

EOC Practice Questions

Name: Answer Key

Date: _____

Hour: _____

1) What is the best definition of a scientific theory?

- A. An explanation of how and why a natural phenomenon behaves the way it does
- B. A description of an invariable relationship that exists in nature
- C. A speculation or guess about how nature works
- D. An unproven fact

Which of the following best describes the level of biological organization that includes assemblages of different groups of species living within a defined area?

- A. Organism
- B. Population
- C. Community
- D. Family

Chan wants to determine how much the mass of fungus growing on a nutrient agar plate changes over an 8 hr period. What is the most appropriate unit of measure for him to use?

- A. Kilogram
- B. Kilometer
- C. Milligram
- D. Millimeter

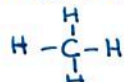
2) Papain, an enzyme in papaya, breaks down polymers composed of amino acids. Which of the following substances does papain break down?

- A. Carbohydrates
- B. Fatty acids
- C. Nucleic acids
- D. Proteins

What is the maximum number of covalent bonds that can form between a single carbon atom and 1 or more hydrogen atoms?

- A. 1
- B. 2
- C. 3
- D. 4

Carbon-VE # 4



Lead (Pb-208) is the heaviest stable isotope known. It has an atomic number of 82. How many neutrons does Pb-208 have?

- A. 82
- B. 126
- C. 164
- D. 208

208 - 82 = 126
Atomic Mass - Atomic #

Which of the following chemical formulas represents an organic molecule?

- A. H₂O
- B. AgNO₃
- C. C₁₂H₂₂O₁₁
- D. CuSO₄·H₂O

*must contain carbon (c)

10) As part of an experiment, a student adds 10 mL of 5% hydrochloric acid solution to 100 mL of a non-buffered, colorless solution of sugar. What is the most likely result?

- A. The concentration of hydroxide ions (OH⁻) will increase.
- B. The concentration of hydrogen ions (H⁺) will increase.
- C. The pH will not change.
- D. The pH will increase.

Acid → H⁺ increase

11) Which of the following solutions has the greatest concentration of hydroxide ions (OH⁻)?

- A. Urine (pH 6.0) → even though it is an "acid"
- B. Rainwater (pH 5.5)
- C. Tomato juice (pH 4.0) it has the highest pH, so
- D. Gastric juice (pH 2.0) most basic

18) During aerobic cellular respiration, in which of the following locations do ATP molecules form?

- A. Cytosol only
- B. Mitochondrial matrix only (inside mitochondria)
- C. Mitochondrial matrix and outer mitochondrial membrane only
- D. Cytosol, mitochondrial matrix, and outer mitochondrial membrane only

19) In biology class, Keesha places a suspension of the green algae *Chlorella* in a growth chamber. She turns the light on in the growth chamber, then measures the change in the amount of CO₂ in the growth chamber over the next 15 minutes. She then repeats the experiment, using a growth chamber that is devoid of light. She finds that the amount of CO₂ in the lighted growth chamber decreases over time, while the amount of CO₂ in the dark growth chamber increases over time. The most likely explanation for her results is that, in the absence of light, CO₂:

- A. consumption by photosynthesis is greater than CO₂ production by cellular respiration.
- B. consumption by cellular respiration is greater than CO₂ production by photosynthesis.
- C. production by photosynthesis is greater than CO₂ consumption by cellular respiration.
- D. production by cellular respiration is greater than CO₂ consumption by photosynthesis.

20) A scientist studies the effects that barnyard grass, a weed, has on the growth of rice, other weeds, and insects. The barnyard grass and other weeds, rice, and insects make up which level of biological organization?

- A. population → only 1 species
- B. community
- C. ecosystem → include living/nonliving
- D. biome → regions of the world with similar climate, animals, & plants

28) The students used correct lab practice when handling samples of pond water. Which practice is NOT an example of correct lab practice?

- A. Wearing disposable gloves
- B. Discarding samples down the drain
- C. Disinfecting the lab countertop before and after each lab session
- D. Washing hands before and after each lab session

Mrs. Lewis set up a lab for her biology students using a culture of the small crustacean *Daphnia*, obtained from a pond that was 20°C. The students are to investigate the effect temperature has on

Daphnia. The students will observe the crustacean's heartbeat under the microscope, at different temperatures, and count the number of heartbeats per sec.

29) If the experiment is designed correctly, what will the students choose for the experimental treatment?

- A. Placing 5 identical cultures of *Daphnia* at 20°C
- B. Placing each of 5 identical cultures of *Daphnia* at a different temperature
- C. Placing 5 cultures, each with a different type of crustacean, at 20°C
- D. Placing 5 cultures, each with a different type of crustacean, at a different temperature

30) What is the independent variable in this experiment?

- A. Temperature of the samples → investigating T° on *Daphnia*
- B. Number of heartbeats/sec
- C. Number of *Daphnia* in the cultures
- D. Type of microscope used

34) A homeowner needs to find the surface area of her pond in order to apply the correct amount of aquatic herbicide. What unit of measurement would be correct and the most efficient to use?

- A. Cubic milliliters > both volume
- B. Cubic meters
- C. Square milliliters - also volume
- D. Square meters → unit for surface area

35) A scientific theory is based on experimental results that satisfy which criterion?

- A. They can be replicated by others.
- B. Their significance is supported by experts.
- C. They are absolute and cannot be challenged.
- D. They are inconsistent with personal experience.

36) Ming volunteers for a study to determine whether a certain medication helps people sleep. Volunteers are assigned to 1 of 2 groups. Volunteers in Group 1 are given the medication, and volunteers in Group 2 are given a placebo. Which of the following steps is necessary to ensure the scientific validity of the results?

- A. Assigning the subjects to each group at random
- B. Assigning all of the subjects with sleeping problems to the placebo group
- C. Telling subjects if they are receiving the medicine or the placebo
- D. Placing 100 volunteers in Group 1 and 10 volunteers in Group 2

leukemia virus. According to cell theory, are viruses, such as feline leukemia, considered living things?

- A. Yes, because they can reproduce.
- B. Yes, because they are composed of cells
- C. No, because they cannot adapt to their environment.
- D. No, because they are not composed of cells.

48) Which is the best example of a population?

- A. All the insects in North America
- B. All the white-tailed deer on an island → 1 species
- C. All the bacteria in a person's digestive tract
- D. All the single-celled creatures in a sample of pond water

51) What is the correct order of organization of all living things from simplest to most complex?

- A. Atom, cell, organ, organelle, organ system, organism, molecule, tissue
- B. Atom, molecule, organelle, cell, tissue, organ, organ system, organism
- C. Atom, molecule, cell, tissue, organelle, organ, organism, organ system
- D. Organelle, atom, molecule, cell, tissue, organ, organ system, organism

54) All members of which of the following groups require a host cell to reproduce?

- A. Fungi
- B. Bacteria
- C. Protists
- D. Viruses

57) Which group(s) contain organisms that can be classified as primary producers?

- A. Monerans only
- B. Protists only
- C. Monerans and protists
- D. Viruses and monerans

*Bad? Monerans thrown out in 1977

59) An ecologist measured the change in the mass of decomposing plant material using the appropriate SI unit. The unit that the ecologist most likely used to measure the mass was:

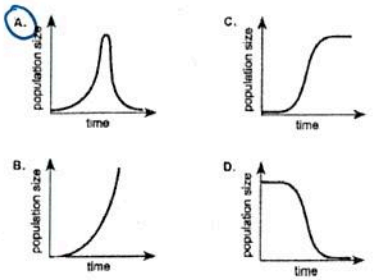
- A. day - not SI
- B. kilogram - Mass
- C. liter - measures volume
- D. pound - not SI

62) Zooxanthellae are protists that live inside reef-building coral polyps and provide the corals nutrients. Corals protect zooxanthellae and give them access to light for photosynthesis. When most of the zooxanthellae inside corals die, the corals also die. Zooxanthellae living in closely related coral species may not be closely related, while zooxanthellae living in distantly related corals may be more closely related. Which description of the relationship between zooxanthellae and corals is accurate?

- A. It is a chance relationship that occurs frequently only if both types of organisms exist close together.
- B. It is a chance relationship that occurs frequently because zooxanthellae are common on coral reefs.
- C. It is a symbiotic relationship that most likely evolved on coral reefs in 1 geographic location.
- D. It is a symbiotic relationship that most likely evolved on coral reefs in a number of geographic locations.

- 63) An oxpecker is a bird that usually feeds on parasites on a rhinoceros's back. It occasionally picks scabs off the rhinoceros's back and drinks blood from the wounds. Describe the relationship(s) between the oxpecker and the rhinoceros.
- A. Mutualism only
 B. Mutualism and predation
 C. Mutualism and parasitism
 D. Mutualism and commensalism

- 65) For years, runoff from a nearby industrial plant has entered a certain lake. The runoff causes seasonal blooms of algae in the lake. These algae are short-lived and die off quickly. Which of the following graphs most likely illustrates the growth pattern of this algal population from the beginning of the spring seasonal bloom to the end of the resultant die-off of the algal population?

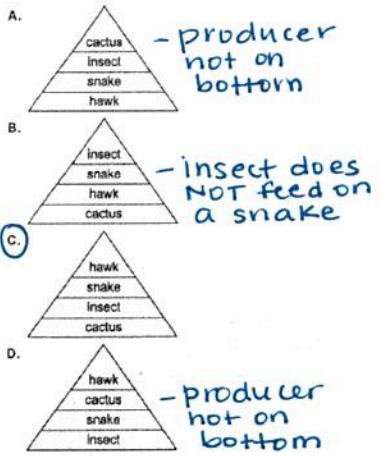


- 66) Collectively, all the biotic and abiotic components in a particular area are best described as which of the following?
- A. Community
 B. Ecosystem
 C. Niche
 D. Population

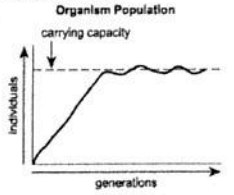
- 7) Consider the following simple lake food chain.
- Algae → Mosquito larvae → Dragonfly larvae → Perch → Pike
- According to this diagram, which of these organisms is a tertiary consumer?
- A. Pike
 B. Perch
 C. Dragonfly larvae
 D. Mosquito larvae

- 73) A hospital patient had a serious bacterial infection that required treatment with strong antibiotics. The patient recovered from the infection, but experienced side effects, including oral fungal infections and digestive problems. What is the most probable reason for the side effects?
- A. The patient experienced an allergic reaction to the antibiotics.
 B. The patient had not fully recovered from the infection.
 C. The antibiotics killed both harmful and beneficial bacteria.
 D. The antibiotics encouraged an overgrowth of beneficial bacteria.

- 74) Which energy pyramid accurately represents the amount of energy in a desert food chain including cactus, hawk, insect, and snake?



- 79) Using the graph, determine which statement most likely describes the relationship between the population of organisms and the resources available to the population.



- A. There are adequate resources to support this stable population.
 B. There are adequate resources to support this unstable population.
 C. There are inadequate resources to support this stable population.
 D. There are inadequate resources to support this unstable population.

- 82) When the pH in a stomach increases from 2 to 4, how does the hydrogen ion concentration change?

- A. It increases by a factor of 2.
 B. It increases by a factor of 100.
 C. It decreases by a factor of 2.
 D. It decreases by a factor of 100.
- Handwritten note: "*Each pH represents a change by 10"

- 88) In aerobic respiration, glucose ($C_6H_{12}O_6$) combines with oxygen (O_2) to yield carbon dioxide (CO_2) and water (H_2O). What is the balanced chemical equation for this reaction?

- A. $C_6H_{12}O_6 \rightarrow CO_2 + H_2O$
 B. $C_6H_{12}O_6 + 6 O_2 \rightarrow 6 H_2O$
 C. $C_6H_{12}O_6 + O_2 \rightarrow 6 CO_2 + 6 H_2O$
 D. $C_6H_{12}O_6 + 6 O_2 \rightarrow 6 CO_2 + 6 H_2O$

- 89) Which functional group found in amino acids is absent from monosaccharides, polysaccharides, fatty acids, and glycerol?

- A. $-COOH$ - Carboxyl
 B. $-NH_2$ - Amino
 C. $-OH$ - Hydroxyl
 D. $-PO_4$ - Phosphate

- 92) Hummingbirds transfer pollen from one flower to another while feeding. What plant structure contains the pollen?

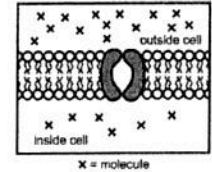
- A. Carpel
 B. Petal
 C. Sepal
 D. Stamen

- 93) The cytoplasm of red blood cells has a higher concentration of Na^+ than does pure water. Suppose a biologist places a red blood cell in pure water. Is there a net flow of water molecules into or out of the red blood cell, and by which process does this net flow of water occur?

- A. Out of the cell; osmosis
 B. Into the cell; osmosis
 C. Out of the cell; active transport
 D. Into the cell; active transport

Handwritten note: "red blood cell" with an arrow pointing to the question. Another note: "water travels from high to low. What will happen to the RBC?"

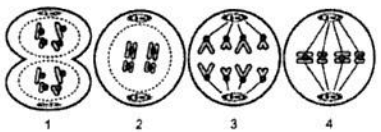
- 94) The diagram shows a cell membrane composed of a phospholipid bilayer with a channel protein. Each x represents the same type of molecule inside or outside the cell. Facilitated diffusion moves these molecules across the cell membrane.



- In what direction do these molecules move and through which structure?

- A. Into the cell through the channel protein
 B. Into the cell through the phospholipid bilayer
 C. Out of the cell through the channel protein
 D. Out of the cell through the phospholipid bilayer

- 95) These diagrams represent different stages of animal cell division.



- From start to finish, what is the correct order of the stages?

- A. 2, 4, 3, 1
 B. 2, 3, 4, 1
 C. 3, 2, 1, 4
 D. 3, 1, 2, 4

Handwritten note: "PMAT"

- 96) What combines with sugar and a phosphate group to form a nucleotide?

- A. Amino acid
 B. Deoxyribose
 C. Glycerol
 D. Nitrogenous base

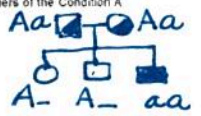
- 97) In humans, pigmented skin is dominant to non-pigmented skin (albinism). What is the genotype of an individual with albinism?

- A. Carrier
 B. Heterozygous
 C. Homozygous dominant
 D. Homozygous recessive

Handwritten note: "In order to show recessive trait, must have aa"

- 98) Suppose Condition A is an autosomal recessive trait that affects the nervous system. In one family, the father, mother, daughter, and elder son do not have Condition A, but the younger son has Condition A. Both of the individuals in which of the following pairs MUST be carriers of the Condition A allele?

- A. Father and elder son
 B. Mother and daughter
 C. Daughter and elder son
 D. Mother and father



- 99) Cystic fibrosis is a genetic disease in which excess mucus accumulates in the lungs and digestive system of affected individuals. Males and females must inherit 2 alleles with this mutation to have the disease. What is the mode of inheritance of cystic fibrosis?

- A. Autosomal dominant
 B. Autosomal recessive
 C. Sex-linked dominant
 D. Sex-linked recessive

- 104) Plant cells contain both a cell wall and a cell membrane. What is the composition of the cell wall, and where is it located in relation to the cell membrane?

- A. Cellulose, inside the cell membrane
 B. Cellulose, outside the cell membrane
 C. Glucose, inside the cell membrane
 D. Glucose, outside the cell membrane

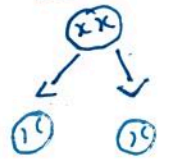
- 107) The aerobic and anaerobic pathways of cellular respiration require which products of glycolysis?

- A. NADH and ATP
 B. Pyruvate and ATP
 C. Pyruvate and NADH
 D. ATP, pyruvate, and NADH

- 111) A single mitotic division of a human skin cell generally produces:

- A. 2 cells, each with 1 complete diploid set of chromosomes.
 B. 2 cells, each with 1 complete haploid set of chromosomes
 C. 4 cells, each with 1 complete diploid set of chromosomes.
 D. 4 cells, each with 1 complete haploid set of chromosomes.

Handwritten note: "Mitosis"



- 114) During metaphase I of meiosis, which of the following occurs?
- Centrosomes of replicated chromosomes line up along the cell's equator.
 - Sister chromatids separate and move toward opposite poles of the cell.
 - Paired homologous chromosomes line up along the cell's equator.**
 - Homologous chromosomes separate and move toward opposite poles of the cell.

- 115) The manner in which chromosomes separate into gametes during meiosis is the molecular mechanism behind which of Mendel's laws, if either?

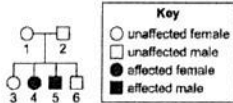
- Law of independent assortment only
- Law of segregation only
- Both the law of independent assortment and the law of segregation**
- Neither the law of independent assortment nor the law of segregation

- 116) Two black guinea pigs bred and produced 3 black offspring and 2 albino offspring. Assuming no mutations, which guinea pigs must be heterozygous?

- All 3 black offspring
- Exactly 2 of the black offspring
- Both albino offspring
- Both parents**

- 118) Alkaptonuria is a genetic disorder of protein metabolism.

The disorder is determined by 2 alleles at 1 locus.



What is the genotype for individual 1 in the diagram?

- AA or Aa
- AA
- Aa**
- aa

- 119) A trisomy of chromosome 21 causes what condition?

- Albinism
- Dwarfism
- Down syndrome**
- Color blindness

- 120) Lazzaro Spallanzani and Louis Pasteur both performed experiments hoping to disprove the hypothesis that organisms can form by spontaneous generation. Which of the following flasks was included in Pasteur's experiment that was NOT included in Spallanzani's?

- A flask that allowed air to enter but did not allow microorganisms to enter**
- A flask that did not allow air to enter but did allow microorganisms to enter
- A flask that allowed neither air to enter nor microorganisms to enter
- A flask that allowed both air to enter and microorganisms to enter

curved neck flasks

- 121) John Needham performed an experiment testing spontaneous generation. He boiled chicken broth, placed it in a sterile flask, and then sealed the flask. After a few days, Needham observed microorganisms in the flask. Based on current understanding, how was his experiment flawed?

- Boiling activated dormant microorganisms present in the broth.
- Boiling the broth did not kill all microorganisms present.
- Microorganisms entered the broth from the flask itself after the flask was sealed.
- After Needham boiled the broth, microorganisms entered from the air.**

- 125) The process that is most directly responsible for the majority of the ATP produced during aerobic respiration is which of the following?

- Fermentation
- Glycolysis
- Krebs cycle
- Electron transport**

- 126) While investigating yeast respiration, a researcher detects ethanol in the yeast culture. Which molecules does the yeast culture also contain?

- Lactic acid and ATP
- Oxygen and lactic acid
- Carbon dioxide and ATP - alcoholic fermentation**
- Oxygen and carbon dioxide

- 133) Keisha passes a local dairy farm that has many brown cows, but only a few white cows. A dominant allele produces brown hair in cows and a recessive allele produces white hair. Which characteristic of any brown cow can Keisha identify?

- The genotype of both of the cow's parents
- The genotype of the cow's hair color
- The phenotype of both of the cow's parents
- The phenotype of the cow's hair color**

Consider the mRNA codon chart:

1st position	2nd position			3rd position
U	C	A	G	
U	Phe	Ser	Tyr	Cys
	Phe	Ser	Tyr	Cys
	Leu	Ser	Stop	Stop
C	Leu	Pro	His	Arg
	Leu	Pro	His	Arg
	Leu	Pro	Gln	Arg
A	Ile	Thr	Asn	Ser
	Ile	Thr	Lys	Arg
	Met	Thr	Lys	Arg
G	Val	Ala	Asp	Gly
	Val	Ala	Asp	Gly
	Val	Ala	Glu	Gly

- 134) Which of the following mRNA sequences codes for valine (Val), glutamic acid (Glu), and serine (Ser), respectively?

- UGG-AGG-CUA
- GUA-GGG-AGC
- GUC-GAA-ACU**
- GUG-GAG-AGC

- 135) The mRNA sequence ACU codes for the amino acid Thr. A mutation occurs, and the resulting mRNA sequence is AUU. What amino acid will replace Thr?

- Val
- Met
- Ile**
- Ala

- 136) Who helped disprove the idea of spontaneous generation by demonstrating that maggots come from fly eggs and NOT from meat?

- Francesco Redi **→ REDi = red meat**
- John Needham
- Lazzaro Spallanzani
- Louis Pasteur

- 140) In coho salmon, hooknose males are large and jack males are small. Average-sized males exist, but are rare. What statement best explains disruptive selection in male coho salmon?

- Average-sized males reach the spawning ground first.
- The scent of average-sized males makes them most attractive to females.
- Hooknose males produce stronger sperm than jack males or average-sized males.
- The relative size of hooknose males and jack males is an advantage during mating.**

- 141) Horse skeleton fossils indicate that the size of horses increased over time. Which statement best explains this fossil record?

- Smaller horses bred with larger horses, creating hybrids.
- Smaller horses were infected by a fatal virus early in their history.
- Larger horses consumed the food supply of the smaller horses.
- Larger horses produced a slightly greater number of surviving offspring.**

organisms best suited to the environment survive

↓
Reproduce

↓
Pass genes to offspring

hormones that are essential for the regulation of the human reproductive cycle?

- Circulatory
- Endocrine**
- Immune
- Nervous

- 164) Alec studied an unknown microscopic, unicellular organism and recorded his observations. He noted that the organism had DNA, ribosomes, and a cell wall, but no nucleus or other membrane-bound organelles. Based on Alec's observations, the organism would be best classified as a

- virus
- prokaryote
- fungus
- bacterium**

- 165) The organisms of what kingdom possess these traits?

- Eukaryotic cells
- Photosynthetic
- Cellulose cell walls

- Eubacteria
- Fungi
- Plantae**
- Monera

- 168) What is the path of deoxygenated blood as it enters a 4-chambered heart?

- Pulmonary vein → left atrium → left ventricle → aorta
- Pulmonary vein → right atrium → left atrium → aorta
- Vena cavae → right atrium → left atrium → pulmonary artery
- Vena cavae → right atrium → right ventricle → pulmonary artery**

vena cavae veins that send blood back to the heart from the body

- 170) Lions and tigers both belong to the genus *Panthera*. Cheetahs belong to the genus *Acinonyx*. Scientists group these 3 types of cats together at the next most inclusive taxonomic level. Which of these taxonomic levels do lions, tigers, and cheetahs have in common?

- Class
- Species
- Family

- I and II only
- I and III only**
- II and III only
- I, II, and III

- 180) Based on their scientific names, which of the following conclusions about the classification of *Bradypus torquatus* and *Bradypus variegatus* is most likely correct? The 2 organisms belong to:

- the same species
- the same genus**
- different phyla
- different kingdoms

*K
P
Class
O
Family
Species*

if they have family in common, then class must also be in common

- 181) The pancreas produces which of the following hormones?

- Insulin and glucagon**
- Oxytocin and prolactin - *pituitary*
- Estrogen and progesterone - *ovaries*
- Epinephrine and norepinephrine - *adrenal medulla in kidneys*

- 182) Which physiological system includes the lungs, trachea, and pharynx?

- Endocrine
- Nervous
- Reproductive
- Respiratory**

→ connects nose and mouth to esophagus

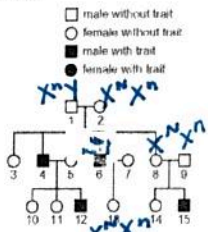
colorblindness is a recessive, X-linked trait. The chromosomes and alleles associated with this type of color blindness are represented in this chart.

X = X chromosome
Y = Y chromosome
B = allele for normal color vision
b = allele for color blindness

Which of these could NOT be a biological child of parents having the genotypes X^BX^b and X^bY?

- A. Color-blind son
- B. Color-blind daughter**
- C. Daughter with normal color vision
- D. Son with normal color vision

95) This pedigree shows 3 generations of a family in which some members exhibit a particular X-linked recessive trait.



The 2 females in which of the following pairs must have the same genotype?

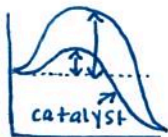
- A. 3 and 5 → was married into family
- B. 7 and 11
- C. 8 and 13**
- D. 10 and 14

16) An entomologist identified a new species of beetle in a South American rain forest. The beetle has all the features of the darkling beetle family Tenebrionidae and closely resembles other darkling beetles of the genus *Tenebrio*. What should the entomologist do next?

- A. Give the beetle new genus and family names
- B. Give the beetle a new species name not used in the genus *Tenebrio***
- C. Name the beetle after the species it is most similar to.
- D. Discard the beetle because it is not found in existing taxonomy.

97) How do enzymes speed up chemical reactions?

- A. By reducing activation energy**
- B. By reducing energy produced by the reaction
- C. By increasing activation energy
- D. By increasing energy produced by the reaction

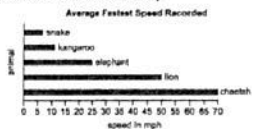


98) What trait of an ATP molecule enables it to store energy for use by cells?

- A. Its small size
- B. Its solubility in water
- C. Its ability to form hydrogen bonds
- D. Its phosphate-phosphate bond**

Adenine - Ribose - Phosphate - Phosphate - Phosphate

↑
highest energy bond



Based on the graph, which species is approximately $\frac{1}{3}$ as fast as the cheetah?

- A. Elephant = 25**
 - B. Kangaroo
 - C. Lion
 - D. Snake
- Handwritten calculation: $3 \overline{) 70} = 23.3$

209) In what kingdom would scientists most likely classify a multicellular, nonmotile, autotrophic organism with a cell wall containing cellulose?

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

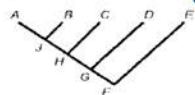
210) A scientist places a cell in a solution, and over time the cell gains mass and swells. What is the most likely explanation for the cell's gain in mass?

- A. The solution is hypertonic to the cell.
- B. The solution is hypotonic to the cell.**
- C. The solution and the cell have equal concentrations of solutes.
- D. The solution and the cell have equal concentrations of water.



water moves from high to low concentration, so solution is hypotonic

223) The following cladogram illustrates the proposed evolutionary relationships of several extant species (A-E).

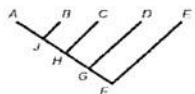


→ still existing

According to the cladogram, which of the following species is the most recent common ancestor to Species A and Species E?

- A. Species J
- B. Species H
- C. Species G
- D. Species F**

224) The following cladogram illustrates the proposed evolutionary relationships of several extant species (A-E).



According to this cladogram, which of the following species is most closely related to Species B?

- A. Species A → because they have the most recent common ancestor**
- B. Species C
- C. Species D
- D. Species E