

# Answer Sheet for PCAT Practice Test 1

(Remove This Sheet and Use It to Mark Your Answers)

## Verbal Ability: Analogies

- 1 A B C D
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## Verbal Ability: Sentence Completions

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## Biology

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## Reading Comprehension

- 117 A B C D
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### Quantitative Ability

166 A B C D	176 A B C D	186 A B C D	196 A B C D	206 A B C D
167 A B C D	177 A B C D	187 A B C D	197 A B C D	207 A B C D
168 A B C D	178 A B C D	188 A B C D	198 A B C D	208 A B C D
169 A B C D	179 A B C D	189 A B C D	199 A B C D	209 A B C D
170 A B C D	180 A B C D	190 A B C D	200 A B C D	210 A B C D
171 A B C D	181 A B C D	191 A B C D	201 A B C D	211 A B C D
172 A B C D	182 A B C D	192 A B C D	202 A B C D	212 A B C D
173 A B C D	183 A B C D	193 A B C D	203 A B C D	213 A B C D
174 A B C D	184 A B C D	194 A B C D	204 A B C D	
175 A B C D	185 A B C D	195 A B C D	205 A B C D	

### PCAT Chemistry

214 A B C D	224 A B C D	234 A B C D	244 A B C D	254 A B C D	264 A B C D
215 A B C D	225 A B C D	235 A B C D	245 A B C D	255 A B C D	265 A B C D
216 A B C D	226 A B C D	236 A B C D	246 A B C D	256 A B C D	266 A B C D
217 A B C D	227 A B C D	237 A B C D	247 A B C D	257 A B C D	267 A B C D
218 A B C D	228 A B C D	238 A B C D	248 A B C D	258 A B C D	268 A B C D
219 A B C D	229 A B C D	239 A B C D	249 A B C D	259 A B C D	269 A B C D
220 A B C D	230 A B C D	240 A B C D	250 A B C D	260 A B C D	270 A B C D
221 A B C D	231 A B C D	241 A B C D	251 A B C D	261 A B C D	
222 A B C D	232 A B C D	242 A B C D	252 A B C D	262 A B C D	
223 A B C D	233 A B C D	243 A B C D	253 A B C D	263 A B C D	

### Critical Thinking Essay

Write your essay on lined paper.

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# PCAT Practice Test 1

## Verbal Ability: Analogies

**Directions:** Select the word that best completes the analogy.

1. MELLIFLUOUS : DISCORDANT :: DULCET:

- A. disastrous
- B. incongruous
- C. harmonic
- D. duet

2. CONVICT : ERRANT :: SAINT:

- A. convincing
- B. upright
- C. sinful
- D. happy

3. SIMPLE : AUSTERE :: DECORATED:

- A. beautiful
- B. expensive
- C. garish
- D. strict

4. RACONTEUR : NARRATIVE :: LYRICIST:

- A. poem
- B. short story
- C. editorial
- D. operetta

5. REITERATE : REPEAT :: RECAPITULATE:

- A. redo
- B. restate
- C. resign
- D. remorse

6. PLUMB : STRAIGHTNESS :: PROTRACTOR:

- A. circles
- B. squares
- C. angles
- D. waves

7. PANACEA : REMEDY :: PLACEBO

- A. substitute
- B. antidote
- C. aspirin
- D. vaccination

8. MINIATURE : PALATIAL :: LILLIPUTIAN

- A. people
- B. flowers
- C. colossal
- D. lackadaisical

9. APEX : NADIR :: PINNACLE:

- A. zenith
- B. mountaintop
- C. base
- D. point

10. MISER : FRUGAL :: MISCREANT:

- A. money
- B. evil
- C. creation
- D. stinginess

11. DISTASTEFUL : REPUGNANT :: TALKATIVE:

- A. noisome
- B. friendly
- C. quiet
- D. loquacious

12. LEXICON : DEFINITION :: ALMANAC:

- A. facts
- B. farmers
- C. weather
- D. fun

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13. TRICKLE : INUNDATE :: FLICKER:

- A. blaze
- B. fail
- C. flood
- D. fumes

14. MOLLIFY : ALLAY :: APPEASE:

- A. allow
- B. mitigate
- C. circumvent
- D. appeal

15. IOTA : MYRIAD :: PAUCITY:

- A. ions
- B. fluidity
- C. profusion
- D. poverty

16. PEDESTRIAN : FOOT :: EQUESTRIAN:

- A. bridle
- B. horse
- C. hand
- D. dog

17. PARIAH : PARAGON :: OUTCAST:

- A. exemplar
- B. paramour
- C. bigot
- D. pedestrian

18. MALEFACTOR : EVIL :: AUTOCRAT:

- A. omnipotence
- B. country
- C. insecurity
- D. laws

19. OAK : ARBOREAL :: PINE:

- A. needle
- B. whine
- C. cones
- D. coniferous

20. ASCETIC : HEDONISTIC :: PURITANICAL:

- A. religious
- B. heathen
- C. indulgent
- D. pensive

21. APPARITION : ETHEREAL :: SPIRIT:

- A. corporeal
- B. scary
- C. diaphanous
- D. substantial

22. CACOPHONY : HARSH :: HARMONY:

- A. orchestra
- B. notes
- C. happy
- D. mellifluous

23. AMALGAMATE : DISSEMINATE :: FUSE:

- A. explode
- B. box
- C. split
- D. spit

24. BANAL : TRITE :: HACKNEYED:

- A. fluent
- B. weak
- C. colloquial
- D. lackluster

25. COMESTIBLE : SAVORY :: EDIBLE:

- A. fragrant
- B. odorous
- C. pungent
- D. tasty

26. ERRATIC : IRREGULAR :: FICKLE:

- A. stern
- B. stalwart
- C. capricious
- D. careful

27. ENGRAVE : CUT :: EMBROIDER:

- A. knit
- B. sew
- C. crochet
- D. create

28. ELEGY : SORROW :: EULOGY:

- A. laudation
- B. recrimination
- C. death
- D. ecstasy

29. ADHESIVE : BOND :: DECORATIONS:

- A. beautiful
- B. expensive
- C. embellish
- D. superfluous

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## Verbal Ability: Sentence Completions

**Directions:** Select the word or words that best complete the sentence.

- 30.** When soaking a turkey in brine, be sure to \_\_\_\_\_ the entire bird in the solution.
- A. convert
  - B. immerse
  - C. converge
  - D. emerge
- 31.** Because the size of their rural habitat has \_\_\_\_\_, coyote sighting in \_\_\_\_\_ areas have become more frequent.
- A. divided . . . . country
  - B. solidified . . . . tropical
  - C. rusted . . . . flooded
  - D. decreased . . . . suburban
- 32.** Although advertisements in magazines rely heavily on \_\_\_\_\_ elements, their texts also play a part in their \_\_\_\_\_ power.
- A. sensational . . . . pictorial
  - B. visual . . . . persuasive
  - C. contrasting . . . . demanding
  - D. productive . . . . human
- 33.** The casserole of potatoes, made without salt, pepper, or spices, tasted \_\_\_\_\_.
- A. savory
  - B. complex
  - C. necrotic
  - D. insipid
- 34.** Aspirin, often used to \_\_\_\_\_ pain, can cause side effects that, unfortunately, most people \_\_\_\_\_.
- A. contradict . . . . choose
  - B. recuperate . . . . restrain
  - C. alleviate . . . . ignore
  - D. restore . . . . consider
- 35.** The voters showed their \_\_\_\_\_ by staying away from the polls.
- A. affluence
  - B. apathy
  - C. interest
  - D. registration
- 36.** A lunar \_\_\_\_\_ occurs during a full moon when the Earth is directly between the sun and the moon.
- A. lull
  - B. volcano
  - C. collapse
  - D. eclipse
- 37.** One of the requirements for employment as a translator is \_\_\_\_\_ in speaking more than one \_\_\_\_\_.
- A. adaptation . . . . English
  - B. customs . . . . country
  - C. courtesy . . . . jargon
  - D. proficiency . . . . language
- 38.** Sodium chloride is the \_\_\_\_\_ name for table salt.
- A. everyday
  - B. chemical
  - C. luxurious
  - D. polite
- 39.** Because she was a \_\_\_\_\_ vegetarian, she glared at anyone eating a hamburger.
- A. militant
  - B. violent
  - C. pacified
  - D. vociferous
- 40.** A career as an independent contractor rather than as an employee may provide \_\_\_\_\_, but without a steady source of income, it can create financial \_\_\_\_\_.
- A. autonomy . . . . insecurity
  - B. difficulties . . . . satisfaction
  - C. dependence . . . . wealth
  - D. chaos . . . . contradictions
- 41.** When the employee was late for the fourth time, the manager began to \_\_\_\_\_ about tardiness as a sign of \_\_\_\_\_.
- A. gesture . . . . wealth
  - B. orate . . . . illness
  - C. demonstrate . . . . forensics
  - D. rant . . . . irresponsibility

42. Her lively and smiling face mirrored her \_\_\_\_\_ personality.
- A. talkative
  - B. somber
  - C. vivacious
  - D. irate
43. The \_\_\_\_\_ wind blowing off the lake and the freezing temperatures made it seem as if winter would never end.
- A. relentless
  - B. temperate
  - C. calming
  - D. relevant
44. Stalactites descend from the \_\_\_\_\_ of a cave, but stalagmites grow \_\_\_\_\_ when water containing dissolved minerals drips to the cave's floor.
- A. bottom . . . . . horizontally
  - B. hole . . . . . sideways
  - C. ceiling . . . . . vertically
  - D. acme . . . . . inward
45. On the one-hundredth anniversary of Mapleton's founding, the city held a \_\_\_\_\_ celebration to \_\_\_\_\_ the occasion.
- A. binary . . . . . recreate
  - B. memorial . . . . . bless
  - C. centennial . . . . . commemorate
  - D. consecration . . . . . eulogize
46. The king planned an elaborate wedding for the princess, but his \_\_\_\_\_ vision was \_\_\_\_\_ by a shortage of funds in the royal treasury.
- A. grandiose . . . . . constrained
  - B. fantastic . . . . . implemented
  - C. imaginary . . . . . omitted
  - D. beautiful . . . . . built
47. Lye is a \_\_\_\_\_ and \_\_\_\_\_ cleaning agent that can cause burns on contact with the skin.
- A. weak . . . . . acid
  - B. fearful . . . . . convenient
  - C. reactionary . . . . . profligate
  - D. potent . . . . . caustic
48. As people age, the spaces between the bones of the spinal column begin to \_\_\_\_\_, causing their height to decrease by \_\_\_\_\_.
- A. swell . . . . . feet
  - B. narrow . . . . . inches
  - C. open . . . . . pounds
  - D. create . . . . . grams
49. Seemingly appearing on every utility pole in town, the \_\_\_\_\_ posters for yard sales contribute to visual \_\_\_\_\_.
- A. helpful . . . . . integrity
  - B. unusual . . . . . contraries
  - C. proximate . . . . . color
  - D. ubiquitous . . . . . pollution
50. The alleged criminal's alibi was so peculiar that jurors thought it was \_\_\_\_\_.
- A. incredulous
  - B. inedible
  - C. inordinate
  - D. incredible
51. Many in the audience left after the first act of the play; their \_\_\_\_\_ opinion of it was clear.
- A. verbal
  - B. tacit
  - C. dramatic
  - D. admiring
52. The saying "look before you leap" implies one shouldn't make \_\_\_\_\_ decisions.
- A. itchy
  - B. lucky
  - C. wrong
  - D. rash
53. A \_\_\_\_\_ plan for improving elementary education must consider not only the standards pupils should meet, but also the \_\_\_\_\_ available to the schools.
- A. revolting . . . . . mediocrity
  - B. willful . . . . . education
  - C. practical . . . . . resources
  - D. noble . . . . . playgrounds

- 54.** In Victorian England, the wealthy ate \_\_\_\_\_ dinners consisting of many courses of rich heavy food.
- A. sumptuous
  - B. nutritious
  - C. spartan
  - D. polite
- 55.** One of the tasks of the Red Cross is to provide material \_\_\_\_\_ to victims of disasters.
- A. laughter
  - B. misery
  - C. solace
  - D. alms
- 56.** Adolescents who differ from their peers may suffer from \_\_\_\_\_ and \_\_\_\_\_.
- A. alienation . . . . discomfort
  - B. hostility . . . . enjoyment
  - C. euphoria . . . . disenchantment
  - D. enlightenment . . . . tranquility
- 57.** In the Middle Ages, bubonic plague was so \_\_\_\_\_ that it killed almost all of its victims.
- A. hostile
  - B. transitory
  - C. virulent
  - D. temporary
- 58.** Because the bystanders did not react to the beating of the innocent victim, their \_\_\_\_\_ made them \_\_\_\_\_ in the crime.
- A. inaction . . . . guiltless
  - B. shouts . . . . helpful
  - C. ferocity . . . . useful
  - D. acquiescence . . . . complicit

## Biology

- 59.** Which of the following processes must occur in order for an individual to express a particular characteristic (for example, blue eye color)?
- A. Genes must be transcribed directly into proteins.
  - B. Genes must be transcribed onto tRNA and then translated into proteins.
  - C. Genes must be transcribed onto mRNA and then translated into proteins.
  - D. Genes must be translated directly into proteins.
- 60.** A DNA molecule that is composed of 30% adenine molecules will also contain
- A. 30% thymine molecules.
  - B. 70% thymine molecules.
  - C. 30% guanine molecules.
  - D. 30% cytosine molecules.
- 61.** An organism that contains a segment of DNA from a different organism inserted into its own DNA is referred to as a
- A. transgenic organism.
  - B. vector.
  - C. plasmid.
  - D. hybrid.
- 62.** If a small amount of DNA (for example, a drop of blood) is found at a crime scene, large quantities of identical DNA can be produced for analysis through the use of
- A. DNA fingerprinting techniques.
  - B. restriction fragment length polymorphism (RFLP) techniques.
  - C. DNA hybridization techniques.
  - D. polymerase chain reaction (PCR) techniques.
- 63.** Which of the following statements best describes the process of evolution?
- A. changes in the genetic composition of a population over time
  - B. natural selection
  - C. genetic drift
  - D. failure of a population to change in genetic composition over time
- 64.** Which of the following is NOT a characteristic of all living cells?
- A. All cells are self-contained (surrounded by a plasma membrane).
  - B. All cells contain DNA.
  - C. All cells contain a nucleus.
  - D. All cells contain cytoplasm.
- 65.** Which of the following statements regarding cell structure is FALSE?
- A. Plant cells have chloroplasts, while animal cells do not.
  - B. Animal cells have mitochondria, while plant cells do not.
  - C. Animal cells lack cell walls surrounding their plasma membranes.
  - D. Plant cells typically have a large central vacuole, while animal cells typically have one or more small vacuoles.
- 66.** Which of the following cellular organelles serves as the primary site of protein synthesis?
- A. nucleus
  - B. mitochondria
  - C. ribosome
  - D. peroxisome
- 67.** In humans, dermal tissue serves which of the following functions?
- A. provides the outer covering of the body
  - B. provides a defense mechanism against invading microorganisms
  - C. serves as a sensory organ
  - D. all of the above

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- 68.** Most cellular membranes are selectively permeable. This means that they
- A. do not allow any substances to pass through them.
  - B. control which substances pass through them, but not the rate at which those substances pass through.
  - C. allow all substances to pass through them, but control the rate at which those substances pass through.
  - D. control which substances pass through them, as well as the rate at which those substances pass through.
- 69.** Diffusion involves
- A. the passive movement of substances from a region of lower concentration to a region of higher concentration.
  - B. the passive movement of substances from a region of higher concentration to a region of lower concentration.
  - C. the input of energy to move substances from a region of higher concentration to a region of lower concentration.
  - D. the input of energy to move substances from a region of lower concentration to a region of higher concentration.
- 70.** During growth, new cells are produced through the process of
- A. mitosis.
  - B. meiosis.
  - C. both mitosis and meiosis.
  - D. budding.
- 71.** During mitosis, a cell containing 24 chromosomes would produce which of the following?
- A. 2 cells, each containing 24 chromosomes
  - B. 2 cells, each containing 12 chromosomes
  - C. 4 cells, each containing 24 chromosomes
  - D. 4 cells, each containing 12 chromosomes
- 72.** During meiosis, a single cell gives rise to
- A. two identical daughter cells.
  - B. four identical daughter cells.
  - C. two genetically unique daughter cells.
  - D. four genetically unique daughter cells.
- 73.** The process of cellular respiration involves
- A. inhaling carbon dioxide and exhaling oxygen through the lungs.
  - B. inhaling oxygen and exhaling carbon dioxide through the lungs.
  - C. the breakdown of glucose molecules to produce energy in the form of ATP.
  - D. the formation of glucose molecules through the breakdown of ATP.
- 74.** Which of the following statements is incorrect?
- A. Plants are capable of producing their own food supply through the process of photosynthesis.
  - B. Plants are capable of producing their own energy through the process of cellular respiration.
  - C. Plants and animals are both capable of producing their own food supply through the process of photosynthesis.
  - D. Plants and animals are both capable of producing their own energy through the process of cellular respiration.
- 75.** A group of related individuals that can interbreed and produce fertile offspring is referred to as a
- A. species.
  - B. population.
  - C. community.
  - D. gene pool.
- 76.** All of the organisms living in a defined area, along with all of the abiotic factors with which they interact, can be defined as a(n)
- A. community.
  - B. population.
  - C. gene pool.
  - D. ecosystem.
- 77.** The base of every food chain consists of
- A. herbivores.
  - B. carnivores.
  - C. producers.
  - D. decomposers.

- 78.** The increase in the concentration of toxins at successive levels in a given food chain is referred to as
- A. toxicity.
  - B. biological magnification.
  - C. trophic enhancement.
  - D. pollution.
- 79.** An organism that lives on or within a host organism is referred to as a
- A. predator.
  - B. microbe.
  - C. disease.
  - D. parasite.
- 80.** Which of the following factors affecting population density would be considered density-independent?
- A. availability of food
  - B. availability of water
  - C. accumulation of toxins in the ecosystem
  - D. prolonged period of drought
- 81.** Which of the following statements regarding the function of ecosystems is incorrect?
- A. Energy cycles through an ecosystem.
  - B. Energy moves in one direction through an ecosystem.
  - C. Water and nutrients are cycled through an ecosystem.
  - D. Carbon is cycled through an ecosystem.
- 82.** Which of the following requires a host cell because they can not make their own proteins?
- A. protists
  - B. prokaryotes
  - C. bacteria
  - D. viruses
- 83.** Which of the following cellular features separates bacteria from all other groups of organisms?
- A. Bacterial cells are prokaryotic.
  - B. Bacterial cells are eukaryotic.
  - C. Bacterial cells contain mitochondria.
  - D. Bacterial cells have a nucleus.
- 84.** Many hospitals will not allow patients with respiratory problems to have plants in their rooms. The primary reason is because
- A. Plants release too much oxygen into the room.
  - B. Plants take too much carbon dioxide out of the room.
  - C. Plants release too much carbon dioxide into the room.
  - D. Plants may harbor mold spores that will aggravate respiratory problems.
- 85.** While steak tartare (chopped raw beef mixed with a raw egg) is still a popular dish, there is a real danger of illness because
- A. Uncooked beef may be infected with bacteria.
  - B. Uncooked beef may be infected with tapeworm cysts.
  - C. Uncooked eggs may be infected with bacteria.
  - D. all of the above
- 86.** Which type of cells is most commonly infected by the HIV virus?
- A. red blood cells
  - B. helper T cells
  - C. phagocytes
  - D. monocytes
- 87.** Rod-shaped bacteria are referred to as
- A. bacilli.
  - B. cocci.
  - C. spirilla.
  - D. protozoa.
- 88.** Which of the following is considered an infectious disease?
- A. tonsilitis
  - B. asthma
  - C. mumps
  - D. diabetes
- 89.** Between 3 and 3.5 billion years ago, simple prokaryotic organisms evolved that were able to capture energy from the sun and create their own food. These organisms are known as
- A. plants.
  - B. green algae.
  - C. cyanobacteria.
  - D. eukaryotes.

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- 90.** Which of the following organisms is NOT considered a protist?
- paramecium
  - amoeba
  - slime mold
  - Escherichia coli*
- 91.** Bacteria are considered to be prokaryotic because they
- lack a nuclear membrane, but contain other membrane-bound organelles.
  - lack both a nuclear membrane and other membrane-bound organelles.
  - have a well-defined nucleus but do not have any other membrane-bound organelles.
  - have both a well-defined nucleus and several other membrane-bound organelles.
- 92.** The normal body temperature of a person is
- 37 degrees Fahrenheit.
  - 37 degrees centigrade.
  - 98.6 degrees centigrade.
  - 98.6 degrees Celsius.
- 93.** Bacteria reproduce by
- both sexual and asexual reproduction.
  - sexual reproduction only.
  - asexual reproduction only.
  - taking over a host cell and reproducing along with the host cell.
- 94.** *Homo sapiens* is believed to have descended from
- Homo erectus*.
  - Homo habilis*.
  - Homo africanus*.
  - Australopithecus africanus*.
- 95.** Which of the following hormones is NOT produced by the pituitary gland?
- epinephrine
  - human growth hormone
  - lactogenic hormone
  - follicle-stimulating hormone
- 96.** The function of the human circulatory system is to
- transport blood throughout the body.
  - transport gasses throughout the body.
  - transport nutrients and waste products throughout the body.
  - all of the above.
- 97.** The amount of force blood exerts against the walls of the blood vessels is referred to as
- heart rate.
  - blood pressure.
  - pulse.
  - diastole.
- 98.** Which of the following represents the correct flow of air in the human respiratory system?
- nose → trachea → pharynx → alveoli → bronchi
  - nose → trachea → pharynx → bronchi → alveoli
  - nose → pharynx → trachea → bronchi → alveoli
  - nose → pharynx → trachea → alveoli → bronchi
- 99.** In humans, organic molecules taken in as food must be transformed into a usable form through the process of
- eating.
  - nutrition.
  - metabolism.
  - digestion.
- 100.** Which of the following macromolecules represents the most basic, direct form of energy in humans?
- carbohydrates
  - lipids
  - proteins
  - vitamins
- 101.** During digestion, proteins are broken down into
- protons.
  - nucleic acids.
  - amino acids.
  - sugars.

- 102.** In the human digestive system, the primary site of digestion and absorption is the
- A. stomach.
  - B. small intestine.
  - C. large intestine.
  - D. liver.
- 103.** The primary functional unit of the human excretory system is the
- A. colon.
  - B. rectum.
  - C. bladder.
  - D. kidney.
- 104.** Chemical coordination of the systems in the human body is controlled by hormones produced in a series of glands that make up the
- A. hormonal system.
  - B. nervous system.
  - C. endocrine system.
  - D. circulatory system.
- 105.** In humans, the hormone responsible for regulating glucose metabolism is
- A. insulin.
  - B. thyroxine.
  - C. adrenaline.
  - D. androgen.
- 106.** In the human reproductive system, fertilization takes place in the
- A. vagina.
  - B. cervix.
  - C. uterus.
  - D. fallopian tube.
- 107.** The central nervous system in humans consists of
- A. the brain and spinal cord.
  - B. the forebrain and hindbrain.
  - C. the spinal cord and the nerves extending from the spinal cord.
  - D. the brain and peripheral nerves.
- 108.** The part of the human brain involved in the coordination of vision, hearing, speech, and smell is the
- A. cerebellum.
  - B. cerebrum.
  - C. medulla.
  - D. hypothalamus.
- 109.** The number of kilocalories needed by the human body to carry out normal metabolic activity (breathing, heartbeat, temperature regulation) is referred to as the
- A. resting heart rate.
  - B. resting pulse rate.
  - C. sedentary blood pressure.
  - D. basal metabolic rate.
- 110.** Fat is a necessary component of the human diet because it serves to
- A. aid in the metabolism of vitamins A, D, and E.
  - B. protect the internal organs from injury.
  - C. insulate the body from cold temperatures.
  - D. all of the above.
- 111.** When a person's diet is lacking certain nutrients, resulting in one or more deficiencies, that person is considered to be
- A. starving.
  - B. undernourished.
  - C. malnourished.
  - D. impoverished
- 112.** Part of the human body's defense system against pathogens and infectious agents is the production of macrophages which function by
- A. producing specific antibodies to invading organisms.
  - B. phagocytizing (engulfing and destroying) pathogens and infectious agents.
  - C. attacking microorganisms and inhibiting their reproduction.
  - D. producing chemicals that kill invading microorganisms.

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- 113.** Vaccines are usually quite effective because they
- A. act as antigens.
  - B. stimulate the primary immune response.
  - C. stimulate the secondary immune response.
  - D. all of the above.
- 114.** Which of the following statements regarding antibiotics is incorrect?
- A. Antibiotics interfere with the growth and development of bacteria.
  - B. Antibiotics are only effective against bacteria.
  - C. Antibiotics are effective against bacteria, viruses, and other infectious agents.
  - D. Many bacterial strains have developed resistance to commonly used antibiotics.
- 115.** Symptoms such as anemia, vision problems, and bone deformities can be caused by deficiencies of
- A. specific fats.
  - B. specific proteins.
  - C. specific carbohydrates.
  - D. specific vitamins.
- 116.** The organ in the human body that is composed primarily of lymph node tissue and is the site where red blood cells are destroyed is the
- A. liver.
  - B. pancreas.
  - C. gall bladder.
  - D. spleen.

## Reading Comprehension

**Directions:** Read each of the following passages and answer the questions that follow.

### Passage 1

- (1) With the cloning of Dolly, the sheep, in 1997, speculators believed that such scientific breakthroughs would soon apply to cells in the human body. Soon afterwards, investigators reported isolating for the first time, human embryonic cells that have the potential to develop into muscle, blood, nerves or any other tissue cell in the human body. In fact, these types of cells are called totipotent because of their multiple possibilities. With these mother cells, scientists may someday create many sorts of tissues to treat conditions such as spinal cord injuries, diabetes, leukemia, and even the neurodegenerative disorders like Parkinson's disease.
- (2) To understand the development of human embryos and to generate tissue for transplantation, several research teams had searched for human embryonic stem cells with no success. They initially tried to separate human blastocysts, clusters of 100 or so cells that constitute a stage of embryonic development. When this didn't work, the scientists collected primordial germ cells, the cells that give rise to sperm and eggs. Grown under certain conditions, these cells come to resemble stem cells derived from blastocysts. These cells were kept alive

for more than seven months. These cells are shaped like embryonic stem cells, carry several of the same surface proteins and make telomerase, an enzyme thought to keep stem cells virtually immortal. They can spontaneously form embryoid bodies, clusters of differentiated cells also formed by embryonic stem cells.

- (3) Debate continues over whether primordial germ cells are the equivalent of blastocyst-derived stem cells. As germ cells develop into sperm or eggs, some genes receive a sex-specific chemical imprint that governs their activity during development. This imprinting may compromise the use of such cells as stem cells. However, if efforts prove successful with human embryonic stem cells that generate blood stem cells, they could eliminate the use of bone marrow tissues or umbilical cord blood to treat blood disorders such as leukemia.

- 117.** The reason for calling the cells "totipotent" is
- A.** They come from all parts of the body such as muscles, blood, and nerves.
  - B.** They are very powerful in regenerating diseased tissue.
  - C.** They can be used directly to treat many conditions and injuries.
  - D.** They become the mother cells, which can create tissues that have many possibilities.

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- 118.** Blastocysts are
- A. cells that were kept alive for over seven months.
  - B. another name for primordial germ cells.
  - C. cells at a certain beginning stage of development.
  - D. any group of more than 100 cells.
- 119.** Scientists became interested in primordial germ cells because
- A. They give rise to sperm and eggs.
  - B. They can resemble blastocysts.
  - C. They will live for a long time.
  - D. It is easy to cultivate them.
- 120.** The most important aspect of the germ cells is
- A. their shape.
  - B. their size.
  - C. the fact that they have proteins.
  - D. the fact that they have enzymes.
- 121.** Germ cells and stem cells both
- A. form embryoid bodies.
  - B. form clusters of differentiated cells.
  - C. form spontaneously.
  - D. all of the above.
- 122.** The use of the word “compromise” in the last paragraph best means
- A. restrict.
  - B. enhance.
  - C. differentiate.
  - D. compliment.
- 123.** The author’s attitude about cloning can best be described as
- A. optimistic about future discoveries.
  - B. skeptical about the application of this discovery.
  - C. curious about the ethics of the discovery.
  - D. cynical about testing on human cells.

## Passage 2

- (1) The old adage “Early to bed, early to rise, makes a man healthy, wealthy, and wise” may be more true than people think. Recent interest in the power and importance of sleep has revealed that a good night’s sleep “wakes up” your mind and increases your brain power. Scientists have discovered that sleep deprivation causes changes in the brain that are almost identical to those that occur naturally in people in their seventies and eighties. These changes, which are in the hardworking frontal part of the brain’s cortex, affect decision-making and the ability to absorb and adapt to new information. People who are affected tend to talk more in clichés and become more rigid in their thinking. A young intern in a hospital, after a long shift, could easily make a mistake if a patient comes in with unexpected symptoms that stretch and challenge his deductive powers.
- (2) Thus, it is important for employers to ensure that their staff does not work exhaustively long hours. Even a power nap in a workplace sleep zone could help in a crisis.
- (3) However, there is good news with this research for those worrying about the decline of brainpower. You don’t have to spend time reading extremely weighty books or doing crossword puzzles in order

to keep your mental acumen. It is more important to bombard your mind with information that is interesting to you—whether it be sightseeing, going to art galleries, surfing the Net, or window-shopping. The latest studies show that other parts of the brain take over from the declining frontal cortex during sleep to reorganize the fresh information gathered during the day. New neural connections are forged during the first hours of sleep.

(4) Thus, for most people, a good night's sleep will restore their brains to full power.

- 124.** It can be inferred from this passage, that as one grows older, one's brain
- A. has more power to connect to ideas that have accumulated over time.
  - B. takes more time to hear the information that is being given.
  - C. places new information into very specific categories.
  - D. allows one to think creatively.
- 125.** A sleep-deprived intern might misdiagnose a patient's condition because the intern
- A. has fallen asleep.
  - B. can't remember details of the symptoms.
  - C. can't recognize and apply similar symptoms to ones in the medical textbook.
  - D. is irritable and doesn't want to take extra time to figure out challenging solutions.
- 126.** The best reason for employers to have places for employees to rest on break is that
- A. even short naps can rejuvenate people.
  - B. their snoring won't annoy those who are working.
  - C. the brain can only rest if the person is lying down.
  - D. quiet places help lower a person's heart rate.
- 127.** In the second paragraph, the term "mental acumen" most closely means
- A. memory.
  - B. sharpness of intellect.
  - C. good vocabulary.
  - D. ability to do math problems.
- 128.** According to this passage, if you were a sports enthusiast, an effective way to maintain your mental acumen would be to
- A. read *Sports Illustrated*.
  - B. read the *Wall Street Journal*.
  - C. read *TV Guide*.
  - D. do crossword puzzles.
- 129.** Which of the following statements is NOT supported by the text?
- A. Other parts of the brain can take over the role of the front of the brain.
  - B. The best sleep that you get is at the beginning of your cycle.
  - C. Your frontal cortex is important to your daytime thinking.
  - D. Once your brain is fatigued, those cells are never rejuvenated.
- 130.** The main idea of this passage is
- A. Healthy brain function is dependent on your frontal cortex.
  - B. Active people have higher intelligence levels.
  - C. Rest is a medicinal activity.
  - D. Certain activities are better for your mental health than others.

### Passage 3

(1) The Greeks believed that everything should be done in moderation. Thus, even exercise can be bad for your health. There is a pattern that is repeated every year after the holiday months of November and December. Overeating and excessive drinking during this period is followed by a nationwide

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fitness drive. Just examine the newspaper sales ads for all the diet and exercise aids. Slim-Fast and Atkins products are splashed across magazine pages with interim advertisements for those ab toners and treadmills. However, health experts are warning people to avoid the trap of “binge exercising,” which can lead to injury and disillusionment.

- (2) Over-exercising can damage muscles and bones that may heal in a matter of weeks, but the damaged self-confidence may last for years. One of the most common injuries is stress fractures, which are extremely painful hairline breaks. Bones need to be strengthened gradually over time. Ones that are too weak to take the strain of new, repetitive exercise can split in as little as two or three weeks of a new exercise regimen. Furthermore, sporadic exercise of any type might increase levels of bad cholesterol. Studies have shown that although regular exercise protects the body by increasing the number of cholesterol-fighting molecules, short bursts of activity either had no effect or made it rise.

- (3) The recommendation for introducing a new exercise program suggests moderate exercise for 30 consecutive minutes five times a week. Moderate exercise, which leaves you slightly breathless but not in discomfort, includes brisk walking, cycling, and even gardening. Although gym membership is expensive, it can be a good investment because it offers

exercise in a controlled way. You cannot change the effects of overindulgence in a day. The secrets of success are patience and realistic expectations.

- 131.** The reference to “moderation” in the first sentence implies
- A. that it is not good to be the champion of anything.
  - B. that people waste their talents by trying to succeed and then fail.
  - C. that too much of even a good thing can be bad.
  - D. that it is healthy to drink only a little at a time.
- 132.** The purpose of mentioning Slim-Fast and Atkins is
- A. to compare effective weight loss plans.
  - B. to advertise for the companies.
  - C. to suggest ways to loss weight in moderation.
  - D. to give examples of the yearly cycle.
- 133.** “Binge exercising” means
- A. only exercising in random bursts of energy.
  - B. eating and then exercising immediately afterward.
  - C. exercising during the month of January.
  - D. exercising once a week.
- 134.** A “stress fracture” is
- A. a very small, hardly noticeable break in a bone.
  - B. an emotional breakdown.
  - C. a cut near your scalp.
  - D. a laceration to your skin.
- 135.** The study that shows that exercise can release cholesterol-fighting molecules
- A. does not fully support binge exercising.
  - B. is an important factor in weighing the results of binge exercising.
  - C. is irrelevant to this article.
  - D. supports the idea that any type of exercise is healthy.

- 136.** Gym membership is advocated because
- A. It helps the economy.
  - B. It gives you more choices of types of exercises.
  - C. It encourages a controlled approach to exercise.
  - D. It provides you with company while you exercise.
- 137.** The author's attitude about exercise in this article can best be described as
- A. guarded because not all exercise is good.
  - B. enthusiastic because exercise makes you fit and healthy.
  - C. objective because the type of exercise that is best is up to the individual.
  - D. cautionary because people need to diet along with exercise.

### Passage 4

(1) The discovery in the 1990s that other stars have planets orbiting around them raised the assumptions that the processes that led to the formation of these planets in our solar system would naturally operate in other locales. What is also fascinating is that other solar systems could exhibit many exotic architectures. Searches turned up planets that went around pulsars and super-Jupiters orbiting their stars at Mercury-like distances. In our own solar system, we know that the sun is about halfway through its 12-billion-year "main sequence" phase. This phase will end when the sun exhausts its supply of useable hydrogen fuel. Then, it will expand about 100 times its present diameter, entering a stage of evolution called a red giant. The effect that

this will have on its surrounding environment will be intense heat, strong enough to consume neighboring planets. Through the observation of the evolution of stars in different stages, scientists are predicting what will happen to the solar system when the sun goes red. These stellar calculations involve knowledge about nuclear fusion rates that control the rate of energy generation in the sun's core and the response of the sun's outer layers to those internal processes. Furthermore, by using the luminosity projections of the red giant sun and the reflectivity of the planet, the approximate surface temperature of the planet around the sun can be determined. It's important to know this reflectivity, or albedo, because it tells how much energy the planet can absorb and what its approximate temperature will be.

(2) There are other factors that can affect the planet's temperature. Scientists question the degree of internal activity in the planet along with the degree to which its atmosphere produces the greenhouse effect. Mars's atmosphere has minuscule effects, but Venus's is most severe. Furthermore, during this red giant phase, the star loses much of its mass that then causes planets to be bound less tightly to their stars. They continue to move greater distances as the star loses mass. The cozy, warm

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kind of “habitable zone” around each star will move outward as the star gets older, moving from the inner to the outer solar system. This means that the possibility of a habitable planetary abode in any given system depends on what phase of evolution the system’s star is in.

(3) The kinds of celestial worlds that were discovered in the 1990s differ from those in our own home system. Therefore, the possibilities of other galaxies sporting life are definitely plausible as long as scientists realize that the type of life might be different.

- 138.** The first sentence of this passage implies
- A. that the fact that other planets have stars might indicate that there might be life on other planets.
  - B. that all planets are formed the same way.
  - C. that all planets have stars.
  - D. that stars are an important influence on a planet’s development.
- 139.** The reference to “exotic architecture” in the second sentence mostly closely means
- A. that other planets might have very strange buildings on them.
  - B. that other planets can contain rock formations or accumulations of mass that are unfamiliar to earthlings.
  - C. that tropical rainforests can be found on them.
  - D. that their atmosphere will not tolerate the same types of houses that we, on Earth, have.
- 140.** It is important to understand nuclear fusion rates because
- A. It tells us when the star becomes a red giant.
  - B. It will reveal the luminosity of the sun.
  - C. It will indicate how much the star will expand.
  - D. It determines energy rates within the core of the sun.
- 141.** Albedo is
- A. the measurement of reflectivity of the sun to the planet.
  - B. the luminosity of the sun to the planet.
  - C. the heat reflectivity of the planet to the sun.
  - D. the measurement of the heat and reflectivity of both the sun and the planet to other planets in the solar system.
- 142.** Planets that are in the red giant phase
- A. are becoming larger so they spread out more in the solar system.
  - B. are becoming smaller so they compact together and become smaller in the solar system.
  - C. Lose mass and therefore become further apart from their stars
  - D. become very bright and are seen more clearly than their stars.
- 143.** Knowing the “habitable zone” means
- A. identifying the phase of evolution of the star.
  - B. selecting the type of life on a planet.
  - C. indicating the size of the planet in relation to its star.
  - D. categorizing the type of nuclear fusion that is happening.
- 144.** Which of the following conclusions are supported by the passage:
- I. Knowing the albedo and habitable zone can help scientists determine the type of life form on other planets.
  - II. The greenhouse effect along with nuclear fusion rates will help determine the distance a star is from its plant.
  - III. The kind of life supported on other planets is determined by the phase of evolution of the red giant.
  - IV. Because of the greenhouse effect, Mars is more likely to have life than Venus is.
- A. only I
  - B. only II
  - C. only II and IV
  - D. only I, II and III

**Passage 5**

(1) The movie *Jurassic Park* is science-fiction. DNA from animals over 50,000 years ago cannot be reliably recovered. However through the power of the computer and virtual reality, researchers have demonstrated that computers can reconstruct with 98% accuracy the DNA of a creature that was a contemporary of the dinosaurs—a small, furry, nocturnal animal. Knowing the mammal’s complete genome—the sequence of As, Cs, Ts, and Gs in the DNA that made up its chromosomes—does not mean that scientists can bring the creature to life. It does mean, however, that this information can help scientists explore the evolution of human and other mammals at the molecular level. It can be called a kind of DNA-based archaeology of comparative genomics. Scientists believe that much more can be learned from this type of research than from the comparative studies of living species such as the mouse, the rat, or the chimpanzee. For instance, if a DNA sequence in the human genome is missing in the corresponding place in the mouse genome, it is uncertain whether that DNA was inserted in the evolution of humans from the mammalian ancestor or deleted in the evolution of mice. If an ancestral genome is available, the ambiguity disappears.

(2) Based on a huge amount of data from research analysis of genomic sequences from any different vertebrate species, an artificial evolutionary tree was created with a massive software program. The software program was able to simulate mammalian evolution on the molecular level. This resulted in simulated modern DNA sequences for 20 different species. Then, the reconstruction procedure was used to create an ancestral sequence. This used no information from the simulated process. When the two were compared, there was a 98% accuracy. To do a complete reconstruction of the ancestral mammalian genome, there would have to be additional genome sequencing. However, if this were accomplished, there would be not only new insights into the core biology that all mammals share but also the unique traits that define each species.

- 145.** The reference to *Jurassic Park* sets the tone
- A.** that information about that period is highly speculative.
  - B.** that movies take liberties about scientific discoveries.
  - C.** that information about dinosaurs is very unreliable.
  - D.** that it is an important document about DNA retrieval.

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- 146.** Understanding and identifying an animal's complete genome
- A. does not mean that the creature can be replicated under similar circumstances.
  - B. means that you have the effective blueprints for re-creation of that creature.
  - C. is the basis of determining nocturnal animals of prehistoric times.
  - D. does not mean that you have the sequence of the chromosomes.
- 147.** The basic reason why scientists believe that computer-generated DNA archeology is better than comparative live species study is
- A. because computers can overcome human error.
  - B. because missing elements could be contingent on an insertion of DNA in one species or the deletion of DNA in the other species along the evolutionary line.
  - C. because even though there are similarities among rats, chimpanzees, and humans, they are not exactly alike.
  - D. because computers are faster and more objective in their findings.
- 148.** The most important data in creating an artificial evolutionary tree is
- A. the genome sequences.
  - B. understanding of mammalian ancestry.
  - C. blood samples from ancient mammals.
  - D. chromosome mapping.
- 149.** Statistics were used in this passage to
- A. present the effectiveness of a computer-generated study.
  - B. show the averages of human error.
  - C. explain how DNA typing works.
  - D. convince you that *Jurassic Park* was a movie based on inaccuracy.
- 150.** The end of this passage implies
- A. that this type of study can only be taken to a certain level before it no longer works.
  - B. that this type of study can lead to changes in existing understandings of species.
  - C. that it would take too long to bring this type of study up to date.
  - D. that this type of study would be beneficial in supporting existing hypotheses.

- 151.** The tone of this passage is
- A. critical of movies that misrepresent scientific facts.
  - B. supportive of research done by computers.
  - C. amazed at the extent to which genome sequencing has led to discoveries.
  - D. relieved that a reliable source of study is available through DNA archeology.

### Passage 6

- (1) On December 26, 2004, at 7:58 A.M., an earthquake in the middle of the ocean set off a devastating tsunami that wreaked death and havoc in over seven countries. The hardest hit was the island of Sri Lanka where over 30,000 people were killed. India and Thailand were the next worst hit. A total of over 125,000 people were killed in this disaster. Like no other natural disaster in living memory, the Asian tsunami induced a planetary torrent of sorrow along with a torrent of questions and concerns: Could people have been forewarned, and could it happen again?
- (2) Geologists describe the tectonics, the almost imperceptibility slow movement of the massive plates, of the southern floor of the Indian Ocean as the Indian plate moving north at around 2.5 inches per year. This is about twice the rate that your fingernails grow. As it moves, it is forced under the Burma plate to its east. Eighteen miles below the surface of the ocean, stresses that had been gradually accumulating forced the Burma plate to snap

upward. This earthquake measured 9.0 on the Richter scale, happened over a length of 745 miles, and within three days had set off 68 aftershocks.

- (3) The movement of these plates sent shock waves through the water. Although the tsunamis are often called tidal waves, they have nothing to do with tides. They are, instead, very long waves, sometimes with hundreds of miles between their crests that race along the ocean at speeds that exceed 500 miles an hour. In open water, the height of the waves is not very noticeable, no more than a few inches. But when the water's depth decreases, the wavelengths shorten and the height of the wave increases. Then it crashes into the shore with the power to wreck buildings and throw trucks as if they were toys. Furthermore, there is a trick to this natural horror. If the trough of the wave hits the shore before a crest, the first thing that anyone on shore notices is not water rushing onto the land but the opposite. The sea rushes out so the beach becomes magically gorgeous with the colorful, stranded fish. What happens next is the onslaught of the next wave, which will hit with deadly force. There is no estimate of how many lives could have been saved if there had been previous warning. However, the United Nations plans to link all the countries in South and Southeast Asia with the Pacific Ocean network that alerts countries like

Japan, Australia, and the United States when tsunamis pose risks to their territories.

- 152.** A tsunami is
- A. an earthquake.
  - B. a devastating high tide.
  - C. a torrential rainstorm.
  - D. a series of tremendous waves.
- 153.** Tectonics in the second paragraph is best described as
- A. underground rumblings of a volcano.
  - B. shifts in the ocean currents.
  - C. the movement of plates on the Earth's surface.
  - D. the irregular movement of tides.
- 154.** Tidal waves is an erroneous term for tsunamis because
- A. They don't affect the tides.
  - B. Tides don't happen at the same time.
  - C. They aren't controlled by the tides.
  - D. They have nothing to do with the tides.
- 155.** In the open water, tsunamis
- A. travel less than 500 miles an hour.
  - B. travel in very close groups of undulating waves.
  - C. have an unnoticeable height.
  - D. increase in length and height as the depth of the water decreases.
- 156.** Which of the following statements is true?
- A. The trough can be more deadly than the crest.
  - B. When you see colorful fish on the sand, you know that you are safe.
  - C. The trough indicates that the danger has passed.
  - D. Tsunamis hit the coasts in the same pattern each time.

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- 157.** The last sentence of this passage indicates
- A. that the danger of the tsunamis is their unpredictability.
  - B. that all lives can be saved with adequate warning.
  - C. that cooperation among countries will increase the viability of an early warning system.
  - D. that the United Nations should not get involved in this type of scientific problem.
- 158.** The purpose of this article was
- A. to encourage people to be more aware of global problems.
  - B. to raise questions about the prevention of further disasters.
  - C. to praise the concern of the world for the victims of the tsunamis.
  - D. to educate tourists about tsunamis.

### Passage 7

- (1) In December 2002, in Fort Myers, Florida, over 3,000 people met in the convention center to protest federal restrictions on waterfront development. These people felt that their basic rights were being violated. They did not have the freedom to use land as they wished. Since land in Florida is at a premium, especially on the intercoastal waterway, which is a superhighway for boats, these people wanted their voices to be heard. On the other hand, the government's concern is to safeguard the chubby marine mammal known as the manatee. These sea cows inhabit the many bays, canals, and rivers of Florida. The primary cause of death of these slow-moving creatures is accidents with boats. They were placed on the endangered species list in 1967.

Boaters and developers argue that these mammals have rebounded in numbers, but their protectors maintain that they are just holding their own.

- (2) These creatures are certainly not beautiful, yet they endear themselves to many. Their body looks like a dumpling with a paddlelike tail and a squint like Mr. Magoo's. An average adult is about 10 feet long and weighs 1,000 pounds. The animals tend to be solitary, except when mating or when cold weather prompts them to huddle near the warm springs or power plant discharge pipes. Like seals and walruses, manatees breathe through their snouts. They surface to take breaths every three or four minutes. Manatees eat mostly aquatic vegetation and have even been seen hauling themselves onto lawns to munch the grass. Because of this grazing, they have been given the bovine nickname. They usually swim no faster than 5 miles an hour, although they can sprint nearly three times as fast.
- (3) Although manatees once ranged from the Carolinas to the west coast of Africa, now they stay in the warmer waters. People once killed the manatees for their succulent meat, but even as early as the 1700s, there was recognition of their decreasing numbers. One of Florida's founding fathers, Frederick Morse, put a ban on the hunting of these mammals in 1893. Then, the major threat to their lives was the increase of boating accidents. Boat

hulls and keels crack manatees' skulls and ribs. The many scars on the animal's hide are nearly as distinctive as a fingerprint and constitute a way of identifying each individual creature. Even though these creatures are not vicious, because of man's encroachment on the waterways, their existence is constantly in peril. Proponents of expansion feel that these animals are no longer in danger and are, in fact, encroaching upon man's territory. Thus, the solution to the problem would be the development of a symbiotic relationship between man and mammal.

- 159.** The purpose of the 3,000 people at the convention center was
- A. to protest the endangerment of the manatees.
  - B. to voice their concern about the inability to develop land.
  - C. to complain about the intrusion of government on local politics.
  - D. to encourage people to get out and vote.
- 160.** The biggest threat to manatees is
- A. dwindling food supplies.
  - B. polluted waterways.
  - C. accidents from boats.
  - D. human diseases carried in the water.

- 161.** Manatees are most like
- A. whales because of their enormous size.
  - B. seals because they are cute.
  - C. walruses because they breathe air.
  - D. sharks because they swim slowly.
- 162.** They are nicknamed sea cows because of
- A. how they look.
  - B. how they eat.
  - C. how they swim.
  - D. how they reproduce.
- 163.** The scars on their backs indicate
- A. how old they are.
  - B. how aggressive they have been.
  - C. what diseases they have had.
  - D. how many injuries from boats have happened.
- 164.** Scientists can best label individual manatees through
- A. their feeding habits.
  - B. their scar patterns.
  - C. their dorsal fins.
  - D. their swimming style.
- 165.** The author's purpose of this passage was to
- A. present a compelling reason for outlawing boats on the waterway.
  - B. criticize developers for their avarice.
  - C. propose solutions to the dilemma.
  - D. explain the information behind a heated issue.

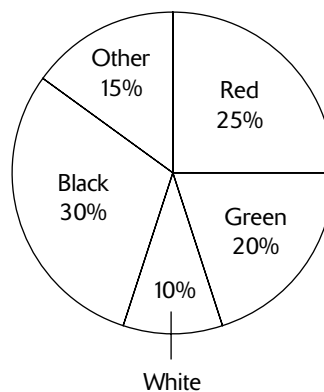
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## Quantitative Ability

**Directions:** Read each of the questions and select the choice that answers the question.

- 166.** A bread recipe calls for  $3\frac{1}{4}$  cups of flour. If you only have  $2\frac{1}{8}$  cups, how much more flour is needed?
- A.  $1\frac{1}{8}$   
B.  $1\frac{1}{4}$   
C.  $1\frac{3}{8}$   
D.  $1\frac{3}{4}$
- 167.** There are 72 freshmen in the band. If freshmen make up  $\frac{1}{3}$  of the entire band, the total number of students in the band is
- A. 24  
B. 72  
C. 144  
D. 216
- 168.** Rae earns \$8.40 an hour plus an overtime rate equal to  $1\frac{1}{2}$  times her regular pay for each hour worked beyond 40 hours. What are her total earnings for a 45-hour workweek?
- A. \$336  
B. \$370  
C. \$399  
D. \$567
- 169.** Davis donates  $\frac{4}{13}$  of his paycheck to his favorite charity. If he donates \$26.80, what is the amount of his paycheck?
- A. \$8.25  
B. \$82.50  
C. \$87.10  
D. \$348.40

- 170.** One phone plan charges a \$20 monthly fee and \$0.08 per minute on every phone call made. Another phone plan charges a \$12 monthly fee and \$0.12 per minute for each call. After how many minutes would the charge be the same for both plans?
- A. 60 minutes  
B. 90 minutes  
C. 120 minutes  
D. 200 minutes



- 171.** Heidi tallied the different car colors in the parking lot and summarized her results in a pie chart. There are 260 cars in the lot. How many cars are either red or black?
- A. 65  
B. 78  
C. 130  
D. 143
- 172.** A cylinder whose height is 8 inches has a volume of  $128\pi\text{cm}^3$ . If the radius is doubled and its height is cut in half, the volume of the resulting cylinder is
- A.  $64\pi\text{cm}^3$   
B.  $128\pi\text{cm}^3$   
C.  $256\pi\text{cm}^3$   
D.  $512\pi\text{cm}^3$

173. What is the value of  $\log_2 16$ ?

- A. 2
- B. 4
- C. 8
- D. 32

174. The scale on a map shows 500 feet for every  $\frac{1}{4}$  inch. If two cities are 6 inches apart on the map, what is the actual distance they are apart?

- A. 125 feet
- B. 750 feet
- C. 2,000 feet
- D. 12,000 feet

175. One gallon of paint covers 400 square feet. How many gallons are needed to cover 2,225 square feet?

- A. 5 gallons
- B. 6 gallons
- C. 7 gallons
- D. 8 gallons

176. Max weighs 209 pounds. If he loses 2 pounds per week, how much will he weigh in 7 weeks?

- A. 191 pounds
- B. 195 pounds
- C. 202 pounds
- D. 207 pounds

177. Kyle ran 3 miles in  $17\frac{1}{2}$  minutes on Saturday,  $4\frac{1}{2}$  miles in 22 minutes on Sunday, and 2 miles in 9 minutes on Monday. What was Kyle's average rate of speed while running?

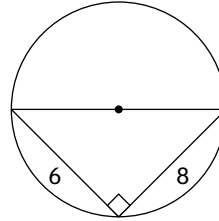
- A. 1.6 minutes per mile
- B. 5.1 minutes per mile
- C. 16.2 minutes per mile
- D. 17.8 minutes per mile

178. If  $f(x) = 9^x$ , then  $f\left(\frac{1}{2}\right) =$ .

- A. 1
- B. 3
- C.  $4\frac{1}{2}$
- D. 18

179. If  $a = \frac{5}{2}$  then  $\frac{1}{a} =$

- A. 2
- B. 5
- C.  $\frac{2}{5}$
- D.  $\frac{5}{2}$

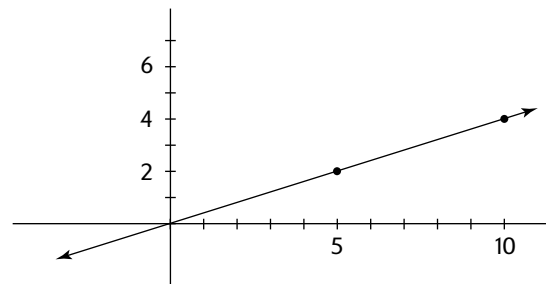


180. Find the length of the radius in the above figure.

- A. 3
- B. 4
- C. 5
- D. 10

181. If  $\sin a > 0$  and  $\cos a < 0$ , then  $\angle a$  must lie in which quadrant?

- A. I
- B. II
- C. III
- D. IV

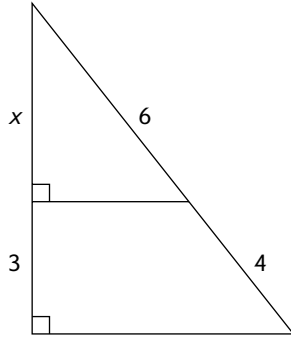


182. The slope of the line shown in the above figure is

- A.  $-\frac{2}{5}$
- B.  $-\frac{5}{2}$
- C.  $\frac{2}{5}$
- D.  $\frac{5}{2}$

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- 183.** What is the value of  $\left(\frac{9}{4}\right)^{-\frac{1}{2}}$ ?
- A.  $-\frac{2}{3}$
  - B.  $\frac{16}{81}$
  - C.  $\frac{2}{3}$
  - D.  $\frac{3}{2}$
- 184.** If  $\log_5 x = 0$ , then  $x =$
- A. 0
  - B. 1
  - C. 5
  - D. 10
- 185.** If  $2^{b+3} = \frac{1}{8}$ ,  $b =$
- A. -6
  - B. -3
  - C. 0
  - D. 2
- 186.** If  $y = 3x - 7$ , then  $\frac{dy}{dx} =$
- A. -7
  - B. -4
  - C. 3
  - D.  $3x$
- 187.** What is the  $x$ -coordinate of the minimum value of  $y = x^2 - 4x + 3$ ?
- A. -2
  - B. 0
  - C. 2
  - D. 3
- 188.** Which expression represents the volume of a cylinder whose height is equivalent to the length of the radius?
- A.  $\pi r^2$
  - B.  $\pi r^3$
  - C.  $(\pi r)^2$
  - D.  $(\pi r)^3$
- 189.** Jack lives  $6\frac{1}{2}$  miles from the library. If he walks  $\frac{1}{3}$  of the way and takes a break, what is the remaining distance to the library?
- A.  $5\frac{5}{6}$  miles
  - B. 4 miles
  - C.  $4\frac{1}{3}$  miles
  - D.  $2\frac{1}{6}$  miles
- 190.** A square garden is to be built inside a circular area. Each corner of the square touches the circle. If the radius of the circle is 2, how much greater is the area of the circle than the square?
- A.  $4 - 4\pi$
  - B.  $4 - 8\pi$
  - C.  $4\pi - 4$
  - D.  $4\pi - 8$
- 191.** Which of the following values of  $x$  is a solution of the equation  $\cos x = -1$ ?
- A.  $x = 0^\circ$
  - B.  $x = 90^\circ$
  - C.  $x = 180^\circ$
  - D.  $x = 270^\circ$
- 192.** There are 800 employees at a company. If 60% drive to work and 30% take the train, how many employees arrive to work by car?
- A. 240
  - B. 480
  - C. 540
  - D. 600
- 193.** If  $c^{\frac{3}{2}} = 8$ , what is the value of  $c$ ?
- A. 2
  - B. 4
  - C. 16
  - D. 64



194. Find the value of  $x$  in the above figure:

- A. 4.5
- B. 4.8
- C. 5
- D. 5.2

195. Yan can read two pages in three minutes. At this rate, how long will it take him to read a 360-page book?

- A. 30 minutes
- B. 2 hours
- C. 6 hours
- D. 9 hours

196.  $y(x) = \frac{1}{x}$ , then  $y'(x) =$

- A. 1
- B.  $\frac{1}{x^2}$
- C.  $-\frac{1}{x^2}$
- D.  $-x^2$

197. The sum of  $\sqrt{50} + 3\sqrt{72}$  is

- A.  $4 + \sqrt{122}$
- B.  $4\sqrt{122}$
- C.  $7\sqrt{2}$
- D.  $23\sqrt{2}$

198. Evaluate  $3r^3 - 2s^2 + t$  if  $r = -1$ ,  $s = -2$ , and  $t = -3$ .

- A. 2
- B. 4
- C. -8
- D. -14

199. If  $\log C = 10$  and  $\log D = 5$ , then  $\log \frac{C}{D} =$

- A.  $\frac{1}{2}$
- B. 2
- C. 5
- D. 15

200. What is the value of  $(\sqrt{7}^\pi)^{-\frac{2}{\pi}}$ ?

- A.  $\frac{1}{7}$
- B. 7
- C.  $7\pi$
- D.  $49\pi$

201. The product of the square of  $x$  and three less than  $x$  is

- A.  $\sqrt{x}(x-3)$
- B.  $\sqrt{x}(3-x)$
- C.  $x^2(x-3)$
- D.  $x^2(3-x)$

202. The expression  $\tan\theta \cos\theta \csc\theta$  is equivalent to

- A. 1
- B.  $\sin\theta$
- C.  $\tan\theta$
- D.  $\sec\theta$

203. Factor  $2a^2 - 4ab + ab - 2b^2$

- A.  $(a+2b)(2a-b)$
- B.  $(a-2b)(2a+b)$
- C.  $(2a-b)(a+2b)$
- D.  $(2a+b)(a-b)$

204.  $-3(-4-5) - 2(-6) =$

- A. 0
- B. -5
- C. 15
- D. 39

205. If  $6m - 2$  is divided by 2, the result is -4. What is the value of  $m$ ?

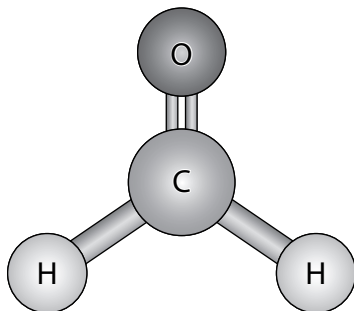
- A. -1
- B. 0
- C. 1
- D. 2

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- 206.** What is the period of the function  $g(x) = 6\sin 2x$ ?
- A. 2
  - B.  $\pi$
  - C. 4
  - D.  $2\pi$
- 207.** If  $x = -3$  and  $y = 2$ , evaluate  $x^{2y}$ .
- A.  $-64$
  - B.  $-81$
  - C. 64
  - D. 81
- 208.** What is the second derivative of  $y = 3x^2 + 5x + 2$ ?
- A. 2
  - B. 5
  - C. 6
  - D.  $6x + 5$
- 209.** One-fourth of the cars purchased at a dealership are luxury models. If 360 luxury models were purchased last year, how many total cars were purchased?
- A. 90
  - B. 250
  - C. 1,440
  - D. 3,600
- 210.** The least common multiple of 8, 12, and 20 is
- A. 4
  - B. 24
  - C. 60
  - D. 120
- 211.** If  $0.08z = 6.4$ , then  $z =$
- A. 0.8
  - B. 8
  - C. 80
  - D. 800
- 212.** What is the slope of the line  $2x + y = 7$ ?
- A.  $-2$
  - B. 1
  - C. 2
  - D. 7
- 213.** Which of the following functions is a solution to the equation  $\frac{dy}{dx} = \sin x$ ?
- A.  $y = -\cos x$
  - B.  $y = \cos x$
  - C.  $y = -\sin x$
  - D.  $y = 5\sin x$

## PCAT Chemistry

**Directions:** Read each of the questions and select the choice that answers the question. To consult the Periodic Table of the Elements, please go to the Appendix.



- 214.** For the molecule shown in the above figure, what will the predominant intermolecular forces be?
- dipole-dipole forces
  - coordinate covalent bonding forces
  - hydrogen bond forces
  - London forces
- 215.** A solution has a pH of 6.0. What is the hydroxide ion concentration of this solution?
- $1 \times 10^{-5}$
  - $1 \times 10^{-6}$
  - $1 \times 10^{-7}$
  - $1 \times 10^{-8}$
- 216.** A reaction results in lower enthalpy and higher entropy. Which of the following four statements can be said of this reaction?
- The reaction will be spontaneous at sufficiently low temperatures.
  - The reaction will be non-spontaneous.
  - The reaction will be spontaneous at sufficiently high temperatures.
  - The reaction will be spontaneous.
- 217.** For the reaction  $2 \text{H}_3\text{PO}_4 (\text{aq}) + 3 \text{Ba}(\text{OH})_2 (\text{aq}) \rightarrow \text{Ba}_3(\text{PO}_4)_2 (\text{aq}) + 6 \text{H}_2\text{O} (\text{l})$ , what volume of 0.2 M phosphoric acid will be required to completely neutralize 100 mL of 0.6 M barium hydroxide?
- 450 mL
  - 100 mL
  - 300 mL
  - 200 mL
- 218.** Of the following functional groups, which is alkaline?
- amines
  - esters
  - amides
  - phenols
- 219.** Keeping volume and the number of moles of gas constant, what will be the effect of doubling the absolute temperature on a container of gas?
- The pressure will decrease by a factor of 2.
  - The pressure will increase by an unknown amount.
  - The pressure will increase by a factor of 2.
  - The pressure will decrease by an unknown amount.
- $$\text{HEME} - \text{CO} + \text{O}_2 \rightleftharpoons \text{HEME} - \text{O}_2 + \text{CO}$$
- 220.** Although carbon monoxide is usually thought to bond permanently to red blood cells, it actually is an equilibrium which, unfortunately, greatly favors the HEME-CO side. This equilibrium can be represented as in the above figure. What conditions will favor replacing the carbon monoxide with oxygen?
- high pressure and high oxygen content
  - low pressure and high oxygen content
  - high oxygen concentration
  - high pressure
- 221.** A saline solution (solution of sodium chloride dissolved in water) will have what property?
- The solution will be either acidic or basic (more information is needed).
  - The solution will be acidic.
  - The solution will be neutral.
  - The solution will be basic.

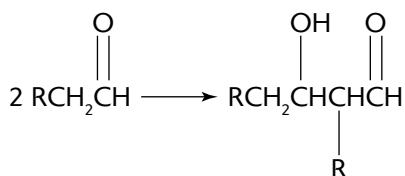
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**222.** In the redox equation  $\text{PbSO}_4(\text{aq}) + \text{Cl}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow \text{Pb}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) + 2\text{HClO}(\text{aq})$ , what is the role being played by lead in the lead (II) sulfate?

- A. the catalyst
- B. the reducing agent
- C. the spectator ion
- D. the oxidizing agent

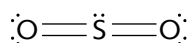
**223.** Of the gases provided, which will diffuse the slowest under identical conditions of T & P?

- A.  $\text{CO}_2$
- B.  $\text{O}_2$
- C.  $\text{H}_2\text{O}$
- D.  $\text{CO}$



**224.** The aldol condensation is important for understanding the behavior of sugars. What aldol will be produced from propanal?

- A. 3,4-dimethyl-2-pentanol-al
- B. 3-methyl-2-hexanol-al
- C. 2-methyl-3-hexanol-al
- D. 2,4-dimethyl-3-pentanol-al



**225.** What is the molecular shape of sulfur dioxide?

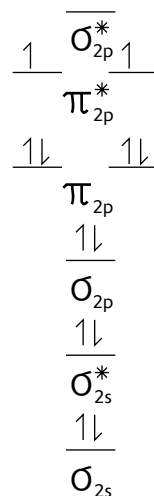
- A. trigonal planar
- B. linear
- C. tetrahedral
- D. bent

**226.** What is the correct formula for ferrous phosphate?

- A.  $\text{Fe}_2\text{PO}_4$
- B.  $\text{Fe}_3(\text{PO}_4)_2$
- C.  $\text{FePO}_4$
- D.  $\text{Fe}_2(\text{PO}_4)_2$

**227.** What is the molecular mass of aluminum carbonate?

- A. 60 g/mol
- B. 234 g/mol
- C. 210 g/mol
- D. 114 g/mol

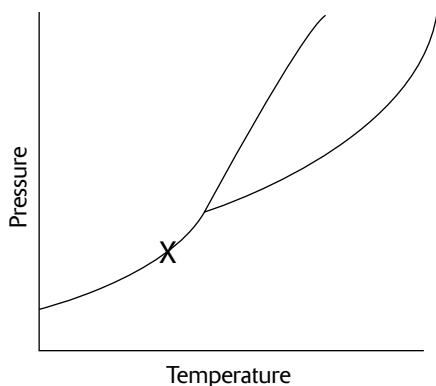


**228.** What is the bond order for the MO diagram shown in the above figure?

- A. 1
- B. 1.5
- C. 2
- D. 3

**229.** What kind of electronic state is represented by the electronic configuration  $1s^2 2s^2 2p^4 3s^1$ ?

- A. forbidden state
- B. atomic state
- C. excited state
- D. ground state

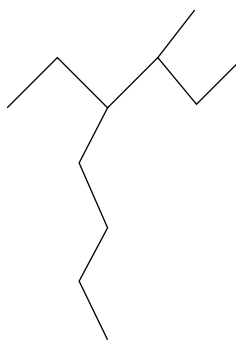


230. On the phase diagram shown in the above figure, what condition is denoted by the *x*?

- A. equilibrium of solid and liquid
- B. equilibrium of solid and gas
- C. equilibrium of liquid and gas
- D. triple point

231. What type of amine is found as an organic salt?

- A. quaternary
- B. tertiary
- C. secondary
- D. primary

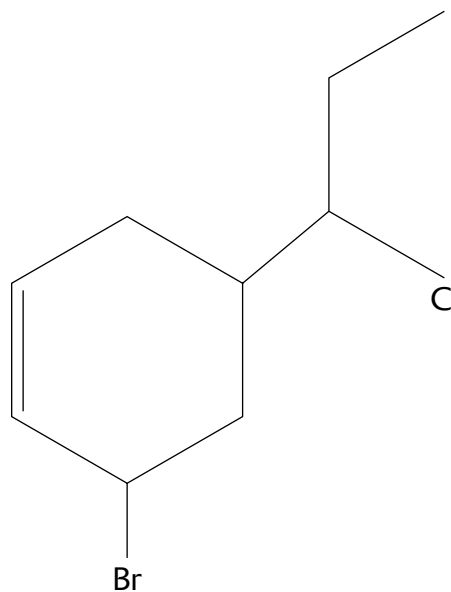


232. What is the correct IUPAC name for the compound shown in the above figure?

- A. 4-ethyl-3-methyloctane
- B. 3-butyl-4-methylhexane
- C. 3-isobutylheptane
- D. 2,3-diethylheptane

233. How would you classify a compound that rotates plane polarized light?

- A. diastereomer
- B. racemic
- C. enantiomer
- D. chiral



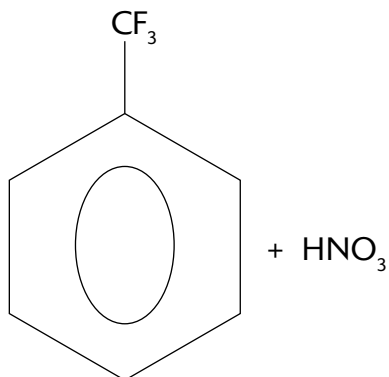
234. The compound shown in the above figure can be formed from what two reactants?

- A. trans-1-bromo-4-chloro-3-ethene-1-hexene and ethene
- B. cis-1-bromo-4-chloro-3-ethene-1-hexene and ethene
- C. trans-1-bromo-1,3-butadiene and 3-chloro-1-pentene
- D. cis-1-bromo-1,3-butadiene and 1-chloro-propene

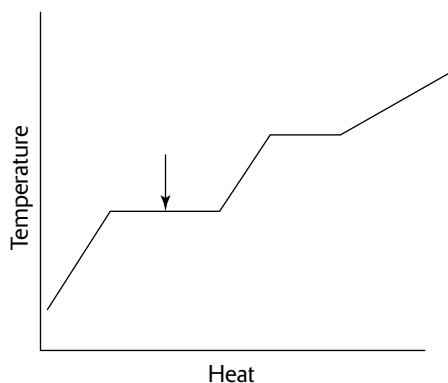
235. What is the ground state electronic configuration of Lu?

- A.  $[\text{Xe}] 6s^2 4f^{14} 5d^1$
- B.  $[\text{Xe}] 6s^2 6f^{14} 6d^1$
- C.  $[\text{Xe}] 6s^2 6d^1 6f^{14}$
- D.  $[\text{Xe}] 6s^2 5d^1 4f^{14}$

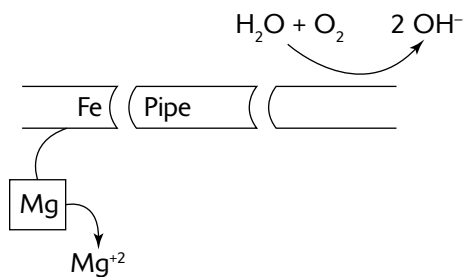
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- 236.** What will be the favored product in the reaction given in the above figure?
- o-nitrotriflourotoluene
  - m-nitrotriflourotoluene
  - p-nitrotriflourotoluene
  - nitrobenzene
- 237.** Of the compounds listed, which can be expected to be the strongest acid?
- 2-flouropropanoic acid
  - propanoic acid
  - More information is necessary before this question can be answered.
  - 1-flouropropanoic acid



- 238.** In the heating curve shown in the above figure, what state or change is designated by the arrow as heat is added to the sample?
- gas state
  - melting transition
  - boiling transition
  - solid state



- 239.** In the above diagram of a pipeline, what is acting as the anode?
- the wire connecting the block of magnesium
  - the iron pipe
  - the water and magnesium
  - the block of magnesium
- 240.** Which of the following is NOT a colligative property?
- osmotic pressure
  - freezing point elevation
  - vapor pressure depression
  - boiling point elevation
- 241.** According to the Lewis-Dot structure, how many lone pairs (or non-bonding pairs) of electrons are around the central element in the polyatomic ion  $\text{IF}_4^{-1}$ ?
- 4
  - 3
  - 2
  - 1
- 242.** Which of the following groups is most highly oxidized?
- ketone
  - carboxylic acid
  - alcohol
  - aldehyde
- 243.** EDTA acts by forming coordination complexes with copper, so the copper is not available to bacteria. Which of the following terms does NOT apply to EDTA?
- ligand
  - Lewis acid
  - chelate
  - polydentate

**244.** What type of chemical reaction is characterized by having more than one reactant, but only one product?

- A. decomposition
- B. addition or combination synthesis
- C. double replacement
- D. single replacement

**245.** Which of the following will NEVER influence solubility?

- A. the polarities of the solvent and solute
- B. changing temperature
- C. stirring
- D. pressure



**246.** What is the correct IUPAC name for the compound in the above figure?

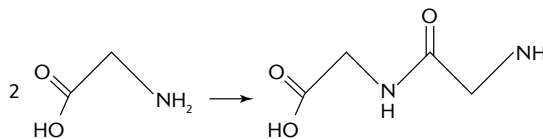
- A. trans R-5-methyl-1,3-heptadiene
- B. trans S-5-methyl-1,3-heptadiene
- C. cis R-5-methyl-1,3-heptadiene
- D. cis S-5-methyl-1,3-heptadiene

**247.** Which carbocation would be most stable?

- A. methyl
- B. secondary
- C. primary
- D. tertiary

**248.** What type of amine is NOT alkaline?

- A. tertiary
- B. primary
- C. quaternary
- D. secondary



**249.** What type of organic reaction is denoted in the above figure?

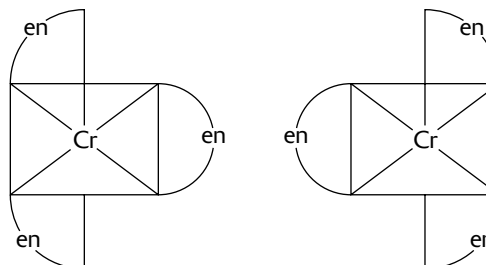
- A. addition
- B. condensation
- C. elimination
- D. rearrangement

**250.** As a general trend, how does electronegativity increase through the periodic chart?

- A. from bottom to top and left to right
- B. from bottom to top and right to left
- C. from top to bottom and right to left
- D. from top to bottom and left to right

**251.** Which of the following functional groups CANNOT be formed from carboxylic acids?

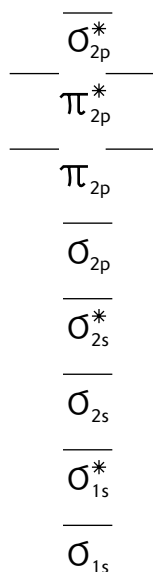
- A. esters
- B. amides
- C. ethers
- D. anhydrides



**252.** What best describes the two compounds shown in the above figure?

- A. hydrate isomers
- B. linkage isomers
- C. optical isomers
- D. ionization isomers

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**253.** Using the diagram in the above figure, what can you tell about diatomic oxygen?

- A. It is paramagnetic with a bond order of 3.
- B. It is diamagnetic with a bond order of 3.
- C. It is paramagnetic with a bond order of 2.
- D. It is diamagnetic with a bond order of 2.

**254.** A solution made from pure water and the salt sodium acetate should be what?

- A. alkaline
- B. neutral/unchanged
- C. could be neutral, acidic or alkaline (more information is necessary)
- D. acidic

**255.** In proton NMR, a peak with a shift between 6.0 and 9.5 PPM denotes what functional group?

- A. aldehyde
- B. aromatic
- C. ketone
- D. ether

**256.** In a mixture of the following cations in equal concentration, which will precipitate from the solution first?

- A.  $\text{Hg}_2^{+2}$  ( $K_{\text{sp}} = 6.8 \times 10^{-7}$ )
- B.  $\text{Ba}^{+2}$  ( $K_{\text{sp}} = 1.1 \times 10^{-10}$ )
- C.  $\text{Pb}^{+2}$  ( $K_{\text{sp}} = 1.8 \times 10^{-8}$ )
- D.  $\text{Sr}^{+2}$  ( $K_{\text{sp}} = 2.8 \times 10^{-7}$ )

**257.** How many grams of sodium hydroxide are required to completely neutralize 200 mL of 0.50 M sulfuric acid?

- A. 2.0 g
- B. 8.0 g
- C. 4.0 g
- D. 16.0 g

**258.** What is the most probable product to be formed from the fluorination of benzene?

- A. fluorobenzene
- B. p-difluorobenzene
- C. m-difluorobenzene
- D. o-difluorobenzene

**259.** In the formation of a hemiacetal or hemiketal, what is the mechanism for the reaction?

- A. The lone pair on the oxygen of an aldehyde or ketone attacks the partial positive carbon of an alcohol.
- B. The lone pair on an hydroxyl attacks the partial positive carbon of a ketone or aldehyde.
- C. The lone pair on the oxygen of a ketone or aldehyde attacks the hydrogen on an alcohol to form a hydrogen bond.
- D. A rearrangement occurs in which the hydrogen shifts changing the position of the aldehyde or ketone with the hydroxyl.

**260.** If the  $\text{pK}_a$  of acetic acid is 4.74, what will be the pH of a buffer solution made from 0.1 moles sodium acetate and 0.01 moles acetic acid?

- A. 3.74
- B. 4.74
- C. 5.74
- D. 6.74

**261.** The subshell after  $f$  would be the  $g$  subshell. How many orbitals would this subshell have?

- A. 8
- B. 9
- C. 12
- D. 14

**262.** If Po undergoes  $\beta$  decay, what element will be formed?

- A. Rn
- B. At
- C. Bi
- D. Pb

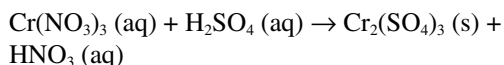
**263.** In an aqueous environment, what would make the worst leaving group?

- A. halogen
- B. hydroxide
- C. hydrosulfide
- D. carbon dioxide

**264.** Which of the following laws specifically concerns the mixtures of gases?

- A. Charles's
- B. Dalton's
- C. Boyles's
- D. combined

**265.** Following is an unbalanced chemical equations.



When it is balanced, what is the Stoichiometric coefficient for the chromium(III) nitrate?

- A. 2
- B. 4
- C. 1
- D. 3

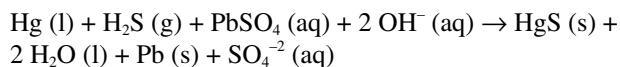
**266.** What type of base is categorized as a hydronium ion ( $\text{H}^+$ ) acceptor?

- A. Coordination
- B. Bronsted-Lowry
- C. Lewis
- D. Arrhenius

**267.** What kind of compound should carbon dioxide be?

- A. non-polar covalent
- B. polar covalent
- C. slightly polar covalent
- D. ionic

**268.** In the following reaction, what is the reducing agent?



- A. hydroxide
- B. lead (II) sulfate
- C. mercury
- D. hydrogen sulfide

**269.** What is the hybridization for a carbon with a linear molecular structure?

- A. sp
- B.  $\text{sp}^2$
- C.  $\text{sp}^3$
- D.  $\text{sp}^3\text{d}$

**270.** A decomposition reaction is found to produce the experimental data in the following table. What is the order of this decomposition reaction?

$[\text{A}]_0$	<i>Initial Rate</i>
2.3 M	6.3 M/s
1.1 M	6.3 M/s
4.6 M	6.3 M/s

- A. zero
- B. first
- C. second
- D. third

GO ON TO THE NEXT PAGE

## Critical Thinking Essay

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**Directions:** You will have 30 minutes in which to write an essay in response to the following statement. This essay will either require you to express an opinion or will present a problem that needs a solution.

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“When we study history, we tend to focus on the contributions of individuals. Most of the major events that have taken place throughout history were made possible by those various groups of people who are no longer remembered—not by those celebrated individuals.”