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QUESTION 1

Which of the following best accounts for the negative slope of the liquid-solid equilibrium line in the phase diagram for water?

A. H2O(s) has a greater density than H2O(l), which causes the solid to form liquid under high pressure conditions.

B. H2O(s) has a greater density than H2O(l), which results from the hydrogen bonds formed between water molecules.

C. H2O(s) has a lower density than H2O(l) which results from the crystalline framework that forms due to hydrogen bonds.

D. H2O(s) has a lower density than H2O(l) which causes the solid to form liquid under low pressure conditions.

Correct Answer: C

This question asks the examinee to identify the correct explanation for the negatively sloped phase diagram for water. During the crystallization of water, each molecule forms four hydrogen bonds with adjacent water molecules resulting in three-dimensional hexagonal lattice structure. Thus, the density of solid water is less than the density of liquid water eliminating choices A and B. The negatively sloped liquid-solid equilibrium line in the phase diagram means that an increase in pressure at a constant temperature can cause water to change phases from solid to liquid. The increase in pressure causes water to convert to the more compact liquid phase in order to relieve the increased pressure. Therefore, answer choice C is the best answer.

QUESTION 2

It is critical for the human body blood to maintain its pH at approximately 7.4. Decreased or increased blood pH are called acidosis and alkalosis respectively; both are serious metabolic problems that can cause death. The table below lists the major buffers found in the blood and/or kidneys. Table 1 Buffer pKa of a typical conjugate acid:*

$HCO_3^- \rightleftharpoons CO_2$

+ Histidine side chains

HPO_4^{2-}

$\rightleftharpoons H_2PO_4^-$

Organic phosphates N-terminal amino groups

$\rightleftharpoons NH_4^+$

NH_3

6.1

6.3

6.8

7.0

8.0

9.2

pK_a

*For buffers in many of these categories, there is a range of actual values.

pK_a

The relationship between blood pH and the of any buffer can be described by the Henderson-Hasselbalch equation:

pK_a

pH = + log([conjugate base]/[conjugate acid]) Equation 1

CO_2

Bicarbonate, the most important buffer in the plasma, enters the blood in the form of carbon dioxide, a byproduct of metabolism, and leaves in two forms: exhaled and excreted bicarbonate. Blood pH can be adjusted rapidly by changes

CO_2

in the rate of exhalation. The reaction given below, which is catalyzed by carbonic anhydrase in the erythrocytes, describes how bicarbonate and interact in the blood.

CO_2

+ + Reaction 1

How does the titration of a weak monoprotic acid with a strong base differ from the titration of a strong monoprotic acid with a strong base?

A. The equivalence point will occur at a higher pH.

B. The equivalence point will occur at a lower pH.

C. The equivalence point will occur at the same pH.

D. Whether the equivalence point is higher or lower depends on the particular monoprotic acids used.

Correct Answer: A

When a weak acid is reacted with a strong base, the equivalence point will be in the basic region. Consider the titration of equimolar solutions of acetic acid and NaOH. Before the equivalence point, the following reaction takes place:

$$HC_2H_3O_2(aq) + OH^-(aq) \rightarrow H_2O + C_2H_3O_2^-(aq)$$

At the equivalence point, only C2H3O2?exists. When C2H3O2?undergoes hydrolysis (i.e., reacts with water), hydroxide ions are formed according to the following equilibrium:

$$C_2H_3O_2^-(aq) + H_2O \rightleftharpoons HC_2H_3O_2(aq) + OH^-(aq)$$

The numerical value of the equilibrium constant along with the initial concentration of acetate is all that is needed to determine the hydroxide ion concentration. When equimolar solutions of a strong acid and a strong base are titrated, the equivalence point will be neutral. It is neutral because neither of the ions present at the equivalence point can undergo hydrolysis. Choice A is therefore the correct response. Choice B would be correct if a weak base was titrated with a strong acid.

QUESTION 3

Although nihilism is commonly defined as a form of extremist political thought, the term has a broader meaning. Nihilism is in fact a complex intellectual stance with venerable roots in the history of ideas, which forms the theoretical basis for many positive assertions of modern thought. Its essence is the systematic negation of all perceptual orders and assumptions. A complete view must account for the influence of two historical crosscurrents: philosophical skepticism about the ultimacy of any truth, and the mystical quest for that same pure truth. These are united by their categorical rejection of the "known". The outstanding representative of the former current, David Hume (1711?776), maintained that external reality is unknowable, since sense impressions are actually part of the contents of the mind. Their presumed correspondence to external "things" cannot be verified, since it can be checked only by other sense impressions. Hume further asserts that all abstract conceptions turn out, on examination, to be generalizations from sense impressions. He concludes that even such an apparently objective phenomenon as a cause-and-effect relationship between events may be no more than a subjective fabrication of the observer. Stanley Rosen notes: "Hume terminates in skepticism because he finds nothing within the subject but individual impressions and ideas". For mystics of every faith, the "experience of nothingness" is the goal of spiritual practice. Buddhist meditation techniques involve the systematic negation of all spiritual and intellectual constructs to make way for the apprehension of pure truth. St. John of the Cross similarly rejected every physical and mental symbolization of God as illusory. St. John\\'s spiritual legacy is, as Michael Novak puts it, "the constant return to inner solitude, an unbroken awareness of the emptiness at the heart of consciousness. It is a harsh refusal to allow idols to be placed in the sanctuary. It requires also a scorching gaze upon all the bureaucracies, institutions, manipulators, and hucksters who employ technology and its supposed realities to bewitch and bedazzle the psyche". Novak\\'s interpretation points to the way these philosophical and mystical traditions prepared the ground for the political nihilism of the nineteenth and twentieth centuries. The rejection of existing social institutions and their claims to authority is in the most basic sense made possible by Humean skepticism. The political nihilism of the Russian intelligentsia combined this radical skepticism with a near mystical faith in the power of a new beginning. Hence, their desire to destroy becomes a revolutionary affirmation; in the words of Stanley Rosen, "Nihilism is an attempt to overcome or repudiate the past on behalf of an unknown and unknowable, yet hoped-for, future." This fusion of skepticism and mystical re-creation can be traced in contemporary thought, for example as an element in the counterculture of the 1960s.

Novak\\'s interpretation of St. John\\'s spiritual legacy (lines 31?8) is important to the author\\'s argument primarily because it:

A. characterizes the essence of St. John\\'s mystical doctrine.

B. gives insight into the historical antecedents of political nihilism.

C. draws a parallel between Christian mysticism and the Humean tradition of philosophical skepticism.

D. suggests that St. John\\'s teachings are influential mainly because of their sociopolitical implications.

Correct Answer: B

In the beginning of the last paragraph, the author says that Novak\\'s quote "points to the way [the] philosophical and mystical traditions prepared the ground for the political nihilism of the 19th and 20th centuries." Choice B paraphrases this statement and is the correct answer.

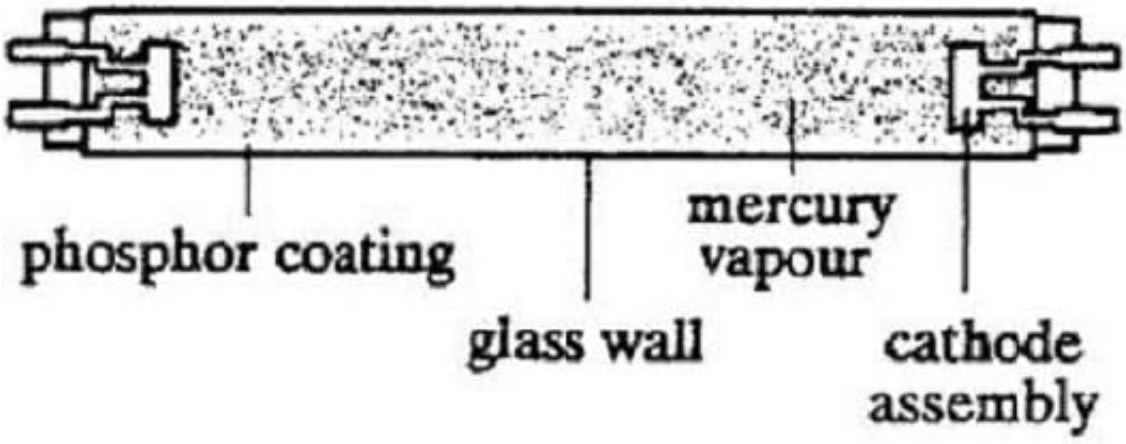
Although Novak does characterize St. John\\'s doctrine, this is not why his interpretation is important to the author\\'s argument, so A is wrong. Novak does not draw a parallel between Humean skepticism and Christian mysticism, which rules out Choice C, nor does he say that St. John\\'s teachings were influential, so D is wrong as well.

QUESTION 4

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.



If the fluorescent light is left on for 4 hours, how much useful energy is emitted as light?

A. 144 kJ

B. 432 kJ

C. 576 kJ

D. 900 kJ

Correct Answer: A

Before answering this question, we must first remember a few facts given in the passage. In the passage we are told that only 25% of the operating power of the lamp is converted to light. We are also told that the lamp has an operating voltage of 100 volts, and that it draws 400 milliamps or 0.4 amps of current. From these facts, we can calculate the operating power of the lamp since P = VI, where P = power, V = voltage, and I = current. The operating power of this lamp, therefore, is (100 V)(0.4 A) or 40 watts. Since only 25% of this power gets converted to light, we get only (10 watts)(4 hours)(3600 seconds/hour), which equals 144 kilo-joules, choice A.

QUESTION 5

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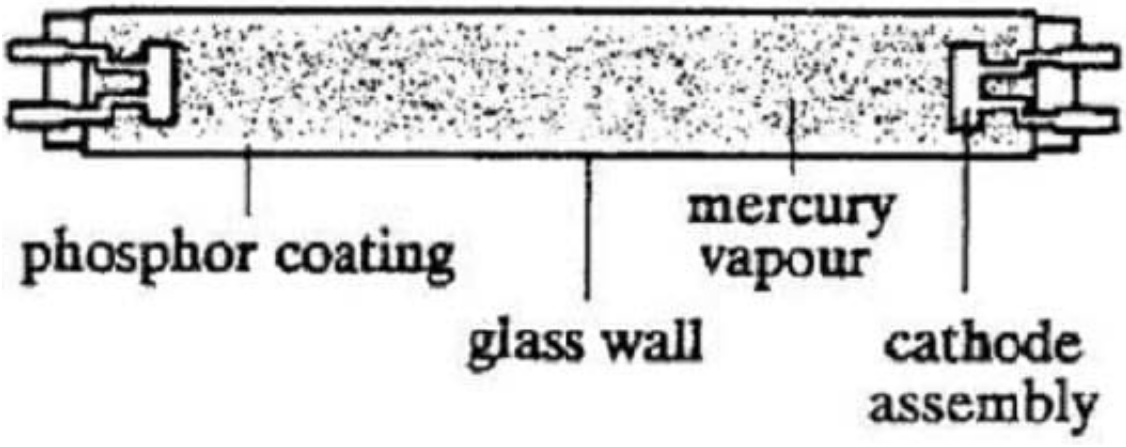


In the phosphor coating, an electron falls from an excited state to a lower energy state, emitting a photon with an energy

of 2.07 eV. What is the wavelength of the light emitted by the fluorescent tube? (Note: Planck\\'s constant h = 4.14?0-15 eV?, and c = 3?08m/s.)

A. 300 nm

B. 600 nm

C. 900 nm

D. 1242 nm

Correct Answer: B

This question is a straightforward application of the equation energy equals hc/? as given in the answer to question 92. Here, the energy is given in electron-volts instead of joules, but that should not bother you since Planck\\'s constant, h, is given as 4.14×10-15 electron-volt seconds. The wavelength therefore equals (4.14×10-15)(3×108)/2.07. Rounding everything to the nearest integer gives ? equals (12×10-7)/2, or 6×10-7 meters, choice B.

QUESTION 6

Pressure exerted on a surface with some force is:

A. directly proportional to the surface area.

B. inversely proportional to the surface area.

C. directly proportional to the force.

D. None of them.

Correct Answer: B

QUESTION 7

Hypoxia refers to a physiological condition in which the body lacks sufficient oxygen for normal cellular functioning. Prolonged hypoxia generally leads to an inhibition of mental capacity and a reduction in the work capacity of muscle. Severe cases of hypoxia can lead to coma or even death. Depending on the cause, hypoxia can be classified into four general types:

Hypoxic hypoxia is a type of hypoxia that occurs when the partial pressure of oxygen in the blood is too low. For example, climbers at high altitude, where the air contains less oxygen, might experience hypoxic hypoxia because the partial pressure of oxygen in the air inhaled is very low, leading to insufficient partial pressure of oxygen in the blood.

Anemic hypoxia describes a diminished ability of the blood to transport oxygen. Several factors can influence the oxygen-carrying capacity of the blood. Primary causes of anemic hypoxia include a lower than normal number of functional erythrocytes or an insufficient quantity of hemoglobin, the oxygen- carrying molecules of the blood. Abnormal hemoglobin can also decrease the blood\\'s capacity to carry oxygen and lead to anemic hypoxia.

Ischemic hypoxia is caused by a decreased delivery of blood to the tissues. Localized circulatory deficiencies, such as blood clots, and global circulatory deficiencies, such as heart failure, decrease the delivery of blood to the tissues, and can therefore cause ischemic hypoxia.

Histotoxic hypoxia results from the inability of cells to utilize the oxygen available in the blood. Causes of histotoxic

hypoxia include the poisoning of cellular enzymes involved in aerobic respiration, as well as the decreased metabolic capacity of the oxidative enzymes due to vitamin deficiency. Cyanide poisoning causes histotoxic hypoxia by blocking the action of cytochrome oxidase in the electron transport chain so that tissues cannot use oxygen even though it is available.

The passages of the respiratory tract which do not participate in gas exchange are called the physiological dead space. Compared to air in the alveoli, air in the physiological dead space will have:

A. higher P_{CO_2} and higher P_{CO_2}
B. higher P_{CO_2} and lower P_{CO_2}
C. lower P_{CO_2} and higher P_{CO_2}
D. same P_{CO_2} and same P_{CO_2}

A. Option A

B. Option B

C. Option C

D. Option D

Correct Answer: C

The question stem states that the physiological dead space is not involved in gas exchange. This means that the composition of air in the dead space is virtually identical to that of atomospheric air. In the alveoli, where gas exchange occurs, oxygen is taken up by the blood and carbon dioxide is released. Thus, the air in the alveoli will have a lower pO2 and a higher pCO2 than dead space air. Conversely, dead space air will have a higher pO2 and a lower pCO2 than alveolar air. Choices A, B, and D are incorrect because they do not indicate that the alveolar air will have a higher concentration of carbon dioxide and a lower concentration of oxygen.

QUESTION 8

Agonistic behavior, or aggression, is exhibited by most of the more than three million species of animals on this planet. Animal behaviorists still disagree on a comprehensive definition of the term, but aggressive behavior can be loosely described as any action that harms an adversary or compels it to retreat. Aggression may serve many purposes, such as food gathering, establishing territory, and enforcing social hierarchy. In a general Darwinian sense, however, the purpose of aggressive behavior is to increase the individual animal\\'s -- and thus, the species\\' -- chance of survival. Aggressive behavior may be directed at animals of other species, or it may be conspecific--that is, directed at members of an animal\\'s own species. One of the most common examples of conspecific aggression occurs in the establishment and maintenance of social hierarchies. In a hierarchy, social dominance is usually established according to physical superiority; the classic example is that of a pecking order among domestic fowl. The dominance hierarchy may be viewed as a means of social control that reduces the incidence of attack within a group. Once established, the hierarchy is rarely threatened by disputes because the inferior animal immediately submits when confronted by a superior. Two basic types of aggressive behavior are common to most species: attack and defensive threat. Each type involves a particular pattern of physiological and behavioral responses, which tends not to vary regardless of the stimulus that provokes it. For example, the pattern of attack behavior in cats involves a series of movements, such as stalking, biting, seizing with the forepaws and scratching with the hind legs, that changes very little regardless of the stimulus -- that is, regardless of who or what the cat is attacking. The cat\\'s defensive threat response offers another set of closely linked physiological and behavioral patterns. The cardiovascular system begins to pump blood at a faster rate, in preparation

for sudden physical activity. The eyes narrow and the ears flatten against the side of the cat\\'s head for protection, and other vulnerable areas of the body such as the stomach and throat are similarly contracted. Growling or hissing noises and erect fur also signal defensive threat. As with the attack response, this pattern of responses is generated with little variation regardless of the nature of the stimulus. Are these aggressive patterns of attack and defensive threat innate, genetically programmed, or are they learned? The answer seems to be a combination of both. A mouse is helpless at birth, but by its 12th day of life can assume a defensive threat position by backing up on its hind legs. By the time it is one month old, the mouse begins to exhibit the attack response. Nonetheless, copious evidence suggests that animals learn and practice aggressive behavior; one need look no further than the sight of a kitten playing with a ball of string. All the elements of attack -- stalking, pouncing, biting and shaking -- are part of the game which prepares the kitten for more serious situations later in life.

According to the author, what is the most significant physiological change undergone by a cat assuming the defensive threat position?

A. An increase in cardiovascular activity

B. A sudden narrowing of the eyes

C. A contraction of the abdominal muscles

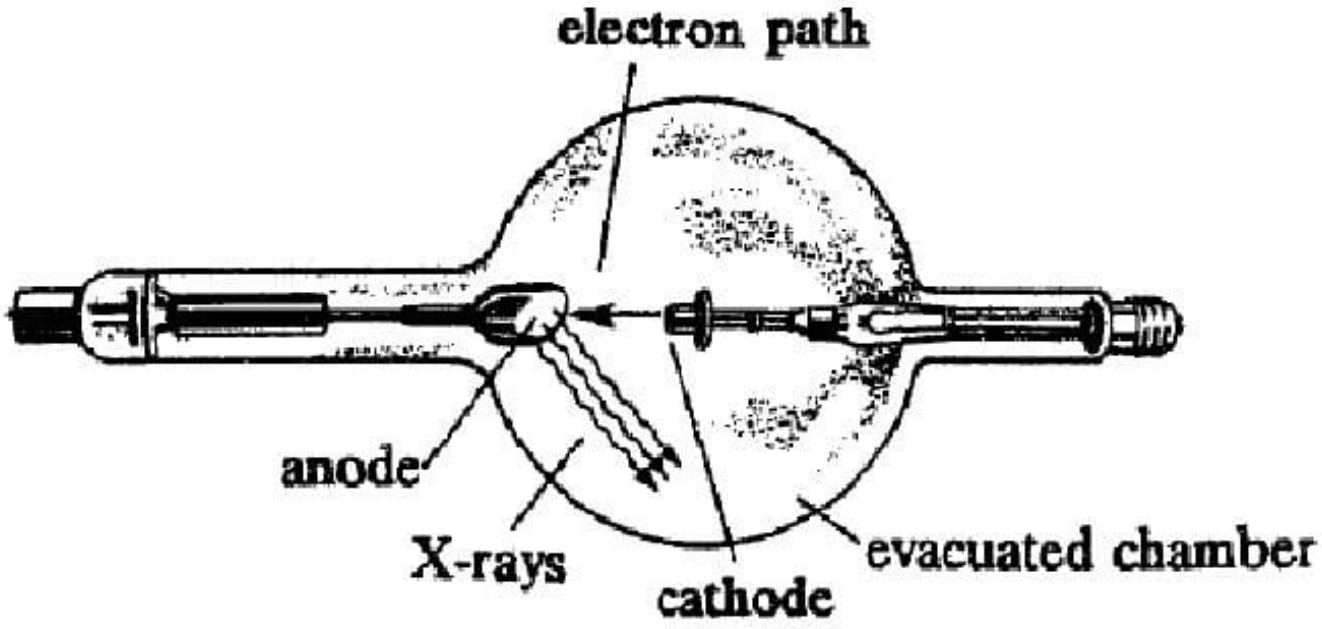
D. The author does not say which change is most significant

Correct Answer: D

This Detail question is about the physiological changes a cat experiences when it assumes the defensive threat position. The defensive threat response is discussed primarily in Paragraph 4. An increase in cardiovascular activity (Choice A), narrowing of the eyes (Choice B), and stomach muscle contraction (Choice C) are all mentioned in the paragraph as being part of the defensive threat response. However, the author never says that one of these is more significant than the others, so Choice D is correct.

QUESTION 9

X-rays are produced by a device which beams electrons with an energy between 103 and 106 eV at a metal plate. The electrons interact with the metal plate and are stopped by it. Much of the energy of the incoming electrons is released in the form of X-rays, which are high energy photons of electromagnetic radiation. An example of such a device is shown below. Electrons are accelerated from the cathode towards the anode by an electric field.



There are two mechanisms by which the X-rays are produced within the metal. The first mechanism is called bremsstrahlung, which is German for "breaking radiation." X-rays are emitted by the electrons as they are brought to rest by

interactions with the positive nuclei of the anode.

The second mechanism occurs when an incoming electron knocks an inner electron out of one of the metal atoms of the anode. This electron is replaced by an electron from a higher energy level of the atom, and a photon making up the

energy difference is emitted.

X-rays are absorbed by a material when they pass through it. The amount of X-rays absorbed increases with the density of the material. In addition, lower energy X-rays are more likely to be absorbed than higher energy X-rays. (Note: 1 eV =

1.6 x 1019 J; Planck\\'s constant h = 4.1 x 10–15 eV•s; speed of light c = 3 x 108 m/s.)

How does the wavelength of an X-ray produced from a K-alpha transition in molybdenum compare to that produced from a lower energy K-alpha transition in copper?

A. It is shorter.

B. It is the same.

C. It is longer.

D. It depends on the energy of the incoming electron.

Correct Answer: A

From the equation E = hf, where E is the energy, h is Planck\\'s constant, and f is the frequency, we know that energy and frequency are proportional. However, the question asks about wavelength, so we have to convert frequency into wavelength. The speed of any wave is equal to its frequency times its wavelength. So solving for frequency, we get that frequency equals the speed of the wave over the wavelength. So frequency is inversely proportional to wavelength.

Since we know that frequency and energy are proportional, we can predict that as the energy difference increases, the wavelength of the emitted photon must decrease. This implies that the wavelengths of the photons emitted from molybdenum will be shorter than that of the photons emitted from copper, since wavelength and energy are inversely proportional -- as one gets bigger, the other gets smaller. Therefore, the correct answer is choice A.

QUESTION 10

Which one of the following chemicals would UNLIKELY be involved in the onset of a panic attack?

A. Melatonin

B. Epinephrine

C. Norepinephrine

D. Serotonin

Correct Answer: A

A is correct. Melatonin helps to sustain people\\'s circadian rhythms. It is mainly involved in the sleep-wake cycle regulation. It is secreted into the bloodstream at night, inducing drowsiness and making the person feel sleepy. It has been found to be effective in the treatment of anxiety due to its calming effects. These effects suggest that melatonin is not involved in the outset of acute anxiety episodes. Moreover, no findings have yet associated low or high levels of melatonin with anxiety disorders. B and C. These are incorrect. The hormone epinephrine (or adrenaline) and the neurotransmitter norepinephrine (or noradrenaline) are released in greater quantities during stressing, threatening situations. Anxiety disorders involve experiencing normal situations as menacing. This perception prompts fight-or-flight, stress-related responses. For example, the person\\'s blood flow, arousal, alertness, attention and memory are boosted; and the chemicals epinephrine and norepinephrine are released in great quantities. Thus, these substances could be present during the onset of a panic attack. D. This is incorrect. Serotonin is a neurotransmitter. It is mainly involved in the regulation of homeostatic processes, such as sleep and appetite. It also plays an important role in the regulation of mood. Low levels of serotonin can result in the development of both depressive and anxiety disorders. Thus, serotonin levels might decrease during the onset of panic attack.

QUESTION 11

According to attachment theory, which of the following children is most likely to attach to a male psychologist, previously unknown to the child, in the course of a psychological study?

A. A two-month old female infant raised in a safe, stable environment

B. A five-month old male infant raised in a safe, stable environment

C. An eight-month old male infant raised by a single caregiver who frequently neglect the child

D. A thirteen-month old female infant raised by two caregivers who occasionally neglect the child

Correct Answer: A

Attachment theory describes a series of steps that infants will progress through as they grow. During the first three months of life, an infant will indiscriminately attach to any person and will respond equally to any caregiver. Thus (A) is an apt description of attaching to a previously unknown adult. Around 4 to 6 months\\' babies will begin to recognize

certain caregivers but will still accept care from anyone. Thus in (B) the baby will probably accept care from the psychologist, but the infant in (A) is much more likely to attach to the psychologist. From 6 to 9 months a baby will exhibit a strong attachment preference for a single caregiver, although the pattern of that attachment will vary based on the relationship that has developed between the caregiver and the child. Despite the neglect, the child in (C) will still have a preference for a single caregiver. After 9 months, children slowly develop increasing independence and will slowly form multiple attachments. The child in (D) will, thus, begin to develop attachments to both caregivers, but not to the psychologist, who is a stranger.

QUESTION 12

At its isoelectric point, an amino acid in an electric field will migrate towards the:

A. anode.

B. cathode.

C. basic region.

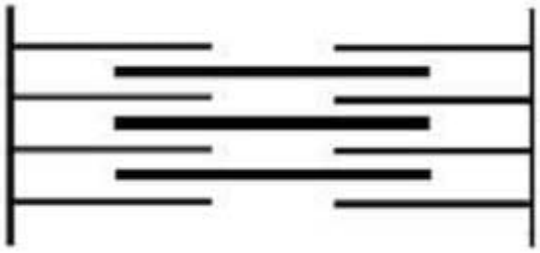
D. it will not migrate.

Correct Answer: D

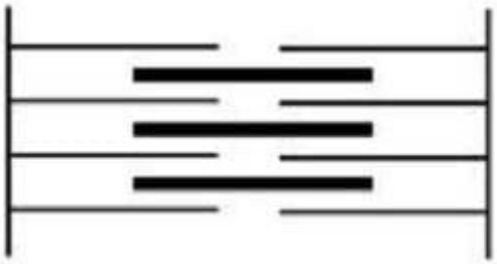
At its isoelectric point, an amino acid exists as a zwitterion with positive and negative charges that cancel each other out. Because it has no net charge, it will not migrate in an electric field.

QUESTION 13

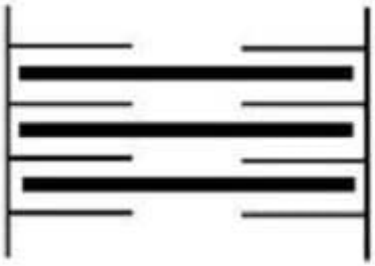
Which of the following best illustrates the contracted state of the sarcomere shown below?



A.

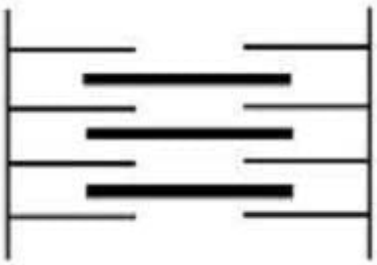


B.



C.

D.



A. Option A

B. Option B

C. Option C

D. Option D

Correct Answer: C

The sarcomere illustrated in the question stem consists of thin and thick filaments. Contraction occurs through the sliding of the thin filaments along the thick filaments, towards the center of the sarcomere. During this contraction, the length of both the thick and thin filaments remains unchanged. This sliding can be seen in the increased overlap between thick and thin filaments. Choice A is incorrect because it indicates that the thick filaments have shortened. Choice B is incorrect because it indicates that the thin filaments have shortened. Choice D is incorrect because it indicates that both the thick and thin filaments have shortened.

QUESTION 14

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.

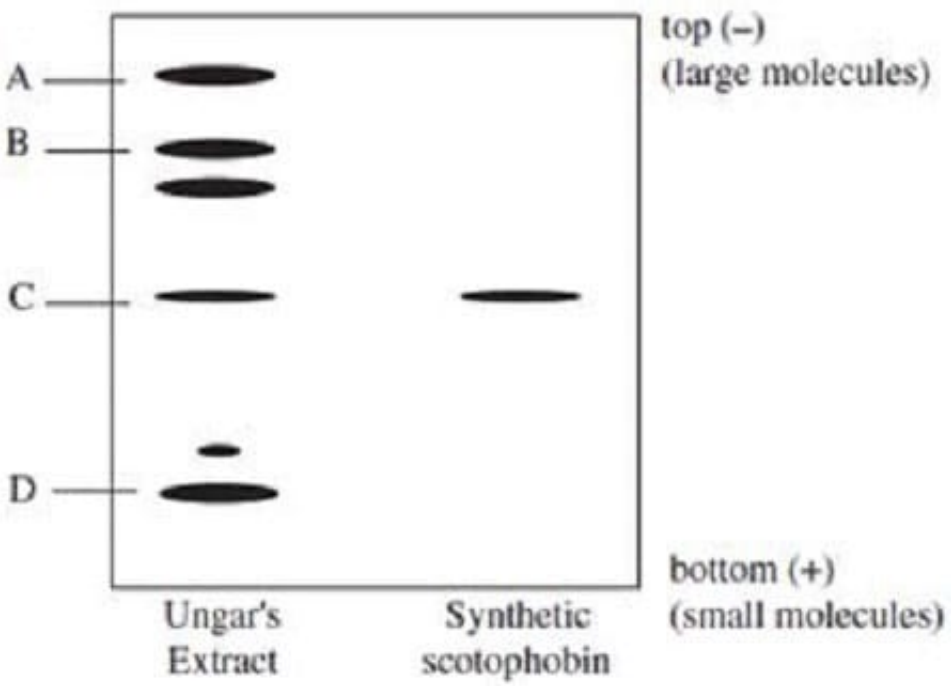


Figure 1

Researchers were interested in purifying a second protein (protein X) from Ungar\\'s extract. The gene segment encoding protein X was believed to consist of thirty nucleotides. According to Figure 1, which band could represent protein X?

A. Band A

B. Band B

C. Band C

D. Band D

Correct Answer: D

If the amino acid sequence encoding for Protein X is thirty nucleotides long, then Protein X consists of 10 amino acids. Protein X is thus smaller than scotophobin. The technique of electrophoresis uses an electrical field to separate proteins

based on size. Larger proteins subjected to the same electric field will move more slowly than smaller proteins. Band C on Figure 1 which is common to the extract and to the purified protein represents scotophobin. Bands A and B which are

closer to the top of the gel would represent proteins larger than scotophobin. Band D, which is below band C, represents a protein that has migrated further and is thus smaller than scotophobin. Of the choices, only band D could potentially

represent Protein X.

Choices A and B are incorrect because bands A and B, which have migrated less than band C, represent proteins that are larger than scotophobin. Choice C is incorrect because band C is common to both the extract and the purified protein,

and must therefore represent scotophobin itself.

QUESTION 15

A student observes that mercury forms a convex meniscus in the graduated cylinder but that water forms a concave one. This behavior is best explained by the fact that:

A. the two liquids are being kept in graduated cylinders made of different materials.

B. the adhesive forces between water and the walls of the graduated cylinder are greater than the adhesive forces between the mercury and the walls of the graduated cylinder.

C. the cohesive forces between two mercury atoms are stronger than the cohesive forces between two water molecules.

D. the mercury has strong cohesive than adhesive forces, whereas water has strong adhesive than cohesive ones.

Correct Answer: D

The shape of the meniscus lets you know whether the substance has more attractive force for itself (convex meniscus) or for the walls of the cylinder (concave meniscus). Water, for example, experiences more adhesion between the water and the walls of the container, thus "pulling" the water up the sides of the container creating a concave meniscus. The adhesive force is greater than the cohesive force between the water molecules. The opposite is true for mercury, thus making (D) the right answer.

A: While this may be true, the student\\'s observation doesn\\'t lead to this conclusion.

B, C: The shape of the meniscus doesn\\'t let you compare the forces in water to the forces in mercury directly. It only lets you compare one force (adhesion) to another force (cohesion) for one substance.