

MCAT Practice Worksheet

Fifty questions across the MCAT's four scored sections: Chemical and Physical Foundations, Critical Analysis and Reasoning Skills, Biological and Biochemical Foundations, and Psychological, Social, and Biological Foundations of Behavior.

QUESTIONS	50	MULTIPLE CHOICE	37	WRITTEN	13
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Instructions

Answer content questions from memory first, then check. For CARS items, stay within what the passage states.

- 1** Using $PV = nRT$, find the pressure (atm) of 2 mol of gas in a 10 L container at 300 K. ($R = 0.0821 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K}$)
- _____
- _____
- _____
- 2** A buffer has pK_a 4.76 with equal concentrations of A^- and HA . Using Henderson-Hasselbalch, the pH is:
- A) Less than 4.76
B) Equal to 4.76
C) Greater than 4.76
D) Cannot be determined
- 3** Which change increases a gas's pressure at constant volume and moles, according to the ideal gas law?
- A) Decreasing temperature
B) Increasing temperature
C) Increasing volume
D) Decreasing moles
- 4** A 5 kg object accelerates at 2 m/s^2 . Find the net force applied.
- _____
- _____
- _____
- 5** According to the first law of thermodynamics, if a gas absorbs 100 J of heat and does 40 J of work on its surroundings, the change in internal energy is:
- A) 140 J
B) 60 J
C) -60 J
D) -140 J
- 6** A circuit has voltage 12 V and resistance 4 ohms. Find the current using Ohm's law.
- _____
- _____
- _____
- 7** Which best describes an exothermic reaction?
- A) Absorbs heat from surroundings
B) Releases heat to surroundings
C) Has no change in enthalpy
D) Only occurs at high temperature
- 8** A solution's pH decreases from 7 to 4. This represents:
- A) A 3-fold increase in H^+ concentration
B) A 1,000-fold increase in H^+ concentration
C) A 1,000-fold decrease in H^+ concentration
D) No change in H^+ concentration

- 9 Which type of intermolecular force is strongest?
- A) London dispersion
 - B) Dipole-dipole
 - C) Hydrogen bonding
 - D) Van der Waals
- 10 Using density = mass/volume, find the density of an object with mass 50 g and volume 25 mL.
- _____
- _____
- _____
- 11 A CARS passage argues that a historical reform succeeded despite public opposition, citing later economic data. The author's overall claim is best described as:
- A) The reform failed due to public opposition
 - B) The reform succeeded, supported by later economic evidence
 - C) Public opposition prevented any economic change
 - D) The passage takes no position on the reform
- 12 A CARS passage repeatedly uses words like 'regrettably' and 'shortsighted' when describing a policy. The author's tone is best described as:
- A) Approving
 - B) Critical
 - C) Neutral
 - D) Celebratory
- 13 A CARS passage states a theory was 'widely accepted until new evidence emerged.' What does this most strongly imply?
- A) The theory was never questioned
 - B) The theory was later challenged by new findings
 - C) No evidence ever existed for the theory
 - D) The theory was proven false before it was proposed
- 14 A CARS passage argues a policy reduced crime, citing a single city's data. Which new information would most WEAKEN this argument?
- A) Crime also fell in comparable cities without the policy during the same period
 - B) The policy was expensive to implement
 - C) The city has a large population
 - D) The policy was popular with voters
- 15 A CARS question asks what the passage 'suggests' about an author's view on tradition. The best-supported answer:
- A) Goes beyond the passage using outside historical knowledge
 - B) Stays within what the passage's own language directly supports
 - C) Assumes the author agrees with every view presented
 - D) Ignores the passage's tone entirely
- 16 Which sequence correctly describes the central dogma of molecular biology?
- A) Protein → RNA → DNA
 - B) DNA → RNA → Protein
 - C) RNA → Protein → DNA
 - D) DNA → Protein → RNA
- 17 Where does the Krebs cycle take place in a eukaryotic cell?
- A) Cytoplasm
 - B) Mitochondrial matrix
 - C) Nucleus
 - D) Endoplasmic reticulum
- 18 An enzyme's K_m is low. What does this indicate about its affinity for substrate?
- A) Low affinity, reaches half-max velocity at high substrate concentration
 - B) High affinity, reaches half-max velocity at low substrate concentration
 - C) No relationship to affinity
 - D) The enzyme is not functional

- 19** A cross between two heterozygous ($Aa \times Aa$) parents for a simple dominant trait. Find the expected fraction of offspring showing the dominant phenotype.
- _____
- _____
- _____
- 20** Which molecule serves as the primary energy currency produced during cellular respiration?
- A) DNA
 - B) ATP
 - C) mRNA
 - D) Cholesterol
- 21** Which best describes the R-group of an amino acid?
- A) It is identical in every amino acid
 - B) It determines the amino acid's unique chemical properties
 - C) It is always positively charged
 - D) It only appears in essential amino acids
- 22** Which organelle is primarily responsible for protein synthesis on membrane-bound ribosomes?
- A) Golgi apparatus
 - B) Rough endoplasmic reticulum
 - C) Lysosome
 - D) Peroxisome
- 23** A mutation changes a single DNA base but does not change the resulting amino acid. This is best described as:
- A) A missense mutation
 - B) A nonsense mutation
 - C) A silent mutation
 - D) A frameshift mutation
- 24** Which best describes the role of tRNA during translation?
- A) It carries the genetic code from the nucleus
 - B) It carries a specific amino acid to the ribosome, matching its anticodon to the mRNA codon
 - C) It catalyzes DNA replication
 - D) It packages proteins for secretion
- 25** Which hormone class is derived from cholesterol?
- A) Peptide hormones
 - B) Steroid hormones
 - C) Amino-acid-derived hormones
 - D) Catecholamines
- 26** Pavlov's dogs salivating at the sound of a bell, after the bell was repeatedly paired with food, is an example of:
- A) Operant conditioning
 - B) Classical conditioning
 - C) Observational learning
 - D) Habituation
- 27** A rat presses a lever and receives a food pellet, increasing the frequency of lever pressing. This is an example of:
- A) Negative punishment
 - B) Positive reinforcement
 - C) Classical conditioning
 - D) Extinction
- 28** Which division of the nervous system controls involuntary functions like heart rate and digestion?
- A) Somatic nervous system
 - B) Autonomic nervous system
 - C) Central nervous system only
 - D) Motor cortex
- 29** The sympathetic nervous system is primarily associated with which response?
- A) Rest and digest
 - B) Fight or flight
 - C) Sleep regulation only
 - D) Sensory processing only
- 30** Which best distinguishes sensation from perception?
- A) Sensation is the brain's interpretation; perception is the raw stimulus
 - B) Sensation is the raw detection of a stimulus; perception is the brain's interpretation of it
 - C) They are identical processes
 - D) Perception only occurs during sleep

- 31** Social stratification primarily refers to:
- A) The biological classification of species
 - B) The ranking of individuals or groups by access to resources and status
 - C) A method of studying animal behavior
 - D) The structure of the nervous system
- 32** Which best describes the concept of socialization in sociology?
- A) The process by which individuals learn the norms and values of their society
 - B) The classification of chemical compounds
 - C) A type of memory storage
 - D) A method for measuring enzyme activity
- 33** Which brain structure is most associated with the formation of new long-term declarative memories?
- A) Cerebellum
 - B) Hippocampus
 - C) Medulla
 - D) Occipital lobe
- 34** Which best describes the concept of cognitive dissonance?
- A) Comfort felt when beliefs and actions align
 - B) The mental discomfort from holding two conflicting beliefs or from a belief conflicting with behavior
 - C) A type of memory loss
 - D) A stage of prenatal development
- 35** A patient's blood pH is 7.50 (normal 7.35-7.45) with elevated bicarbonate. Identify the acid-base disturbance.
- _____
- _____
- _____
- 36** Which best describes negative feedback in an endocrine system?
- A) Rising hormone levels stimulate further hormone release
 - B) Rising hormone levels suppress further release, returning the system toward baseline
 - C) Hormone levels have no regulatory mechanism
 - D) Feedback only occurs in the nervous system
- 37** Which describes the difference between an agonist and an antagonist at a receptor?
- A) An agonist blocks the receptor; an antagonist activates it
 - B) An agonist activates the receptor's normal response; an antagonist blocks or reduces it
 - C) Both always activate the receptor
 - D) Both always block the receptor
- 38** Explain why MCAT science passages test the ability to APPLY a concept to new data rather than only recalling the concept in isolation.
- _____
- _____
- _____
- 39** Explain why CARS should be practiced on a separate weekly schedule rather than folded into general content review.
- _____
- _____
- _____
- 40** Explain why reviewing a full-length practice exam by error category (content gap, reasoning error, timing, careless read) is more useful than reviewing only the overall score.
- _____
- _____
- _____
- 41** Explain why identifying a CARS passage's central assumption is necessary before evaluating how new information would strengthen or weaken its argument.
- _____
- _____
- _____
- 42** Explain why a low K_m value indicates high enzyme-substrate affinity rather than low affinity.
- _____
- _____
- _____

- 43** A study found medical students who explained concepts aloud to a study partner scored higher on application-based exam questions than those who only reviewed notes silently. Explain the most likely reason for this outcome.
- _____
- _____
- _____

- 44** Which best describes osmosis?
- A) The movement of solute across a membrane against its gradient
 - B) The movement of water across a semipermeable membrane from low to high solute concentration
 - C) The active transport of ions using ATP
 - D) The breakdown of glucose in the cytoplasm

- 45** Which best describes a competitive enzyme inhibitor?
- A) It binds the active site and can be outcompeted by increasing substrate concentration
 - B) It binds only the enzyme-substrate complex
 - C) It permanently destroys the enzyme
 - D) It has no effect on reaction rate

- 46** Which best describes the function of the myelin sheath on a neuron's axon?
- A) It generates neurotransmitters
 - B) It insulates the axon and speeds up signal conduction
 - C) It forms the neuron's nucleus
 - D) It absorbs excess neurotransmitter

- 47** A solution has $[H^+] = 1 \times 10^{-3} \text{ M}$. Find its pH.
- _____
- _____
- _____

- 48** Which term describes learning a behavior by observing and imitating a model, without direct reinforcement?
- A) Operant conditioning
 - B) Observational learning
 - C) Habituation
 - D) Classical conditioning

- 49** Which best describes an amphipathic molecule such as a phospholipid?
- A) It is entirely hydrophobic
 - B) It is entirely hydrophilic
 - C) It has both a hydrophilic head and a hydrophobic tail
 - D) It cannot form membranes

- 50** A CARS passage presents an author's argument, then a counterargument, then reaffirms the original position with new reasoning. This structure is best described as:
- A) A one-sided argument with no counterpoint
 - B) A dialectical structure that addresses and responds to opposition
 - C) A purely descriptive, non-argumentative passage
 - D) A passage with no discernible structure

Answer key

Direct answers only, in question order. Work the set first, then check.

- | | | | | |
|---|---|--|--|---|
| 1. 4.93 | 2. B) Equal to 4.76 | 3. B) Increasing temperature | 4. 10 | 5. B) 60 J |
| 6. 3 | 7. B) Releases heat to surroundings | 8. B) A 1,000-fold increase in H ⁺ concentration | 9. C) Hydrogen bonding | 10. 2 |
| 11. B) The reform succeeded, supported by later economic evidence | 12. B) Critical | 13. B) The theory was later challenged by new findings | 14. A) Crime also fell in comparable cities without the policy during the same period | 15. B) Stays within what the passage's own language directly supports |
| 16. B) DNA → RNA → Protein | 17. B) Mitochondrial matrix | 18. B) High affinity, reaches half-max velocity at low substrate concentration | 19. 3/4 | 20. B) ATP |
| 21. B) It determines the amino acid's unique chemical properties | 22. B) Rough endoplasmic reticulum | 23. C) A silent mutation | 24. B) It carries a specific amino acid to the ribosome, matching its anticodon to the mRNA codon | 25. B) Steroid hormones |
| 26. B) Classical conditioning | 27. B) Positive reinforcement | 28. B) Autonomic nervous system | 29. B) Fight or flight | 30. B) Sensation is the raw detection of a stimulus; perception is the brain's interpretation of it |
| 31. B) The ranking of individuals or groups by access to resources and status | 32. A) The process by which individuals learn the norms and values of their society | 33. B) Hippocampus | 34. B) The mental discomfort from holding two conflicting beliefs or from a belief conflicting with behavior | 35. Metabolic alkalosis |

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|--|--|---|--|--|
| 36. B) Rising hormone levels suppress further release, returning the system toward baseline | 37. B) An agonist activates the receptor's normal response; an antagonist blocks or reduces it | 38. The exam is designed to mirror how physicians must interpret unfamiliar clinical or experimental data using foundational science, so questions typically embed a familiar concept inside a new context, requiring application rather than simple recall | 39. CARS tests reading and reasoning skill rather than memorized content, so it improves through consistent, dedicated timed-passage practice and error review, a different skill-building rhythm than content-based studying for the science sections | 40. The overall score does not reveal WHY points were lost, while categorizing each miss shows whether the fix is learning new content, practicing a reasoning skill, adjusting pacing, or slowing down on careless reads, which targets study time far more efficiently |
| 41. New information can only strengthen or weaken an argument in relation to what the argument actually assumes; without first identifying that assumption, it is easy to misjudge whether the new information is relevant or supports the opposite conclusion | 42. K_m is the substrate concentration needed to reach half of the enzyme's maximum reaction rate, so a low K_m means the enzyme reaches that half-maximum rate at a low substrate concentration, which happens only when the enzyme binds substrate readily, indicating high affinity | 43. Explaining a concept aloud requires actively organizing and applying the material rather than passively recognizing it, which builds the same retrieval and application skill that application-based exam questions test, unlike passive review | 44. B) The movement of water across a semipermeable membrane from low to high solute concentration | 45. A) It binds the active site and can be outcompeted by increasing substrate concentration |
| 46. B) It insulates the axon and speeds up signal conduction | 47. 3 | 48. B) Observational learning | 49. C) It has both a hydrophilic head and a hydrophobic tail | 50. B) A dialectical structure that addresses and responds to opposition |

Error log

Bring this page to your next session so the tutor can start from what actually blocked you.

Questions I answered incorrectly:

Was it Chem/Phys, CARS, Bio/Biochem, or Psych/Social?

The single topic I want to start the next session with:
