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Unit II Minitest

26 Questions **30 Minutes**

This minitest is designed to assess your mastery of the content in Chapters 5 through 7 of this volume. The questions have been designed to simulate actual MCAT questions in terms of format and degree of difficulty. They are based on the content categories associated with Foundational Concept 2, which is the theme of this unit. They are also designed to test the scientific inquiry and reasoning skills that the test makers have identified as essential for success in medical school.

In this test, most of the questions are based on short passages that typically describe a laboratory experiment, a research study, or some similar process. There are also some questions that are not based on passages.

Use this test to measure your readiness for the actual MCAT. Try to answer all of the questions within the specified time limit. If you run out of time, you will know that you need to work on improving your pacing.

Complete answer explanations are provided at the end of the minitest. Pay particular attention to the answers for questions you got wrong or skipped. If necessary, go back and review the corresponding chapters or text sections in this unit.

Now turn the page and begin the Unit II Minitest.

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Directions: *Choose the best answer to each of the following questions. Questions 1–4 are not based on a passage.*

1. The DNA doubles and chromosomes replicate during which phase of the cycle cell?
   A. G_1 **B.** metaphase **C.** S **D.** G_2
2. When two solutions that differ in solute concentration are placed on either side of a semi-permeable membrane and osmosis is allowed to occur, which of the following will be observed?
   A. Water will move from an area of low solute concentration to an area of high solute concentration.
   B. The solute will move from an area of high concentration to an area of low concentration.
   C. There will be no net movement of water.
   D. Water will move from an area of high solute concentration to an area of low solute concentration.
3. A scientist discovers an unidentified unicellular organism. To identify it as eukaryotic, she must determine if it has:
   A. ribosomes
   B. a cell membrane
   C. DNA
   D. mitochondria
4. Which of the following would help you identify an unknown cell type as connective?
   A. the ability to contract
   B. the presence of lots of cells arranged in sheets
   C. the presence of a basement membrane
   D. the presence of collagen fibers

Questions 5–8 are based on the following passage.

Passage I

The origin of eukaryotic organelles has been subject to speculation for many years. In particular, chloroplasts and mitochondria have some unusual features unlike the other organelles of the cell, which suggests they have had a unique history. The evidence collected as a result of the development of molecular research techniques provides an explanation for the origin of these organelles.

The theory of endosymbiosis is used to explain the presence of organelles such as mitochondria and chloroplasts in modern-day eukaryotic cells. The theory suggests that small prokaryotic cells were at one time engulfed by larger prokaryotic cells. Once inside the larger cells, a symbiotic relationship developed. In the case of mitochondria, it has been speculated that the larger cell was likely anaerobic and ingested a smaller aerobic cell. Once inside, the aerobic cell was able to perform aerobic respiration to produce additional ATP for the host cell. To explain the evolution of chloroplasts, it has

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been suggested that cyanobacteria with the ability to photosynthesize were engulfed by a larger anaerobic prokaryotic cell. Support for this theory exists in the fact that both mitochondria and chloroplasts have double membranes, have their own genetic material that is different from typical eukaryotic chromosomal DNA, and have their own ribosomes.

5. According to the endosymbiotic theory presented in this passage, the original anaerobic cell that engulfed the smaller cell was likely to be performing _____ to produce ATP prior to entering a symbiotic relationship.
   A. glycolysis
   B. electron transport
   C. the Krebs cycle
   D. all of these

6. The genetic material of mitochondria and chloroplasts resemble that of modern-day bacteria as opposed to that of typical eukaryotic genetic material. This would mean which of the following?
   A. The DNA in these organelles exists in linear chromosome form.
   B. The DNA in these organelles exists in plasmid form.
   C. The DNA in these organelles exists in a single loop.
   D. The RNA in these organelles is single stranded.

7. Under normal circumstances, items engulfed by a eukaryotic cell might be broken down by which organelle?
   A. the lysosomes
   B. the smooth endoplasmic reticulum
   C. the Golgi apparatus
   D. the rough endoplasmic reticulum

8. Which of the following would lend additional evidence to the endosymbiotic theory?
   A. discovering a difference in the size of the subunits of the ribosomes inside the mitochondria and chloroplasts as compared to the rest of the cell
   B. finding that the inner membrane of the mitochondria and chloroplasts resembled that of modern bacteria
   C. finding plasmid DNA in the mitochondria and chloroplasts
   D. all of the above

Questions 9–12 are based on the following passage.

Passage II

In the early 1900s, it was noticed that cellular materials that passed from the tumors of chickens with cancer to chickens without cancer would eventually cause cancer to develop in the recipient chickens. In this case it appeared that the cancer was somehow "contagious," and it was suspected that viruses were somehow involved in this infectious type of cancer. Later, it was determined that certain viruses have the ability

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to genetically transform normal cells to a cancerous state by inserting into the chromosomes of their host cells. The virus that caused cancer was named the Rous sarcoma virus (RSV) after its founder. The RSV has only four genes. The *gag* gene codes for the capsid of the virus, the *env* gene codes for the envelope of the virus, the *pol* gene which codes for reverse transcriptase, and the *src* gene encodes for a tyrosine kinase.

Within normal cells, there are proto-oncogenes, which are involved in cell division and development. Since most cells are not reproducing all the time, proto-oncogenes tend to be expressed at low levels or not at all. If viral genetic material inserts into a proto-oncogene, it will be converted to an active oncogene, which stimulates excessive cell division, eventually leading to tumor development. Viruses with this ability are termed *oncogenic* viruses. While some viruses activate an oncogene by inserting their genetic material into a cellular proto-oncogene, some oncogenic viruses actually carry oncogenes into their hosts. Whether the virus inserts into a cellular proto-oncogene or it carries an oncogene into the cell, the end result is increased cell proliferation and changes in the cell, which can include lack of contact inhibition and immortality.

9. Oncogenic viruses are known to become latent as they enter into the host cell's chromosomes. Many oncogenic viruses are retroviruses. In order for a retrovirus to insert into the host cell's chromosomes, it must FIRST:
   A. convert its RNA to DNA
   B. translate its RNA
   C. initiate transcription
   D. recombine with the host cell's chromosomes

10. Suppose a drug had been made to target the RSV. This drug attempts to prevent the packaging and release of the virus from its host cell. This drug would MOST likely target which of the RSV genes?
    A. *gag* and *env*
    B. *pol* and *src*
    C. *src* only
    D. *pol* only

11. It is known that some viruses carry activated oncogenes into their hosts. What is the BEST explanation for how a virus could acquire an oncogene?
    A. The virus spontaneously mutates.
    B. The virus acquires the oncogene via conjugation with another virus.
    C. The virus is transformed by DNA from another source.
    D. The virus acquired the oncogene from a previous host.

12. Once an oncogene is activated and a cell becomes cancerous, which of the following would be MOST likely to halt the excessive cell division associated with cancer?
    A. microtubule and mitotic disruption in dividing cells
    B. disruption of protein synthesis
    C. introduction of additional growth factors to the cell
    D. disruption of aerobic cellular respiration

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Questions 13–16 are based on the following passage.

Passage III

Evolutionary theory predicts that given selective pressures, populations will evolve in certain ways. Antibiotic resistance that develops in bacteria is an excellent example of evolutionary selection in action. Spontaneous mutations in bacteria will happen in nature. Due to random chance, some of these mutations provide bacteria with the ability to survive in the presence of antibiotics that would normally kill them. These mutations can provide advantages to the bacteria such as the ability to degrade the antibiotics with enzymes, the ability to pump the antibiotic out of the cell, the ability to prevent the antibiotic from entering the cell, and the ability to change target molecules in the cell so that the antibiotic is unable to affect its target. Additionally, most antibiotic resistance genes can easily be passed from a resistant bacterium to a nonresistant bacterium via the process of conjugation. Transduction by viruses can also carry resistance genes from one bacterium to another. It becomes very easy for an entire bacterial population to become resistant to an antibiotic in a very short period of time.

Antibiotic resistance is a major public health concern because as bacteria develop resistance to certain antibiotics, those antibiotics are no longer capable of eliminating infections caused by resistant bacteria. Further, some bacteria are able to acquire mutations that provide them with resistance to multiple antibiotics. One such example is methicillin-resistant *Staphylococcus aureus* (MRSA). This type of bacteria can be carried asymptomatically by some people and passed to others where it will cause an infection. One of the most common places for MRSA to be spread is through hospitals. The problem with MRSA is that its multiple resistance leaves it susceptible to very few antibiotics. In fact, strains of MRSA are known to show resistance to nearly every antibiotic available.

13. Why would repeated use of antibiotics select for resistant strains of bacteria?
    - **A.** The antibiotics would force the bacteria to mutate at a greater rate.
    - **B.** The antibiotics would kill the susceptible bacteria, leaving only the resistant ones to multiply.
    - **C.** The antibiotics would directly increase the rate of binary fission in resistant organisms.
    - **D.** All of the above would be logical reasons that the repeated use of antibiotics selects for resistant bacteria.

14. Conjugation is one method bacteria use to pass their resistance genes to other bacteria. During conjugation, the genes transferred are typically located on:
    - **A.** the bacterial chromosome
    - **B.** the ribosome
    - **C.** the mRNA
    - **D.** a plasmid

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15. A variety of biotechnology techniques have been developed that allow for manipulated gene transfer. Often, antibiotic resistance genes are purposefully transferred along with the gene of interest. Why would this be important?
    A. to make sure that the transformed cells can survive in the presence of antibiotics
    B. to be able to use antibiotics as a marker to select between transformed and nontransformed cells
    C. the antibiotic resistance genes happen to be near the gene of interest being transferred
    D. to prevent infection of the transformed cells

16. When humans take antibiotics to treat infections, we rely on the fact that the antibiotics target the bacterial cells while leaving our own cells unharmed. What cell structure in bacteria is structurally different from eukaryotic cells and could potentially be a target of an antibiotic?
    A. the cell membrane
    B. the DNA nucleotides
    C. the ribosomes
    D. the cytoplasm

Questions 17–20 are not based on a passage.

17. Some human males have three sex chromosomes (XXY) and suffer from a genetic disease known as Klinefelter's syndrome. The symptoms include a failure to develop sexually and an impairment of intelligence. Klinefelter's syndrome is an example of a disease related to:

    A. karyotype **B.** point mutation
    C. homeostasis **D.** bacterial origin

18. In humans, the number of tetrads formed during mitosis is:

    A. 23 **B.** 46 **C.** 0 **D.** 4

19. The centromere, or primary constriction of the chromosome, contains rings of proteins that are intimately associated with a spindle fiber. These rings are called:

    A. somites **B.** centrioles
    C. asters **D.** kinetochores

20. The two sets of chromosomes present in the cells of diploid organisms are derived from:
    A. the doubling of a haploid cell
    B. the contribution of one haploid set from each parent
    C. a reduction process within a tetraploid cell
    D. all of the above

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Questions 21–26 are based on the following passage.

Passage IV

Apoptosis, also known as programmed cell death, is initiated by a unique series of complex events in the cell. These events eventually result in the death of the cell and subsequent phagocytosis by macrophages. Apoptosis is a critical part of development as well as an important defense against cells that are damaged or present a threat to the organism.

One event that characterizes the initiation of apoptosis in the cell is apoptotic volume decrease (AVD). During AVD, the internal volume of the cell decreases due to mass water loss. The decreased volume of water in the cell creates an environment that is hospitable to the activation of enzymes needed to cause cell death. In order for the AVD to occur, there must be major changes to the polarity of the plasma membrane. These changes involve preventing K^+ intake and allowing a major influx of Na^+ into the cell that results in continued depolarization of the membrane. After this depolarization occurs, there is a release of cytochrome c from the mitochondrial membrane and an efflux of K^+ and other ions such as Na^+ and Cl^-. The eventual efflux of ions creates an osmotic gradient across the membrane. Water then follows the ions as they leave the cell that results in the AVD. It has been hypothesized that the major movement of water occurs through specialized and highly conserved proteins called aquaporins, which allow for regulated and fast movement of water out of the cell.

21. Based on the information provided in the passage, a drug that inhibited the activity of aquaporins would directly cause:
    - **A.** a decrease in ion efflux from the cell.
    - **B.** an increase in the osmotic gradient across the membrane.
    - **C.** a decrease in the AVD.
    - **D.** increased water loss via osmosis.

22. Which of the following pieces of evidence would best support the hypothesis that aquaporins are in fact a critical part of the AVD event?
    - **A.** finding no change in the AVD of a cell that has been engineered to overexpress aquaporins
    - **B.** finding a decrease in the AVD of a cell that underexpresses aquaporins
    - **C.** finding an increase in the AVD of a cell that does not express aquaporins
    - **D.** finding no change in the rate of apoptosis in cells that have a mutation in an aquaporin gene

23. One of the early events required to initiate the AVD is continued depolarization of the plasma membrane. In order to cause continued depolarization of the membrane, which of these structures must be inhibited?
    - **A.** Na^+/K^+ pumps
    - **B.** voltage gated Na^+ channels
    - **C.** K^+ leak channels
    - **D.** Cl^- channels

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24. During the AVD cytochrome c is released from the mitochondrial membranes. What process might be affected by the loss of cytochrome c?
    A. glycolysis
    B. fermentation
    C. Krebs cycle
    D. electron transport systems

25. Cells that perform apoptosis are ultimately able to activate enzymes within the cell that damage and destroy cellular contents. Which of the following organelles is MOST likely to become involved with apoptosis?
    A. the endoplasmic reticulum
    B. the Golgi complex
    C. lysosomes
    D. mitochondria

26. The best explanation for why water leaves the cell to initiate the AVD as the result of ion efflux is that:
    A. The efflux of ions creates an isotonic solution outside of the cell.
    B. The efflux of ions creates a hypotonic solution outside of the cell.
    C. The efflux of ions creates a hypertonic solution outside of the cell.
    D. The efflux of ions creates a solution conducive for active transport of water out of the cell.

This is the end of the Unit II Minitest.

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Unit II Minitest Answers and Explanations

1. **The correct answer is C.** The majority of the cell cycle is spent in interphase which consists of three stages: G_1, S, and G_2. In the G_1 stage of interphase, the cell organelles are doubled and materials required for DNA synthesis are accumulated for the onset of cell division. The S stage of interphase is the stage of the cell cycle where the amount of DNA doubles with the replication of chromosomes. In the G_2 stage of interphase, which follows the synthesis of DNA, proteins required for the next cell division are synthesized. Metaphase is the stage in mitosis characterized by the precise lineup of the chromosomes along the equatorial plane.
2. **The correct answer is A.** Osmosis is a specialized form of diffusion, or passive transport. During osmosis, water always moves from the side of the membrane that has more water to the side of the membrane that has less water. The only thing that moves by osmosis is water. This means that choice B can be eliminated because solutes are not moving by osmosis. If there is a concentration difference across the membrane, there will be water movement which eliminates choice C. When osmosis occurs, water moves from the side of the membrane that has more water to the side that has less water. This means that the side of the membrane with more water has less solute (and is therefore less concentrated) than the side of the membrane with less water and more solute (being more concentrated). Based on the choices provided, choice A is the most appropriate.
3. **The correct answer is D.** Prokaryotic and eukaryotic cells have several structures in common. In order to determine that a cell is eukaryotic, structures that are unique to eukaryotic cells must be identified. Ribosomes perform protein synthesis and can be found in all cells. The cell membrane is the outer boundary of the cell and is also found in all types or cells. DNA serves as the genetic material found in all cell types. Mitochondria (choice D) are true bound organelles that perform the process of cellular respiration. Because they are true organelles, they are found only in eukaryotic cells.
4. **The correct answer is D.** Connective tissues are characterized by cells scattered in a nonliving matrix. This matrix often consists of collagen fibers. Muscle has the ability to contract, while epithelial cells are characterized by cells arranged in sheets and a basement membrane.
5. **The correct answer is A.** A bacterial cell performing anaerobic respiration would perform a fermentation step following glycolysis. The Krebs cycle and electron transport chain are associated with aerobic cellular respiration.
6. **The correct answer is C.** This question is asking for a comparison between the organization of DNA in bacteria and eukaryotic cells. Eukaryotic DNA exists in multiple linear pieces termed *chromosomes*. Bacterial DNA consists of a single loop of DNA. While bacteria can have extrachromosomal DNA known as plasmids, this is not the case for all bacteria. While RNA is single stranded, it is not the primary genetic material of the cells and is only produced during transcription.

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7. **The correct answer is A.** Once taken inside a cell, foreign items can be broken down in the lysosomes of the cell. The smooth endoplasmic reticulum is responsible for lipid synthesis, while the rough endoplasmic reticulum deals in protein labeling. The Golgi apparatus sorts and modifies contents from the endoplasmic reticulum.
8. **The correct answer is D.** All of the given choices would give support to the endosymbiotic theory. The subunit sizes of bacterial and eukaryotic ribosomes are known to be different. Bacterial cell membranes have some different properties as compared to their eukaryotic counterparts. Because plasmids are unique to bacteria, finding them in the chloroplasts or mitochondria would support the idea that these structures were once prokaryotic in nature.
9. **The correct answer is A.** Retroviruses are unique in that they enter their host as RNA but must convert themselves to DNA to enter the latent phase and insert into the host's chromosomes, which are also DNA. This is indicated by choice A. This conversion of RNA to DNA is carried out by the enzyme reverse transcriptase. The question is asking specifically about retroviruses, so choices B and C can be eliminated, as they are not unique to the retrovirus family. Choice D indicates that the retrovirus needs to recombine with the host chromosomes. Recombination implies genetic exchange between the two sources. Although the viral genetic material will insert into a proto-oncogene of the host, there will not be an exchange of DNA.
10. **The correct answer is A.** The passage describes the function of the four genes found in RSV. Packaging of viruses for release involves the viral envelope and capsid, which implicates the *gag* gene and the *env* gene. The *pol* gene codes for reverse transcriptase, which converts viral RNA to DNA and is not needed for the packaging viruses. The *src* gene encodes for tyrosine kinase. Kinases phosphorylate other molecules, which would not be part of the viral packaging process.
11. **The correct answer is D.** Oncogenes develop when a proto-oncogene activates. In order for a virus to carry an oncogene into its host, that virus must be derived from a virus that picked up the gene from a former host cell. Spontaneous mutation alone could not account for a virus acquiring an entire proto-oncogene, which eliminates choice A. Viruses do not conjugate, so choice B can be eliminated as well. Transformation occurs when a cell incorporates foreign DNA from its environment into its own genome. This occurs with bacteria but not viruses, meaning that choice C can also be eliminated. This leaves transduction as the only choice. When a virus excises from the host chromosome, it can take with it genes from the host's chromosome. A virus could feasibly acquire an activated oncogene when excising from its host, and this gene could be transferred to a new host.

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12. **The correct answer is A.** This question is essentially asking how a cancerous cell could have its cell division halted. Because cancer is characterized by uncontrolled mitosis, the best way to halt the cancer would be to halt mitosis. Disrupting protein synthesis, or aerobic cellular respiration, would not directly affect cell division, so these choices can be eliminated. Introducing additional growth factors to the cell would only increase the rate of cell division, which is the opposite of what this question is asking. The only feasible choice would be to interfere with the microtubules (spindle fibers) and halt mitosis.
13. **The correct answer is B.** For this question, the best strategy is to find the most logical sounding answer. Choice A suggests that antibiotics cause the mutation rate to increase. You have no evidence to support this assertion; therefore this choice should be eliminated. Choice C suggests that antibiotics increase the rate of reproduction in bacteria. Again, you have no evidence to support this. Choice D can be eliminated since other choices have already been found incorrect. This leaves choice B as your answer. The antibiotics will kill all but the resistant bacteria, leaving them to multiply and lead to a new generation of resistant bacteria.
14. **The correct answer is D.** This question is asking about a basic knowledge of bacterial conjugation. During conjugation, a bacterial cell copies a plasmid and transfers that plasmid to a recipient that is lacking the plasmid. Because the question tells you that the resistance genes are often passed by conjugation and you know conjugation passes plasmids, then you can assume that the resistance genes are located on plasmids.
15. **The correct answer is B.** This question requires you to locate the most logical explanation as to why antibiotic genes are often purposefully transferred along with a gene of interest in biotechnology procedures. Because the question does not provide information on what type of cells are being transformed, don't assume anything. Choice A suggests that you need resistance genes transferred so the cells can survive in the presence of antibiotics. If the cells transformed are not bacterial, they would survive anyway, as antibiotics would target and kill only bacteria. Choice C suggests that the antibiotic genes are transferred out of convenience because they happen to be near the gene of interest. If the gene of interest is not coming from bacteria, then there could not be any antibiotic resistance genes nearby. Choice D really doesn't offer much in the way of logic, suggesting that antibiotic resistance would be necessary to prevent infection in transformed cells. The only logical explanation is choice B. In order to determine if a cell was transformed with the gene of interest or not, antibiotics could be added. The transformed cells that picked up the gene of interest would also pick up the antibiotic resistance marker and would grow in the presence of antibiotics. The nontransformed cells would not be resistant to the antibiotics and would be killed.

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16. **The correct answer is C.** Of the choices listed, only the ribosomes are structurally different between prokaryotic and eukaryotic cells. While both eukaryotic and prokaryotic ribosomes have a small and large subunit, the sizes of these subunits are different in prokaryotic cells.
17. **The correct answer is A.** The karyotype is the characteristic morphology of a species' chromosome set. The normal karyotype for humans consists of 23 pairs of chromosomes. The twenty-third pair constitutes the sex chromosomes, which consist of a pair of X chromosomes in the female or an X and Y chromosome in the male. In Klinefelter's syndrome, males exhibit an altered karyotype in that they possess a third X chromosome.
18. **The correct answer is C.** Mitosis is the process during which chromosomes are distributed evenly to two new cells that arise from the parent cell undergoing division. Tetrads, or the formation of four new cells, do not occur during mitosis. Thus the number of tetrads formed during mitosis is 0.
19. **The correct answer is D.** During the S phase of interphase before mitosis proper, each chromosome will have replicated. The two chromosomal strands or chromatids are identical in their genetic material and are joined at a constricted region called the centromere. Within the centromere are one or more rings of protein known as kinetochores, which play a significant role in the attachment of the spindle fibers to the chromosomes.
20. **The correct answer is B.** Diploid organisms have two sets of 23 chromosomes, with one (haploid) set provided by each parent.
21. **The correct answer is C.** The passage indicates that aquaporins are membrane proteins that allow for the exit of water from the cell. Since no other information is given, we should not assume anything else. Choice A suggests that inhibiting aquaporin activity would decrease ion efflux from the cell. Since the passage indicates that aquaporins allow water to leave the cell following the ion efflux, this choice is not appropriate. Choice B indicates that inhibiting aquaporin activity would increase the osmotic gradient across the membrane. Since the passage only tells us that aquaporins influence water movement, this choice can be eliminated. A drug that blocks the activity of aquaporins would prevent water from leaving the cell. If water cannot leave the cell through aquaporins, then there should not be an increase of water loss, as indicated by choice D. The only reasonable explanation is choice C. A decrease in aquaporin activity should mean that less water leaves the cell, so the volume of the cell should not decrease. This means that the apoptotic volume decrease (AVD) should be reduced or decreased.

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22. **The correct answer is B.** In order to support the idea that aquaporins are a critical part of the water loss associated with the AVD, it would be necessary to show that water loss does not occur when the aquaporins are inhibited, that water loss is slowed when aquaporins are underexpressed, or that water loss occurs at an accelerated rate when aquaporins are overexpressed. Choice A introduces a cell that overexpresses aquaporins. We would expect that cell to lose more water as a result (increasing the AVD), yet the choice suggests there would be no change in the AVD. A cell that does not express aquaporins at all (choice C) should be unable to lose water so that the AVD would be decreased yet this choice suggests that under these conditions the AVD would be increased. Choice D suggests that a mutated aquaporin gene should cause no changes related to the rate of apoptosis. A mutation in the gene should cause some change to the aquaporins. Of the choices provided, only choice B links an appropriate change in the AVD to aquaporins. If the aquaporins are underexpressed, less water should leave the cell, which would decrease the AVD.
23. **The correct answer is A.** This question relies on your knowledge of membrane potentials. The passage describes that continued depolarization is needed to initiate the AVD. In membrane depolarization, the most critical event is that Na^+ must enter the cell through membrane channels. The Na^+/K^+ pump is used to maintain membrane polarity and helps restrict Na^+ to the outside of the cell and K^+ to the inside of the cell. If the pump were to be inhibited, Na^+ could enter the cell (and K^+ could leave) to cause depolarization as indicated by choice A. Choice B suggests that inhibiting Na^+ channels would allow for depolarization of the membrane. However, Na^+ channels are required for depolarization. Inhibition of K^+ channels as indicated by choice C would not be appropriate either as K^+ must leave the cell as a result of depolarization. Choice D is a distractor since Cl^- channels would not be directly related to depolarization.
24. **The correct answer is D.** In order to answer this question, you need to be familiar with electron transport systems that occur within the mitochondrial membranes. Cytochrome c is a component of electron transport systems. If it is released from the membrane, we would expect that electron transport systems would be affected as indicated by choice D. The other choices listed (glycolysis, fermentation, and Krebs cycle) do not rely on electron transport systems; therefore, cytochrome c would not be involved with their function.

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25. **The correct answer is C.** A familiarity with eukaryotic cell structures and organelles is needed to answer this question. The organelles that normally contain digestive enzymes are the lysosomes (choice C), which makes them the most likely candidate for being involved with apoptosis. Each of the other choices listed does not deal with destruction of cellular components. The endoplasmic reticulum has two sides—rough and smooth. The rough endoplasmic reticulum is involved with protein production and modification, while the smooth endoplasmic reticulum is involved with lipid synthesis. The Golgi complex sorts and routes contents from the endoplasmic reticulum. Mitochondria are involved with aerobic cellular respiration and the production of adenosine triphosphate (ATP).
26. **The correct answer is C.** This question relies on a knowledge of osmosis and toxicity. In osmosis, water always crosses the membrane from the side that has more water to the side that has less. If the solution outside the cell were isotonic, as suggested by choice A, the solutions and water levels would be equal on both sides of the membrane. This would lead to no net movement of water. Choice B indicates that the solution outside the cell is hypotonic. Hypotonic solutions have more water than what they are being compared to. If the cell were in a hypotonic solution, water would enter the cell, which would be the opposite of what is needed for the AVD. Choice D suggests that the ion efflux creates a situation that makes active transport of water likely. Since osmosis is a form of passive transport, choice D is eliminated. Choice C is the only reasonable choice. If the solution outside the cell is hypertonic, it has less water (and more solute due to the ion efflux) than the inside of the cell. This would lead to water leaving the cell, which is needed for the AVD.