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QUESTION 1

In 1972, Georges Ungar reported the discovery of a peptide that appeared to transfer learning. Ungar's claim was based on experiments in which rats placed in a chamber with specially designed dark and light regions were trained to avoid

the dark regions of the chamber. Following their training, the rats were killed and brain extracts were prepared. These brain extracts were injected into naive rats which were then observed to acquire the fear of darkness without training. Two

hypotheses were proposed to explain these remarkable results:

Hypothesis 1

Ungar concluded that the extracts contained some chemical that transmitted the learned fear of darkness to the naive rats. A fifteen amino-acid polypeptide was isolated from the brain extracts and sequenced. Ungar claimed that this peptide,

called scotophobin, was a chemical transmitter of learning. The peptide had the primary structure shown below:

C-ser-asp-asn-arg-gln-gln-gly-lys-ser-ala-arg-gln-glygly-tyr-N scotophobin

Hypothesis 2

Other researchers, who tested scotophobin but could not reproduce Ungar's results, argued that scotophobin did not transfer the learned fear of darkness. Instead, they suggested that scotophobin, which is structurally similar to ACTH and

vasopressin, acted to increase stress in the rats. Since stress increases sympathetic nervous activity, rats injected with scotophobin would become hyperactive and tend to spend less time in the dark regions of the experimental chamber.

They argued that such stress responses in the rats could be misinterpreted as a fear of darkness. Ungar's claim was further weakened by chemical analysis in which both the scotophobin extracts which Ungar had injected into the naive rats

and a sample of synthesized scotophobin peptide were subjected to SDS polyacrylamide gel electrophoresis, as shown in Figure 1.

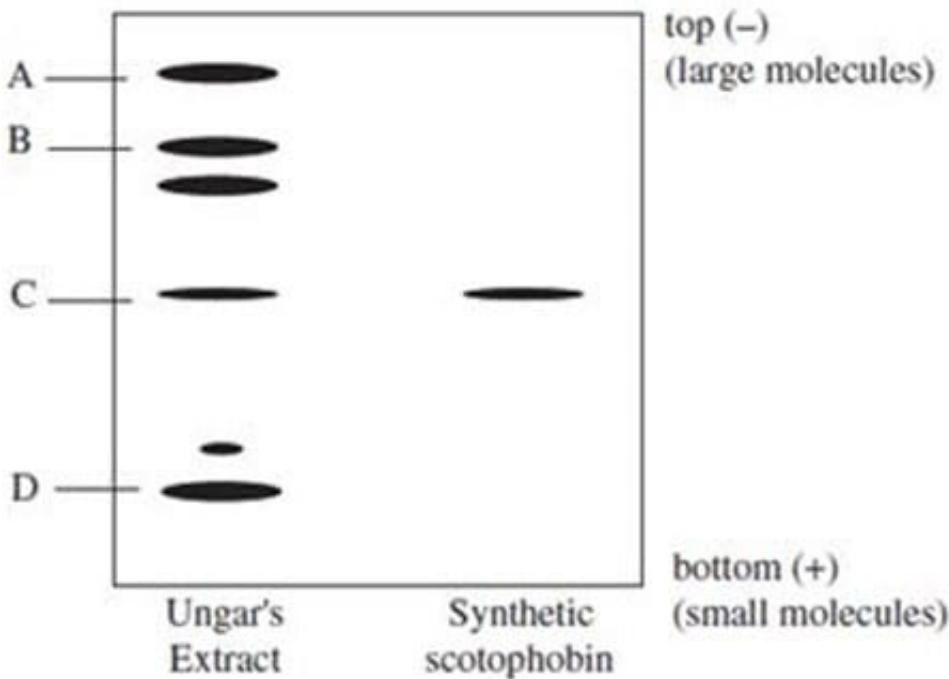


Figure 1

Hydrolytic enzymes cleave polypeptides at specific amino acid residues. Which of the following hydrolytic enzymes could be used to cleave scotophobin into three fragments?

Enzyme	Sites of Cleavage	Bond Cleaved
Trypsin	Lys or Arg	carboxy end
Clostripain	Arg	carboxy end
Chymotrypsin	Phe, Trp, or Tyr	carboxy end
Pepsin	Asp, Glu, Leu, Phe, Trp, or Tyr	carboxy end

- A. Trypsin only
- B. Trypsin or clostripain only
- C. Clostripain or chymotrypsin only
- D. Clostripain or pepsin only

Correct Answer: D

In order to cleave scotophobin into three fragments, the protein must be cleaved at two sites. Clostripain will cleave scotophobin at both Arg residues, while pepsin will cleave scotophobin at the Asp residue and at the Tyr residue. Note that

the enzymes cleave at the carboxy end of the residue. Thus, according to the direction in which the sequence of the protein is written in the text (carboxy to amino end), the enzymes will cleave before, i.e., to the left of, the specified amino

acid residue. Choice A and B are incorrect because trypsin will cleave the peptide at two Arg location and one Lys location, creating 4 fragments.

Choice C is incorrect because chymotrypsin will cleave the peptide at a single point (Tyr), creating 2 fragments.

QUESTION 2

By now the image of California in decline looms as large in the conventional media wisdom as the Golden State --triumphant cliché of a generation ago -- "this El Dorado," as Time magazine had put it in 1969, that was to be "the mirror of America as it will become." Hardly anyone mentions the sunshine these days, or the beaches, or the beautiful young families around the pool, or the new lifestyles that all Americans will soon emulate, or how the University of California is wall-to-wall with cyclotrons and Nobel laureates, or how the state's higher-education system is accommodating absolutely all comers at little or no cost.

Today, California classrooms are among the most crowded in the country; many schools operate without libraries, without counselors, without nurses, without art or music, with greatly diminished curricular offerings. And what's true for the schools is true for the other services that have no powerful constituencies: children's protective services, probation, public health. Many cities have shut down swimming and wading pools because they cannot be safely maintained, and fenced playgrounds have been shut because of the danger presented by cracked and splintered structures. The list could be extended indefinitely. As thousands of professors receive golden handshakes from the University of California and California State University, among them some of the stars recruited in the go-go Fifties, the crowding in the lecture halls has increased and the lines at the classroom door have gotten longer and longer ("Don't panic," says the T-shirt on a student waiting to enroll at a Sacramento junior college, but many have been in line since four in the morning). U.C. tuition, which was roughly \$800 a year in the early 1980s, is now over \$4,000, a figure not out of line with tuitions at public colleges in other states but a far cry from the cost of a California state education in the golden days -- and it is almost certain to increase again next year. More than 200,000 students -- roughly 10 percent -- have vanished from the rolls of the state's colleges and universities in the past two years. While per capita tax revenues have been effectively frozen, and while they have declined relative to other states, client rolls for state services -- schools, prisons, Medicaid, welfare -- have been rising faster than population, leaving a structural gap that no one has yet confronted, much less closed. Again this year, the governor and legislature borrowed \$7 billion from the banks and rolled over a \$5 billion budget deficit, for which few politicians have proposed any remedies. Thanks to the deficit, California, which a decade ago, had one of the highest bond ratings in the country, has one of the lowest. "Were California a corporation," said John Vasconcellos, the chairman of the State Assembly Ways and Means Committee, "it would have little option but to initiate some sort of bankruptcy proceeding." The new image of California is familiar enough: a state suffering from earthquakes, fires, drought, floods, urban riots, dirty air, schools as overcrowded as the freeways; a legislature -- once said to be the nation's most professional and progressive -- oozing with corruption and stuck in the budgetary gridlock; and of course, recession, unemployment, chronic budget deficits, and financial calamity. For those who know their Nathaniel West, their Raymond Chandler, and their Joan Didion, the California apocalypse imagery is hardly new; it was always there on the dark side of the dream. This was the place, as Didion wrote back in the 1960s, "in which a boom mentality and a sense of Chekhovian loss meet in uneasy suspension; in which the mind is troubled by some buried but ineradicable suspicion that things better work here, because here, beneath that immense bleached sky, is where we run out of continent." Los Angeles has burnt before. If you believe people like Governor Wilson, most of the state's problems were created somewhere else, usually in Washington, where the Clinton Administration has, on the one hand, cost California hundreds of thousands of jobs through excessive defense cuts and, on the other, allowed a horde of illegal immigrants to overrun the state's schools and health facilities without paying them for the immense costs that come with them...much has been changed in California since the days of West and Chandler, but the capacity for denial and self-deception is undiminished. In fact, California's trouble is at once more prosaic and more complex than the political rhetoric claims or the apocalyptic imagery suggests. It began before the recent recession, the big 1991 fire in the Oakland hills or the San Francisco earthquake of 1989 (itself a rerun of a classic), before those L.A. cops beat up Rodney King or the riot and the fire that followed their acquittal in the first trial, before the eight-year drought that still may not be over. And contrary to what a lot of Californians believe, a lot of the damage didn't just happen to us: we

inflicted it on ourselves.

Which of the following most weakens the image of California as an "El Dorado"?

- A. "...the California apocalypse imagery...was always there on the dark side of the dream..."
- B. "...the University of California is wall-to-wall with cyclotrons and Nobel laureates..."
- C. "...U.C. tuition...is now over \$4,000, a figure not out of line with tuitions at public colleges in other states..."
- D. "...the new lifestyles that all Americans will soon emulate..."

Correct Answer: A

The first paragraph of the passage describes California's 1960s image as an "El Dorado." Even if you do not know the image associated with an "El Dorado" -- a place associated with wealth and prosperity. Nonetheless, using the context of the passage, you should be able to decipher that an accompany "El Dorado" such as California is called that because of its sunshine, perfect lifestyles and opportunities -- best education system in the country. This image is weakened by descriptions from around the same time, of "the dark side of the dream." Choice B supports the image of California as an ideal state for opportunity. Choice D also supports the image of California as a "golden" state. Choice C does not weaken the image of California as an "El Dorado" as much as does Choice A because the tuition is still comparable to other states. The MCAT will require that you make distinctions in degree as in this question. While the increase in the cost of education is not a positive portrayal of California, it does not weaken the "El Dorado" image as much as choice A. Choice A leads us to believe that the whole pretense of the "El Dorado" was rather weak and that inevitably California would see failure (an apocalypse).

QUESTION 3

A helium-neon gas discharge laser as shown in Figure 1 below generates a coherent beam of monochromatic light at a wavelength of 632.8 nm.

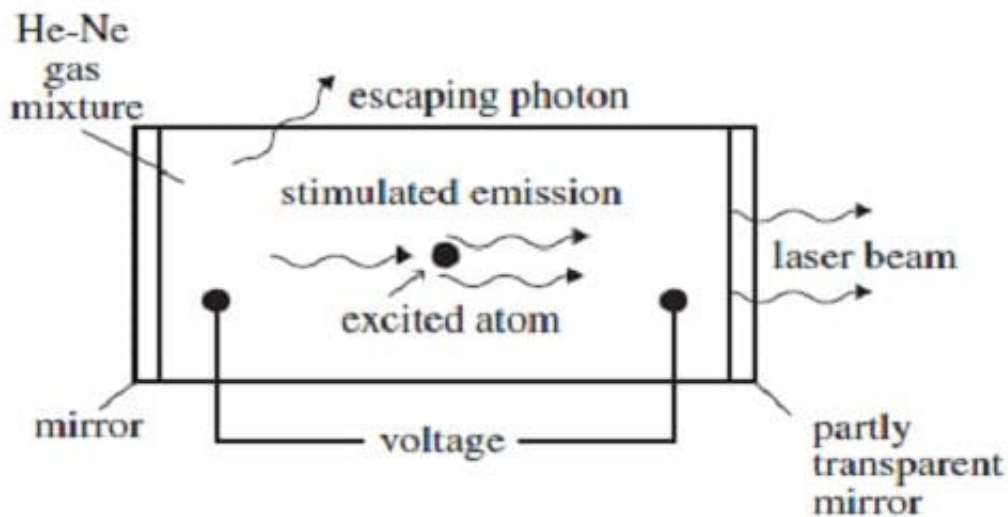


Figure 1

A discharge current of electrons is created in the tube by an applied voltage. When these electrons collide with the

helium atoms, they can excite ground-state helium electrons to an energy level of 20.61 eV. The excited electrons cannot decay back to the ground state by emitting a photon because such a transition does not conserve angular momentum. Instead, if the excited helium atom collides with a neon atom, a ground-state electron in the neon atom can be excited to an energy level of 20.66 eV, and the helium electron can return to its ground state. The above process occurs quite often in the tube until the percentage of neon atoms with electrons in the 20.66-eV energy level is greater than the percentage of neon atoms with electrons in lower levels. This condition is called a population inversion. An excited electron in one of the neon atoms can then spontaneously decay by emitting a photon of wavelength 632.8 nm in a random direction. The photon will stimulate the same transition in another excited electron in a neon atom. The photon radiated by this stimulated emission process travels in the same direction as the original photon. The resulting light is then reflected back and forth inside the tube until it escapes through the partially transparent mirror. (Note: A photon's energy in eV is given by $E = 1240/\lambda$, where λ is the photon's wavelength in nm. The helium and neon ground-state energies are both 0 eV.)

Why is stimulated emission of photons necessary in order to produce a coherent beam of light instead of spontaneous emission alone?

- A. Stimulated emission produces photons of higher energy than those produced by spontaneous emission.
- B. Stimulated emission produces photons that travel in the same direction as the photon that induces their emission.
- C. Stimulated emission produces photons with longer wavelengths than those produced by spontaneous emission.
- D. Either spontaneous or stimulated emission alone would be sufficient to produce laser light.

Correct Answer: B

To answer this question, you have to figure out the difference between stimulated and spontaneous emission. The passage states that a photon is emitted in a random direction when an atom spontaneously decays. This process is called spontaneous emission. It also states that a photon can stimulate an electron transition in an atom. The photon that is emitted in this process, called stimulated emission, travels in the same direction as the stimulating photon. Therefore, spontaneous emission produces photons that travel in random directions, whereas stimulated emission produces photons that travel in the same direction as the stimulating photon. A coherent beam of light consists of photons travelling in the same direction. So choice B is correct. Choices A and C are wrong because, as stated in the third paragraph, the photon produced by spontaneous emission causes stimulated emission by inducing the same electron transition in another excited atom. Since the electron transition is the same, the photon energy released by the transition is the same, and the photon wavelengths must be the same because energy and wavelength are related by the formula $E = 1240/\lambda$. Choice D is incorrect because stimulated emission is necessary to obtain a large number of photons traveling in the same direction.

QUESTION 4

A symbolic interactionism researcher who is observing two people enjoying a coffee together at a cafe would primarily point out that:

- A. the drinking ritual is symbolic and more important than the drink itself.
- B. coffee is a stimulant drug.
- C. coffee is the second most valuable commodity in international trade.
- D. coffee is a branded and politicized consumption good.

Correct Answer: A

A is correct. Symbolic interactionists observe how people relate to things on their daily life based on the meanings those

things have for them. These meanings or symbols are created mainly through social interaction and language, and shape subsequent behavior. For instance, people can agree to meet to `have a coffee` but are not obliged to actually consume the drink. This is because the idea of meeting for a coffee is merely symbolic, standing for a short period of togetherness and socialization. Thus, they will not feel they are going against the initial plan if they have a tea instead. They will still enjoy the shared meaning of comfort and spending time with friends that stems from the idea of `having a coffee`. Thus, knowing the meaning of actions, words, and images for people is critical for understanding people's behavior and interaction. B. This is incorrect. The claim that coffee is a stimulant drug is true but a social interactionist perspective would not be interested in that issue. Rather, it would search for the underlying meaning of `having a coffee` or why it is acceptable to consume a particular type of stimulant drugs in certain settings and under certain circumstances.

C. This is incorrect. A Marxist perspective might pay attention to the nature of coffee as a commodity and how the global supply chain affects workers and economies worldwide. This is not of primary concern for social interactionism theory.

D. This is incorrect. This would be of interest to theories about consumption and lifestyle. This is not of primary concern for social interactionism theory.

QUESTION 5

...[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."

Suppose that the contestants on the television game shows mentioned in the passage had not been supplied with answers. Which of the following conclusions would most likely be correct?

- A. The Justice Department would have ended its investigation into the television production industry.
- B. Herb Stempel would have continued as champion on Twenty-one.
- C. The ABC chairman would not have removed Robert Kintner from the presidency.
- D. Herb Stempel would not have gone to the press shortly after December 1956.

Correct Answer: D

It was stated in the passage that the reason why Stempel went to the press was because he did not like being the "predetermined loser." If the contestants had been competing fairly, therefore, he would not have gone to the press. Choice A is incorrect because even though the rigging of game shows was what precipitated intense investigation, it is stated in paragraph 1 that a secret investigation had been launched more than two years before because of suspected monopolizing activity within the industry. Choice B is not the correct choice because Stempel may have lost fairly as well. Nothing in the passage indicates that his continued winning is necessarily a likely outcome. Choice C is incorrect because there is no indication at all that the firing of Kintner is related to the quiz show scandal.

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