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QUESTION 1

If $f(x) = 3x$ and $g(x) = 2x^2$, what is $g(f(-2))$?

- A. 24
- B. -72
- C. 48
- D. 72

Correct Answer: D

First evaluate $f(-2)$: $3(-2) = -6$

Next evaluate $g(-6)$: $2(-6)^2 = 2 \times 36 = 72$

QUESTION 2

Lead is non-biodegradable, soft, malleable, as well as heat and corrosion resistant and 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.

In context, which of the following expresses an opinion of the author?

- A. "Unfortunately, lead is toxic to humans." in paragraph 1.
- B. "Overall incidence of lead poisoning...has fallen from 4.4%...to 1.4%" in paragraph 1.
- C. "Lead exposure can start with prenatal maternal-fetal transmission." in paragraph 3.

D. "Sometimes, classic signs and symptoms are absent..." in paragraph 5.

Correct Answer: A

The inclusion of the word "unfortunately" characterizes this statement as an opinion and not a fact. In the absence of the word "unfortunately," this would convey a measurable and factual statement.

QUESTION 3

The rate law for a reaction is of the second order. Which statement is true?

- A. The rate must depend on both reactants.
- B. The reaction must depend on the square of one reactant.
- C. The reaction must depend on only k squared.
- D. The reaction must depend on at least one of the reactants.

Correct Answer: D

In a second-order reaction the reaction rate is dependent upon either the product of the reactants, or the square of one of the reactants.

QUESTION 4

Sickle cell disease (SCD) affects millions of individuals worldwide, and the Sickle Cell Disease Association of America estimates that 70,000 to 100,000 individuals have SCD and 3 million individuals have the sickle cell trait. While SCD is known to primarily affect individuals of African American descent, individuals from South America, the Caribbean, Central America, the Middle East, and the Mediterranean can also have SCD or the SCD trait. SCD is estimated to affect 1 in 500 African American infants, and 1 in 12 African Americans are estimated to have the sickle cell trait. SCD is characterized by episodes of acute and chronic pain. By increasing awareness about SCD and promoting patient education, health care professionals can help patients and their families cope with SCD and better manage the associated pain. Recurring episodes of acute and/or severe pain are hallmarks of SCD. SCD pain can often be debilitating, and episodes of pain vary from patient to patient in both frequency and intensity. SCD pain can be classified as acute, chronic, or mixed. At some point, most SCD patients experience episodes of pain often referred to as vaso-occlusive crisis (sickle cell crisis), the duration of which may range from hours to days. Some patients seldom have a sickle cell crisis, while others may experience crises several times a year. Some episodes may be so severe that hospitalization is warranted to manage the pain. An acute pain event is the most common type of pain, and the onset is typically abrupt. It is often the result of an ischemic tissue injury, which is due to the occlusion of microvascular beds by sickled erythrocytes during an acute crisis. Acute pain episodes can also be triggered by factors including extreme temperature changes, changes in altitude, physical and emotional stress, illnesses, infections, dehydration, cold climates, menstruation, and fatigue. Chronic pain is pain that lasts for 3 to 6 months or longer. Chronic pain often results from the destruction of bones, joints, and visceral organs due to recurrent crises. Sources of chronic sickle cell pain include aseptic necrosis, leg ulcerations, and osteomyelitis. Unfortunately, acute and chronic pain associated with SCD are commonly undertreated or inappropriately managed due to patient fear of potential addiction and adverse effects. Many studies report that some health care professionals are also concerned about the potential for addiction. When appropriate, pharmacologic management of SCD pain may involve the use of 3 major pharmacologic classes: nonopioids, opioids, and adjuvants.

According to the passage, the major difference between acute pain and chronic pain is:

- A. The severity of the pain involved

- B. The duration of the pain involved
- C. The side effects of the pain involved
- D. The methods of managing the pain involved

Correct Answer: B

While there are minor differences between acute and chronic pain, the major difference between the two is the pain's duration. Acute pain is abrupt and short lived. However, if acute pain lasts for longer than 3 months, it is categorized as chronic pain.

QUESTION 5

The region in space where an electron is likely to be found is called a(n):

- A. Axis
- B. Cloud
- C. Orbital
- D. Configuration

Correct Answer: C

The region in space where an electron is likely to be found is called an orbital. There are different kinds of orbitals with different sizes and shapes. The orbital at the lowest energy level is defined as a 1s orbital. It is a sphere with its center at the nucleus of the atom. The next higher energy level is called a 2s orbital. It is larger than a 1s orbital. Since it has a higher energy level, it has lower stability compared to a 1s orbital. This is because the average distance between the nucleus and electrons in a 2s orbital is greater than in a 1s orbital. The next three orbitals are of equal energy, known as 2p orbitals. They are dumbbell-shaped. They are further differentiated by the names 2px, 2py, and 2pz, where the x, y, and z refer to the corresponding axes.

QUESTION 6

A cross between red bean (RR) and a blue bean (UU) yields all purple beans. How many purple beans would result from a cross between two purple beans?

- A. 0.25 of the offspring
- B. 0.50 of the offspring
- C. 0.75 of the offspring
- D. all of the offspring

Correct Answer: B

Begin by crossing a red bean with a blue bean: RR × UU gives all RU, also known as incomplete

dominance. Next cross a purple bean with a purple bean: RU × RU yields 1 RR, 2 RU and 1 UU. Two out of the four offspring are purple beans.

This is the same as 0.50, or 50%.

QUESTION 7

The mean of 17 exam scores is 26. After one exam is dropped, the mean drops to 25.625. What is the value of the exam that was dropped?

- A. 33
- B. 32
- C. 30
- D. 35

Correct Answer: B

QUESTION 8

Bile mainly helps in the digestion of:

- A. Fats
- B. Proteins
- C. Carbohydrates
- D. Bile pigments

Correct Answer: A

Bile (or gall) is a bitter, greenish-yellow alkaline fluid secreted by the liver of most vertebrates. It helps in the complete digestion of fats by reducing surface tension. It also activates the enzyme lipase. It serves as a good solvent for fats and fat-splitting enzymes. Bile also helps in absorption of carbohydrates, fats, fat soluble vitamins and proteins.

QUESTION 9

What would be the percentage mass of chlorine in a molecule of methyl chloride? (C = 12 gm/mole, H = 1 gm/mole, Cl = 35.5 gm/mole).

- A. 18 %
- B. 50 %
- C. 70 %
- D. 12 %

Correct Answer: C

The molecular formula for methyl chloride is CH₃Cl. The mass of a chlorine atom in methyl chloride is 35.5 gm/mole. The molecular weight of methyl chloride is 50.5 gm/mole (1C = 12, 3H = 3 and 1Cl = 35.5). Therefore, the % mass of chlorine in methyl chloride will be $35.5 / 50.5 = 70\%$

QUESTION 10

When blood flow to human tissue is interrupted, the lack of sufficient blood supply is called ischemia. If ischemia is not restored quickly, the affected tissue may undergo a process called infarction, which involves a series of chemical changes that damage the tissue. The lack of blood supply results in lack of oxygen, and thus lactic acidosis. Mitochondrial dysfunction results. Microscopic examination and chemical analysis of ischemic cells reveal membrane degeneration, excessive calcium (Ca⁺) inside the cell, and free radical formation, accompanied by a reactive inflammation and free fatty acid formation. A research experiment is designed to evaluate the response of infarcted tissue to intra-arterial administration of an antioxidant. Preliminary results demonstrate that follow-up evaluation of tissue exposed to intra-arterial antioxidant injection resulted, on average, in a smaller area of infarcted tissue after seven days when compared to controls without exposure to the antioxidant. It was noted that 70% of the patients who demonstrated smaller areas of infarction also had a notable decrease in edema of the ischemic tissue lasting about 6 to 10 hours after injection.

Which of the following chemical moieties forms the backbone of DNA?

- A. Nitrogenous bases
- B. Glycerol
- C. Amino groups
- D. Pentose and phosphate

Correct Answer: D

DNA is composed of nucleotides joined together in long chains. Nucleotides are composed of a pentose sugar, a phosphate group, and a nitrogenous base. The bases form the "rungs" of the ladder at the core of the DNA helix and the pentose-phosphates are on its outside, or backbone.

QUESTION 11

Express 8% as a fraction.

- A. 4/25
- B. 4/100
- C. 2/50
- D. 2/25

Correct Answer: D

$8\% = 8/100 = 2/25$.

QUESTION 12

For most Americans, the words "Alzheimer's disease" (AD) often mispronounced purposefully or accidentally as "old timers' disease" signify devastating memory loss and stigma. The information about AD often learned solely through the media may lead individuals to believe that AD is inevitable (it isn't), and possibly think that all AD patients receive poor care (there are many remarkably good AD units). Many individuals may envision a future burdened with more dementia patients and fewer societal resources to help support them (a real possibility). In general, pharmacists are well aware of what AD is and isn't. AD is complex and relentlessly progressive; it affects patients, loved ones, and caregivers adversely. Pharmacists can provide pertinent information about AD's myths, realities, and available symptomatic treatments. AD's harbinger is language difficulties, which include aphasia (language disturbance), apraxia (inability to carry out motor functions), and agnosia (failure to recognize or identify objects). Consequently, those with AD will often create new words for items. They may call a pencil a "list writer," or a key a "door turner." Clinicians stage AD as mild, moderate, or severe depending on the patient's cognitive and memory impairment, communication problems, personality changes, behavior, and loss of control of bodily functions. People often dismiss mild AD as normal cognitive decline or senility—in other words, "normal" aging. For this reason, most people don't seek treatment and are diagnosed in the late-mild to early-moderate stage. In the severe stage, difficulty swallowing elevates the risk of aspiration pneumonia, which often marks the beginning of the downward spiral that ultimately ends with death; AD has no cure. A handful of pharmacologic treatments—acetylcholinesterase inhibitors and N-methyl-D-aspartate antagonists—alter the decline trajectory. These treatments slow disease progression, enhance cognitive function, delay cognitive decline, and decrease disruptive behaviors. Not all patients respond to these medications, but experts generally believe that those who do will show mild to moderate improvements for 6 months to a year. Although the drugs' effects are short-lived, they improve patients' quality of life and briefly enable independence. Determining when medications stop providing a therapeutic benefit and should be discontinued is challenging. Clinicians use various methods to monitor decline, including mental status tools, patient self-report, and loved ones' observations. Most clinicians continue drug treatment if the patient seems to tolerate the medication well, can afford it, and if there seems to be a benefit. With disease progression, specific behavioral symptoms including depression, agitation, hallucinations, and sleep disturbances become concerns. Antianxiety drugs, antipsychotics, and antidepressants are sometimes used to alleviate symptoms, but effective behavioral strategies are much preferred.

Which of the following is NOT something pharmacists can provide information about?

- A. myths about AD
- B. truths about AD
- C. cures for AD
- D. treatments for AD

Correct Answer: C

The passage states, "Pharmacists can provide pertinent information about AD's myths, realities, and available symptomatic treatments." The passage mentions that Alzheimer's is currently incurable.