

Answer Key

Consciousness and Cognition

- 1. B**—A morpheme is the smallest grammatical unit in a language. In other words, it is the smallest meaningful unit of a language.
- 2. C**—Chomsky labeled whatever innate capacity the human has for language acquisition the language acquisition device (LAD). It is a hypothetical module of the human mind posited to account for children's innate predisposition for language acquisition. This is an example of the nativist theory of language. This theory asserts that humans are born with the instinct or "innate facility" for acquiring language.
- 3. A**—A representativeness heuristic is a cognitive bias in which an individual categorizes a situation based on a pattern of previous experiences or beliefs about the scenario. While representativeness heuristics can be useful, they can also be limiting.
- 4. A**—Holophrasis is the prelinguistic use of a single word to express a complex idea.
- 5. D**—Non-rapid eye movement sleep, or NREM, is, collectively, sleep stages 1–3, previously known as stages 1–4. Rapid eye movement sleep (REM sleep, REMS), characterized by random movement of the eyes, low muscle tone throughout the body, and the propensity of the sleeper to dream vividly, is also known as paradoxical sleep because of physiological similarities to waking states, including rapid, low-voltage desynchronized brain waves.
- 6. C**—Slow-wave sleep (SWS), often referred to as deep sleep, consists of stage three of non-rapid eye movement sleep. There is not a clear distinction between stages three and four. Stage three has 20-50 percent delta activity, whereas stage four has more than 50 percent. As of 2008, the American Academy of Sleep Medicine (AASM) has discontinued the use of stage four, such that the previous stages three and four now are combined as stage three.
- 7. B**—A typical sleep cycle is approximately 90 minutes in duration. The whole period normally proceeds in the order: N1 → N2 → N3 → N2 → REM.
- 8. B**—A night terror typically occurs with arousal from delta sleep (slow wave, N3). A night terror is not a dream. It is not a nightmare, in other words. Sleep paralysis, on the other hand, generally occurs in cases of interrupted REM sleep, where the muscles are paralyzed to prevent acting out dream content.
- 9. C**—The cocktail party effect is the phenomenon of being able to focus one's auditory attention on a particular stimulus while filtering out a range of other stimuli, much the same way that a partygoer can focus on a single conversation in a noisy room. The term may also be used to describe a similar phenomenon that occurs when one may immediately detect words of importance originating from unattended stimuli, for instance hearing one's name in another conversation.
- 10. A**—REM sleep is regulated by the pons region of the brainstem. Acetylcholine neurotransmitters activate this part of the brainstem. Inhibitory signals are sent from the pons to the spinal cord to bring about muscle paralysis. The release of neurotransmitters norepinephrine, serotonin and histamine is completely shut down.
- 11. B**—A K-complex is an electroencephalography (EEG) waveform that occurs during stage 2 of NREM sleep. It is the largest event in healthy human EEG. They are more frequent in the first sleep cycles. K-complexes have two proposed functions: first, suppressing cortical arousal in response to stimuli that the sleeping brain evaluates not to signal danger, and second, aiding sleep-based memory consolidation. A sleep spindle is a burst of oscillatory brain activity

visible on an EEG that also occurs during stage 2 sleep.

12. **C**—A schema describes a pattern of thought or behavior that organizes categories of information and the relationships among them.
13. **C**—Stereotype threat is a situational predicament in which people are or feel themselves to be at risk of conforming to stereotypes about their social group. Since its introduction into the academic literature, stereotype threat has become one of the most widely studied topics in the field of social psychology. Stereotype threat has been shown to reduce the performance of individuals who belong to negatively stereotyped groups. If negative stereotypes are present regarding a specific group, group members are likely to become anxious about their performance, which may hinder their ability to perform at their maximum level.
14. **D**—The availability heuristic is a mental shortcut that relies on immediate examples that come to a given person's mind when evaluating a specific topic, concept, method or decision. The availability heuristic operates on the notion that if something can be recalled, it must be important, or at least more important than alternative solutions which are not as readily recalled. Subsequently, under the availability heuristic, people tend to heavily weigh their judgments toward more recent information, making new opinions biased toward that latest news.
15. **A**—Inductive reasoning involves starting from specifics to derive a general rule.
16. **C**—Research findings in the field of affective forecasting allow us to deduce that Jane is likely to overestimate the negative emotional impact and underestimate her ability to cope. Affective forecasts tend to be colored by impact bias, the tendency to overestimate the emotional impact of a future event, whether in terms of intensity or duration. Our affective forecasts also tend to be colored by immune neglect, which refers to

forecasters' unawareness of their tendency to adapt to and cope with negative events.

17. **A**—Prototype theory is a mode of graded categorization in cognitive science, where some members of a category are more central than others. Instead of a definition based model - e.g. a bird may be defined as elements with the features [+feathers], [+beak] and [+ability to fly], prototype theory would consider a category like bird as consisting of different elements which have unequal status - e.g. a robin is more prototypical of a bird than, say a penguin. This leads to a graded notion of categories, which is a central notion in many models of cognitive science and cognitive semantics.
18. **C**—Mental sets represent a form of rigidity in which an individual behaves or believes in a certain way due to prior experience.
19. **D**—Behavioral scripts are a sequence of expected behaviors for a given situation. Scripts include default standards for the actors, props, setting, and sequence of events that are expected to occur in a particular situation
20. **A**—When people rely on representativeness to make judgments, they are likely to judge wrongly because the fact that something is more representative does not actually make it more likely. The representativeness heuristic is simply described as assessing similarity of objects and organizing them based around the category prototype.
21. **B**—A heuristic is any approach to problem solving, learning, or discovery that employs a practical method not guaranteed to be optimal or perfect, but sufficient for the immediate goals. Trial and error is the most fundamental heuristic. An algorithm is different from a heuristic in that an algorithm will always produce a correct solution.
22. **A**—Inductive reasoning attempts to support a determination of the rule. It hypothesizes a

rule after numerous examples are taken to be a conclusion that follows from a precondition in terms of such a rule.

- 23 B**—Telegraphic speech, according to linguistics and psychology, is speech during the two-word stage of language acquisition in children, which is laconic and efficient.
- 24 C**—Displacement is the capability of language to communicate about things that are not immediately present (spatially or temporally); i.e., things that are either not here or are not here now.
- 25 D**—Anomia is a deficit of expressive language. It is the most pervasive deficit in the aphasia. Some level of anomia is seen in all of the aphasias.
- 26 A**—Hypnagogia is the experience of the transitional state from wakefulness to sleep: the hypnagogic state of consciousness, during the onset of sleep. Mental phenomena that occur during this “threshold consciousness” phase include lucid thought, lucid dreaming, hallucinations, and sleep paralysis.
- 27 D**—Functional fixedness is a cognitive bias that limits a person to using an object only in the way it is traditionally used.
- 28 A**—Pragmatics is a subfield of linguistics and semiotics that studies the ways in which context contributes to meaning. Pragmatics explains how language users are able to overcome apparent ambiguity, since meaning relies on the manner, place, time etc. of an utterance.
- 29 C**—This would be a common form of base-rate fallacy. The probability of a positive test result is determined not only by the accuracy of the test but by the characteristics of the sampled population. When the incidence, i.e. the proportion of those who have a given condition, is lower than the test’s false positive rate, even tests that have a very low chance of giving a false

positive in an individual case will give more false than true positives overall. In other words, if less than 5% of drivers are actually drunk, more false breathalyzer results will be obtained from random selection than true ones. Where false positive tests are more probable than true positive tests this is known as the false positive paradox.

- 30 D**—The reticular formation is a set of interconnected nuclei that are located throughout the brainstem. The reticular formation is not anatomically well defined because it includes neurons located in diverse parts of the brain. The neurons of the reticular formation all play a crucial role in maintaining behavioral arousal and consciousness.
- 31 D**—Theta waves tend to appear in meditative, drowsy and sleeping states (stage 1 and stage 2) but not the deepest stages of sleep where delta waves predominate.
- 32 C**—Night terrors, nocturnal enuresis, sleep walking, and somniloquy occur during stage 3 sleep.
- 33 A**—A classic symptom of narcolepsy, cataplexy is an episodic loss of muscle function, ranging from slight weakness such as limpness at the neck or knees to a complete body collapse. Cataplexy is generally considered to be unique to narcolepsy and is analogous to sleep paralysis in that the usually protective paralysis mechanism occurring during sleep is inappropriately activated. The opposite of this situation (failure to activate this protective paralysis) occurs in rapid eye movement behavior disorder. The major and arguably only abnormal feature of RBD is loss of muscle atonia (i.e., the loss of paralysis) during otherwise intact REM sleep (during which paralysis is not only normal but necessary). The loss of motor inhibition leads to a wide spectrum of behavioral release during sleep. This extends from simple limb twitches to more complex integrated movement, in which people appear to be unconsciously acting

out their dreams.

- 34 C**—Often those affected with narcolepsy have low levels of the neuropeptide orexin. Research suggests that this is often due to an autoimmune disorder. Choice ‘C’ has to do with Alzheimer’s disease and choice ‘D’ with Parkinson’s (The neurons of the substantia nigra are dopamine producing).
- 35 D**—Ethanol, benzodiazepenes (like valium), and barbiturates are GABA_A receptor positive allosteric modulators (GABA_A PAMs). GABA_A receptor positive allosteric modulators increase the activity of the GABA_A receptor protein. Unlike GABA_A receptor agonists, GABA_A PAMs do not bind at the same active site as the γ -Aminobutyric acid (GABA) neurotransmitter molecule: they affect the receptor by binding at a different site on the protein. In contrast, opioids act on opioid receptors. The endogenous opioids are dynorphins, enkephalins, endorphins, endomorphins and nociceptin.
- 36 A**—Dopaminergic pathways, sometimes called dopaminergic projections, are the sets of projection neurons in the brain that synthesize and release the neurotransmitter dopamine. Two of the most significant dopaminergic pathways are the nigrostriatal pathway and the mesolimbic pathway. The nigrostriatal pathway transmits dopamine from the substantia nigra to the caudate nucleus and putamen. The substantia nigra is located in the midbrain, while both the caudate nucleus and putamen are located in the dorsal striatum. The nigrostriatal pathway is important in motor function and reward learning. Disorder in the nigrostriatal pathway is implicated in Parkinson’s disease. The mesolimbic pathway transmits dopamine from the ventral tegmental area to the nucleus accumbens. The mesolimbic pathway is important for pleasure and positive reinforcement. Disorder in the mesolimbic pathway is implicated in addiction.
- 37 C**—This is a gene nomenclature question that is meant to also teach a bit about the molecu-

lar cell biology of the addiction process within neurons of the nucleus accumbens (The mesolimbic dopaminergic pathway transmits dopamine from the ventral tegmental area to the nucleus accumbens). The molecular hallmark of the addiction process is the accumulation of phosphorylated Δ FosB within the nuclei of accumbal cells where it participates as a transcription factor (repressing *c-fos*). Regarding nomenclature, the question hinges on the meaning of the ‘ Δ ’ in the gene product signifier ‘ Δ FosB’. This symbol, ‘ Δ ’, under HGNC guidelines signifies ‘deletion’. Δ FosB is a truncated splice variant of FosB. (Notice that when the gene itself is indicated in the nomenclature, the gene name is italicized and uncapitalized). You NEED to be comfortable with gene and gene product nomenclature for the new MCAT.

- 38 D**—Stimulus-driven attention is bottom-up processing, also known as exogenous attention. Exogenous attention is driven by the properties of the objects themselves. Some processes, such as motion or a sudden loud noise, can attract our attention in a pre-conscious, or non-volitional way. We attend to them whether we want to or not. Exogenous attention is thought to involve parietal and temporal cortices, as well as the brainstem. The second aspect is called top-down processing, also known as goal-driven, endogenous attention, attentional control or executive attention. This aspect of our attentional orienting is under the control of the person who is attending. It is mediated primarily by the frontal cortex and basal ganglia as one of the executive functions.
- 39 D**—Entactogens (or empathogens) are a class of psychoactive drugs that produce experiences of emotional communion, oneness, relatedness, emotional openness—that is, empathy or sympathy—as particularly observed and reported for experiences with 3,4-Methylenedioxymethamphetamine (MDMA).
- 40 B**—Systematic desensitization, also known as graduated exposure therapy is a type of behav-

ior therapy used in the field of psychology to help effectively overcome phobias and other anxiety disorders.

- 41 **B**—Because the EEG contains a sleep spindle and a K-complex, we know that this is stage 2 sleep.



- 42 **D**—The axons in the optic tract terminate in four nuclei within the brain: 1) the lateral geniculate nucleus of the thalamus - for visual perception, 2) the superior colliculus of the midbrain - for control of eye movements, 3) the pretectum of the midbrain - for control of the pupillary light reflex; and 4) the suprachiasmatic nucleus of the hypothalamus - for control of diurnal rhythms and hormonal changes.
- 43 **B**—Alpha brainwaves are dominant during quiet relaxation and in some meditative states. Beta brainwaves dominate when attention is directed towards difficult cognitive tasks and engaging stimuli in the outside world.
- 44 **D**—REM sleep begins with signals from the pons to the cerebral cortex which lead to EEG patterns similar to wakefulness as well as signals to the spinal cord, causing temporary paralysis of the limb muscles.
- 45 **C**—In Chomsky's view a baby possesses a large body of prior knowledge about the structure of language in general, and need only actually learn the idiosyncratic features of the language it is exposed to.
- 46 **C**—Prototype theory is a mode of graded categorization in cognitive science, where some members of a category are more central than others.

For example, when asked to give an example of the concept furniture, chair is more frequently cited than, say, stool. Prototype theory was a radical departure from traditional necessary and sufficient conditions as in Aristotelian logic. Thus instead of a definition based model - e.g. a bird may be defined as elements with the features [+feathers], [+beak] and [+ability to fly], prototype theory would consider a category like bird as consisting of different elements which have unequal status - e.g. a robin is more prototypical of a bird than, say a penguin. This leads to a graded notion of categories, which is a central notion in many models of cognitive science and cognitive semantics.

- 47 **C**—Mental sets represent a form of rigidity in which an individual behaves or believes in a certain way due to prior experience. In the field of psychology, mental sets are typically examined in the process of problem solving, with an emphasis on the process of breaking away from particular mental sets into formulation of insight.
- 48 **A**—Inductive reasoning is reasoning in which the premises are viewed as supplying strong evidence for the truth of the conclusion. It is the derivation of general principles from specific observations. While the conclusion of a deductive argument is certain, the truth of the conclusion of an inductive argument is probable, based upon the evidence given. In the specific example, we are inferring a future probability, the general proposition, from specific past instances. Unlike deductive arguments, inductive reasoning allows for the possibility that the conclusion is false, even if all of the premises are true.
- 49 **C**—In linguistics, syntax is the set of rules, principles, and processes that govern the structure of sentences in a given language, specifically word order.
- 50 **D**—The best answer in this question reflects the tenets of linguistic relativism. Choices 'A' and

'B' are too strong, verging on linguistic determinism. Choice 'C' reflects a criticism of the experimental methodology. Note that the degree to which language influences thought is not at all settled. Taking the universalist point of view, for example, Steven Pinker argues in *The Language Instinct* that thought is independent of language, that language is itself meaningless in any fundamental way to human thought, and that human beings do not even think in "natural" language.