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QUESTION 1

Which of the following does hemoglobin bond most strongly with?

A. oxygen

B. carbon dioxide

C. carbon monoxide

D. hydrogen

Correct Answer: C

Hemoglobin bonds most strongly with carbon monoxide as a result of the interaction of the orbitals of the hemoglobin and the carbon monoxide molecule. The carbon forms an ionic bond with the hemoglobin\\'s iron, and because of the joint configuration, the iron is able to donate additional electrons to the carbon monoxide.

QUESTION 2

Which of the following decompose disaccharides into monosaccharides?

A. salivary amylase

B. pancreatic enzymes

C. gastrin

D. brush border enzymes

Correct Answer: D

Disaccharides such as sucrose, maltose, and lactose, etc., are broken down further into monosaccharides (primarily glucose) in the small intestine by way of brush border enzymes lining microvilli of the small intestine.

QUESTION 3

When a population reaches its carrying capacity?

A. The population size begins to decrease.

B. The population growth rate approaches zero.

C. Other populations will be forced out of the habitat.

D. Density-independent factors no longer play a role.

E. Density-dependent factors no longer play a role.

Correct Answer: B

Within a habitat, there is a maximum number of individuals that can continue to thrive, known as the habitat\\'s carrying capacity. When the population size approaches this number, population growth will stop.

QUESTION 4

In which locations does this reaction occur?

Glyceraldehyde-3-phosphate (G3P) ———andgt; Pyruvate

A. cytoplasm

B. nucleus

C. mitochondria

D. none of the above

Correct Answer: A

The oxidation of G3P into pyruvate occurs during the glycolysis stage of cellular respiration. Glycolysis occurs in the cytoplasm.

QUESTION 5

PLASTICS

Plastics have long been considered one of the great conveniences of the modern era, but evidence is mounting to indicate that these conveniences have come at an incredible cost. The chief benefit of plastics is their durability, but this benefit turns out to be the same reason plastic has become a significant problem: It takes 200 to 400 years to decompose. All of this plastic has accumulated into a catastrophic mess and has also caused disease in humans.

Between Hawaii and Japan, a giant mass of plastic twice the size of Texas slowly swirls with the currents of the Pacific Ocean. This area has come to be known as the Great Pacific Garbage Patch, and its effects on the ecology of the ocean are unimaginable. According to United Nations researchers, a hundred thousand sea mammals and a million seabirds die each year. They are found with cigarette lighters, syringes, and other plastics that they mistake for food in their stomachs.

Evidence also indicates that the plastic receptacles that people store their food in poses health risks. For instance, phthalates have been shown to have detrimental effects on the reproductive system, yet they are found in many plastic products including baby bottles and water bottles. They have also been linked to various forms of cancer. Additionally, a chemical called bisphenol A that is found in many plastics can mimic the effects of the hormone estrogen, which can also affect the reproductive system.

What particular risk does the author say the Great Pacific Garbage Patch poses to marine animals?

A. The animals\\' habitat is poisoned by phthalates.

B. It affects yearly temperature averages.

C. Animals accidentally ingest the plastics and die.

D. Seabirds cannot get to the fish below the garbage.

Correct Answer: C

QUESTION 6

The T-tubules transmit an action potential, causing the opening of ____ channels in the ____.

A. Na+, Sarcoplasm

B. Ca2+, Sarcoplasmic Reticulum

C. Na+, Sarcoplasmic Reticulum

D. Ca2+, Sarcoplasm

Correct Answer: B

The T-tubules conduct action potentials that cause channels to open on the surface of the sarcoplasmic reticulum. The opening of these channels results in a release of Ca2+ into the sarcoplasm of the muscle fiber.

QUESTION 7

The primary seat of tubercular infection is generally in the upper part of the lung. The invading organisms settle on the surface here and cause a multiplication of the cells and an inflammatory exudate in a small area. With the continuous growth of the bacilli in the localized region, adjoining areas of the lung become affected, and there is further extension into the immediate vicinity by means of the lymphatics. Small nodules form and then coalesce to create a larger area. The body primarily defends itself with the formation of dense masses of cicatricial tissue, which function to wall off the affected area. This results in unfavorable growth conditions for the bacilli. This mode of defense, combined with the production of substances antagonistic to the toxins produced by the bacilli, is so efficacious that in the great majority of cases no further extension of the process takes place. In certain cases, however, the growth of the bacilli in the focus area is unchecked, then the surrounding tissue is killed and converted into a soft semi-fluid material; further extension then takes place. All parts of the enormous surface of the lungs are connected by a system of air tubes or bronchi, and as a result, the bacilli have favorable opportunity for distribution. This opportunity is facilitated by sudden movements of the air currents in the lung produced by coughing. The body\\'s defense; however, can still keep pace with the attack, and even in an advanced stage, the infection can sometimes be permanently checked; in other cases, the check is temporary, the process of softening continues, and large cavities are produced by the destruction of the tissue. On the inner surface of these cavities there may be a rapid growth of bacilli. From the lungs, the bacilli are carried by the lymphatics to the lymph nodes at the root of the lungs, in which a similar process takes place; this, on the whole, is favorable, because further extension by this route is for a time blocked. The extension across surfaces continues and the abundant sputum, which is formed in the lungs and contains large numbers of bacilli, becomes the vehicle of transportation. The windpipe and larynx may become infected, as the back parts of each are more closely in contact with the sputum and are the parts most generally infected. A large part of the sputum is swallowed and infection of the intestine takes place with the lesions taking the form of large ulcers. From the intestinal ulcers there is further extension by means of the lymphatics to the large lymph nodes in the back of the abdominal cavity.

It is true that bacilli:

A. are insensible to outside influence.

B. attack lymph nodes first.

C. produce toxins harmful to the body.

D. do not destroy surrounding tissue.

Correct Answer: C

The passage states that the body tries to defend itself with the production of substances that are antagonistic to "toxins produced by the bacilli."

QUESTION 8

Which of the following organisms has a circulatory system in which blood circulates in an internal cavity called a hemocoel?

A. Birds

B. Cats

C. Centipedes

D. Eels

E. Earthworms

Correct Answer: C

Insects and most mollusks have open circulatory systems. Vertebrates, the phylum Annelida (earthworms), and some mollusks (squid and octopuses) have closed circulatory systems.

QUESTION 9

Lead ?non-biodegradable, soft, malleable, as well as heat and corrosion resistant ?is environmentally omnipresent. Its known properties make it an ideal metal for automobiles, paint, smelting, ceramics, and plastics. Not many years ago, it was also utilized in the toy industry. Unfortunately, lead is toxic to humans. Humans neither need lead nor derive benefits from it. Although lead toxicity has been a global concern since the industrial revolution in the late 1800s, civilization has been unable to prevent or control it satisfactorily. Overall incidence of lead poisoning among American children has fallen from 4.4% in the early 1990s to 1.4% in 2004. In 2002, around 10 out of every 100,000 of adults had lead toxicity. Venous blood lead levels (BLLs) of 10 mcg/dL and 25 mcg/dL were considered toxic in children and adults, respectively. But, since any level of lead can cause toxicity, the CDC announced a new, lower reference value for children in June 2012: 5 mcg/dL. Infants and children absorb a higher fraction of lead than adults do when exposed, increasing their vulnerability. Approximately 450,000 American children have BLLs >5 mcg/dL. Consequently, lead poisoning is still a problem. Lead exposure can start with prenatal maternal-fetal transmission. Outside the womb, children may inhale (or eat) lead dust, often present in street debris, soil, and most frequently, aged house paint. Lead-based paint was phased out in the 1970s, lowering, but not eliminating, risk of exposure. Old pipes sometimes leach lead into drinking water. Lead hazards are disproportionately found in low-income housing. Adults rarely develop lead poisoning, but risk is increased for industrial workers who use or manufacture lead-based products. Health care providers use many tests to identify lead poisoning. In addition to the BLL, a blood smear may show basophilic stippling ribosomal clusters. Increased urinary aminolaevulinic acid concentrations are also reliable indicators. Plain film radiographs can reveal visible lead lines in patients\\' long bones. Astute clinicians sometimes diagnose lead poisoning after seeing a blue line along patients\\' gums (Burton\\'s line) that forms when lead reacts with sulfur ions released by oral bacteria. Lead affects every organ system and causes an unpredictable variety of symptoms. The nervous system is most sensitive (centrally in children, peripherally in adults), but lead affects hematopoietic, hepatic, and renal systems, producing serious disorders. Acute lead poisoning\\'s classic symptoms include colic, encephalopathy, anemia, neuropathy, and Fanconi syndrome (abnormal glucose, phosphates, and amino acid excretion). Sometimes, classic signs and symptoms are absent, confusing the clinical picture. The inclusion of what evidence would best support the author\\'s claim in the first paragraph that "civilization has been unable to prevent or control it satisfactorily."

A. A quote from a well-respected doctor.

B. A survey of 10,000 randomly selected people.

C. A collection of statistics stating the number of deaths from lead poisoning.

D. A series of anecdotes describing lead poisoning.

Correct Answer: C

In the absence of any factual evidence, the author\\'s claim stands out; however, if there were concrete details supporting this claim, the author\\'s argument would be stronger. Of the possible choices, a collection of statistics would best support the idea that civilization has been unable to control lead poisoning satisfactorily. While the other answer choices may prove effective in supporting the author\\'s claim, they would not be as effective as inarguable numbers.

QUESTION 10

The hybridization of the oxygen in CO2 is:

A. s

B. sp

C. sp2

D. sp3

Correct Answer: C

QUESTION 11

Which of the following is the greatest?

A. 162

B. 44

C. 83

D. 26

Correct Answer: C

In this question, we are asked to determine the answer choice with the greatest value. It is important to notice that all the answer choices are powers of 2: 2, 4, 8, 16, and 32. Therefore, all of the answer choices need to be expressed powers of 2. To start, let\\'s leave choice [26] alone because it already has 2 as its base term. Choice [44] is the same as (22)4 or 28. It is important to note that when you take an exponent to a power, the exponent and the power term are multiplied. Choice [83] is (23)3 = 29. Choice [162] equals (24)2 or 28. Now you can see that choice [83] is correct because it has the greatest exponent.

QUESTION 12

What is the x-intercept of y = e5x + 2?

A. 2

B. 0

C. ln 2

D. no x-intercept

Correct Answer: D

The x-intercept is where the function crosses the x-axis and can be found by setting the function equal to 0 and solving for x:

0 = e5x + 2 ?gt; -2 = e5x

To isolate the variable, take the natural log of both sides; however, ln -2 is undefined, so this function does not cross the x-axis.

QUESTION 13

The primary seat of tubercular infection is generally in the upper part of the lung. The invading organisms settle on the surface here and cause a multiplication of the cells and an inflammatory exudate in a small area. With the continuous growth of the bacilli in the localized region, adjoining areas of the lung become affected, and there is further extension into the immediate vicinity by means of the lymphatics. Small nodules form and then coalesce to create a larger area. The body primarily defends itself with the formation of dense masses of cicatricial tissue, which function to wall off the affected area. This results in unfavorable growth conditions for the bacilli. This mode of defense, combined with the production of substances antagonistic to the toxins produced by the bacilli, is so efficacious that in the great majority of cases no further extension of the process takes place. In certain cases, however, the growth of the bacilli in the focus area is unchecked, then the surrounding tissue is killed and converted into a soft semi-fluid material; further extension then takes place. All parts of the enormous surface of the lungs are connected by a system of air tubes or bronchi, and as a result, the bacilli have favorable opportunity for distribution. This opportunity is facilitated by sudden movements of the air currents in the lung produced by coughing. The body\\'s defense; however, can still keep pace with the attack, and even in an advanced stage, the infection can sometimes be permanently checked; in other cases, the check is temporary, the process of softening continues, and large cavities are produced by the destruction of the tissue. On the inner surface of these cavities there may be a rapid growth of bacilli. From the lungs, the bacilli are carried by the lymphatics to the lymph nodes at the root of the lungs, in which a similar process takes place; this, on the whole, is favorable, because further extension by this route is for a time blocked. The extension across surfaces continues and the abundant sputum, which is formed in the lungs and contains large numbers of bacilli, becomes the vehicle of transportation. The windpipe and larynx may become infected, as the back parts of each are more closely in contact with the sputum and are the parts most generally infected. A large part of the sputum is swallowed and infection of the intestine takes place with the lesions taking the form of large ulcers. From the intestinal ulcers there is further extension by means of the lymphatics to the large lymph nodes in the back of the abdominal cavity.

In context, efficacious, in the middle of the first paragraph, most closely means:

A. active

B. ineffective

C. potent

D. competent

Correct Answer: C

The combination of the antagonistic substances and the dense masses of cicatricial tissue is very effective in terminating the progress of the bacilli. Potent, which means having great influence or effect, is closest in meaning to efficacious.

QUESTION 14

Which of the following is involved in hearing?

A. microvilli

B. cilia

C. hair follicles

D. hair cells

Correct Answer: D

Hair cells lining the basilar membrane utilize mechanotransduction to detect, to amplify, and to convert mechanical sound waves into electrical signals. The resulting action potential then passes through the cochlear nerve to reach the brain.

QUESTION 15

Which of the following yields the least ATP directly?

A. TCA cycle

B. oxidative phosphorylation

C. glycolysis

D. Beta Oxidation

Correct Answer: A

The TCA cycle yields 2 GTPs (molecules that can be converted to ATP but are not ATP themselves), oxidative phosphorylation, which includes the ETC, can yield from 32 to 34 ATP. Glycolysis yields 2 ATP. Beta oxidation yields a range over 100 ATP that depends on the length of the fatty acid being degraded.