MCAT Diagnostic Review

Today's Info Session

- Welcome to this Info Session!
- Introduction
- Biochemistry
  - Nucleotides
  - Amino acids
  - Lipids
- How Can Next Step Help?
- Questions?

Next Step TEST PREP

MCAT

Medical College Admission Test

WHAT IS YOUR NEXT STEP?

Introduction

Hi, I'm Phil!

- MCAT Content writer
- Tutored and taught for 9+ years
- Attended University of Nebraska Medical Center as an MD/PhD student.

✓ Next Step is a team of test prep and educational experts committed to excellence.

Who Is Next Step?

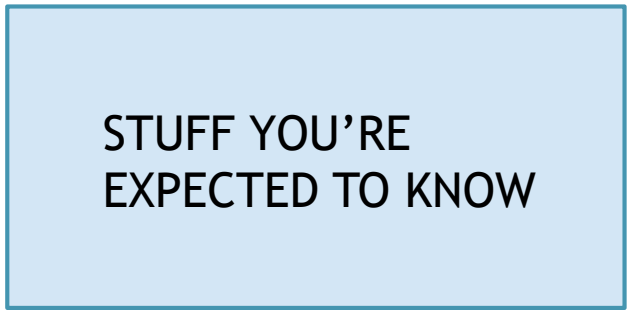
- Began in 2009 as a tutoring company
- Focus on graduate admissions tests only
- Team of educational experts
- First company to have materials built from ground up for 2015 MCAT format
- Now the first company to have new 2018 MCAT Interface

✓ We never stop improving our materials!

The Why and How of Reviewing:

- **Isolate weak areas**
  - *Weak sections (science or CARS)*
  - *Weak science topics (broad or specific)*
  - *Timing or endurance problems*
- **Optimize future prep**
  - *Start your Lessons Learned Journal*
  - *Efficiently choose which "optional" assignments to complete*
  - *Add related resources in your free time*
- **But remember, you're still early in your prep process! DON'T:**
  - *Worry about your score – you still have a long way to go!*
  - *Put pressure on yourself to improve immediately*
  - *Assume that your strong/weak areas will be the same on every exam*

Bonus! Reviewing helps you understand "the box."



Dealing with Passages

- **Stuff you'll never see questions about**

  Mostly background knowledge

  "Research into these fields may satisfy this need."

  "Ebola is a rising problem in third world countries"

- **Stuff you will definitely need to refer back to**

  Figures and numbers

  Things that are danced around

  Thing that are tacked on

- **Topics for questions, but you may not need to come back to.**

  "5 mL of the cell solution were collected and fractionated with the aid of centrifugation"

  "These ß-lactam molecules are particularly reactive due in part to significant ring strain"

  Research into floating drug delivery systems (FDDS) may satisfy this need.

Chem/Phys passage 1

Oral drug delivery systems are limited by the short gastrointestinal transit time, leading to low bioavailability. Drug delivery systems able to retain the dosage form in the stomach are needed. Research into floating drug delivery systems (FDDS) may satisfy this need.

FDDS can be approached by either effervescent or non-effervescent techniques. Ideal effervescent techniques achieve floating duration times > 16 hours in the stomach. Effervescent FDDS incorporate gas-generating agents, which provide buoyancy. Newer research focuses on non-effervescent systems, where the swelling of polymers joined to the drug entraps air within the polymeric matrix, providing buoyancy to the dosage form.

A study was performed on the antidiabetic sulfonylurea glipizide. The drug and one of three polymers were mixed in a mortar according to the ratios described in Table 1. A drop of water was added, and the mixture was kneaded until a homogenous paste was obtained. The mixture was then placed in an oven at 50°C for 30 min to remove water. The compound was then compressed into tablets which served as the basis for drug release and buoyancy measurements.

Chem/Phys passage 1

		Drug to Polymer Ratio		
Drug	**Bulk Density**	**Trial 1**	**Trial 2**	**Trial 3**
Glipizide	0.2 g/mL	1:1	1:4	1:8
FDDS Polymer		gelucire	β-cyclodextrin	Polaxemer-188
gelucire	0.6 g/mL			
β-cyclodextrin	0.3 g/mL			
Polaxemer 188	0.1 g/mL			

Table 1 The density of glipizide and the three polymers and the drug to polymer ratio in each trial

Chem/Phys passage 1

To test *in vitro* drug release of solid dispersions, the tablets were placed into dissolution vessels containing 900 mL of 0.1 M HCl. Dissolution studies were carried out for one hour, with samples withdrawn at predetermined intervals. Drug concentrations were assayed using HPLC methods. The dissolution experiments were carried out in triplicate, and the results are shown in Figure 1. *In vitro* buoyancy was also tested. Tablets were placed in a vessel containing 500 mL of 0.1 M HCl. The time taken for the tablet to rise to the surface of the dissolution media (floating lag time) and total duration that the tablet remained on the surface (total floating time) were recorded.

Chem/Phys passage 1

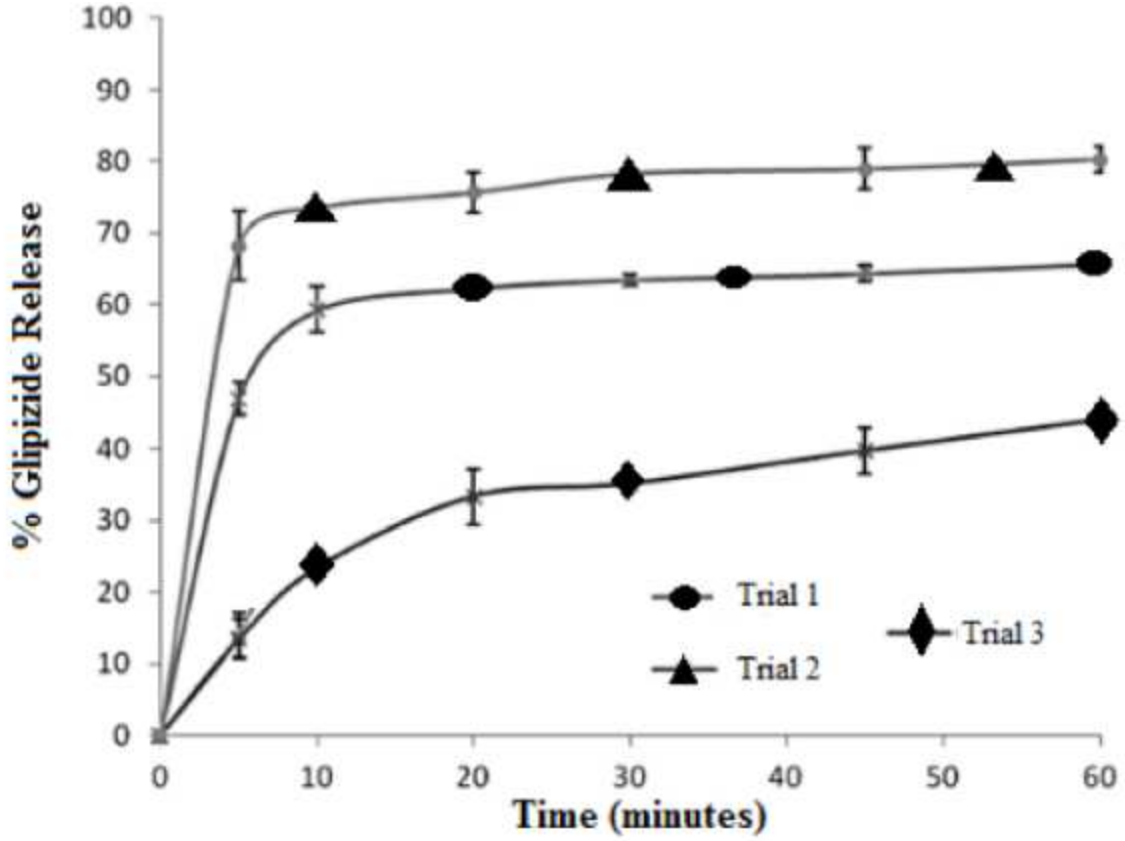


Figure 1 Drug release as a function of time and pill composition

The Ksp for glipizide-cyclodextrin in a chyme solution at 37°C was determined to be 5.8 x 10-4. Increased solubility of drug dispersions may be achieved by wetting via hydrophilic polymers, or by polymer size reduction.

(Note: all pills for the above trials have the same volume.)

Bio passage 3

A woman began canning her own jams as a hobby. She shared several cans of her jam with her mother for lunch. The next day, her mother was found suffering from blurry vision, difficulty swallowing and troubled breathing. Given the quick progression of symptoms, associated with the new food, the ER physician suspected botulism poisoning. Due to the danger and toxicity of botulism, tests were performed immediately to determine the best course of treatment.

The botulinum toxin is a neurotoxin produced by the bacterium *Clostridium botulinum*. Botulism is a life-threatening illness in humans, although forms of the toxin are used for various cosmetic and medical procedures. The eight distinct toxin types are designated A to H. The botulinum toxin protein is a two-chain polypeptide with a 100-kDa heavy chainjoined by a disulfide bond to a 50-kDa light chain. This light chain is a protease that attacks one of the fusion proteins (SNARE protein) at a neuromuscular junction, preventing vesicles from anchoring to the membrane to release acetylcholine.

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Bio passage 3

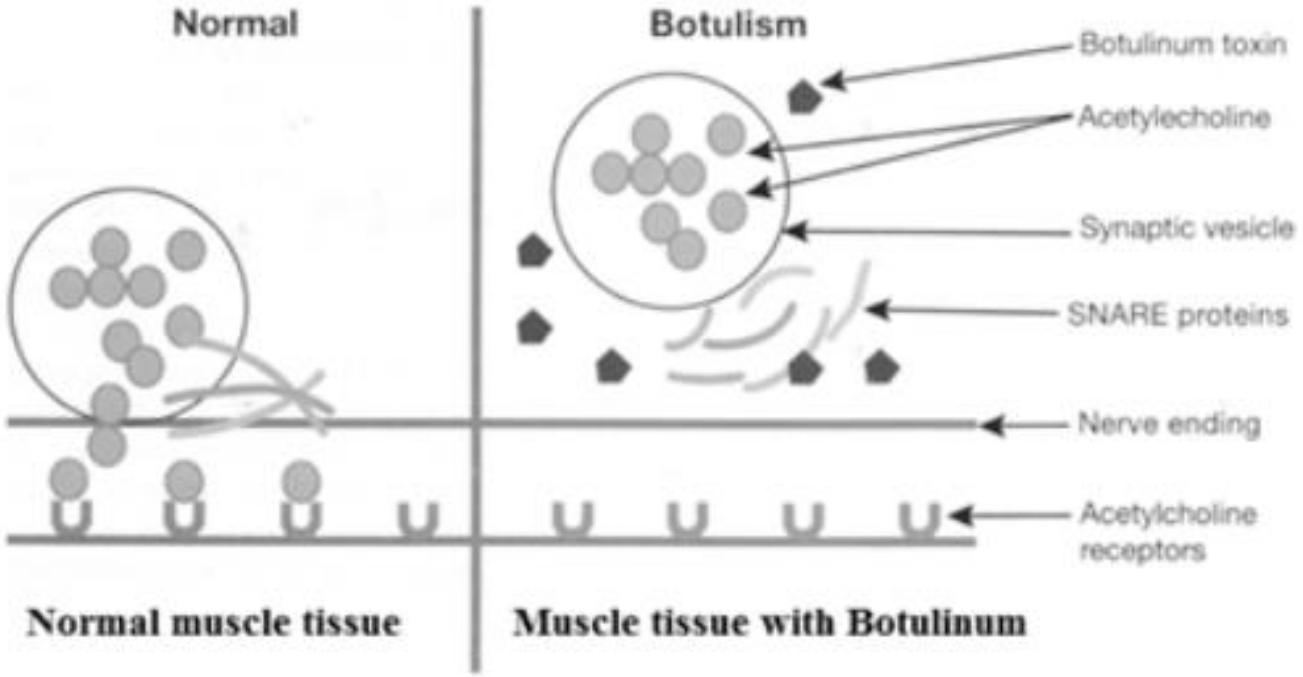


Figure 1 Mechanism of neuromuscular blockade by botulinum toxin

Tests employed to detect botulism include brain scans and nerve conduction tests. Toxicity testing of serum specimens, wound tissue cultures, and stool specimen cultures are the best methods for identifying botulism, though they are time-consuming. If the symptoms are diagnosed early, treatment can reduce fatality to less than 20%. A faster way to detect the toxin in humans is using mass spectrometry.

Next Step TEST PREP

Q&A

Next Step: Core Values

Educate Daily

Approachability

Authenticity

Professionalism

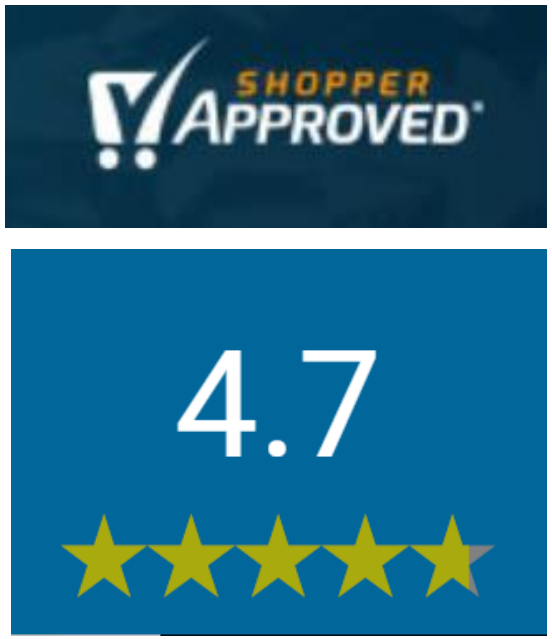
Ownership

We are dedicated to providing personalized support, advice and prep options that match each student's individual needs.

Students Have a Choice

✓ **Over 50,000 students have used Next Step Test Prep in their MCAT Prep journey**

- **Always up-to-date content, strategy and tests**
- **Guaranteed Satisfaction**
- **Expert instructors on call for you**
- **No call center – instead, Academic Managers guide you all the way!**



Personalized Options

- ✓ **No matter your study style, subject expertise, or MCAT goal, Next Step has an option for your personal needs and lifestyle.**

- **Self-Prep Materials and Planning**
- **Guided Online Study with Free Extra Help**
- **Flexibility and Personalization**
- **One-on-One Tutoring**

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- ✓ **Start your prep with high-value FREE practice to build a study plan suited to your goals, needs, and schedule.**

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- **Half-length MCAT diagnostic**
- **Full-length MCAT exam**
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- **Aligned to new MCAT 2018 Interface**

Get your FREE MCAT Practice Bundle

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Additional Free Resources

✓ **Supplement your prep with additional support tools**

- **Question of the Day Quick Prep**
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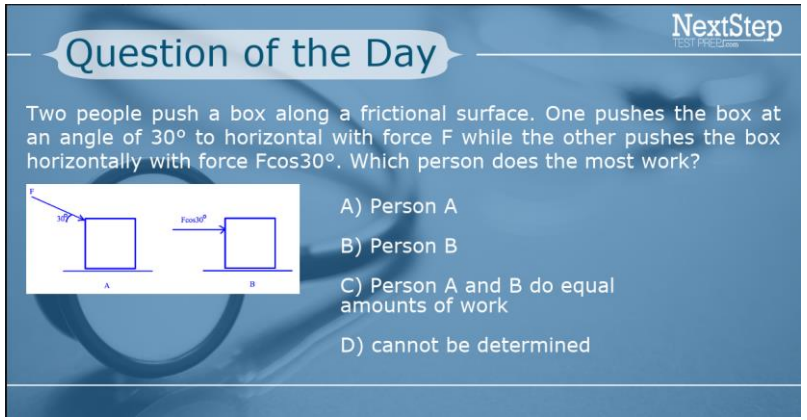
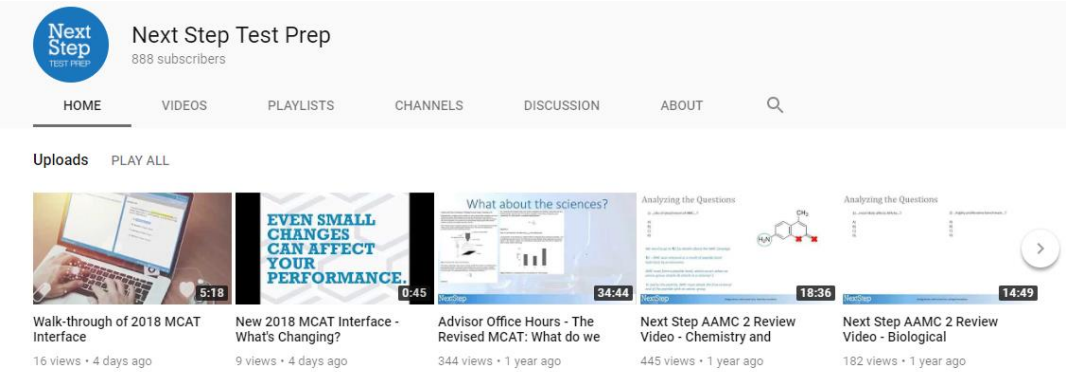
- **MCAT Blog: Content and Admissions**
- **Next Step MCAT Forum**



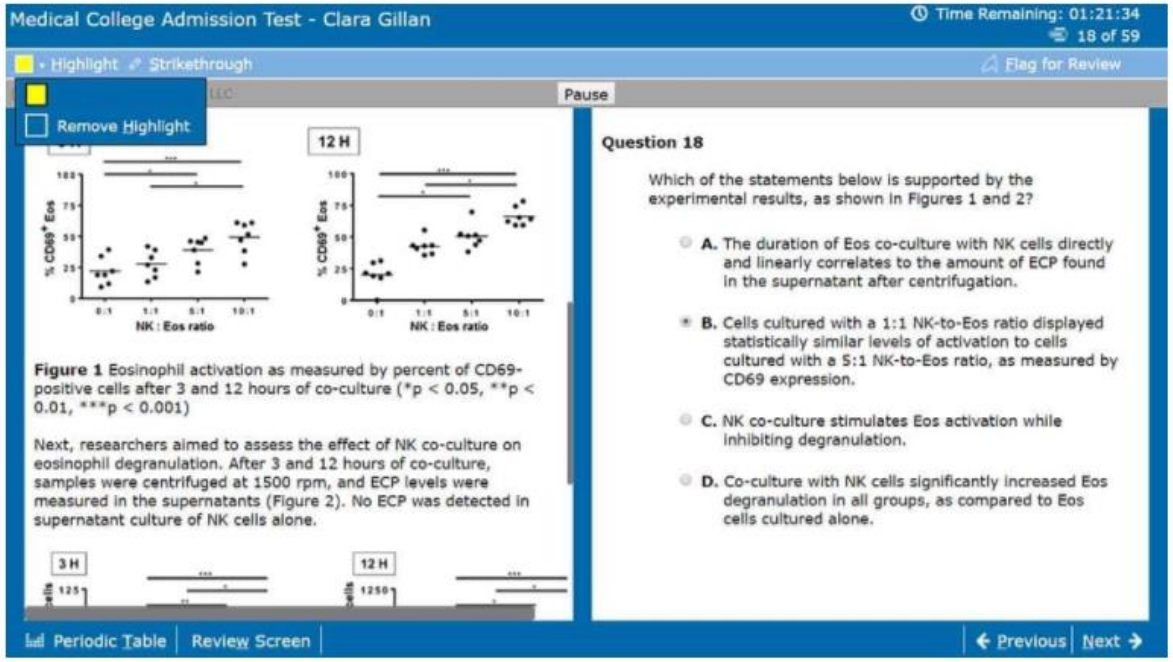


New 2018 MCAT Interface

Next Step TEST PREP

- New highlighting features
- New strikethrough features
- New keyboard shortcuts
- New Navigation/Review Screens

Next Step is ready. Are you?



✓ Your practice experience matters! Prep with the most realistic testing environment with Next Step.

Take the Best Next Step

✓ **Others say it. We deliver it.**

- **Most up-to-date Lesson Review Books in 4-color**
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- **Exclusive Study Plan Generator personalized for you**
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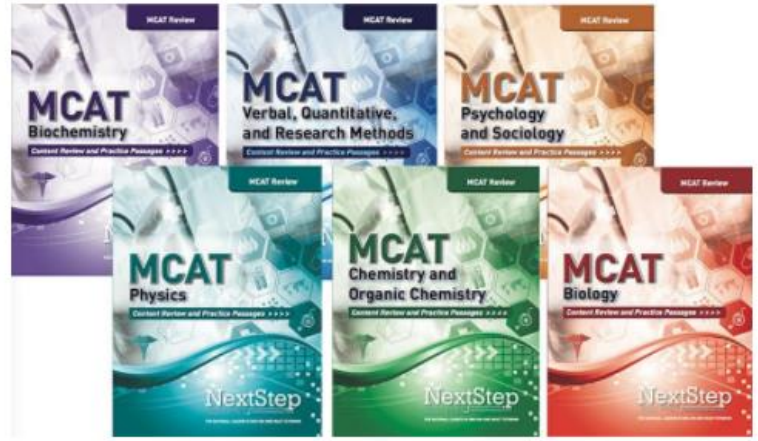
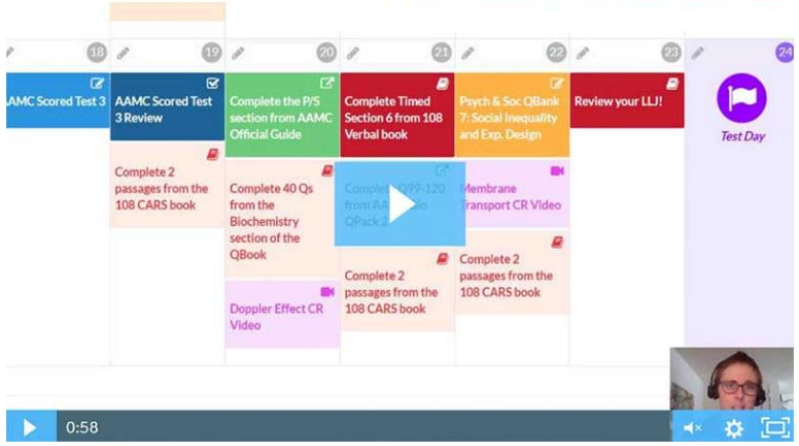
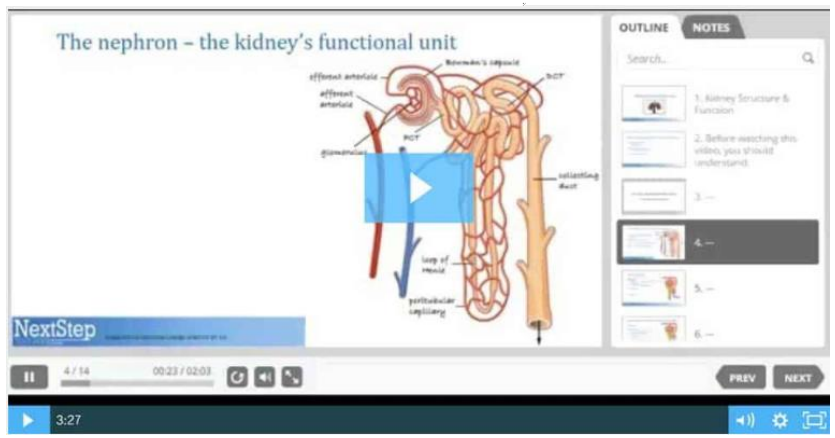
- **Direct access to MCAT Content Team**
- **Affordable prep options: from books to tutoring**







MCAT Study Options

- **Best-in-Class MCAT Tutoring Packages**
  - Variety of packages: Crash Course to Elite
  - Choices include our MCAT Online Course
  - Personalized Study Plan for each student
  - Top-scoring tutors

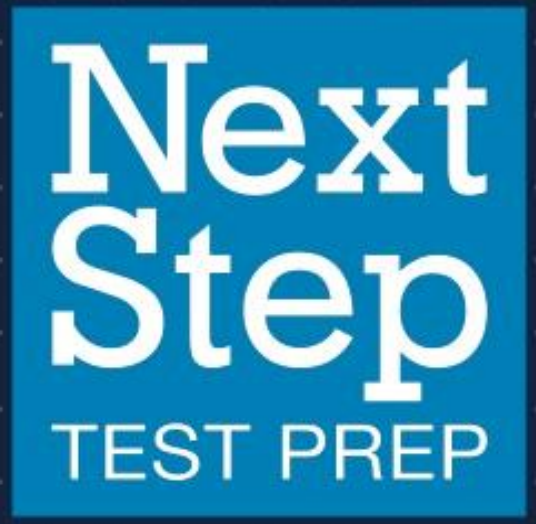
- **Most up-to-date MCAT Course**
  - All new books in color, all online AAMC resources
  - 10 full-length exams aligned to new interface
  - Live online office hours for any Q&A held 5 days per week
  - Study Plan Generator to match each student's strengths, weaknesses and schedule needs.

- **MCAT Practice Test Bundles**
  - Available in 4-, 6-, and 10-pack bundles

✓ **All aligned to new 2018 interface**

Looking for free resources, or interested in signing up for future webinars?

nextsteptestprep.com/smith/



Get Solid Advice for Your Next Step

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