1. A. Calcitonin reduces bone resorption. Bone resorption occurs when the level of calcium in the blood plasma is low, but resorption is not needed when the level of calcium is high. Therefore, resorption would be reduced by calcitonin under conditions in which the level of calcium in the plasma is high.

2. B. The passage states that vitamin D is nonpolar and that it can be obtained through the action of ultraviolet rays on the skin. Nonpolar molecules tend to be lipid-soluble rather than water-soluble, and exposure to ultraviolet rays tends to be less in northern climates than in tropical climates. Of the choices given, a child who has a dietary deficiency of fat-soluble vitamins and lives in a northern climate would be most likely to develop rickets.

3. D. Activated vitamin D acts on the small intestine to stimulate the absorption of calcium into the bloodstream. The inclusion of vitamin D in calcium supplements would ensure that vitamin D is present in the body to help promote this absorption.

4. D. The passage states that rickets is caused by insufficient vitamin D activity. Insufficient vitamin D activity would reduce the ability of the body to absorb ingested calcium from the small intestine. To maintain calcium levels in the blood plasma, parathyroid hormone would promote the breakdown of bone tissue, causing the bones to become weak. If there were a metabolic deficiency of parathyroid hormone, the body would be unable to break down bone tissue (option I), causing a higher than normal ratio of mineral to organic matter in the bones instead of a lower than normal ratio. However, if the body were unable to convert vitamin D to its active form, or if vitamin D were unable to act on its target tissue, overall vitamin D activity would be impaired, which can lead to rickets.

5. C. When the level of calcium in the blood plasma is low, the body responds by mobilizing stores of calcium from the bones via the activity of parathyroid hormone. Parathyroid hormone will increase the number of osteoclasts, which break down bone cells. Therefore, one would expect an increase in both parathyroid hormone and osteoclast activity in order to increase the level of calcium in the blood plasma. However, vitamin C promotes bone formation, a process that would further lower the calcium level in the plasma.

6. D. Removal of the parathyroid gland would lead to *hypocalcemia*, a condition of low blood calcium, resulting from the lack of parathyroid hormone. This would cause increased neuromuscular excitability because of the change in membrane potential, which under normal physiological conditions, is partially kept in balance with extracellular calcium. Typically, the person would eventually die from severe respiratory muscle spasms.

7. A. As early humans migrated from Africa to Europe they experienced decreased exposure to sunlight. This necessitated an increase in calcium intake (in this case from dairy products) and a decrease in melanin in the skin to increase the rate of vitamin D production from sunlight.

8. C. Scurvy is caused by a deficiency in vitamin C. Vitamin C acts in the formation and maintenance of connective tissue. Bleeding under the skin, fluctuating blood pressure and heart rate, and brittle bones would all be expected consequences of weak connective tissues.

A tingling sensation in the limbs is the result of a neural impairment, not a connective tissue weakness.

9. D. All of these are functions of the vertebrate skeleton except detoxification of poisons which is mostly the responsibility of the liver.

10. A. Control of heart rate, muscle coordination, and appetite is maintained by the brain stem, cerebellum, and hypothalamus, respectively.

11. C. According to the item, Norman noticed that his skin blood vessels were usually constricted to conserve body heat in the cold environment of the mountains where he went skiing. Occasionally, however, his vessels would dilate for short periods of time to enable a sufficient supply of blood (and oxygen) to his cells. Due to the physical exertion of skiing, his cells had an increased need for oxygen.

12. C. According to the passage, Norman was in excellent physical condition prior to his diving trip. After his first diving experience, he noticed an elevated pulse rate and ventilation rate. The most likely explanation for his body's response was the activation of his sympathetic autonomic nervous system—the "fight or flight" response caused by adrenaline.

13. B. According to the passage, Norman went skiing in the mountains. At first, he noticed an elevated pulse rate and ventilation rate. As the week progressed, these rates dropped, but were still higher than usual. This prolonged increase in heart rate and breathing rate was most likely the cause of hypoxia (insufficient oxygen to the body cells) caused by insufficient blood hemoglobin to supply oxygen for exercise at the low oxygen pressure found at high altitudes.

14. B. According to the passage, Norman was in excellent physical condition prior to his diving trip. After his first diving experience, he noticed an elevated pulse rate and ventilation rate. According to the item, he also noticed that he produced more urine than usual. The increased urine production can be explained by an increased blood pressure caused by adrenaline, released in response to excitement or anxiety—the fight or flight response.

15. D. The sympathetic autonomic nervous system stimulates the heart during stressful situations, increasing the rate via adrenaline. Therefore, the parasympathetic nervous system is involved in slowing the heart rate. Acetylcholine is the neurotransmitter utilized by the parasympathetic nervous system.

16. B. The "lub" sound in the "lub-dup" of a heart beat is caused by closing of the aortic and pulmonary valves during ventricular systole. The blood is forced against the closed valves, causing the valves to act like a drum.

17. D. The darkening of the skin is a direct response to the UV spectrum in sunlight. The skin increases its production of melanin in the melanocytes to form a darker, more opaque epidermis, thereby protecting the dermis from damage.

18. B. If an ulcer penetrated the walls of the intestine, this would allow the contents of the gastrointestinal tract to enter the peritoneal cavity. Membranes surround this cavity, which would prevent further transport of the gastrointestinal contents through the rest of the body. An ulcer in the small intestine would not allow the contents to enter the lumen because this is the normal place in which the contents are found.

19. B. The passage presents information about inflammatory bowel disease, including Crohn's disease and ulcerative colitis, the latter of which is associated with inflammation of the colon. The item asks what process would be most disrupted by an inflammation in the colon. Since the primary process that takes place in the colon is absorption of water, then the absorption of water is the most likely process to be disrupted.

20. D. The immune system is designed to attack foreign material in the body. It avoids attacking tissues of its own body because it suppresses cells that are specific to its own body's antigens (surface molecules that would otherwise initiate an immune response).

21. B. Inflammatory bowel disease appears to have a genetic component, but it does not show clear evidence of Mendelian inheritance. This means that the trait cannot simply be "recessive" since, if it were, it would show Mendelian inheritance patterns.

22. B. Assuming the genetic and autoimmune theories of inflammatory bowel disease are true, then the gastrointestinal antigen being targeted must be located on the surface of proteins encoded by the genes for the disease. Antigens are carried on the surface of cells, not on the chromosomes, DNA segments, or RNA.

23. D. If the ulcers found in a diseased colon in UC were caused by a bacterium, it would be expected that symptoms would be confined to the colon and its associated functions. If other symptoms outside the GI tract were detected, a bacterial agent may not be the cause of the symptoms.

24. D. According to the passage, rates of IBD are lower in developing countries that have higher incidences of roundworm infections. Roundworm infections are fought by the body's immune system. When this natural target of the immune system is removed, as in more developed countries, the immune system is bored and begins to find other, inappropriate targets.

25. C. CD is not treatable by surgery because it is systemic to the entire GI tract (while UC is usually confined to the colon and removing a diseased section of colon is a surgical option).

26. B. The only clear result from Experiment 1 is that following irradiation, no cultures were able to grow on medium with ampicillin. This observation should not eliminate the possibility that other mutations may have occurred in the tube. The medium used in the dish was only designed to test for ampicillin-resistance among the normally sensitive cells.

27. B. The passage reveals that single cells can grow into colonies after incubation. Therefore, the two colonies that grew in Experiment 2 were derived from at least one cell each. The

observation that they grew on a medium with ampicillin indicates that they cells became ampicillin-resistant after the second irradiation.

28. C. Medium Y contains lactose instead of glucose. Cells from Colony B were unable to grow on this lactose medium. Both colonies were able to grown on a minimal medium (Medium X, containing glucose) as well as on ampicillin.

29. A. The passage states that normal cells can grow on a lactose medium because they have the enzymes needed to convert it to glucose. If cells from Colony B can no longer grow on lactose, the irradiation may have affected the gene coding for this enzymes (or one of the enzymes) Lactose is still nutritious for Colony A, and the lactose medium was not irradiated – only the test-tube suspension was irradiated. Finally, the colonies were placed on separate dishes – no competition was involved.

30. C. As stated earlier (question 25), we cannot eliminate the possibility that the mutation at the lactose enzyme locus could have occurred in Experiment 1. Experiment 1 was simply not designed to isolate such a mutant. It is also possible (slightly) that two mutants arose in the same cell with the same dose of radiation in Experiment 2.

31. D. The original suspension of bacteria contained normal cells that can grow on a minimal medium. Regardless of how many cells mutated, there would be innumerable cells still able to grow on this medium (cells that gave rise to Colony a and Colony B should also be able to grow on a ampicillin-free medium!).

32. D. Basic knowledge of how bacteria can transfer genetic material is required. Only transference is not a genetic transfer mechanism in bacteria.

33. C. Answer C is a false statement as antibiotics do not increase the mutation rate of bacteria. Resistance is a phenomenon of selection, with resistant bacteria surviving the antibiotic onslaught.

34. C. A basic knowledge of digestive processes is required (i.e., the stomach is a highly acidic environment, whereas the small intestine is slightly alkaline). The lower part of the graph shows that Enzyme A works best at a pH close to 2, while Enzyme B works best at a pH closer to 8.

35. A. Because the two enzymes have two different, non-overlapping pH ranges, they could not be at work in the same place at the same time. In addition, the graph does not refer to the temperature ranges of A and B (only X and Y). Although Enzyme A generally works more slowly than Enzyme B, neither enzyme works at all in pH 4.5.

36. B. The key to this question is the temperature range at which the two enzymes work. Only Enzyme X has a temperature range encompassing human body temperature (37ºC). An enzyme whose peak activity is close to 75ºC-80ºC (Enzyme Y) is unlikely to be found in the human body.

37. D. Both enzymes overlap between 40ºC and 50ºC. Choices A and B are too broad, and each includes a range of temperatures beyond which one of the enzymes cannot work.

38. B. When an enzyme is not active in a particular environment, it may be because that environment affects its conformation. The only possible answer, therefore, is B. For choices C and D, no information is provided in the graphs.

39. A. Some knowledge about factors that affect enzyme activity is needed here. Within an enzyme's normal range of activity, a clear indication that all enzyme molecules are saturated is a leveling off of the rate of reaction curve (an increase in enzyme concentration would help increase activity again).

40. B. When enzymes are at work, they help bring their substrate(s) to the "transition state." At which time bonds can break and the reaction can proceed. To be able to do this, the enzyme must be in an environment compatible with its range of activity. A pH below 5.5 is not within the activity range of Enzyme B. Therefore, it would be unable to bring its substrate(s) to the transition state.

41. C. A reaction that has negative heat change and increases in entropy is spontaneous. In general, energy transformations proceed spontaneously to convert matter from a more ordered, less stable form to a less ordered, more stable form. Answers A and B are the same, with the reaction requiring energy to proceed and therefore not spontaneous.

42. B. An enzyme is a protein produced by an organism that lowers the activation energy of reactions and increasing the reaction rate.

43. C. Negative feedback involves the product of the reaction inhibiting the enzyme from creating more product. It does not destroy the enzyme (as in answer D).

44. A. The membrane that the liposome-DNA complex has to cross to gain access to the cell is the cell's external plasma membrane. This membrane consists of lipids and membrane bound proteins, so option B is correct. All the membranes of the cell incorporate proteins, so option D is incorrect. The cell membrane would be a very unlikely place to find DNA, so options B and C are also incorrect.

45. D. Although rare in girls, DMD does occur in girls, precluding its location on the Y chromosome (answers C and A – fathers pass only their Y chromosome onto sons). Mothers pass X chromosomes randomly to their sons and daughters, so they could not control which gender of child would receive the defective gene (answer B).

46. B. DNA is hydrophilic and negatively charged. The lipids used to create the liposome-DNA complex must be amphipathic (amphiphilic), with a cationic (positively charged) portion that would complex with DNA.

47. A. It is important to make sure that therapeutic genes get to cells that can use them because not all cells express the same genes. In general, all cells in an organism contain the same

genes (although there are some exceptions). The differences between cells of different types are directly related to which genes are expressed and which are not expressed.

48. A. Somatic cells, as opposed to germ cells, do not take part in reproduction. The germ cells are those that produce the sex cells such as spermatozoa and ova. Changes in somatic cells are not passed on to offspring, so answer C is correct. Options C and D are incorrect because they suggest that somatic cell DNA could be passed on. Answer B is incorrect, because there is no reason to suspect that foreign DNA, if appropriately introduced into a germ cell chromosome, would not be passed on to the offspring.

49. D. As dystrophin is found on the inner surface of the plasma membrane it is likely to be involved in membrane integrity (answers A and B) and in ion transport (answer C). It is unlikely to be involved in protein recognition (as those structures are normally located on the outer surface of the cell).

50. B. The passage states that the gene dystrophin is 2.4 megabases in length. If mutation rates are relatively constant across the entire genome, large genes such as dystrophin are more likely to undergo a mutation than shorter genes. A is most likely incorrect since all DNA is folded into chromosomes. C is also unlikely to be correct since the passage stated nothing about other genes and there are no known genes that cause mutations in other genes. D is incorrect because X-inactivation has to do with phenotype and genetic expression and not inheritance.

51. A. This answer is arrived at by process of elimination. B is incorrect because one would expect that an enzyme that breaks down muscle components would increase in a degenerative disease. C is incorrect because the passage states that heart muscle fibers are affected, most likely affecting an EKG. D is incorrect because DMD causes a disruption in dystrophin production, so decreased levels of dystophin are expected. Therefore, answer A is correct.

52. A. There are two things that you need to remember to determine the sequence of DNA that is complementary to the segment of DNA given in the passage. The first is that DNA strands are situated antiparallel to one another in a DNA helix, meaning that the 3’ end of one strand is paired with the 5’ end of the other strand. The next important point is that the DNA there is complementary pairing of nitrogenous bases; that is, adenine always pairs with thymine, and cytosine always pairs with guanine. Taking this information, we can start from the 3’ end of the given strand, which will correspond to the 5’ end of the complementary strand, and match up the bases with their complements. Therefore, the complementary DNA strand will be TCGCTCTATGGC in the 5’ to 3’ direction. So, choice A is the right answer. Choice C is wrong because it has the wrong polarity but the right sequence. Choices B and D are wrong because they both contain uracil, which is only found in RNA.

53. D. Epistasis is the phenomenon of one gene modifying another’s expression. Polygenes are the genes involved in that modification. A dilution gene would be an example of a modifying gene. However, pleiotropy occurs when a single gene influences multiple phenotypic traits (such as a particular protein found in multiple structures).

54. A. Coat length is an autosomal trait with short being dominant to long. Black/red color is an X-linked trait expressed through X-inactivation. The homozygous short-haired, black male is of genetype LLX_bY and the long-haired, red female is of genotype llX_rX_r. F1 progeny would be all heterogygous short-hairs (Ll) and half would be red males (X_rY) and half would be calico females (X_bX_r). If these two F1 progeny were crossed to create an F2 generation, 3 of the 16 resulting kittens would be short-haired calicos (use a Punnett square to figure this out). Therefore the answer is A (1/2 and 3/16).

55. B. Answers A, C and D are wrong because all contain only a single copy of the X chromosome (and two are needed for X-inactivation to take place). Therefore, the only possible answer is XXY, in which non-disjunction occurred in one of the parents of this male.

56. A. Answer D is incorrect because it is not specifically X-linked. Answers B and C are incorrect because X-deactivation occurs randomly. There is no way to selective inactivate only maternal or paternal X-chromosomes.

57. D. The passage explains that the pigment-producing cells originate at the neural crest (which later forms the spinal chord of the cat) and migrate away from the crest. Therefore, areas furthest from the body are most likely not to have these pigment-producing cells. Answers A, B and C all are part of or lie along the neural crest structure and are therefore most likely to express color. Answer D, the paws, are the furthest away from the neural crest and therefore the mostly likely to be white.

58. D. All of the options are involved in genetic expression, thereby contributing to the phenotype of an organism.

59. C. This requires that you have some knowledge regarding the end fates of embryonic tissue. Skin cells are derived from the ectodermal germ layer of the embryo.

60. D. Inbreeding involves the mating of relatives or a very small gene pool. Therefore it is unlikely to increase the genetic diversity of the population. The level of aggression in a population is not necessarily increased by inbreeding. The rate of spontaneous mutation is relatively constant across a species and has nothing to do with patterns of reproduction. Therefore, it follows that incidence of expression of deleterious recessive traits would increase. If the participants in the inbreeding are carriers of recessive traits, their offspring are more likely to be homozygous for the deleterious alleles than if out-breeding occurred.

61. C. Transport of sweat electrolytes is accomplished by simple diffusion across a concentration gradient. Blood plasma has higher electrolyte concentrations than sweat glands. Active transport is movement of molecules against a concentration gradient. Osmosis involves movement of water.

62. C. Sweating is a response to an increase in body temperature. It is an attempt by the body to decrease its temperature. Drinking ice water would reduce the core temperature, thus decreasing the need to sweat.

63. B. This question requires some knowledge of the fate of embryonic tissue. As the disease is known as ectodermal dysplasia, it is a safe assumption that it affects structures originating from the ectoderm. From the offered options, only teeth are ectodermal structures and therefore the most likely to be affected by the dysplasia.

64. B. The extremities of a human are long and thin, maximizing the surface area to volume ratio of these structures. Since blood vessels loop along the extremity, the counter-current exchange system can be taken advantage of. Sweating on these extremities accelerates the heat loss from these large surface area structures, rapidly decreasing the blood temperature running through them. Answer C is wrong because the entire body is covered in an ectodermal covering called the skin. D is incorrect because the extremities are actually located furthest away from the hypothalamus, and it would actually take longer to receive information from these sources than others in the torso.

65. D. Negative feedback loops involve the product of a reaction inhibiting the reaction itself. It therefore works to decrease the rate of system, preventing a buildup of product.

66. B. Desert-adapted animals rarely, if ever, sweat. Water is the limiting resource in any desert and so all animals have mechanisms to minimize water loss. Desert animals have a litany of other mechanisms to cope with the heat, including being active at night, seeking shade, changing color and reducing metabolic rates during the day.

67. C. When an animal is in a situation where it must dissipate heat, the most efficient way to do so would be to maximize the surface area to volume ratio, thereby allowing for maximum heat loss. A ribbon shape has a much greater surface area than a sphere (which has the smallest surface area to volume ratio of any known shape).

68. B. The body creates a fever in hopes of killing the invading organisms by denaturizing their proteins. Because the body would naturally attempt to decrease the body's temperature in order to maintain homeostasis, changing the set-point to a higher temperature would prevent the body's cooling mechanisms from starting and decreasing the body's temperature. Answer A is incorrect because the body cannot change it's basal metabolic rate on demand. Answer C is incorrect because the body cannot shut-down a basic function such as sweating on demand. Answer D is incorrect because the body must always know its internal temperature to ensure it does not denature its own proteins.

69. D. Water is lost through the skin primarily as a means to keep the body at normal temperatures. Therefore, raising the environmental temperature would cause a person to perspire, releasing water to the environment where it can evaporate and cool down the body.

70. D. The passage indicates that a change in the base sequence occurs, affecting a single triplet codon. A deletion or an insertion causing a reading frameshift and will affect more than a

single codon. An inversion involves the reversal of a codon, e.g., ACT becomes TCA. Valine is coded by GUN while glutamine acid is coded by GAA or GAG; they are not inversions of each other. Therefore, only answer D is a possible answer.

71. C. Heterozygote advantage is defined as a selective advantage incurred by having the heterozygote condition for a particular locus. The heterozygous condition is more advantageous than either homozygous condition. Answer A is incorrect because inbreeding depression is reduced fitness in a given population as a result of breeding of related individuals. Answer B is incorrect because the fitness of the heterozygous condition is not frequency dependent. Answer C is incorrect because genetic drift is a phenomenon that occurs in small populations which randomly lose genetic diversity.

72. B. Because the sickle cell trait affects the bloods ability to carry oxygen for cellular respiration, the production of CO_2 and ATP in the electron transport chain are affected. Answer C is incorrect because fermentation is an anaerobic process and answer D is wrong because glycolysis does not involve oxygen. Answer A is also incorrect because oxygen is not required for the Krebs' cycle. Oxygen is the final electron acceptor of the electron transport chain.

73. C. A woman living in the United States would not need protection from malaria (a rare disease in the US), nor wish to increase the chance her child would contract sickle cell anemia by reproducing with another carrier. Therefore, it would be most advantageous to be homozygous for the normal allele.

74. A. The substitution in beta hemoglobin is a missense mutation. A nonsense mutation would result in an inappropriate stop codon, shortening the resultant protein. A frameshift mutation is caused by an insertion or a deletion in the genetic code, and an RNA splicing mutation would affect transcript processing.

75. B. A deletion will cause a shift in the reading frame, changing a large portion of the resultant protein. A base change at the third position (the 3' end) is less likely to change the matching amino acid than a change in the first position (5' end).

76. C. This question involves basic understand of Hardy-Weinberg equilibrium. The frequency of the sickle cell trait is 0.12. Therefore the frequency of the normal trait is 0.88 ($p + q = 1$; $0.12 + 0.88 = 1$). To determine the percentage of homozygous and heterozygous individuals, the previous equation is squared: $p^2 + 2pq + q^2 = 1$; p^2 is the percentage of individuals homozygous for the normal trait, q^2 is the percentage of individuals homozygous for the sickle cell trait, and $2pq$ is the percentage of homozygous individuals. $2pq = 2 \times 0.88 \times 0.12 = 0.211$.

77. D. Answers A, B and C all would likely occur if malaria was widespread disease in the US. Answer D, however, is not a logical outcome of increased malaria incidence because the mosquitoes are simply the transmission vectors of the disease and are not affected by it positively or negatively.

78. B. Global warming could increase the number of malaria occurrences because an increase in the mosquito population, the transmission vector of malaria, could increase the infection rates of malaria. Mosquitoes breed in warm, wet environments, the number of which would be increased by global warming.

79. D. She is not the mother. She can contribute only the i allele, and this child must receive i_A from one parent and i_B from the other parent. The man cannot be ruled out as the father with the limited information given, since he can contribute a i_B allele to the child.

80. D. If the man previously fathered a child with blood type O, then the man must be of genotype i_Bi. The woman can contribute only the O gene. Since the man has an equal chance of contributing the i or i_B allele, there is a 50% chance of the child being type O (genotype ii) or type B (i_Bi).

81. B. Because the man in question 76 fathered a child of blood type O, he must be capable of passing on the i allele, and therefore must be of genotype i_Bi.

82. B. Because the genes are so close in proximity, it follows that they are on the same chromosome and will be inherited as a unit. The affected type AB man (genotype i_ai_B Nn) had a type A affected mother (genotype i_Ai Nn) and a normal type B father (i_Bi nn) reproduces with a normal type O woman (ii nn), their children have four possible genotypes: i_Ai nn, i_Ai Nn, i_Bi nn, and i_Bi Nn. Therefore the chances of a normal child of type B blood is 1 in 4 or 25%.

83. D. People with blood type O are known an universal donors because their blood contains neither A nor B antigens, and therefore nothing to trigger an immune response from any of the blood types.

84. C. People with Rh- blood will produce antibodies in response to exposure to Rh antigens. Therefore, an Rh- mother, with previous exposure to Rh antigens will have Rh antibodies. If she is carrying an Rh+ child, her immune system will attack the Rh antigens in her child's blood stream resulting in erythroblastosis fetalis.

85. C. Alleles are different forms of a gene at the same locus. They are located on homologous chromosomes.

86. D. One would never expect to find A and B antibodies because both the A and B proteins are present in a person of blood type AB.

87. C. The P wave represents the first stage of the cardiac cycle, atrial contraction.

88. C. The "lub" sound in the "lub-dup" of a heart beat is caused by blood being forces against the closed atrioventricle valve, during ventricle systole.

89. A. The walls of the ventricles would be thicker than the wall of the atria because wall thickness is a measure of muscle strength. Since the ventricles are responsible for the power stroke or high stroke volume.

90. D. The wall of the left ventricle would be expected to be thicker than the right ventricle because the blood pressure entering the aorta (from the left ventricle) is higher than the blood pressure entering the pulmonary artery (from the right ventricle). The pressure must be higher in the aorta because that blood must travel further, around the systemic circulatory system than the blood flowing into the pulmonary artery, around the respiratory circulatory system.

91. A. According to Figure 2, the pulmonary and aortic valves are open during the third phase of the cardiac cycle, systole and a rise and fall in aortic pressure. The opening of these valves is associated with a drop in left ventricular stroke volume but not a rise in stroke volume.

92. A. The depolarization of the atria (P wave) takes place as electrical charges initiated at the S-A node pass across the right atrium to the A-V node. Areas in the ventricles are not yet involved.

93. A. Interpreting each peak in Figure 1 indicates that the height of R extends above +1.0 mV, while S extends to about -0.5mV. Thus, the net change is closest to 1.5mV.

94. C. The P wave is initiated by depolarization at the S-A node, whereas depolarization of the ventricles is associated with the QRS complex. The distance between these points represent the time needed for the impulse to reach the Bundle of His and Purkinji fibers in the ventricular walls (the T wave represents a later point in time when the ventricles repolarize).

95. B. Knowledge about the sequence of cardiac cycle should immediately help eliminate answers A and D. Repolarization of the atria coincides with ventricular depolarization. Answer C is highly improbable. It is unlikely that an instrument designed to pick up the electrical changes in an organ as vital at the heart, would not be sensitive enough to detect each event in the sequence.

96. D. Since the QRS complex represents depolarization of the ventricles, a prolonged depolarization would make this part of the EKG wider. A higher QRS complex would indicate a stronger depolarization (contraction) not a longer one.

97. C. It should be understood that regulation of heart rate is under autonomic control. The sympathetic division is responsible during stressful situations (“fight or flight” response), whereas the parasympathetic division controls the heart during normal activity.

98. B. Each of the electrolytes is vital to membrane function and muscle contraction except Chloride, which does not play a role in these processes.

99. B. This molecule of CO_2 would pass through the left ventricle and travel out to the tissues, return to the heart via the superior vena cava, enter the heart through the right atrium, and

finally, exit the heart through the pulmonary vein on its way to lungs in order to leave the body.

100. D. Activated helper T cell interacts with B cell displaying same antigen complex, B cell then becomes activated, B cell divides and gives rise to clone, which differentiate, forming plasma cells, and finally antibodies are produced.