

Sample MCAT Items: **BIOLOGICAL SCIENCES**

(Extracted from *MCAT Practice Test 3R*)

Passage III (Questions 151-155)

The runny nose associated with common colds is related to the release of either virus-induced histamine or acetylcholine. The nasal mucosa contain receptors for both histamine and acetylcholine. Activation of either of these receptor types results in increased secretion by nasal glands, producing a runny nose.

In an attempt to treat this condition, several new drugs have been investigated. Drug A primarily blocks histamine receptors but also partially blocks acetylcholine receptors. Drug B blocks histamine receptors but has no effect on the acetylcholine receptors.

Eighteen subjects with severe common colds, whose symptoms were judged to be identical, were randomly assigned to three groups. Patients A-F in Group 1 received Drug A, Patients A-F in Group 2 received Drug B, and those in Group 3 were treated with a nondrug placebo. After 4 hours, patients reported their own runny nose symptoms on a 5-point scale ranging from a dry nose (1) to an excessively runny nose (5).

Table 1 Self-Reported Symptoms 4 Hours after Treatment

Subject	Group 1 (Drug A)	Group 2 (Drug B)	Group 3 (Placebo)
A	2	3	1
B	1	4	4
C	3	2	5
D	2	3	4
E	1	3	5
F	1	3	4

151. In Group 3, the response of Patient A can best be classified as a response most likely:

- A) not associated with the treatment.
- B) associated with histamine blocking only.
- C) associated with acetylcholine blocking only.
- D) associated with a combination of histamine and acetylcholine blocking.

152. Based on the passage, which drug treatment would hypothetically provide the maximum reduction in nasal secretions?

- A) Antihistamine only
- B) Acetylcholine only
- C) Antihistamine and acetylcholine
- D) Antihistamine and acetylcholinesterase

153. Based on Table 1, the individual who benefited most from a specific blocking effect on the histamine receptors *only* is:

- A) Subject B in Group 1.
- B) Subject C in Group 1.
- C) Subject B in Group 2.
- D) Subject C in Group 2.

154. The nasal mucosa cells responsible for the release of excessive fluid during the common cold can best be classified as:

- A) epithelial.
- B) connective.
- C) contractile.
- D) neurosecretory.

155. An acetylcholinesterase inhibitor increases nasal secretions because it:

- A) blocks acetylcholine release from parasympathetic nerve endings.
- B) blocks acetylcholine response at acetylcholine receptors.
- C) increases parasympathetic activity at acetylcholine receptors.
- D) decreases parasympathetic activity at acetylcholine receptors.

Questions 211 through 216 are NOT based on a descriptive passage.

211. In eukaryotes, oxidative phosphorylation occurs in the mitochondrion. The analogous structure used by bacteria to carry out oxidative phosphorylation is the:

- A) cell wall.
- B) ribosome.
- C) nuclear membrane.
- D) plasma membrane.

212. Nucleosomes typically consist of which of the following?

- I. DNA
- II. Histones
- III. Microtubules

- A) I only
- B) I and II only
- C) II and III only
- D) I, II, and III

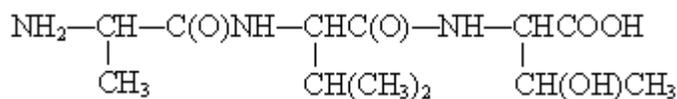
213. In which organelle of a eukaryotic cell is the pyrimidine uracil, as part of uridine triphosphate (UTP), incorporated into nucleic acid?

- A) The nucleus
- B) The Golgi bodies
- C) The ribosomes
- D) The endoplasmic reticulum

214. The enzyme pepsin, which catalyzes the hydrolysis of proteins in the stomach, has a pH optimum of 1.5. Under conditions of excess stomach acidity (pH of 1.0 or less), pepsin catalysis occurs very slowly. The most likely reason for this is that below a pH of 1.0:

- A) pepsin is feedback-inhibited.
- B) pepsin synthesis is reduced.
- C) the peptide bonds in pepsin are more stable.
- D) the three-dimensional structure of pepsin is changed.

215. Ignoring stereochemistry, how many different tripeptides may exist that contain the same three amino acids as the molecule shown below?



- A) 1
- B) 3
- C) 6
- D) 9

216. A drug that binds to tubulin molecules of plant cells and prevents the cells from assembling spindle microtubules would most likely cause the resulting plants or plant cells to have:

- A) greater genetic variability than the parent plants.
- B) more than two sets of chromosomes.
- C) a stronger cell wall because of excess tubulin.
- D) independent movement because of excess tubulin.