

CHAPTER

2

Test-Taking Tips and Techniques

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INTRODUCTION

To perform well on the CRT exam, you first must know the subject matter covered. However, to pass this exam, you also need good test-taking skills. **Figure 2-1** offers our simple two-part “formula” for success on the CRT exam.

Inspection of this formula reveals why many knowledgeable candidates fail the CRT exam. Typically, such individuals do poorly on the exam because they lack the *test-taking skills* needed to translate their mastery of the subject matter into consistently correct answers. The common refrain “I’m no good at taking tests” is a symptom of this problem. Fortunately, this condition is treatable. With good guidance and practice, everyone can develop good test-taking skills. The purpose of this chapter is to help you become a better test-taker. By doing so, you will improve your odds of passing the NBRC CRT exam.

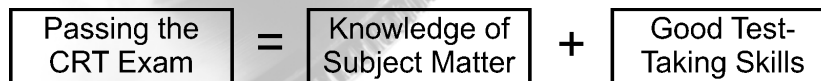


Figure 2-1 Formula for Success on the NBRC CRT Exam.

HOW TO FAIL THE CRT EXAM

It may seem a bit strange to begin with instructions on how to fail your test. However, knowing why people fail the CRT exam can actually help you avoid failure. Of course, the most common reason why candidates perform poorly on the CRT exam is lack of content knowledge. Other causes of failure include the following:

- Taking the test “cold” or unprepared
- Memorizing as many practice questions and answers as possible
- Reviewing everything you ever learned in school
- Cramming the night before the exam
- Letting anxiety get the best of you
- Not finishing the test

It always amazes us how some candidates insist on taking the CRT exam without the proper preparation. Of course, some of these folks do so because they planned poorly and simply ran out of time. Others take the test cold because they are overly confident in their abilities. Last and most foolish are those who take the exam without preparation just to “see how they will do.” By not preparing for the exam, you risk both time and money should you fail and need to retake the exam. Although

we do advocate “gambling” on specific test questions, taking the CRT exam without any preparation is a very bad bet that you are more than likely to lose. As indicated in our formula for success, you cannot pass the exam without good knowledge of the content covered on the exam. And good knowledge of the subject matter comes only with good preparation.

Another common cause of failure is the misguided strategy of memorizing hundreds of practice questions and answers. As mentioned in Chapter 1, this is a waste of your time. Instead, you should use practice questions and answers to help identify concepts that you know and those that you still need to work on.

We also know of candidates who prepare by surrounding themselves with the dozens of books and hundreds of pages of notes that they acquired while in school. Many of these folks simply do not know where to begin, and sooner or later most will feel overwhelmed by the sheer volume of these materials. Such a strategy typically begets both anxiety and confusion, which are among the most common causes of poor exam performance. To avoid the problems associated with this strategy, you first need to remember that the CRT exam does *not* test for isolated facts or the “book knowledge” covered in specific courses you took in school. Instead, *this exam assesses your job-related knowledge and skills*. So instead of reviewing everything you learned in school, your time is better spent focusing on the specific content of the exam as defined by the NBRC. That is exactly what the remaining chapters in this text do.

Cramming is perhaps the most common reason why candidates fail the CRT exam. Lacking a good study plan and being pressed for time due to job and/or family commitments, some individuals typically put off their preparation until the week *or even the night* before their scheduled test date. Besides producing even worse anxiety than trying to review everything ever learned, cramming typically results in a loss of sleep in the days leading up to the test. “Dazed and confused” best describes such candidates when they show up to take the test—and disappointed when they get their score report.

Anxiety is a common cause of poor CRT exam performance. More precisely, *overanxiety* can lead to failure. Some anxiety prior to taking a test is not only natural but can have positive benefits. Like getting “pumped up” in anticipation of a sports contest, the stress associated with taking a test can help motivate you to excel. Channeling the extra energy associated with test apprehension in a positive way can improve your exam performance.

Last, the surest way to fail the CRT exam is not to finish it. Unlike some exams in which the score is based on the number of questions you complete, the NBRC computes your CRT exam score based on the number of questions you answer correctly. Every question you skip or fail to answer is counted against you. When every question counts, you simply cannot afford to throw away points by omitting answers. To finish the CRT exam in the time allotted (3 hours), you will need to develop good pacing strategies, as described later in this chapter.

GENERAL PREPARATION TIPS

Be Prepared!

Good preparation is the key to success on the CRT exam. Good preparation involves knowing:

- WHAT to study
- WHERE to study
- WHEN to study
- HOW to study

What to Study

Know Your Enemy: The CRT Examination

A common strategy among generals planning a battle is to *know your enemy*. Thinking of the CRT exam as an adversary that you can and will conquer can help you prepare for your coming “battle” with this test. In this case, *knowing the enemy means understanding both the structure and the content of the CRT exam and applying this knowledge to your study plan*.

The structure and content of the CRT exam are well defined in the NBRC CRT examination matrix, published in the current version of the *Candidate Handbook and Application*. The current CRT

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exam consists of 140 graded questions and 20 ungraded items being pretested for future use. The 140 graded questions fall under one of three major content sections: (I) Patient Data Evaluation and Recommendations, (II) Equipment Manipulation, Infection Control, and Quality Control, and (III) Initiation and Modification of Therapeutic Procedures. **Table 2-1** summarizes the current NBRC CRT examination matrix. The full matrix for the current CRT exam, including detailed content in each of these major areas, is reproduced in Appendix A.

Table 2-1 Summary of the Current NBRC CRT Examination Matrix (2009 Version)

Content Area	Number of Questions by Cognitive Level			
	<i>Recall</i>	<i>Application</i>	<i>Analysis</i>	<i>Totals</i>
I. PATIENT DATA EVALUATION AND RECOMMENDATIONS	11	14	1	26
A. Review Data in the Patient Record	4	0	0	4
B. Collect and Evaluate Additional Pertinent Clinical Information	6	11	1	18
C. Recommend Procedures to Obtain Additional Data	1	3	0	4
II. EQUIPMENT MANIPULATION, INFECTION CONTROL, AND QUALITY CONTROL	5	15	9	29
A. Manipulate Equipment by Order or Protocol	4	10	8	22
B. Ensure Infection Control	0	2	1	3
C. Perform Quality Control Procedures	1	3	0	4
III. INITIATION AND MODIFICATION OF THERAPEUTIC PROCEDURES	19	45	21	85
A. Maintain Records and Communicate Information	2	3	0	5
B. Maintain a Patent Airway Including the Care of Artificial Airways	2	2	3	7
C. Remove Bronchopulmonary Secretions	1	3	0	4
D. Achieve Adequate Respiratory Support	2	5	1	8
E. Evaluate and Monitor Patient's Objective and Subjective Responses to Respiratory Care	3	7	5	15
F. Independently Modify Therapeutic Procedures Based on the Patient's Response	2	9	7	18
G. Recommend Modifications in the Respiratory Care Plan Based on the Patient's Response	3	10	4	17
H. Determine the Appropriateness of the Prescribed Respiratory Care Plan and Recommend Modifications When Indicated by Data	1	3	0	4
I. Initiate, Conduct, or Modify Respiratory Care Techniques in an Emergency Setting	1	1	1	3
J. Act as an Assistant to the Physician Performing Special Procedures	1	1	0	2
K. Initiate and Conduct Pulmonary Rehabilitation and Home Care	1	1	0	2
TOTALS	35	74	31	140

In terms of major content levels, questions on Sections I (patient data evaluation) and II (equipment, infection control, and quality control) each constitute about 20% of the exam. The bulk of the current CRT exam (60%) focuses on questions in Section III (therapeutic procedures).

All questions on NBRC exams are also categorized by cognitive level. The cognitive level of a question is based on the mental process involved in answering it and generally is associated with its complexity or difficulty. As outlined in **Table 2-2**, the NBRC defines three cognitive levels of its exam questions. The *Recall*, *Application*, and *Analysis* columns in Table 2-1 specify the distribution of questions in each content area by their cognitive level. As indicated in the *Totals*, about half the test items are at the application level with about one-quarter each requiring recall or analysis.

Here are some examples of questions at each of these three levels covering the same content area, with the correct answers underlined (Subcategory III-E: Evaluate and Monitor Patient's Objective and Subjective Responses to Respiratory Care):

Recall Example

2-1. An otherwise healthy 25-year-old male patient who took an overdose of sedatives is being supported on a ventilator. Which of the following measures of total static compliance (lungs + thorax) would you expect in this patient?

- A.** 100 mL/cm H₂O
- B.** 10 mL/cm H₂O
- C.** 1 mL/cm H₂O
- D.** 0.1 mL/cm H₂O

Comments: To evaluate and monitor a patient, you need to know what is normal and what is abnormal. This item tests your ability to recall normal static compliance. It also separately assesses your ability to differentiate the common bedside units used for this measure (mL/cm H₂O) from that typically employed in a pulmonary lab (L/cm H₂O).

Application Example

2-2. An adult patient receiving volume-oriented assist/control ventilation has a corrected tidal volume of 700 mL, a peak pressure of 50 cm H₂O, and a plateau pressure of 40 cm H₂O and is receiving 5 cm H₂O positive end-expiratory pressure (PEEP). What is this patient's static compliance?

- A.** 200 mL/cm H₂O
- B.** 20 mL/cm H₂O
- C.** 2 mL/cm H₂O
- D.** 0.2 mL/cm H₂O

Comments: This item tests your ability to apply a formula to a clinical situation (most formula-type questions are at the application level). To answer it correctly, you need to “plug” the correct data into the formula for computing static compliance—i.e., C (mL/cm H₂O) = delivered volume ÷ (plateau pressure – PEEP).

Table 2-2 NBRC Exam Question Cognitive Levels

Level	NBRC Definition
Recall	The ability to recall or recognize specific information
Application	The ability to comprehend or apply knowledge to new or changing situations
Analysis	The ability to analyze information, to put information together to arrive at solutions, and/or to evaluate the usefulness of the solutions

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Analysis Example

2-3. A patient in the intensive care unit with congestive heart failure receiving assist/control ventilation with a set volume of 650 mL exhibits the following data on three consecutive patient-ventilator checks:

Time	Peak Pressure	Plateau Pressure	PEEP
9:00 AM	40	25	8
10:00 AM	50	35	8
11:00 AM	60	45	8

The patient also exhibits diffuse crackles at the bases and some wheezing. Which of the following would you recommend for this patient?

- A.** A diuretic
- B.** A bronchodilator
- C.** A mucolytic
- D.** A steroid

Comments: This item assesses your ability to analyze monitoring data and apply this information to recommend a treatment approach for this patient. First, you must analyze the data, which should reveal that the patient is suffering from a progressive decrease in compliance (rising plateau – PEEP pressure difference). Second, you need to recognize that in patients with congestive heart failure, the most common cause for a progressive decrease in compliance is the development of pulmonary edema. Last, you need to apply these data and your knowledge of pathophysiology and pharmacology to recommend the correct course of action, in this case the administration of a diuretic like Lasix.

What conclusions can you glean from these examples? Key pointers that inspection of the NBRC CRT exam matrix reveals include the following:

- Only about one-quarter of the exam questions are based on recall—you *cannot pass this exam by simply memorizing facts!*
- About one-half of the questions on the exam require you to apply your knowledge in a variety of clinical situations; to do well in this area, it can help to visualize and relate your experiences at the bedside as you prepare for your test.
- Most of the exam focuses on therapeutic procedures—you should spend the majority of your preparation in this area!
- Over half of the current exam (75 items) focuses on *just four* of the 17 content areas, to which you should give high priority:
 - Collect and Evaluate Additional Pertinent Clinical Information (18 items)
 - Manipulate Equipment by Order or Protocol (22 items)
 - Independently Modify Therapeutic Procedures (18 items)
 - Recommend Modifications in the Respiratory Care Plan (17 items)
- Most analysis-type questions pertain to equipment and therapeutic procedures, making these areas the most critical overall in terms of both content and level of difficulty.

The “NBRC Hospital”

What you study also should take into account what we refer to as the NBRC hospital. What is the NBRC hospital? *It is not a place but a state of mind.* You “enter” the NBRC hospital whenever you take an NBRC or an NBRC-like exam. This hospital may or may not function the same as the clinical sites you rotated through as a student or the facility where you currently work. Instead, it represents an idealized institution. What do we mean by *idealized*? We mean that the NBRC hospital’s “respiratory care department” always relies on generally accepted knowledge in the field, based in part on the various practice guidelines and standards described below. In addition, the NBRC hospital respiratory care department’s “procedure manual” is based on broad national agreement among clinicians and educators as to what common clinical skills the *average* graduate performs when first employed. For these reasons, when entering the NBRC hospital, you may be expected to know and do different things from those you do or were trained to do.

For example, in your facility there may be a separate electrocardiogram (ECG) department responsible for taking 12-lead ECGs and maintaining the related equipment. And maybe nurses, physician assistants, or residents are the ones responsible for obtaining 12-lead ECGs in your special care units or the emergency department. But, in the NBRC hospital, you are expected to be able to both use an ECG machine to obtain a good 12-lead tracing and also troubleshoot the device should it not be properly functioning.

Another potential difference operating in the NBRC hospital is the level of independent judgment you are expected to exercise. In many hospitals, new graduates are very limited in what they can do without either supervisor or physician approval. However, a quick review of the CRT examination matrix reveals that the single most important subsection in the therapeutic procedures category is to modify these procedures *independently* based on the patient's response. And this expectation goes well beyond making adjustment to simple "floor therapy" to include using your judgment to alter many key mechanical ventilation parameters, such as the oxygen concentration (FiO_2) or PEEP level. In these cases, the NBRC hospital typically gives you free choice, without being constrained by having to get physician approval. Only if the scenario in question specifies checking with the physician as an option should you consider not exercising your independent judgment.

So how do you prepare to "work" in the NBRC hospital? We recommend the following:

- First, *treat the CRT exam matrix as your departmental procedure manual* focusing in particular on those things you either don't do or don't do frequently in your facility.
- Second, use the questions we include here to help you identify how the practices at the NBRC hospital differ from what you have learned in your training or experience.
- Lastly, when given the opportunity on the CRT exam, do not be afraid to exercise your independent judgment and modify a procedure when changes in the patient's status warrant it.

Study Resources

In terms of the needed knowledge in each content area of the CRT exam, we recommend you focus on what we provide here in Chapters 3–20, using the study plan outlined in Chapter 1. In addition, the NBRC recommends that you obtain or review the most current versions of the following publications in preparation for the CRT exam:

American Association for Respiratory Care (AARC)

- Evidence-Based Guidelines
- Expert Panel Guidelines

Available online at <http://www.rcjournal.com/cpgs>

American Heart Association (AHA)

- 2005 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Available online at http://circ.ahajournals.org/content/vol112/24_suppl

- The following training texts:
 - 2008 Handbook of Emergency Cardiovascular Care for Healthcare Providers
 - Advanced Cardiovascular Life Support Provider Manual
 - Pediatric Advanced Life Support (PALS) Provider Manual and Course Guide

Available online at <http://aha.channing-bete.com>

American Thoracic Society/European Respiratory Society

- Brusasco, V., Crapo, R., & Viegi, G. (Eds). (2005). Standardisation of spirometry. *European Respiratory Journal*, 26, 319–338.

Available online at: <http://erj.ersjournals.com/cgi/reprint/26/2/319.pdf>

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Clinical Laboratory Standards Institute

- Blood Gas and pH Analysis and Related Measurements (C46-A)
- Reference and Selected Procedures for the Quantitative Determination of Hemoglobin in Blood (H15-A3)
- Procedures for the Collection of Arterial Blood Specimens (H11-A4)
- Pulse Oximetry (HS3-A)

Not available online; check with your arterial blood gas or clinical lab

You should also have access to a good, comprehensive reference text on respiratory care. To that end, we highly recommend the current edition of *Egan's Fundamentals of Respiratory Care*. To help you find applicable CRT exam-related content, the publisher of the current version of *Egan's* provides an excellent cross-reference between the NBRC matrix and the current edition's content, available to registered users online at <http://evolve.elsevier.com>.

Where and When to Study

Obviously, where you study depends on your personal circumstances. That being said, it's always best to set aside a familiar and quiet place to do your exam preparation. Often, how quiet your chosen study location is depends on the time of day or night you intend to use it, so plan accordingly. We also recommend that you establish and *strictly follow* a set study schedule, for example, Wednesday and Friday evenings from 8:00 PM to 11:00 PM. In our experience, you must treat your planned study time like a required class or important appointment (with yourself!) to stick to your plan.

How to Study

We provide our principal guidance on how to study in Chapter 1, which describes the use of this text as the primary basis for your CRT exam preparation. Other general advice we provide to our students includes the following.

Prepare Yourself Mentally and Physically

Your brain is part of your body. To stay focused as you study and prepare for the CRT exam, you need to be in top mental *and* physical condition. Be sure to get enough sleep, eat healthy, and get regular exercise. In combination these activities boost your energy levels and keep you sharp.

Be Organized

As we previously discussed, being disorganized leads to confusion and anxiety. Taking the time needed to organize your resources and plot your "battle plan" may at first seem unproductive. However, putting things in order at the beginning of your study plan always pays off big in terms of time saved in the process. In addition, being organized also helps you reduce your anxiety levels as you prepare for the CRT exam.

Once you have set aside a good time and place to study and have all your needed resources in hand, we recommend you follow the systematic plan we outline in Chapter 1 (see Figure 1-1) or a version of this plan adapted to your personal needs and circumstances.

In addition, to help you focus on what content to prioritize, we also recommend that you maintain a problem list, what we call a "lousy log." You should maintain and update this log after each study session and include any problem areas that you discover as you progress through the book and supplementary materials. In most cases, these problem areas represent specific concepts that you have yet to fully master and/or CRT exam sections in which your pre- or post-test performance remains "lousy." In general, your lousy log should initially grow as you identify areas needing attention, then shrink as you master the relevant concepts or content. Of course one goal of your study plan should be that your lousy log be blank before you take the CRT exam.

Get Psyched

As we mentioned previously, anxiety can affect your test performance in negative or positive ways. To ensure that your anxiety helps improve your test performance, you need to "get psyched." *Getting*

psyched means creating and maintaining a positive attitude toward your test preparation and testing experience.

Maybe you are not that affected by test anxiety and have already learned to channel your apprehension into a positive force to help you do well on exams. If so, you are in a distinct minority. Most of our students tend to let anxiety get the best of them when preparing for or taking tests, especially high-stakes tests like course finals or NBRC exams.

How do you know if you are negatively affected by test anxiety? How about taking a quiz to find out! The accompanying box provides a 12-question self-assessment developed by the Penn State University Learning Centers to help you determine if you are letting anxiety get the best of you. If several of these statements are true for you, you likely suffer from test anxiety.

Test Anxiety Self-Assessment

- | | | |
|---|---|---|
| T | F | I have trouble sleeping at night and spend those last few minutes before sleep worrying about upcoming exams or projects. |
| T | F | The day of an exam, I experience drastic appetite changes and either overeat or skip breakfast and lunch. |
| T | F | While studying for or taking an exam, I often feel a sense of hopelessness or dread. |
| T | F | While studying or taking an exam, I have problems concentrating and I sometimes feel bored or tired. |
| T | F | I often yawn during an exam or while studying. |
| T | F | During an exam, I often feel confused or panicky. |
| T | F | During an exam, I experience sweaty palms, mental blocks. |
| T | F | While taking an exam, I sometimes experience headaches, vomiting, or fainting. |
| T | F | After the exam, I pretend the exam meant nothing to me and discard the result as meaningless. |
| T | F | When I am finished with an exam, I sometimes feel guilt and blame myself for not studying enough. |
| T | F | I sometimes get angry or depressed after an exam. |
| T | F | As a general rule, I view test taking as a stressful situation and dread it. |

Adapted from: Penn State University Learning Centers. (2001). *Test taking and anxiety*. Retrieved August 28, 2008, from http://www.ulc.psu.edu/studyskills/test_taking.html

If you are an anxious test-taker, that anxiety tends to spill over into your test preparation. A good way to avoid anxiety is to maintain a positive attitude during exam preparation. To do so, we recommend that you reward yourself for studying. This gives you something to look forward to after each prep session and can help give you a regular sense of accomplishment. Some good ways to reward yourself when preparing for a major test include the following:

- When studying, be sure to have a few favorite snacks on hand; these not only can serve as a reward for doing well on small tasks—such as passing a post-test—but also can help maintain your blood sugar level, which is needed for focus and concentration.
- Schedule and complete your test prep sessions *before* enjoyable events, such as a good meal or favorite activity.
- Set a specific time schedule for studying; in this manner you can remind yourself as the end of the session nears (e.g., “just one more hour to go”).
- Consider going out for dinner or a movie after completing major milestones in your study plan, such as finishing a set of chapters covering one of the NBRC major content areas.

Even with a positive rewards system, you will likely experience some periods of high anxiety when preparing for or taking your CRT exam. Anxiety often increases as your test date gets closer and closer. **Table 2-3** outlines some good ways to help you allay anxiety when it occurs.

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Table 2-3 Ways to Decrease Anxiety

Method	Description
Stop and clear the clouds	If you feel yourself beginning to get overly anxious, force yourself to stop what you're doing and clear your mind for a minute or two before continuing. The time spent "clearing the clouds" generally will be less than that you lose due to stress-associated confusion.
Think good thoughts (daydream)	If you feel overwhelmed by the material, let your mind wander briefly. Thinking good thoughts can help you relax. Once you have released your tension, return to the task at hand.
Visualize success	High achievers always visualize success, not failure. Consistent with this approach, try to picture what it will feel like to pass the CRT exam. Think about getting your permanent state license to practice, getting or advancing in the job you want, becoming registry-eligible, etc. You might even try putting a "CRT certificate" on the wall in your study area with your name on it. Visualizing all these positive outcomes will help you get psyched to achieve them.
Focus, focus, focus	Trying to accomplish multiple tasks at the same time increases stress. When doing your exam prep, always focus on the task at hand, avoid or eliminate any distractions, and do not let outside influences occupy your thoughts. This approach not only reduces stress but also helps you make the most efficient use of your time.
Praise yourself	For every correct answer, every good score on a practice test, every chapter or review session completed, or every item crossed off your "lousy log," give yourself some deserved praise. If you do encounter difficulty with a concept or question, rather than getting "stuck on stupid," put the item in your lousy log and return to it after making progress elsewhere. Praise helps promote a positive attitude, and a positive attitude leads to success.
Avoid the "Nervous Nellies"	Many candidates organize peer study groups to help prepare for NBRC exams. If you are still in school, your class may be preparing for the CRT and RRT exams together. If you find study groups useful in preparing for a test, by all means join or create one. However, try to avoid working with peers whose anxiety overflows and increases your stress levels.
<i>Adapted from:</i> Penn State University Learning Centers. (2001). <i>Test taking and anxiety</i> . Retrieved August 28, 2008, from http://www.ulc.psu.edu/studyskills/test_taking.html	

Crunch Time

The days immediately before your exam often are the most stressful. The key is to stick with your study plan, maintain your positive attitude, and continue to practice good health habits, including getting sufficient sleep, eating healthy, and exercising.

If you follow your study plan, you should feel confident and well prepared as exam day approaches. Do *not* try to do much additional review the day before the exam. Instead, plan to spend time doing something enjoyable and stress free. The night before the test, be sure to get a full night's rest. The day of the exam, eat a healthy but light meal before the test, and schedule your time so that you are not rushed getting to your testing center.

BECOME A WISE GUY (OR GAL): DEVELOPING TEST-WISENESS

Students and NBRC examination candidates who consistently do well on tests have two things going for them. First, *they know the content and are confident in that knowledge*. But these high performers also have a "secret weapon" in their back pocket. This weapon is the ability to apply knowledge of test design and specific reasoning skills to improve their exam scores. We call this ability *test-wiseness*.

Table 2-4 Hypothetical Impact of Test-Wiseness on Exam Performance

Candidate Response and Performance	Test-Unaware Candidate		Test-Wise Candidate	
	Questions Answered	Questions Correct	Questions Answered	Questions Correct
“Knows cold”	70	70	70	70
Guesses at	70	18	70	35
Raw score		88		105
Percentage		63%		75%
Result		FAIL		PASS!

How does test-wiseness work? **Table 2-4** demonstrates the difference between a test-unaware and a test-wise candidate on a hypothetical NBRC CRT exam. Both are comfortable enough with the content to “know cold” or be absolutely sure about their answers to half the questions on the exam (70 items). Both have to guess at the remaining 70 questions. Unfortunately, the test-unaware candidate does no better than chance on these questions, getting about one in four correct, resulting in a failing score of 88/140, or 63%. In contrast, the test-wise candidate applies knowledge of test design and question reasoning skills to get half of these questions correct, resulting in an overall score of 105/140, or 75%, sufficient to pass the exam.

Fortunately, test-wiseness is a skill that anyone can learn. It entails both techniques related to multiple-choice questions in general and specific rules of thumb applicable to NBRC-like questions. By developing this skill, you not only will improve your exam scores but will also increase your command over testing situations in general. The added benefits are increased confidence and decreased anxiety when taking tests.

General Tips for Multiple-Choice Items

Dissecting Questions: The Anatomy of Multiple-Choice Items

The NBRC CRT exam consists entirely of multiple-choice questions. Most of these are the simple “one best answer” type, but a small percentage use the multiple-true format, also known as complex multiple-choice items.

The first skill in becoming test-wise is to understand the various parts of these questions and to use that knowledge to improve your odds of identifying the correct answer. **Table 2-5** summarizes the key elements common to most NBRC CRT exam questions, and **Figure 2-2** provides a “dissected” example.

Table 2-5 Elements Common to NBRC CRT Multiple-Choice Questions

Question Element	Description
Scenario	Brief description of the clinical situation
Stem	The statement that asks the question or specifies the problem
Options	Possible answers to the question or solutions to the problem
Keyed response	The option that answers the question correctly (the <i>correct</i> answer)
Distractors	The remaining incorrect options (<i>wrong</i> answers)

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An 80 kg adult male patient with aspiration pneumonia receiving volume-oriented SIMV has the following ventilator settings and blood gas results:

Ventilator Settings		Blood Gases	
Mode	SIMV	pH	7.29
VT	500 mL	PaCO ₂	52 mm Hg
Rate	12	HCO ₂	25 mEq/L
FI ₀₂	0.50	PaO ₂	63 mm Hg
PEEP	5 cm H ₂ O	SaO ₂	91%

Scenario

The respiratory therapist should do which of the following first?

Stem

- A. Increase the FI₀₂
- B. Increase the tidal volume
- C. Add pressure support
- D. Increase PEEP

Options (B is keyed response;
A, C, and D are the distractors)

Figure 2-2 The Key Elements in a Typical NBRC-Like Question. In this example, the scenario and stem are separate. The scenario and stem may be combined in many cases.

Scenario

Typically, a question scenario briefly describes a clinical situation that you need to assess. We recommend that you thoroughly review the scenario before even looking at the stem or question options (note that sometimes the scenario and stem are combined and must be reviewed together). When assessing the scenario, look for the following critical information:

- The location or setting (e.g., ICU, outpatient clinic, patient's home)
- The available resources (e.g., equipment that is being used or is at hand)
- The patient's general characteristics (e.g., age, size, disease process, mental status)
- Any relevant objective data (e.g., from ABGs, PFTs)
- Any relevant subjective information (e.g., signs and symptoms)

Assume all the information in the scenario is there for a reason. As you assess the scenario, note in particular the patient's characteristics and any and all *abnormal* data or information, especially laboratory results. As an example, based on your assessment of the scenario in Figure 2-2, you should extract the following critical information:

1. The patient:
 - a. Is an adult male weighing 80 kg (about 200 lbs)
 - b. Has aspiration pneumonia (often a cause of hypoxemia)
2. The equipment is a ventilator capable of volume-oriented SIMV
3. In terms of the objective data:
 - a. The set tidal volume may be a bit low for an 80-kg patient
 - b. The FI₀₂ is near the high end of its safe level
 - c. The blood gas is abnormal:
 - i. The primary/most severe problem is acute respiratory acidosis
 - ii. The PaO₂ is low but adequate (SaO₂ > 90%)

Stem

The stem asks the question or directs your action. In Figure 2-2, the stem is asking what action the respiratory therapist should take. As with the scenario, you always must read the stem carefully. The stem often contains key words or phrases that may help you choose the correct answer. **Table 2-6** describes common key words or phrases that you should look for in question stems and what to do when you encounter them.

Table 2-6 Key Words or Phrases Found in Question Stems

Type of Clue	What to Look For	What to Do
Priority	Words such as <i>first, initially, best, priority, safest, most, and least</i>	Put a value on each available option and then place them in rank order
Sequence	Words such as <i>before, after, and next</i>	Apply procedural knowledge or logic to place the options in proper sequence
Negative polarity	Words such as <i>not, except, contraindicated, unacceptable, and avoid</i>	Switch from being concerned with what is correct or true to what is false; consider each option a T/F question and select the one that is <i>false</i>
Absolutes	Key words such as <i>always</i> and <i>never</i>	Find the only option that would be correct <i>in every case every time</i>
Verbal associations	Word or phrase in the stem that is identical or similar to a word in the correct answer	Select the option that includes wording similar to that found in the stem

In our sample question in Figure 2-2, the stem contains the key word *first*. This is a priority clue that directs you to choose the action *most immediately* needed. Based on our analysis of the blood gas data, we identified the primary/most severe problem as being acute respiratory acidosis. The keyed response or right answer should therefore be one that best corrects this problem, in this case option B, *Increase the tidal volume*.

In addition to the general clues described in Table 2-6, be on the lookout for other key words or phrases. For example, compare the wording of the following two question stems related to endotracheal tube positioning:

Stem Wording A

Which of the following assessment procedures would help determine proper positioning of an endotracheal tube in a patient's trachea?

Stem Wording B

Which of the following assessment procedures would confirm proper positioning of an endotracheal tube in a patient's trachea?

Note that the two stems are identical except for the verb. Question stem A specifies “help determine,” while B specifies “confirm.” This tiny variation in wording makes a huge difference in the likely best answer for these two questions. Whereas there are many potentially good answers for A (e.g., breath sounds, capnography, tube insertion length, esophageal detection device, chest X-ray, etc.), there is only one consistently correct response for B (i.e., a chest X-ray).

Although you should always be on the lookout for key words or phrases in CRT test items, we also recommend that you avoid reading anything into your exam questions. When you read too much into a test item, you usually end up answering a question differently than intended by the exam writers. Read all questions as is. Don't be led astray by either overanalyzing or oversimplifying any question. Last, avoid drawing any assumptions beyond those supported by the facts at hand. *The simplest interpretation is generally the correct one.*

You also might want to consider a useful strategy that many good test-takers employ. Good test-takers frequently paraphrase the question in their own words and then anticipate the answer—*before looking at the options available*. In the days of pencil-and-paper testing, this meant actually covering up each question's options with scratch paper or one's hand. This can help minimize any confusion that a question's options may cause, especially the distractors. In general, this technique works best when you can quickly and confidently identify the answer in your head.

Options

Options are the possible answers to a question. The good news is that every NBRC CRT exam item has only four options, labeled A through D. Also good news for well-prepared candidates is that a substantial portion of these questions will be straightforward and relatively easy to answer. Indeed, if you

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understand and can apply the information being tested, you will often recognize the correct answer immediately.

The bad news is that not even the smartest candidate knows all the correct answers. Indeed, we believe that on average most candidates will be forced to guess on between one-third to one-half of the questions on the exam. If the best you can do on these questions is to guess randomly at their answers, you'll only get about 25% of them correct. To do better you'll need to apply our recommended option selection strategies.

Option Selection Strategies

To do well on the CRT exam, you need to thoughtfully examine each question's options. *When you are sure of the correct response, select it and move on.* In contrast, if the correct response is not immediately apparent to you, you will need to apply specific skills to analyze the available options before selecting an answer.

First, do not panic when you encounter questions that appear difficult or unfamiliar to you. All CRT exam candidates will encounter dozens of such questions when they take this test. Instead of getting flustered, get resourceful. Whenever you encounter a difficult question, you need to rise to the challenge and use the strategies we provide here to select the most logical answer.

Useful general option selection strategies include the following:

- Always look for the best option, not just a correct one (two or more options may be correct, but one likely is the “most” correct in *the particular circumstances or with the specific patient described*).
- When you are unsure of the correct option, switch from finding the right answer to finding the wrong answer(s).
- Eliminate options you know to be incorrect; each time you can eliminate a true distractor, you dramatically increase your chances of answering the question correctly.
- When in doubt, give each option a “true–false” test as compared with the stem (the true statement is usually the most plausible answer).
- Be wary of options that are totally unfamiliar to you; more often than not unfamiliar options are distractors.
- If you encounter a “double negative” in a stem and option, remember that it creates the equivalent positive statement.
- Avoid impulsively selecting an option simply because it provides correct information as an option can provide correct information but still be the wrong choice because it does not answer the question asked.

If these selection strategies do not help, you'll need to apply more specific reasoning skills to identify the correct answer. These skills involve identification of absolutes and qualifiers, dealing with equally plausible options, weighing two options that are opposite to each other, addressing duplicate facts appearing in options, finding the most general or global option, and dealing with a range of option values. In addition, if the question involves using basic math skills, a few key strategies can help you succeed whenever you need to perform computations.

Absolutes (Specific Determiners)

As with question stems, some options may include absolutes or specific determiners. You know an option includes a specific determiner when you find words such as *always, never, all, every, none, and only*. These key words indicate that the option has no exceptions. Question 2-4 provides an illustrative example.

2-4. Which of the following is true regarding patients in the early stages of an asthmatic attack?

- A.** They all exhibit respiratory alkalosis.
- B.** They always have moderate hypoxemia.
- C.** They have decreased expiratory flows.
- D.** They never respond to beta adrenergics.

In this hypothetical example, options A, B, and D all contain specific determiners or absolutes. More often than not, options that use absolutes are false. Generally, you should avoid choosing any option that *must* be true or false every time, in every case or without exception. In this case, applying this strategy helps you easily zero in on the correct answer (C), the only one not containing an absolute.

Note that because specific determiners are easy to identify, the NBRC minimizes their use on its exams. So do not expect to encounter these frequently. Also note that some absolutes, especially those founded in rules or standards, may be a correct option. For example, most would agree that the statement “You always must properly identify the patient before treatment” holds without exception in general patient care situations. For this reason, if the scenario and stem are addressing policies, procedures, rules, or standards, you may need to allow for absolutes. *In contrast, if the question involves a patient in unique clinical circumstances, few if any absolutes pertain.*

Qualifiers

A qualifier is the opposite of a specific determiner. Qualifiers represent a conditional or “hedge” word or phrase such as *usually, probably, often, generally, may, frequently, and seldom*. Qualifiers may appear either in the question stem or in one or more options. Question 2-5 is a good example of the use of qualifiers.

2-5. A patient’s advanced directive:

- A.** Is usually obtained at the time of admission
- B.** Can be found in the doctor’s progress notes
- C.** Represents a guideline, not a legal requirement
- D.** Cannot be altered after it is written and signed

Options that contain qualifiers usually represent good choices. In this example, only option A contains a qualifier and is in fact the correct option. As with absolutes, note that the NBRC minimizes the use of qualifiers in its exam questions, especially in question options. Nonetheless, you need to be on the lookout for these key words and apply the appropriate strategy when needed.

Equally Plausible Options

Often, NBRC questions contain two options that are very similar or equivalent to each other, as apparent in question 2-6.

2-6. An intubated patient is receiving volume control ventilation. The patient’s condition has not changed, but you observe higher peak inspiratory pressures than before. Which of the following is the most likely cause of this problem?

- A.** There is a leak in the patient-ventilator system.
- B.** The endotracheal tube cuff is deflated or burst.
- C.** The endotracheal tube is partially obstructed.
- D.** The endotracheal tube is displaced into the pharynx.

Note that options A and B are equivalent because a deflated or burst endotracheal (ET) tube cuff represents a leak in the patient-ventilator system. Usually when two items are very similar or equivalent to each other, they are distractors and should be eliminated from consideration. Then make your choice from among the remaining two options (in this case option C is the correct choice). By doing so, you immediately improve your odds of correctly answering this question from 25% to 50%. As noted previously, this is exactly what test-wise candidates do.

What if three of the options are very similar to each other? In this case, apply the “Odd Man Out” strategy, as applicable in answering question 2-7.

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2-7. Over a 3-hour period, you note that a patient's plateau pressure has remained stable, but her peak pressure has been steadily increasing. Which of the following is the best explanation for this observation?

- A.** The patient's airway resistance has increased.
- B.** The patient is developing atelectasis.
- C.** The patient's compliance has decreased.
- D.** The patient is developing pulmonary edema.

In this example, options B, C, and D are similar in that they all correspond to a decrease in the patient's compliance. When this occurs, turn your attention to the different or "Odd Man Out" option, which is most likely the correct one (option A in this example).

Opposite Options

Another very common way NBRC item writers create distractors is to include a pair of direct opposites among the options, what we call "mirror-image options." Question 2-8 is an NBRC-like item with mirror-image options:

2-8. You are assisting with the oral intubation of an adult patient. After the ET tube has been placed, you note that breath sounds are decreased on the left compared with the right lung. What is the most likely cause of this?

- A.** The tip of the tube is in the right mainstem bronchus.
- B.** The cuff of the endotracheal tube has been overinflated.
- C.** The endotracheal tube has been inserted into the esophagus.
- D.** The tip of the tube is in the left mainstem bronchus.

In general, when you encounter two options that are opposites, chances are the correct choice is one of the two. In this example, options A and D are literally mirror images of each other, and one of them is likely the correct answer. Referral back to the scenario (breath sounds decreased on the left compared to the right) should help you decide which of these two responses is correct (A).

It is important to note that there are exceptions to this strategy. Although you will encounter them less frequently, some questions may include mirror-image options as distractors, meaning that *both* are incorrect choices. In these cases, the item writer is using option opposites to divert your attention from the correct answer, as in question 2-9.

2-9. A patient receiving long-term positive-pressure ventilatory support exhibits a progressive weight gain and a reduction in the hematocrit. Which of the following is the most likely cause of this problem?

- A.** Leukocytosis
- B.** Chronic hypoxemia
- C.** Water retention
- D.** Leukocytopenia

In this example, leukocytosis and leukocytopenia are polar opposites. Is one of them the correct choice, or are they both distractors? To make this decision often requires referring back to the scenario or stem (which are combined in this question). Logically, both leukocytosis and leukocytopenia are more often the result of abnormal processes (such as infection) and less often the *cause* (a key word in the stem). So here these two options are more likely both being used as distractors and should be eliminated. Now, by selecting from the two remaining two options, your odds of correctly answering this question have improved to 50-50. If you also remember that chronic hypoxemia tends to increase and not decrease the hematocrit, you can now be almost certain of selecting the correct option (C).

Duplicate Facts in Options

Item writers often create options that include two or more similar or identical statements among the choices. Question 2-10 is a good example of this question design.

2-10. In reviewing the PFT results of a 67-year-old smoker with an admitting diagnosis of emphysema and chronic bronchitis, you would expect which of the following general findings?

- A. Increased airway resistance and decreased lung compliance
- B. Increased airway resistance and increased lung compliance**
- C. Decreased airway resistance and decreased lung compliance
- D. Decreased airway resistance and increased lung compliance

Note that this question's options contain two contrasting sets of statements: increased/decreased resistance and increased/decreased compliance. When you encounter this type of question and are unsure of the answer, you should try to identify any statement that you know is *either* true or false. Once you do so, you usually can eliminate at least two options as being distractors. In our example above, if you know that patients with emphysema and chronic bronchitis typically have high airway resistance, then you can immediately eliminate options C and D. Alternatively, if you know that patients with emphysema do *not* have decreased lung compliance, then you can eliminate options A and C. Either way, you have doubled the likelihood of selecting the correct answer (B).

Global Options

Question options often include a mix of general and specific statements, as in question 2-11.

2-11. In instructing a patient how to breathe during a small-volume nebulizer drug treatment, the respiratory therapist coaches the patient to hold his breath at the end of each inspiration. The purpose of this maneuver is to improve:

- A. Drug delivery**
- B. Particle stability
- C. Aerosol penetration
- D. Inertial impaction

In this example, option A is the most general or global alternative, while options B through D are much more specific. Candidates who are test-wise know that global statements are more likely to be the correct option than choices that are very specific or limited in focus. This is because the most global option usually includes the most information. In this question, particle stability, aerosol penetration, and inertial impaction are all factors that *fall under the broader concept of enhanced drug delivery*, making option A the best choice here.

Options Constituting a Range

Some test questions, especially those focusing on recall, provide options representing a range of values, typically from early to late, or from big to small. Question 2-12 is a good example.

2-12. You obtain an SpO₂ measurement on a patient of 80%. Assuming this is an accurate measure of hemoglobin saturation, what is the patient's approximate PaO₂?

- A. 40 torr
- B. 50 torr**
- C. 60 torr
- D. 70 torr

When item writers create questions like this one, they often try to hide or mask the correct choice by placing it within a set of higher and lower values. In these cases, you should consider eliminating the highest and lowest values, choosing an option in the middle. Following this logic for this question would result in eliminating options A and D, giving you a 50-50 shot at the correct answer to this question (B). Of course this strategy should be applied only when you do not know the answer. Those familiar with the "40-50-60/70-80-90" rule of thumb might recognize its application to this question and immediately know that 80% saturation roughly corresponds to a PaO₂ of 50 torr.

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Math Problems

Typically, the NBRC CRT exam will include a small number of questions that require a simple calculation in order to obtain the correct answer. To help you prepare for these questions, Chapter 20 reviews common cardiopulmonary calculations likely to appear on the CRT exam. Here we provide more general guidance in regard to selecting options when presented with questions involving math.

Because many candidates lack confidence in their math skills, they tend to panic when confronted with a question that requires a computation. This response generally is unwarranted because the math skills required on the CRT exam are rather basic and typically involve no more than one or two computational steps. So there is really no reason to get anxious over these questions.

To improve your confidence in approaching math questions and help you consistently select the correct answers, we recommend the following:

- Always set up the problem before you begin to solve it; use the scratch paper provided at the testing center to write out the applicable formula, *being sure to set it up properly to solve for the value being requested.*
- After setting up the formula, try *estimating* the answer without calculating it; prior estimation can help you avoid making formula or computational errors.
- After doing the computation, do it a second time to confirm that you get the same answer.
- Don't immediately select an answer that matches your calculation; most math question distractors are based on common formula or computation errors. Instead, reread the problem, recheck your formula, and if necessary redo your math.
- If you are completely stumped, "choose from the means and not the extremes." If you do not know the applicable formula or cannot come up with a good estimate, toss out the high and low numbers and select one near the middle.

Question 2-13 illustrates using math problem strategies to arrive at the correct answer.

2-13. A portable spirometer requires that you enter the patient's height in centimeters in order to derive normal values. The patient tells you that she is 5 feet 6 inches tall. What value would you enter into the device?

- A. 26 cm
- B. 66 cm
- C. 168 cm
- D. 186 cm

First, you should set up the problem. This represents a straight unit conversion, from English to metric units (inches to centimeters). All such problems are based on a simple formula that requires knowledge of the applicable conversion factor:

$$\text{measurement (X units)} \times \text{conversion factor} = \text{measurement (Y units)}$$

In this case the X units are inches, the Y units are centimeters, and the conversion factor is 2.54 cm/inch. So the proper setup of the formula for this problem is:

$$\text{measurement (inches)} \times 2.54 \text{ cm/in} = \text{measurement (cm)}$$

Slightly complicating this problem is your need to convert 5 feet 6 inches to inches. Since there are 12 inches to a foot, the patient is $(5 \times 12) + 6$, or 66 inches tall. Note that the numeric value 66 appears among the distractors. Including a value derived in an intermediate step as a distractor is a common ploy used by item writers. You can avoid succumbing to this ploy by completing all computations before comparing your answer to those provided.

Now that you are sure you have set the correct formula to answer the question, estimate the answer before you compute it. The answer should be about $2\frac{1}{2}$ times greater than the patient's height in inches, 66 inches. Twice 66 is *about* 130 and $\frac{1}{2}$ 66 is *about* 33, so the answer should be *about* 130 + 33 or 163 cm. Based on estimation alone, answer C, 168 cm, looks very good. Based on estimation,

you also can eliminate option A because it is *less than* the patient's height in inches. Based on the setup of your formula, that would be impossible. Indeed, option A (26 cm) is lurking there to catch those who set up the formula improperly or use the wrong conversion factor. You would get 26 cm as the answer if you mistakenly *divided* the patient's height in inches by 2.54 instead of multiplying by this factor.

Last, after doing the initial computation, do not immediately select the answer. Instead, recompute the answer after rereading the question and rechecking the setup of your formula.

What if you don't know the exact formula or factor to use? Hopefully your estimated answer will allow you to eliminate at least some of the distractors and improve your odds of answering the question correctly. And if elimination does not help, apply our last-ditch "choose from the means and not the extremes" strategy.

Specific Tips for Common NBRC-Type Items

Applying general option selection strategies will go a long way toward improving your NBRC CRT exam score. To boost your score even more, we have developed several item response guidelines that apply specifically to common NBRC question formats. By learning to apply these guidelines when you encounter these question formats, you will increase your likelihood of passing the exam!

The Triple S Rule

The "Triple S" rule is the most basic of all principles we recommend you apply to answering NBRC-type questions. Put simply, if a patient gets worse when you are giving therapy, *Stop, Stabilize, and Stay*. Stop what you are doing, try to stabilize the patient, and stay until help arrives. Question 2-14 is a good example of the Triple S rule.

2-14. During postural drainage of the left lower lobe, a patient complains of acute chest pain. Which of the following should you do?

- A. Give the patient supplemental oxygen
- B. Continue the treatment with the bed flat
- C. Ask the nurse to administer pain medication
- D. Discontinue the treatment and monitor the patient**

A corollary to the Triple S rule is to *never start* therapy if the patient is exhibiting abnormal signs or symptoms that could be worsened by your action. Instead, as illustrated in Question 2-15, you should always contact the physician.

2-15. A 45-year-old patient with asthma is prescribed 0.3 mL of albuterol (Proventil) in 3 mL normal saline via small-volume nebulizer. Before initiating therapy, you note from chart review that the patient is severely hypertensive and has been experiencing episodes of supraventricular tachycardia. You should do which of the following?

- A. Administer the treatment as ordered
- B. Postpone the treatment and notify the physician**
- C. Dilute the albuterol with extra normal saline
- D. Decrease the amount of albuterol administered

Act First, Ask Questions Later

With all of the emphasis teachers place on assessing patients, students often forget that there are times you should act first, then gather information. The best examples are always emergency situations, where any delay for information gathering may cause harm to the patient. Question 2-16 provides a good example of this principle.

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2-16. A patient is admitted to the emergency department comatose with suspected smoke inhalation. After confirming airway patency, which of the following should you do *first*?

- A. Measure the SpO₂
- B. Initiate 100% oxygen**
- C. Obtain an arterial blood gas
- D. Request a STAT chest X-ray

In this scenario, getting more information is important, but the first priority is to ensure adequate oxygenation. Given that the patient is suspected of having a smoke inhalation injury, 100% O₂ should be administered STAT, without waiting for more information.

Question 2-17 also illustrates this principle, which emphasizes that your patient's safety and welfare must always be your first priority.

2-17. You are called to the bedside of a patient by her ICU nurse to check the attached volume ventilator. You note that both the low-volume and high-pressure limit alarms are sounding on each breath. Your first action should be to:

- A. Disconnect patient and manually ventilate with 100% O₂**
- B. Call the attending physician for further patient information
- C. Check the patient's chart for the original ventilator orders
- D. Ask the nurse about how recently the patient was suctioned

In this example, the patient is in danger, as evident by the ventilator alarms. Although options B, C, and D might help you understand the cause of the problem, they waste valuable time and ignore the immediate needs of the patient. Since your priority always must be the patient's safety and welfare, option A is the best answer for this question.

If It Ain't Broke, Don't Fix It!

Another of our "top ten" principles is to *leave well enough alone*—i.e., if it ain't broke, don't fix it! Typically this will show up on an NBRC exam as a situation in which patient data indicate normal parameters, but you are given the option to change things. DON'T. Question 2-18 illustrates application of this item response guideline.

2-18. A 60-kg (132-lb) COPD patient is receiving SIMV with a V_T of 500 mL at a rate of 9/min with an F_IO₂ of 0.35. Blood gases are as follows: pH = 7.36; P_{CO}₂ = 61 torr; HCO₃ = 36 mEq/L; P_aO₂ = 64 torr. Which of the following changes would you recommend at this time?

- A. Increase the IMV rate
- B. Increase the F_IO₂
- C. Maintain settings**
- D. Increase the V_T

Back Off Bad!

Exam candidates love to complain about NBRC questions with "two right answers." Of course, according to the NBRC, there is only one best answer for each question. One perfect example of this type of question is the "double effect" scenario. Typically, a patient who is receiving multiple therapies at the same time either worsens or improves. At least two different changes could help the situation—which do you choose? Question 2-19 is a good example.

2-19. A 30-kg (66-lb) child is being mechanically ventilated in the SIMV mode. The following data are available:

Ventilator Settings	Blood Gases
FiO ₂ 0.45	pH 7.38
Mandatory rate 18	Paco ₂ 42 torr
Total rate 23	Pao ₂ 110 torr
V _T 350 mL	HCO ₃ 23 mEq/L
PEEP 12 cm H ₂ O	BE 0 mEq/L

Based on these data, which of the following should you do?

- A. Decrease tidal volume
- B. Reduce the PEEP**
- C. Decrease the rate
- D. Lower the FiO₂

In this scenario, the child's acid-base status and PCO₂ are normal, so no change in ventilation is warranted. The PaO₂ is above normal (hyperoxia) and can be safely lowered if the patient's hemoglobin is acceptable. You can lower the PaO₂ by either lowering the PEEP level *or* lowering the FiO₂. Both answers are right! Which do you choose?

Actually, there is only one correct answer. In this case an FiO₂ of 0.45 presents little or no danger to the patient, but a PEEP of 12 cm H₂O is definitely hazardous. Decrease the PEEP first!

The lesson is that when confronted with two or more possible changes in therapy, both of which would have the same good effect, first change the therapy that poses the greatest potential harm to the patient—*back off bad!*

Data Just Don't Jive

Given the number and variety of instruments used to measure and monitor a patient's physiologic status, it is no wonder that the NBRC will test your ability to recognize and/or deal with conflicting data—i.e., numbers that “just don't jive” with each other. Question 2-20 is a good example.

2-20. The following data are obtained for a patient:

Blood Gas Analyzer	CO-Oximeter
pH 7.35	Oxyhemoglobin 97%
Paco ₂ 28 torr	Carboxyhemoglobin 1%
HCO ₃ 14 mEq/L	Methemoglobin 1%
BE -10 mEq/L	Hemoglobin 13.8 g/dL
PaO ₂ 40 torr	
SaO ₂ 73%	

You should do which of the following?

- A. Report the SaO₂ value as 73%
- B. Report the SaO₂ value as 97%
- C. Recommend administration of bicarbonate
- D. Recalibrate the instruments and repeat the analysis**

In this example, careful inspection of the data indicates a large discrepancy between the ABG analyzer's PaO₂ and SaO₂ (40 torr and 73%) and the actual oxyhemoglobin reported by the oximeter (97%). *One of these readings must be wrong.* Unfortunately, since no additional information is provided (patient or equipment status), the only good option is to recalibrate the instruments and repeat the analysis.

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At the same time, you should probably give the patient supplemental oxygen (just to be sure) while repeating the lab analysis.

Errors, Errors Everywhere!

A little-known NBRC exam specification requires candidates be able to “verify computations and note erroneous data” (Section III-A). Usually the NBRC will offer up 1 to 2 questions that confirm your ability to “check your math” or to recognize plainly incorrect data. Common math error questions focus on equations you use frequently in clinical practice, such as the alveolar air equation and the calculation of compliance or airway resistance on ventilator patients. Also common are errors in reported lab values, as evident in question 2-21.

2-21. The results of an arterial blood gas analysis for a patient who is breathing 100% oxygen are below:

Blood Gases

pH 7.27

Paco₂ 44 torr

HCO₃ 23 mEq/L

BE +1

PaO₂ 598 torr

SaO₂ 100%

Which of the following is the likely problem?

- A.** Respiratory acidosis
- B.** Large physiologic shunt
- C.** Metabolic acidosis
- D.** Laboratory error

Whenever one option (here D) includes the possibility of an error, check out the numbers! First, the PaO₂ of 598 torr on 100% O₂ is not only possible, but near normal (based on the alveolar air equation). In contrast, the acid-base values are *not* consistent with the underlying relationship that determines pH (the Henderson-Hasselbach equation). In this case, both the Paco₂ and HCO₃ are normal. With both these values being within the normal range, the pH also would have to be close to normal, which it clearly is not (pH = 7.27). The only possibility here is a laboratory error.

Don't Know What You're Missing!

In addition to using conflicting or erroneous data in its questions, the NBRC likes to give candidates questions with missing data. These questions are designed to “trap” those inclined to act on insufficient information, while rewarding those who carefully review the data. Question 2-22 illustrates this type of question.

2-22. A doctor asks you to assess if a 75-kg (165-lb) patient with a neuromuscular disorder being mechanically ventilated in the SIMV mode is ready for weaning. You obtain the following data during a bedside ventilatory assessment:

Spontaneous tidal volume	250 mL
Minute ventilation	10 L/min
Vital capacity	750 mL
Max inspiratory pressure (MIP)	-28 cm H ₂ O

Based on this information, which of the following would you recommend?

- A. Begin a spontaneous breathing T-piece trial
- B. Postpone weaning and reevaluate the patient
- C. Begin weaning using a pressure support protocol
- D. Begin weaning by decreasing the SIMV rate

In this question, many candidates would observe that the patient's vital capacity and MIP are borderline adequate, and conclude that the patient is ready for weaning. *Wrong!* In this case, the minute ventilation and tidal volume data suggest a major problem, but this becomes clear only after identifying and deriving the missing data—the spontaneous breathing rate (spontaneous rate = $10 \text{ L/min} \div 250 \text{ mL/ breath} = 40 \text{ breaths/min}$). This yields a rapid shallow breathing index of $40/0.25 = 160$, far above the threshold value of 100 that indicates a potential weaning problem and likely weaning failure. Based on discovery and analysis of the missing data, you would recommend postponing weaning and reevaluating the patient.

This type of question should make it clear that when given a problem with numeric information, you should *always* review the numbers to see what, if anything, is missing. Then see if you can derive the missing data from the available numbers. Often this is the key to solving these problems.

Jump Back, Jack!

Often the NBRC presents you with a situation in which things go bad (patient worsens, equipment fails, etc.). Just as often, *your* action immediately preceded things going bad. In these cases, the corrective action is usually to reverse course and *undo* what you have done—*jump back, Jack!* Question 2-23 illustrates this principle.

2-23. A surgeon orders an increase in PEEP from 6 to 10 cm H₂O for a post-op patient receiving mechanical ventilation. After you adjust the PEEP setting, you note a rapid fall in the patient's arterial blood pressure and a rapid rise in her heart rate. Which of the following actions would you recommend to the surgeon?

- A. Increase the FiO₂ by 10%
- B. Administer a vasopressor
- C. Return the PEEP to 6 cm H₂O
- D. Obtain a stat blood gas

One of the adverse effects of PEEP is decreased cardiac output (due to increased pleural pressure and decreased venous return). A rapid drop in a patient's blood pressure and rise in heart rate indicate decreased cardiac output. Whenever an adverse response to therapy occurs, your first consideration should be to stop the therapy and restore the patient to his or her prior state; in this case, return the PEEP to its initial level of 6 cm H₂O.

KISS It!

The KISS principle is straightforward: Keep It Simple, Stupid! When taking an NBRC test, this means that the simplest solution to a problem is often the best. Question 2-24 is a good example of the KISS principle.

2-24. Manual ventilation of a patient with a self-inflating bag-valve-mask device fails to inflate the patient's chest adequately. You should do which of the following?

- A. Intubate and mechanically ventilate the patient
- B. Switch to gas-powered resuscitator with mask
- C. Reposition the patient's head, neck, and mask
- D. Insert a laryngeal mask airway (LMA)

In this sample troubleshooting question, most options might help resolve the problem. However, option C is the simplest and should at least be tried before moving on to more aggressive options. The lesson here is that whenever one of the options is relatively simple and could provide the solution to the problem at hand, it is probably the correct answer.

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Gas Goes In, Gas Comes Out

Almost every NBRC exam includes two or more questions testing your ability to differentiate between leaks and obstructions in equipment, their sources, and their correction. A basic rule of thumb is that *leaks prevent pressure buildup, and obstructions cause pressure buildup*. The classic example is the simple bubble humidifier. Block the tubing outlet while gas is flowing and the pressure pop-off should sound (an obstruction). If the pressure pop-off does not sound, there is a system leak. A similar example is the leak test you perform on a ventilator circuit.

Identifying sources of leaks is simple—any mechanical connection (tubing, nebulizer/humidifier caps, exhalation valves) is a potential source for leakage, as is the patient’s airway (mouthpiece, mask, tracheal tube/cuff). To correct a leak, tighten the connection, fix or replace the component, or provide a better airway seal. Question 2-25 provides a good example of a “leaky” question.

2-25. When checking a ventilator, you discover that the set PEEP level cannot be maintained. Which of the following might be causing this problem?

- I. Leak in the tubing
 - II. Faulty exhalation valve
 - III. Leak around the airway cuff
 - IV. Loose humidifier connection
- A.** I and II
 - B.** I and III
 - C.** II and IV
 - D.** I, II, III, and IV

According to our rule of thumb, this is definitely a leak scenario. And since any mechanical connection or the patient’s airway can be the source of a leak, *all* of the cited problems could be the cause, making D the correct response.

Obstructions can be harder to identify, in part because an obstruction can be complete or partial and because “obstruction” during mechanical ventilation can involve any factor that raises airway pressure (increased resistance or decreased compliance). Correcting or overcoming an obstruction must address the underlying cause. Question 2-26 illustrates this type of question.

2-26. At the bedside of a patient receiving volume-oriented mechanical ventilation, you suddenly observe the simultaneous sounding of the high-pressure and low-volume alarms. Which of following is the most likely cause of this problem?

- A.** A leak in the ET tube cuff
- B.** A mucous plug in the ET tube
- C.** Ventilator circuit disconnection
- D.** Development of pulmonary edema

Since this scenario deals with volume-oriented mechanical ventilation, it’s best to rely first on a tried and true alarm rule of thumb to identify this problem as being an obstruction:

If the alarm combination is:	Then the problem is:
High pressure/low volume	An obstruction
Low pressure/low volume	A leak

The problem here is that there are two options that involve “obstruction”—the mucous plug and the decreased compliance associated with the development of pulmonary edema. Which to choose? In this case our prior advice on dissecting the question should help. Note the key word *suddenly* in the stem. Although pulmonary edema can develop relatively quickly, it would not change airway pressures suddenly. In contrast, a mucous plug can cause a sudden rise in airway pressure, making B the best choice and correct answer.

Love Those Multiple Trues!

Students tend to hate multiple-true-type questions (the ones with all those answer combinations!). The fact is that most multiple-true questions are easier to answer than simple “ABCD” questions. Why? Because more than any other type of question, multiple trues improve your odds of being correct when you have only partial knowledge of the answer. Question 2-27 demonstrates this important item response concept.

2-27. Which of the following would facilitate clearance of pulmonary secretions in a patient with cystic fibrosis?

- I. Mucomyst
 - II. Flutter valve
 - III. Atropine
 - IV. DNase
- A.** I and III
 - B.** II and IV
 - C.** I, II, and IV
 - D.** II, III, and IV

Most candidates will recognize Mucomyst as a mucolytic agent that might facilitate clearance of pulmonary secretions. Based on this partial knowledge, you can eliminate options B and D since they do not include Mucomyst. Alternatively, if based on your partial knowledge you recognize that atropine can dry airway secretion, you can eliminate options A and D since they both include this drug. Note that either of these partial-knowledge approaches immediately improves your odds of getting this question correct from 1 out of 4 (for pure guessing) to 50-50. Then all you need to know is that either DNase *or* a flutter valve can also help, and you can be sure to get this item right!

Treat the Patient, Not the Monitor!

A favorite NBRC “trick” question is to place you in a scenario where patient and monitor data conflict, but action is required. Common forms of this type question include: (1) pulse oximetry data (good) versus bedside assessment of the patient’s oxygenation (bad) or (2) ECG (good) versus bedside assessment of the patient’s perfusion (bad). Question 2-28 is a good example.

2-28. During a short pause from resuscitation of a child in the emergency department, you cannot palpate a carotid pulse but observe the following rhythm on the ECG monitor (**Figure 2-3**):

Which of the following actions should you take at this time?

- A.** Resume cardiac compressions and ventilation
- B.** Discontinue compressions and monitor the patient
- C.** Recommend cardioversion at 100 Joules
- D.** Recommend epinephrine administration



Figure 2-3 ECG Rhythm Observed on Monitor.

Source: Garcia, T. & Miller, G. T. (2004). *Arrhythmia recognition: the art of interpretation*. Sudbury, MA: Jones and Bartlett.

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In question 2-28, the likely problem is pulseless electrical activity (PEA). Remembering that the ECG represents only electrical activity and that a patient with no pulse requires resuscitation should make this a “no-brainer.” However, over a third of those taking our practice exams decide to go against their better judgment (and their training) and instead treat the monitor. Test smart and don’t join that group!

Keeping Order

All NBRC entry-level exams assess your ability to sequence multiple therapies or coordinate your therapy with that of other health professionals. Most of these questions rely on simple common sense—e.g., don’t perform postural drainage right after a patient has eaten!

As a special case, you will often be asked in what order to perform combinations of therapy aimed at either getting drugs (e.g., steroids, antibiotics) in or getting secretions out of the airway. In these situations, apply the following rule of thumb:

1. Open ‘em up
2. Thin ‘em down
3. Clear ‘em out

“Open ‘em up” means first open the airways, using a bronchodilator. Then administer any other drugs designed for pulmonary deposition (e.g., antibiotics, steroids). “Thin ‘em down” means you should next use hydrating or mucolytic agents (bland aerosols, acetylcysteine, DNase) to decrease the viscosity of secretions. “Clear ‘em out” means the last step should be to aid in removing the secretions (e.g., directed coughing, postural drainage, suctioning). Question 2-29 illustrates this approach.

2-29. A physician has ordered albuterol (Proventil) and deoxyribonuclease (DNase) by aerosol for a cystic fibrosis patient who also receives postural drainage 3 times a day. You should administer these therapies in which of the following sequences?

- A. Deoxyribonuclease (DNase), postural drainage, albuterol (Proventil)
- B. Albuterol (Proventil), deoxyribonuclease (DNase), postural drainage
- C. Postural drainage, albuterol (Proventil), deoxyribonuclease (DNase)
- D. Deoxyribonuclease (DNase), albuterol (Proventil), postural drainage

Give Me a V; Give Me an O!

Typically the NBRC includes at least half a dozen questions testing your ability to modify ventilator settings properly based on a blood gas report. You simply can’t afford to get many of these questions wrong.

First, you need to be able to interpret blood gases properly. Just as important, however, is the need to differentiate between problems of ventilation (“Give Me a V”) and problems of oxygenation (“Give Me an O”). This is the secret to slam-dunking these questions.

To help you out in this area, we recommend that you draw a line or mark or circle to separate the blood gas report’s ventilation/acid-base data from its oxygenation data. As an example:

Blood Gases

pH 7.20

Paco₂ 65 torr

HCO₃ 26 mEq/L

BE +1

PaO₂ 70 torr

SaO₂ 81%

Once you have drawn the line, *separately* assess (1) ventilation/acid-base status and then (2) the adequacy of oxygenation. In most cases the NBRC will limit the problem to one or the other—i.e., a problem of ventilation *or* a problem of oxygenation.

If the problem is mainly one of ventilation (as above), either increase or decrease the ventilation, as appropriate. If the problem is mainly oxygenation, you will need to either raise or lower the F_{iO_2} or adjust PEEP/CPAP. Question 2-30 is an example.

2-30. A 90-kg (198-lb) patient is being ventilated in the postanesthesia care unit (PACU) following upper abdominal surgery. Ventilator settings and arterial blood gas data are below:

Ventilator Settings	Blood Gases
Mode SIMV	pH 7.51
V_T 800 mL	P_{aCO_2} 31 torr
Set rate 14/min	HCO_3 24 mEq/L
Total rate 14/min	BE +1
F_{iO_2} 0.40	P_{aO_2} 115 torr
PEEP 5 cm H_2O	SaO_2 99%

You should recommend which of the following?

- A. Increase the F_{iO_2}
- B. Decrease the rate
- C. Decrease the tidal volume
- D. Discontinue the PEEP

Here the problem is clearly one of ventilation, *not* oxygenation. In this case, the patient is being hyperventilated (respiratory alkalosis) and the minute ventilation should be decreased. Since the tidal volume is okay (about 9 mL/kg), you should recommend decreasing the rate.

Alternatively, you may identify the primary problem as one of oxygenation, as evident in question 2-31.

2-31. A 45-year-old 70-kg (154-lb) male with a diagnosis of bilateral pneumonia is receiving volume-controlled ventilation in the SIMV. Ventilator settings and arterial blood gas data are below.

Ventilator Settings	Blood Gases
Mode SIMV	pH 7.35
V_T 700 mL	P_{aCO_2} 45 torr
Set rate 6/min	HCO_3 23 mEq/L
Total rate 10/min	BE -1
F_{iO_2} 0.65	P_{aO_2} 55 torr
PEEP 5 cm H_2O	SaO_2 83%

Which of the following should be recommended?

- A. Increase PEEP
- B. Increase the rate
- C. Increase the F_{iO_2}
- D. Add an inspiratory plateau

Since the P_{aO_2} is less than 60 torr and the SaO_2 is less than 90%, hypoxemia is present. Therefore option A or C could potentially improve oxygenation (a good example of a “double effect” item). Which you choose to raise depends on the underlying cause of the patient’s hypoxemia.

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To determine the cause and treatment of hypoxemia we recommend you use the “60/60” rule, outlined in **Table 2-7**.

In the scenario in question 2-31, the patient’s P_{aO_2} is less than 60 torr and the F_{iO_2} is greater than 0.60, so according to the 60/60 rule the cause of the hypoxemia is physiologic shunting. When the cause of the hypoxemia is physiologic shunting, increasing the F_{iO_2} further will do little good and potential harm (oxygen toxicity). Instead, you need to open up unventilated alveoli (the cause of physiologic shunting). To open up unventilated alveoli, you need to add or increase PEEP/CPAP.

Who’s in Charge Here?

These questions typically check to confirm that you know who prescribes respiratory care and who needs to be contacted should a change in care be needed and no protocol exist to manage the patient. Question 2-32 also tests your knowledge of what to do before initiating therapy on a patient.

2-32. A nurse tells you that his patient is scheduled to start chest physiotherapy four times a day this morning and that he would like you to get started before she goes to radiology for a CT scan. Which of the following should you do *first*?

- A.** Auscultate and percuss the patient’s chest
- B.** Initiate therapy after reviewing the X-ray
- C.** Interview the patient to obtain a history
- D.** Confirm the doctor’s order in the chart

Similar questions will ask what to do if you believe a change in therapy is needed, or if the patient asks specific questions regarding his or her diagnosis or prognosis (contact the doctor). Remember, all respiratory care is provided by physician prescription, and (without a protocol) only the physician can change the order.

TAKING THE TEST

Good preparation for any test should also involve consideration of how to take the exam (i.e., strategies to use just before and during actual test administration). Here we provide a few additional pointers specifically applicable to taking the NBRC CRT exam.

Know What to Expect When Reporting to the Testing Center

We recommend that you arrive early for your scheduled test and do something relaxing before actually reporting to the testing center. Note that if you are more than 15 minutes late, you will forfeit your test reservation and will have to reschedule another administration with the NBRC.

In order to sit for the exam, you’ll need proper identification. The NBRC currently requires two valid forms of identification that include your name and signature, *one of which must be an official governmental ID with photograph* (e.g., passport, driver’s license, military identification card).

If your identification checks out properly, you will be led to a testing room. Note that you are allowed to take only your keys and wallet into the testing room. Test center personnel will provide you with a pencil and scratch paper, which must be returned at the end of the exam.

Table 2-7 60/60 Rule for Oxygenation

Patient’s Oxygenation		Cause of Hypoxemia	Best Solution
P_{aO_2}	F_{iO_2}		
> 60 torr	< 0.60	Maldistribution of ventilation	Increase the F_{iO_2}
< 60 torr	> 0.60	Physiologic shunting	Add/increase PEEP/CPAP

To familiarize you with its exam format, the NBRC provides a short practice session before testing begins. This practice session does not affect either the time allotted for the actual exam or your score. Only after you finish or quit the practice session does the actual exam begin.

Once you begin the actual exam, you cannot ask questions. Although you are allowed to take breaks during your exam, break time counts against the total time allotted for your test.

Be Familiar with the Exam Format

Our “know your enemy” guideline applies not just to the content of the CRT exam but to its format. Fortunately, by the time most candidates actually take the NBRC CRT exam, they have taken dozens of similar tests, usually in school. Indeed, most programs require that students pass a computer-based CRT-like exam in order to graduate. You probably already know most of what to expect on the real thing.

As most candidates are aware, all NBRC exams are administered by computer at selected testing centers throughout the United States. The CRT exam is a 3-hour (180-minute) test consisting of 160 multiple-choice questions, of which 140 are scored. The additional 20 test items are what the NBRC terms “pre-test questions” that are being evaluated for use on future exams. You will not know which questions are being scored and which are being pre-tested, so you should try your best on all test items.

The NBRC test software presents one question at a time on the computer screen. As depicted in **Figure 2-4**, each question appears at the top of the screen with the four answer options immediately below. A function bar appears below each question. This bar contains several important buttons and text boxes, and their functions are described in the figure. If you choose to provide comments on specific test questions, the NBRC will apply this information when determining if test score adjustments are needed. For this reason, if you believe that the question you are trying to answer is flawed, be sure to provide a comment that explains why.

To select an option as your answer, you either click your mouse over the corresponding letter (A, B, C, or D) or type in that letter using the keyboard. To change your option choice, simply click on or key in a different letter. Your responses are not registered until you exit the exam for scoring, so you can change your answer to any question at any time during the exam period.

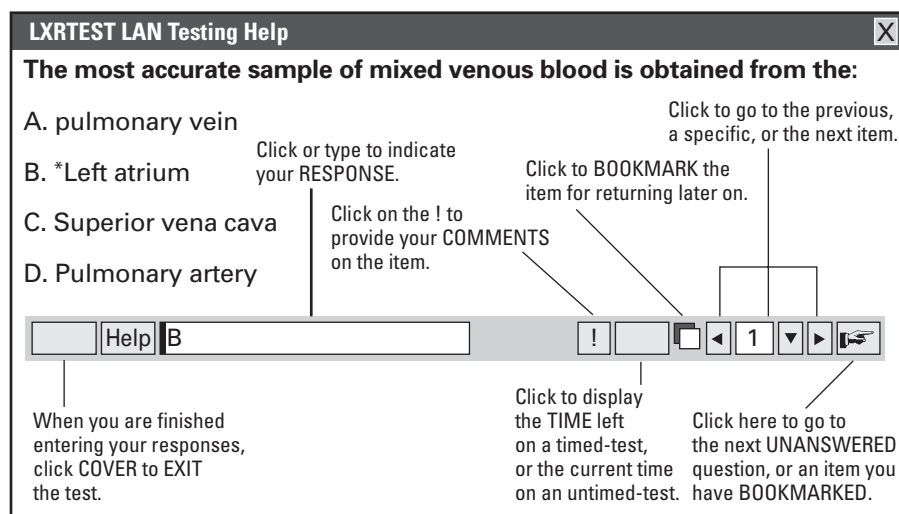


Figure 2-4 NBRC Computer-Based Testing Help Screen.

Source: National Board for Respiratory Care. (2008). *Candidate handbook and application*. Olathe, KS: National Board for Respiratory Care. Reprinted with permission.

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Strategies to Employ During the Test

The following strategies should help you perform at your best level when taking the CRT exam:

- Get comfortable
- Answer all questions
- Budget your time
 - Monitor your pace
 - Answer easy questions first
 - Bookmark difficult items and return to them later
 - Use all the available time
- If in doubt, reconsider your answers

Getting comfortable may seem difficult when taking a high-stakes exam, but the preparation this text provides—especially the strategies provided in this chapter—should help allay your test anxiety. Moreover, just like an athlete with pregame “butterflies in the stomach,” once you get down to the task at hand, you’ll get into the needed rhythm.

Because your score on the CRT exam is based on the number of items you get correct, it is essential that you answer all questions. To do so, you need to develop a good pace and budget your time properly.

Budgeting your time is the single most important strategy when test-taking. You have 180 minutes to answer 160 questions (140 scored and 20 pre-test items), which gives you just over a minute for each question. To keep on pace, you need to be aware of your progress. However, rather than constantly checking the clock, we recommend that you check your progress every 20 to 30 minutes, with the goal of completing, on average, one question per minute. For example, if you check your progress at one hour into the exam, you should have completed about 60 questions.

To further maximize your use of time, you should answer the easy questions first and save the difficult ones for last. However, even if a question appears straightforward, don’t rush through it. Spend enough time on each item to read it carefully and apply the strategies we recommend here to select your answer. However, don’t linger too long on any one question. In general, if you feel stumped on any given question or know that more than a minute has elapsed, bookmark the item and return to it later.

After completing all the easy questions, use the remaining time to review and answer all your bookmarked items. If you must guess, apply the option selection strategies outlined in this chapter to better your odds of selecting the correct answer.

If time remains after you have answered all the questions, review those items about which you were most unsure. *If an answer was a guess, don’t hesitate to reconsider your choice.* Note that this advice is contrary to what most students are taught (i.e., “your first guess is best”). Research consistently indicates that changing answers on multiple-choice exams is more likely to boost your score than lower it.

After you finish the exam, clicking on the COVER button on the function bar will take you to a “cover page,” which summarizes how many questions you have answered and how much time you have used. If you have completed all questions and are satisfied with your answers, you can EXIT the exam from this cover page. After exiting the exam, the testing center provides you with your score report. If you have followed the guidance we provide throughout this text, we are confident that you will have passed the exam and achieved your goal of becoming a Certified Respiratory Therapist.

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