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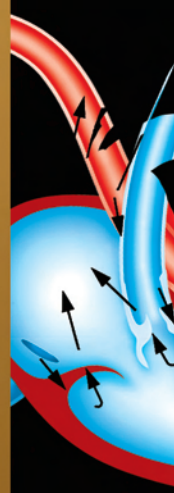
Clear approach to get into med-school

GAMSAT*



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Dr. Brett Ferdinand, M.D.

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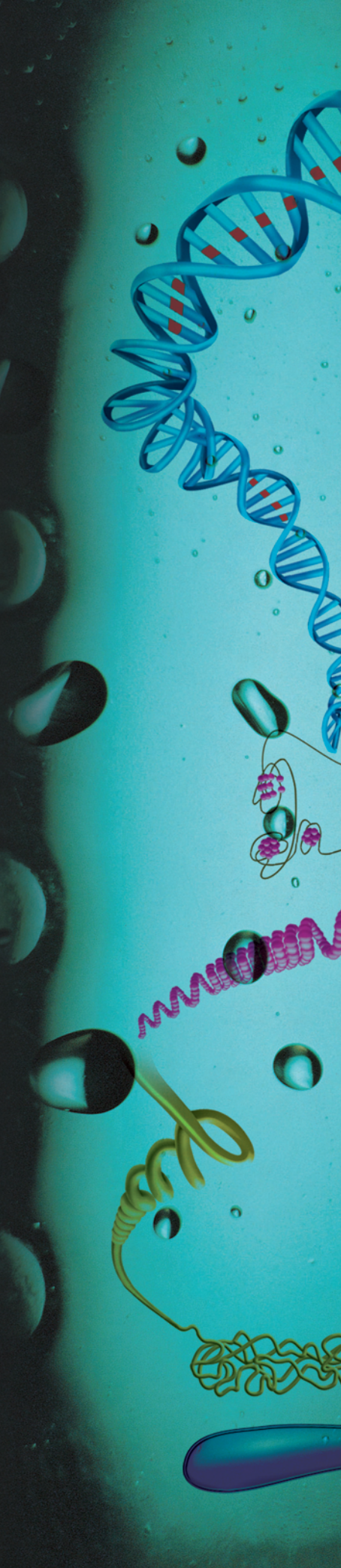
2nd EDITION

THE GOLD STANDARD

GAMSAT



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PREFACE

No science background in university? Great in the sciences but little experience reading from the humanities or writing essays? Had a bad experience with a high school physics teacher? Full time arts student? Full time mom? Part time job? It's OK. The Gold Standard has you covered. This is not just a textbook, it is a learning experience.

The Gold Standard has integrated textbook reading with many free features including online problem solving with explanations, essays for you to review in the book and online, 10 hours of online teaching videos with ideas presented in clear terms, online equation lists and organic reaction summary, hundreds of additional practice questions, a full length paper practice test with online detailed explanations and a forum thread to discuss every individual question - for free - and much more. We also offer - separately or in packages - the Gold Standard GAMSAT DVD with helpful strategies for all test sections; 16 science review DVDs prepared for the MCAT which, thankfully, contain all the major GAMSAT science topics clearly explained; and to increase study efficiency: flashcards, MP3s and an iPhone application.

The flashcards and iPhone App point to which section in the book you can find more details. The book points to which DVD you can use as a lecture. The videos and the explanations to the practice tests also point to specific sections of the book should you require clarification. We have also added options like an essay correction service and live courses in classrooms in Australia, Ireland and the UK. Thus we created a multimedia integrated approach so you can choose the tools that help you study best.

Now let's discuss medical school admissions. Your GPA and GAMSAT score can write the ticket for a medical school interview where success opens the door for admissions. Our aim is to be of help every step of the way. Herein lies a comprehensive section by section review for the GAMSAT, a concise examination as to how you can improve your grades at school, and a 'to the point' approach on the non-academic aspects of the admissions process: in particular, medical school interviews and, for those that require them, autobiographical materials and letters of reference. The medical interview section can stand alone or can be used in conjunction with The Gold Standard Medical School Interview DVD where I conduct a live interview in front of a class on campus and then analyze each response - question by question.

Truly, The Gold Standard has evolved into a complete reference textbook for the premedical student and other students who may need to sit the GAMSAT. Learn well and it will be reflected in your performance.

Good luck!

– B.F., MD

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INTRODUCTION

The GAMSAT (Graduate Australian Medical School Admissions Test), developed by the Australian Council for Educational Research (ACER), helps determine whether a student with at least a bachelor's degree can advance their studies in medicine, dentistry, pharmacy and veterinary science. In many ways, modeled after the MCAT which has a 70 year history, the GAMSAT was developed for the universities in Australia in the mid-1990s and, more recently, has been used as a component of the admissions procedure at a growing number of institutions in the UK and Ireland.

The GAMSAT is divided into 3 sections: (i) Section I: Reasoning in the Humanities and Social Sciences; (ii) Section II: Written Communication (two essays); and (iii) Section III: Reasoning in the Biological Sciences (biology and organic chemistry) and the Physical Sciences (physics and general chemistry).

The Gold Standard will expose the GAMSAT section by section - both within the pages to come and with the help of the Gold Standard Online Access Card, which can be found on the inside back cover of this textbook. Exam-taking tips for the GAMSAT, the Recipe for GAMSAT Success, and a review with strategies for Section I and Section II will all be explored. After which, a comprehensive and fully illustrated science review will follow. The science review contains physics, general chemistry, biology, and organic chemistry - all in the necessary detail. Hundreds of chapter review questions are online and you will also be able to use the pull-out full length simulated GAMSAT test at the back of this textbook. Thus the information you learned will be put into practice. You will also have online access to 10 hours of teaching videos which most students find very helpful. This book, in combination with the free online videos or the more comprehensive Gold Standard science review DVDs, will be able to teach the student without a science background from the bottom up or serve as a fresh basic review for the advanced student in science. You will not be required to consult any textbooks and, if you are doing so, you are likely chasing salient details that are not required for the GAMSAT.

The GAMSAT is a reasoning test. You must master some basic scientific principles but memorization alone will not get you far. You are to do a "science survey" to get a foundation NOT a marathon of memorization. We understand this tenet and we have designed this book to emphasize this reality by describing in front of each chapter: what to memorize, what to understand and what is simply not required.

Your formula for success comes in 3 parts: content review, practice problems and full length testing. We will guide you through the process.

Let's begin...

IMPROVING ACADEMIC STANDING

1.1 Lectures

Before you set foot in a classroom you should consider the value of being there. Even if you were taking a course like 'Basket-weaving 101', one way to help you do well in the course is to consider the value of the course to **you**. The course should have an *intrinsic* value (i.e. 'I enjoy weaving baskets'). The course will also have an *extrinsic* value (i.e. 'If I do not get good grades, I will not be accepted...'). Motivation, a positive attitude, and an interest in learning give you an edge before the class even begins.

Unless there is a student 'note-taking club' for your courses, your attendance record and the quality of your notes should both be as excellent as possible. Be sure to choose seating in the classroom which ensures that you will be able to hear the professor adequately and see whatever she may write. Whenever possible, do not sit close to friends!

Instead of chattering before the lecture begins, spend the idle moments quickly reviewing the previous lecture in that subject so you would have an idea of what to expect. Try to take good notes and pay close attention. The preceding may sound like a difficult combination (esp. with professors who speak and write quickly); however, with practice you can learn to do it well.

And finally, do not let the quality of teaching affect your interest in the subject nor your grades! Do not waste your time during or before lectures complaining about how the professor speaks too quickly, does not explain concepts adequately, etc... When the time comes, you can mention such issues on the appropriate evaluation forms! In the meantime, consider this: despite the good or poor quality of teaching, there is always a certain number of students who **still** perform well. You must strive to count yourself among those students.

1.2 Taking Notes

Unless your professor says otherwise, if you take excellent notes and learn them inside out, you will *ace* his course. Your notes should always be up-to-date, complete, and separate from other subjects.

THE MEDICAL SCHOOL INTERVIEW

2.1 Introduction

The application process to most medical schools includes interviews. Only a select number of students from the applicant pool will be given an offer to be interviewed. The medical school interview is, as a rule, something that you *achieve*. In other words, after your school grades and GAMSAT scores (and/or references and autobiographical materials for international schools) have been reviewed, you are offered the ultimate opportunity to put your foot forward: a personalized interview.

Depending on the medical school, you may be interviewed by one, two or several interviewers. You may be the only interviewee or there may be others (i.e., *a group interview*). There may be one or more interviews lasting from 20 minutes to two hours. And, of course, there is the increasingly popular multiple mini-interview (MMI) which includes many short assessments in a timed circuit.

Despite the variations among the technical aspects of the interview, in terms of substance, most medical schools have similar objectives. These objectives can be arbitrarily categorized into three general assessments: (i) your personality traits, (ii) social skills, and (iii) knowledge of medicine.

Personality traits such as maturity, integrity, compassion, sincerity, honesty, originality, curiosity, self-directed learning, intellectual capacity, confidence (*not arrogance!*), and motivation are all components of the ideal applicant. These traits will be exposed by the process of the interview, your mannerisms, and the substance of what you choose to discuss when given an ambiguous question. For instance, bringing up *specific* examples of academic achievement related to school and related to self-directed learning would score well in the categories of intellectual capacity and curiosity, respectively.

Motivation is a personality trait which may make the difference between a high and a low or moderate score in an interview. A student must clearly demonstrate that they have the enthusiasm, desire, energy, and interest to survive (typically) four long years of medical school and beyond! If you are naturally shy or soft-spoken, you will have to give special attention to this category.

Social skills such as leadership, ease of communication, ability to relate to others and work effectively in groups, volunteer work, cultural and social interests, all constitute skills which are often viewed

The MCAT can be used by international students applying to medical schools that accept GAMSAT scores. Only international students have the option of sitting the MCAT instead of the GAMSAT. Consult individual programmes for confirmation.

1.2 The Format of the GAMSAT

The GAMSAT aims to test your skills in problem solving, critical thinking, writing as well as mastery and application of concepts in the basic sciences. The exam is divided into three sections. All questions, save for Section II, are multiple choice with 4 options per question. Ten minutes reading time is given for Sections I and III, and five minutes for Section II. The following is your schedule for the test day:

Section I	
Reasoning in the Humanities and Social Sciences	
Questions	75
Time	100 minutes

Section II	
Written Communication	
Questions	2
Time	60 minutes
Lunch	60 minutes

Section III	
Reasoning in Biological and Physical Sciences	
Questions	110
Time	170 minutes

Biological and Physical Sciences collectively include biology, general and organic chemistry at the introductory university level, and physics at essentially the Grade 12 level. Overall, the subject material is weighted as follows:

Biology	40%
Chemistry	40%
Physics	20%

The layout of Section I and Section III are similar with separate "Units" containing stimulus material followed by multiple choice questions. Section I may use excerpts from poems, novels, articles, a cartoon, etc. However, for Section III, the stimulus material can also include a passage, graph, equation(s), text, data, etc.

GAMSAT score that you wish to submit for consideration for admissions.

Since there is no limit to the number of times you can sit the GAMSAT, you may even choose to sit the exam twice in one year: for example, GAMSAT Australia or Ireland in March and then GAMSAT UK in September.

Any two tests on different examination dates will have, essentially, the same format; however, the questions are different for each exam.

How many times did you sit the GAMSAT?	
Once	67%
Twice	27%
3 Times	6%
2010 Gold Standard GAMSAT survey at the University of Sydney (Usyd Medical Science Society), n>100, average reported GAMSAT score (most recent): 62.2.	

1.3.2 Average, Good and High GAMSAT Scores

Please keep in mind that the percentile rank indicates your test performance relative to all the students who sat the same test on the same day. It records the percentage of students whose scores were lower than yours.

Score	Percentile	Score
56-58	50th	average
61-63	75th	usually good*
73 or higher	98th	very high

*Please note, a "good" score may be good enough for admittance to one particular medical school but below the cutoff of another. Consult the websites of the medical institutions to which you intend to apply.

REVIEW FOR SECTION I

3.1 Overview

Section I of the GAMSAT is, for many applicants, the most difficult section to do well. This can be explained by the absence of an overall set of facts to study in order to prepare. Some applicants, due to the lack of review material, neglect to prepare for this section.

While the best preparation is regular reading from a variety of sources throughout your high school and undergraduate studies, it is also possible to improve your ability to do well in this section as you approach the test date. You should not neglect to prepare for this section as it accounts for one of your final GAMSAT numerical scores!

Section I is called "Reasoning in Humanities and Social Sciences." You are provided 100 minutes to complete 75 questions. This section consists of a number of "Units" where each Unit presents stimulus material and a number of multiple choice questions (4 options per question).

The stimulus material in Section I can be anything from a poem, a cartoon, a picture, an extract from a play, novel, song, instructional manual or magazine. Essentially anything that involves words or symbols and thinking is fair game. There is no specific presumed knowledge required to answer any of the questions. Reasoning, analysis, timing and pacing are all key components to success.

Which GAMSAT section was the easiest?	
Section I	5%
Section II	54%
Section III	41%
2010 Gold Standard GAMSAT survey at the University of Sydney, n>100, <5% with a non-science background; average reported GAMSAT score (most recent): 62.2.	

3.5 Types of Questions

Main Idea Questions

These test your comprehension of the theme of the article. Questions may ask you for the main idea, central idea, purpose, a possible title for the passage, and so on. You may be asked to determine which statement best expresses the author's arguments or conclusions.

Inference Questions

These require you to understand the logic of the author's argument and then to decide what can be reasonably inferred from the article and what cannot be reasonably inferred.

Analysis of Evidence Questions

These ask you to identify the evidence the author uses to support his/her argument. You may be required to analyze relationships between given and implied information. You may be asked not only to understand the way the author uses different pieces of information but also to evaluate whether the author has built sound arguments.

Implication Questions

You may be asked to make judgments about what would follow if the author is correct in his/her argument or what a particular discovery might lead to. You may be given new information and then asked how this affects the author's original argument.

Tone Questions

You may be asked to judge the attitude of the author towards the subject.

Hybrid Questions

Often more than one question type is used in the same instance. An “implication” question can be answered through the “tone” or “evidence” which is presented within the material. In addition, an assessment of material such as a “main idea” often includes “an analysis of evidence.” There may be a number of “hybrid” type questions, which include one or more of all the question types discussed. In logically deducing and ruling out answers, two central ideas are very helpful: the most “encompassing” of the answers, and which of the answers has the most “explanatory power” in relation to the others. This will become more clear as we do some exercises.

3.5.1 Main Idea Questions

Since this is very common, we will do some exercises to ensure that you can successfully deal with these question types. Please take a piece of paper (i.e. Post-it

Unit 5

Question 11

Two very short stories by Franz Kafka

The Wish to be a Red Indian

If one were only an Indian, instantly alert, and on a racing horse, leaning against the wind, kept on quivering jerkily over the quivering ground, until one shed one's spurs, for there needed no spurs, threw away the reins, for there needed no reins, and hardly saw that the land before one was smoothly shorn heath when horse's neck and head would be already gone.

The Trees

For we are like tree trunks in the snow. In appearance they lie sleekly and a little push should be enough to set them rolling. No, it can't be done, for they are firmly wedded to the ground. But see, even that is only appearance.

11. A wise literary critic remarked that the whole point of reading Kafka was to re-read. Indeed, he presents us with an abstract world of images which almost seem to operate on their own volition. After re-reading these two very short stories, which of the following abstract terms, by way of ratio, would best describe the stories respectively?

A. Initiation – Naturalization
B. Transformation – Simulation
C. Alienation – Perception
D. Being - Becoming

REVIEW FOR SECTION II

4.1 Overview

GAMSAT Section II, or "Written Communication," is comprised of 2 essays.

Why write an essay?

In the early 1990s, the essay was included in the MCAT following complaints from the deans of various medical schools concerning the communication skills of medical students. Subsequently, it was included in the inaugural GAMSAT and, of course, has continued to this day.

Section II will measure your ability to:

1> develop a central idea
2> synthesize ideas and concepts
3> express ideas in a logical and cohesive way
4> write clearly, using standard English and appropriate grammar, spelling and punctuation.

You are not expected to write a short polished essay of final draft quality. The people grading your exam are aware that you only had 30 minutes to write the essay. Nevertheless, you will be expected to write a 'good' essay. Please refer to Section 4.4 for a scoring key. You may also consult Section 4.5 and GAMSAT-prep.com for examples of what a 'good' essay is in the eyes of the markers.

Section II, being the only non-multiple choice section of the GAMSAT, includes two separately timed hand-written thirty minute essays. You are provided 5 minutes reading time. Each essay is on a theme which is conveyed through a group of five quotes. Your essay must address the theme and may include 1 or more of the given quotations. The first essay "Task A" and the second essay "Task B" have different themes.

	Writing Task A	Writing Task B
Writing style	• expository • argumentative	• reflective • discursive
Theme	• philosophical • political	• interpersonal • social
Topics (examples)	• censorship • human nature • education • progress • wealth	• hatred • youth • self-discovery • conformity • humour

lesser extent, (4) organization and technical issues. Of course, being "overly" creative could have its own risks (i.e. inappropriate distraction).

If you can, since this is formal writing, minimize your use of contractions as well as first-person and second-person pronouns ("I," "me," "you").

Typically, the most interesting ideas will get the most marks.

Specific examples can be powerful from history or from current affairs. Both will be greatly bolstered with the advice in Sections 3.2.1 and 3.2.2 of the previous chapter - irrespective of your academic background.

4.1.3 Focussing on Task A

Let "A" be Argumentative!

An argumentative essay has three tasks. These tasks can be summarized as follows:

1 **Thesis:** the first paragraph should provide an explanation or an interpretation of the quotation or quotations that you have chosen.

2 **Antithesis:** the second paragraph (and sometimes a 3rd and/or 4th) provides an example, real or hypothetical, that demonstrates a point of view opposite to the one presented in the Thesis.

3 **Synthesis:** the final paragraph concludes with a way for the conflict between the viewpoint expressed in the Thesis and the one presented in the Antithesis to be reconciled.

These three tasks should keep you quite busy for the 30 minutes you have to write the essay. The tasks, however, once you are familiar with them, will help you by structuring your essay automatically for you.

All MCAT Writing Samples follow the rules of Section II Task A. You will get access to at least a dozen officially corrected real Writing Samples at GAMSAT-prep.com to provide you with examples of both poor and great argumentative essays written in 30 minutes.

4.5 Corrected Essays

In this section, you will find two response essays with corresponding comments. More corrected essays can be accessed at GAMSAT-prep.com. If you wish, use this as yet another exercise. Get a pen and some lined paper. Time yourself (30 minutes) and create an essay in response to the instructions below. Subsequently, compare your response to the graded essays that follow.

WRITING TASK A

Consider the following comments and develop a piece of writing in response to one or more of them.

Your writing will be judged on the quality of your response to the theme; how well you organise and present your point of view, and how effectively you express yourself. You will not be judged on the views or attitudes you express.

* * * * * *

"Laws made by common consent must not be trampled on by individuals."

George Washington

"The final test of civilization of a people is the respect they have for law."

Lewis F. Korns

"In matters of conscience, the law of the majority has no place."

Mahatma Gandhi

"In Republics, the great danger is that the majority may not sufficiently respect the rights of the minority."

James Madison

"All, too, will bear in mind this sacred principle, that though the will of the majority is in all cases to prevail, that will to be rightful must be reasonable; that the minority possess their equal rights, which equal law must protect, and to violate would be oppression."

Thomas Jefferson

SAMPLE ESSAY #1

A A A A A

The law of the majority Unimportant?

"In matters of concience the law of the majority has no place." For instance, a hs student, greatly feels peer pressure would choose not to smoke eventhough the majority of his peers feel that it is a desirable thing to do. According to the statement this student should make his choice based on what he believes not to be right, regardless of the general consesnus of his peers.

There are some situations in which the law of majority is important in matters of conscience. For instance, a politician that believes in firearms can not make a law to force his constituents to carry guns, if they are horrible opposed to such weapons in the first place. Therefore the politician, in doing what he feels is right wouldn't be able to ignore the general consensus of the people of his province about firearms because his decision about such a law would affect them as well as him.

Certain circumstances would govern whether the law of majority is important or not in matters of conscience. If a person acts in such a way that he can live with, and it doesn't have adverse effects on other people who may

IF YOU NEED MORE SPACE, CONTINUE ON THE NEXT PAGE.

SAMPLE ESSAY #1

A A A A A

feel quite differently, then the law of majority is unimportant. If a person's conscience tells them to act in ways that hurt others, then the conscience of the majority must be taken into account. For instance, a Christian school teacher can't force her class that is majority Jewish to sing christmas songs because she believes it's the proper thing to do during the christmas holidays. That would antagonize the class, which would have been taken into consideration when she wanted to do what's right.

IF YOU NEED MORE SPACE, CONTINUE ON THE BACK OF THIS PAGE.

Analysis of Sample Essay #1

Score	
2/6	44–50

Task 1 – not really achieved. Although the statement was used in the first sentence, it was never really defined as a thesis nor otherwise defined. Encountering the typographical error "concience" instead of "conscience" or the mistake in spelling the quote in the beginning, seriously hurts the credibility of the writer. Peer evaluation or pressure is somewhat analogous to the making of laws by the majority, but quite loose as an association. For these reasons, clarity of thought and concrete examples to support a given thesis seem cloudy and unfocused.

Task 2 – an antithesis is never really developed to the extent needed. While the politician example whom is juxtaposed in relation to a general consensus, could be developed, the idea of "forcing" people to carry weapons, seems an example, a bit absurd and reaching. The credibility of the writer is also questioned, when the use of "horrible" instead of the correct "horribly" (Para. 2, Line 2) is used adding to a general tone of inconsistency in care of grammar, and overall approach to the subject.

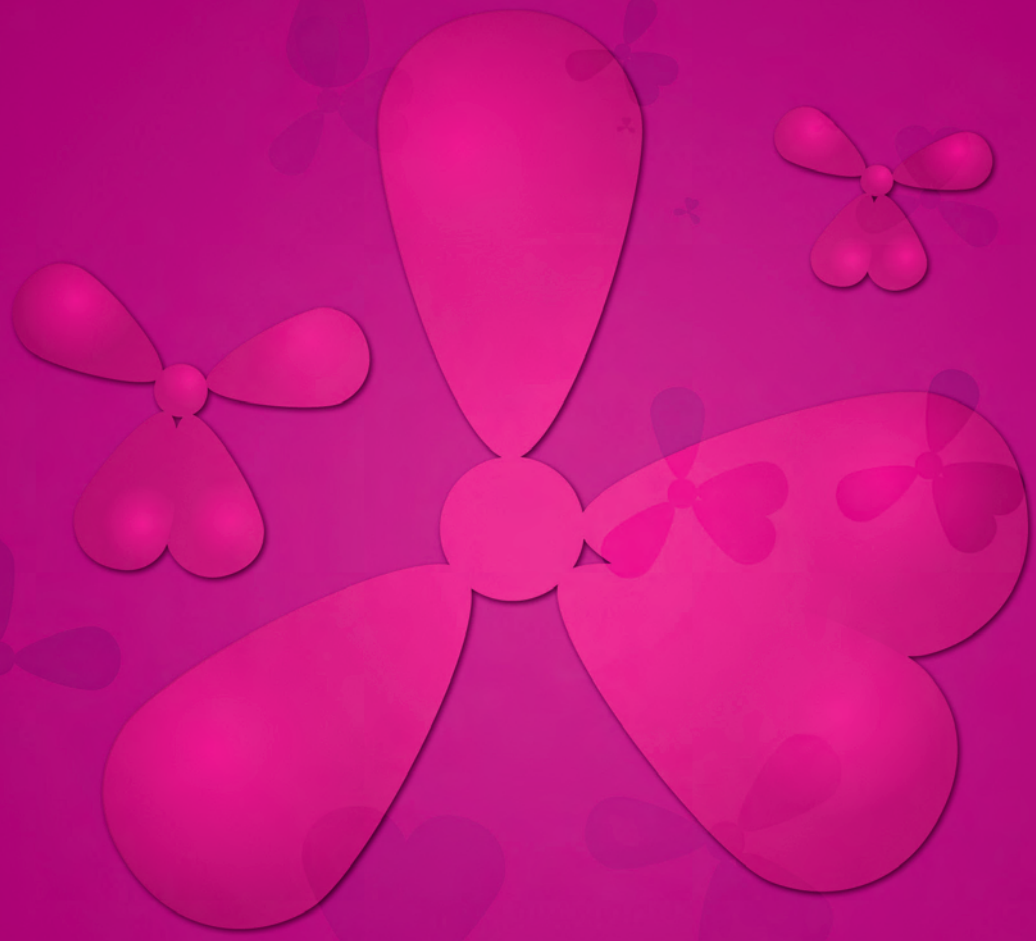
Task 3 – Because neither of the above tasks were completed with the necessary organizational and supportive devices and materials, providing a synthesis of arguments presented is impossible. A touchy feely context-based qualification in the surmounting to a "well, it all depends on the circumstance," is an intellectual and academic cop-out. The example of the Christian school teacher with Jewish students not forcing them to sing Christian songs, could be developed in more detail, if such an example is chosen.

Overall – some good ideas, but unfocused, not organized to the extent needed. There seems to be some misunderstanding of the quote. The writer needs to reveal the Gandhi meaning that non-violent resistance to certain political repressions was not only necessary, but morally correct and in opposition to the laws of the majority. Hypothetical examples could be explored also: suppose that there was a law passed that said you could not protest or peaceably assemble to protest, or a law prohibiting you from enjoying "life, liberty, and the pursuit of happiness.' In many ways, the subject of the essay concerns "personal liberty" vs. "collective responsibility" or "subjective reactions" to "legislative mandates or laws." This juxtaposition, or fulcrum needs to be explored and balanced to a larger degree.

Technical errors, spelling, and typographical errors deflated the essay – as previously noted. A stronger organizational pattern is needed, which follows a sequential and logical progression.

Evaluation (*see* Section 4.5): 2/6. This essay completely fails to address adequately one or more of the tasks. There may be recurring mechanical errors (i.e. spelling and grammar). Problems with analysis and organization are typical (though organization was fine in this instance).

2	These essays may show some problems with clarity or complexity of thought. The treatment of the writing assignment may show problems with integration or coherence. Major ideas may be underdeveloped. There may be numerous errors in mechanics, usage, or sentence structure.



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GENERAL CHEMISTRY

PART III.A: PHYSICAL SCIENCES

IMPORTANT: Before doing your science survey for the GAMSAT, be sure you have read the Preface, Introduction and Part II, Chapter 2. The beginning of each science chapter provides guidelines as to what you should Memorize, Understand and what is Not Required. These are guides to get you a top score without getting lost in the details. Our guides have been determined from an analysis of all ACER materials plus student surveys. Additionally, the original owner of this book gets a full year access to many online features described in the Preface and Introduction including an online Forum where each chapter can be discussed.

ELECTROCHEMISTRY

Chapter 10

Memorize

* Define: anode, cathode, anion, cation
* Define: standard half-cell potentials
* Define: strong/weak oxidizing/reducing agents

Understand

* Electrolytic cell, electrolysis
* Calculation involving Faraday's law
* Galvanic (voltaic) cell, purpose of salt bridge
* Half reaction, reduction potentials
* Direction of electron flow

Not Required*

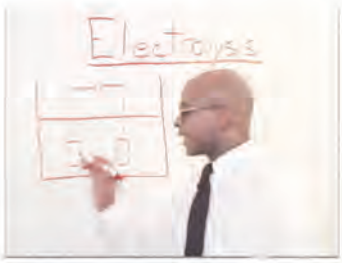
* Advanced level college info
* Memorizing the value of a faraday
* Nernst equation, Frost diagram

Introduction

Electrochemistry links chemistry with electricity (the movement of electrons through a conductor). If a chemical reaction produces electricity (i.e. a battery or galvanic/voltaic cell) then it is an **electrochemical cell**. If electricity is applied externally to drive the chemical reaction then it is **electrolysis**. In general, oxidation/reduction reactions occur and are separated in space or time, connected by an external circuit.

Additional Resources

Free Online Q & A



Video: Online or DVD 4

Flashcards

Special Guest

* The real GAMSAT may have advanced level information presented (ie. in a passage) but previous knowledge of said information is not required to answer the questions that would follow. Practice ACER and GS practice GAMSATs can help you clarify this point.

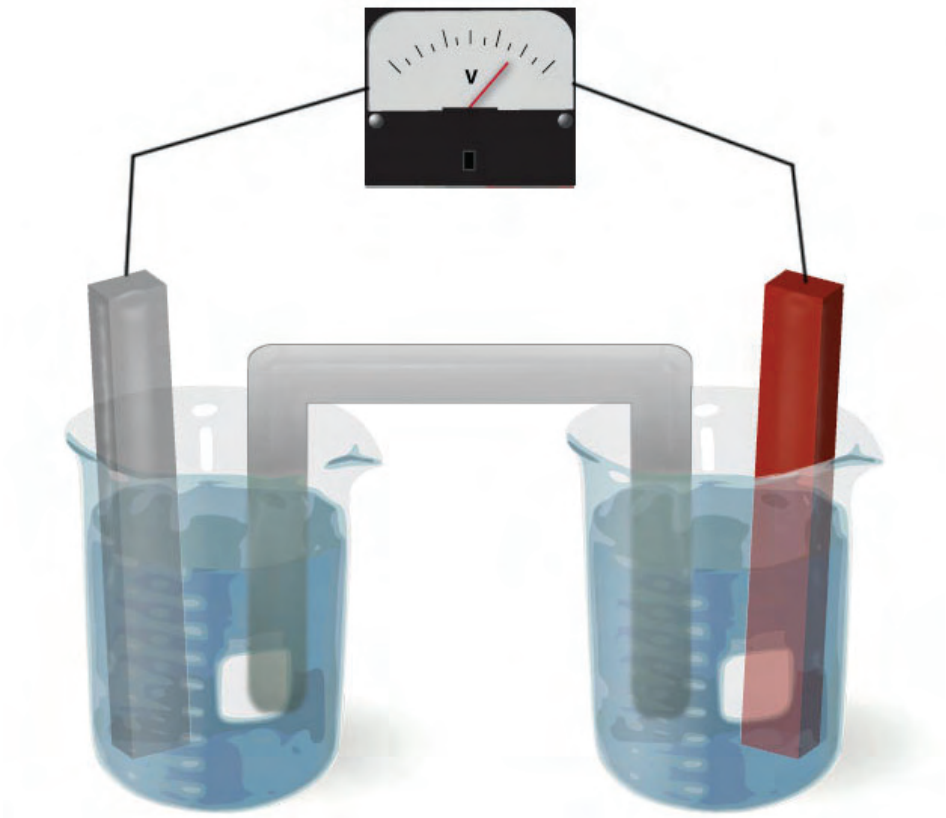


Figure III.A.10.1a: A galvanic (electrochemical) cell.

The metallic parts (Cu(*s*) and Zn(*s*) in our example) of the galvanic cell which allow its connection to an external circuit are called electrodes. The electrode out of which electrons flow is the anode, the electrode receiving these electrons is the cathode. In a galvanic cell the oxidation occurs in the anodic compartment and the reduction in the cathodic compartment. The voltage difference between the two electrodes is called the electromotive force (*emf*) of the cell, if the concentration of all the ions involved is 1 molal, the emf is simply:

$$emf = n \times E^{o}(\text{reduction}) - m \times E^{o}(\text{oxidation})$$

Where n and m are the stoichiometric factors by which each half-reaction needs to be multiplied to yield a balanced overall reaction. The stoichiometric factors are *not* used if one is simply calculating the E^{o} of the cell. The voltage can be measured by the voltmeter. {Mnemonic: LEO is A GERC = Lose Electrons Oxidation is Anode, Gain Electrons Reduction at Cathode}

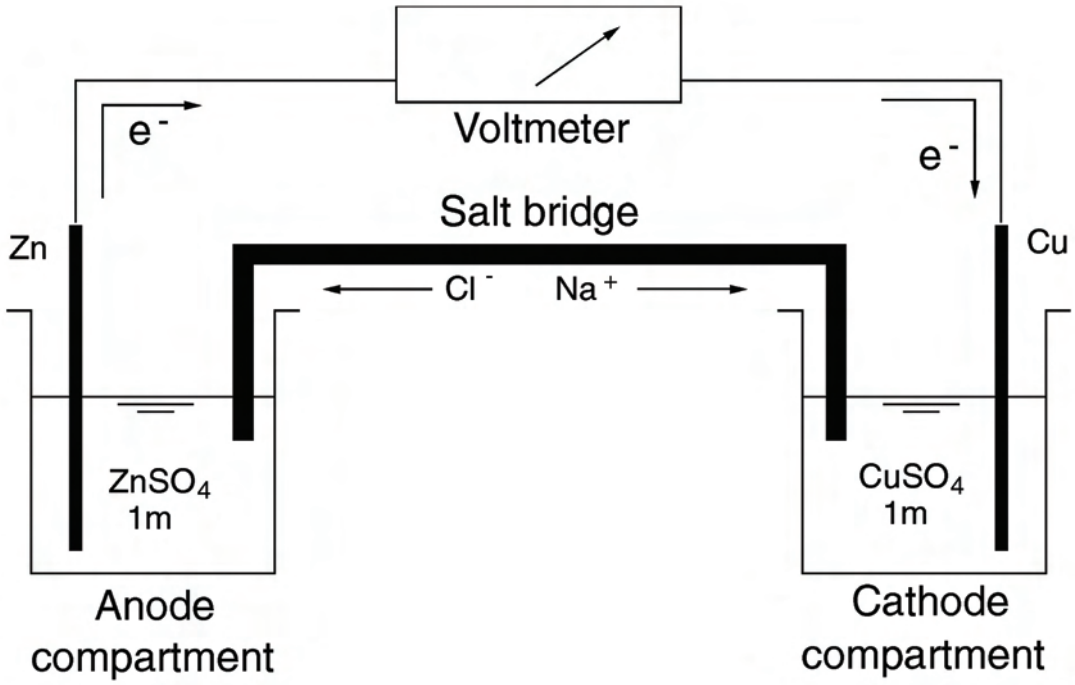


Figure III.A.10.1b: Line diagram of a galvanic (electrochemical) cell.

10.2.1 The Salt Bridge

The salt bridge connects the two compartments chemically (for example, with Na^+ and Cl^-). It has two important functions:

1) Maintenance of Neutrality: As Zn(*s*) becomes $Zn^{2+}(aq)$, the net charge in the anode compartment becomes positive. To maintain neutrality, Cl^- ions migrate to the anode compartment. The reverse occurs in the cathode compartment: positive ions are lost (Cu^{2+}), therefore positive ions must be gained (Na^+).

2) Completing the Circuit: Imagine the galvanic cell as a circuit. Negative charge leaves the anode compartment via electrons in a wire and then returns via chemicals (i.e. Cl^-) in the salt bridge. Thus the galvanic cell is an electrochemical cell.

As an alternative to a salt bridge, the solutions (i.e. $ZnSO_4$ and $CuSO_4$) can be placed in one container separated by a porous material which allows certain ions to cross (i.e. SO_4^{2-}, Zn^{2-}). Thus it would serve the same functions as the salt bridge.

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PHYSICS

PART III.B: PHYSICAL SCIENCES

IMPORTANT: Before doing your science survey for the GAMSAT, be sure you have read the Preface, Introduction and Part II, Chapter 2. The beginning of each science chapter provides guidelines as to what you should Memorize, Understand and what is Not Required. These are guides to get you a top score without getting lost in the details. Our guides have been determined from an analysis of all ACER materials plus student surveys. Additionally, the original owner of this book gets a full year access to many online features described in the Preface and Introduction including an online Forum where each chapter can be discussed.

ELECTRIC CIRCUITS
Chapter 10

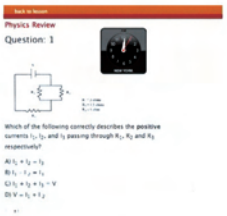
Memorize	Understand	Not Required*
* Definition/equation/units: current, resistance * Ohm's law, resistors in series/parallel * Kirchoff's laws	* Battery, emf, voltage, terminal potential * Internal resistance of the battery, resistivity * Ohm's law, resistors in series/parallel * Parallel plate capacitor, series, parallel * Conductivity, power in circuits, Kirchoff's laws	* Advanced level college info * Complex/discrete/digital circuits * Transistors, FPGAs, microprocessors

Introduction

Electric circuits are closed paths which includes electronic components (i.e. resistors, capacitors, power supplies) through which a current can flow. There are 3 basic laws that govern the flow of current in an electrical circuit: Ohm's law and Kirchoff's first and second laws.

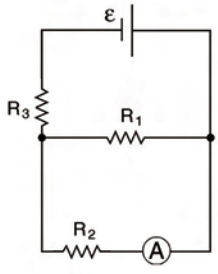
Additional Resources

Free Online Q&A + Forum



Video: Online or DVD 1, 2, 4

Flashcards



Special Guest

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10.1 Current

The current (I) is the amount of charge (Q) that flows past a point in a given amount of time (t),

$$I = Q/t = \text{amperes} = \text{coulombs/sec.}$$

Current is caused by the movement of electrons between two points of significant potential difference of an electric circuit. Free electrons will accelerate towards the positive connection. As they move they will collide with atoms in the substance, losing energy which we observe as heat. The net effect is a drift of electrons at a roughly constant speed towards the positive connection. The motion of electrons is an *electric current*. As electrons are removed by the electric potential source at the positive connection, electrons are being injected at the negative connection. The potential can be considered as a form of *electron pump.*

This model explains many observed effects.

If the magnitude of the electric potential is increased, the electrons will accelerate faster and their mean velocity will be higher, i.e., the current is increased. The collisions between electrons and atoms transfer energy to the atoms. The collisions manifest themselves as heat. This effect is known as *Joule heating*. Materials such as these are termed ohmic conductors, since they obey the well-known Ohm's Law:

$$V = IR$$

where V is the voltage, I is the current, and R is the resistance.

The potential difference is maintained by a voltage source (emf). The direction of current is taken as the direction of positive charge movement, by convention. It is represented on a circuit diagram by arrows. Ammeters are used to measure the flow of current and are symbolized as in Figure III.B.10.1.

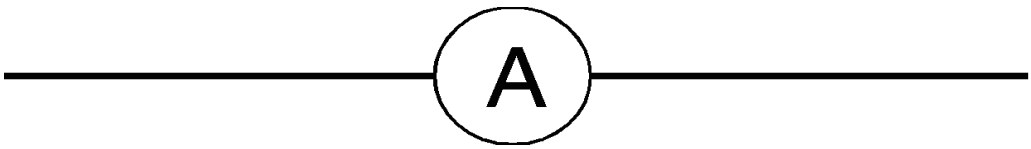


Figure III.B.10.1: Symbol of an ammeter.

Resistance (R) is the measure of opposition to the flow of electrons in a substance. Resistivity (ρ) is an inherent property of a substance. It varies with temperature. For example, the resistivity of metals increases with increasing temperature.

Resistance is directly proportional to resistivity and length *l* but inversely proportional to the cross-sectional area *A*.

$$R = \rho l/A$$

Resistance increases with temperature because the thermal motion of molecules increases with temperature and results in more collisions between electrons which impede their flow.

The units of resistance are ohms, symbolized by Ω (omega). From Ohm's Law, 1 ohm = 1 volt/ampere.

When a positive current flows across a resistor, there is a voltage decrease and an energy loss:

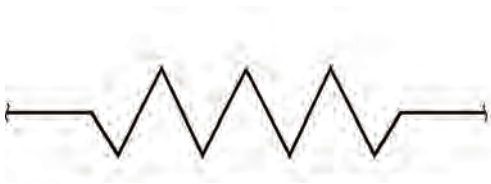
$$\text{energy loss} = Vq = VIt = \text{joules}$$

$$\text{power loss } (P) = VIt/t = VI = \text{watts}$$

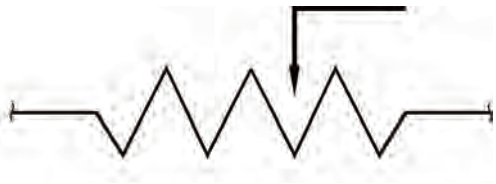
$$\text{watts} = \text{volts} \times \text{amperes} = \text{joules/sec.}$$

The energy loss may be used to perform work. These relations hold for power (P),

$$P = VI = (IR)(I) = I^2R = V(V/R) = V^2/R.$$



constant (normal) resistance



variable resistance (rheostat)

Figure III.B.10.2: Representation of two types of resistors.

Circuit elements are either in series or in parallel. Two components are in series when they have only one point in common; that is, the current travelling from one of them back to the emf source must pass through the other. In a complete series circuit, or for individual series loops of a larger mixed circuit, the current (I) is the same over each component and the total voltage drop in the circuit elements (resistors, capacitors, inductors, internal resistance of emf sources, etc.) is equal to the sum V_t of all the emf sources. The value of the equivalent resistance R_{eq} in a series circuit is:

$$R_{eq} = R_1 + R_2 + R_3 + \ldots$$

Two components are in parallel when they are connected to two common points in the circuit; that is, the current travelling from one such element back to the emf source need not pass through the second element because there is an alternate path.

In a parallel circuit, the total current is the sum of currents for each path and the voltage is the same for all paths in parallel. The equivalent resistance in a parallel circuit is:

$$1/R_{eq} = 1/R_1 + 1/R_2 + 1/R_3 + \ldots$$

10.2.1 Resistance Problem in Series and Parallel

Determine the equivalent resistance between points A and B in Figure III.B.10.3.

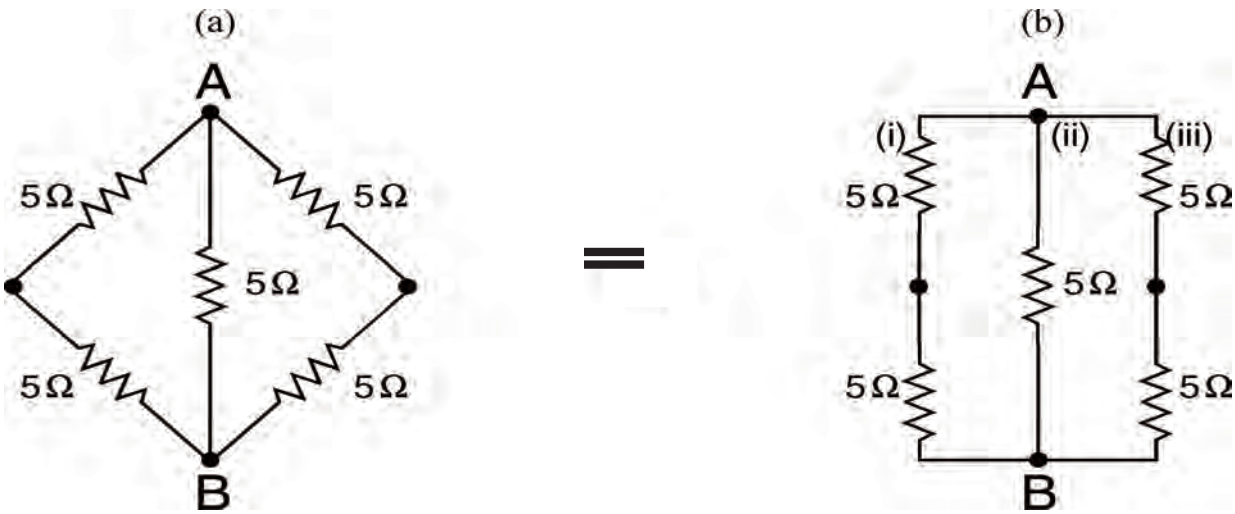
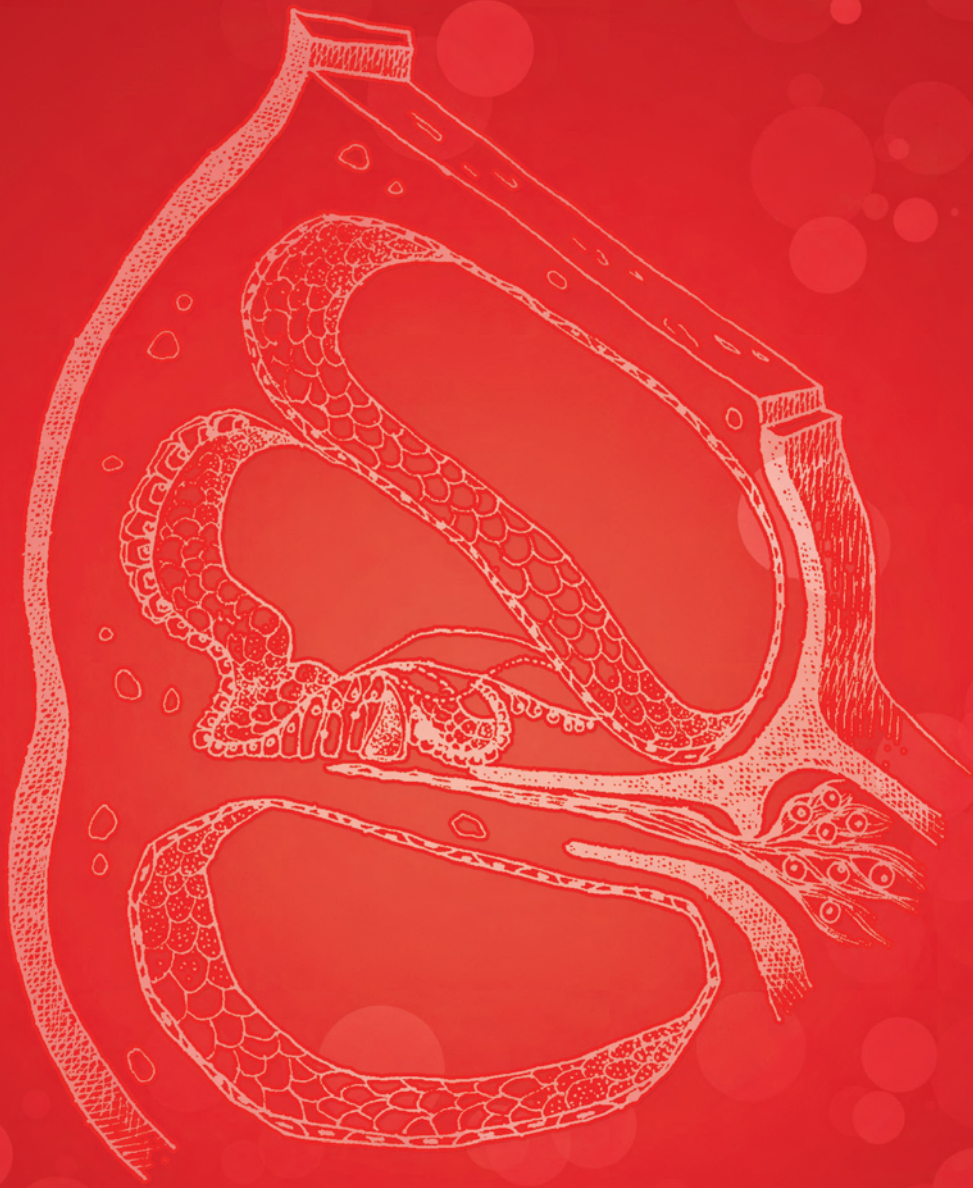


Figure III.B.10.3: Equivalent resistance.
(a) The problem as it could be presented; (b) the way you should interpret the problem.



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BIOLOGY

PART IV.A: BIOLOGICAL SCIENCES

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GENERALIZED EUKARYOTIC CELL

Chapter 1

Memorize	Understand	Not Required*
* Structure/function: cell/components * Components and function: cytoskeleton * DNA structure and function * Transmission of genetic information * Mitosis, events of the cell cycle	* Intro level college info * Membrane transport * Hyper/hypotonic solutions * Saturation kinetics: graphs * Unique features of eukaryotes	* Advanced level college info * Molecular bio., detailed mechanisms * Plant cells, chloroplasts * Experiments in genetics * Specify polymerases or such details

Introduction

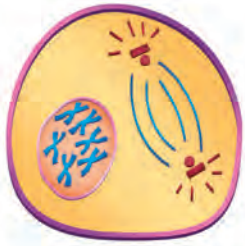
Cells are the basic organizational unit of living organisms. They are contained by a plasma membrane and/or cell wall. Eukaryotic cells (*eu* = true; *karyote* refers to nucleus) are cells with a true nucleus found in all multicellular and nonbacterial unicellular organisms including animal, fungal and plant cells. The nucleus contains genetic information, DNA, which can divide into 2 cells by mitosis.

Additional Resources

Free Online Q&A + Forum

Video: Online or DVD 3

Flashcards



Special Guest

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1.1 Plasma Membrane: Structure and Functions

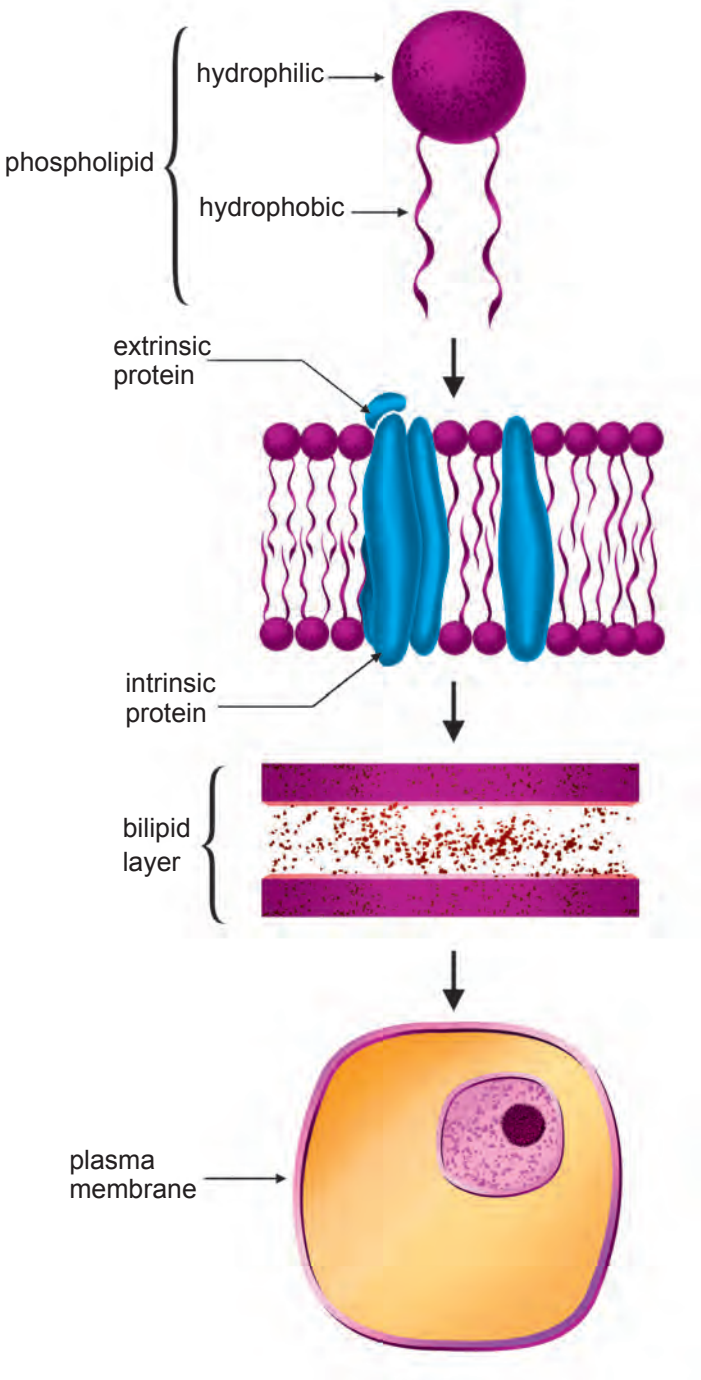


Figure IV.A.1.1: Structure of the plasma membrane.

The plasma membrane is a semipermeable barrier that defines the outer perimeter of the cell. It is composed of lipids (fats) and protein. The membrane is dynamic, selective, active, and fluid. It contains phospholipids which are amphipathic molecules. They are amphipathic because their tail end contains fatty acids which are insoluble in water (hydrophobic), the opposite end contains a charged phosphate head which is soluble in water (hydrophilic). The plasma membrane contains two layers of phospholipids thus it is called a bilipid layer.

The Fluid Mosaic Model tells us that the hydrophilic heads project to the outside and the hydrophobic tails project towards the inside of the membrane. Further, these phospholipids are fluid - thus they move freely from place to place in the membrane. Distributed throughout the membrane is a mosaic of proteins with limited mobility.

Proteins can be found associated with the outside of the membrane (extrinsic or peripheral) or may be found spanning the membrane (intrinsic or integral). Many intrinsic proteins represent channels through which specific molecules and ions can pass, or, receptors which hormones may activate.

The plasma membrane is semipermeable. In other words, it is permeable to small uncharged substances which can freely

diffuse across the membrane (i.e. O_2, CO_2, urea). On the other hand, it is relatively impermeable to charged or large substances which may require transport proteins to cross the membrane (i.e. ions, amino acids, sugars) or cannot cross the membrane at all (i.e. protein hormones, intracellular enzymes). Substances which can cross the membrane may do so by simple diffusion, carrier-mediated transport, or by endo/exocytosis.

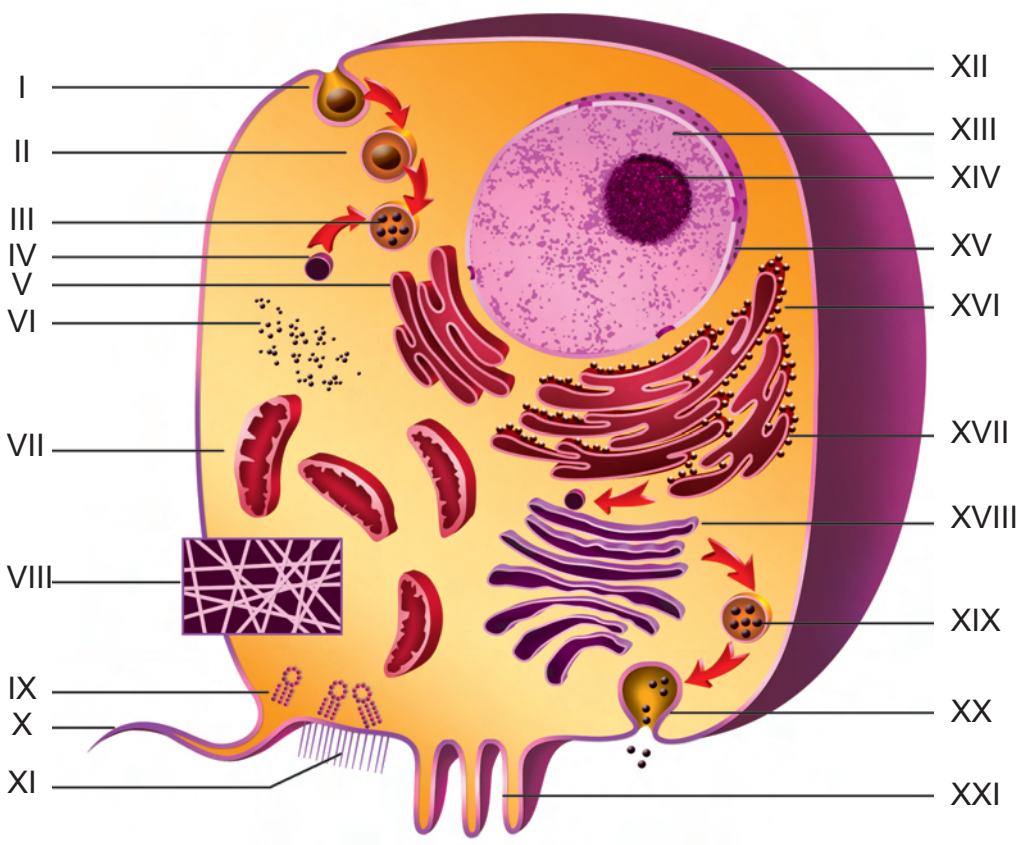


Figure IV.A.1.2: The generalized eukaryotic cell.

I	endocytosis	VIII	cytoskeleton (further magnified)	XV	nuclear envelope
II	endocytotic vesicle	IX	basal body (magnified)	XVI	cytosol
III	secondary lysosome	X	flagellum	XVII	rough endoplasmic reticulum
IV	primary lysosome	XI	cilia	XVIII	Golgi apparatus
V	smooth endoplasmic reticulum	XII	plasma membrane	XIX	exocytotic vesicle
VI	free ribosomes	XIII	nucleus	XX	exocytosis
VII	mitochondrion	XIV	nucleolus	XXI	microvillus

1.1.1 Simple Diffusion

Simple diffusion is the spontaneous spreading of a substance going from an area of higher concentration to an area of lower concentration (i.e. a concentration gradient exists). Gradients can be of a chemical or electrical nature. A chemical gradient arises as a result of an unequal distribution of molecules, and is often called a concentration gradient. In a chemical (or concentration) gradient, there is a higher concentration of molecules in one area than there is in another area, and molecules tend to diffuse from areas of high concentration to areas of lower concentration. An electrical gradient arises as a result of an unequal distribution of charge. In an electrical gradient, there is a higher concentration of charged molecules in one area than in another (this is independent of the concentration of all molecules in the area). Molecules tend to move from areas of higher concentration of charge to areas of lower concentration of charge.

Osmosis is the diffusion of water across a semipermeable membrane moving from an area of higher water concentration (i.e. lower solute concentration = hypotonic) to an area of lower water concentration (i.e. higher solute concentration = hypertonic). The hydrostatic pressure needed to oppose the movement of water is called the osmotic pressure. Thus, an isotonic solution (i.e. the concentration of solute on both sides of the membrane is equal), would have an osmotic pressure of zero.

Figure IV.A.1.2.1a: Isotonic Solution.

The fluid bathing the cell (i.e. red blood cell or RBC in this case; see BIO 7.5) contains the same concentration of solute as the cell's inside or cytoplasm. When a cell is placed in an isotonic solution, the water diffuses into and out of the cell at the same rate.

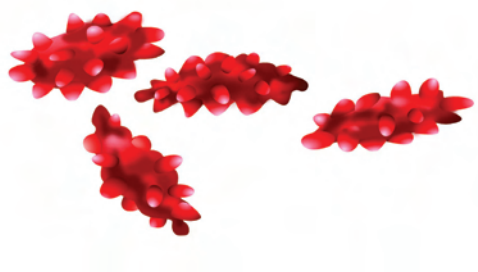


Figure IV.A.1.2.1b: Hypertonic Solution.

Here the fluid bathing the RBC contains a high concentration of solute relative to the cell's cytoplasm. When a cell is placed in a hypertonic solution, the water diffuses out of the cell, causing the cell to shrivel.

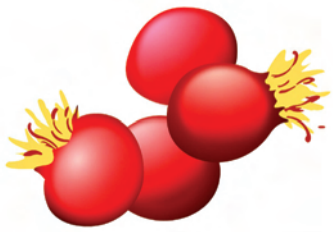


Figure IV.A.1.2.1c: Hypotonic Solution.

Here the surrounding fluid has a low concentration of solute relative to the cell's cytoplasm. When a cell is placed in a hypotonic solution, the water diffuses into the cell, causing the cell to swell and possibly explode.

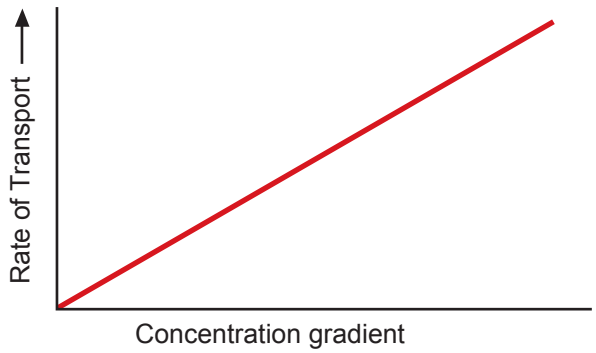
{Memory guide: notice that the "O" in hyp-O-tonic looks like a swollen cell. The O is also a circle which makes you think of the word "around." So IF the environment is hypOtonic AROUND the cell, then fluid rushes in and the cell swells like the letter O}.

1.1.2 Carrier-Mediated Transport

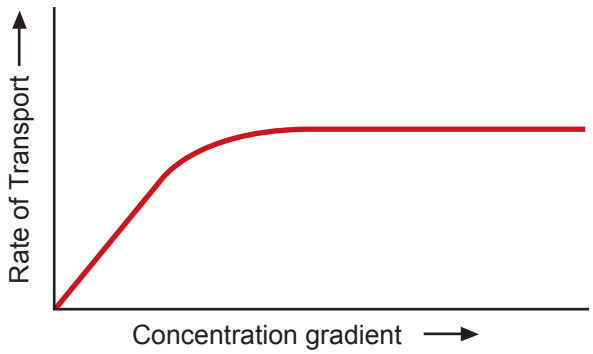
Amino acids, sugars and other solutes need to reversibly bind to proteins (carriers) in the membrane in order to get across. Because there are a limited amount of carriers, if the concentration of solute is too high, the carriers would be saturated thus the rate of crossing the membrane would level off (= saturation kinetics).

The two carrier-mediated transport systems are:

i) facilitated transport where the carrier helps a solute diffuse across a membrane it could not otherwise penetrate, and ii) active transport where energy (i.e. ATP) is used to transport solutes against their concentration gradients. The Na^+- K^+ exchange pump uses ATP to actively pump Na^+ to where its concentration is highest (outside the cell) and K^+ is brought within the cell where its concentration is highest (see Neural Cells and Tissues, BIO 5.1.1).

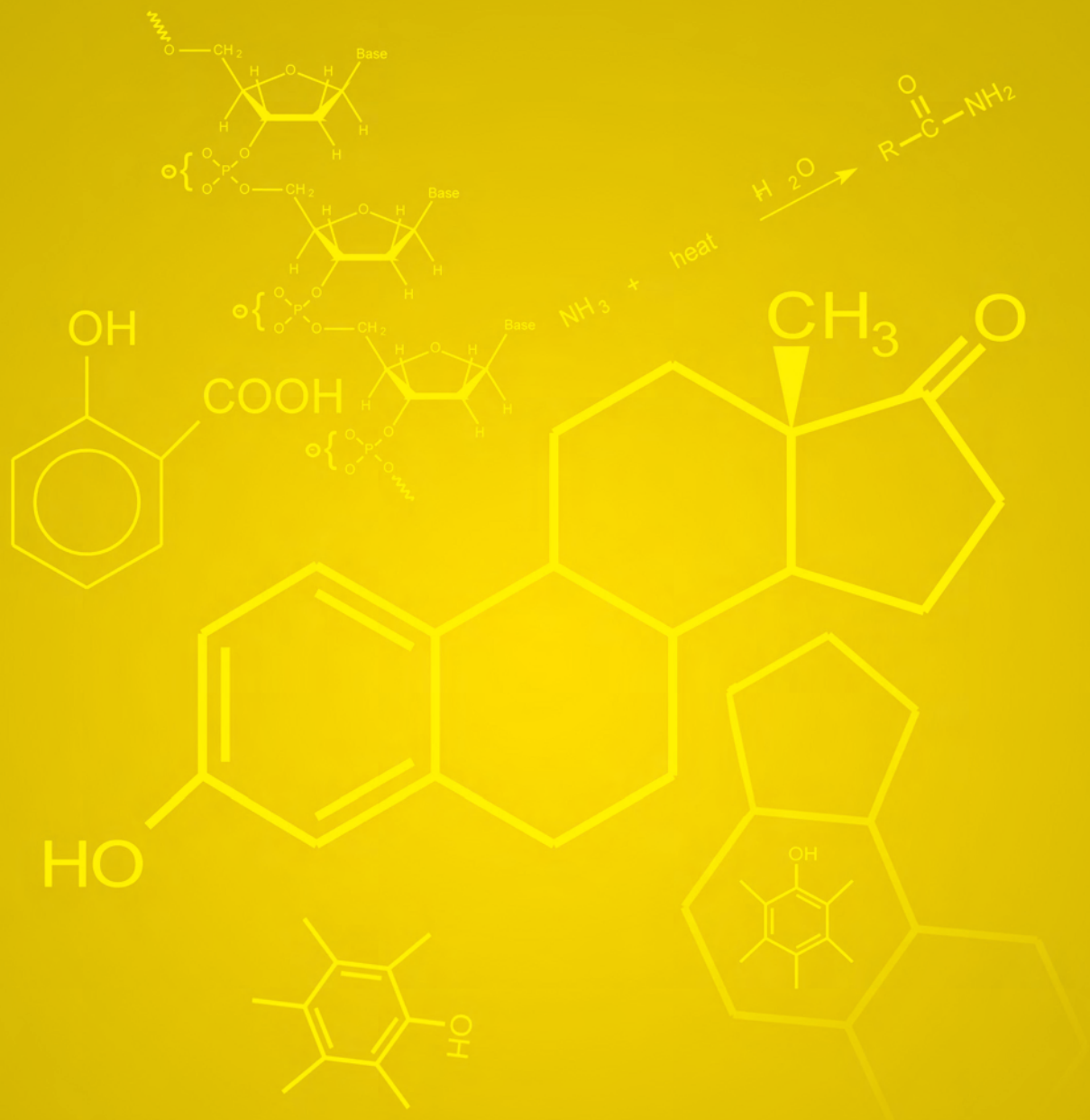


Simple Diffusion: the greater the concentration gradient, the greater the rate of transport across the plasma membrane.



Carrier-Mediated Transport: increasing the concentration gradient increases the rate of transport until a maximum rate at which point all membrane carriers are saturated.

Figure IV.A.1.3: Simple diffusion versus carrier-mediated transport.



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ORGANIC CHEMISTRY

PART IV.B: BIOLOGICAL SCIENCES

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MOLECULAR STRUCTURE OF ORGANIC COMPOUNDS

Chapter 1

Memorize

* Hybrid orbitals and geometries
* Periodic table trends
* Define: Lewis, dipole moments
* Ground rules for reaction mechanisms

Understand

* Delocalized electrons and resonance
* Multiple bonds, length, energies
* Basic stereochemistry
* Principles for reaction mechanisms

Not Required *

* Advanced level college info
* Hybrids involving d, f, etc.

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Introduction

Organic chemistry is the study of the structure, properties, composition, reactions, and preparation (i.e. synthesis) of chemical compounds containing carbon. Such compounds may contain hydrogen, nitrogen, oxygen, the halogens as well as phosphorus, silicon and sulfur. If you master the basic rules in this chapter, you will be able to conquer GAMSAT mechanisms with little or no further memorization.

Additional Resources

Free Online Q&A + Forum

Video: Online or DVD 1

Flashcards

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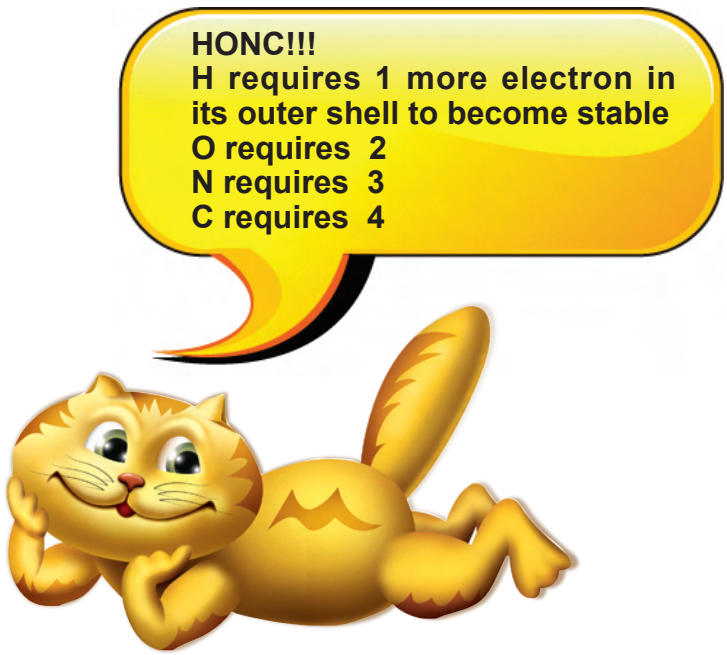
1.1 Overview: The Atoms of Organic Chemistry

Organic chemistry may be defined as the chemistry of the compounds of carbon. Organic chemistry is very important, as living systems are composed mainly of water and organic compounds. Other important organic molecules form essential components of fuels, plastics and other petroleum derivatives.

Carbon (C), hydrogen (H), oxygen (O), nitrogen (N) and the halides (i.e. fluorine - F, chlorine - Cl, bromine - Br, etc.) are the most common atoms found in organic compounds. The atoms in most organic compounds are held together by covalent bonds (*the sharing of an electron pair between two atoms*). Some ionic bonding (*the transfer of electrons from one atom to another*) does exist. Common to both types of chemical bonds is the fact that the atoms bond such that they can achieve the electron configuration of the nearest noble gas, usually eight electrons. This is known as the *octet rule*.

A **carbon** atom has one s and three p orbitals in its outermost shell, allowing it to form 4 single bonds. As well, a carbon atom may be involved in a double bond, where two electron pairs are shared, or a triple bond, where three electron pairs are shared. An **oxygen** atom may form 2 single bonds, or one double bond. It has 2 unshared (lone) electron pairs. A **hydrogen** atom will form only one single bond. A **nitrogen** atom may form 3 single bonds. As well, it is capable of double and triple bonds. It has one unshared electron pair. The **halides** are all able to form only one (single) bond. Halides all have three unshared electron pairs.

Throughout the following chapters we will be examining the structural formulas of molecules involving H, C, N, O, halides and phosphorus (P). However it should be noted that less common atoms often have similar structural formulas within molecules as compared to common atoms. For example, silicon (Si) is found in the same group as carbon in the periodic table; thus they have similar properties. In fact, Si can also form 4 single bonds leading to a tetrahedral structure (i.e. SiH_4, SiO_4). Likewise sulfur (S) is found in the same group as oxygen. Though it can be found as a solid (S_8), it still has many properties similar to those of oxygen. For example, like O in H_2O, sulfur can form a bent, polar molecule which can hydrogen bond (H_2S). We will later see that sulfur is an important component in the amino acid cysteine. {*To learn more about molecular structure, hybrid orbitals, polarity and bonding, review General Chemistry chapters 2 and 3* }



1.6 Ground Rules

Opposites attract. Like charges repel. Such simple statements are fundamental in solving over 90% of mechanisms in organic chemistry. Once you are comfortable with the basics - electronegativity, polarity and resonance - you will not need to memorize the grand majority of outcomes of given reactions. You will be capable of quickly deducing the answer even when new scenarios are presented.

A substance which has a formal positive charge ($^{+}$) or a partial positive charge ("delta^{+}" or δ^{+}) is attracted to a substance with a formal negative charge ($^{-}$) or a partial negative charge (δ^{-}). In general, a substance with a formal charge would have a greater force of attraction than one with a partial charge when faced with an oppositely charged species. There is an important exception: spectator ions. Ions formed by elements in the first two groups of the periodic table (i.e. Na^{+}, K^{+}, Ca^{++}) do not actively engage in reactions in organic chemistry. They simply watch the reaction occur then at the very end they associate with the negatively charged product.

In most carbon-based compounds the carbon atom is bonded to a more electronegative atom. For example, in a carbon-oxygen bond the oxygen is δ^{-} resulting in a δ^{+} carbon (*see* ORG 1.5). Because opposites attract, a δ^{-} carbon (which is unusual) could create a carbon-carbon bond with a δ^{+} carbon (which is common). There are two important categories of compounds which can create a carbon-carbon bond; a) alkyl lithiums (RLi) and b) Grignard reagents (RMgBr), because they each have a δ^{-} carbon. Note that the carbon is δ^{-} since lithium is to the left of carbon on the periodic table (for electronegativity trends *see* CHM 2.3).

For nucleophiles, the general trend is that the stronger the nucleophile, the stronger the base it is. For example:

$$RO^{-} > HO^{-} >> RCOO^{-} > ROH > H_2O$$

For information on the quality of leaving groups, see ORG 6.2.4.

Appendix A

GAMSAT MATH REVIEW

In the preceding science review sections, several mathematical concepts were presented (i.e. basic trigonometry, vectors, rules of logarithms, the right hand rule, etc.). The purpose of this section is to review the GAMSAT mathematical concepts not presented elsewhere, though there may be some overlap for emphasis.

A.1 Probability and Statistics for the GAMSAT

No calculations of correlation coefficients or standard deviations is required for the GAMSAT. However, a basic understanding of these concepts can be helpful.

A.1.1 The Correlation Coefficient

The correlation coefficient r indicates whether two sets of data are associated or *correlated*. The value of r ranges from -1.0 to 1.0. The larger the absolute value of r, the stronger the association. Given two sets of data X and Y, a positive value for r indicates that as X increases, Y increases. A negative value for r indicates that as X increases, Y decreases.

Imagine that the weight (X) and height (Y) of everyone in the entire country was determined. There would be a strong positive correlation between a person's weight and their height. In general, as weight increases, height increases (*in a population*). However, the correlation would not be perfect (i.e. $r \neq 1.0$). After all, there would be some people who are very tall but very thin, and others who would be very short but overweight. We might find that $r = 0.7$. This would suggest there is a strong positive association between weight and height, but it is not a perfect association.

If two sets of data are correlated, does that mean that one *causes* the other? Not necessarily; simply because weight and height are correlated does not mean that if you gained weight you will necessarily gain height! Thus association does not imply causality.

A.1.2 The Standard Deviation

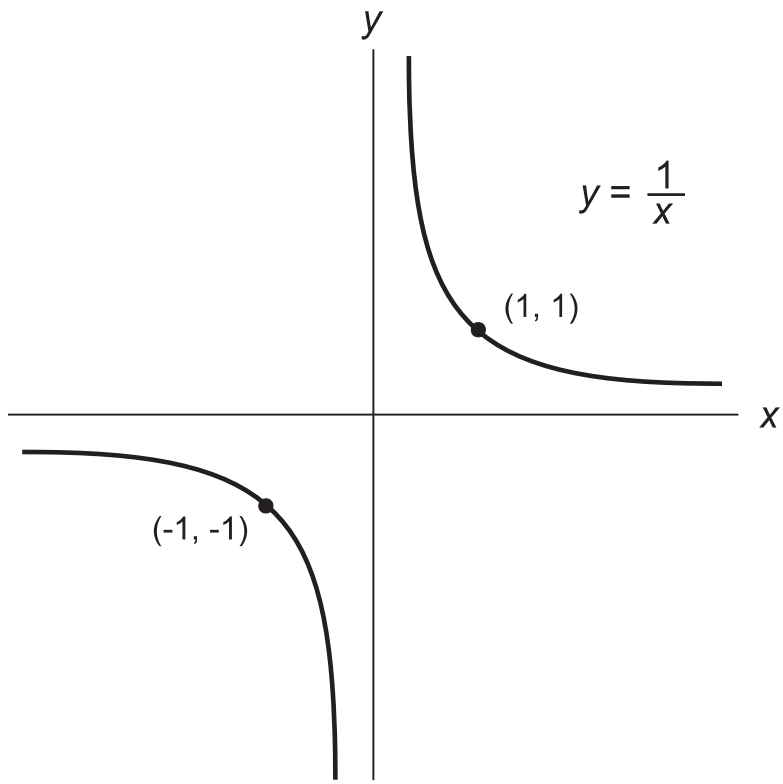
When given a set of data, it is often useful to know the average value, *the mean*, and the *range* of values. The mean is simply the sum of the data values divided by the number of data values. The range is the numerical difference between the largest value and the smallest value.

Another useful measurement is the *standard deviation*. The standard deviation indicates the dispersion of values around the mean. Given a bell shaped distribution of data (i.e. the height and weight of a population, the GPA of undergraduate students, etc), each standard deviation (SD) includes a given percentage of data. For example, the mean ± 1 SD includes approximately 68% of the data values, the mean ± 2 SD includes 95% of the data values, and the mean ± 3 SD includes 99.7% of the data values.

For example, imagine that you read that the mean GPA required for admission to Belcurve University's Medical School is 3.5 with a standard deviation of 0.2 (SD = 0.2). Thus approximately 68% of the students admitted have a GPA of 3.5 ± 0.2, which means between 3.3 and 3.7. We can also conclude that approximately 95% of the students admitted have a GPA of 3.5 ± 2(0.2), which means between 3.1 and 3.9. Therefore the standard deviation becomes a useful measure of the dispersion of values around the mean 3.5.

A.3.2 Reciprocal Curve

For any real number x, there exists a unique real number called the multiplicative inverse or *reciprocal* of x denoted $1/x$ or x^{-1} such that $x\,(1/x) = 1$. The graph of the reciprocal $1/x$ for any x is:



A.3.3 Miscellaneous Graphs

There are classical curves which are represented or approximated in the science text as follows: sigmoidal curve (CHM 6.9.1, BIO 7.5.1), sinusoidal curve (PHY 7.1.1 and 7.1.2), and hyperbolic curves (CHM 9.7 Fig III.A.9.3, BIO 1.1.2).

If you were to plot a set of experimental data, often one can draw a line (A.3.1) or curve (A.3.2/3, A.4.2) which can "best fit" the data. The preceding defines a *regression* line or curve. The main purpose of the regression graph is to predict what would likely occur outside of the experimental data.

A.4 Exponents and Logarithms

A.4.1 Rules of Exponents

$$a^0 = 1 \qquad a^1 = a$$

$$a^n\, a^m = a^{n+m} \qquad a^n / a^m = a^{n-m}$$

$$(a^n)^m = a^{nm} \qquad a^{1a_n} = \sqrt[n]{a}$$

{*See Chemistry Section 6.5.1 for rules of logarithms*}

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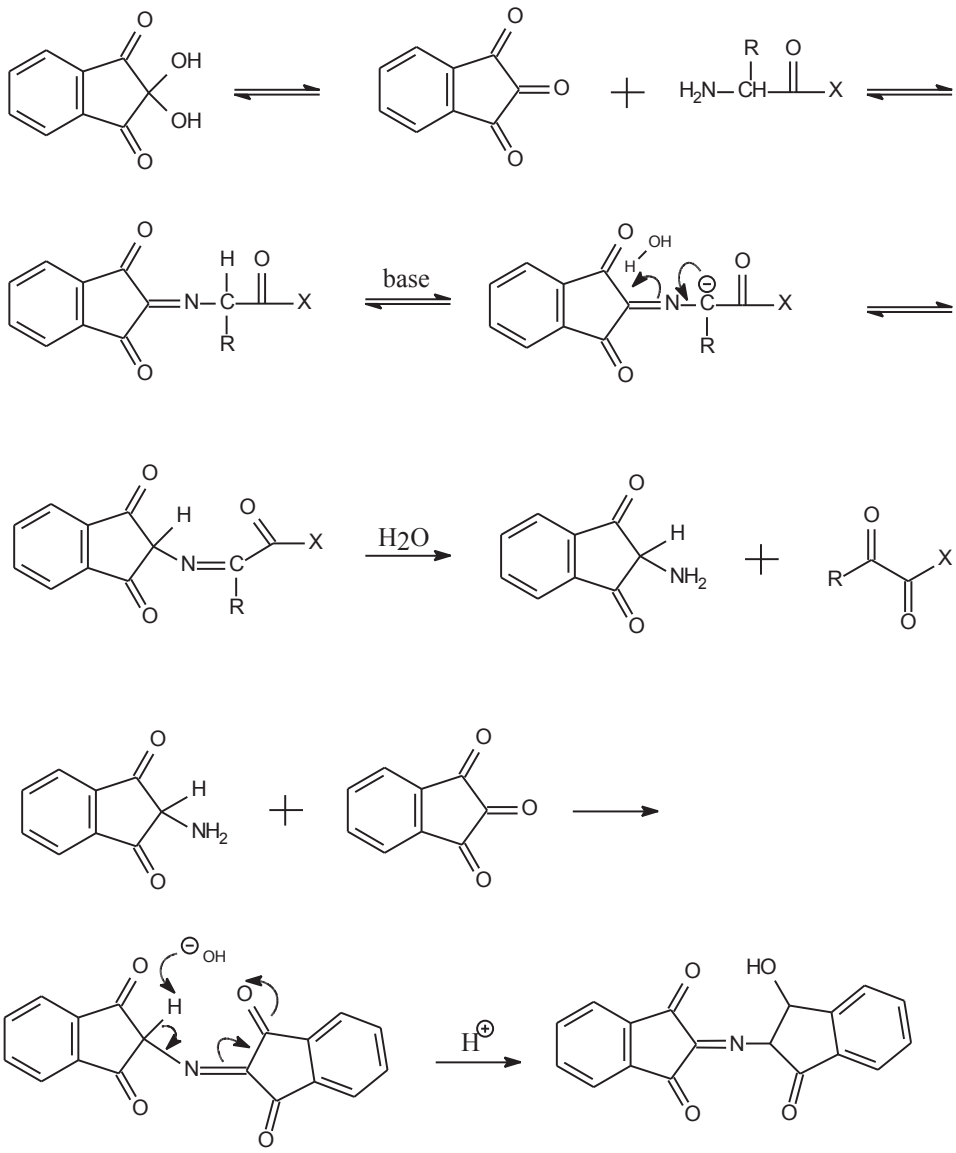

Part V: The Gold Standard GAMSAT

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CANDIDATE'S NAME _____ BOOKLET GS1-I

STUDENT ID _____

TEST GS-1

Section I:
Reasoning in Humanities and Social Sciences

Questions 1-75
Time : 100 Minutes

INSTRUCTIONS: Of the 75 questions in this test, many are organized into groups preceded by stimulus material. After evaluating the stimulus material, select the best answer to each question in the group. Some questions are independent of any descriptive passage or each other. Similarly, select the best answer to these questions. If you are unsure of an answer, eliminate the alternatives that you know to be incorrect and select an answer from the remaining alternatives. To indicate your selection, use a pencil to blacken the corresponding oval on Answer Document 1, GS-1. If you wish to make notes, it must be done ONLY in the test booklet. No scrap paper is permitted. No marks are deducted for wrong answers.

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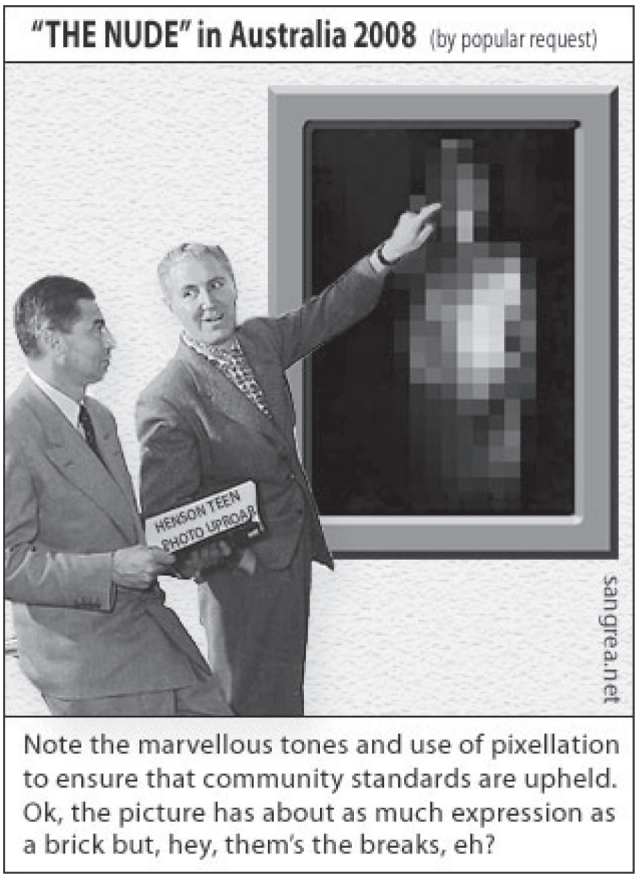
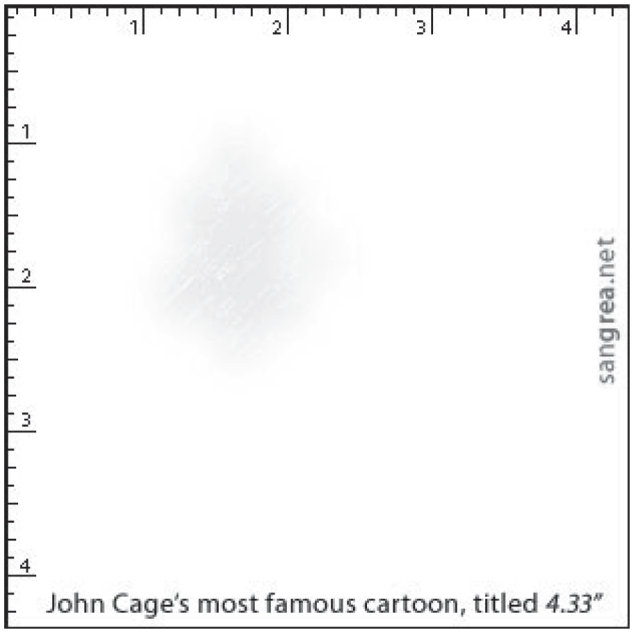
Questions 38–40

Two cartoons concerning "Art"



Cartoon 1



Cartoon 2

38. Undoubtedly, Cartoon 1 derives its humour from the over bearing standards of:

A. censorship.
B. representation.
C. satire.
D. colour contrast to black and white.

Some aspects of postmodern art concern self-consciousness of the art act itself, the laying bare of the devices used to construct the illusion or representation, and blurring the divisions between the audience and the art. For example, John Cage, a pianist and to some extent experimentalist in art, recorded, only audience noise, for one of his compositions: the shuffling about in seats, coughs, whispers, etc… all to some extent, what would be considered noise.

39. In relation to this commentary, what makes Cartoon 2 humorous?

A. Its self-referentiality
B. There is nothing there, except the two axis.
C. It mocks the pretensions of such notions.
D. All of the Above

40. The text within the box in Cartoon 1 is a literary example of:

A. derision.
B. irony.
C. foreshadowing.
D. allegory.

Questions 66 – 69

The following are two short passages from Shakespeare (Macbeth and King Lear).

Macbeth, after his queen's death, makes the following famous speech in Act 5, Scene 5, lines 17-28.

MACBETH: Wherefore was that cry?

SEYTON: The queen, my lord, is dead.

MACBETH: She should have died hereafter;
There would have been a time for such a word.
To-morrow, and to-morrow, and to-morrow,
Creeps in this petty pace from day to day
To the last syllable of recorded time,
And all our yesterdays have lighted fools
The way to dusty death. Out, out, brief candle!
Life's but a walking shadow, a poor player
That struts and frets his hour upon the stage
And then is heard no more: it is a tale
Told by an idiot, full of sound and fury,
Signifying nothing

Act III, Scene IV, during the terrible storm. While his fool takes shelter in a hovel, Lear, after learning of his daughter's treachery, throws himself into the wilderness, losing his sanity or so it seems. Here he remains standing for a moment in the rain and meditates on the poor citizens of his kingdom:

Poor naked wretches, whereso'er you are,
That bide the pelting of this pitiless storm,
How shall your houseless heads and unfed sides,
Your loop'd and window'd raggedness, defend you
From seasons such as these? O, I have ta'en
Too little care of this! Take physic, pomp;
Expose thyself to feel what wretches feel,
That thou mayst shake the superflux to them,
And show the heavens more just.

66. In the Macbeth passage, the tonality of Shakespeare suggests:
- **A** remorse.
- **B** despair.
- **C** grief.
- **D** anxiety.

67. In the King Lear passage, the tonality of Shakespeare suggests:
- **A** shattered innocence.
- **B** profound enlightenment.
- **C** remorseful compassion.
- **D** indignant defiance.

CANDIDATE'S NAME _____ BOOKLET GS1-II

STUDENT ID _____

TEST GS-1

Section II: Written Communication

2 Writing Tasks (A and B); 60 Minutes (total)
Two 30 Minute Prompts, Timed Separately

INSTRUCTIONS: This test is designed to evaluate your writing skills. There are two writing assignments. You will have 30 minutes to complete each part. Your answers for Section II should be written in ANSWER DOCUMENT 2. Your response to Writing Task A must be written only on answer sheets marked "A," and your response to Writing Task B should be written only on answer sheets marked "B." The first 30 minutes may be used to respond to Task A only. The second 30 minutes may be used to respond to Task B only. If you finish writing before time is up, you may review your work ONLY on the response you have just completed.

Use your time in an efficient manner. Prior to writing your response, read the assignment carefully. The empty space on the page with the writing assignment may be used to make notes in planning your response. Scratch paper is not permitted. Corrections or additions can be made neatly between the lines but there should be no writing in the margins of the answer booklet. You are not expected to use each page of your answer document but do not skip lines. Use a black or blue pen to write your response. Illegible essays cannot be scored.

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CANDIDATE'S NAME _____ BOOKLET GS1-III

STUDENT ID _____

TEST GS-1

Section III:
Reasoning in Biological and Physical Sciences

Questions 1-110
Time : 170 Minutes

INSTRUCTIONS: Of the 110 questions in this test, many are organized into groups preceded by a passage. After evaluating the passage, select the best answer to each question in the group. Some questions are independent of any descriptive passage or each other. Similarly, select the best answer to these questions. If you are unsure of an answer, eliminate the alternatives that you know to be incorrect and select an answer from the remaining alternatives. To indicate your selection, use a pencil to blacken the corresponding oval on Answer Document 1, GS-1. You may use a non-programmable calculator. Rough work is to be done ONLY in the test booklet. No scrap paper is permitted. No marks are deducted for wrong answers.

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Questions 4–6 refer to the following additional information:

Experiment 1

Determining the Effect of the Timing of Calcium Action on Transmitter Release

Calcium ions were removed from the bathing solution of a muscle cell so that release of ACh in response to nerve stimulation was virtually abolished. Calcium ions were then applied to the nerve terminal by ionophoreses, from a micropipette close to the terminal, just before the nerve was stimulated (N), without nerve stimulation, and just after the nerve was stimulated. The results obtained are shown in Fig. 1.

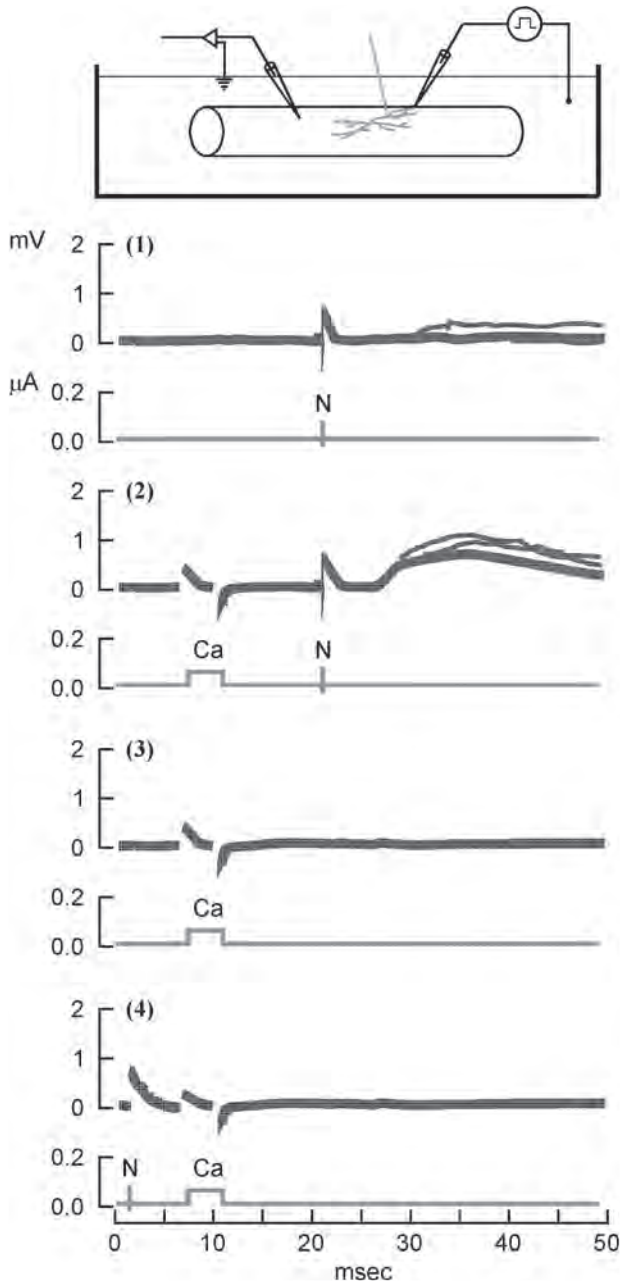


Figure 1

Experiment 2

Determining the Effect of ACh on Neuromuscular Transmission and its Subsequent Action on the Postsynaptic Membrane

Stimulating electrodes were placed on the nerve and a pair of recording electrodes was placed on the muscle. One of the electrodes was placed very close to the end plate region. First curare and then eserine were added to the solution bathing the muscle. The action potentials produced on stimulating the nerve were recorded. The results obtained are shown in Fig. 2.

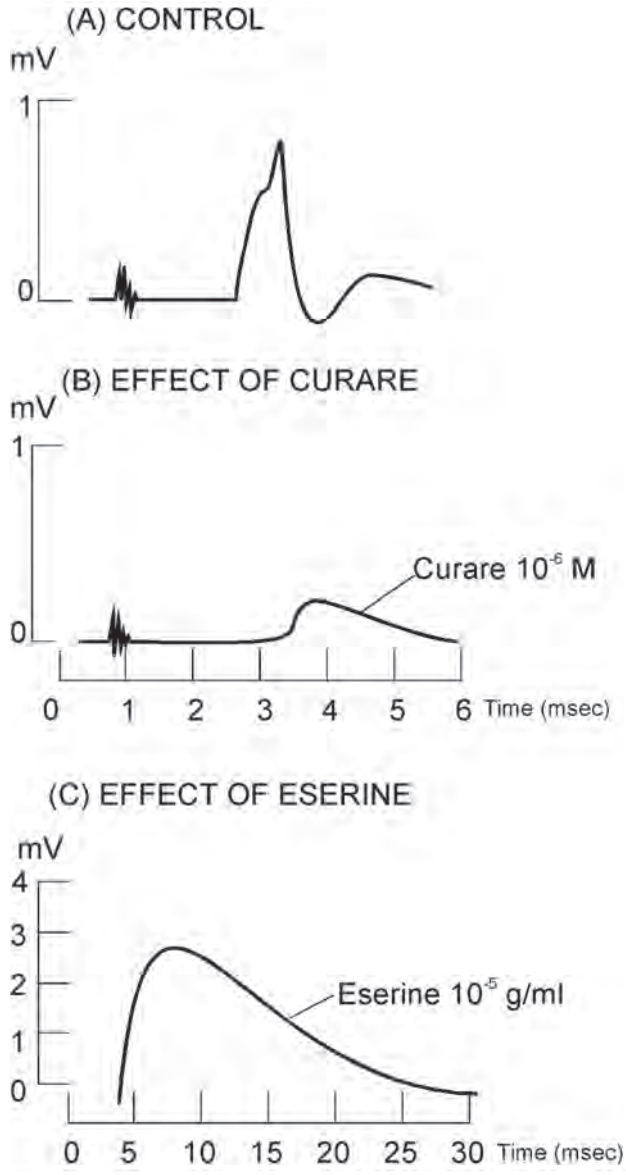


Figure 2

4. According to Fig. 1, which of the following conclusions was confirmed by the experiment?

A For transmitter release to occur, calcium ions need only be present after the depolarization of the presynaptic membrane.

B The presence of calcium ions is the only variable which affects transmitter release at the synapse.

C For transmitter release to occur, calcium ions must be present before and after depolarization of the presynaptic membrane.

D For transmitter release to occur, calcium ions must be present before depolarization of the presynaptic membrane.

5. According to Fig. 2, curare and eserine could act by, respectively:

A blocking ion channels and binding to the receptors on ACh-activated channels.

B blocking ion channels and preventing the hydrolysis of acetylcholinesterase.

C initiating the entry of calcium ions into the synaptic knob and initiating the passage of a nerve impulse along the muscle cell.

D binding to ACh receptor sites on the postsynaptic membrane and preventing the hydrolysis of acetylcholine.

6. In the control of Fig. 2, the part of the curve between 4 and 5 msec represents:

A the absolute refractory period.

B the relative refractory period.

C the depolarization of the membrane.

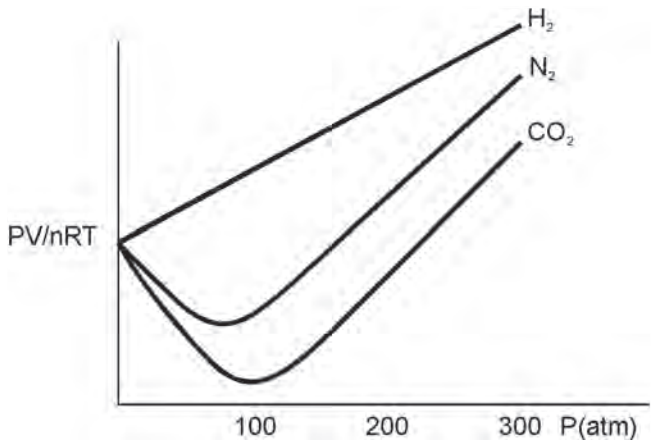
D saltatory conduction.

Questions 56–61

In the simple model of a gas as described by the kinetic molecular theory, a gas is pictured as an assembly of particles travelling at high velocities in straight lines in all directions. The particles are constantly colliding, but they are supposed to be perfectly elastic so that no momentum is lost on impact. They are also supposed to be point masses, that is, they have mass but occupy no space. In addition, no attractive or repulsive forces are exerted between particles.

From this theory, and the work of other great scientists like Boyle and Charles, the ideal gas law was devised: PV = nRT where P = pressure of the gas, V = volume of the gas, n = number of moles of gas particles present, T = Kelvin temperature of the gas and R = universal gas constant.

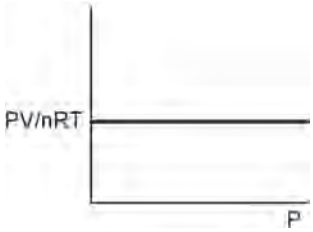
However, no "real" gas conforms to this "ideal" gas theory, that is, no real gas obeys all of these laws at all temperatures and pressures. These deviations were investigated by the French physicist Amagat, who used pressures up to 320 atmospheres and a range of temperatures to investigate these deviations. The following diagram shows how the PV/nRT value varies with pressure for certain gases at 50 °C.



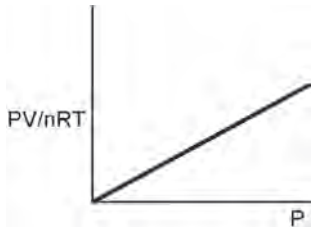
The deviations of real gases from ideality confers a number of properties on the gas which could not be explained by the kinetic molecular theory.

56. What would the PV/nRT versus P graph look like for an ideal gas?

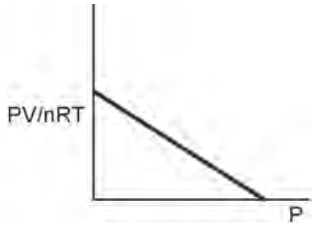
A



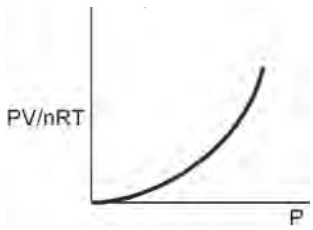
B



C



D



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Answer Document 1

Test GS-1

CANDIDATE'S NAME _____ STUDENT ID _____

Mark one and only one answer to each question. Be sure to use a soft lead pencil and completely fill in the space for your intended answer. If you erase, do so completely. Make no stray marks.

Section I

1	A B C D	39	A B C D	2	A B C D	40	A B C D	3	A B C D
41	A B C D	4	A B C D	42	A B C D	5	A B C D	43	A B C D
6	A B C D	44	A B C D	7	A B C D	45	A B C D	8	A B C D
46	A B C D	9	A B C D	47	A B C D	10	A B C D	48	A B C D
11	A B C D	49	A B C D	12	A B C D	50	A B C D	13	A B C D
51	A B C D	14	A B C D	52	A B C D	15	A B C D	53	A B C D
16	A B C D	54	A B C D	17	A B C D	55	A B C D	18	A B C D
56	A B C D	19	A B C D	57	A B C D	20	A B C D	58	A B C D
21	A B C D	59	A B C D	22	A B C D	60	A B C D	23	A B C D
61	A B C D	24	A B C D	62	A B C D	25	A B C D	63	A B C D
26	A B C D	64	A B C D	27	A B C D	65	A B C D	28	A B C D
66	A B C D	29	A B C D	67	A B C D	30	A B C D	68	A B C D
31	A B C D	69	A B C D	32	A B C D	70	A B C D	33	A B C D
71	A B C D	34	A B C D	72	A B C D	35	A B C D	73	A B C D
36	A B C D	74	A B C D	37	A B C D	75	A B C D	38	A B C D

Section III

1	A B C D	38	A B C D	75	A B C D	2	A B C D	39	A B C D
76	A B C D	3	A B C D	40	A B C D	77	A B C D	4	A B C D
41	A B C D	78	A B C D	5	A B C D	42	A B C D	79	A B C D
6	A B C D	43	A B C D	80	A B C D	7	A B C D	44	A B C D
81	A B C D	8	A B C D	45	A B C D	82	A B C D	9	A B C D
46	A B C D	83	A B C D	10	A B C D	47	A B C D	84	A B C D
11	A B C D	48	A B C D	85	A B C D	12	A B C D	49	A B C D
86	A B C D	13	A B C D	50	A B C D	87	A B C D	14	A B C D
51	A B C D	88	A B C D	15	A B C D	52	A B C D	89	A B C D
16	A B C D	53	A B C D	90	A B C D	17	A B C D	54	A B C D
91	A B C D	18	A B C D	55	A B C D	92	A B C D	19	A B C D
56	A B C D	93	A B C D	20	A B C D	57	A B C D	94	A B C D
21	A B C D	58	A B C D	95	A B C D	22	A B C D	59	A B C D
96	A B C D	23	A B C D	60	A B C D	97	A B C D	24	A B C D
61	A B C D	98	A B C D	25	A B C D	62	A B C D	99	A B C D
26	A B C D	63	A B C D	100	A B C D	27	A B C D	64	A B C D
101	A B C D	28	A B C D	65	A B C D	102	A B C D	29	A B C D
66	A B C D	103	A B C D	30	A B C D	67	A B C D	104	A B C D
31	A B C D	68	A B C D	105	A B C D	32	A B C D	69	A B C D
106	A B C D	33	A B C D	70	A B C D	107	A B C D	34	A B C D
71	A B C D	108	A B C D	35	A B C D	72	A B C D	109	A B C D
36	A B C D	73	A B C D	110	A B C D	37	A B C D	74	A B C D

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ABOUT THE AUTHOR

Dr. Ferdinand was awarded numerous scholarships en route to graduating with honors in a B.Sc. program. After medical school, he wrote the two-time book award nominee The Gold Standard MCAT. He would later study the GAMSAT, give seminars about the test on campuses in Sydney and, after polling hundreds of students about what they wanted in a GAMSAT book, he wrote The Gold Standard GAMSAT.

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