PCAT Test Blueprint and Sample Items

Biological Processes

Biological Processes Objectives	
B1. General Biology	**B2. Microbiology**
A. Cellular and Molecular Biology	**A.** Microorganisms
1. Structure and functions of cells	**B.** Infectious Diseases & Prevention
2. Gene expression	**C.** Microbial Ecology
3. Cell division and growth	**D.** Medical Microbiology
4. Energy transformations	**E.** Immunity
5. Metabolism	**B3. Human Anatomy and Physiology**
B. Diversity of Life Forms	**A.** Structure
1. Genetics	1. Cells
C. Health	2. Tissues
1. Nutrition	3. Organs
2. Diseases	**B.** Systems
3. Drugs	1. Skeletal/muscular/nervous
	2. Circulatory/respiratory
	3. Excretory/digestive
	4. Endocrine/reproductive
	5. Integumentary/immune

Examples of Biological Processes Items

- Biological Processes items may be presented either standing alone (Biological Processes Examples 1–4) or associated with a short passage (Biological Processes Examples 5–8). Stand-alone items can be answered independent of any passage or other item, while items associated with a passage will require understanding part or all of the passage in order to answer them correctly.

- Each Biological Processes item stem will be either in the form of a question (followed by a question mark) or in the form of an incomplete sentence that requires completion (with no end punctuation).

- Answer options may contain more than one concept or piece of information but each one will plausibly relate to the stem.

In the following sample Biological Processes items, the correct answer for each item is followed by an asterisk (*), and each answer option is followed by a bracketed explanation for why it is correct (CA) or incorrect (neither of which will appear in the actual test).

Biological Processes Example 1

Content Objective: Microbiology, Immunity

Any foreign substance that triggers the formation of the lymphocyte immune response and is itself the target is called a(n)

A. leukocyte.
[A leukocyte is a white blood cell and not the target of an infection from a foreign molecule.]

B. eosinophil.
[Eosinophil is a type of white blood cell that is involved in the immune response to parasitic infections or allergic reactions and not the target of infection from a foreign molecule.]

C. immunoglobulin.
[Immunoglobulins are antibodies formed by B cells and not the targets of an infection from a foreign molecule.]

D. antigen. *
[CA: Antigen is the correct term for anything that is the target of the immune response, causing production of antibodies by the living organism. Antigens can include foreign pollen, bacteria, viruses, proteins, and some other materials.]

Biological Processes Example 2

Content Objective: General Biology, Health, Diseases

Which of the following conditions is caused by an impairment in the exchange of oxygen and carbon dioxide that is associated with emphysema?

A. Respiratory alkalosis
[Respiratory alkalosis is due to alveolar hyperventilation leading to decreased plasma carbon dioxide concentration. It develops when the lungs remove more carbon dioxide than is produced in the tissues. It is a common finding in patients receiving medical ventilation, but it is not associated with emphysema, which results in a decreased expulsion of carbon dioxide.]

B. Metabolic alkalosis
[This condition results from an altered metabolism. A decreased hydrogen ion concentration results in increased bicarbonate and carbon dioxide concentrations. It occurs most commonly when a person has been vomiting profusely. It is not associated with emphysema, which results in a decreased expulsion of carbon dioxide.]

C. Respiratory acidosis *
[CA: Respiratory acidosis is a clinical disturbance that is due to alveolar hypoventilation. It results in low blood pH due to decreased clearance of carbon dioxide by the lungs. This condition occurs in emphysema as exhalation becomes insufficient.]

D. Metabolic acidosis
[Metabolic acidosis is a condition in which the blood pH is low due to increased production of hydrogen ions by the body or the inability of the body to form bicarbonate in the kidney. It is not associated with emphysema, which results in a decreased expulsion of carbon dioxide.]

Biological Processes Example 3

Content Objective: General Biology, Diversity of Life Forms, Genetics

DNA testing is performed for a child born with trisomy 21. The test, using a polymorphic DNA marker for chromosome 21, revealed the pattern exhibited in the Southern blot below.

Father   Mother   Child
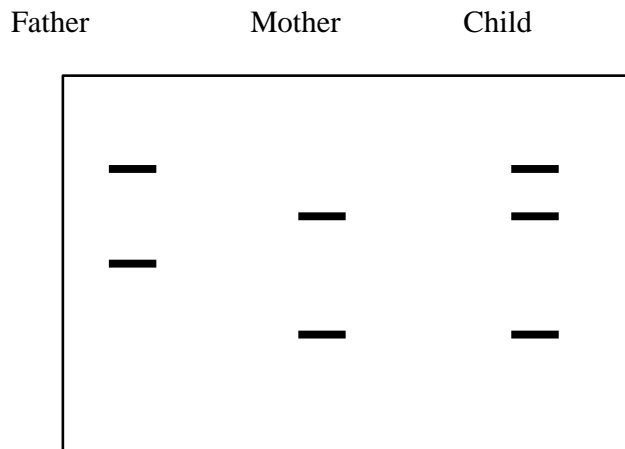
At which meiotic division did nondisjunction occur?

A. Maternal meiotic division I *
   [CA: Nondisjunction is an error that can occur during meiosis or mitosis, causing the daughter cells to have too many or too few chromosomes. Because the child has two maternal alleles that are not identical and one paternal allele, nondisjunction occurred at this stage of division.]

B. Paternal meiotic division I
   [If nondisjunction occurred here, the child would have two paternal alleles and one maternal allele.]

C. Maternal meiotic division II
   [If nondisjunction had occurred here, the maternal contribution would have been either no allele or two of the same kind.]

D. Paternal meiotic division II
   [If nondisjunction had occurred here, the paternal contribution would have been either no allele or two of the same kind. Because there is only one of paternal origin, disjunction did not occur at this stage of division.]

Biological Processes Example 4

Content Objective: Human Anatomy and Physiology, Systems, Excretory/digestive

Which sphincter in the gastrointestinal tract controls movement of chyme from
the stomach into the small intestine?

A. Cardiac
[The cardiac sphincter (lower esophageal sphincter) is located at the junction of the esophagus
and the stomach.]

B. Pyloric *
[CA: The pyloric sphincter separates the stomach from the duodenum, the first division of the
small intestine. The pyloric sphincter normally is in a contracted state, and retains food within
the stomach until it has been broken down mechanically and chemically into chyme that can
be passed into the duodenum of the small intestine.]

C. Ileocecal
[The ileocecal sphincter is located at the junction of the small intestine (ileum) and the large
intestine.]

D. Anal
[The anal sphincter is located at the end of the rectum.]

Biological Processes Example Passage and Accompanying Items

Chronic Stress and Immunity

Stress is an intrinsic part of life for most organisms, and dealing successfully with stressors enables survival. Early studies in rats showed that acute stress results in a redistribution of leukocytes from the blood to other organs such as skin, lymph nodes, and bone marrow, and that adrenal stress hormones are the major mediators of this response. Because the skin is one of the targets to which leukocytes traffic during stress, researchers hypothesized that such a leukocyte redistribution may increase immune surveillance and consequently enhance immune function if skin is exposed to an antigen after acute stress.

To test this hypothesis, researchers examined the effects of acute stress on skin immunity by exposing rats to containment in a restraining cage (see partial results below in Table 1). Physical restraint activates the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis, and results in the activation of adrenal steroid receptors throughout the body. Results showed larger numbers of leukocytes in the skin of stressed animals both before and after exposure to an antigen. In contrast to the immunoenhancing effects of acute stress, researchers found that chronic stress significantly suppressed the immune response. An adrenalectomy eliminated the stress-induced enhancement of skin immune response.

Table 1: Physiological Change from Baseline in Response to Stimuli

Stimulus	Heart Rate	Bronchiole Diameter	Bone Marrow Leukocytes
A	Increase	Decrease	Increase
B	Increase	Increase	Increase
C	Decrease	Increase	Decrease
D	Decrease	Decrease	Decrease

Biological Processes Example 5

Content Objective: Human Anatomy and Physiology, Systems, Excretory/digestive

Questions for Passage "Chronic Stress and Immunity"

If the study described in the passage had examined the effects of an acute stressor on digestion, the information in the passage would best support the prediction that

A. peristalsis would be increased.
[Sympathetic activation results in decreased rather than increased peristalsis.]

B. intestinal motility would be decreased. *
[CA: According to the passage, an acute stressor results in activation of the sympathetic nervous system. Sympathetic effects on digestion include decreased intestinal motility and peristalsis, decreased salivation, and increased anal sphincter tone.]

C. salivation would be increased.
[Sympathetic activation results in decreased rather than increased salivation.]

D. anal sphincter tone would be decreased.
[Sympathetic activation results in increased rather than decreased anal sphincter tone.]

Biological Processes Example 6

Content Objective: Human Anatomy and Physiology, Systems, Integumentary/immune

Questions for Passage "Chronic Stress and Immunity"

According to the passage, which of the following is likely to act as a mediator for the redistribution of blood to other organs in response to an acute stressor?

A. Aldosterone
[Aldosterone is a mineralocorticoid hormone produced by the adrenal medulla. Aldosterone functions to maintain bodily sodium balance and is not considered an adrenal stress hormone.]

B. Glucagon
[Glucagon is a peptide hormone secreted by the pancreas that functions to raise blood glucose levels.]

C. Cortisol *
[CA: The passage mentions that "adrenal stress hormones are the major mediators" of the redistribution of leukocytes. Adrenal stress hormones could include glucocorticoids such as cortisol or epinephrine (not an answer choice). Additionally, the passage mentions that the hypothalamic-pituitary-adrenal axis is stimulated by sympathetic activation in the stressful situation. Activation of this axis results in the release of cortisol.

D. Vasopressin
[Vasopressin is a neurohypophysial hormone synthesized in the hypothalamus and stored by the posterior pituitary. It functions to regulate water retention by acting on the nephron.]

Biological Processes Example 7

Content Objective: Human Anatomy and Physiology, Systems, Circulatory/respiratory

Questions for Passage "Chronic Stress and Immunity"

Which stimulus in Table 1 most likely represents an acute stressor?

A. A
[Stimulus A results in decreased bronchiole diameter, which would not be expected with sympathetic activation.]

B. B*
[CA: The passage states that acute stress redistributes leukocytes to bone marrow, and that adrenal stress hormones mediate this response. The passage also explains that in the current study, the acute stressor was physical restraint, which activates the sympathetic nervous system and the hypothalamic pituitary axis. Thus, an acute stressor should show increased leukocytes to bone marrow and physiological effects of sympathetic activation. Sympathetic activation results in increased heart rate and increased bronchiole diameter. In Table 1, only Stimulus B shows increased heart rate, increased bronchiole diameter, and an increased number of bone marrow leukocytes.]

C. C
[Stimulus C shows decreased heart rate and decreased bone marrow leukocytes, which would not be expected with activation of the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis.]

D. D
[Stimulus D results in physiological effects that would be opposite of those predicted for each category. Heart rate, bronchiole diameter, and number of bone marrow leukocytes should all increase with activation of the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis.]

Biological Processes Example 8

Content Objective: Human Anatomy and Physiology, Systems, Integumentary/immune

Questions for Passage "Chronic Stress and Immunity"

Which of the following therapies is designed to harness the physiological response to stress that the research described in the study addresses?

A. Antibiotic treatment for a skin infection
[Antibiotics work by killing or slowing the growth of bacteria. As they are not an acute stressor, they do not stimulate the sympathetic nervous system and hypothalamic-pituitary-adrenal axis, and so should not result in an increased immune response.]

B. Relaxation meditation before a chemotherapy session
[Relaxation would result in decreased sympathetic activity and would not be an acute stressor. Furthermore, chemotherapy does not involve the presentation of antigens.]

C. Exercise prior to the administration of a vaccine *
[CA: The passage describes the physiological process whereby an acute stressor activates the sympathetic nervous system and hypothalamic-pituitary-adrenal axis, which results in an enhanced immune response to antigens. As an acute stressor, exercise should activate these systems and result in an increased immune response to an antigen. Because vaccines work by presenting an attenuated antigen to a body so that the immune system can develop a response, an acute stressor prior to antigen introduction should result in an increased response to the vaccine, which studies have confirmed.]

D. Physical therapy for an atrophied muscle
[While some forms of physical therapy (e.g., exercise) function as acute stressors that activate the sympathetic nervous system, muscle atrophy does not involve the immune system or antigen presentation.]

Chemical Processes

Chemical Processes Objectives	
C1. General Chemistry	**C2. Organic Chemistry**

A. Atomic Theory
 	
  1. Structure
 	
  2. Ions
 	
  3. Periodicity
	A. Structure and Properties
	
	  1. Structural formulas and bonding
	
	  2. Properties of organic compounds

B. Chemical Bonding
 	
  1. Nomenclature/formulas
 	
  2. Bonding
	B. Reactions of Organic Compounds
	
	  1. Oxidation–reduction reactions
	
	  2. Hydration and dehydration
	
	  3. Hydrolysis
	
	  4. Addition/substitution/elimination

C. Reactions and Reaction Mechanisms
 	
  1. Types of reactions
 	
  2. Balancing equations
 	
  3. Equilibrium
 	
  4. Stoichiometry
	C3. Basic Biochemistry Processes

	A. DNA and RNA
	B. Lipids
	C. Proteins

D. Kinetic Theory
 	
  1. States of matter
 	
  2. Gas laws
 	
  3. Causes and effects of changes in states	

E. Solutions
 	
  1. Concentration (pH)
 	
  2. Solubility
 	
  3. Acid–base theories	

F. Nuclear Chemistry: Radioisotopes	

Examples of Chemical Processes Items

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- Answer options may contain more than one concept or piece of information but each one will plausibly relate to the stem.

In the following sample Chemical Processes items, the correct answer for each item is followed by an asterisk (*), and each answer option is followed by a bracketed explanation for why it is correct (CA) or incorrect (neither of which will appear in the actual test).

Chemical Processes Example 1

Content Objective: General Chemistry, Kinetic Theory, Causes and effects of changes in states

A student has a sample of a gas in a glass container with a movable piston. In order to convert this gas to a liquid, the student should

A. increase the inside pressure by decreasing the volume, decreasing the temperature as needed. *
[CA: These conditions will lead to the reduction in volume and kinetic energy needed to convert the sample to a liquid phase.]

B. transfer the gas to a container of larger volume.
[This will increase the volume and not move the sample toward the liquid state.]

C. increase the inside temperature by increasing the volume, decreasing the pressure as needed.
[This will cause an increase in volume and kinetic energy and will not move the sample toward the liquid state.]

D. transfer the gas to a container of a different shape.
[This will not affect the interactions between molecules.]

Chemical Processes Example 2

Content Objective: C1A3 General Chemistry, Atomic Theory, Periodicity

Considering that the first ionization energy for arsenic is 947 kilojoules/mole (kJ/mol), which elements shown in the section of the periodic table below are most likely to have a first ionization energy of 1,000 kJ/mol or higher?

13	14	15	16
Al	Si	P	S
26.98	28.09	30.974	32.06
31	32	33	34
Ga	Ge	As	Se
69.72	72.59	74.92	78.96
49	50	51	52
In	Sn	Sb	Te
114.82	118.71	121.75	127.60

A. Aluminum (Al) and silicon (Si)
[Though Al and Si are above As, they are both to the left and are not as likely to have an ionization energy (IE) $\geq$ 1,000 kJ/mol. Note: $IE_{Al} = 577$ kJ/mol and $IE_{Si} = 786$ kJ/mol.]

B. Indium (In) and tin (Sn)
[Both In and Sn are below and to the left of As; therefore, an ionization energy (IE) < 1000 kJ/mol. Note: $IE_{In} = 558$ kJ/mol and $IE_{Sn} = 709$ kJ/mol.]

C. Antimony (Sb) and tellurium (Te)
[Because antimony is below As, an ionization energy (IE) < 1000 kJ/mol. And though Te is to the right, it is lower than As and not as likely to have an IE $\geq$ 1,000 kJ/mol. Note: $IE_{Sb} = 834$ kJ/mol and $IE_{Te} = 869$ kJ/mol.]

D. Phosphorus (P) and sulfur (S) *
[CA: Ionization energy (IE) generally increases from left to right and going up the periodic table. Because P is above and S is above and to right of As, IE's are most likely $\geq$ 1,000 kJ/mol. Note: $IE_P = 1,012$ kJ/mol and $IE_S = 1,000$ kJ/mol.]

Chemical Processes Example 3

Content Objective: Organic Chemistry, Reactions of Organic Compounds, Hydration and dehydration

Which of the following products is formed when ethyne reacts with water and H_2SO_4 in the presence of mercuric sulfate $HgSO_4$ at 60 ℃?

A. CH_2CH_2
[This would require a different set of reactants, namely, H_2 and a Lindlar catalyst.]

B. CH_3CHO *
[CA: The hydration of ethyne breaks the triple bond and produces acetylaldehyde (ethanal).]

C. CH_3CH_3
[This would require a different set of reactants, namely, H_2 and a Lindlar catalyst.]

D. CH_3CH_2OH
[The candidate may have confused alkenes, which give alcohol products, with alkynes.]

Chemical Processes Example 4

Content Objective: Basic Biochemistry Processes, Proteins

The loss of a secondary, tertiary, or quaternary protein structure due to the disruption of noncovalent interactions and/or disulfide bonds that leaves the primary structure intact is known as

A. esterification.
[Esterification is a reaction that usually involves the combination of an acid and an alcohol and leads to the production of an ether.]

B. denaturation. *
[CA: Denaturation is a biochemical process that involves an unfolding of a protein's secondary, tertiary, or quaternary structure but does not affect the primary structure. Denatured proteins can exhibit a wide list of changes, such as a decrease in solubility.]

C. saponification.
[Saponification is a reaction that involves the alkaline hydrolysis of an ester to produce soap and glycerin.]

D. dehydration.
[Dehydration is a reaction that usually involves the loss of water molecules.]

Chemical Processes Example Passage and Accompanying Items

## Alternative Method of Arylation of Aromatic Compounds

One major goal in synthetic chemical research is to develop sustainable methods that are cost-effective with broad applications. A common reaction used in pharmaceutical chemistry is arylation. Traditional methods typically include the use of toxic or expensive reagents including silver salts and harsh reaction conditions which make them less than ideal for large scale industrial processes. Research chemists have recently developed a synthetic approach using an inexpensive quaternary ammonium salt (NMe_4Cl) with a palladium catalyst as an effective alternative to traditional methods.

Figure 1: Examples of Arylation Reactions Using Acetate Salts and a Palladium Catalyst

Example A
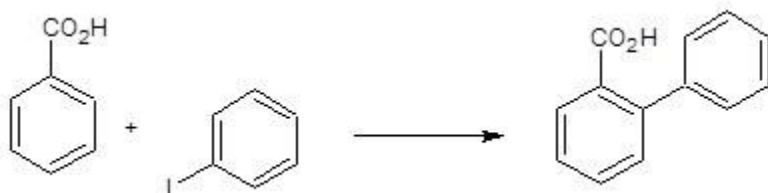
Example B
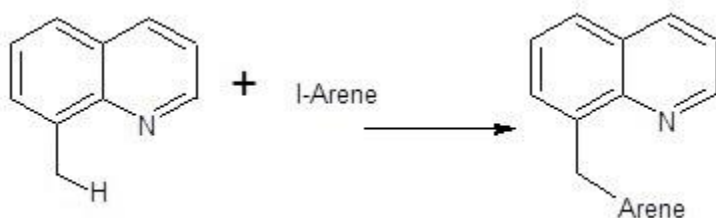
Once these researchers established this as a viable method for arylation, they examined the yield with various substrates as shown in Table 1.

Table 1: Reactants and Percent Yields of Arylation

Group of Reactant	Percent Yield
Amides as directing groups	56-76%
Pyridines as directing groups	51-80%
Electron-rich heteroarenes	51-61%
Electron-poor arenes	45-63%

Chemical Processes Example 5

Content Objective: Organic Chemistry, Structure and Properties, Structural formulas and bonding

Questions for the Passage "Alternative Method of Arylation of Aromatic Compounds"

Which of the following is the correct IUPAC name for the product of Example A in Figure 1?

A. 1-phenyl-2-benzoic acid
[This correctly identifies the product as a benzoic acid substituted compound. However, this incorrectly determines the number position for the phenyl as 1st instead of the 2nd position.]

B. 1-carboxyl-2-phenyl benzene
[This correctly identifies the substituents on the ring. However, this does not identify the compound as a substituted benzoic acid.]

C. 2-phenyl benzoic acid*
[CA: This correctly identifies the product as a benzoic acid substituted compound with the phenyl group in the ortho 2nd position.]

D. 2-phenyl benzaldehyde
[This correctly identifies the phenyl substitution in the 2nd position, but it incorrectly identifies the main structure as benzaldehyde instead of benzoic acid.]
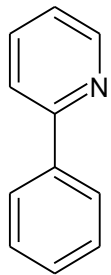
Chemical Processes Example 6

Content Objective: Organic Chemistry, Structure and Properties, Structural formulas and bonding

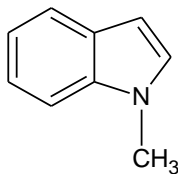**Questions for the Passage "Alternative Method of Arylation of Aromatic Compounds"**

Which compound could be an ideal example of an electron-poor arene in arylation shown in Table 1 that can produce a maximum yield of 63%?
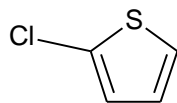
A.

[This compound incorrectly identifies a relatively electron deficient pyridine, which can produce a maximum yield of 80%.]
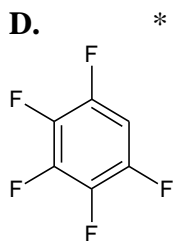
B.

[This compound is an example of an electron-rich heteroarene, which can produce a maximum yield of 61%.]

C.

[This compound is an example an electron-rich heteroarene, which can produce a maximum yield of 61%.]

D.   *

[CA: This fluoro substituted benzene would be an ideal electron-poor arene, which can produce a maximum yield of 63%.]

Chemical Processes Example 7

Content Objective: Organic Chemistry, Reactions of Organic Compounds, Addition/substitution/elimination

Questions for the Passage "Alternative Method of Arylation of Aromatic Compounds"

Which of the following best describes the type of reaction shown in the examples in Figure 1?

A. Electrophilic substitution *
    [CA: This answer choice correctly identifies that arylation reactions are a type of electrophilic substitution reaction.]

B. Addition
    [This answer choice incorrectly identifies an arylation reaction as a type of addition reaction. Addition reactions occur when two or more molecules combine to form a single product which contains all of the atoms present in the reactants. Arylation is a type of electrophilic substitution and requires a nucleophile in the mechanism.]

C. Nucleophilic substitution
    [This answer choice correctly identifies that arylation is a type of substitution, but incorrectly describes it as a nucleophilic substitution. Arylation is a type of electrophilic substitution reaction due to the use of a metal to help activate the C-H bond.]

D. Elimination
    [This answer choice incorrectly identifies the reaction as an elimination reaction, which is typically seen when forming double bonds. However, arylations are a type of electrophilic substitution reaction.]

Chemical Processes Example 8

Content Objective: Organic Chemistry, Structure and Properties, Structural formulas and bonding

Questions for the Passage "Alternative Method of Arylation of Aromatic Compounds"

Example B shown in Figure 1 is significant due to its application on which type of bond hybridization?

A. $C(sp^2)$—H
[This correctly identifies arylation to be a type of C–H bond formation reaction. However, Example B shows the efficiency of arylation with a $C(sp^3)$—H product.]

B. $C(sp^3)$—$C(sp^3)$
[This does not correctly identify arylation as a C—H bond formation reaction, but does correctly identify that the carbon being reacted is sp^3-hybridized.]

C. $C(sp^3)$–H *
[CA: This correctly identifies Example B as an arylation with a $C(sp^3)$—H hybridization.]

D. $C(sp^2)$—$C(sp^3)$
[This incorrectly identifies the hybridization, and does not correctly determine arylation as a type of C—H bond formation reaction with $C(sp^3)$ hybridization.]

Critical Reading

Critical Reading Content Objectives
R1. Comprehension (recognition, understanding)
A. Words in Context (defining a term used in the passage)
B. Main Ideas (identifying or inferring the main idea of a paragraph or group of paragraphs)
C. Supporting Details (identifying facts or ideas explicitly stated in the passage)
D. Drawing Conclusions (making inferences from statements in the passage)
R2. Analysis (inference, interpretation)
A. Relationships Between Ideas (identifying relationships between ideas in different parts of a paragraph or in different paragraphs)
B. Author's Purpose (inferring the author's purpose for writing the entire passage or for including a statement in part of the passage)
C. Author's Tone (inferring author's attitude in the entire passage or in a specific statement in part of the passage)
D. Facts/Opinions (distinguishing between statements of fact and expressions of opinion)
E. Rhetorical Strategies (identifying methods used by the author for effect, to persuade, or to make a point)
R3. Evaluation (reasoned judgment)
A. Bias (inferring author's assumption, viewpoint, preference, or position in entire passage or in a specific statement in part of the passage)
B. Support in an Argument (evaluating the effectiveness of elements of support used by the author in the passage)
C. Author's Conclusion/Thesis (identifying or inferring the author's overall point in the passage, or evaluating how well the author's overall point follows from the support provided)

Examples of a Critical Reading Passage and Items

- Each PCAT Critical Reading passage will address historical or contemporary social, cultural, ethical, political, or technical issues related to the applied or basic natural sciences, the social sciences, or the humanities.

- Passages may be informative, persuasive, or speculative in purpose or may be practical or theoretical in nature.

- Each reading item stem will clearly relate to the reading passage and will require understanding part or all of the passage in order to answer correctly.

- Each item stem may refer to a specific word, phrase, sentence, paragraph, or section of the passage or may refer to the passage as a whole.

For each sample Critical Reading item, the correct answer is followed by an asterisk (*), and each answer option is followed by a bracketed explanation for why it is correct (CA) or incorrect (neither of which will appear in the actual test).

Critical Reading Passage Example

Low-Calorie Diet and Aging

1   An interesting question has emerged from research involving calorie restriction and aging: Can a low-calorie diet help people live longer? Studies involving animals such as mice, worms, and fish have shown that eating a very low-calorie diet can prevent such ailments as heart disease, diabetes, and some cancers and can actually extend life spans. The reasons for these results are not adequately understood, and scientists are uncertain whether the same results can occur in humans. However, some promising research findings are beginning to appear.

2   In studies conducted at the University of California, Riverside (UCR), researchers have found that by decreasing the intake of calories in laboratory mice, regardless of the time period involved, most diseases caused by aging are prevented. Based on findings from their most recent studies, these researchers suggest that it is possible to help avoid heart disease, cancer, and diabetes simply by restricting caloric intake for as short a time as four weeks. The UCR researchers have also found that a chemical change takes place in the body through calorie restriction, and suggest that it is possible to duplicate this change through the use of pharmaceuticals.

3   Research is also beginning to reveal some interesting findings involving low-calorie diets and humans. Several studies have been conducted within human populations in Okinawa, Japan. Results of these studies have shown that individuals under the age of sixty show very little serious disease, and that there are forty times as many residents of Okinawa living 100 years or longer than in more northeastern areas of Japan. Studies have concluded that a lower calorie intake appears to be the main difference in the eating habits of Okinawans.

4   In findings published in 2006, researchers at the Pennington Biomedical Center at Louisiana State University reported on a study involving calorie restriction with forty-eight overweight humans. Though considered preliminary, the results of this study suggested that people on a six-month calorie-restricted diet showed several improvements in health markers associated with aging. In this study, one group of twelve individuals followed a diet with a 25 percent calorie restriction from the usual daily calorie amount. Another group combined a 12.5 percent increase in exercise with a 12.5 percent reduction in calorie intake. A third group followed an 890-calorie liquid diet for three months, followed by a weight-maintenance diet. A control group attempted to merely maintain steady weight. While no changes were observed in the control group, the results of this study suggested that individuals who followed a strict low-calorie diet showed decreased amounts of age-related DNA damage when compared to individuals who merely maintained a steady weight. The results of this study also suggested that individuals who followed a strict low-calorie diet showed decreased amounts of age-related DNA damage when compared to initial levels, as well as decreased insulin levels and body temperature, both of which are considered signs of longevity.

5   The findings of studies such as this and others conducted more recently, including several funded by the U.S. Department of Health and Human Services National Institute on Aging (NIA), suggest that the effects of a low-calorie diet on the aging process appear quite positive. In fact, in one NIA-funded study reported in 2015, researchers concluded that calorie restriction with individuals who were not overweight positively influenced several key indicators associated with a longer life span. An especially interesting possibility suggested by some of these studies involves developing pharmaceuticals that may duplicate the chemical changes produced in the body from calorie restriction. Although more research is clearly needed to confirm preliminary findings, promising results so far suggest that following a calorie-restricted diet can very possibly help us avoid many of the diseases that now plague us as we grow older, and thus lead to longer, healthier lives.

Critical Reading Example Item 1

Content Objective: Comprehension, Main Ideas

Questions for Passage "Low-Calorie Diet and Aging"

What main point from the passage is supported by the suggestion made by UCR researchers referred to in the second paragraph that "it is possible to help avoid heart disease, cancer, and diabetes simply by restricting caloric intake for as short a time as four weeks."

A. It seems that heart disease, cancer, and diabetes are all directly tied to diet.
   [The author never states this unequivocally but simply as a growing theory.]

B. Improvements are often seen for patients with chronic diseases in a relatively short amount of time.
   [The four-week time period is referring to the amount of time calories were restricted, not diseases.]

C. Preliminary research indicates that major diseases may be affected by calorie intake. *
   [CA: The author is showing that early research had found correlations between caloric intake and incidence of major diseases.]

D. Many serious diseases can be avoided if a person makes sufficient effort to avoid them.
   [This is never stated or implied anywhere in the passage.]

Critical Reading Example Item 2

Content Objective: Analysis, Facts/Opinions

Questions for Passage "Low-Calorie Diet and Aging"

Which words from the passage reflect the author's opinion?

A. ". . . adequately understood . . ." (Paragraph 1)
[Even though the word *adequately* can show opinion, in this context it seems to refer to how researchers assess the situation, rather than to how he author sees it.]

B. ". . . recent studies . . ." (Paragraph 2)
[Neither word implies an option because *recent* merely makes a time reference.]

C. ". . . considered preliminary . . ." (Paragraph 4)
[The word *preliminary* could imply opinion, but in this context the word refers to how the Pennington Biomedical Research Center researchers consider their findings, not to how the author sees them.]

D. ". . . quite positive." (Paragraph 5) *
[CA: In this context, the word *quite* implies a judgment concerning the degree to which the author considers the results to be *positive*, which also suggests the author's view.]

Critical Reading Example Item 3

Content Objective: Analysis, Rhetorical Strategies

Questions for Passage "Low-Calorie Diet and Aging"

Which strategy does the author use throughout the passage to support the overall thesis?

A. Adding personal anecdotes to highlight the best way to restrict calories
[There are no personal anecdotes, or stories based on personal experience, in the passage.]

B. Referring to respected publications for additional facts and statistics
[Even though study results are mentioned that have presumably been published, there are no references to the actual names of the publications in the passage.]

C. Listing results from prestigious studies to add credibility *
[CA: The author refers to studies in paragraphs 2, 4, and 5 that are associated with respected institutions in support of the main point.]

D. Repeating key words to link diverse and unique ideas together
[There is no obvious repetition of this sort and no attempt to represent diverse ideas in the passage.]

Critical Reading Example Item 4

Content Objective: Evaluation, Support in an Argument

Questions for Passage "Low-Calorie Diet and Aging"

Which point from the passage best supports the author's suggestion that a low-calorie diet may be able to extend the average life span?

A. Research subjects on a calorie-restricted diet showed decreased amounts of age-related DNA damage. *
[CA: This is suggested near the end of paragraph 4 and shows that calorie restriction does affect the basic DNA, which provides strong support for the author's main point in this passage.]

B. Many Okinawans live to be more than 100 years old.
[Although this statement made in paragraph 3 may be true, it is not itself evidence but is the kind of statement that other evidence in the passage related to a low-calorie diet is meant to support.]

C. Studies conducted on mice, worms, and fish have shown that calorie reduction prevents age-related diseases.
[The fact that positive changes occur in various animals (mentioned in paragraphs 1 and 2) is suggestive only and provides no convincing evidence for the benefits to humans of calorie reduction.]

D. A chemical change takes place in the body when calories are sufficiently restricted.
[Chemical changes are mentioned in paragraph 2, but the fact that a chemical change occurs is not explicitly connected to longevity in such a way as to make this fact as strong a support as other evidence presented elsewhere in the passage.]

Critical Reading Example Item 5

Content Objective: Comprehension, Supporting Details

Questions for Passage "Low-Calorie Diet and Aging"

Support in paragraph three for the benefits of a low-calorie diet is provided in the statement that Okinawans

A. have been studied by researchers a number of times in the past.
[Just because Okinawans may have been studied a lot does not suggest any benefits of their diet.]

B. show no serious diseases until well after the age of sixty.
[The statement in the paragraph is that they "show very little serious disease," under 60 years of age, not that they have no diseases illnesses before that age.]

C. appear to eat fewer calories overall than the people in northeastern Japan.
[Eating fewer calories is the key distinguishing characteristic of the Okinawan diet, but this fact says nothing about the benefit of their diet.]

D. are more likely to live 100 years or longer than many other Japanese.*
[CA: This is correct because the author states that there are 40% more people living to be 100 or more in Okinawa than in "more northeastern areas of Japan."]

Critical Reading Example Item 6

Content Objective: Analysis, Author's Purpose

Questions for Passage "Low-Calorie Diet and Aging"

The author's primary purpose in this passage is to

A. explain how pharmaceuticals will eventually be used to increase longevity.
[Although the idea of using pharmaceuticals to mimic calorie restriction is mentioned in paragraph 5, it is not the author's main purpose to point this out.]

B. demonstrate the potential link between low-calorie intake and chronic disease.*
[CA: This point suggests a possible link but without taking a position either in support of the idea or in opposition to it, which is exactly what the author does in the passage.]

C. show how a combination of diet and exercise is the key to living longer.
[The author does not explore the benefits of exercise in this passage but focuses only on diet.]

D. prove that restricting daily calorie intake will slow down the aging process.
[Nothing in the passage states that anything has been proven, just that this possibility is being investigated and studied.]

Critical Reading Example Item 7

Content Objective: Evaluation, Bias

Questions for Passage "Low-Calorie Diet and Aging"

Language used by the author in the passage suggests which attitude towards calorie restriction and health?

A. Circumspect
[Being circumspect implies that the author is being very careful not to draw any conclusions, but the author does in the final paragraph express an optimism about the possibilities of the diet.]

B. Ambivalent
[The author does not use any phrases that would indicate ambivalence or mixed feelings about the topic.]

C. Optimistic*
[CA: The author uses words in paragraphs 1 and 5 such as "promising," "positive," "positively," and "interesting possibility" that suggest an optimism toward the possibilities of a calorie-restricted diet, especially in light of research findings discussed throughout the passage.]

D. Skeptical
[There is no evidence suggested by language used that the author doubts the findings reported in the passage.]

Critical Reading Example Item 8

Content Objective: Evaluation, Author's Conclusion/Thesis

Questions for Passage "Low-Calorie Diet and Aging"

What idea does the author express in paragraph one that the evidence presented in the following paragraphs is meant to support?

A. Researchers are now studying possible factors contributing to longevity.
[This may be so, but the author makes clear in paragraph 1 that only calorie restriction will be discussed in the passage.]

B. There may be a link between calorie restriction and human longevity.*
[CA: This idea is clearly the focus of the first paragraph, which introduces the topic of a possible link between calories and longevity that is discussed in subsequent paragraphs.]

C. Animals subject to chronic diseases can benefit from dietary interventions.
[This may be so, but the introductory paragraph specifies that humans are the focus of the passage.]

D. Evidence suggests that experimental results seen in animals also apply to humans.
[The author suggests that scientists are currently researching this possibility, not that it has already been conclusively shown.]

Quantitative Reasoning

Quantitative Reasoning Content Objectives
Q1. Basic Math
A. Fractions, Percentages, & Decimals
B. Unit Conversions
C. Log Base 10
D. Ratios
Q2. Algebra

A. Expressions, Equations, and Inequalities
    1. Evaluate algebraic expressions for given values
    2. Represent verbal quantitative situations as algebraic expressions or equations
    3. Solve problems using linear equations and inequalities
    4. Solve problems using equations and inequalities involving absolute value
    5. Solve problems using equations and inequalities involving rational expressions
    6. Solve quadratic equations and inequalities
    7. Solve equations and inequalities involving 1 or 2 radicals
    8. Solve systems of equations or inequalities involving 2 or 3 variables

B. Functions
    1. Perform algebraic operations on functions
    2. Determine compositions of functions
    3. Determine inverses of functions
    4. Determine and use maximum and minimum points

Q3. Probability & Statistics
A. Measures of Central Tendency
B. Variation
C. Graphical
D. Probability
E. Statistical Concepts

Quantitative Reasoning Content Objectives *(continued)*

Q4. Precalculus

A. Functions

   1. Graph and identify domains, ranges, intercepts, and zeros of exponential functions

   2. Logarithms (natural or other base with multiple operations)

   3. Solve problems related to exponential and logarithmic functions

   4. Graph and identify domains, ranges, intercepts, zeros, and inverses of the circular functions

   5. Perform algebraic operations on functions

   6. Identify and use composite functions

B. Complex Numbers

C. Vectors

   1. Add vectors graphically and algebraically

   2. Perform scalar multiplications

   3. Represent and/or recognize vector equations of lines and planes

Q5. Calculus

A. Limits (Find: Limits of functions, One-sided limits, Infinite limits)

B. Continuity (Interpret graphs of continuous and discontinuous functions)

C. Derivatives

   1. Find derivatives of algebraic functions by means of the Sum and product, Power rule, apply the Mean Value Theorem

   2. Use the Chain Rule to find derivatives of composite functions

   3. Solve problems by differentiation (e.g., velocity and acceleration)

   4. Use and/or interpret derivative tests to find extrema, points of inflection, intervals

   5. Interpret and/or use the derivatives of circular functions and their inverses

   6. Interpret and/or use the derivatives of transcendental functions

   7. Determine the derivatives of composite functions involving the circular and transcendental functions

   8. Use implicit differentiation

   9. Determine related rates

D. Integrals

   1. Find antiderivatives, and interpret C

   2. Understand and use sigma notation for simplifying sums

   3. Approximate areas bounded by curves

E. Integration

Examples of Quantitative Reasoning Items

- Each Quantitative Reasoning item stem will be in the form of a question (followed by a question mark), in the form of an incomplete sentence that requires completion (with no end punctuation), or in the form of an incomplete statement that ends in an equals sign (=).

- Answer options may contain more than one concept or piece of information but each one will plausibly relate to the stem.

In the following sample Quantitative Reasoning items, the correct answer for each item is followed by an asterisk (*), and each answer option is followed by a bracketed explanation for why it is correct (CA) or incorrect (neither of which will appear in the actual test).

Quantitative Reasoning Example 1

Content Objective: Algebra, Expressions, Equations, and Inequalities, Solve equations and inequalities involving 1 or 2 radicals

Let c be a constant. The lines $2x - y = 5$ and $x - y = c$ intersect in a unique point (r, s) in the coordinate plane. In which way does increasing the value of c affect the values of r and s?

A. The values of r and s both decrease. *
   [CA: Solve the system by eliminating y; subtract the second equation from the first equation to get $x = 5 - c$; then substitute into the equation $x - y = c$ to get $5 - c - y = c$; $y = 5 - 2c$. So, $r = 5 - c$; $s = 5 - 2c$; both r and s decrease with c because the coefficient of c is negative in the expressions for r and s.]

B. The value of r increases; the value of s decreases.
   [The candidate chooses the wrong direction of change for r.]

C. The values of r and s both increase.
   [The candidate chooses the wrong directions of change for both r and s.]

D. The value of r decreases; the value of s increases.
   [The candidate chooses the wrong direction of change for s.]

Quantitative Reasoning Example 2

Content Objective: Basic Math, Fractions, Percentages, & Decimals

A student folded a square sheet of paper in half four times and then unfolded it. The dashed lines in the figure below show where the student folded the sheet of paper.
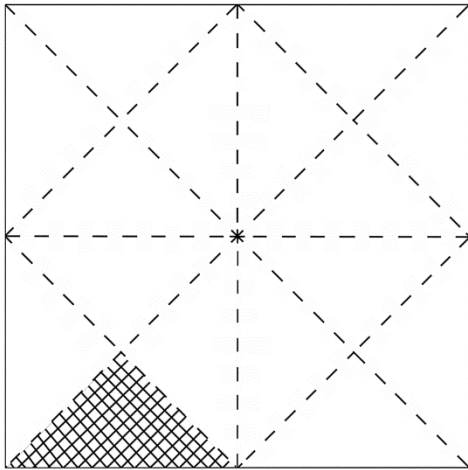
Before the student unfolded the paper, it looked like the shaded triangle. Which is closest to the percent of the sheet of paper that is the shaded triangle?

A. 4%
[This option assumes that the number of times that the paper is folded equals the percentage of the shaded region .]\

B. 6% *

[CA: Solve this problem by first determining that the shaded are is $\dfrac{1}{16}$ of the sheet of paper:

$\dfrac{1}{16} = 0.0625 = 6.25\%$.]

C. 15%
[The candidate thinks the 15 unshaded triangles represent 15%.]

D. 16%
[The candidate thinks that the 16 triangles represent 16%.]

Quantitative Reasoning Example 3

Content Objective: Probability & Statistics, Measures of Central Tendency

A student took five measurements of the freezing point of an unknown chemical solution. The mean of the first four measurements was –8.40 ˚C, and the fifth measurement was –9.00 ˚C. What was the mean of the student's five measurements of the freezing point?

A. –8.88 ˚C

[This option finds the temperature that is one-fifth of the way from –9.00 ˚C to –8.40 ˚C, rather than from –8.40 ˚C to –9.00 ˚C.]

B. –8.70 ˚C

[This option simply averages –8.40 ˚C and –9.00 ˚C.]

C. –8.55 ˚C

[This option finds the temperature that is one-quarter rather than one-fifth of the way from –8.40 ˚C to –9.00 ˚C.]

D. –8.52 ˚C *

[CA: One way to do this is to find the temperature one-fifth of the way from –8.40 ˚C to –9.00 ˚C. Another way is to realize that the sum of the first four measurements (in ˚C) was 4(–8.40), conclude that the sum of all the measurements was 4(–8.4) + (–9.00), and then divide this result by 5 to obtain the mean of all five measurements.]

Quantitative Reasoning Example 4

Content Objective: Precalculus, Functions, Logarithms (natural or other base with multiple operations)

If $\ln e^{2x+1} = 9$, what is the value of x

A. $\dfrac{(-1+\ln 9)}{2}$

[This option makes a mistake and assumes that 2x + 1 = ln 9, and then solves the equation and gets $\dfrac{(-1+\ln 9)}{2}$.]

B. 4 *

[CA: The natural logarithmic function and the exponential function are inverse functions. Therefore, ln e2 x+1 = (2x + 1) × ln e = 2x + 1 . Therefore, 2x + 1 = 9 ⇒ 2x = 8 ⇒ x = 4.]

C. $\left[\dfrac{9}{(2)(\ln e)}\right]$

[This option makes a mistake and assumes that ln e2 x+1 = 2 ln e, and then solves the equation and gets $\left[\dfrac{9}{(2)(\ln e)}\right]$.]

D. 5

[The natural logarithmic function and the exponential function are inverse functions. Therefore, ln e2 x+1 = (2x + 1) × ln e = 2x + 1 . However, the candidate makes a computational error with the following: 2x + 1 = 9 ⇒ 2x = 10 ⇒ x = 5.]

Quantitative Reasoning Example 5

Content Objective: Q5C1 Calculus, Derivatives, Find derivatives of algebraic functions by means of the Sum and product, Power rule, apply the Mean Value Theorem

If $f(x) = e^{\sqrt{x+1}}$, what is $f'(3)$?

A. $\dfrac{e}{4}$

[This option makes a computational error and does not find the correct numerator.]

B. $\dfrac{e^2}{4}$

[First, we find the derivative:

$$f'(x) = e^{\sqrt{x+1}} \times \frac{d}{dx}\left(\sqrt{x+1}\right) = e^{\sqrt{x+1}} \times \frac{1}{2}(x+1)^{-\frac{1}{2}} = \frac{e^{\sqrt{x+1}}}{2\sqrt{x+1}}$$

Therefore, if we calculate the derivative at x = 3, we have:

$$f'(3) = \frac{e^{\sqrt{3+1}}}{2\sqrt{3+1}} = \frac{e^{\sqrt{4}}}{2\sqrt{4}} = \frac{e^2}{2\times 2} = \frac{e^2}{4}. \text{ Thus, } f'(3) = \frac{e^2}{4}$$]

C. $\dfrac{e^2}{2}$

[This does not find the derivative correctly and forgets a factor of 2 in the denominator.]

D. e^2

[This option does not find the derivative correctly.]

Quantitative Reasoning Example 6

Content Objective: Basic Math, Ratios

All the students taking a particular calculus class at a university are either in their sophomore or junior year. Among the engineering majors in the class, the ratio of sophomores to juniors is 2:3. If $\frac{2}{5}$ of the sophomores and $\frac{4}{7}$ of the juniors in this class are engineering majors, what is the ratio of sophomores to juniors in the entire class?

A. 16:105

[This option misinterprets the fractions in the stem by mistakenly multiplying, instead of dividing, by the fraction of the sophomores that are engineering majors; incorrectly concluding that the solution is $\frac{2}{3} \times \frac{4}{7} \times \frac{2}{5} = \frac{16}{105}$, or 16:105.]

B. 7:15

[This option misinterprets the fractions in the stem by mistakenly dividing by the fraction of the juniors that are engineering majors and multiplying by the fraction of the sophomores that are engineering majors, instead of vice versa. The candidate therefore incorrectly concludes that the solution is $\frac{2}{3} \div \frac{4}{7} \times \frac{2}{5} = \frac{2}{3} \times \frac{7}{4} \times \frac{2}{5} = \frac{7}{15}$, or 7:15.]

C. 20:21 *

[CA: Among the engineering majors, let s and j represent the numbers of sophomores and juniors, respectively. In the entire class, let S and J represent the numbers of sophomores and juniors, respectively. We have $\frac{s}{S} = \frac{2}{5}$, $\frac{j}{J} = \frac{4}{7}$, and $\frac{s}{j} = \frac{2}{3}$. Therefore, the ratio of sophomores to juniors in the entire calculus class is

$\frac{S}{J} = \frac{s}{j} \times \frac{j}{J} \div \frac{s}{S} = \frac{2}{3} \times \frac{4}{7} \div \frac{2}{5} = \frac{2}{3} \times \frac{4}{7} \times \frac{5}{2} = \frac{20}{21}$, or 20:21.]

D. 35:12

[This option misinterprets the fractions in the stem by mistakenly dividing, instead of multiplying, by the fraction of the juniors that are engineering majors; incorrectly concluding that the solution is $\frac{2}{3} \div \frac{4}{7} \div \frac{2}{5} = \frac{2}{3} \times \frac{7}{4} \times \frac{5}{2} = \frac{35}{12}$, or 35:12.]

Quantitative Reasoning Example 7

Content Objective: Algebra, Functions, Determine and use maximum and minimum points

An object is fired at 19.6 meters per second (m/s) from a 58.8 m tall height. The equation for the object's height s in meters at time t in seconds after firing is $s(t) = -4.9t^2 + 19.6t + 58.8$. What is the maximum height of the path of the object?

A. 2

[This option correctly solves to find the maximum using $t = \dfrac{-b}{2a}$, which gives $t = 2$, but then forgets to go back and find $s(t)$.]

B. 4

[This option solves to find the maximum using $t = \dfrac{-b}{a}$, which gives $t = 4$, but then forgets to go back and find $s(t)$.]

C. 58.8

[This option solves to find the maximum using $t = \dfrac{-b}{a}$, which gives $t = 4$, but then finds $s(4) = 58.8$.]

D. 78.4*

[CA: This option correctly solves to find the maximum using $t = \dfrac{-b}{2a}$, which gives $t = 2$, and then correctly finds $s(2) = 78.4$.]

Quantitative Reasoning Example 8

Content Objective: Probability & Statistics, Statistical Concepts

A research group is testing the efficacy of the order in which a particular drug regiment is administered. Drug X with 5 potential dosage levels is administered three separate times, and the dosage level cannot be repeated. After Drug X has been administered, a separate Drug Y with 4 potential dosage levels is administered two separate times, and the dosage level can be repeated. Given this information, how many ways can 3 doses of Drug X and 2 doses of Drug Y be administered?

A. 720

[This option misinterprets the stem and mistakenly finds the number of ways that 3 doses of Drug X and 2 doses of Drug Y can be administered where the dosage levels of both Drug X and Drug Y cannot be repeated, incorrectly concluding that the solution is $5 \times 4 \times 3 \times 4 \times 3 = 60 \times 12 = 720$.]

B. 960 *

[CA: Because 3 of 5 potential dosage levels of Drug X are administered at separate times and the dosage level cannot be repeated, there are $5 \times 4 \times 3 = 60$ ways of administering 3 doses of Drug X. Because, after Drug X has been administered, 2 of 4 potential dosage levels of Drug Y are administered at separate times and the dosage level can be repeated, there are $4 \times 4 = 16$ ways of administering 2 doses of Drug Y. Thus, the number of ways that 3 doses of Drug X and 2 doses of Drug Y can be administered is $60 \times 16 = 960$.]

C. 1,500

[This option misinterprets the stem and mistakenly finds the number of ways that 3 doses of Drug X and 2 doses of Drug Y can be administered where the dosage levels of Drug X can be repeated and the dosage levels of Drug Y cannot, incorrectly concluding that the solution is $5 \times 5 \times 5 \times 4 \times 3 = 125 \times 12 = 1,500$.]

D. 2,000

[This option misinterprets the stem and mistakenly finds the number of ways that 3 doses of Drug X and 2 doses of Drug Y can be administered where the dosage levels of both Drug X and Drug Y can be repeated, incorrectly concluding that the solution is $5 \times 5 \times 5 \times 4 \times 4 = 125 \times 16 = 2,000$.]

Writing

Writing Prompt Content Objectives
A. Health Issues (issues related to public health, medicine, nutrition, fitness, prevention, treatments, therapies, medications, drugs, attitudes)
B. Science Issues (issues related to research, theories, findings, applications, controversies, education, attitudes)
C. Social, Cultural, or Political Issues (issues related to beliefs, attitudes, behaviors, trends, laws, policies)

Examples of Writing Prompts

- Each writing prompt will be in the form of a statement that presents a contemporary problem relating to one of the general Content Objectives listed above.

- The problem referred to in each prompt may be specific but will also be universal enough that it does not require extensive background in the history, politics, or situation of any particular region of the world.

The following sample Writing prompts are like those you will find on the actual PCAT.

Writing Prompt Example 1

Content Objective: Health Issues

Aging populations and growing shortages of organ donor supplies result in thousands of deaths each year of people on waiting lists in the U.S. from such conditions as chronic lung disease, kidney failure, and coronary heart disease. Discuss a solution to the problems resulting from insufficient supplies of donated human organs.

Writing Prompt Example 2

Content Objective: Health Issues

According to a recent report from the U.S. Census Bureau, people without health insurance are more costly to the health care system, are more likely to delay or forgo medical services, and are generally in poorer health than people with insurance. Discuss a solution to the problem of providing adequate health care for the uninsured.

Writing Prompt Example 3

Content Objective: Health Issues

According to the U.S. Centers for Disease Control, poor diet and inactivity result in tens of thousands of deaths each year and are major contributors to debilitating conditions, such as diabetes, osteoporosis, obesity, and stroke. Discuss a solution to the problem of promoting healthy dietary habits.

Writing Prompt Example 4

Content Objective: Science Issues

Even though the use of fossil fuels has enabled worldwide industrial development, it has also been the largest source of carbon dioxide emissions, and the development of renewable resources has been hindered by issues related primarily to high costs. Discuss a solution to the problem of developing affordable alternatives to fossil fuels.

Writing Prompt Example 5

Content Objective: Science Issues

According to the World Wildlife Federation, as many as one-third of all wildlife species in the United States are at risk of extinction due to decades of habitat loss and the spread of invasive species. Discuss a solution to the problem of protecting endangered wildlife species in a rapidly changing world.

Writing Prompt Example 6

Content Objective: Science Issues

According to the U.S. Environmental Protection Agency, an average temperature increase of nearly 1.5 °F over the past century and projections of an even greater rise over the next century could result in dangerous climate and weather changes with challenging social and environmental consequences. Discuss a solution to the problem of dealing with global warming.

Writing Prompt Example 7

Content Objective: Social, Cultural, or Political Issues

A functioning democracy requires well-informed citizens who actively participate in voting and other civic activities, but research suggests that such forms of civic engagement are declining among people in the United States today. Discuss a solution to the problems resulting from a lack of participation in civic life.

Writing Prompt Example 8

Content Objective: Social, Cultural, or Political Issues

Immigration policies are being debated in the United States and other countries, especially where many immigrants are illegal, assimilation is challenging, unemployment is relatively high, and needs for both skilled and unskilled workers are not met by citizens. Discuss a solution to the problem of establishing immigration policies that are both effective and fair.

Writing Prompt Example 9

Content Objective: Social, Cultural, or Political Issues

According to the U.S. Department of Justice, the deliberate defacing or destroying of public or private property results in more than $15 billion in damages to schools, businesses, and individuals each year. Discuss a solution to the problem of reducing graffiti and vandalism in neighborhoods where they are common.