

## CAPT PRACTICE TEST

DEVELOPED FROM RELEASED QUESTIONS AND OTHER SOURCES.

**Directions:** The following Practice Test is keyed to the CAPT numbered strands therefore Question 1 corresponds to Strand 1 etc. This practice test is intended to give students an idea of areas they need to review and is tied to a second document CAPT VIDEO ARCADE an excel document that has links to games, videos and animations that can be useful to reviewing the CAPT strands.

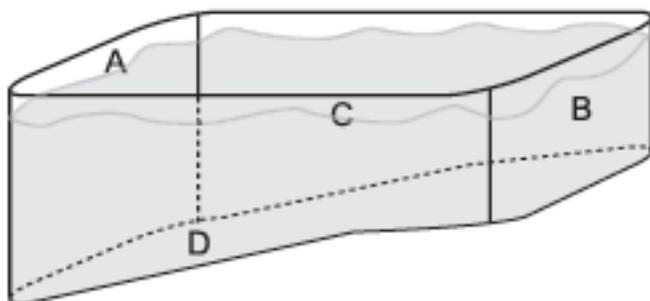
### Strand I: Energy Transformations: Expected Performances 1-9

#### Recreation Center Pool

A local recreation center has received funding to build a swimming pool. After construction, the center will be responsible for all costs associated with pool operation. As a result, the center must consider a variety of design options, including pool size, location and heating.

1. What happens to water molecules in a pool as they absorb energy?
  - a. The molecules occupy less volume.
  - b. The molecules begin to move more slowly.
  - c. The kinetic energy of the atoms decreases.
  - d. The rate of collision between molecules increases.

#### Recreation Center Pool



2. Where should hot water enter the pool to better heat the water?
  - a. A
  - b. B
  - c. C
  - d. D

3. Energy changes occur during the flight of a firework rocket. Which of the following represents a correct energy change?
  - a. When the firework rocket left the ground, chemical potential energy was changed into kinetic energy.
  - b. When the firework rocket exploded, kinetic energy was changed into chemical potential energy.
  - c. During the rise of the firework rocket, gravitational potential energy was changed to kinetic energy.
  - d. During the rise of the firework rocket, gravitational potential energy was changed to

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heat, light and sound.

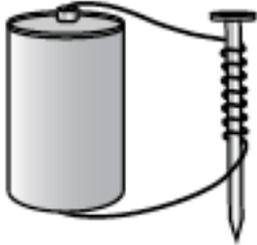
4. To demonstrate static electricity, a teacher takes an inflated rubber balloon and rubs it on his head. The rubber balloon picks up electrons from his hair, which causes his hair to have a(n) \_\_\_\_\_.

- a. electrical current
- b. net positive charge
- c. net negative charge
- d. buildup of magnetic energy

5. When in use, the heating element in a toaster glows and gives off heat. This is because atoms within the heating element \_\_\_\_\_.

- a. undergo chemical reactions
- b. are excited by the flow of electrons
- c. gain electrons and increase in temperature
- d. conduct light and heat from the outlet

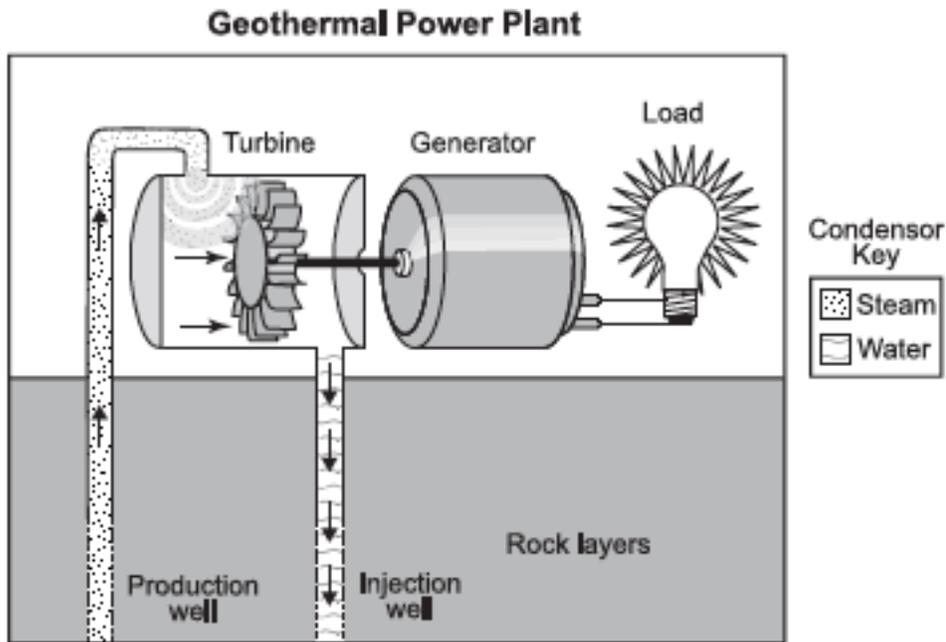
6. A student makes the following apparatus to generate an electric magnet. The magnet works when wires are connected to both poles of the battery but not when one wire is removed. Why is this the case?



- a. Disconnecting one wire disrupts current flow and generation of the magnetic field
- b. Disconnecting one wire increases the resistance which is greater than the magnetic field
- c. Disconnecting one wire increases the amperage which decreases the magnetic field
- d. Disconnecting one wire disrupts the magnetic field by created by the flow of neutrons through the wire

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The picture below shows a turbine generator used to produce electricity at a geothermal power plant.



7. Electricity is produced by using steam to \_\_\_\_\_.
- heat the turbine generators
  - spin the turbine generators
  - reduce friction in the turbine generators
  - reduce emissions from the turbine generators
8. Nuclear and coal powered power plants share a number of pollution issues. When functioning normally which type of pollution is a major issue of coal fired plants but not nuclear power plants when functioning normally?
- air pollution due to emissions of smoke,  $\text{SO}_2$  and  $\text{NO}_x$  contaminants
  - pollution of water including thermal pollution
  - soil contamination due to solid waste
  - none are different they share the same pollutants
9. What is a major advantage of using wind energy instead of coal or nuclear power plants?
- Windmills reduce the strength of severe storms.
  - Wind is consistently available in all locations.
  - Wind is a renewable energy source.
  - A single windmill produces more energy than a nuclear plant.

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**Strand II: Chemical Structures and Properties: Expected Performances 10-18**

10. An ion with 5 protons, 6 neutrons, and a charge of 3+ has an atomic number of

- A. 5
- B. 6
- C. 8
- D. 11

11. Which of these compounds is most likely to contain an ionic bond?

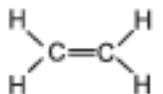
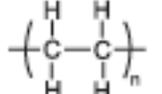
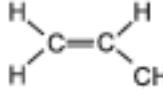
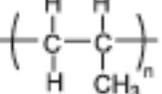
- a. CH<sub>4</sub>
- b. SO<sub>2</sub>
- c. H<sub>2</sub>
- d. CaCl<sub>2</sub>

12. The name of the salt formed by the neutralization of hydrochloric acid and sodium hydroxide is \_\_\_\_\_.

- a. sodium chloride
- b. sodium chlorate
- c. sodium chlorite
- d. sodium hypochlorite

Consumers use many products made of plastic. Plastics are carbon-based polymers made from smaller carbon compounds, called monomers.

**Common Plastics**

Plastic	Monomer	Polymer
<b>Polyethylene</b>		
<b>Polypropylene</b>		

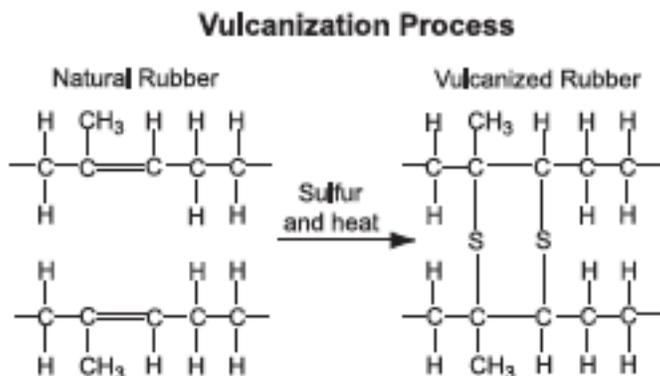
13. In organic molecules, the carbon atoms and the hydrogen atoms are held together by \_\_\_\_\_.

- a. hydrogen bonds
- b. covalent bonds
- c. ionic bonds
- d. nuclear bonds

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**Rubber Tires**

The tires on most cars are not made of natural rubber because it becomes brittle in the cold and sticky in the heat. Instead, natural rubber is vulcanized by adding sulfur and heat, making it stronger and more elastic. This process is represented chemically in the diagram below.



14. The complete combustion or burning of **natural rubber** will produce \_\_\_\_\_.
- hydrogen and oxygen
  - oxygen and water
  - hydrogen gas and water
  - carbon dioxide and water
15. What is a possible explanation for why Vulcanized rubber is stronger than natural rubber.
- branched polymers with more than one hydrocarbon strand are stronger than linear polymers
  - linear polymers with one strand are stronger than branched polymers
  - Sulfur is stronger than Hydrogen
  - Sulfur is stronger than Carbon
16. During the vulcanization reaction shown above, the natural rubber polymer is converted to a new polymer by the \_\_\_\_\_.
- cross-linking of carbon atoms with sulfur atoms
  - cross-linking of hydrogen atoms with sulfur atoms
  - replacement of carbon atoms with sulfur atoms
  - replacement of hydrogen atoms with sulfur atoms
17. Vulcanization leads to \_\_\_\_\_ bonds between two polymer chains to increase strength and elasticity.
- ionic
  - hydrogen
  - covalent
  - Van der Waals

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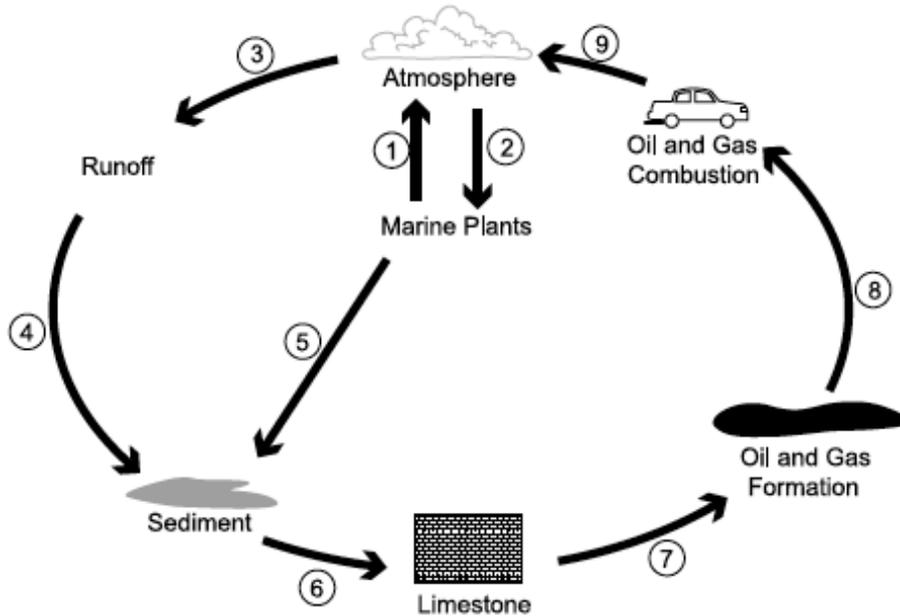
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18. Many communities encourage the recycling of plastics, even though it is often expensive to do so. Why is it beneficial to the environment to recycle plastics?

- a. Plastics are expensive to manufacture.
- b. Plastics are made from renewable resources.
- c. Plastics decompose quickly, releasing toxic chemicals.
- d. Plastics decompose slowly, taking up space in landfills.!

**Strand III: Global Interdependence: Expected Performances 19-26**

19. The diagram below shows carbon cycling associated with oil and gas consumption.



Which arrow on the carbon cycle diagram represents the process that takes the longest amount of time to occur?

- a. 1
- b. 3
- c. 5
- d. 7

20. Over 6 billion people on Earth use water every day, yet Earth's water supply remains relatively constant. This is because \_\_\_\_\_.

- a. the sea level is rising
- b. water exists in three phases on Earth
- c. water is constantly recycled by the hydrologic cycle
- d. global warming melts ice to replace water that is used

21. Rocks pushed deep into the earth's surface can \_\_\_\_\_.

- a. remain unchanged forever
- b. can melt into liquid magma
- c. melt and become sedimentary rock
- d. weather easily into soil

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**The London Smog Disaster of 1952**

On December 5, 1952, London, England, experienced temperatures that were much colder than normal. As a result, large amounts of coal were burned in furnaces to keep residences warm. This occurred at the same time as the formation of a heavy fog. Water from the fog condensed around airborne soot particles, and a thick smog quickly developed. Nearly 12,000 human deaths resulted.

**22** In addition to soot, what product of the burning coal contributed **most** to the extreme pollution of London's air?

- a. uranium (U)
- b. methane (CH<sub>4</sub>)
- c. sulfur dioxide (SO<sub>2</sub>)
- d. chlorofluorocarbons (CFCs)

23. In addition to a short-term toxic effect as described in London in 1952 the burning of coal and other fossil fuels may increase global temperatures. What might lead to this increase .

- a. The combustion products reflect solar radiation away from Earth.
- b. Carbon dioxide in the atmosphere attracts solar radiation.
- c. Carbon dioxide in the atmosphere blocks energy from escaping into space.
- d. The combustion products allow more energy to enter the earth.

24. Coal combustion releases [nitrogen oxides](#) and [mercury](#), and dozens of other substances known to be hazardous to human health and can pollute streams and lakes. Nitrogen oxide pollution primarily leads to \_\_\_\_\_ of lakes, while mercury biomagnification can make fish inedible as mercury is \_\_\_\_\_.

- a. neurotoxicity, acidic
- b. acidification, neurotoxic
- c. neutralization, acidic
- d. alkalization, acidic

25. Which transportation option will most likely have the most positive effect on the environment with respect to producing less carbon dioxide emissions and other gasses that may pollute the environment.

- a. carpools with 2 people in gasoline powered vehicles
- b. the use of diesel vehicles
- c. use of mass transit electric trains
- d. use of gasoline powered vehicles

**26.** Which government action was **most likely** the result of the London smog disaster of 1952?

- a. establishment of youth curfews after dark
- b. creation of a privately funded healthcare system
- c. conversion from underground mining for coal to strip mining for coal
- d. provision of grants for homeowners to convert to gas or oil-fueled heaters

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**Strand IV: Cell Chemistry and Biotechnology: Expected Performances 27-35**

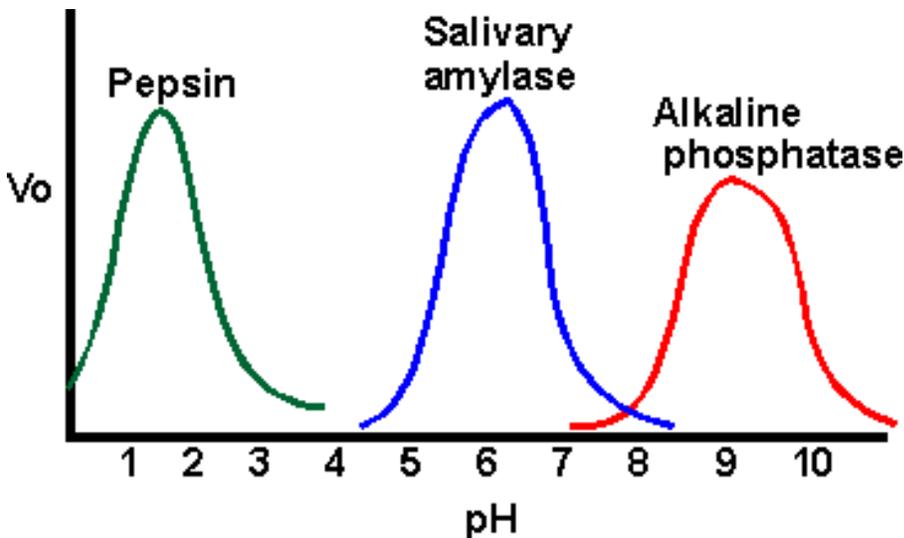
27. Which of the following describes an important difference between a potato plant cell and a human cell?

- a. Plant cells have a cell wall, and animal cells do not.
- b. Animal cells store water inside, and plant cells do not.
- c. Plant cells have a cell nucleus, and animal cells do not.
- d. Animal cells perform respiration, and plant cells do not.

28. The shape of a protein is most directly determined by the

- a. amount of energy available for synthesis of the protein
- b. kind and sequence of amino acids in the protein
- c. type and number of DNA molecules in a cell
- d. mistakes made when the DNA is copied

29. Enzymes have an optimal operating range. Most enzymes have evolved to work maximally in the environmental conditions where they reside. Based on this concept which enzyme shown below is most likely a digestive enzyme in the stomach.



- a. Pepsin
- b. Salivary amylase
- c. Alkaline phosphatase.
- d. Can't tell from this data.

30. Depending on its electric charge, shape, and chemical properties, a substance may or may not be allowed to pass through a cell membrane. This function of the cell membrane is important because it \_\_\_\_\_.

- a. prevents cell division
- b. prevents destruction of the cell wall
- c. allows the cell to maintain homeostasis
- d. allows amino acids to move into and out of the cell

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31. A new drug is developed that inhibits protein synthesis enzymes in the prokaryotic ribosome. This drug might be effective against.

- a. bacteria
- b. viruses
- c. bacteria and viruses.
- d. yeast

32. What is accomplished by treating a person who has a bacterial infection with antibiotics?

- a. immunity to future infections
- b. weakening of the person's immune system
- c. reduction in the duration and intensity of the infection
- d. modification of bacterial DNA to make the bacteria harmless

33. Yeast can perform cellular respiration and fermentation. Which waste product of these reactions is important for the rising of bread?

- a. ethanol
- b. carbon dioxide
- c. oxygen
- d. lactic acid

34. Genes can be transferred from one organism to another using a plasmid vector that can be reproduced in E.coli bacteria. This ability to move DNA from one organism to another is dependent on \_\_\_\_\_.

- a. The universal use of amino acids
- b. The universal code of DNA
- c. The same mechanisms for cell division
- d. The same mechanism for cellular energy

35. Two farmers plant different varieties of corn on neighboring farms. Farmer A plants genetically modified corn. Farmer B plants a non-modified variety of corn. What would be farmer B's **primary** concern if she plans to gather seed for next year's crop?

- a. loss of genetic variability in the non-modified variety
- b. that mutation rates will increase in the non-modified variety
- c. that insects will only pollinate the genetically modified corn
- d. unintended transfer of modified genes to her crop by cross-pollination

### **Strand V: Genetics, Evolution and Biodiversity: Expected Performances 36-45**

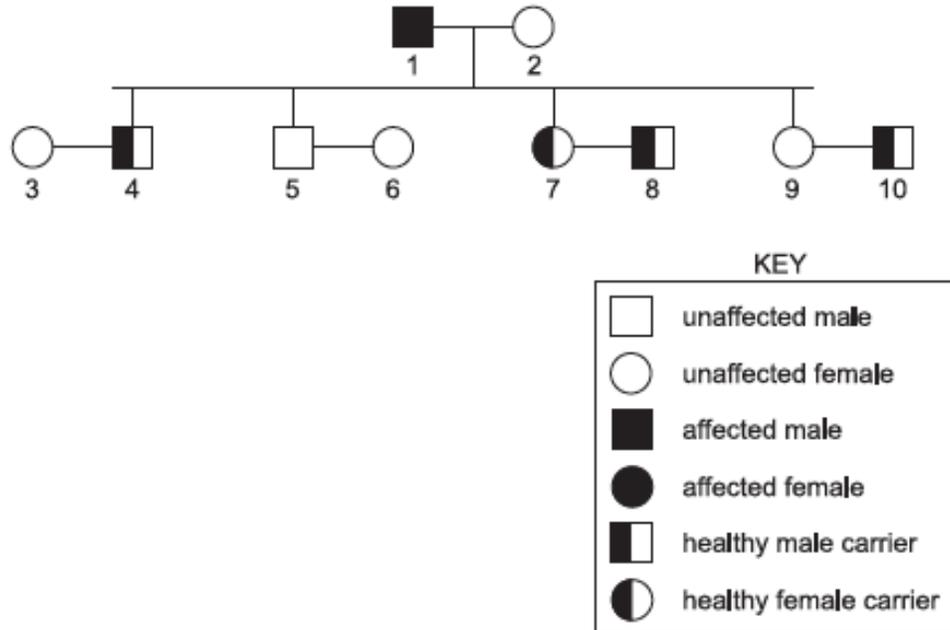
36. Genetic Diversity by independent assortment occurs during the \_\_\_\_\_ stage of meiosis.

- a. Prophase
- b. Metaphase
- c. Anaphase
- d. Telophase

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**Cystic Fibrosis**

Cystic fibrosis (CF) is a condition characterized by difficulty in breathing and digestion. CF is caused by a defect in a specific gene. The pedigree diagram below shows the inheritance pattern of cystic fibrosis in two generations of a family.



37. Which couple has a 25% probability of producing offspring who are homozygous for cystic fibrosis?
- 3 and 4
  - 5 and 6
  - 7 and 8
  - 9 and 10
38. Based on the pedigree of Cystic Fibrosis above what is the mode of inheritance for this disease.
- X-linked Dominant
  - X-linked Recessive
  - Autosomal Dominant
  - Autosomal Recessive
39. An individual with CF is **not** able to transmit the disease by physical contact because \_\_\_\_\_.
- the gene for the disorder is only carried in the bloodstream
  - CF is a genetic disorder and can only be passed from parent to offspring
  - the bacteria that transmit the defective gene must be inherited from a parent
  - CF is so rare that the probability of coming into contact with an affected individual is low

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40. It is very difficult to develop a vaccine against the common cold. The reason for this is that the common cold virus \_\_\_\_\_.

- a. hides in the digestive system
- b. changes rapidly due to high mutation rates
- c. includes RNA as its genetic materials
- d. is too small for the immune system to detect

41. Vestigial structures, such as hip bones in whales and appendixes in humans, are those that have little or no function for the organism. What is the **most likely** reason for this loss of function over time?

- a. The organism is undergoing speciation.
- b. The organism is experiencing genetic drift.
- c. The structure was over utilized by the organism.
- d. The structure was not highly beneficial to the organism.

42. An early biological theory stated that a change in a population can occur when organisms with favorable variations for a particular environment survive and pass these variations on to the next generation. This theory is better known as the Theory of —

- a. Natural Selection
- b. Punctuated Selection
- c. Variation and Adaptation
- d. Acquired Characteristics

43. Yeast is grown in a 500 ml flask that is shaken to introduce oxygen for cellular respiration. The growth media contains 2% Glucose and other nutrients. The nutrients and the size of the container are limiting factors that determine the \_\_\_\_\_ of the environment.

- a. absolute value
- b. total population
- c. carrying capacity
- d. mortality rate

44. The growth rate of a local population is dependent on the birth rate minus the death rate and \_\_\_\_\_.

- a. the ratio of males to females in the population
- b. the lifespan of females beyond the reproductive age
- c. the amount of genetic variation that exists in the population
- d. the immigration and emigration of individuals to and from the population

45. The invention of antibiotic and vaccines are two technological advances that have \_\_\_\_\_ the mortality rate in developed countries.

- a. eliminated
- b. raised
- c. lowered
- d. maintained

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