

# Next Step Public Office Hours: CARS Strategy Review

- Welcome to Office Hours!
- Introduction
- Overview of CARS Strategy
- CARS Practice Passage 1
- CARS Practice Passage 2
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- Questions?

# Introduction to Office Hours

- **Thanks for coming to Next Step Office Hours!**
- **These sessions are meant to be:**
  - Interactive*
  - Problem-focused*
  - Specific to your needs (so ask questions!)*
- **Today's focus: CARS strategy**
- **Other sessions: content refreshers, exam review**
- **This is not just a lecture! You can benefit most by:**
  - Raising your hand and speaking*
  - Commenting in the chat box*
  - Responding to poll questions*

## Before Getting Started

- 1. If you have a microphone, make sure it is turned on and easily available.**
- 2. Locate the hand-raise button on the toolbar on your screen.**
- 3. Locate the chat box on the toolbar.**
- 4. Let me know if you're having any technical issues!**

# CARS Strategy Overview

- **Find your optimal strategy (highlighting, note-taking, etc.)**
- **Focus on concepts that are likely to appear in questions**

*Key terms*

*Opinions (author's and others')*

*Contrast*

*Cause and effect relationships*

- **Most importantly, review! Ask yourself:**

*Did what I highlighted or wrote down actually end up being important?*

*Did I miss any important points or opinions?*

*What types of questions did I miss? Any common theme?*

*What wrong answers did I pick, and why was I tempted by them?*

# CARS Practice Passage 1

The San Francisco Ballet (SFB), the oldest professional ballet troupe in the US, is lauded the world over for its masterful execution of ballet in the neoclassical “Balanchine aesthetic.” The San Francisco Ballet School (SFBS) is one of the most competitive dance programs in the world, with even the Level One program (for dancers aged 7-8) rejecting over 85% of auditioners. Certainly the raw athleticism, coordination, and grace of the dance students in the SFBS is remarkable, although in this regard the SFBS does not stand out from its peer institutions in New York, Moscow, Tokyo, and elsewhere around the world. But what makes the SFB and the SFBS unique is its especially strong adherence to the uniformity of body type demanded by the Balanchine aesthetic.

George Balanchine was at the forefront of the neoclassical emphasis on movement itself as the key expressive element of ballet as a medium. He stripped away props, sets, and even costumes and haircuts. Dancers wore plain leotards, kept their hair in a tight bun, and were encouraged to have no facial expression at all – nothing to distract from the pure expression of movement. In his later years, Balanchine continually revised his works to simplify everything but the movement and music, and demanded ever more rigorous uniformity in the look and bodies of the dancers themselves. To those who continue the Balanchine approach into the 21st century, classical ballet all but demands a dancer have a height as near as possible to 5’ 8”, an exceptionally slim build, a small head and bust, and long, willowy arms and legs.

# CARS Practice Passage 1

An adherence to this look landed the SFBS in hot water in 2001 when it found itself subject to a lawsuit by Krissy Keefer on behalf of her 8 year-old daughter, Fredrika Keefer. Krissy is herself a classically trained dancer and knows, better than most, the rigors of a classical ballet education. Several members of the SFBS faculty suggested to her that it would not be worth Fredrika's time to audition as she would be unlikely to be selected. Nonetheless, Krissy persisted and the school permitted Fredrika to audition. Afterwards, when 18 of the 22 auditioners were rejected, Fredrika found herself as one of them.

This would normally be the end of the story, but for a then very-recently enacted municipal statute in San Francisco which barred employer discrimination on the basis of height or weight (expanding the existing statute covering usual things like race, gender, sexual orientation, etc.) Given the ridiculously overbroad language in the statute, even a privately-funded school selecting dance students on the basis of bona fide occupational qualifications (the usual legal test for discriminatory action) would fall under the rule's purview.

# CARS Practice Passage 1

The media attention the case received has, unsurprisingly, prompted a large response from across the spectrum in both the dance and legal communities.

Many correctly point out that it seems long past time to move beyond the strictures of neoclassical ballet and Balanchine's increasingly-outdated 1930's worldview about what makes for an exceptional ballet dancer. Critics point out that even companies doing revivals of Balanchine classics like *The Firebird* or *Swan Lake* always include embellishments in the sets or costumes that would have made Balanchine himself livid. In a world where Alvin Ailey's *Revelations*, with its dancers of various shapes and sizes, commands more respect, bigger audiences, and more imitation than any neoclassical work, it is time we free ourselves from the shackles of a 111 year old Russian's view as to what comprises ballet. This view is limiting and in dancers' efforts to achieve some perfect look they often end up with eating disorders and doing long-term damage to their bodies.

Yet is it appropriate to put this eight year-old girl in the crosshairs of this debate? And is the legal system the appropriate venue for ballet to carry out this necessary soul-searching? If the San Francisco ballet, of anyone, cannot make its own decisions about who is and who is not qualified to meet its own particular artistic requirements, one fears for a future in which any institution must keep a federal district judge on staff to guide its artistic decision-making.

# CARS Practice Passage 1: Questions

1. Balanchine would most likely approve of which of the following artistic works?

- A. A modern dance depicting the effect that technology has had on social isolation, using modern lighting and projection techniques to provide context for the dancers' movements
- B. The sculpture *Bird in Space* renowned for its elegance in evoking the puffed chest and upward movement of a flying bird while stripping away elements extraneous to the expression such as the tail and wings
- C. A revival of a classic Greek dance in which the story-telling of the chorus is replaced by a group of dancers using only movement to express the dramatic beats of the narrative
- D. A combine in the style of Rauschenberg that manages to masterfully evoke the paintings of Kirchner and the sculpture of Donatello

2. The author would most likely disapprove of which one of the following as a basis for a lawsuit?

- A. A modern dance company refuses to hire black dancers as a part of its debut season.
- B. A highly respected sculpture school refuses to admit any student who is unwilling to invest six months in reproducing at least one work of a Renaissance master as part of the application process.
- C. A new clothing store that seeks to appeal primarily to wealthy white suburban teenage girls refuses to hire homosexual or transgender employees for any position that involves customer contact.
- D. An artist of Mexican nationality who grew up as an undocumented immigrant in Tucson sues the Phoenix Art Museum for excluding works by Latino artists in its "Voices of the Arizona Territory" special exhibit.

# CARS Practice Passage 1: Questions

3. The passage suggests that:

- A. had Fredrika been rejected from a similar program in another city, no lawsuit would have followed.
- B. George Balanchine's aesthetic views were informed by his political orientation.
- A. Alvin Ailey pursued a similar aesthetic to George Balanchine.
- B. the author believes that tort law in the U.S. has gotten out of hand.

4. The author would most likely agree with which one of the following statements?

- A. The lawsuit against the SFBS is a good thing because it will decrease the likelihood of future dancers damaging themselves in an effort to achieve a certain look.
- B. It is inappropriate to place children as young as 7 or 8 into rigorous classical ballet programs.
- C. More cities ought to enact laws like the one Krissy Keefer used to sue to SFBS.
- D. The view of ballet established by George Balanchine is outdated and merits significant revision.



# CARS Practice Passage 1: Questions

5. Which of the following arguments most closely parallels the main argument presented by the passage author?

- A. A hospital administrator believes that a pharmaceutical company has been engaging in price gouging towards urban hospitals and organizes a class-action lawsuit.
- B. A government contractor has a slow, cumbersome appeals process that provides a formal mechanism for censuring employees, and one manager at the company requires every disciplinary action against his subordinates to go through this process rather than a simpler informal discussion.
- C. A software development company discovers that a competitor has engaged in corporate espionage to beat them to market with a new piece of software and decides to sue for patent infringement.
- D. A school official argues against instituting a formal dress code with rules and punishments even though she agrees that some students currently dress in a manner that is unsuitable and that these students' behavior should change.

6. Which one of the following statements, if made by the author in another publication, would most contradict the views expressed here?

- A. Balanchine's view of ballet is outdated and should be revised by lawsuit or threat of lawsuit.
- B. Both ballroom dance and jazz dance, as media with more variety and fewer restrictions than classical ballet, are ultimately more expressive art forms.
- C. Dancers who join specialized troupes such as The Rockettes are often required to have even more strict physical uniformity than SFB dancers.
- D. Alvin Ailey was a much less prolific choreographer than George Balanchine, but he produced works of higher merit.

# CARS Practice Passage 2

## Passage 2 (Questions 7-12)

The German Empire existed for only 47 years and yet in that time did more to shape the nature of the 20th century than any other state in Europe (or possibly, the world). While most will only remember the end of the Empire – starting World War I and then being dissolved upon losing it – the German Empire should instead be remembered for its startling internal contradictions. It was a nation of impressive social, electoral, and economic advances but also a strictly authoritarian place. It is in this tension that Germany embodied much of the zeitgeist of the subsequent century. In 1871, the newly-minted Empire enacted universal male suffrage. At a time when poll taxes and literacy tests were being aggressively used to disenfranchise black voters in the U.S. and while the U.K. still had property requirements for suffrage, the German Empire permitted every single male the right to vote. Germany also created Europe’s first social welfare system, providing old-age pensions, sickness benefits, and accident and disability insurance for its industrial workers. The model set by the Empire saw increases in worker health and productivity that would not be rivaled for over a century (with the dawn of the information economy). This combination of expanding political participation, capitalist welfare systems, and freedom of the press set the tone for much of the political progress of the 20th century.

# CARS Practice Passage 2

In addition to these social reforms, the Empire experienced an unprecedented industrial and military expansion. Germany can rightly claim to be the first truly “urbanized” nation in the world. In 1870, Germany had almost no rail system to speak of and yet by 1913 had the largest rail network in the world, after the U.S. Germany’s dye and chemical industries grew exponentially in the decades prior to 1900, and expanded into pharmaceuticals, electrochemistry, and agricultural chemicals. This rapid industrial expansion had two significant corollaries: the development of the first class of industrial managers in the world – bureaucrats in the classic Song Dynasty sense who also embodied the scientific and technical know-how that created a strongly practical world-view; and second the research and development needed to drive this industrial expansion created a scientific Renaissance in German universities – over 1/3 of all Nobel prizes issued during the German Empire’s existence went to German scientists.

# CARS Practice Passage 2

The strong investment in industrial and scientific expansion was not without a significant dark side. The authoritarianism that quickly built an impressive industrial base also lent itself to disastrous social policies. Extending the vote to every adult male meant that suddenly, repressed Catholic and Polish minorities had a voice in the government. In response, Bismarck carried out two campaigns: the *kulturkampf* and Germanization. In the former, the Imperial government attempted to seize control of all Catholic churches. Over the course of a decade, every single Catholic bishop was imprisoned and as many as 1/4 of parishes found themselves without a priest. In line with government efforts to spread Lutheranism were the efforts to get every single person in the Empire to speak German. Significant minorities spoke French, Polish, and Lithuanian and efforts to force such groups to adopt German backfired spectacularly. In one province, the percentage of German-speaking citizens actually dropped by over 10% in the decade during which Germanization was being most aggressively pursued. The authoritarianism that failed so markedly in social policies had an even more impressively negative effect in foreign policy . . .

This set of contrasting, yet complementary, approaches to authoritarianism is best revealed by the incident which led to Chancellor Bismarck's resignation. Near the end of 1889, a group of coal miners in the German region of Silesia went on strike. Bismarck's reaction was swift: he began mobilizing the Army to go in and crush the strike. Emperor Wilhelm, however, stopped him and sent an official to negotiate with a delegation from the miners. The strike ended without violence and Bismarck resigned months later. Wilhelm is reputed to have said, "I do not wish to stain my reign with the blood of my subjects." Yet such measured non-violence obviously did not stay the Emperor's hand in dealing with the Empire's colonies.

# CARS Practice Passage 2: Questions

7. The author would most likely approve of which one of the following policies enacted by the German Empire?

- A. Shortly after enacting universal male suffrage, the empire enacted a policy requiring any legislation passed by elected members of the Reichstag to be approved by the Bundesrat, a legislative body consisting of un-elected landowning nobles.
- B. The imperial treasury paid companies for expenses incurred providing free housing to workers.
- C. Males living in Kingdoms, Grand Duchies, and Duchies of the Empire could vote, but those living in Principalities and Free Cities could vote only in local politics and had no representation in Imperial assemblies.
- D. Areas which embraced Germanization and had near-100% adoption of the German language for schools and businesses saw significant improvements in quality of life due to subsidized investments by large industrial firms.

8. The passage suggests that the Empire's violent authoritarianism in foreign policy was:

- A. primarily due to Emperor Wilhelm.
- B. primarily due to Chancellor Bismarck.
- C. crafted by Chancellor Bismarck and executed by Emperor Wilhelm.
- D. an outgrowth of policies of worker support and control in domestic policy.

# CARS Practice Passage 2: Questions

9. The author of this passage is most likely:
- A. a social conservative who favors limiting entitlement spending.
  - B. a historian discussing his area of expertise.
  - C. a journalist who specializes in studying the after-effects of European colonialism.
  - D. a Catholic scholar who examines the suppression of the Catholic faith around the world.
10. The passage suggests that Chancellor Bismarck's role in aggressive domestic policies like the *kulturkampf* and Germanization was:
- A. at least passive approval, if not active support and direction.
  - B. ignorance, as the Chancellor was only concerned with foreign policy.
  - C. one of active disapproval, with the Chancellor using his political influence to oppose the Emperor.
  - D. nonexistent, as Bismarck was not Chancellor of the German Empire during those two initiatives.

# CARS Practice Passage 2: Questions

11. The author discusses the rail system in order to:

- A. demonstrate the superiority of the German industrial base as compared to its continental neighbors.
- B. provide proof that had the German Empire continued into the twentieth century, it would soon have out-stripped even the U.S. in its advancement.
- C. compare Germany's successes at expanding its rail system with its failure to develop other technologies.
- D. provide supporting detail about the swiftness of Germany's industrial expansion.

12. The author's respect for the achievements of the German Empire is:

- A. founded in an ideological respect for the top-down organization of the various Germanic kingdoms into a single quasi-federal Empire.
- B. unreflective and thoughtlessly positive, suggesting that the author himself is a German nationalist.
- C. tempered by an appreciation for the negative consequences that came with achievements made possible by strong authoritarian control.
- D. balanced by his awareness that the authoritarian style of German governance paved the way for the atrocities of World War II.

# CARS Practice Passage 3

## Passage 3 (Questions 13-18)

Olav Hammer’s scathing critique of anthroposophy centers primarily on his assertion that anthroposophy is not science, but scientism – the inappropriate application of the methods of empirical science to all areas of life and the assertion that the only true knowledge or facts that can be discovered are those revealed through typical scientific methods. Both in subsuming the natural sciences under the umbrella of spiritual “science” and in its unjustifiable defense of fringe sciences such as biodynamic agriculture, anthroposophy places itself firmly in the realm of the delusional, holds Hammer. Anthroposophy is a philosophy founded at the start of the 20th century by Austrian philosopher and social reformer Rudolf Steiner. The core mission of anthroposophy is to help individuals develop imagination and intuition, and to study the spiritual world with the same objective rigor as the natural sciences. People were expected to develop a super-sensory consciousness which could then be used to study the spiritual realm and report back in a way intelligible to those who had not yet developed such consciousness. Steiner believed that the spiritual realm was real, and had the same objective existence as our material one.



# CARS Practice Passage 3

Steiner defined human nature as existing of four different components – a physical body that is created from and returns to the inorganic world; an etheric body (similar to all living things); an astral body (similar to all sentient beings); and a unique self-aware component called the ego. Humans reincarnate as part of a karmic cycle and are a higher life-form because they are less specialized. This last point reflects anthroposophy’s odd view of evolution: a single unspecialized archetype was the progenitor of all animal life and organisms are devolved from this state, rather than evolved towards increasing complexity as in Darwinism.

It was in this discussion of anthroposophical evolution that Steiner’s work drew the attention and ire from so many in both philosophical and scientific circles. Steiner’s defenders in the middle and later parts of the 20th century emphasized that such criticism ultimately missed the point. While any number of esoteric traditions flourished at the end of the 19th century (most prominently the Theosophy from which anthroposophy derived), none of them come in for the same criticism as anthroposophy. Defenders such as Herbert Hahn counter that we ought to look at the practical application of anthroposophic ideas and judge the philosophy not on its rarefied esoteric principles, but on its effect in the real world. “Christianity is not to be judged through a meditation on the paradox of how a being, Jesus, could be both fully man and fully God, but rather on the great works and good charity actually demonstrated by Christians,” held Hahn. “We only ask the same.”

# CARS Practice Passage 3

Hahn points out the Waldorf schools around the world which focus on holistic, developmentally-appropriate education for students at all levels. Waldorf schools typically produce young adults that are far more well-rounded and creative, and who excel at lateral thinking and problem solving, they assert. Biodynamic agriculture, developed in the early 1920's, laid the foundations for both modern organic farming and what would eventually become Integrated Pest Management, the gold standard in sustainable agriculture. Finally, Steiner's ideas about socially responsible financial associations set the framework for Social Finance that began with the *Gemeinschaftsbank* in Germany in the 1970's.

Both critics and defenders of Steiner's work have valid points, so far as they go, but ultimately end up speaking past one another.

# CARS Practice Passage 3: Questions

13. Had Steiner's writings never addressed the concept of evolution, which one of the following would likely have occurred?

- A. Organic farming would never have been developed.
- B. Anthroposophy would have received less criticism from some scientists and philosophers.
- C. Anthroposophy would have developed a view of humanity as consisting of three components instead of four.
- D. Biodynamic agriculture would have developed along different lines.

14. Which of the following would be an example of scientism, as the word is used in the passage?

- A. A behavioral economist thinks the best way to assess how effective a product's packaging is as a marketing tool is to empirically observe actual shoppers and whether they look at or reach for a type of package, rather than through surveys or focus groups.
- B. A psychic claims he is able to channel the spirit of Albert Einstein because he is able to relate minor details about Einstein's life and able to answer questions about physics that he would otherwise not know.
- C. A psychologist believes cognitive behavioral therapy is the most effective therapy technique for treating a certain mental illness based solely on data about reduced need for medication rather than any subjective feedback from patients.
- D. A researcher believes the only true way to measure the value of poetry is to do brain scans of people while they read the poem and measure the level of activity in the brain's pleasure center.

# CARS Practice Passage 3: Questions

15. Hahn and Hammer would most likely disagree about which of the following?

- A. Anthroposophy has had at least some positive impact on the world through its effective education.
- B. Biodynamic agriculture laid the groundwork for subsequent developments in organic farming.
- C. The methods and worldview of empirical science should remain tightly confined to the ambit of the classic natural sciences such as physics, chemistry, and botany.
- D. When evaluating a certain intellectual position, one should consider only the principles and assumptions of the position itself.

16. The author would describe which of the following as an example of people who are “speaking past one another”?

- A. A parent and teenager fight over whether the teenager should get to drive the family’s car, with the teenager pointing out how many of her peers get to drive their family car.
- B. Two political candidates discuss foreign policy in a debate, with one candidate focusing on the political interests of U.S. allies overseas and the other candidate emphasizing the need to spend more government money on solving domestic issues.
- C. Two chemists have different theories about a proposed mechanism for a chemical reaction and are each able to produce and publish data supporting their hypotheses.
- D. Two children on the playground get in a fight about whether one superhero could beat up another superhero, each supporting his argument with reference to the superpowers possessed by the superhero.

# CARS Practice Passage 3: Questions

17. The passage mentions Christianity in order to do which of the following?

- A. Provide an example of one means used by defenders of anthroposophy to bolster their position against critics.
- B. Prove that anthroposophy is not an example of scientism.
- C. Demonstrate that anthroposophy's positive effects through Waldorf schools and organic farming make anthroposophy a valuable philosophy.
- D. Imply that Christianity itself is an example of scientism and point out the hypocrisy of those attacking anthroposophy.

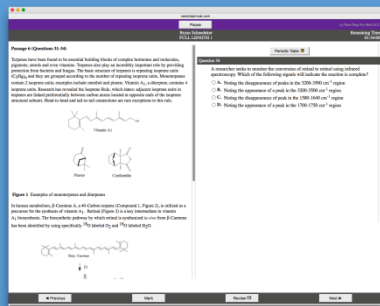
18. Those who defend anthroposophy rely on each of the following EXCEPT:

- A. Reasoning by analogy based on other worldviews
- B. A demonstration of apparent hypocrisy by critics
- C. A proof that scientism is irrelevant to the good works done based on a view
- D. A utilitarian argument about positive outcomes

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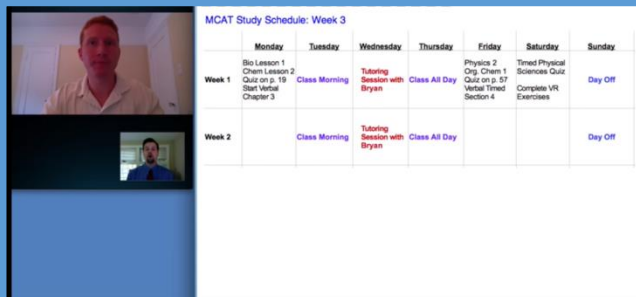
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## Self-Study

## MCAT Class



MCAT Study Schedule: Week 3

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Week 1	Bio Lesson 1 Chem Lesson 2 Quiz on p. 19 Start Verbal Chapter 3	Class Morning	Tutoring Session with Bryan	Class All Day	Physics 2 Quiz on p. 51 Verbal Timed Section 4	Timed Physical Sciences Quiz Complete VR Exercises	Day Off
Week 2		Class Morning	Tutoring Session with Bryan	Class All Day			Day Off

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# Custom study plan to show you your path

## GENERATE YOUR CUSTOM STUDY PLAN

### 1 Select your start date

08/10/2016

### 2 Select your exam date

10/31/2016

### 3 How will you be preparing for the MCAT?

On the side (5-20 hrs/week)

Part-Time (20-40 hrs/week)

Full-Time (40+ hrs/week)

### 4 Select the MCAT science subject about which you are most worried

Biology

Biochem

General Chemistry

Organic Chemistry

Physics

Psy/Soc

## YOUR CUSTOM STUDY PLAN

Edit Dates

Jump to a month: Aug Sep Oct

August 2016

SUN	MON	TUE	WED	THU	FRI	SAT
			10 DAY 1 REQUIRED Watch Orientation Video Take Science Content Diagnostic OPTIONAL	11 DAY 2 REQUIRED Take Diagnostic Test OPTIONAL Complete 2 CARS passages Watch 3 Bio/Biochem Content Review Videos Office Hours	12 Catch Up Day	13 DAY 3 REQUIRED Lesson 1 OPTIONAL Complete 30 questions from Biology Qbank
14 DAY 4 REQUIRED Read CARS SP Chapters 1-3 Complete practice passages for CARS SP Chapters 1-3 OPTIONAL Complete 2 CARS passages Watch 2 Bio/Biochem Content Review Videos Office Hours	15 Catch Up Day	16 DAY 5 REQUIRED Lesson 2 OPTIONAL Complete 30 questions from Biology Qbank Watch 2 Psych/Soc Content Review Videos Office Hours	17 DAY 6 REQUIRED Read CARS SP Chapter 4 Read Physics/Math CR Section 1 Complete Math Assessment from Physics/Math CR Section 5 OPTIONAL Complete 2 CARS passages Complete 20 questions from Biochem Qbank	18 Catch Up Day	19 DAY 7 REQUIRED Read Chem/Orgo CR Sections 1 and 2 Read Chem/Phys SP Ch 1 and 2 OPTIONAL Complete 2 CARS passages Watch 2 Physics Content Review Videos	20 DAY 8 REQUIRED Lesson 3 OPTIONAL Complete 2 CARS passages Complete 30 questions from Chemistry Qbank

# To be the best, work with the best

- Bryan: 15 years MCAT teaching experience
- Anthony: MD/PhD; 12 years MCAT experience
- Clara: 526 MCAT, 5 years experience
- Phil: 5 years experience; 98% score
- Andrew: U Chicago PhD, 523 MCAT



Bryan



Anthony



Clara



Phil



Andrew



# Welcome to Office Hours



## Buoyancy

Whenever an object is submerged in a fluid, it provides a lifting force.

$$F_{\text{Buoyancy}} = \rho g V_{\text{sub}}$$



Common Trap!

$\rho$  = Density of the fluid!

$$g = 9.8 \frac{\text{m}}{\text{s}^2}$$

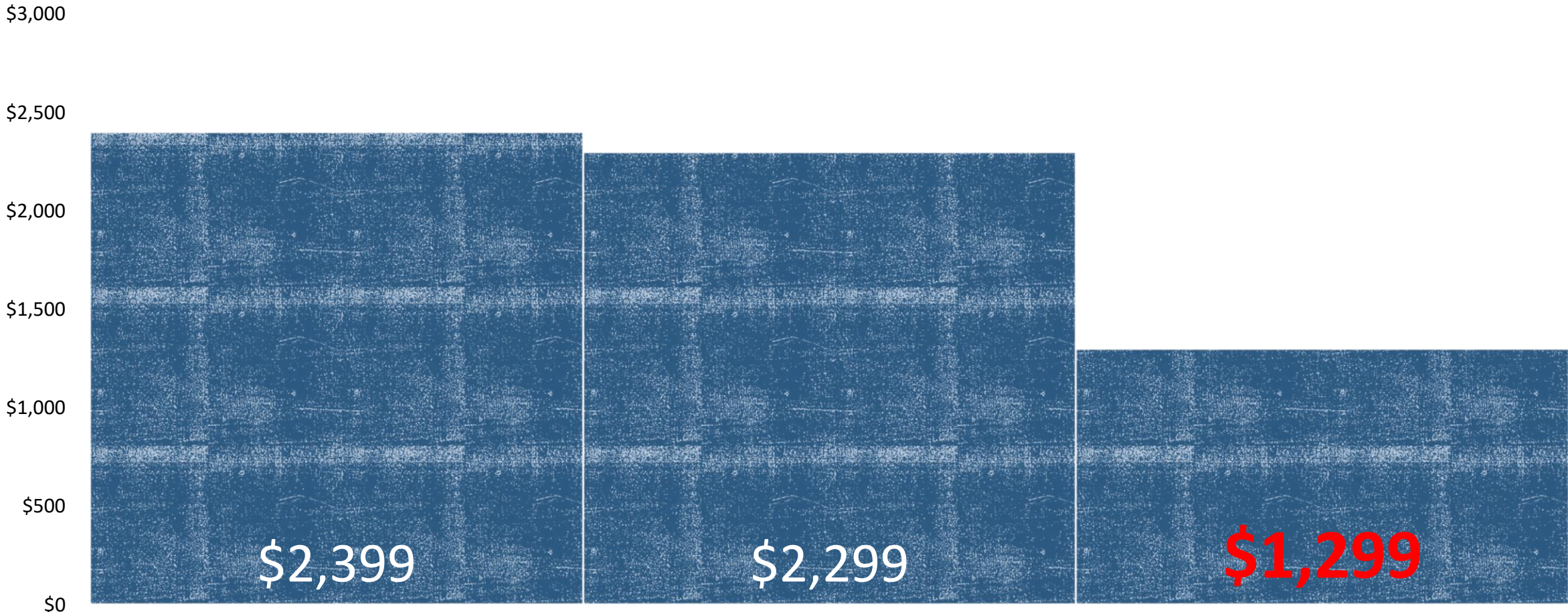
$V_{\text{sub}}$  = part of the object below the surface of the fluid



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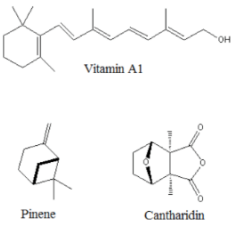
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Pause Remaining Time 01:34:06

Bryan Schnedeker FULL LENGTH 1

Passage 6 (Questions 31-34)

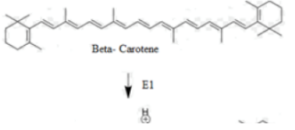
Terpenes have been found to be essential building blocks of complex hormones and molecules, pigments, sterols and even vitamins. Terpenes also play an incredibly important role by providing protection from bacteria and fungus. The basic structure of terpenes is repeating isoprene units ( $C_5H_8$ )<sub>n</sub> and they are grouped according to the number of repeating isoprene units. Monoterpenes contain 2 isoprene units; examples include menthol and pinene. Vitamin A<sub>1</sub>, a diterpene, contains 4 isoprene units. Research has revealed the Isoprene Rule, which states: adjacent isoprene units in terpenes are linked preferentially between carbon atoms located at opposite ends of the isoprene structural subunit. Head-to-head and tail-to-tail connections are rare exceptions to this rule.



Vitamin A<sub>1</sub>  
Pinene  
Cantharidin

Figure 1 Examples of monoterpenes and diterpenes

In human metabolism,  $\beta$ -Carotene A, a 40-Carbon terpene (Compound 1, Figure 2), is utilized as a precursor for the synthesis of vitamin A<sub>1</sub>. Retinal (Figure 2) is a key intermediate in vitamin A<sub>1</sub> biosynthesis. The biosynthetic pathway by which retinal is synthesized *in vivo* from  $\beta$ -Carotene has been identified by using specifically  $^{18}O$  labeled  $O_2$  and  $^{18}O$  labeled  $H_2O$ .



Beta-Carotene

Periodic Table

Question 34

A researcher seeks to monitor the conversion of retinal to retinol using infrared spectroscopy. Which of the following signals will indicate the reaction is complete?

A. Noting the disappearance of peaks in the 3200-3500  $cm^{-1}$  region

B. Noting the appearance of a peak in the 3200-3500  $cm^{-1}$  region

C. Noting the disappearance of peak in the 1580-1640  $cm^{-1}$  region

D. Noting the appearance of a peak in the 1700-1750  $cm^{-1}$  region

◀ Previous Mark Review Next ▶

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Close and Return Remaining Time 01:34:06

Bryan Schnedeker FULL LENGTH 1

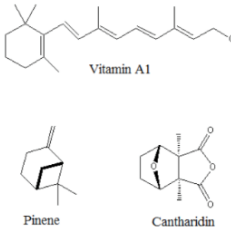
Passage 6 (Questions 31-34)

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Key terms: terpenes, isoprene unit formula, mono/di terpene, isoprene rule

Contrast: the favored isoprene links are head-to-tail, though exceptions do occur

Cause and effect: repeated isoprene units can combine to form several biologically important molecules



Vitamin A<sub>1</sub>  
Pinene  
Cantharidin

Figure 1 Examples of monoterpenes and diterpenes

Figure 1 shows us that the various terpene molecules made up of repeating isoprene units

In human metabolism,  $\beta$ -Carotene A, a 40-Carbon terpene (Compound 1, Figure 2), is utilized as a precursor for the synthesis of vitamin A<sub>1</sub>. Retinal (Figure 2) is a key intermediate in vitamin A<sub>1</sub> biosynthesis. The biosynthetic pathway by which retinal is synthesized *in vivo* from  $\beta$ -Carotene has been identified by using specifically  $^{18}O$  labeled  $O_2$  and  $^{18}O$  labeled  $H_2O$ .

Periodic Table

Question 34

A researcher seeks to monitor the conversion of retinal to retinol using infrared spectroscopy. Which of the following signals will indicate the reaction is complete?

A. Noting the disappearance of peaks in the 3200-3500  $cm^{-1}$  region

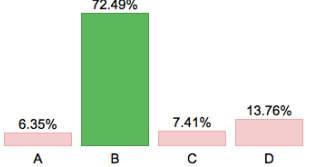
B. Noting the appearance of a peak in the 3200-3500  $cm^{-1}$  region

C. Noting the disappearance of peak in the 1580-1640  $cm^{-1}$  region

D. Noting the appearance of a peak in the 1700-1750  $cm^{-1}$  region

72.49% of students answered this question correctly.

Your answer was incorrect



Answer Explanation:

- Difficulty: 2 Medium
- Reasoning Skill: 2 Scientific Reasoning and Problem Solving
- Concept Category: 4D Light and Sound

B is correct. Retinol differs from retinal in that it contains -OH groups, but does not contain a carboxyl group (C=O). The carbonyl stretching frequency falls in the region 1700-1750  $cm^{-1}$ , whereas the O-H stretching frequency is expected to fall in the region 3200-3500  $cm^{-1}$ .

A: This would indicate a lack of OH groups, which is a characteristic of retinal, not retinol.

C: This peak is indicative of C=C groups, which both molecules have and cannot be used to determine when retinal has been converted.

◀◀ Previous Passage ◀ Previous Next Section ▶▶ Next ▶ Next Passage ▶▶

# Comprehensive Reporting and Analytics

## Scaled Scores

Section	Scaled Score	Percentile
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Chemical and Systems		
Critical Analy		
Biological and Systems		
Psychological Behavior		
<b>Total</b>		

## Results by Reasoning Skills

Concept Category	Total Correct	Correct Percentage
1 Knowledge of Scientific Concepts and Principles	49	71.01% (49/69)
2 Scientific Reasoning and Problem Solving	39	68.42% (39/57)
3 Reasoning About the Design and Execution of Research	23	69.7% (23/33)
4 Data-based and Statistical Reasoning	10	55.56% (10/18)
5 Foundations of Comprehension	12	75% (12/16)
6 Reasoning within the Text	14	60.87% (14/23)
7 Reasoning Beyond the Text	9	64.29% (9/14)

RESULTS

## Results by Section

Chemical

Correct:

Critical Ar

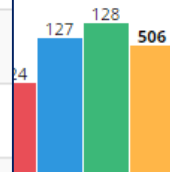
Correct:

Biological

Correct:

Psycholog

Correct:



## Results by Concept Category

Concept Category	Total Correct	Correct Percentage
1A Amino Acids and Proteins	4	57.14% (4/7)
1B Molecular Genetics	9	81.82% (9/11)
1C Classical Genetics	9	69.23% (9/13)
1D Metabolism	3	37.5% (3/8)
2A Cell Biology	1	100% (1/1)
2B Microbiology	4	80% (4/5)
2C Reproduction	3	60% (3/5)
3A Nerve and Endocrine	4	50% (4/8)
3B Organ Systems	1	100% (1/1)
4A Kinematics and Force	5	50% (5/10)

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