Test-Taking Skills
in Dentistry

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Preface

This book is designed to instruct you in a number of test-taking skills that may be useful in taking multiple-choice examinations. These skills are not meant to replace content knowledge in answering test questions, but instead are intended to increase your ability to utilize the characteristics of multiple-choice tests to increase your test score. Individuals who possess these skills are said to be "test-wise," and are often able to answer correctly certain multiple-choice items with minimal knowledge of the subject matter being tested. Since you will encounter a number of multiple-choice tests in your dental education, it may be advantageous for you to become acquainted with these test-taking techniques.

As you are no doubt aware, a test is nothing more than a measuring instrument that purports to measure your knowledge of certain subject matter. In this manner, a test is to your content knowledge what a thermometer is to temperature, or a yardstick is to distance. Obviously, the more accurate the measuring instrument, the more precise the measurements that result from its use. However, by their very nature, tests are not as accurate tools of measurement as are thermometers and yardsticks. First, what
they measure is not as well defined as what other measurement instruments measure. For example, knowledge is a more abstract construct than are feet and inches. Feet and inches have universally agreed upon and reliably consistent measurable dimensions, whereas knowledge does not.

Second, as a result of the “ambiguity” of what knowledge really is, there is no one “best test” to measure this construct. Consequently, many forms of test instruments have been constructed to measure knowledge, with no one test format or test administration being a completely accurate measure of the construct. The recognized imprecision in the measurement of cognitive abilities is illustrated in the test-maker’s numerical estimates of a test’s reliability (consistency in measurement), validity (the extent to which the test measures what it purports to measure), and standard error of measurement (an estimate of error in a test score).

For you as a test-taker, these shortcomings in the test as a measuring tool translate into the task of being aware of what sort of test instrument you may be exposed to, and how to handle any nuances of a specific test format. For example, as stated earlier, you no doubt will encounter many multiple-choice tests in your educational career. However, multiple-choice tests in dental education (including the National Board examination) frequently include complex multiple-choice formats that you may not have seen before. For such a test to be a more representative measure of your content knowledge (and not your skill in dealing with nuances of the test), it is important for you as a prospective examinee to become familiar with alternate multiple-choice formats, and to develop requisite test-wise skills helpful in answering these complex formats. In this way, not only does the test become a better measuring instrument, but more practically, your score will not be lowered by your lack of test-wiseness, and instead may be increased by the development of various test-taking skills.

In light of these considerations, remember that the material presented in this book is not intended to replace your knowledge of content when answering multiple-choice test questions. Instead, it is meant to supplement that knowledge by providing information that is intended to increase your skills in dealing with multiple-choice tests in general, and complex multiple-choice formats in particular.

The information presented in this book is divided into three sections. The first is a basic review of general test-taking strategies applicable to all multiple-choice tests. The information provided in Part I attempts to make you a defensive test-taker, so you will not lose points because of careless mistakes or naiveté. Part II introduces you to a number of alternate multiple-choice formats commonly used in dental education tests. Various strategies are suggested for answering these types of questions, and distinctions are made between those question formats used on Dental Board exams and those appearing on teacher-made (classroom) tests. Finally, Part III introduces you to commonly occurring flaws in multiple-choice questions. These flaws can be utilized in arriving at the answer to a question when your knowledge of content is weak.

Some of the material presented in Part I and Part III of this book has been extrapolated from a previous work by me.* In some instances the material is presented verbatim; however, in most cases the material has been refined and expanded. Some of the material in Part II is also extrapolated from the previous work. Most of Part II and all the material relating to multiple-choice testing in dental education are original. The previous book dealt with similar testing issues in medical education, and I am indebted to University Park Press for their permission to reproduce some of that material in this book.

Buffalo, NY

Randolph E. Sarnacki

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### COMMON TERMINOLOGY

Although you have no doubt encountered many multiple-choice tests during your educational experiences, it is first necessary to define some common test terminology. In a multiple-choice test, each question or incomplete statement is followed by several possible answers. Two examples of such problems follow:

50. Which of the following cities is not a state capital?
   (a) Albany, New York
   (b) Austin, Texas
   (c) Salt Lake City, Utah
   (d) Cleveland, Ohio
   (e) Sacramento, California

51. Particles with a negative charge are called
   (a) protons
   (b) neutrons
   (c) electrons
   (d) molecules
   (e) elements
The problems on a multiple-choice test are called items. The question or incomplete statement in each item is called the stem. The possible answers following the stem are called options. The option that is the correct response to the stem is called the keyed option. The options that are incorrect responses to the stem are called distractors. In the examples above, the two problems (50 and 51) are the items. The question, "Which of the following cities is not a state capital?", and the incomplete statement, "Particles with a negative charge are called," are the stems. The possible answers to item 50 (Albany, New York; Austin, Texas; Salt Lake City, Utah; Cleveland, Ohio; Sacramento, California) and to item 51 (protons, neutrons, electrons, molecules, elements) are the options. The keyed option (correct answer) in item 50 is Cleveland, Ohio, and in item 51, electrons. The remaining options in each item are the distractors.

For each item on a multiple-choice test, you must choose the one option that you think best answers the question or best completes the incomplete statement (in general, best satisfies the stem). For item 50, you should choose option (d), and for item 51, the correct choice is option (c).
General Test-Taking Strategies

When approaching any testing situation, the test-wise person employs a number of general techniques that protect against a loss of points due to careless and minor mistakes. These techniques are no more than basic approaches to test-taking that center around the general components of tests. However, since these test components are universal, they are frequently overlooked by complacent or over-anxious test-takers. Unfortunately, failure to attend to these components may result in a loss of points for reasons other than lack of content knowledge. Therefore, this section of the book is designed to point out various aspects of tests that merit attention, and the subsequent modes of response (types of answers you are required to provide) that are suggested by those components.

TEST DIRECTIONS

The first test component that offers vital information is the directions. Although you may feel that your extensive experience with multiple-choice exams has made you sufficiently familiar with testing procedures to permit your inattentive reading of the test directions, you are wrong. An individual may fail to pass an examination not because of a lack of knowledge, but because of not following the directions properly. It is especially necessary to
scrutinize test directions in dental education exams since it is a common practice to employ complex types of questions that demand alternate types of responses from examinees.

For example, suppose you were presented the following question and you had not read the test directions. What would your answer be?

1. With regard to insulin and proinsulin:
   (1) proinsulin cleavage gives rise to production of insulin and C-peptide
   (2) preproinsulin is the precursor form of insulin which arises first in the biosynthetic process
   (3) proinsulin is mostly cleaved to form insulin within the beta cells of the pancreas
   (4) insulin secretagogues, when administered to a normal subject, will cause an increase in blood levels of insulin, proinsulin, and C-peptide

If you had selected either of the options (1), (2), (3), or (4) and either had circled your choice on your test paper or, if given an answer sheet, had filled in the corresponding "sequential" space, you would not have received any credit for this item. The reason for this should be evident when you read these directions.

DIRECTIONS: For each of the questions or incomplete statements below, ONE or MORE of the answers or completions given is correct.

Select

A if only 1, 2, and 3 are correct,
B if only 1 and 3 are correct,
C if only 2 and 4 are correct,
D if only 4 is correct,
E if all are correct.

ON YOUR ANSWER SHEET SELECT ONLY ONE RESPONSE FOR EACH QUESTION.
that although the Dental Board exam does not use this exact format, it does employ a variant of this item type, which also will be discussed in Part II.

A number of these items are often found on basic science examinations, usually grouped in a set under the directions described earlier. Therefore, it is important to keep in mind the intended basis of response (letters vs. numbers) throughout the entire group of questions. On some tests, a box summarizing the possible responses appears on the top of each test page. However, not all tests have this feature, so the examinee must be consistently aware of the type of response required.

It should be clear to you at this point that a careful reading of the test directions is necessary to protect against losing points as a result of inappropriate or inaccurate responding. You should note that, as a general rule when approaching any test, your first task is to ascertain how you are to provide the answers. Failure to do so is the costliest mistake you can make on a test, since your level of content knowledge is determined by the answers you provide. Remember, inaccurate responses are scored as incorrect answers.

It is also important to remember that on many multiple-choice tests the use of a variety of question types necessitates the inclusion of a number of sets of directions. In general (although not on the Dentistry National Board Examination), questions are ordered by item type and not by subject matter. Whenever one item type changes to another, a new set of directions is included for the new items. Needless to say, failure to read all the directions may be quite a costly mistake. You may think that these cautions are trivial, but on many multiple-choice tests such factors as a large number of items, frequent changes between item types, transferring your responses to answer sheets, and, of course, fatigue, make it all the more important for you to be constantly aware of the appropriate basis of response.

**GRADING PROCEDURES**

In addition to informing test-takers of what types of responses are required, the directions also provide other important information. First, the initial set of directions normally states how the exam is graded. For example, on some tests your final score is based on the total number of items answered correctly, whereas on others a "correction-for-guessing" formula is employed to compute your score. Guessing formulas are used to "correct" scores so that some examinees are not overly rewarded (or penalized) for their tendency to guess on exams. Basically, such a formula attempts to make examinees equal-risk-takers by giving full credit for a correct response, deducting partial credit for an incorrect response, and deducting no credit for an omitted response. Knowledge of the method used to grade the test is important, since it should help determine the strategy you use on any test items that you must guess at. Many examinees are confused over the issue of guessing, since they are unclear as to whether the rewards for correct guessing outweigh the penalties for incorrect guessing. This confusion may be eliminated by a careful reading and correct interpretation of what the directions state concerning the method used to grade the exam.

When your score is determined by the total number of items answered correctly, the initial test directions should state this explicitly. Fortunately for you, most multiple-choice tests in dental education (including both Parts I and II of the Dental National Boards) are graded in this manner, and explicitly say so in the directions. For example, the directions on a typical Dental National Board test state: "Your score is based on the total number of correct answers you choose. There is no penalty for choosing an incorrect response." Ideally of course, being this explicit concerning grading procedures is the best practice. Not only is test-taking anxiety calmed, but the test becomes a better measure when everyone is told the rules. However, not all test-makers are so precise in their directions. Therefore, if you find yourself in a testing situation in which the directions are ambiguous concerning grading procedures, you should do one of two things. First, if the test-grader is present, ask how the test is graded. If the grader is not available, look for some key words in the directions that may indicate the grading mechanism. For example, you may frequently see the term "rights only," or sim-
ply may be instructed to "answer all items." In these instances you can conclude that your score will be determined by the number of correct answers you provide.

**GUESSING STRATEGIES**

However the directions express it, once you have concluded that your score is based on the total number of correct responses, your guessing strategy should be to answer all items, even if you must guess. Remember, in this grading procedure you are not penalized for an incorrect guess, so it is in your best interest to provide an answer for every test item. Even if some of your answers are no more than blind guesses, you are not in danger of losing points, and always stand a chance of gaining points. Even a random guess in a five-option multiple-choice item has a 20% chance of being correct. Therefore, to maximize your score in such testing situations, you should always guess at the correct answer.

Furthermore, on tests in which your score equals the "total correct," and in which time prevents you from attending to all items, you should still provide an answer for items that you have not had an opportunity to read. Remember, blank spaces receive no credit, correct guesses receive full credit, and no points are deducted for incorrect guesses. The only way that you can gain points is by providing answers, and no examiner can ascertain merely from a mark on an answer sheet whether your response is a random scratch or the result of intense cogitation.

Lastly, there are two final notes concerning guessing on "total-correct" tests. First, if you decide to guess at an item, be sure you select only one option unless expressly told to do otherwise. As stated earlier, most multiple-choice items have only one keyed option. Therefore, if you select more than one option in any one item you will not receive credit for the item. This is definitely true on computer-scored tests, where the computer is programmed to accept only one answer per item.

Second, you should note that when the test directions provide information concerning the "norming" of test scores, or "conversion of raw scores to standard scores," this does not indicate that a correction-for-guessing formula is to be employed. Such phrases indicate that the distribution of scores obtained from that test administration will be converted to standardized scores on a normal (bell-shaped) distribution with a particular mean and standard deviation (usually $\mu = 500$, $\sigma = 100$). This procedure is employed when the test is "norm-referenced," since it provides the test administrator with information concerning how examinees did in comparison to each other. However, norm referencing does not mean that you are penalized for incorrect responses. On a test marked with the "total-correct" procedure, the "raw" score that is converted to a standard score is the number of correct answers provided. Similarly, on a test graded with a correction for guessing, the "raw" score that is converted to a standard score is the mathematically corrected score received on the test, that is, the number of items answered correctly minus the total penalty for the items answered incorrectly. Therefore, norm referencing, or standardizing the test scores, can be done on tests that use either grading procedure. Consequently, you should not be dissuaded from guessing on a norm-referenced exam. In fact, as we shall soon see, norm referencing may be reason enough to encourage you to guess, regardless of how the test is graded.

The question of guessing becomes a bit clouded when the test is graded with a correction formula. As was stated earlier, most tests in dental school, including the National Boards, are graded by the total-correct method. However, you may encounter a test or two that uses a correction-for-guessing formula. This possibility increases if your classroom instructor uses the university computing service to mark the test and the program utilized contains a correction formula.

The directions for a test using a correction formula will caution against indiscriminate guessing, since points are deducted for any incorrect responses. This procedure is based on the rationale that a test-taker either knows the answer or is forced to guess blindly. Blind guessing is undesirable on a test because it decreases the test's reliability, thereby making it a poorer measure. Consequently, it is further believed that, as a result of penalizing incor-
Corrected score = \( R - \frac{W}{K - 1} \)

where \( R \) = the total of right answers, \( W \) = the total of wrong answers, and \( K \) = the number of options per item.

The votes are split concerning guessing on such tests. Some researchers advocate strict adherence to the test's directions and believe that examinees should guess only when various options can be eliminated in an item. In this way, they argue, the test's reliability is protected, since any guesses made are not purely random. However, other researchers have demonstrated that the threat of losing points for incorrect guesses inhibits many examinees from answering items that they in fact have some knowledge about. Other test-takers who are willing to take chances answer all items regardless of the warning against doing so. In effect, then, the directions often create two divergent groups of respondents, making a test a less adequate measure of content since it fails to control for individual differences in risk taking. This line of research has also found that examinees receive higher mean scores on objective examinations when they answer all items. This has been shown to be true even when a correction formula is applied.

This second line of thought illustrates my bias. Therefore, I suggest that you should not be intimidated by the penalty for guessing, and should provide answers to all items, even if some of your answers are guesses. Remember, empirical research has demonstrated that over the course of the test you are likely to receive a higher score when you guess. Furthermore, you should realize that you are usually not totally ignorant about an item's content. You frequently have at least partial information that allows you to eliminate one or more of the possible responses as incorrect. Therefore, your probability of guessing correctly within an item is usually greater than mere chance, so you should have no reservations about guessing.

If you still have doubts about guessing when a penalty is imposed, consider the following illustration. In a multiple-choice test in which there are five options per item, the correction-for-guessing formula subtracts one fourth of a point for each incorrect answer. Imagine that you are unsure of the answers for ten test items. If you offer a random guess at all ten items, mere chance alone gives a probability of answering two of the ten correctly. If this occurs, under the correction formula you receive 2 points for your correct answers and lose \( 8 \times \frac{1}{4} = 2 \) points for the incorrect responses. As is evident, the gain minus the penalty equals a net of zero points, which is the same amount you would have received if you had left all ten items blank. Therefore, over a number of items guessed at, the chances that you will lose points for incorrect guesses are minimal. Remember also that this illustration describes a situation in which your guesses are random, and as was stated earlier, you rarely are forced to make random guesses since you usually have at least partial information about an item. Consequently, whenever you possess partial information, your probability of guessing correctly is greater than chance, meaning you will probably get more than two of the ten items correct. This, of course, translates to a gain of points (at the least +1.25 when 3 of 10 are correct) which you would not have achieved if you had failed to guess. In summary, there is no reason to be conservative in your guessing strategy since the expected gains normally outweigh the expected losses when you answer all items. Even when you are cautioned against guessing, you stand a better chance of maximizing your test score if you answer all items, even if some of your answers are guesses. In addition, when the test results are normalized and your score is "compared" with the other examinees' scores, it is obvious that any points you gain through guessing are a "pure gain" of points over those not earned by any fellow examinee who does not guess.
TIMED TESTS

A third major piece of information that the test directions provide is whether the test is timed. A timed test is one in which examinees are given a set amount of time to complete the test. It is important for you to know if the test is timed so that you may set up a schedule to follow as you proceed through the exam. Most standardized tests are timed, with the test subdivided into a number of timed sections. Teacher-made tests are usually less strict concerning time limitations. However, the size of the test and the time allotted to finish it are usually directly proportional to the length of class or exam time.

If a test is timed, and you do not follow a schedule, you may not have adequate time to read all items. Consequently, you may fail to receive credit for items you normally would have answered correctly, only because of their position at the end of the test. Therefore, to assure that you allot adequate time to read each item, you should make it a practice to set up a schedule for progressing through the test.

This is accomplished quite easily with only two pieces of information—the amount of time allotted to complete the test, and the total number of items on the test. By simply dividing the amount of time allotted by the number of test items provided, you can compute the maximum amount of time you should spend on each item. For example, on a 30-item multiple-choice test in which you are allowed 1 hour to finish, you should allot 2 minutes per item (60 ÷ 30 = 2). Of course, this time allotment is only a suggested pace, and strict adherence to it is not mandatory, or even advisable, if it creates test anxiety. Its main purpose is to remind you that excessive time spent on any item necessarily means a loss of time for later items.

Time schedules are not intended to make you overly concerned with punctuality at the risk of interfering with an accurate interpretation of test items. Their major function is simply to remind you to allow sufficient time to read each item by “pacing” you through the test. When you find you are exceeding the time allotment, you should simply mark the item and return to it after you have proceeded through the entire test. If you feel confident enough to offer a guess at a problematic item on your original reading, do so. If not, some future item may provide some information that will help you to answer the earlier item. In either case, if you “stick” to the schedule, you will have adequate time to return to these items later. If you mark the items, they will be easy to relocate, allowing you to double-check guesses and to provide responses to items omitted.

Timed tests should not provoke your anxiety as a test-taker. If you proceed rapidly, without sacrificing accuracy, you should have minimal problems in completing the test. The procedures suggested here are intended to aid your accurate progression through a timed exam and, hopefully, to make you feel more at ease in timed testing situations. Probably the most basic defensive step in preventing a loss of valuable test time is to become aware of the test’s size and structure before the exam is administered. In this manner, excessive time is not lost in interpreting unfamiliar directions, or in determining the type of response required by complex multiple-choice formats.
PART II

Alternate Multiple-Choice Formats
Alternate Multiple-Choice Formats

A common objection to standard multiple-choice questions is that they test only factual recall and not any higher cognitive processes. As a result, educators have adopted more complex question formats in an attempt to evaluate various "higher-order" cognitive skills that are not adequately evaluated by standard multiple-choice items. However, although these question types make possible the testing of alternate abilities, it is also possible that their unfamiliar structure introduces extraneous factors that interfere with a truly valid measure of these abilities. Therefore, it is important for you as a test-taker in dental education to become acquainted with these alternate types of items so that these confounding factors have minimal influence on your test score.

This section of the book is intended to introduce you to these alternate item types, as well as to suggest optimal approaches in providing answers to these items. These approaches are aimed at attaining such goals as reducing test anxiety by creating a sense of familiarity with these items, saving time in responding accurately to a number of such items on timed tests, and increasing the
probability of selecting the correct answer when you are forced to guess.

To preserve clarity and prevent confusion, I have first illustrated those item types that frequently appear on teacher-made tests. The item formats used on the Dental National Board examination follow.

ITEM TYPES ON TEACHER-MADE (IN-HOUSE) EXAMINATIONS

Standard Multiple-Choice Questions

As was illustrated in the early pages of this book, a standard multiple-choice item contains a stem followed by a list of possible answers. From this list of alternatives, you must select the one option that best answers the question or best completes the statement expressed in the stem. Since you must choose the one best answer, standard multiple-choice questions are often referred to as the one-best-response type. Since you have no doubt encountered many standard multiple-choice items, there is no need to spend excessive time discussing the structure of these items. However, you should realize that the stem of a standard multiple-choice item often takes on appearances other than those of the routine incomplete statement or question. It is not unusual to see a chart, table, graph, photograph, roentgenogram, case history, or description of a situation used as a stem. Do not be misled; it is still a regular multiple-choice question requiring you to select one of the listed alternatives as the best response to the “stem.”

Standard multiple-choice items are also used in a negative form. In this situation, all but one of the listed alternatives are correct responses to the basic (positive) premise of the stem. The examinee is required to select the one option that, unlike all the other options, does not share the same relationship to the stem's basic premise. In other words, the examinee must select the one exception to the stem's basic premise. An example of a standard multiple-choice item in negative form follows:

2. All of the following are syndromes except
(A) Adams-Stokes
(B) Forssman's carotid
(C) Hunt's striatal
(D) Seidel's scotoma
(E) Arnold's nerve reflex cough

Like regular multiple-choice questions, negative multiple-choice items also require the selection of the one option that best completes the stem, but the use of the word except requires that you shift your mode of thought from the positive to the negative. Therefore, it is important that you give the stem a careful reading so you are aware of the response mode demanded. Finally, with standard multiple-choice items in general, five options are usually presented as possible answers within an item. This “optimal” number of options has been determined through research in test-taking behavior. As a result, most test-makers and test-construction companies write their multiple-choice items with five options. However, it is not unusual to see regular multiple-choice questions with as few as four options and as many as seven. In the former situation, the test-maker is unable to generate five plausible responses to the stem, so only four appear. For you as a test-taker this is a fortunate happenstance. The presence of four options instead of five indicates that the probability of guessing correctly is increased from 20% with five options to 25% with four.

In the latter situation where there are more than five options, the probability of guessing correctly is decreased as each additional option is added. The presence of more than five options in an item is, for the most part, a rare occurrence. It usually suggests that an unskilled item-writer has unwittingly made the “simple” task of assessing your knowledge unnecessarily complex by using cumbersome items. In addition, you will frequently discover that when larger numbers of options are used, some can be discarded immediately as possible answers because of their irrelevance to the stem. Therefore, the item and the test-taker are better served
when these extra options do not appear at all, or are separated into two different items assessing similar content.

**Standard Matching Questions**

In this item type, a diagram containing approximately five lettered components must be matched to four possible descriptions of the component parts in the diagram. Each of these descriptions refers to only one of the diagram parts, meaning that each lettered component can be used as an answer only once. One more diagram part than descriptions is included, since this is standard test construction procedure. Questions 3 to 6 illustrate the standard matching question.

**DIRECTIONS:** The group of questions below consists of a list of numbered descriptive phrases accompanied by a diagram with certain parts indicated by letters. For each numbered phrase select the lettered part on the diagram that matches it correctly.

Questions 3 to 6

3. Cytoplasm of the ovum
4. Nucleus of the ovum
5. Zona pellucida
6. Corona radiata


Since the descriptions are the items for which responses must be provided, you should first read the description and then check the diagram for the appropriate part. If you are unable to answer an item, move to the next and return to the problematic item after you have answered other items in the set. At this point, you will have less options (diagram parts) from which to select, meaning that if you must guess, your odds get better every time you eliminate a diagram component.

Two final points concerning matching items should be considered. First, matching items can use formats other than the diagram. For example, you may have to match a set of terms with a list of corresponding definitions. However, in the sciences, it appears that matching questions are most appropriately and frequently used with some sort of pictorial presentation that permits the assessment of the student's knowledge of various physical configurations. Second, you should remember that with the standard matching item, unlike various other item types you will encounter later, an option used as an answer cannot be used again as an answer for another item in the same set. This is almost always true in standard matching items, unless the directions inform you otherwise. Consequently, make sure you always read the directions in case the test-maker is asking for some sort of unusual response mode.

**Multiple True-False Type K Items**

Since the complete title of this item type is so complex, it is frequently referred to as a "multiple-multiple," or simply a "type K." Type K items are frequently used in medical education exams, and appear on both teacher-made and standardized tests in medicine. As a result, basic science educators frequently use type K items on their tests to prepare medical students for medical board examinations. Since you are exposed to these same basic science educators and their tests, you are more than likely apt to encounter type K items on teacher-made tests in your basic science courses in dental school.
The type K item is composed of a stem, a list of alternatives called primary (or numbered) options, and a list of possible responses called secondary (or lettered) options from which you must select an answer. An example of a type K item and the corresponding directions are presented below.

**Directions:** For each of the incomplete statements ONE or MORE of the completions given is correct. On the answer sheet fill in the circle containing

- A if only 1, 2, and 3 are correct,
- B if only 1 and 3 are correct,
- C if only 2 and 4 are correct,
- D if only 4 is correct,
- E if all are correct.

**ON YOUR ANSWER SHEET FILL IN ONLY ONE CIRCLE FOR EACH QUESTION.**

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<thead>
<tr>
<th>Directions Summarized</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
</tr>
<tr>
<td>1,2,3</td>
</tr>
<tr>
<td>only</td>
</tr>
</tbody>
</table>

*7. Which of the following events may take place during active inspiration?

(1) The diaphragm descends.
(2) Rib joints are active.
(3) The lateral diameter of the thorax increases.
(4) The uvula swings superiorly.

The initial characteristic to note about a type K item is that the answer you must provide is not one of the primary (numbered) options. Instead, you must select one of the secondary (lettered) options, which represent various combinations of the four primary alternatives. It is important to keep this in mind, since it is easy to misinterpret a type K item as a standard multiple-choice question. Because the primary (not the secondary) options are listed directly under the stem, the item has the appearance of a standard multiple-choice question. This may prompt the examinee to select a primary option as an answer. However, you should recall from the earlier illustration with this item type that selecting a primary option results in an incorrect answer (see page 6). You should also recall that these items are usually presented in groups, with the directions summarized only by listing the possible answers in a box on the top of each test page. Therefore, over a number of type K items it is necessary to remember what type of item you are working on, so that you will provide the appropriate response to each item. In summary, your primary tasks in dealing with type K items include: correctly distinguishing them from standard multiple-choice items, remembering that the required response must be selected from the secondary options, and adhering to this response mode over a large number of type K items.

Although these considerations are rather straightforward, the complex structure of a type K item may cause some confusion in determining the optimal approach to an answer. A number of questions arise. Should one focus on the primary or secondary options? Should one concentrate on specific combinations of options? Should one try to identify options as correct, or eliminate them as incorrect?

It is necessary for you as a test-taker to have the answers to these questions before you are confronted with a test composed of type K items. Approaching these items with a predetermined strategy eliminates unnecessary confusion and avoids a loss of precious time. Fortunately, all these questions are resolved when you adopt the one best strategy for answering type K items. This strategy suggests a standard approach that allows you to deal with each type K item in the same manner, thereby eliminating any confusion that the structure of the item may cause. In addition,
this strategy allows you to save time on each item (and therefore on the entire test) without sacrificing accuracy. This technique also increases the probability of selecting the correct answer when you must guess at a type K item. Finally, this approach should make you feel more at ease with type K items, consequently making them a more valid measure of your knowledge of the material tested.

The optimal approach to type K items suggests that you focus on the primary (numbered) options, and then proceed by eliminating them as incorrect (vs. retaining them as correct). By eliminating primary options as incorrect, you significantly reduce the number of secondary options remaining as possible answers. Elimination of any one of the four primary options reduces the number of possible answers from five to two. At this point, even a guess between the two remaining secondary options has a 50% chance of being correct. On the other hand, if you identify a primary option as correct, you only reduce the number of possible answers from five to three. A guess here has a 1 in 3 (33%) chance of being correct, which obviously is not as advantageous as a 50% chance. To understand the advantage of identifying primary options as incorrect vs. correct, consider the following type K item presented earlier:

<table>
<thead>
<tr>
<th>Directions Summarized</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) 1,2,3</td>
</tr>
<tr>
<td>(B) 1,3</td>
</tr>
<tr>
<td>(C) 2,4</td>
</tr>
<tr>
<td>(D) 4</td>
</tr>
<tr>
<td>(E) All are only only only only only correct</td>
</tr>
</tbody>
</table>

7. Which of the following events may take place during active inspiration?

(1) The diaphragm descends.
(2) Rib joints are active.
(3) The lateral diameter of the thorax increases.
(4) The uvula swings superiorly.

If you are able to eliminate option (1), the only possible remaining answers are (C) and (D), since they are the only secondary options that do not contain (1). However, if you accept option (1) as correct, secondary options (A), (B), and (E) must still be considered as possible answers since they all contain option (1). If you were to complete this comparative procedure for each of the remaining primary options, you would find that in each case eliminating that primary option as incorrect results in only two possible answers remaining. Conversely, accepting that primary option as correct still leaves three possible answers from which to choose. It should be evident from this illustration that the process of eliminating primary options is more beneficial than that of retaining primary options as correct.

In practice, if you are unable to eliminate a primary option as incorrect in a type K item, move to the next primary option until one can be eliminated. If you are unable to eliminate any primary options as incorrect, you should select (E) as your answer.

In addition to increasing your probability of guessing correctly by reducing the number of alternatives from which to choose, there is a second advantage to eliminating primary options. Returning to the sample item on page 26, recall that if option (1) is eliminated, alternatives (C) and (D) are the only possible answers remaining. If you look at options (C) and (D), you will note that both contain primary option (4). Since (C) and (D) are the only remaining choices, option (4) must be correct since it is contained in both of these choices. Therefore, you need only to decide about the correctness/incorrectness of primary option (2). Remember also, even if you are unable to arrive at a decision concerning option (2), a guess between (C) and (D) has a 50% chance of being correct.

Conversely, if you accept option (1) as correct, recall that alternatives (A), (B), and (E) are still valid answers. A brief examination of these secondary options reveals that you still must decide about options (2), (3), and (4) before you can arrive at a final answer. This step is necessary since all these numbered options are present in one or more of the remaining secondary options. Identifying option (2) as correct still leaves options (A)
TABLE 1. A Suggested Technique for Approaching the Type K Multiple-Choice Item  
(Read this table by rows — left to right)

<table>
<thead>
<tr>
<th>Eliminate Primary Option</th>
<th>Possible Answers Remaining</th>
<th>Primary Options Contained in These Answers</th>
<th>Probability of Guessing the Right Answer (with no further information)</th>
<th>Procedure Used to Answer the Item</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C, D</td>
<td>2, 4</td>
<td>Guess between C and D is 50-50</td>
<td>Option 4 appears in both C and D, so it must be correct. The choice centers around the correctness/incorrectness of primary option 2.</td>
<td>If 2 is correct, choose C. If 2 is incorrect, select D.</td>
</tr>
<tr>
<td>2</td>
<td>B, D</td>
<td>1, 3, 4</td>
<td>Guess between B and D is 50-50</td>
<td>Identifying the correctness/incorrectness of 1, 3, or 4 leads to the answer.</td>
<td>If 1 is correct, select B. If 3 is correct, select B. If 4 is correct, select D.</td>
</tr>
<tr>
<td>3</td>
<td>C, D</td>
<td>2, 4</td>
<td>Guess between C and D is 50-50</td>
<td>Option 4 appears in both C and D, so it must be correct. The choice centers around the correctness/incorrectness of primary option 2.</td>
<td>If 2 is correct, choose C. If 2 is incorrect, select D.</td>
</tr>
<tr>
<td>4</td>
<td>A, B</td>
<td>1, 2, 3</td>
<td>Guess between A and B is 50-50</td>
<td>1 and 3 must be correct since they appear in both A and B; the choice centers around the correctness/incorrectness of primary option 2.</td>
<td>If 2 is correct, choose A. If 2 is incorrect, select B.</td>
</tr>
<tr>
<td>No</td>
<td>E</td>
<td>1, 2, 3, 4</td>
<td>100%</td>
<td>Since no options can be eliminated, all are correct. Secondary option E is the correct answer.</td>
<td>Select E.</td>
</tr>
</tbody>
</table>

The advantage of eliminating options (3) and (4) before answering the item is that the process can be less confusing and more efficient. The process of answering the item leaves fewer secondary options remaining, which in turn means that only one (not all) primary options remain, each primary option being as valid as the others. Do not be concerned that by not evaluating all of the options present and judging the correctness of each primary option, you are ignoring important information needed to answer the item. The elimination strategy, coupled with the structure of the type K item, allows you to ignore certain primary options. As a result, it is not necessary to evaluate each primary option. Instead, you need only to consider in turn those primary options contained in the secondary options that remain, after having identified the correct answer.
one at a time. However, this is not the case since all possible combinations of primary options do not exist as alternatives in type K items. In addition, you should recall that it is not necessary to evaluate each primary option in a type K item. Elimination of only one primary option dictates which of the remaining primary options do not need evaluation. Therefore, approaching type K items by focusing on specific combinations of primary options is likely to be an unnecessary effort, resulting only in wasted time and energy.

In summary, the technique of eliminating primary options as incorrect allows you to take advantage of the "shortcuts" that the type K item structure offers. This approach not only saves time and effort, but it also offers the advantages of increasing your guessing probability and eliminating confusion that may unduly affect your test score. Perhaps the biggest advantage of this strategy, however, is that the progressive steps and consequences of this answering process need not be committed to memory. All you need to remember is the basic principle: focus on the primary (numbered) options, and then proceed by eliminating them as incorrect (vs. retaining them as correct).

One final point worth noting is that, on various tests constructed by different test-makers, the numbered and lettered options may be reversed. That is, the numbered options may represent various combinations of lettered options instead of vice versa. In this case, the numbered options are the secondary options and, therefore, the alternatives from which an answer must be selected. This should present no problem; however, since a careful reading of the directions will tell you the proper mode of response.

Also in terms of variant forms of type K items, you should be aware that inexperienced test-makers may construct "K-like" items that provide greater rewards for eliminating some options over others. For example, study the following list of options:

(a) (1) and (3)
(b) (2) and (3)
(c) (1) and (4)
(d) (1), (2), (3), and (4)
(e) none of the four options

You should note that eliminating options (1) or (3) eliminates three possible answers, whereas eliminating options (2) or (4) eliminates two possible answers. Therefore, it should be obvious that the more productive initial step is to focus first on options (1) or (3). In general, however, you may be assured that knowledgeable test-constructors use the standard type K item format outlined earlier. Now that you know that the method of elimination is the best approach in answering type K items, you should make it a common practice to utilize this technique on any test containing this item type.

Finally, you may be wondering why type K items are called multiple true-false items. This name is used because, although you are selecting one lettered option that represents various combinations of four numbered responses, you are actually saying true or false to the four numbered responses.

**Multiple True-False Type X Items**

A variant, but more conventional type of multiple true-false item is called a type X item. Type X items contain only one list of options, and the examinee is required to make a decision about the correctness/incorrectness of each of the options. In X items, any combination of rights and wrongs is possible, including all correct or all incorrect. Depending on how the test-maker scores the test, partial credit may or may not be rewarded for correct responses within an item. A type X item has the appearance of a standard multiple-choice item, but the directions and the type of response required are different.

**DIRECTIONS:** For each of the questions or incomplete statements below, ONE or MORE of the answers or completions given is correct. You are to mark as true (T) the alternative(s) that correctly complete(s) the statement or answer(s) the ques-
tion, and as false (F) the alternative(s) that incorrectly complete(s) the statement or answer(s) the question. Each item may have one, two, three or four options as correct responses.

8. Neostigmine bromide is a quaternary ammonium compound. It would be expected to diffuse across the walls of capillaries in the

(1) kidney (T) (F)  
(2) heart (T) (F)  
(3) skeletal muscle (T) (F)  
(4) brain (T) (F)

As you can see from the above illustration, when answering a type X item you are not deciding about the correctness of specific combinations of options, but are deciding about the correctness/incorrectness of each individual option. Therefore, this somewhat obtuse item type actually reduces to simple true-false questions. Although this item type is used in certification examinations in medicine, it is not frequently used in dental exams. It is not used on the Dental Boards, and the probability of its appearance on an in-house (classroom) test is much less than that of its companion, the type K item. However, since you will encounter a great many tests and test-constructors throughout your education, there is a chance that you may see some type X items.

Matching Type B Items

Another alternate form of multiple-choice item used in basic science education exams is referred to as the matching type B. Item type B appears as a series of items that frequently (but not always) test knowledge of closely related subject matter. Type B items are composed of a list of lettered headings followed by a list of numbered phrases. For each of the numbered headings, the test-taker must select the one best lettered heading that is most closely related to it. Each lettered heading may be the keyed option once, more than once, or not at all. (This is how type B items differ from standard matching questions.) An example of a set of matching type B items along with the corresponding directions follows.

DIRECTIONS: Each group of questions below consists of five lettered headings, or a diagram, or table, with five lettered components, followed by a list of numbered words, phrases, or statements. For each numbered word, phrase, or statement, select the one lettered heading or lettered component that is most closely associated with it. Each lettered heading or lettered component may be selected once, more than once, or not at all.

(A) methotrexate  
(B) bleomycin  
(C) 6-mercaptopurine  
(D) actinomycin D  
(E) nitrogen mustard

9. Binds two strands of DNA by covalent bonds  
10. Engages in pseudofeedback inhibition  
11. Has a very short half-life in solution  
12. Is converted to active form in the tumor cell

As the directions above indicate, diagrams or tables sometimes are used to present the lettered components, instead of a straightforward list of phrases as in the example. Of course, this variation does not alter your task in any way. You still must select a lettered component for each numbered heading. You should also note that any number of items (i.e., numbered headings) may be included in a set of type B items. However, it most frequently occurs that four to seven items are included in each type B set. It is also a common practice to include five lettered headings. In this way, each numbered item (regardless of how many items are included in the set) has five lettered options as possible answers, similar to the structure of a standard multiple-choice question.
On actual tests, a number of sets of type B items are presented together, possibly with varying numbers of questions in each set. By presenting a number of such type B item sets together, test-constructors may test your knowledge of various aspects of each of a wide variety of topics, without forcing you to change your response set from one type of item to another. Type B items are becoming more popular among test-writers, probably because the far-sighted test constructor is aware that the type B format allows him to ask a larger amount of questions, without being forced to generate a large number of plausible options to each question. For this reason, and because the B item is used in other health science tests, you are likely to encounter it on a test in dental school.

When answering type B items, the first relevant point to be aware of is that, in effect, each numbered heading is a separate multiple-choice question and the five lettered headings are the options. Thinking of the questions in this way serves two purposes. First, it creates a more familiar perceptual set, thereby preventing possible confusion over the structure of type B items. Second, picturing the set of lettered options under each numbered item reminds you that even though a lettered heading is used once as an answer, it still remains a possible answer for other items in the set. To understand how familiar these items appear when “reversed,” consider item numbers 9 and 10 from the previous example.

9. Binds two strands of DNA by covalent bonds
   (A) methotrexate
   (B) bleomycin
   (C) 6-mercaptopurine
   (D) actinomycin D
   (E) nitrogen mustard

10. Engages in pseudofeedback inhibition
    (A) methotrexate
    (B) bleomycin

When approaching type B items, you are advised first to read and focus on the numbered headings, since they are the "questions" for which answers must be provided. If you think of each numbered heading as a standard multiple-choice item, you can then merely read the item (numbered heading) and then search the options (lettered headings) for the one best alternative. On the other hand, if you are confused by the structure of the type B item and decide to evaluate each lettered option first, you may be headed for a futile exercise. For example, you may eliminate a lettered heading from association with all the listed numbered headings, and consequently still not have answered an item, only lost time.

The previous techniques used in dealing with type B items have been "defensive" in that they are intended to prevent the loss of points due to item misinterpretation or carelessness. The following suggestions, on the other hand, point to various characteristics of the type B item that may help you when you are unsure of an answer. In general, you should approach each series of type B items as an interrelated set of items. As you have just learned, all the type B items in a set share the same options (lettered headings) as possible answers. Therefore, certain content relationships may exist between the items. That is, a relationship between a numbered heading and a lettered heading may offer relevant information as an aid in answering (reasoning to) another item in the set. Remember type B items normally test various aspects of closely related subject matter, so what you know about one type B item may either provide direct information or initiate a deductive reasoning process toward answering another item in the set. I am not suggesting that there are structural dependencies between the items, for as the directions note, "each lettered heading may be selected once, more than once, or not at all." All that is being propounded is that since these items share a com-
mon structure, they are not separate and unrelated entities. Consequently, it would be folly for you to approach those items as unrelated, since it may be possible for you to identify certain content relationships from the internal structure of a set of type B items.

From your years of test-taking experience you should know that some questions on objective tests can be answered from information culled from other items on the test. The same principle applies here, but within a defined set of items. Test constructors are dealing with a delicate instrument in the type B item. If they intend to measure knowledge of related subject matter, examiners must take adequate care to assure that the numbered headings cannot be associated with more than one lettered title. However, in meeting this assurance, they must also be sure that all the options provided are reasonable alternatives to each numbered heading. If not, you may find it easy to eliminate a certain lettered heading as a possible answer, making the item a poor measure of your content knowledge.

Matching Type C Items

A final type of matching item is referred to as a type C item. Type C items contain four lettered alternatives as possible answers and any number of numbered headings as items to be answered. An example of a set of type C items and the corresponding directions follow.

DIRECTIONS: Each set of lettered headings below is followed by a list of numbered words or phrases. For each numbered word or phrase select

A if the item is associated with (A) only,
B if the item is associated with (B) only,
C if the item is associated with both (A) and (B),
D if the item is associated with neither (A) nor (B).

(A) Paranoia
(B) Schizophrenia

(C) Both
(D) Neither

13. In extreme forms can lead to a completely distorted perception of reality
14. Characterized by excessive mood changes
15. Best treated by thorazine

As with matching type B items, the options to a set of type C items are shared by all the numbered headings in the set. Also like type B items, an answer here may be used once, more than once, or not at all. Since type C items are so similar in structure to type B items, the techniques suggested for answering type B items are also appropriate in dealing with the type C item. For example, you are advised again to note that, in effect, each numbered heading is a separate multiple-choice item and the four lettered headings are the options. Second, in answering type C items you should initially focus on the numbered headings since they are the questions for which answers must be provided. And finally, each series of type C items should be approached as a set. The shared options may result in content relationships between items, which may provide information to aid you in answering another item in the set.

In addition to the previous suggestions, another consideration about type C items is worth noting. Recall from the earlier discussion concerning type K (multiple true-false) items that the possible answers were combinations of various responses. The particular combinations of these responses on a type K item meant that the examinee was "rewarded" more for rejecting than for accepting these responses. As a result, you may be tempted to conclude that this same approach is the optimal approach with type C items. However, this is not true.

The alternatives in type C items from which you must select an answer are summarized as follows:

(A) A only
(B) B only
ITEM TYPES ON DENTAL NATIONAL BOARD EXAMINATION

As a test-taker in dental education, you are fortunate in that recent (1981) Dental Boards (Parts I and II) have used only three basic item types. The first is a variant form of the type C item (both-neither) discussed immediately above. The second, and most frequently used, is the standard multiple-choice question. The third consists of a number of variations of the "multiple-multiple" type K item, discussed earlier. This third item type provides problems for the unskilled test-taker since the combinations of responses provided as options vary considerably from item to item. Basically, although this item's structure resembles that of the type K item, it does not consistently employ the same combinations of responses as does the type K item. Each of these three item types will be reviewed in this section. In addition, a final note will be included as to some other item possibilities on future board exams.

"Both-Neither" Items

The literal form of type C item illustrated earlier is likely to appear on teacher-made tests, but not on the Dental Boards. However, a variant of this format is likely to appear on a boards exam, although in small quantities. Consider the following example taken from Part I of the 1981 Dental Board.

*16. In the case of a slowly occluded inferior vena cava, a useful collateral route may develop involving the
(1) several epigastric veins.
(2) total azygos system.
(3) both (1) and (2) above.
(4) neither (1) nor (2) above.

As you can see, although the formats of the two items are slightly different, they are actually variations of the same "both-neither" theme, and are in essence the same item type. Therefore, you can expect to see this item type on the Board, and the suggestions given earlier for type C items also apply here.

Standard Multiple-Choice Items

By now you should be familiar with this item type. If not, return to page 20 and read about regular multiple-choice items. Concerning their use on the Dental Boards, you should know that they comprise the majority of items on a usual board exam. You should also expect to see a stem presented with from three to eight options. Remember, the fewer options in an item, the better your probability of guessing correctly. Finally, you will see standard multiple-choice items expressed as negatives. These items

are easily identified by the use of the words not or except presented in the item stem in capital letters or italics.

Multiple-Multiples

To the best of my knowledge, no specific name has been coined for these item types appearing in dental education exams. Therefore, we will lump them all under the rubric commonly used by students, namely "multiple-multiples." As previously stated, dental multiple-multiples structurally resemble the type K item discussed in the previous section. The resemblance centers on the fact that both types are composed of a stem, a list of primary options, and a list of secondary options consisting of various combinations of the primary options. In both item types, you must select one of the secondary options as the answer to the question. The difference between K items and dental multiple-multiples is that the former always uses the same secondary options, whereas the latter does not. In fact, dental multiple-multiples use a wide variety of secondary (combinations of primaries) options. Since all the possible combinations of primary options in a multiple-multiple format are too numerous to review here, only some of the possible multiple-multiples will be examined, along with suggested strategies for answering them.

The first point to note concerning dental multiple-multiples is that the letters and numbers are reversed from their position in the type K item. That is, the primary options are now labeled with letters, while the secondary options are now labeled with numbers. Recall that the secondary options represent various combinations of the primaries, and that the answer you select must come from the list of secondary options. This new arrangement is illustrated in the following item.

*17. Temperature-regulating mechanisms that increase heat production include

(a) shivering.
(b) cutaneous vasodilation.
(c) increased voluntary activity.
(d) cutaneous vasoconstriction.
(e) increased secretion of epinephrine from the adrenal medulla.

1. (a), (b) and (c)
2. (a), (b) and (e)
3. (a), (c) and (d)
4. (a), (c) and (e)
5. (c), (d) and (e)

You should also note that dental multiple-multiples usually contain from three, (a) through (c), to six, (a) through (f), primary options, and from four, 1 through 4, to six, 1 through 6, secondary options (possible answers to the item). Obviously, the more primary options provided, the more possible combinations of these options, and therefore, the greater likelihood that more secondary options will be given in an item. However, it appears that the "norm" is five primary options with five secondary options. Again, note that the five secondaries are not always the same combinations of primaries, and that since this item type is so flexible, the "norm" of five primaries and five secondaries is easily and frequently broken.

In addition, unlike the type K item, multiple-multiples on dental exams are presented in the text of the test without a separate set of directions. That is, the specific secondary options are spelled out under each item, enabling the multiple-multiples to be mixed with standard multiple-choice items. In this manner, you are less likely to misinterpret a multiple-multiple as a standard multiple-choice item. Of course, this procedure is necessitated by the fact that the Dental Boards use a variety of secondary options, meaning that the item-specific secondary options must be spelled out each time.

In reviewing strategies for answering these multiple-multiples, remember that the information presented here is not intended to

replace your knowledge of content. It is intended only to supplement your knowledge by pointing out certain structural characteristics of the multiple-multiple item type. These strategies only make it easier for you to answer the item, and are also meant to disarm you of any confusion or anxiety you may develop when faced with a number of multiple-multiple items.

Since the strategies and item nuances discussed here relate only to the structure of multiple-multiples, it is not necessary to present the item's actual content (stem and primary options) in illustrating answering strategies. Consequently, the following techniques are employed in illustrating various multiple-multiples.

18. 5 primary options:  
(a) through (e)  
5 secondary options: 1. (a), (b), and (e)  
2. (b) and (c) only  
3. (b), (c), and (d)  
4. (b), (c), and (e)  
5. (c), (d), and (e)

In this example, the stem to item 18 has been omitted, as has the actual list of the primary options. However, you are told that five primary options labeled (a) through (e) are given in the item. In addition, secondary options 1 through 5 are presented exactly as they appear in the item. Again, since the structural strategies of concern center around the secondary options, this format is sufficient in illustrating multiple-multiples found in dental exams. It also illustrates that we will be considering test-taking strategies that are independent of item content.

Multiple-Multiple Strategy

First, recall again that multiple-multiples in dental exams vary considerably in the composition of their secondary options. This means that no one specific strategy can be built around a specific recurring structural event in a number of multiple-multiples. For example, one cannot safely concentrate on primary option (a) as opposed to (b), feeling that (a) occurs more frequently than (b) in the secondary options. Nor can one expect to see specific combinations of options occurring more frequently than others (e.g., (a) and (b) vs. (b) and (d)). Nor should an examinee try to evaluate specific combinations of primaries without first checking the secondaries. (The combination of primaries you select as correct may not even be listed as a possible answer.)

Consequently, the prospective test-taker must develop a strategy that is specific to the multiple-multiple, but generic enough to be successful across numerous variations of secondary options. I believe that the strategy about to be suggested allows you to approach each multiple-multiple in the same manner, hopefully eliminating any confusion that the structure of the item may cause. In addition, this strategy allows you to save time on each item (and therefore across the entire test) by focusing your task. This technique also increases the probability of selecting the correct answer when you must guess at an item. And finally, this approach should make you feel more at ease with multiple-multiples, thereby making them a more valid measure of your knowledge of the material on the test.

To illustrate this strategy, consider the following item.

19. 5 primary options:  
(a) through (e)  
5 secondary options: 1. (a) and (b) only  
2. (a), (b), and (e)  
3. (a), (c), and (d)  
4. (a), (c), (d), and (e)  
5. (d) and (e) only

First, you should look at the secondary (numbered) options and determine how frequently each primary (lettered) option is listed as a possible answer. In item 19 above, this process results in the following observations:

(a) is listed 4 times (or in 80% of the secondary options)  
(d) is listed 3 times (or in 60% of the secondary options)
(e) is listed 3 times (or in 60% of the secondary options)
(b) is listed 2 times (or in 40% of the secondary options)
(c) is listed 2 times (or in 40% of the secondary options)

Second, depending on your content knowledge (what you know concerning the content in the item), you may now select one of two paths in answering this item.

1. Option (a) appears in four of the five secondary options. If you can eliminate this option as incorrect, you can eliminate options 1, 2, 3, and 4 as possible answers. Consequently, option 5 must be the answer since it is the only secondary option that does not contain (a). At this point, if you are sure about your decision concerning the incorrectness of (a), the probability of guessing correctly is 100% since you have only one option to select. This probability remains 100% even if you know nothing about the correctness/incorrectness of options (b), (c), (d), and (e). If you are unable to decide about the correctness/incorrectness of (a), move to either (d) or (e), which both appear the next most frequently (three times) in the secondary options. Again, try to reject as incorrect any option that contains (d) or (e). If you choose to focus on (d) and are able to identify it as incorrect, only secondary options 1 and 2 are left as possible answers. At this point, even if you have no further content knowledge and are forced to guess, the probability of your guessing correctly is 50% (1 out of 2). In addition, note that options (a) and (b) are both contained in secondary options 1 and 2. Therefore, in choosing between options 1 and 2 at this point, you need only decide about the correctness/incorrectness of (e), which is the only option that distinguishes secondary option 1 from 2.

Similarly, if you can reject (e) as incorrect, only options 1 and 3 remain as viable answers because neither contains (e). The probability of guessing correctly at this point is again 50%. However, knowing anything about the correctness/incorrectness of any of options (b), (c), or (d) will give you the answer. For example, knowing (c) is correct indicates that 3 must be the answer.

At this point, before a general rule is stated, keep in mind what you have just learned, and now consider the second strategic path to answering this item.

2. Options (b) and (c) each appear only twice in the secondary options. If you can accept either of these options as correct, you have eliminated three secondary options as possible answers. For example, identifying (b) as correct leaves options 1 and 2 as possible answers. Similarly, identifying (c) as correct leaves 3 and 4 as possible answers. In both cases, at this point, the probability of guessing correctly is 50%. Choosing between options 1 and 2 means only deciding about option (e). Similarly, choosing between 3 and 4 also means deciding about (e). In either case, if you know about the correctness/incorrectness of (e), you can arrive at the answer.

Combining the two pathways just discussed, we can now describe the general rule. After you have determined the frequency of occurrence of the primary (lettered) options, follow this general procedure. If a primary option appears in more than 50% of the listed secondary options, examine that option and try to eliminate it as incorrect. Since the option appears in more than half of the possible answers, you can eliminate a majority of the alternatives by eliminating the option as incorrect. Consequently, your probability of getting the item correct increases, and your remaining content decisions are made much more simple (i.e., having to decide about less primary options).

If a primary option appears in more than 50% of the secondary options and you retain it as correct, you have not gained much in arriving at an answer, but have prolonged your task of answering the item. In addition, on a timed test you may have wasted valuable time. For example, if we had identified option (a) as correct in item 19 on page 43, we would have had options 1, 2, 3, and 4 remaining as possible answers. A guess here has a 25% chance of being right, and trying to select from options 1 through 4 still involves deciding about options (b), (c), (d), and (e). For your own illustration, follow this procedure for options (d) and (e), which both appear in more than 50% of the secondary op-
tions. You should be able to see that accepting them as correct does not provide as many rewards as does rejecting them as incorrect.

Conversely, the second part of the rule states that if a primary option appears in less than 50% of the listed secondary options, you should examine it and try to retain it as a correct response. Since it appears in less than half of the possible answers, identifying it as correct eliminates most of the alternatives and results in less answers from which to choose. Again, the structure of the secondaries means that your probability of guessing correctly is higher at this point, and the primary options yet left to decide about are fewer. For your own reference, go back to item 19 and compare the benefits of accepting as correct options (b) or (c) versus rejecting them as incorrect.

The rule can be summarized by the following:

If a primary option appears in more than 50% of the listed secondary options, try to eliminate it as incorrect. If a primary option appears in less than 50% of the listed secondary options, try to retain it as correct. If a primary option appears in exactly 50% of the items, either reject it as incorrect or accept it as correct.

As further examples of this strategy, consider the following two items from a previous Dental Board Exam.

*20. Transitional epithelium is characteristic of the lining of the
(a) trachea.
(b) ureter.
(c) uterus.
(d) first part of the prostatic urethra.
(e) urinary bladder.
1. (a), (c) and (d)

*21. Modifications of the cell membrane for special functions include
(a) microvilli.
(b) basement membranes.
(c) desmosomes.
(d) mucous membranes.
(e) brush border.

1. (a) only
2. (a), (b) and (e)
3. (a), (c) and (e)
4. (b) and (d)
5. (c) and (d)

The keyed option is 3. Options (b), (c), (d), and (e) each appear only twice in the secondaries. Correct content knowledge permits you only to retain (c) and (e) as correct. Retaining either as correct leaves you with a 50-50 guess between two remaining secondary options. Only one more bit of content knowledge concerning the primaries in these remaining secondaries allows the answer to fall out. Conversely, if you reject as incorrect any of (b), (c), (d), or (e), you still have, at best, only a 33% chance of guessing correctly, and more primary options about which to decide.

At this point, it is probably necessary to address some concerns you may have with this strategy. First, you are not doubt wondering what happens when you know that the most frequent primary option is correct and/or the least frequent primary option is incorrect? In this case, the literal strategy obviously is inapplicable. No real structural shortcut is available, and you must piece together content knowledge of at least two primary options to arrive at the answer. Fortunately, this item format presents only a limited number of specific combinations of the primary options. As a result, even when the item is complex, you still can increase your probability of being right with each bit of content knowledge. Since such a variety of secondary options is used, there are instances when the structure of the secondary options offers no strategic advantage.

However, recall that this approach is not suggested as a replacement of your content knowledge. Instead, it points to the fact that since this item is a multiple true-false type, and you must answer true or false to the primary options, there are instances in which certain secondary options (i.e., specific combinations of primaries) make it more beneficial for you to say “true” to some primaries and “false” to others. Obviously, however, when your knowledge of content tells you not to do this, don’t. But, when you can, maximal gain can be achieved by saying true or false to certain primary options as a result of their juxtaposition in the secondary options.

A second possible concern is that this process may be too arduous and time consuming for you. Actually, it should save you time when dealing with a large number of multiple-multiples on a timed test. The process directs you to the specific combinations of primaries you should focus on; you do not waste time on other irrelevant combinations. In addition, since there is no memorization involved, this approach only requires that you learn the basic premises. In applying these premises, all the possibilities necessarily follow without any other steps required. With practice, you will quickly see that you will become adept at scanning an item and determining the frequency and combinations of primary options.

However, if you are an overly anxious test-taker, this strategy may interfere with your content reasoning processes, and you should consider avoiding its use. The best way to test your reactions is by practicing the strategy on a number of multiple-multiples. If it confuses you, do not use it. If it does not confuse you, practice with more multiple-multiples until you feel at ease.

Another concern may be whether the suggested strategy generalizes across all, or most, variations of the multiple-multiple found on dental exams. As has been stated frequently, a large number of different combinations of primary options are employed in dental multiple-multiples. The number of these combinations is limited only by the number of primaries included in the item, the number of secondaries provided, and the number of primaries combined in a secondary option. In short, as you have probably surmised, a large number of possible multiple-multiple formats exists. However, since all these formats share the characteristic of combining various primary options, they are all susceptible to the use of some primary options more frequently than others. Consequently, you as the test-taker can search for the various options that provide maximal gain for a specific decision of acceptance or rejection.

The structure of a multiple-multiple permits greater benefit for focusing on one primary option over the others. Even though the
specific options and combinations vary from item to item, the same structural characteristics make our strategy applicable when it does not interfere with content knowledge. A number of multiple-choice formats used on past board exams illustrate this fact and are presented for you to review. However, as a final note of caution, remember that initially approaching a multiple-choice by evaluating various combinations of primary options instead of by focusing on one at a time may be a futile exercise. This is so since all possible combinations of primary options do not exist as possible alternatives in a multiple-choice. Deciding on the correctness/incorrectness of one specific primary dictates which other primaries are, or are not, necessary for you to evaluate.

As a final exercise, consider the following four examples of multiple-multiples. Try to determine which primary options offer maximal effort for a decision of acceptance, and which for a decision of rejection. Consider which secondary options are left as viable alternatives after this initial decision. Determine the probability of guessing correctly at this point, and decide which primary options still must be evaluated as possible responses to the item's stem. A "key" describing these characteristics in each item is presented directly after each item.

22. 5 primary options: (a) through (e)
   5 secondary options: 1. (a), (b), (c), and (d)
                           2. (a), (b), (c), and (e)
                           3. (a), (b), (d), and (e)
                           4. (a), (c), (d), and (e)
                           5. (b), (c), (d), and (e)
                           6. All of the above

KEY:
1. Options (a), (b), (c), (d), and (e) each appear in five of six (or in all but one) of the secondary options.
2. Procedure. Reject any of the five primary options as untrue. The one secondary option that does not possess this primary option must be the correct answer.
3. Probability of guessing correctly (after this initial decision of rejecting any one of the primaries as incorrect) is 100%.

23. 5 primary options: (a) through (e)
   5 secondary options: 1. (a), (b), and (c)
                         2. (a), (c), and (d)
                         3. (a) and (d) only
                         4. (c) and (d) only
                         5. (c), (d), and (e)

KEY:
1. Options (c) and (d) appear in four of the five (80%) secondary options; (a) appears in three of five (60%) of the secondaries. Options (b) and (e) appear in only one (20%) of the five secondaries.
2. Procedure. If you are able to reject option (c) as an incorrect response to the stem, secondary choice number 3 must be the answer since it does not contain (c). Similarly, if you can reject (d) as incorrect, number 1 must be the answer since it does not contain (d). In both cases, if you are correct about your initial decision of rejection, the probability of your answer being correct is 100%. If you do not know about (c) or (d), or if you know one of them is correct, instead of spending time deciding between four plausible answers (those secondaries containing the correct primary), you can locate a primary option used in less than 50% of the secondaries and try to identify it as a correct response to the stem. In the present item, if you know that either (b) or (e) is correct, the answer to the item becomes evident. Since (b) and (e) are each used in only one of the secondaries, number 1 must be the answer if (b) is correct and number 5 must be the answer if (e) is correct. Again, either decision, if correct, results in a 100% probability of answering the item correctly.
3. Note: If you are forced to decide about (a), a decision of rejection leaves only numbers 4 and 5 as possible answers.
The guessing probability at this point is 50% (one of two). However, since numbers 4 and 5 both contain (c) and (d), these lettered options must be correct responses, meaning you do not have to deliberate over them. Instead, you must decide only about (e). If (e) is a correct response to the stem, you select number 5. If not, select number 4.

24. 5 primary options: (a) through (e)
   6 secondary options: 1. (a), (b), (c), and (d)
                        2. (a), (c), (d), and (e)
                        3. (b), (c), and (d) only
                        4. (b) and (e)
                        5. (c), (d), and (e) only
                        6. All of the above

KEY:
(1) Options (c) and (d) both appear in five of six, or 83%, of the secondary options. Options (b) and (e) both appear in four of six, or 67%, of the secondary options. Option (a) appears in three of six, or 50%, of the secondaries.

(2) Procedure.
   □ Reject (c), answer must be number 4.
   □ Reject (d), answer must be number 4.
   □ Reject (b), answer must be either option 2 or option 5.
     Probability now is 50%. Options 2 and 5 differ only on option (a), so you must only decide about (a).
   □ Reject (e), answer must be either option 1 or option 3.
     Probability of a guess is 50%. You must only decide about (a).
   □ Since (a) appears in exactly 50% of the secondary options, a choice of acceptance or rejection leaves three of six possible answers. Guessing probability is 33%, or one of three. Examine the secondaries to determine which primaries are left when you reject (a), and which remain when you accept (a).

(3) Note: Remember, this strategy does not encourage you to reject or accept against your content knowledge. It only points out the benefits of rejecting or accepting certain primaries over others because the rewards are better for certain initial decisions over others. This approach is intended to direct your task for maximal benefit in answering an item, and, as a result, to save you time and effort in examining the specific primary combinations that lead directly to an answer.

25. 4 primary options: (a) through (d)
      5 secondary options: 1. (a), (b), and (d)
                            2. (a) and (c)
                            3. (b), (c), and (d)
                            4. (c) and (d) only
                            5. All of the above

KEY:
Since (c) and (d) appear in four of the five options, the correct answer is quickly evident if you can identify either one as incorrect. Similarly, if you can reject (a) or (b) as incorrect, you have a 50:50 guess between two remaining secondary options. As an illustration of another approach, consider what would happen if our strategy was inapplicable. That is, if we could not eliminate any primary option occurring in more than half of the secondaries as incorrect. What do we do?

In the item above, imagine we knew that (a) was correct. Examination of the secondaries reveals that options 1, 2, and 5 remain as possible answers.

Guessing now is one of three, but if you then reject any of the remaining primaries you will have the answer. For example, if you could reject (d), number 2 would have to be the answer. (Try the others.) When our strategy is inapplicable, look at the secondaries to determine which primaries still must be evaluated after you make your initial decision. Although the probability of guessing at this point is lower than that with our strategy (and you will have to look at more primaries), if you look for the structural combinations left in the item, your specific task in terms of the primaries will be defined for you.
In summary, if you have not already noticed, one or more forms of our basic strategy have been followed in each of the four examples. That is, if a primary option appears in more than one half of the secondary options, maximal gain in answering the item is achieved if you can eliminate that primary as incorrect. Similarly, if a primary option appears in less than one half of the secondary options, maximal gain occurs if you can retain it as correct. When a primary option appears in exactly one half of the secondaries, you can either accept or reject it, with equal gain occurring with either decision.

To become proficient at this strategy, as well as to convince yourself of its feasibility, you should practice on real multiple-multiples. You can use your own classroom tests, and released copies of previous board exams should be found in your library. Remember, use this approach as a supplement to your content knowledge. It should make you a better test-taker with multiple-multiples, but it cannot help you to master content.

Variations of Item Types

Finally, a couple of variations on the standard multiple-choice item may occur on a boards exam. The first is the use of the "statement-reason" relationship. In this type of item, the stem contains a statement followed by a reason for that statement. In providing an answer, you must select from a number of options that refer to the correctness/incorrectness of the statement and reason, and to their relationship to each other (e.g., if the reason is a correct explanation for the statement). For example, consider the following item, which presents one possible set of options for this type of item.

26. Psychotherapy is preferable to behavioral therapy in treating schizophrenia because psychotherapy results in fewer side-effects

SELECT

1. If both assertion and reason are true statements and the reason is a correct explanation for that assertion,
PART III

Cues in Multiple-Choice Items
Regardless of which multiple-choice item format is involved, it is always incumbent on the test-maker to construct test items that are free of structural faults. However, this task is not as easy as you may think. Even the most skilled test-maker is capable of writing a poor item. Consequently, it is probably worth your while to become acquainted with a number of specific item faults (or secondary cues) that may occur in multiple-choice test items. Knowledge of these faults is important to you as a test-taker since they may serve as cues to the keyed answer, or may at least help to eliminate some options as incorrect.

This section of the book is intended to introduce you to a number of these item flaws and to illustrate how they may "point" to the correct answer. You should note that teacher-made tests are more susceptible to these flaws than are standardized exams, such as the Boards. The classroom instructor is usually not a skilled test-writer, and his items are not subject to the intense scrutiny that board items must undergo. Consequently, a poor item that would be screened out of the Boards may still appear on a classroom test. If a poor item appears on a standardized exam, often it is removed from the test after its deficiency
is discovered and does not count in the scoring. However, this is an administrative decision, and a bad item may be retained in the scoring. On a teacher-made test, the item is more than likely retained, since the instructor rarely discovers (or admits) his deficiencies in constructing items. Consequently, it is wise for the examinee to be able to identify these flaws, so that one becomes more test-wise and is able to supplement knowledge of content when faced with a troublesome test item.

STEM-OPTION

An initial faulty item type to be examined is called a "stem-option" or "stem-cue." In a stem-option item, you are able to ascertain the keyed option through its relationship (resemblance) to the stem. This stem-option relationship can take a number of forms, such as:

1. an exact repetition (in the keyed option) of one or more words presented in the stem.
2. a repetition (in the keyed option) of part of a word used in the stem.
3. a word (in the keyed option) with the same meaning as a stem word, or possessing a close logical relationship to the stem.

For example, consider the following item.

27. In an address entitled "The Future of the Throne," Richard II spoke to Parliament concerning:
(a) legislators' health insurance
(b) divine rights of kings
(c) the development of a navy
(d) taxation of imports
(e) the declining morality

If you did not know the answer to this item, but were aware of the stem-option flaw, you would have selected option (b) as the correct answer. One form of the relationship in a stem-option item is the appearance of words with the same or logically similar meaning in both the stem and the keyed option. In this instance the words "divine rights of kings" in option (b) have a close logical relationship to the stem words "The Future of the Throne." Obviously, the relationship between a stem and the correct response is not usually as obvious as in the present example. But stem-options do occur in teacher-made tests; the poorer the test-writer, the greater the likelihood of stem-options occurring.

ABSORB OPTION

A second item flaw that may occur in multiple-choice questions is called an "absurd option." In this item type, an option can be eliminated as a possible answer because of its logical inconsistencies with the stem. For example, if the stem asks a question about amalgam restorations, all the options should pertain to this topic so that they all appear equally attractive to the examinee. If one or more of the options obviously does not pertain to the stem's content, the test-wise examinee may quickly eliminate these absurd options as incorrect. This elimination makes answering the item an easier task because the test-writer has inadvertently allowed test-taking skill to interfere with assessment of content knowledge.

As an example of an absurd item, consider item 28.

28. The Civil War Senator Franklin Warfield is most noted for his
(a) filibuster on slavery
(b) role in helping to draft the "Emancipation Proclamation"
(c) legislation concerning carpetbaggers
(d) nominating speech of U.S. Grant
(e) busing legislation

If you knew nothing about Senator Franklin Warfield, you still could have eliminated one of the options as incorrect through recognition of the absurd-option flaw. The stem of the item asks about a Civil War senator. Options (a) through (d) all deal with viable senatorial activities in Civil War times. However, option (e) is obviously absurd, because busing was not a Civil War issue,
or even a physical possibility at that time. Therefore, because of its absurd relationship to the stem, option (e) could quickly be eliminated, thereby improving your guessing probability from one in five to one in four.

If you can successfully identify a primary option as absurd in a multiple-choice item, you can also eliminate from consideration any secondary option that contains that primary option. If the example above were a multiple-choice, and option (e) was used in two of five of the secondaries, then only three remaining secondaries would be left as plausible answers. The point here is that test-wiseness cues can be combined with test-taking strategies in helping to arrive at an answer to a test item.

SIMILAR OPTIONS

Another secondary cue that may appear in multiple-choice questions is known as “similar options.” In most multiple-choice items, you are required to select the one response that best completes the stem. When two of the options express the same fact, then both may be eliminated since they both cannot be correct. When an examiner finds it difficult to write adequate distractors, it is quite tempting to recreate one of the other options. This is frequently done unconsciously; nevertheless, when two or more of the options are similar, it is a bit easier for the examinee to find the right answer. Try to locate the similar options in the following item.

29. According to the child psychologist, C.P. McAndrew, children educated in “open schools”

(a) are more verbally and literarily expressive than children in traditional schools
(b) possess higher IQs than children in traditional schools
(c) experience less learning problems than children in traditional schools
(d) exhibit less personality disorders than children in traditional schools
(e) have larger vocabularies than children in traditional schools

You should have recognized that options (a) and (e) basically express the same fact concerning children’s vocabularies. Therefore, both (a) and (e) could be eliminated as answers since they both cannot be the keyed option.

GENERAL CHARACTERISTICS OF TEST CONSTRUCTION

In addition to all the specific item flaws that you have just encountered, there is a general factor that will also add to your test-wiseness. From all your previous test-taking experiences, you have no doubt noticed that what is characteristic of one examiner’s tests may be a rarity in another’s. Being cognizant of a test-maker’s idiosyncrasies in test construction not only may serve to identify who wrote the items, but may also help you to select the correct response. Therefore, the following item characteristics, which may be the result of the test-constructor’s personal style in item writing, are briefly explained.

1. Specific Determiners. Specific determiners are characterized by the use of modifiers that imply the absolute, such as “always” or “never.” Although the caution has been given that these options are incorrect since the absolute rarely exists in reality, it may be a frequent characteristic of a certain test-maker to key a specific determiner option as correct. Your best bet when in doubt is to play the odds and follow the tendencies of your test-maker.

2. Option Length. The keyed option may frequently be longer (or, with some test-makers, shorter) than the distractors. This occurs when the test-maker has trouble either expressing the keyed option or adequately distinguishing it from the other options.

3. Overqualification or Overgeneralization of the Keyed Answer. In this situation, the test-maker is not able to express the correct answer concisely. As a result, to assure that it is recognizable as correct, the test-constructor is forced to make the answer quite wordy.

4. “All of the Above” or “None of the Above.” Certain test-makers may have a tendency to frequently key one of these as correct. However, you should be aware that some testwriters often include these options because they are unable to write any
other plausible alternatives. In this situation, these options are usually incorrect.

5. Item Give Aways: This flaw refers to the fact that an answer to one question may be found in the information provided in another test item. Although on actual tests it is unusual to encounter items with answers that are directly visible in other items, it is always a good practice to check all items for relevant information that may be used in answering test questions. This is especially true when the items test similar subject matter, or when the test-maker has difficulty in generating a sufficiently large number of test items.

6. Familiar or Stereotyped Language. Test-writers may unconsciously use familiar terminology when writing options to questions. The language used is directly derived from familiar phrases used in class, presented in texts, or derived from quotations. In these cases, the familiar options are usually the keyed answers.

For additional information on various test-wiseness cues, consult the sections labeled “Suggested Readings” at the end of the book.

Hopefully, you will become a more successful test-taker as a result of what you have learned in this book. There is no reason for losing points because of avoidable minor errors, confusion over item format, or poorly constructed items. The information provided in this book has specifically addressed these areas, with the intention of providing an important supplement to your content knowledge, not a substitute for it. Proper use of this information not only should make your test-taking experiences less anxious, but, more practically, should enable you to maximize your test scores.

If you desire further exercise and evidence in the area of general test-taking skills and test preparation, consider the suggested readings that follow.

SUGGESTED READINGS

Part I
A visit to your campus “learning center,” or to the reference section of any commercial bookstore, should result in locating a number of “how-to-take-a-test” books. A number of these books have been written over the years. In general, they deal with the basics of test-taking, and you are probably already a sophisticated enough test-taker to not need such basic instruction. However, if you are a weak test-taker and feel that you need further help, you should consult one or more of these books.

Although there are newer titles than those listed below, these four books are presented because they are in some sense the “classics” in the field, from which the newer works derive their content.


Part II
As evidence that instruction in strategies used to answer complex multiple-choice formats can facilitate test scores, you may want to read the following article.


In terms of direct exposure to the content and item types used on Dental Board exams, your best bet is to examine past Board examinations. These usually can be procured at your school’s library or student affairs’ office. If not, write to the Joint Commission on National Dental Examinations, 211 E. Chicago Ave., Chicago, IL 60611.

Part III
In addition to the test-wiseness cues addressed in Part III of this text, you can find other cues described in the following article.

Further test-taking techniques can be found in this brief article from the Medical Times.


Finally, a list of additional test-wiseness references, as well as a relatively recent review of the professional literature in test-wiseness, can be found in the following reference.


As a final thought, when searching for any additional references on this book's general topic, the key words in any library or computer search are as follows:

Test-wiseness
Test-taking skills
Cognitive tests
Objective tests
Multiple-choice items
Test anxiety
Guessing