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Medical College Admission Test: Verbal Reasoning, Biological Sciences, Physical Sciences, Writing Sample

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**QUESTION 1**

The anthropomorphic bias of those who would relegate marsupials to an inferior evolutionary status is most apparent in their recourse to data on brain structure and behavior. Unlike humans and other placentals, marsupials lack the corpus callosum, which facilitates inter-hemisphere transfer of data acquired through the senses. Yet it cannot be inferred that marsupials are thus deprived of such function. Didelphis Virginiana, one of the opossums, makes use of the anterior commissure, an adaptation that is also found in reptiles and monotremes. Diprodontons, including kangaroos and koalas, supplement the anterior commissure with the fasciculus aberrans. While the modes of neocortical interconnection may be diverse, the work of Johnson, Heath and Jones points to the conclusion that, functionally speaking the cortices and neocortices of both groups of mammals exhibit parallel connections. Parker also notes "a similar range of brain size to body weight ratios and of neocortical expansion". Another stigma borne by marsupials is the consensus that they are less intelligent than placentals. Yet Williams argues that, all else being equal, natural selection will favor instinctive over learned behavior as being more biologically efficient and that it is the accidental death of the young that is the prime selective pressure for the evolution of intelligence. Seen in this light, marsupials have a competitive edge; their gestation period is brief and the young remain in the pouch for an extended period exposed only to those dangers which also affect the mother. There they are directly exposed to the mother\\'s food supply and can observe her behavior at leisure. Placentals, on the other hand, not only have a longer gestation period but, once their young are born, must often leave while foraging. Such absences increase the risk of mortality and decrease the opportunity to learn. Thus, among placentals, selection would favor the apparent intelligence in the young and protective behavior in the mother. Marsupials are not known to exhibit maternal protective behavior. In fact, Serventy has reported that frightened female kangaroos will drop their pouch-young as they flee, drawing a predator\\'s attention to the less able offspring while the adult escapes. This behavior, whether purposeful or accidental, instantaneously relieves the female marsupial of the mechanical difficulties of pregnancy with which her placental counterpart would be burdened, while marsupials can replace any lost young quickly. Thus, in the absence of any need for close maternal supervision, sacrificing their offspring in this manner may well have been favored in selection. Pointing to the absence of the "virtue" of maternal protectiveness in marsupials is an instance of how mistaken are those theorists who see similarities with humans as marks of evolutionary sophistication.

With which of the following statements would the author be most likely to agree?

A. Maternal protectiveness is a trait common to all higher mammals.

B. Any physical or behavioral trait in animals should be evaluated primarily in terms of its contribution to species survival.

C. Current conceptions of evolution must be modified to account for new data.

D. Evolution is a progressive process culminating in the dominance of learned over instinctive behavior.

Correct Answer: B

Choice A is incorrect because throughout the passage the author questions the concept of which mammals are higher and which are lower. Choice C is much too broad: just what the current concepts of evolution might be is very unclear from the passage. Also, the use of the phrase "new data" is off key here; there is no indication that any of the work the author cites is new. Choice D is a little easier to eliminate, as this is the very attitude that the author is against. This idea would lead, naturally, to the conclusion that placentals are more advanced than marsupials. Choice B is supported by the author\\'s discussion of the marsupial\\'s lack of maternal instinct. Thus, by process of elimination alone, choice B is our correct answer choice. Kaplan Strategy: When you are in doubt, use the process of elimination to keep your thinking patterns clear.

**QUESTION 2**

...[TV Guide\\'s] immediate concern was the television quiz show scandal, which had reached its climax two weeks

earlier when Charles Van Doren, the appealing young man who\\'d taught viewers the value of learning while winning big on MCA\\'s Twenty-one, stood before a House committee and admitted he was a fraud. But the issue went well beyond rigged quiz shows. The charge was that through their stranglehold on talent, MCA and William Morris monopolized the medium to the detriment of their clients, the industry, and the public at large. This was why the Justice Department had launched a secret investigation of both agencies more than two years before. The Morris Agency had started the quiz show vogue in 1955, when it packaged The $64,000 Question for Revlon and sold it to CBS. While the show won praise for its "educational" nature, the real source of its appeal was in its crapshoot format -- the idea that once contestants\\' winnings hit the $32,000 mark, they had to decide whether to go double or nothing on the final, $64,000 question, or play it safe and go home. The response was tremendous. Within weeks, the show knocked I Love Lucy out of the number-one slot in the ratings. Casinos in Vegas emptied out when it went on the air. Bookies took odds on whether the first contestant to go for the big one -- a marine captain whose specialty was cooking -would get the answer right. (He did.) Revlon sold so much Living Lipstick that its factory was unable to meet the demand. The $64,000 Question quickly inspired imitators, among them an MCA package called Twenty-one. Based on the card game, more or less, Twenty-one was a dismal failure at first. "Do whatever you have to do," the sponsor ordered angrily, so the producers put the fix in. In December 1956, when Charles Van Doren, a boyishly attractive English instructor at Columbia University, beat Herb Stempel, a short, squat, nerdy grad at City College, Van Doren became the first intellectual hero of the television age. Honors and acclaim poured in--the covers of Time, letters by the hundreds, offers of movie roles and tenured professorships and a regular guest spot on The Today Show. But Herb Stempel didn\\'t like being told to lose, especially to some Ivy League snot. He went to the press. The DA\\'s office started to investigate. The walls began to close in. Meanwhile, the show\\'s producers agreed to sell the rights to NBC for $2 million. One of them started to feel queasy about selling the show without letting the network know the score, so he went to Sonny Werblin, MCA\\'s top man in New York, and asked his advice. Werblin, the man behind such hits as The Ed Sullivan Show and The Jackie Gleason Show, ran the television department as if it were a football team coached by Attila the Hun. "Dan," he asked the producer, "have I ever asked you whether the show was rigged?" No, he hadn\\'t. "And has NBC ever asked you whether the show is rigged?" No, they hadn\\'t either. "Well," Werblin concluded, "the reason that none of us has asked is because we don\\'t want to know." And with good reason. Not only was Twenty-one an MCA package and Van Doren himself an MCA client; Werblin had a special relationship with NBC\\'s president, Robert Kintner. Kintner had been president of ABC until...ABC\\'s chairman forced him out in his determination to move the network out of third place. MCA used its influence to place him at NBC, where he proved an extremely pliant customer. In the spring of 1957, when the networks were putting together their schedules for the next season, Werblin went to a meeting of NBC programming executives led by Kintner and his boss, RCA chairman Robert Sarnoff. "Sonny, look at the schedule for next season," Kintner said when he walked in, "here are the empty slots, you fill them."

According to the passage, which of the following are true statements?

I. A correlation between successful contestants and successful sponsors exists in the television industry.

II. Most game shows in the 1950s were rigged.

III.

Van Doren\\'s quiz-show success provided him with further opportunity in his academic career.

A.

I only

B.

II only

C.

III only

D.

None of the above

Correct Answer: C

Statements I and II are general claims that cannot be concluded based solely on the incidents cited in the passage. Statement III is supported by information found in the third paragraph.

**QUESTION 3**

Due to ever-increasing paranoia about the transmission of hepatitis and AIDS via blood transfusions and the frequent difficulty of procuring matching blood donors for patients, researchers have been working at a feverish pace to produce disease-free and easy-to-use blood substitutes. The difficulty most synthetic blood researches have had is in formulating a substance that combines qualities of sterility, high capacity for carrying oxygen to body tissues, and versatility within the human body. Three major substitute technologies have been developed to date; each has certain advantages and shortcomings.

"Red blood," the first of the blood substitute technologies, is derived from hemoglobin which has been recycled from old, dead, or worn-out red blood cells and modified so that it can carry oxygen outside the red blood cell. Hemoglobin, a complex protein, is the blood\\'s natural oxygen carrier and is attractive to scientists for use in synthetic blood because of its oxygen-carrying capacity. However, hemoglobin can sometimes constitute a two-fold threat to humans when it is extracted from the red blood cell and introduced to the body in its naked form. First, hemoglobin molecules are rarely sterile and often remain contaminated by viruses to which they were exposed in the cell. Second, naked hemoglobin is extremely dangerous to the kidneys, causing blood flow at these organs to shut down and leading, ultimately, to renal failure. Additional problems arise from the fact that hemoglobin is adapted to operate optimally within the intricate environment of the red blood cell. Stripped of the protection of the cell, the hemoglobin molecule tends to suffer breakdown within several hours. Although modification has produced more durable hemoglobin molecules which do not cause renal failure, undesired side effects continue to plague patients and hinder the development of hemoglobin-based blood substitutes.

Another synthetic blood alternative, "white blood", is dependent on laboratory synthesized chemicals called perfluorocarbons (PFCs). Unlike blood, PFCs are clear oil like liquids, yet they are capable of absorbing quantities of oxygen up to 50% of their volume, enough of an oxygen carrying potential for oxygen-dependent organisms to survive submerged in the liquid for hours by "breathing" it. Although PFCs imitate real blood by effectively absorbing oxygen, scientists are primarily interested in them as constituents of blood substitutes because they are inherently safer to use than hemoglobin-based substitutes. PFCs do not interact with any chemicals in the body and can be manufactured in near-perfect sterility. The primary pitfall of PFCs is in their tendency to form globules in plasma that can block circulation. Dissolving PFCs in solution can mitigate globulation; however, this procedure also seriously curtails the PFCs\\' oxygen capacity.

The final and perhaps most ambitious attempt to form a blood substitute involves the synthesis of a modified version of human hemoglobin by genetically-altered bacteria. Fortunately, this synthetic hemoglobin seems to closely mimic the qualities of sterility, and durability outside the cellular environment, and the oxygen-carrying efficiency of blood. Furthermore, researchers have found that if modified hemoglobin genes are added to bacterial DNA, the bacteria will produce the desired product in copious quantities. This procedure is extremely challenging, however, because it requires the isolation of the human gene for the production of hemoglobin, and the modification of the gene to express a molecule that works without support from a living cell.

While all the above technologies have serious drawbacks and difficulties, work to perfect an ideal blood substitute continues. Scientists hope that in the near future safe synthetic blood transfusions may ease blood shortages and resolve the unavailability of various blood types.

According to the passage, how much oxygen can be absorbed by a 300 cc sample of PFC?

A. 50 cc

B. 100 cc

C. 150 cc D. 300 cc

Correct Answer: C

This is an application question which requires you to apply information from the passage to solve a problem. The passage mentions that PFCs are capable of absorbing quantities of oxygen up to 50% of their volume. Applying this information, then, a 300 cc sample of PFC can absorb up to 150 cc, 50% of 300 cc. The correct answer, then, is choice (C), 150 cc.

**QUESTION 4**

A rate of change of angular momentum of a body is equivalent to:

A. impulsive force.

B. the applied torque.

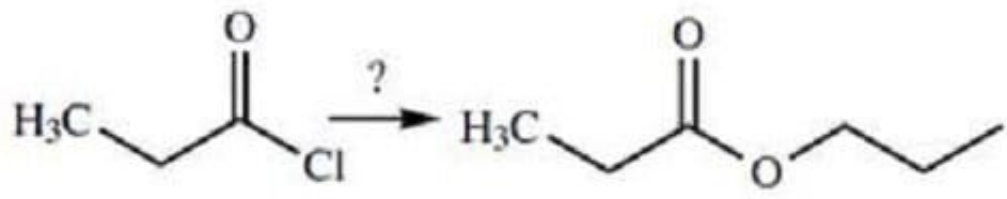
C. applied force.

D. moment of inertia.

Correct Answer: B

**QUESTION 5**

Which of the following reactants should be used to form the product shown below?




A. Sodium ethanoate

B. 1-propanol

C. Ammonia and ethane

D. Dimethyl ether

Correct Answer: B

This question is primarily testing your knowledge of nomenclature. Reacting an alkanoyl halide with an alcohol will lead to formation of an ester, as shown. Note that we have added 3 carbons to our molecule, and so the unknown reactant must have three carbons. Propanol is the only three carbon choice, and the only alcohol.

**QUESTION 6**

Several models have been developed for relating changes in dissociation constants to changes in the tertiary and quaternary structures of oligomeric proteins. One model suggests that the protein\\'s subunits can exist in either of two distinct conformations, R and T. At equilibrium, there are few R conformation molecules: 10 000 T to 1 R and it is an important feature of the enzyme that this ratio does not change. The substrate is assumed to bind more tightly to the R form than to the T form, which means that binding of the substrate favors the transition from the T conformation to R.

The conformational transitions of the individual subunits are assumed to be tightly linked, so that if one subunit flips from T to R the others must do the same. The binding of the first molecule of substrate thus promotes the binding of the second and if substrate is added continuously, all of the enzyme will be in the R form and act on the substrate. Because the concerted transition of all of the subunits from T to R or back, preserves the overall symmetry of the protein, this model is called the symmetry model. The model further predicts that allosteric activating enzymes make the R conformation even more reactive with the substrate while allosteric inhibitors react with the T conformation so that most of the

enzyme is held back in the T shape.

Experiment Evaluating Non-Symmetry Model Enzymes

Experiments were performed with enzyme conformers that did not obey the symmetry model. The data is summarized in Figure 1.

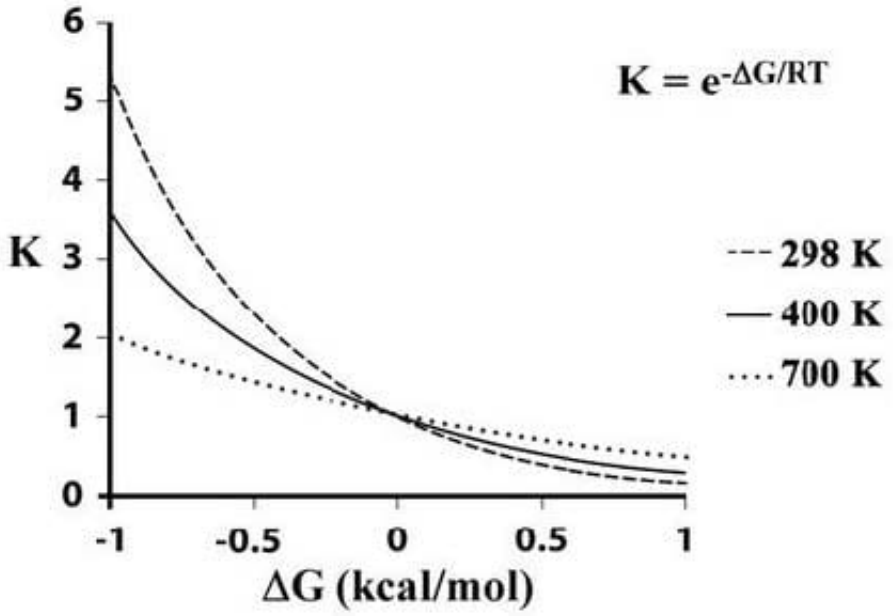



Figure 1: Equilibrium distribution of two conformers at different temperatures given the free energy of their interconversion. (modified from Mr.Holmium). Allosteric enzymes differ from other enzymes in that they:

A. are not denatured at high temperatures.

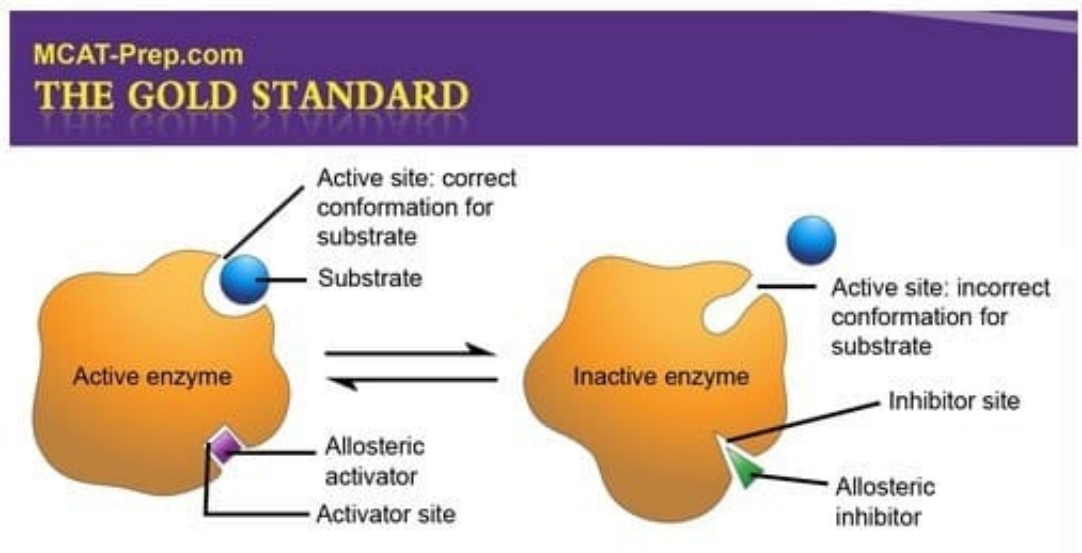
B. are regulated by compounds which are not their substrates and which do not bind to their active sites.

C. they operate at an optimum pH of about 2.0.

D. they are not specific to just one substrate.

Correct Answer: B

You must be familiar with how enzyme function is regulated to answer this question. An allosteric enzyme has a site other than the one for the substrate at which a molecule (not the substrate) that directs the function of the enzyme can bind.




The above illustrates the allosteric regulation of an enzyme with a positive effector (on the left) and a negative effector (on the right).

**QUESTION 7**

Four major blood types exist in the human ABO blood system: types A, B, AB, and O; and there are three alleles that code for them. The A and B alleles are codominant, and the O allele is recessive. Blood types are derived from the presence of specific polysaccharide antigens that lie on the outer surface of the red blood cell membrane. The A allele codes for the production of the A antigen; the B allele codes for the production of the B antigen; the O allele does not code for any antigen. While there are many other antigens found on red blood cell membranes, the second most important antigen is the Rh antigen. Rh is an autosomally dominant trait coded for by 2 alleles. If this antigen is present, an individual is Rh+; if it is absent, an individual is Rh-. For example, a person with type AB blood with the Rh antigen is said to be AB+.

These antigens become most important when an individual comes into contact with foreign blood. Because of the presence of naturally occurring substances that closely mimic the A and B antigens, individuals who do not have these antigens on their red blood cells will form antibodies against them. This is inconsequential until situations such as blood transfusion, organ transplant, or pregnancy occur.

Erythroblastosis fetalis is a condition in which the red blood cells of an Rh+ fetus are attached by antibodies produced by its Rh- mother. Unlike ABO incompatibility, in which there are naturally occurring antibodies to foreign antigens, the Rh system requires prior sensitization to the Rh antigen before antibodies are produced. This sensitization usually occurs during the delivery of an Rh+ baby. So while the first baby will not be harmed, any further Rh+ fetuses are at risk.

The Coombs tests provide a method for determining whether a mother has mounted an immune response again her baby\\'s blood. The tests are based on whether or not agglutination occurs when Coombs reagent is added to a sample. Coombs reagent contains antibodies against the anti-Rh antibodies produced by the mother. The indirect Coombs test takes the mother\\'s serum, which contains her antibodies but no red blood cells, and mixes it with Rh+ red blood cells. Coombs reagent is then added. If agglutination occurs, the test is positive, and the mother must be producing anti-Rh

antibodies. The direct Coombs test mixes the baby\\'s red blood cells with Coombs reagent. If agglutination occurs, the test is positive, and the baby\\'s red blood cells must have been attacked by its mother\\'s anti-Rh antibodies.

If a man with type AB blood needed a transfusion of red blood cells, which of the following individuals could safely donate blood?

A. A man with type A blood

B. A man with the genotype BO

C. A woman with the genotype AB

D. All four blood types are equally safe

Correct Answer: D

The thinking process behind this question is similar to the one used to answer the previous question. A person with type AB blood expresses both the A and B antigens on his red blood cells, which implies that his blood does NOT contain any anti-A or anti-B antibodies. Since the recipient\\'s blood does not contain anti-A antibodies or anti-B antibodies; this means that any blood type can b safely transfused, regardless of the A and B antigens found in the donor\\'s blood. Be aware that there are other blood antigens typically present that could cause problems during transfusions, but this is beyond the scope of this question. Also recognize that the gender of the person donating the blood is in no way relevant.

**QUESTION 8**

The time has come to acknowledge the ascendancy of the humanistic psychology movement. The so- called "Third Stream" emerged at mid-century, asserting itself against the opposition of a pair of mighty, long-established currents, psychoanalysis and behaviorism. The hostility between these two older schools, as well as divisiveness within each of them, probably helped enable humanistic psychology to survive its early years. But the movement flourished because of its wealth of insights into the nature of this most inexact science.

Of the three major movements in the course of 20th century psychology, psychoanalysis is the oldest and most introspective. Conceived by Sigmund Freud as a means of treating mental and emotional disorders, psychoanalysis is based on the theory that people experience unresolved emotional conflicts in infancy and early childhood. Years later, although these experiences have largely disappeared from conscious awareness, they may continue to impair a person\\'s ability to function in daily life. The patient experiences improvement when the psychoanalyst eventually unlocks these long-repressed memories of conflict and brings them to the patient\\'s conscious awareness.

In the heyday of behaviorism, which occurred between the two world wars, the psychoanalytic movement was heavily criticized for being too concerned with inner subjective experience. Behavioral psychologists, dismissing ideas and feelings as unscientific, tried to deal only with observable and quantifiable facts. They perceived the human being merely as an organism which generated responses to stimuli produced by its body and the environment around it. Patients\\' neuroses no longer needed analysis; they could instead by modified by behavioral conditioning. Not even babies were safe: B.F. Skinner devised a container in which infants could be raised under "ideal" conditions -- if a sound-proof box can be considered the ideal environment for child-rearing.

By mid-century, a number of psychologists had grown dissatisfied with both the deterministic Freudian perspective and the mechanistic approach of behaviorism. They questioned the idea that human personality becomes permanently fixed in the first few years of life. They wondered if the purpose of psychology was really to reduce people to laboratory specimens. Was it not instead possible that human beings are greater than the sum of their parts? That psychology should speak to their search for fulfillment and meaning in life?

It is questions like these that members of the Third Stream have sought to address. While the movement cannot be simplified down to a single theoretical position, it does spring from certain fundamental propositions. Humanistic

psychologists believe that conscious experience, rather than outward behavior, is the proper subject of psychology. We recognize that each human being is unique, capable of change and personal growth. We see maturity as a process dependent on the establishment of a set of values and the development of self. And we believe that the more aspects of self which are satisfactorily developed, the more positive the individual\\'s self-image. Abraham Maslow, a pioneer of the Third Stream, articulated a hierarchy of basic human needs, starting with food, water and air, progressing upward through shelter and security, social acceptance and belonging, to love, esteem and self-expression. Progress toward the higher stages cannot occur until all of the more basic needs have been satisfied. Individuals atop the pyramid, having developed their potential to the highest possible extent, are said to be "self-actualized".

If this humanist theoretical perspective is aimed at empowering the individual, so too are the movement\\'s efforts in the practical realm of clinical psychology. Believing that traditional psychotherapists tend to lead patients toward predetermined resolutions of their problems, Carl Rogers pressed for objective evaluations of both the process and outcome of psychotherapeutic treatment. Not content to function simply as a reformer, Rogers also pioneered the development of "client-centered" or nondirective therapy, which emphasizes the autonomy of the client (i.e., patient). In client-centered therapy, clients choose the subjects for discussion, and are encouraged to create their own solutions to their problems.

The author most probably believes that, in its early days, the humanistic psychology movement:

I. benefited from dissension among psychologists.

II. acknowledged Maslow and Rogers as its only leaders.

III.

was an offshoot of behaviorism.

A.

I only

B.

II only

C.

I and II only

D.

II and III only

Correct Answer: A

This is in Roman Numeral format. It asks you to infer what the author believes about the early days of humanistic psychology. The movement\\'s early days are referred to in the opening paragraph of the passage. In sentence 2 of paragraph 1, the author says that, at first, humanistic psychology had to struggle against the two older movements, psychoanalysis and behaviorism. In the next sentence, the author says that hostility between psychoanalysts and behaviorists, and divisiveness within their respective movements, probably helped humanistic psychology to survive those early years. This last point, concerning divisiveness between and within each of the two older schools, means that Roman numeral statement I is true, and will be part of the correct answer. So choices (B) and (D), which don\\'t contain Roman Numeral I, are already eliminated. More importantly, there is no choice that says Roman numerals I and III, we know we don\\'t even have to look at Roman numeral statement III. So what about Roman numeral statement II? In its early days, did the humanistic psychology movement recognize Maslow and Rogers as its only leaders? No, the author never hints that this is so. Maslow and Rogers are named as early pioneers of the movement, not as its first, or unchallenged and exclusive rulers. So Roman numeral statement II is false, and the correct answer must be choice (A),

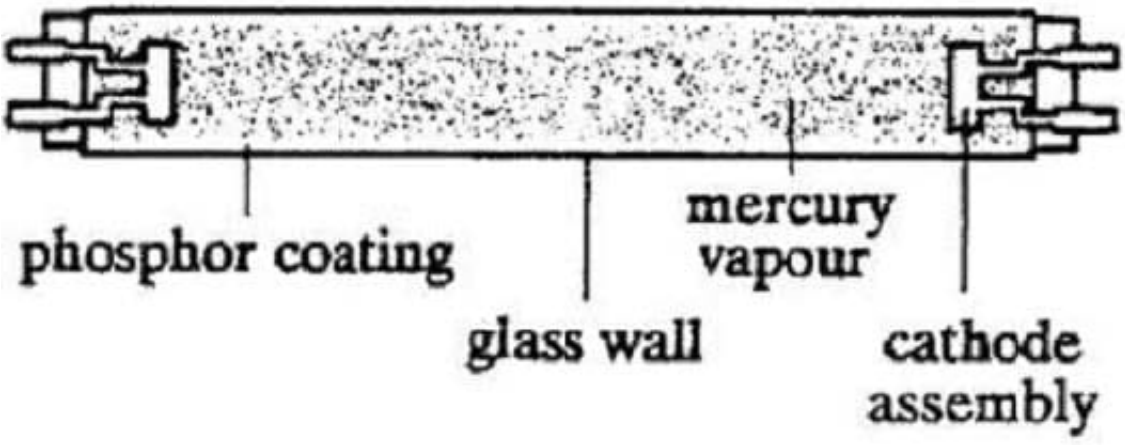
statement I only. Statement III says that early humanistic psychology was an offshoot of behaviorism. This is not true; from what the author says, it seems clear that humanism was a revolt against both of the older schools, psychoanalysis and behaviorism. If anything, humanism seems to have more in common with psychoanalysis than with behaviorism, since humanism and psychoanalysis are both concerned with conscious experience. Regardless, statement III is incorrect, and choice (A), statement I only, is correct.

**QUESTION 9**

When light in the ultraviolet region of the spectrum is shone on a type of material known as a phosphor, it fluoresces and emits light in the visible region of the spectrum. Lamps that utilize this property, known as fluorescent lamps, are very efficient light sources. The arrangement of a typical fluorescent lamp is shown below. The lamp is a glass tube whose inside walls are covered with a phosphor. The tube has an appreciable length-to-diameter ratio so as to reduce the power losses at each end, and it is filled with argon gas mixed with mercury vapor. Inside each end of the tube are tungsten electrodes covered with an emission material.

Electrons are liberated at the cathode and accelerated by an applied electric field. These free electrons encounter the gas mixture, ionizing some mercury atoms and exciting others. Since it requires more energy to ionize the atoms than to excite the electrons, more excitation than ionization occurs. When the excited electrons revert to their ground state, they radiate ultraviolet photons with a wavelength of 253.7 nm. These photons impinge on the phosphor coating of the tube and excite electrons in the phosphor to higher energy states. The excited electrons in the phosphor return to their ground state in two or more steps, producing radiation in the visible region of the spectrum. Not every fluorescent lamp emits the same color of radiation; the color is dependent on the relative percentages of different heavy metal compounds in the phosphor.

The fluorescent lamp shown operates at 100 volts and draws 400 milliamps of current during normal operation. Of the total power that the lamp consumes, only 25% is converted to light, while the remaining 75% is dissipated as heat. This energy keeps the lamp at its optimum working temperature of 40°C. In the lamp shown, the phosphor coating is calcium metasilicate, which emits orange to yellow light.




Some fluorescent light bulbs are observed to glow for a short period after their power supply has been turned off. This glow is generated mainly by:

A. the incandescence of the hot ionic gas within the bulb surface.

B. emission of light stored as vibrational kinetic energy in the phosphor coating.

C. the dissipation of electric charge built up on the bulb\\'s surface.

D. electrons returning to the ground state from excited states after the power was shut off.

Correct Answer: D

We can eliminate the other answer choices. Choice A talks about the incandescence of the hot ionic gases in the bulb\\'s surface. This is one of those answer choices which sounds impressive and very feasible, but is incorrect. Incandescence is light which is emitted due to heat and since we are told in the passage that the lamp works at an optimum temperature of 40°C, this choice cannot bet correct. 40°C is not nearly hot enough for incandescence to occur. Choice B states that the glow is due to energy stored in the coating molecules\\' vibrational kinetic energy. We can rule out this answer choice since although moving charges can radiate light, the energy of vibration is much too small to emit visible light. Choice C is also incorrect since the dissipation of electric charge cannot cause a steady glow.

**QUESTION 10**

Hemophilia is a genetically inherited disease that causes the synthesis of an abnormal clotting factor. As a result, hemophiliacs bleed excessively from the slightest injury. The figure below is a partial pedigree for the hemophilia trait in Queen Victoria\\'s descendants. The pedigree indicates no history of hemophilia for either parent prior to the F1 generation.

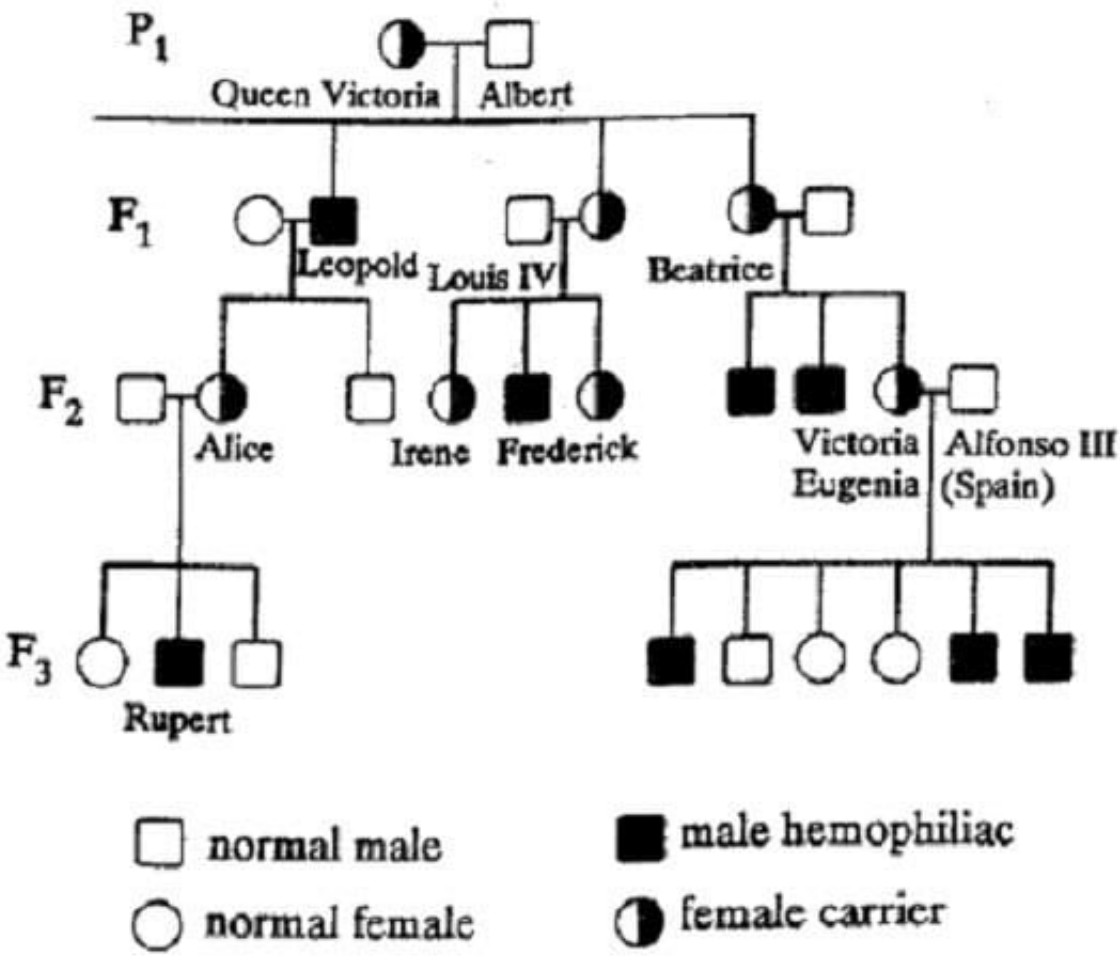



Figure 1

If Beatrice had married a hemophiliac and had a son, what is the probability that the son would have been a

hemophiliac?

A. 0%

B. 25%

C. 50%

D. 100%

Correct Answer: C

If you look at the pedigree, you\\'ll see that Beatrice, a member of the F1 generation, was a carrier of the gene for hemophilia, which means that she had one copy of it on one of her X chromosomes. In reality, Beatrice married a normal male, whose name you\\'re not given; but for the purpose of this question, you\\'re asked to determine the probability that any of her sons would have been hemophiliacs if she had in fact married a hemophiliac. So this is basically a cross between a carrier and a hemophiliac. Therefore, Beatrice\\'s genotype is XhX, and her theoretical husband\\'s genotype is XhY. So, in a cross between these two people, 50% of all their children are expected to be hemophiliacs. But you need to look at the disease in terms of gender; 50% of the daughters are expected to be hemophiliacs; the other 50% will be normal. Likewise, 50% of the sons are expected to be hemophiliacs; the other 50% to be normal.

**QUESTION 11**

Our sense of smell is arguably the most powerful of our five senses, but it also the most elusive. It plays a vital yet mysterious role in our lives. Olfaction is rooted in the same part of the brain that regulates such essential functions as body metabolism, reaction to stress, and appetite. But smell relates to more than physiological function: its sensations are intimately tied to memory, emotion, and sexual desire. Smell seems to lie somewhere beyond the realm of conscious thought, where, intertwined with emotion and experience, it shapes both our conscious and unconscious lives.

The peculiar intimacy of this sense may be related to certain anatomical features. Smell reaches the brain more directly than do sensations of touch, sight, or sound. When we inhale a particular odor, air containing volatile odiferous molecules is warmed and humidified as it flows over specialized bones in the nose called turbinates. As odor molecules land on the olfactory nerves, these nerves fire a message to the brain. Thus olfactory neurons render a direct path between the stimulus provided by the outside environment and the brain, allowing us to rapidly perceive odors ranging from alluring fragrances to noisome fumes.

Certain scents, such as jasmine, are almost universally appealing, while others, like hydrogen sulfide (which emits a stench reminiscent of rotten eggs), are usually considered repellent, but most odors evoke different reactions from person to person, sometimes triggering strong emotional states or resurrecting seemingly forgotten memories. Scientists surmise that the reason why we have highly personal associations with smells is related to the proximity of the olfactory and emotional centers of our brain. Although the precise connection between emotion and olfaction remains a mystery, it is clear that emotion, memory, and smell are all rooted in a part of the brain called the limbic lobe.

Even though we are not always conscious of the presence of odors, and are often unable to either articulate or remember their unique characteristics, our brains always register their existence. In fact, such a large amount of human brain tissue is devoted to smell that scientists surmise the role of this sense must be profound. Moreover, neurobiological research suggests that smell must have an important function because olfactory neurons can regenerate themselves, unlike most other nerve cells. The importance of this sense is further supported by the fact that animals experimentally denied the olfactory sense do not develop full and normal brain function.

The significance of olfaction is much clearer in animals than in human beings. Animal behavior is strongly influenced by pheromones, which are odors that induce psychological or behavioral changes and often provide a means of communicating within a species. These chemical messages, often a complex blend of compounds, are of vital

importance to the insect world. Honeybees, for example, organize their societies through odor: the queen bee exudes an odor that both inhibits worker bees from laying eggs and draws drones to her when she is ready to mate. Mammals are also guided by their sense of smell. Through odors emitted by urine and scent glands, many animals maintain their territories, identify one another, signal alarm, and attract mates.

Although our olfactory acuity can\\'t rival that of other animal species, human beings are also guided by smell. Before the advent of sophisticated laboratory techniques, physicians depended on their noses to help diagnose illness. A century ago, it was common medical knowledge that certain bacterial infections carry the musty odor of wine, that typhoid smells like baking bread, and that yellow fever smells like meat. While medical science has moved away from such subjective diagnostic methods, in everyday life we continue to rely on our sense of small, knowingly or not, to guide us.

The sense of smell in animals is different from olfaction in humans in that animals:

A. are unable to make associations between smells and past experience.

B. only use smell to communicate outside their own species.

C. rely on olfaction only for mating purposes.

D. more clearly exhibit behavioral changes in response to odors.

Correct Answer: D

This requires the reader to identify how the sense of smell in animals is different from olfaction in humans. The author discusses olfaction in animals in the fifth paragraph, which begins with the statement that "the significance of olfaction is much clearer in animals than in human beings". Then, the author discusses the ways in which odors affect animals and bring about behavioral changes. Considering this information, the way smell in animals differs from that in humans is best expressed by answer choice (D) -- animals more clearly exhibit behavioral changes in response to odors.Choice (A) says that animals are unable to make associations between smells and past experience. There is no instance in the passage that outright states or implies that. In actuality, the passage suggests that animals, with their clearly important sense of smell, probably are able to remember smells and what they signal or signify. So choice (A) is incorrect. Choice (B) states that animals only use smell to communicate outside their own species. This contradicts information in the second sentence of the fifth paragraph, which says that animals often rely on pheromones to communicate within their own species. Choice (C) suggests that animals rely on olfaction only for mating purposes. This is incorrect, as the fifth paragraph details the many functions of olfaction in animals -- attracting mates is only one important aspect of smell in other animals species. So (C) is also wrong.

**QUESTION 12**

As Alice Echols went on to claim, "Nothing seems to conjure up the 1970s quite so effectively as disco. Even at the time, critics remarked upon disco\\'s neat encapsulation of that decade\\'s zeitgeist. `It must be clear by now to everyone with an ear or an eye that this era,\\' wrote journalist Andrew Kopkind in 1979, `is already the Disco Years, whether it will be called by that name or not.\\' A former sixties radical, Kopkind was by turns fascinated, bemused, and appalled by the disco epoch, and he likely imagined that in years to come fellow cultural critics would share his interest. But the seventies have not loomed large in our national imagination, except perhaps as comic relief. For many Americans, these were the forgettable years.

That forgettability owes a lot to the 1960s, the outsized decade that dwarfs all others in recent memory. The sixties will always be remembered for their audacity, whether found in the courage of civil rights protesters who put their bodies on the line or in those doomed but beautiful rock stars who tried breaking through to the other side. By contrast, the seventies seem the decade when nothing, or nothing good, happened ?an era memorable for the country\\'s hapless presidents, declining prestige, bad fashions, ludicrous music, and such over-the-top narcissism that Tom Wolfe dubbed it the `Me Decade.\\' Before the decade was out, this narrative of decline had become routine. `After the poetry of the Beatles comes the monotonous bass-pedal bombardment of Donna Summer,\\' huffed one New York Times writer in

1979. It is a measure of the era\\'s persistent bad press that a recent book challenging this view carries the pleading title Something Happened.

As for the sixties, it doesn\\'t matter how much silliness went down, we still invest those times with seismic significance. Take Joe Cocker\\'s performance at Woodstock. His spasmodic thrashing about and his vocals, slurred to the point of incomprehensibility, are something of a joke today. Cringe-inducing though it may be, however, Cocker\\'s performance is never made to stand in for the whole of the sixties. The sixties remain enveloped in the gauzy sentimentalism of what might have been. Yet the iconic image of John Travolta as dance-floor king Tony Manero in white polyester suit, arm thrust to the disco heavens, has come to symbolize the narcissistic imbecility and inconsequentiality of the disco years.

Were it not for the Rubaiyat, I, too, might well regard the seventies as a lamentable and regrettable period in American history. The Rubaiyat was, yes, a disco. It was located in the heart of sixtiesland: Ann Arbor, Michigan, the home of the University of Michigan and legendary incubator of radical activism. At the height of the seventies, the town\\'s annual Hash Bash ?a smoke-in to reform marijuana laws ?was still going strong and so were its two food co-ops-one reform, the other orthodox when it came to selling white foods (that is, rice, sugar, and flour of the white variety). Ann Arbor also had bookstores galore, including the original, wonderful Borders Bookstore, and any number of hippie-ish restaurants and bars such as the Fleetwood Diner, the Del Rio, and the Blind Pig. Musically, it prided itself on its vintage music (it hosted one of the earliest blues festivals), but at heart it was a rock town besotted with Iggy Pop and the Stooges and Sonic\\'s Rendezvous, a band fronted by Patti Smith\\'s future husband, Fred Smith. Its leading music store, Schoolkids\\' Records, stocked disco, but never played it. All of this is to say that disco-averse Ann Arbor came close to providing something of a safe haven from glitterball culture.

The Rubaiyat was no red-velvet-rope disco where fashionista doormen determined who was sufficiently fabulous to gain entry. This would never have worked in a town where down jackets and army surplus were hardly an unusual sight. The

club did have some pretensions to classiness, but the mismatched, sagging booths and bordello red defeated occasional efforts at upmarket sophistication. What the Rubaiyat did have were better-than-average speakers, a heterogeneous

cliente, and a weekend cover of three dollars."

Echols, A. (2011). Hot stuff: Disco and the Remaking of American Culture. New York: W. W. Norton.

The passage implies that cultural commentators tend to agree on which of the following ideas about music?

A. Popular music is typically inane because its success is determined by the narcissistic desires of the marketplace.

B. Popular music and the social life around it are an important window into the national mood.

C. An era is defined by whatever music becomes popular because this reflects people\\'s desires and influences.

D. The most talented artist of an era are "doomed" because they are not appreciated by their contemporaries.

Correct Answer: B

The Reasoning Within the Text question asks you to identify a common thread in the author\\'s quotes and paraphrases from other cultural commentators. The author points out that "critics remarked upon disco\\'s neat encapsulation of that decade\\'s zeitgeist," that one journalist saw the 70s as the "Disco Years" while being "bemused...and appalled" by disco, and that the image of a dancing Tony Manero "has come to symbolize the narcissistic imbecility and inconsequentiality of the disco years." These critics all see disco as reflecting the bad qualities of an era, thus suggesting that music reflects the mindset of the time it was created.

A. This choice is incorrect because the author suggests critics see the music of the 60s positively, therefore not all popular music is inane or determined by narcissistic trends. C. ?incorrect. The author points out that Joe Cocker\\'s bad Woodstock performance has been overlooked, thus suggesting that critics ignore popular music if it does not fit their view of an era. Also, he starts by claiming that "Nothing seems to conjure up the 1970s quite so effectively as disco," but that "For many Americans, these were the forgettable years." This suggests that music is a good representation of the

spirit of an era whether or not it is popular and appreciated or not by critics. D ?incorrect. The author suggests that some critics are fixated on doomed 60s rock stars, not that they see all talented rock stars this way.

**QUESTION 13**

A gibbon (lesser ape) of mass m and arm length l reaches to a branch level with its shoulder and starts to swing with its arm fully extended. At the bottom of the swing, its velocity is: A. Option A

A. $\sqrt{2gl}$

B. $\frac{1}{2}mv^2$

C. $\frac{m^2}{l}$

D. $2\pi\sqrt{\frac{l}{g}}$

B. Option B

C. Option C

D. Option D

Correct Answer: A

This question is a simple energy analysis. The height of the gibbon will decrease by the length of its arm as it reaches the bottom of the swing. Its potential energy of mgl will be converted to kinetic energy. mgl = 1/2mv2

$$\sqrt{2gl} = v$$

Choice B is the kinetic energy at the bottom of the swing. Choice C is just wrong. Choice D calculates for the period of an ideal pendulum.

**QUESTION 14**

Which of these is NOT true about ultrasound waves?

A. The medium (type of tissue) affects the propagation speed.

B. If frequency increases, wavelength increases as well.

C. The resolution of images depends on the wavelength.

D. Propagation speed is higher through solids than through liquids.

Correct Answer: B

Actually, if an ultrasound frequency increases, its wavelength decreases. All of the other answer choices are true.

**QUESTION 15**

...Until last year many people -- but not most economists -- thought that the economic data told a simple tale. On one side, productivity -- the average output of an average worker -- was rising. And although the rate of productivity increase was very slow during the 1970\\'s and early 1980\\'s, the official numbers said that it had accelerated significantly in the 1990\\'s. By 1994 an average worker was producing about 20 percent more than his or her counterpart in 1978. On the other hand, other statistics said that real, inflation- adjusted wages had not been rising at anything like the same rate. In fact, some of the most commonly cited numbers showed real wages actually falling over the last 25 years. Those who did their homework knew that the gloomiest numbers overstated the case....Still, even the most optimistic measure, the total hourly compensation of the average worker, rose only 3 percent between 1978 and 1994.... ...But now the experts are telling us that the whole thing may have been a figment of our statistical imaginations.... a blue-ribbon panel of economists headed by Michael Boskin of Stanford declared that the Consumer Price Index [C.P.I.] had been systematically overstating inflation, probably by more than 1 percent per year for the last two decades, mainly failing to take account of changes in the patterns of consumption and improvements in product quality.... ...The Boskin report, in particular, is not an official document -- it will be quite a while before the Government actually issues a revised C.P.I., and the eventual revision may be smaller than Boskin and his colleagues propose. Still, the general outline of the resolution is pretty clear. When all the revisions are taken into account, productivity growth will probably look somewhat higher than it did before, because some of the revisions being proposed to the way we measure consumer prices will also affect the way we calculate growth. But the rate of growth of real wages will look much higher -- and so it will now be roughly in line with productivity, which will therefore reconcile numbers on productivity and wages with data that show a roughly unchanged distribution of income between capital and labor. In other words, the whole story about workers not sharing in productivity gains will turn out to have been based on a statistical illusion. It is important not to go overboard on this point. There are real problems in America, and our previous concerns were by no means pure hypochondria. For one thing, it remains true that the rate of economic progress over the past 25 years has been much slower than it was in the previous 25. Even if Boskin\\'s numbers are right, the income of the median family -- which officially has experienced virtually no gain since 1973 -- has risen by only about 35 percent over the past 25 years, compared with 100 percent over the previous 25. Furthermore, it is quite likely that if we "Boskinized" the old data -- that is, if we tried to adjust the C.P.I. for the 50\\'s and 60\\'s to take account of changing consumption patterns and rising product quality -- we would find that official numbers understated the rate of progress just as much if not more than they did in recent decades.... ...Moreover, while workers as a group have shared fully in national productivity gains, they have not done so equally. The overwhelming evidence of a huge increase in income inequality in America has nothing to do with price indexes and is therefore unaffected by recent statistical revelations. It is still true that families in the bottom fifth, who had 5.4 percent of total income in 1970, had only 4.2 percent in 1994; and that over the same period the share of the top 5 percent went from 15.6 to 20.1. And it is still true that corporate C.E.O.\\'s, who used to make about 35 times as much as their employees, now make 120 times as much or more.... ...While these are real and serious problems, however, one thing is now clear: the truth about what is happening in America is more subtle than the simplistic morality play about greedy capitalists and oppressed workers that so many would- be sophisticates accepted only a few months ago. There was little excuse for buying into that simplistic view then; there is no excuse now.... According to the passage, "Boskinization" adjusts the C.P.I. by:

A. increasing wages and decreasing productivity to reconcile the present disparity.

B. taking into account technology\\'s role in an improved efficiency.

C. reassessing consumption patterns and quality of product.

D. evaluating the inequalities in various levels of incomes.

Correct Answer: C

Boskin points out that previously the C.P.I had been overstating inflation by "failing to take account of changes in the patterns of consumption and improvements in product quality." Choice C paraphrases this. Further support for this can be found in paragraph five\\'s description of old data that has been "Boskinized." Choice A may have been appealing; however, Boskin did not reconcile the disparity by decreasing productivity (he showed increased values for productivity after an adjustment of the C.P.I.). Choice B can be eliminated because this goes beyond the scope of the passage -- technology\\'s role is not discussed in regard to the level of efficiency. Choice D is wrong because this is what the author examines, while Boskin focuses on the C.P.I. and the rates of productivity and of wages.