organelles that are present ONLY in plant cells?

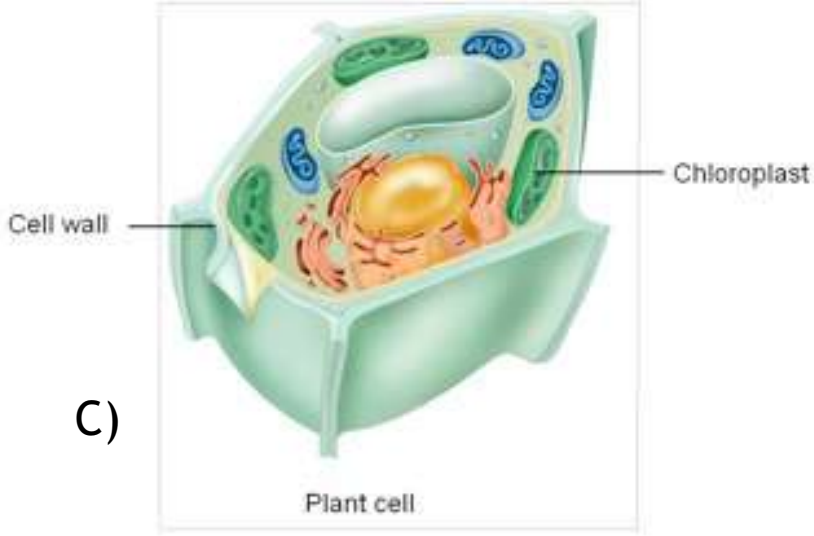
A)



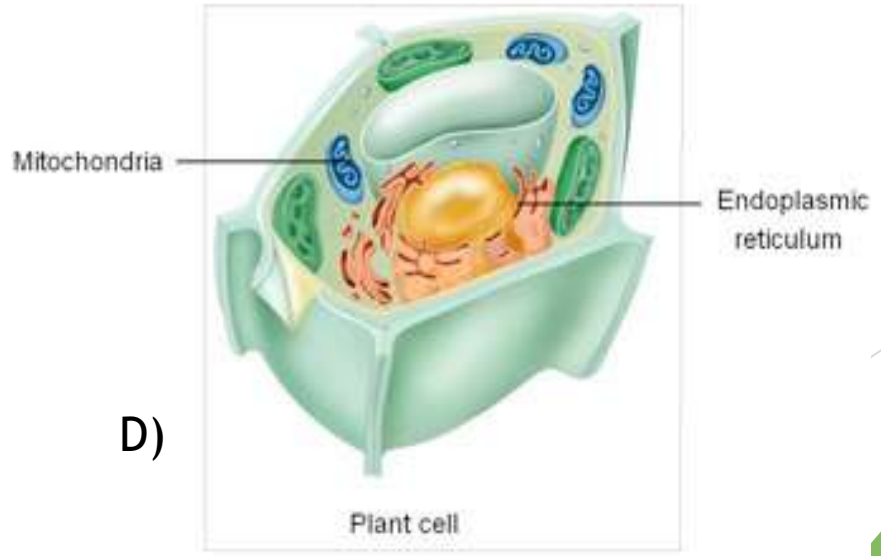
B)



C)



D)



130)SB3c. According to classification, if two organisms are in the same class, then they must be in the same kingdom and

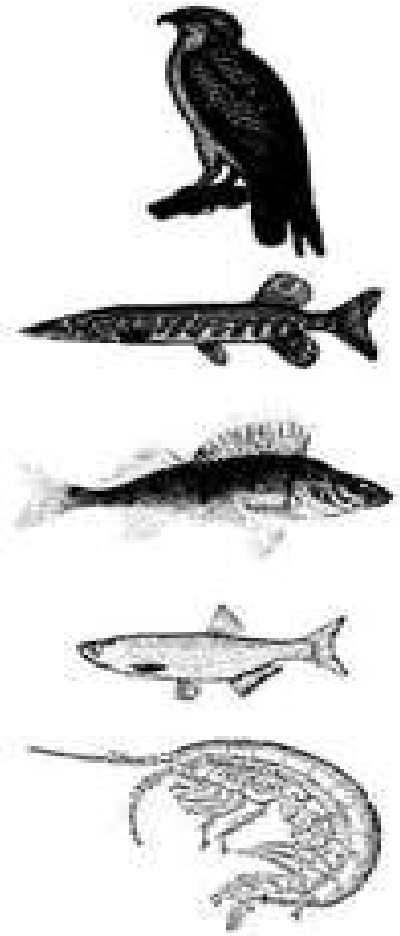
- A) family
- B) order
- C) phylum
- D) species

131) SB3d. The basic structure of a virus contains:

- **A)** a nucleic acid
- **B)** a cell wall
- **C)** a protein coat
- **D)** both a and c

132)SB4a.
This food chain is one part of of a _____ within an ecosystem.

- A) biome
- B) community
- C) population
- D) species



133)SB4b. Which organisms feed on decomposing plant and animal remains?

- A) carnivores
- B) detritivores
- C) herbivores
- D) omnivores

134)SB4d. The most likely source of thermal pollution in a river ecosystem would be _____.
One harmful effect that this type of pollution has is to _____,
killing fish and other native animals.

- A) an automotive junkyard, fill the water with oil and gasoline.
- B) a hydroelectric power plant, lower oxygen levels in the water.
- C) a large farm, poison the water with fertilizers and pesticides.
- D) a nuclear power plant, place radioactive materials in the water.

135)SB4f. In which habitat is one likely to find plants that have developed extremely large, broadleaf, evergreen leaves for gathering light, epiphytes, and climbing vines that strangle other plants?

- A) taiga
- B) kelp forest
- C) tropical rainforest
- D) temperate deciduous forest

136)SB5a. According to the fossil record, five _____ took place, which lowered the variety of species found on Earth today.

- A)mass clonings
- B)microevolutions
- C)mass extinctions
- D)mass revolutions

137)SB5b. Sharks and dolphins look very much alike--both have streamlined bodies, fins, and
sharp teeth. Sharks and dolphins, however, are not closely related. The body structures that
characterize sharks and dolphins have evolved independently. Which term is used by evolutionary
biologists to describe the process by which two separate species may evolve in a similar way and
come to resemble one another?

- A) adaptive radiation
- B) convergent evolution
- C) punctuated evolution
- D) coordinated development

138) SB5c.Which fact about fossils is MOST important to scientists who study evolution?

- A)Fossils are often found in sedimentary rock.
- B)Footprints, body structures, and even animal droppings can become fossilized.
- C)The age of a fossil can be determined by examining the rock strata in which the fossil is found.
- D)The formation of a fossil depends on the geologic and chemical conditions present when an organism dies.

139)SB5d. An earthquake causes a huge canyon to form, permanently dividing a population of wild donkeys. On the windward side of the canyon, dry conditions develop and grasses grow. On the leeward side of the canyon, rainfall is frequent and a forest grows.
Which of the following is LEAST likely to happen over the course of 100,000 years?

- A) Two new species of donkeys will form.
- B) Donkeys from the grassy side could develop zebra striping for camouflage.
- C) The two populations of donkeys will remain physically identical in both areas.
- D) Over a long time, even if introduced to each other, donkeys from the grassy side of the canyon,
  will not be able to reproduce with donkeys on the forest side.

140). SB1a. A cell stores food or waste products in

- A. chloroplasts.
- B. nuclei.
- C. ribosomes.
- D. vacuoles.

141). SB1b. Human tears contain the enzyme lysozyme, which damages the cell walls of bacteria.
Which of the following statements about lysozyme is most accurate?

- A. Lysozyme causes mutations in bacterial cell wall molecules.
- B. Lysozyme is destroyed as it digests bacterial cell wall molecules.
- C. Lysozyme breaks a specific type of bond in a bacterial cell wall molecule.
- D. Lysozyme is converted to another chemical by a bacterial cell wall molecule.

142). SB1c. Carbohydrates are used by the body as a source of quick energy, and are made up of

- A. carbon, hydrogen, and oxygen.
- B. oxygen, hydrogen, and protein.
- C. potassium, oxygen, and carbon.
- D. hydrogen, cholesterol, and oxygen.

143). SB1d. A red blood cell was placed in a concentrated salt water solution. It would be expected to

- A. shrink.
- B. swell.
- C. divide.
- D. grow.

144). SB2b. If the sequence of nucleotides were A-G-C on a strand of DNA, what would be the nucleotide sequence on a strand of mRNA formed during transcription?

- A. ACG
- B. UCG
- C. TGC
- D. TCG

146) SB2c.The observed trait that appears in an organism as a result of its genetic makeup is called the organism's

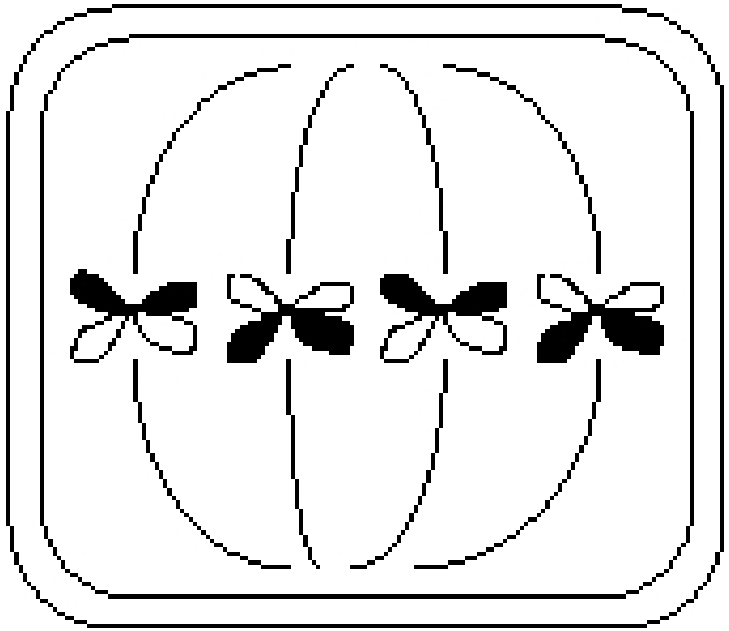
- A. allele
- B. genotype
- C. phenotype
- D. karyotype

147). SB2d. A rare genetic condition causes dwarfism and immune deficiencies. Which of the following is the most likely cause of this condition?

- A. a parasitic infection
- B. a mutation in DNA
- C. a bacterial disease
- D. an excess of ATP

148). SB2e.
The plant cell shown above is in which phase of mitosis?

- A. anaphase
- B. interphase
- C. prophase
- D. metaphase



149). SB3a. Which set of chemical reactions is performed by the chloroplast of the cell?

- A. carbon dioxide + water⟶ glucose + oxygen
- B. glucose + oxygen ⟶ATP energy + water + carbon dioxide
- C. glucose⟶ ATP energy + lactic acid
- D. amino acids + tRNA + mRNA⟶ proteins + tRNA + mRNA

150). SB3b. The main difference between prokaryotic and eukaryotic cells is that —

- A. prokaryotic cells are always much larger.
- B. prokaryotic cells do not have a plasma membrane.
- C. eukaryotic cells have a smaller cell nucleus.
- D. eukaryotic cells have a more advanced cellular organization.

151). SB3c. According to the table, as vertebrate embryos develop —

- A. amphibians and humans develop the same structures.
- B. only mammals develop both limbs and external ears.
- C. reptiles and amphibians grow external ears.
- D. limbs and external ears grow on mammals and birds.

Structures Present in Vertebrate Embryos

Stage of Development	Structure	Frog	Fish	Pig	Bird	Turtle	Human
early	tail	✔	✔	✔	✔	✔	✔
early	gill slits	✔	✔	✔	✔	✔	✔
early	notochord	✔	✔	✔	✔	✔	✔
late	external ears			✔			✔
late	limbs	✔		✔	✔	✔	✔

152). SB3d. An important difference between viruses and living cells is that viruses —

- A. cannot reproduce outside of cells.
- B. contain more nuclei than cells.
- C. cannot mutate but cells can.
- D. need an energy source but cells do not.

153). SB4a. Physical and chemical factors may affect an organism's survival. These abiotic factors may include

- A. infectious parasites.
- B. autotrophs and chemoautotrophs.
- C. pathogens such as fungi and bacteria.
- D. available gases such as O2, CO2 and N2 .

154). SB4b. Replacing inorganic nutrients in soil is accomplished primarily by the

- A. second-order consumers.
- B. first-order consumers.
- C. decomposers.
- D. herbivores.

155). SB4c. Which of the following is an example of ecological succession?

- A. a moth species evolving gray wings for camouflage
- B. a dog chasing a bird to use it for nutritional value
- C. a pine forest slowly replacing a grassy meadow
- D. leaves decomposing in a forest

156). SB4f. Unlike other animals, mammals can perspire. The main benefit of perspiring is that it —

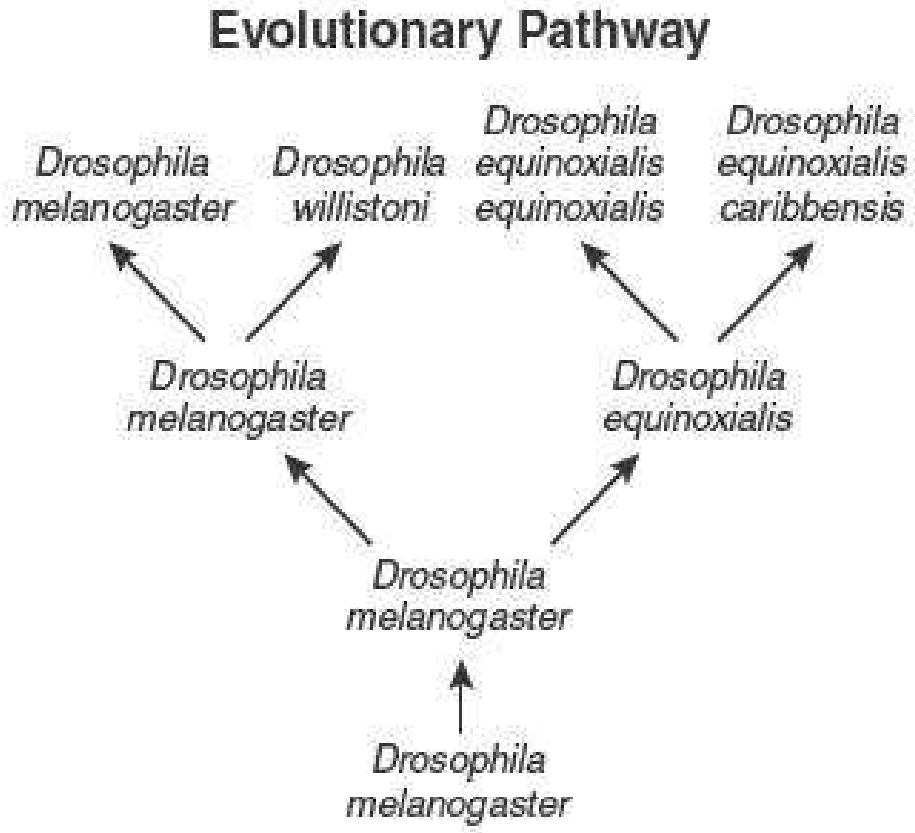
- A. removes extra water from the cells
- B. cools the skin with evaporation
- C. removes dirt from the surface of the skin
- D. relaxes the muscles

157). SB5a. Scientists hypothesize that oxygen began to accumulate in Earth's atmosphere after the appearance of living things with the ability to —

- A. form tissues.
- B. reproduce sexually.
- C. photosynthesize.
- D. breathe air.

158). SB5b. Which type of Drosophila probably changed the least over time?

- A. *Drosophila melanogaster*
- B. *Drosophilawillistoni*
- C.*Drosophilaequinoxialisequinoxialis*
- D. *Drosophilaequinoxialiscaribbensis*



159). SB5c. Scientists believe that a dinosaur known as a hadrosaurus was a plant eater. Which of the following pieces of evidence supports this conclusion?

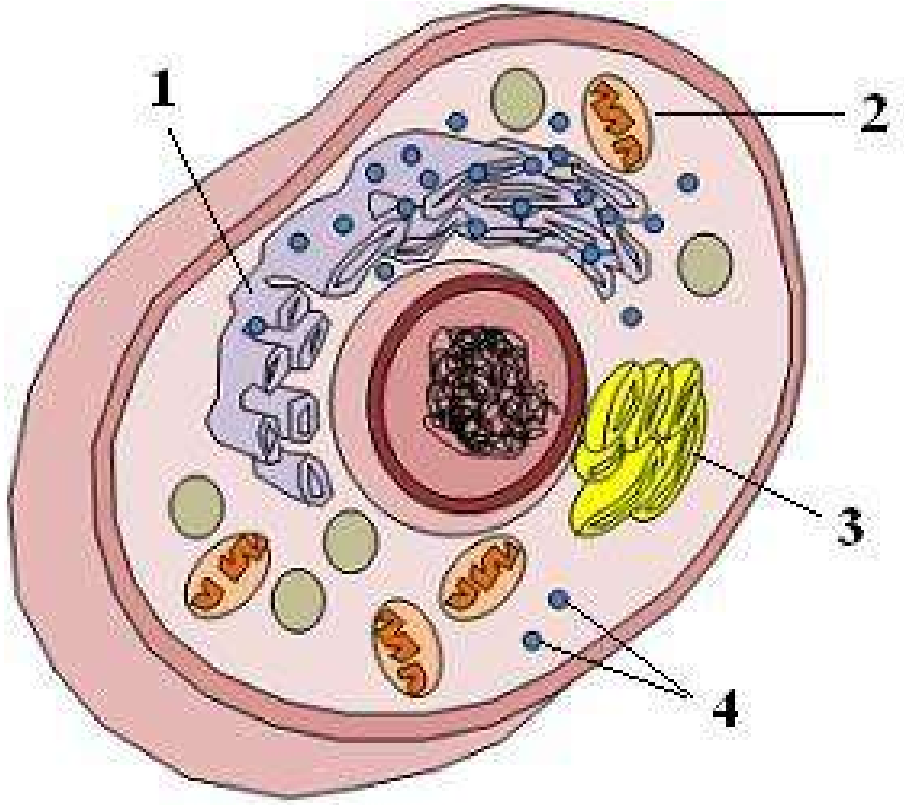
- A. Hadrosaurus fossils are found with fossils of other dinosaurs that were herbivores.
- B. Fossilized plant remains are found with the fossils of the hadrosaurus.
- C. The fossilized teeth of the hadrosaurus are flat like the teeth of modern herbivores.
- D. The regions where hadrosaurus fossils are found were heavily forested.

160). SB5d. During the fall reproductive season, the belly of a male brook trout becomes bright orange.
The orange belly provides some camouflage and helps attract females. This trait evolved in brook trout because, compared to males with pale bellies, males with bright orange bellies are more likely to

- A. live in good habitats.
- B. be eaten by predators.
- C. mate with other species of fish.
- D. fertilize eggs to produce offspring.

161).SB1a. In the above diagram of an animal cell, what is the function of organelle 1?

- A. to store ions, create and store steroids, and synthesize and package proteins
- B. to collect, package, and distribute molecules produced by the cell
- C. to supply the cell with energy in the form of ATP through the process of cellular respiration
- D. to aid in protein synthesis by joining amino acids together to form polypeptides



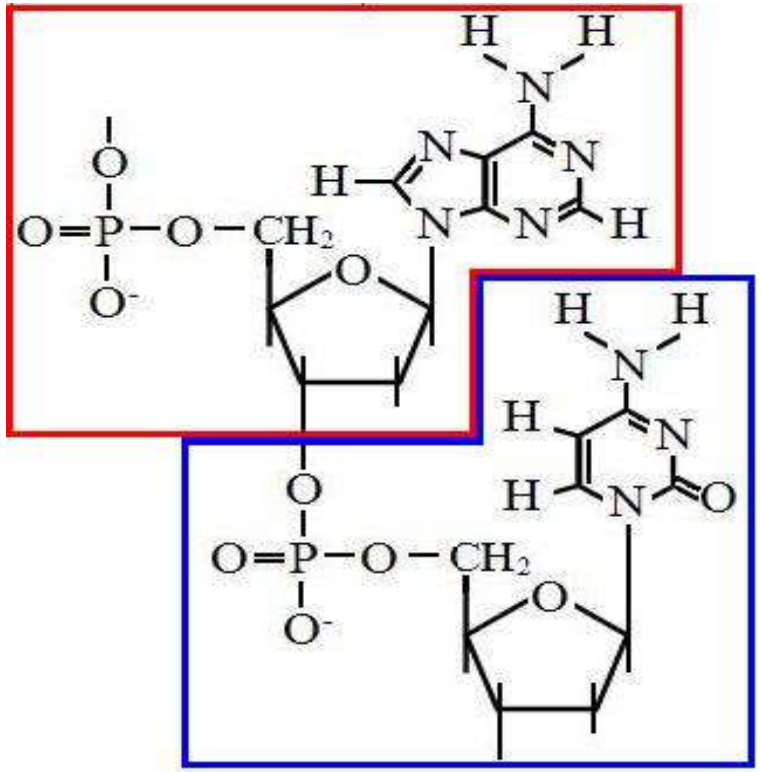
162). SB1b. A biochemist is attempting to replicate a chemical reaction that commonly takes place in cells.
During the chemical reaction, starch is broken down into glucose. What will most likely happen if the amount of enzyme that catalyzes this reaction is increased?

- A. The reaction will slow down.
- B. The reaction will take place at a higher temperature.
- C. The reaction will speed up.
- D. The reaction will stop.

163). SB1c. Nucleic acids are biological polymers that are comprised of nucleotide monomers covalently bonded together.

The picture above shows two monomer units of a nucleic acid chain. What are the components that make up each nucleotide monomer?

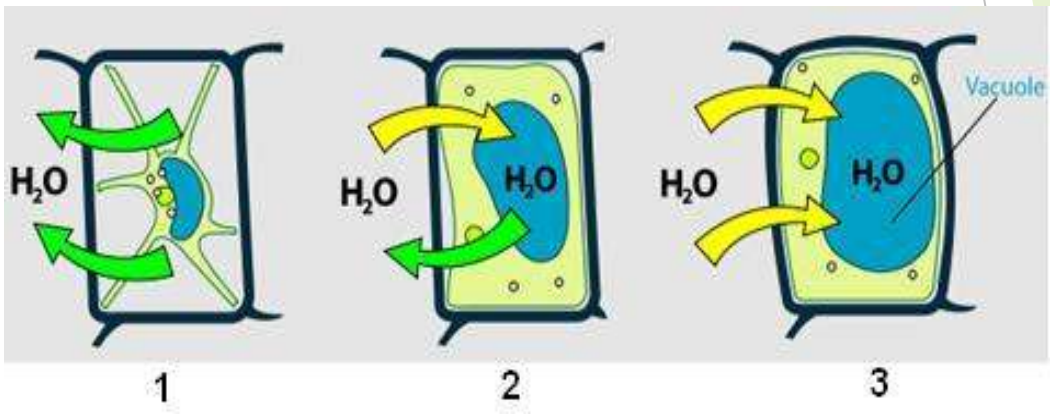
- A. glucose, a phophate group, and an amino acid
- B. a five-carbon sugar, a phosphate group, and a nitrogenous base
- C. a five-carbon sugar, a phosphate group, and an amino acid
- D. glucose, a phosphate group, and a nitrogenous base



164). SB1d. The diagram below shows plant cells submerged in solutions with different concentrations of sugar.

In diagram 1, water is flowing by osmosis out of the cell because the concentration of water

- A. inside the cell is higher than in the surrounding solution.
- B. forces waste products to leave the cell.
- C. inside the cell is lower than in the surrounding solution.
- D. is the same both inside and outside the cell.



165). SB2a. Which of the following is true about the differences between the types of nucleic acids?

- A. DNA contains the five-carbon sugar deoxyribose, whereas RNA contains the five-carbon sugar ribose.
- B. RNA contains genetic information, whereas DNA is involved in the direct production of proteins.
- C. RNA is typically a double-stranded molecule, whereas DNA is always single stranded.
- D. DNA can contain the nitrogenous base uracil, whereas RNA can contain the nitrogenous base thymine.

166). SB2c. Lupe grows pea plants in her garden. The pea plants have flowers that can be either purple or white, with purple color being dominant to white color. The peas produced by Lupe's pea plants can also be either round or wrinkled, with round peas being dominant to wrinkled peas. Lupe crosses two pea plants that are heterozygous for both traits. If a gamete from this cross receives a dominant allele for flower color, how does this influence the probability of the gamete receiving a dominant allele for pea shape? (Assume that the genes for flower color and pea shape follow the law of independent assortment.)

- A. It decreases the probability that the gamete will receive a dominant allele for pea shape.
- B. It increases the probability that the gamete will receive a dominant allele for pea shape.
- C. It has no effect on the probability of the gamete receiving a dominant allele for pea shape.
- D. It causes the gamete to be unable to receive a dominant allele for pea shape.

167). SB2d. Unique heritable characteristics can result from

- A. I, II, III, and IV
- B. I, II, and III only
- C. II and IV only
- D. I and III only

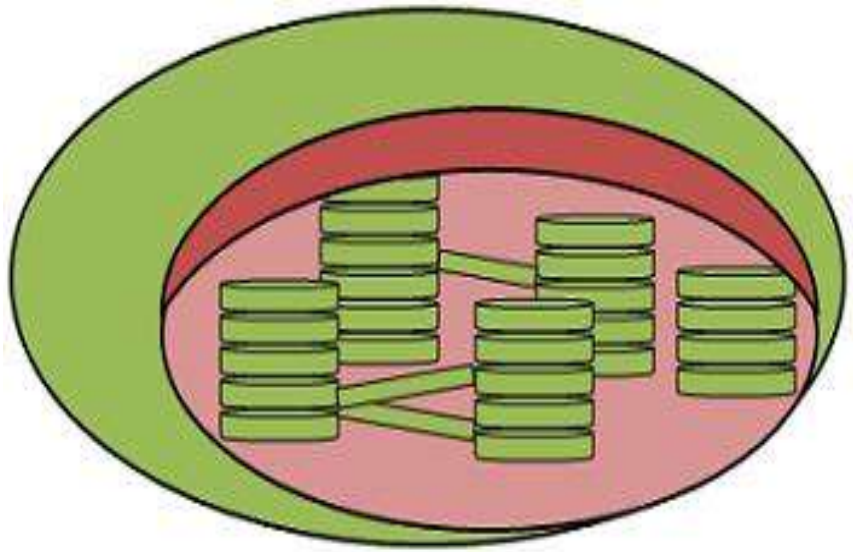
I. mutations of genes in an organism's sex cells.
II. mutations of genes in an organism's body cells.
III. recombination of existing genes during sexual reproduction.
IV. replication of existing genes during asexual reproduction.

168). SB2e. Which of the following is a source of genetic variation in sexually-reproducing organisms?

- A. translation
- B. meiosis
- C. mitosis
- D. all of these

169). SB3a. Examine the picture of the chloroplast below. Chloroplasts contain flattened disks known as thylakoids that are stacked into grana. In the thylakoids are proteins that

- A. help capture light from the Sun during the process of cellular respiration.
- B. help capture oxygen from the atmosphere during the process of cellular respiration.
- C. help capture oxygen from the atomosphere during the process of photosythesis.



170). SB3d. What kingdom includes organisms credited for breaking down dead plants and animals into rich soil?

- A. Animalia
- B. Plantae
- C. Fungi
- D. Protista

171). SB3c. Nearly all mammals have seven cervical (neck) vertebrae. This fact implies that

- A. all mammals have to stretch their necks to obtain food.
- B. predators prefer to eat animals with either six or eight cervical vertebrae.
- C. all animals can turn their heads the same amount.
- D. all mammals descended from a common ancestor.

172). SB3d. Both viruses and cells are able to replicate their genetic material. What is the main difference in their replication processes?

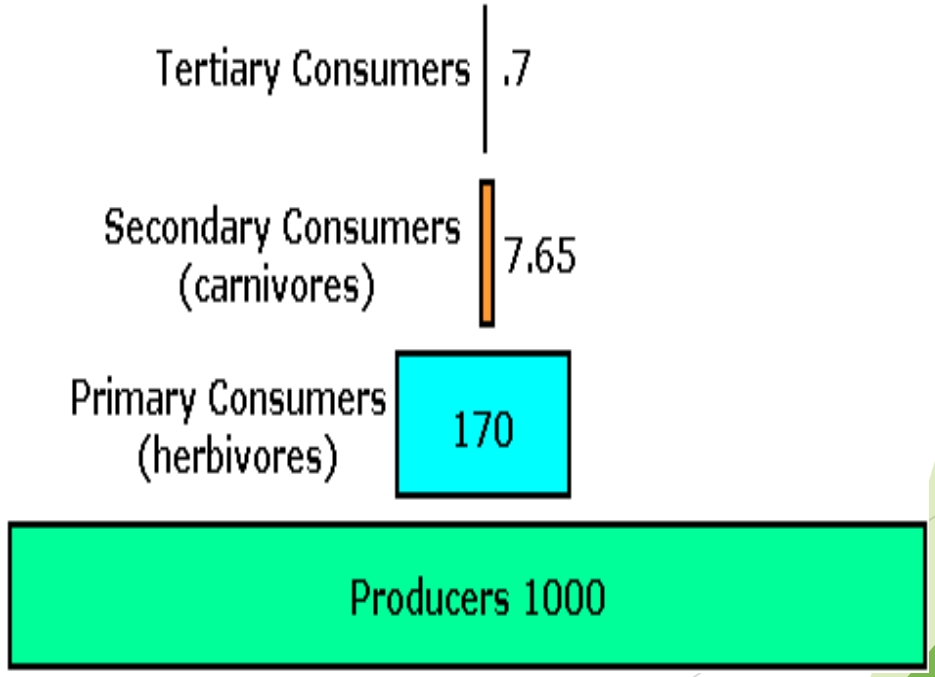
- A. Viruses require host cells, whereas cells provide their own replication mechanisms.
- B. Viral replication always takes longer than the replication of cellular genetic material.
- C. Viruses can replicate independently, whereas cells require assistance.
- D. Viral replication does not use any enzymes, whereas cells use enzymes during the replication process.

173). SB4a. Which of the following is an example of a population?

- A. a hot, dry climate that receives very little rain
- B. a large clan of meerkats, including their offspring
- C. a pack of wolves chasing a family of deer through a grove of trees
- D. the bank of a pond and the frogs and salamanders that live there

174). SB4b. The energy pyramid below shows a possible amount of energy, in kilocalories, available in the organisms at each trophic level in an ecosystem. According to the law of conservation of energy, energy can neither be created nor destroyed. If this is true, why is there less energy in the top of the energy pyramid than there is in the bottom of the energy pyramid?

- A. The extra energy in the bottom is slower to reach the top.
- B. The law of conservation of energy does not apply to ecosystems.
- C. Energy is lost between each trophic level as heat.
- D. Organisms in the top of the energy pyramid use up energy the fastest.



175). SB4c. According to the United States Fish and Wildlife Service, nearly 260,000 acres of forest are destroyed by wildfires every year. During a process called _____, the destroyed acres of forest will gradually recover to support ecosystems that are very similar to the originals.

- A. lithification
- B. primary succession
- C. secondary succession
- D. territoriality

176). SB4e. The pineapple plant closes its stomata during the day and opens its stomata during the night. This process helps the plant conserve water by preventing

- A. condensation.
- B. photosynthesis.
- C. transpiration.
- D. hydrotropism.

177). SB5a. John Baptiste Lamarck believed that anatomical features could increase or decrease in size over the course of a lifetime due to excessive use or disuse, and these changes could be passed on to an organism's offspring. Is Lamarck's hypothesis accurate?

- A. It is impossible for offspring to inherit certain anatomical features from their parents whether the features were used excessively or not.
- B. It is true that certain anatomical structures change in size according to use, but these changes cannot be passed on to the organism's offspring.
- C. Lamarck's ideas on heredity have been proven to be true through the study of genetics.
- D. Anatomical structures are never able to change in size according to use, and therefore cannot be passed along to the following generations.

178). SB5d. Three billion years ago, Earth's atmosphere was very different. It included the gases methane and ammonia. If scientists found a new planet outside our solar system that had an atmosphere similar to Earth's three billion years ago, what kingdom's organisms would you expect the new planet's organisms to resemble?

- A. Archaebacteria
- B. Eubacteria
- C. Plantae
- D. Protista

179). SB5c. Species Nucleotide sequence of gene ABX

- A. TAC ATA CGC GGG ACC TTT AGT GGG GCC CCC ACT
- B. TAC ATA CCC CCG ACC TAT CGC GGG GCG CCC ACT
- C . TAC ATA CCC CCG ACC TTT CGC GGG GCG CCC ACT
- D . TAC ATA CGG GGG AAA TTT CGC TTT GCG CGC ACT

180) The gene sequences of four species for a blood protein encoded by gene ABX are shown in the table above.
Which of the species are most closely related?

- A. Species B and Species C
- B. Species A and Species B
- C. Species B and Species D
- D. Species C and Species D

181). SB5d. Which of the following is the most likely side effect of the over usage of pesticides?

- A. The insect population will become extinct.
- B. Insects will taste bad to consumers, so they won't be eaten.
- C. Pesticide-resistant pests will survive, reproduce and flourish.
- D. Plants will eventually develop natural resistance to pests.