ITEM WRITING MANUAL

Revised July 2019
Introduction

Welcome to your endeavor to learn and develop the skills to become an item writer for the Pediatric Nursing Certification Board (PNCB). Our mission is to promote optimal outcomes in global pediatric health by providing certification services that validate specialized knowledge and continuing competence in pediatric nursing. This mission is directly supported by a rigorous exam development process that includes item writing. Your charge as an item writer is to develop items that ensure our exams appropriately measure the skills, knowledge, and abilities of test-takers to determine their qualification for certification and continuing competency.

Writing good test questions is both an art and a science. As you begin to develop your skills as an item writer, you will appreciate its challenge. Up to 60% of submitted items never make it to a scored, usable status in the item bank because they do not perform well statistically. This is often due to flaws such as unclear stems or distractors that are implausible. Working to improve and refine your item writing skills increases the impact of your contributions, as well as the chance that your questions will be included in PNCB’s exams!

The purpose of test questions is to differentiate between test-takers who have the knowledge and those who do not. Items should be written in a fair manner (no trick questions) so that test-takers with the knowledge get the question correct, and those without the knowledge get the question wrong. Questions should also assess higher level thinking skills. Thus, questions that require the test-taker to apply knowledge or analyze information to identify a correct response are more relevant to the purpose of our exams than questions that require only recall of information. This is addressed within this manual in a section on cognitive levels, and we encourage you to pay close attention to the content. For the item writer this means delving into topics to understand what is most relevant to practice when developing questions. Item writers who learn to write well-developed, higher-level questions make important contributions to PNCB exams.

This manual provides the rules and rationale for best practices in item writing, supported by the science of measurement and assessment known as psychometrics. You are asked to read about these practices and apply them to your item writing.

This manual is divided into the following sections:

- **Section 1:** The Basics of Item Writing (pg. 3)
- **Section 2:** Item Writing Guidance through Examples (pg. 17)
- **Section 3:** Developing Questions and Refining Skills (pg. 29)
- **Section 4:** Reviewing your Items before Submission (pg. 36)
- **Section 5:** The Documented Item and Resource Links (pg. 37)

While the term examination is the most appropriate for assessments used to establish professional credentials, the terms “test” and “exam” or “examination” are used synonymously throughout this manual, such as when referring to test questions, test items, and test-takers.
SECTION 1: The Basics of Item Writing

What is a test item?

“Test item” and “test question” are equivalent terms and describe what is used to assess some aspect of knowledge. The items on PNCB’s exams are formatted as multiple-choice questions with four options (A, B, C or D) from which the test-taker selects a single correct response. This type of multiple-choice question format is also referred to as the “one-best-answer”.

A test question represents a task posed to the test-taker, which is introduced in the stem. There are two styles of stems: a closed stem asks a complete question, punctuated with a question mark at the end; an open stem is formatted with an incomplete or lead-in statement where each of the options completes the sentence started in the stem. Because the options complete the sentence, each will end with a period.

<table>
<thead>
<tr>
<th>EXAMPLES of OPEN versus CLOSED STEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Closed Stem</strong></td>
</tr>
<tr>
<td>A 2 month old presents with bilious vomiting for 24 hours. Physical exam is unremarkable and there is no weight loss. Which of the following interventions is the anticipated care of this infant?</td>
</tr>
<tr>
<td><strong>Open Stem</strong></td>
</tr>
<tr>
<td>A 2 month old presents with bilious vomiting for 24 hours. Physical exam is unremarkable and there is no weight loss. The anticipated care of this infant includes</td>
</tr>
</tbody>
</table>

Other components of a question are the:

- **Key** correct option/response
- **Distractors** incorrect options/responses

<table>
<thead>
<tr>
<th>SAMPLE QUESTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STEM&gt;&gt;</strong></td>
</tr>
<tr>
<td>The MOST important reason to frequently review a child’s use of a peak expiratory flow device is because</td>
</tr>
<tr>
<td><strong>DISTRACTOR&gt;&gt;</strong></td>
</tr>
<tr>
<td>a. noncompliance is prevalent.</td>
</tr>
<tr>
<td>b. values and technique vary by brand.</td>
</tr>
<tr>
<td>c. technique and effort affect measurements.</td>
</tr>
<tr>
<td>d. personal best measurement must be validated.</td>
</tr>
</tbody>
</table>

The following styles of items are **NOT** used in PNCB exams and will **NOT** be accepted:

- True or False questions
- Fill in the blank questions
- Multiple answer or select all that apply questions
- Questions with options that include “all of the above” or “none of the above.”
- Questions which are negatively worded (e.g., “Which of the following is not...”, “All of the following except...”)
Exam Content

For each certification exam, PNCB conducts initial and on-going role delineation/job analysis studies to determine the knowledge, skills, and abilities necessary for each nursing role. The final products of this research include the test specifications, which contain the content outline for the exam. To promote the validity and defensibility of exams, questions included in any exam must relate to specific areas on the content outline.

The content outline is an essential document used by the test developers who build the exams, PNCB staff, item writers, and exam candidates. It identifies the major domains of knowledge or content that may be covered in the exam. Within the content outline, content areas are weighted to show how many items are included from each content area. Your item writing assignment will often be based on needs within specific content areas.

As an item writer, you must ensure that your items are fair. One aspect of an item’s fairness is that it must be congruent with the required knowledge reflected in the content outline. The item writer is also responsible for ensuring that questions ask about important knowledge for entry-level practice in the role, as opposed to being written to an advanced level of experience. Questions should also represent what is most prevalent and realistic in practice, rather than asking about what is obscure or rarely encountered.

Additionally, avoid writing items about information that in practice is not routinely committed to memory; this may be information that changes periodically, or it is information that is readily accessible in work references. Examples include immunization schedules or certain formulas that are used for calculations. For this reason, it is NOT appropriate to write questions about knowledge that is routinely accessed through available references in the work setting.

Recall, Application, Analysis

Test questions vary in their complexity and reflect the level of consideration and cognitive processing expected of the test-taker to answer the item. This complexity is linked to the objective of the question. Questions in PNCB exams are written to one of three cognitive levels: recall, application, or analysis:

<table>
<thead>
<tr>
<th>Complexity</th>
<th>ANALYSIS</th>
<th>Questions that require test-takers to identify the significance and implications of several pieces of information (if X and Y, then Z) to determine priorities, next steps, diagnoses, or actions. Analysis questions often include a patient scenario.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>APPLICATION</td>
<td>Questions that have the test-taker use information or knowledge in another familiar situation, such as to select an appropriate action or response. Application questions may include conditions such that the question poses if X then Y. Application questions often involve a patient scenario, but the amount of data and problem-solving is less than an analysis-based question.</td>
</tr>
<tr>
<td></td>
<td>RECALL</td>
<td>Questions that require recall of terms, facts or other information.</td>
</tr>
</tbody>
</table>

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Application and analysis level questions are more appropriate to certification exams, although a small percentage of recall questions are included in PNCB’s exams. When completing an item writing assignment your efforts should be focused on developing application and analysis level questions. **Section 3** of this manual (pg. 29) contains extensive information about developing patient scenario-based questions that begin with creating a “clinical stem.” Scenario-based questions are most often application or analysis questions, especially if the diagnosis is not stated, but must be deduced from information in the stem. For example, these questions will often ask for the priorities, appropriate treatment, or next steps, without the stem specifically identifying the diagnosis.

In the table below, a selection of sample items is provided to demonstrate questions written to different cognitive levels. When reviewing these items, consider the knowledge required to answer each question and how it differs for each level. Analysis questions require knowledge of multiple concepts to answer. For example, the last sample is an analysis level question because the test-taker must understand the importance of independence to an adolescent and the differences between the types of devices in order to select the device that best meets this developmental need.

<table>
<thead>
<tr>
<th>COGNITIVE LEVEL</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall</td>
<td>Cystic fibrosis involves dysfunction of the:</td>
</tr>
<tr>
<td></td>
<td>a. ciliary bodies</td>
</tr>
<tr>
<td></td>
<td>b. endocrine glands</td>
</tr>
<tr>
<td></td>
<td>c. exocrine glands &quot;key&quot;</td>
</tr>
<tr>
<td></td>
<td>d. hypothalamus</td>
</tr>
<tr>
<td>Application</td>
<td>A school-age child with cystic fibrosis asks about participating in sports. Which of the following is the BEST response?</td>
</tr>
<tr>
<td></td>
<td>a. “Be sure to stop exercising if you start coughing.”</td>
</tr>
<tr>
<td></td>
<td>b. “It’s important to drink plenty of fluids when you are playing.” &quot;key&quot;</td>
</tr>
<tr>
<td></td>
<td>c. “You can participate in any activity as long as it’s indoors.”</td>
</tr>
<tr>
<td></td>
<td>d. “Avoid sports that cause you to breathe faster or increase your heart rate.”</td>
</tr>
<tr>
<td>Analysis</td>
<td>An adolescent with cystic fibrosis would be MOST likely to adhere to which airway clearance technique?</td>
</tr>
<tr>
<td></td>
<td>a. airway oscillating device such as the FLUTTER®</td>
</tr>
<tr>
<td></td>
<td>b. manual chest percussion with postural drainage</td>
</tr>
<tr>
<td></td>
<td>c. positive expiratory pressure (PEP) mask</td>
</tr>
<tr>
<td></td>
<td>d. high-frequency chest compression vest &quot;key&quot;</td>
</tr>
</tbody>
</table>

Writing well-developed items for exams important enough for establishing credentials takes time, much thought, and effort. That effort includes considering topic ideas (based on your item writing assignment) and how it relates to your practice experience, as well as exploring references. It takes mulling and pondering and challenging yourself to delve into a topic to consider many aspects of clinical implications. Generally, it is wisest to avoid writing the first question idea that comes to mind (or keep it on hold for a bit). The most obvious question on a topic has likely already been written many times.

Once you have your idea for an item, the actual execution takes time. Some item writers find it helpful to begin with writing an objective for the question identifying what knowledge they are intending to
assess. After completing the item, review your original statement to ensure that what you have written does indeed assess the intended knowledge.

**EXAMPLE: An Item Writer’s Objective and Item**

<table>
<thead>
<tr>
<th>Objective: Test-takers should know specific techniques for making a small child comfortable during a physical exam.</th>
<th>Item: Which of the following is the best position for an apprehensive toddler during a physical exam?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. reclining on examiner’s and caregiver’s laps as they sit knee to knee &lt;&lt;key</td>
<td></td>
</tr>
<tr>
<td>b. seated on the exam table and allowed to remain upright</td>
<td></td>
</tr>
<tr>
<td>c. reclining on exam table holding comfort object</td>
<td></td>
</tr>
<tr>
<td>d. reclining on exam table with head in caregiver’s lap</td>
<td></td>
</tr>
</tbody>
</table>

As you begin writing your item, develop a stem that asks a question in a fair, directed manner that contains ALL the information the test-taker needs to answer the question. The next task is to write the correct response, followed by developing plausible but incorrect options, known as distractors. The role of distractors is to attract the test-taker who lacks the knowledge and is guessing. Distractors should be plausible and not be easily dismissed by test-takers. Your questions need to avoid cues that make guessing easy, and ensure the correct response blends-in well among the options.

**EXAMPLE: An Easily Dismissed Distractor**

Which of the following individuals was the first president of the United States of America?

- a. John Adams
- b. George Washington <<key
- c. Alexander Hamilton
- d. Bill Clinton <<easily dismissed as not from the same period in history

With all these requirements (and many more detailed throughout this manual), it is easy to understand why a commitment to editing is important to creating quality items... item writing is said to be both an “art and a science”. Your strong knowledge of pediatric practice is a true asset to this endeavor, but time, effort, and commitment to developing your questions is what most often differentiates weaker versus stronger items.

**Item Writing Rules**

**Rule #1: Promote fairness in your test questions**

*Write clearly and succinctly*

The fairness of a test question is promoted by ensuring it is written with clarity and succinctness. Why is this rule critical in your test questions? Most people can identify with experiencing some anxiety or nervousness about test-taking, especially when the exam is used to establish important professional credentials. It is unfair to add to that anxiety by padding questions with inconsequential information that causes the test-taker to waste time reading and considering information that is not pertinent to the subject matter. For example, a common flaw by new item writers is including the setting where the child was seen, which is generally unnecessary information. Keeping items succinct helps promote fairness by minimizing reading load since assessing reading comprehension is not the purpose of PNCB’s exams.
A test question sets up a clear task for the test-taker, containing all the information necessary to select the correct response. If an item is well-written, the test-taker who has the knowledge should be able to anticipate the correct response before even reading the options. It should NEVER be necessary to read the options to understand what a question is asking.

Poorly developed stems can occur when the question is too broad to define a clear task. This type of flaw is referred to as an undirected stem, which will require revision. The undirected stem creates an unfair question as the test-taker tries to determine what exactly is expected when the possibilities may seem limitless. An example of an undirected stem is: “When completing a physical assessment on a child it is important to...” In this example it is easy to imagine the hundred or more possible important aspects of physical assessments that could be an answer.

Asking “Which of the following...” is a frequently used approach for stems. To help ensure the stem is more directed with this style of question, define specifically what “which of the following” is referring to by preceding the phrase with a noun. See how this is accomplished in the revised version of the item in the table below.

<table>
<thead>
<tr>
<th>EXAMPLE: Making the stem more direct</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ORIGINAL</strong></td>
</tr>
<tr>
<td>An adolescent presents with a pierced naval that is swollen, erythematous, and has purulent exudate. Which of the following is the MOST appropriate?</td>
</tr>
<tr>
<td>a. prescribe oral antibiotic therapy</td>
</tr>
<tr>
<td>b. remove jewelry from naval</td>
</tr>
<tr>
<td>c. prescribe topical therapy</td>
</tr>
<tr>
<td>d. cleanse with peroxide</td>
</tr>
</tbody>
</table>

Stems that ask, “Which of the following is true (or correct or accurate) about...?”, all create very broad and undirected stems, and therefore they are not used in exam questions.

In striving for succinctness, keep in mind that the purpose of the test or questions is not to teach. When writing stems, avoid introductory statements that teach. For example, the first sentence of this stem is teaching and unnecessary: “Assessing changes in pulmonary function affecting the child’s functional status is important. Which of the following devices provides an objective method of measuring asthma severity and is most helpful in assessing function?”

**Helpful Hint**

After you write your item, leave it for a while. Later, with a fresh eye, re-read the question. Consider the objective of the question and ask yourself what information the test-taker really needs to answer the question. Edit your question to remove extraneous words.
**Do not write negatively worded stems**

A negatively worded question requires that the test-taker recognize a single exception. Looking for an exception takes an active shift in logic for the test-taker. With a negatively worded stem, the test-taker needs to recognize several correct options but select an option that is incorrect. This style of question increases test-takers’ risk of misinterpreting the task or answering the question incorrectly because the “negative” word in the stem was simply overlooked.

<table>
<thead>
<tr>
<th>Examples of negatively worded stems</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All of the following studies are used to establish the diagnosis of malrotation EXCEPT:</td>
</tr>
<tr>
<td>• Which of the following is NOT a diagnostic study used to diagnose malrotation?</td>
</tr>
<tr>
<td>• Which is the LEAST likely cause of....</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXAMPLE: ☹ NEGATIVE Stem with Options ☹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which of the following interventions is NOT recommended to decrease the frequency of injury/death of adolescent drivers?</td>
</tr>
<tr>
<td>a. A learner permit period that lasts at least 6 months &lt; recommended</td>
</tr>
<tr>
<td>b. Passenger age restrictions &lt; recommended</td>
</tr>
<tr>
<td>c. 50 hours of adult supervised road driving &lt; recommended</td>
</tr>
<tr>
<td>d. Use of hands-free mobile devices &lt;&lt;key &lt; NOT recommended</td>
</tr>
</tbody>
</table>

While questions that ask about CONTRAINDICATIONS are technically negative stems, these are allowed because they ask about knowledge important and relevant to clinical practice. Students also learn specifically about contraindications.

**Limit the use of age and gender**

When writing questions, consider if there is real significance to knowing the age of a child for the knowledge being tested. Test-takers should not be distracted considering the potential influence of age unless it is critical to the knowledge being assessed.

If age is important to include, consider if a specific age is necessary or whether referring to an age group is reasonable. The age groups included in PNCB’s style are: **newborn, infant, toddler, preschooler, school-age child, or adolescent.** The use of terms such as “baby” or “teen” should be avoided unless used within a quotation as stated by a caregiver or parent. When a specific age is not important, the use of “child” is appropriate, and preferred over the use of “patient”.

This same principle relates to gender. Introducing a child’s gender should be avoided unless it is relevant to the knowledge being tested. It is also inappropriate for a child’s gender to be referred to in the options when it was not previously introduced in the stem. Usually this occurs when an item writer confronts a grammatical challenge. Take time to rethink alternate wording, as the use of gender in any options when previously unmentioned in the stem might confuse the test-taker.
Avoid referring to the “nurse” or “nurse practitioner” in the question

Questions should NOT be worded to refer to the nurse or nurse practitioner (NP) or to ask what the nurse or NP should do. As the test-takers, the nurse or NP is already the implied audience for the question. If your questions refer to the nurse or NP, take time to revise your items and pose the question more directly.

**EXAMPLE:** When selecting an appropriate gauge needle the nurse should...

**REVISED:** When selecting an appropriate gauge needle it is important to...

Keep “YOU” out of the question

Questions should NOT be worded to include the word “you.” The reason for this is rather humorous. For example, if the question asks, “When giving an IM injection to an adolescent in the deltoid muscle, which needle gauge would you use?” the wording suggests the objective is to identify your personal preference or choice. There is no way to mark a question correct or incorrect that is asking a personal choice. Therefore, NEVER include “you” in the question, and instead make the objective of the question to establish the appropriate action or response.

Other guidelines for promoting fairness, clarity and succinctness:

- Do NOT personalize children, their families, or the nurse by giving them names.
- Do NOT use the term “patient”. Instead, refer to “the child” if needed.
- Keep questions focused on a single behavior or objective. Avoid trying to assess as much as possible about the test-taker’s abilities from a single clinical situation.
- When an item includes a scenario, address the status of the child first, then ask the question. See the two examples below and note how it is easier to read and understand the item when the clinical context is presented before asking the question.

**Example 1: Question First**

Which is the BEST initial treatment for a 10 year old who presents with a six month history of headaches twice a month described as frontal, pounding, lasting for most of the day, and accompanied by nausea and light sensitivity?

**Example 2: Child First**

A 10 year old presents with a 6 month history of headaches twice a month described as frontal, pounding, lasting for most of the day, and accompanied by nausea and light sensitivity. Which is the BEST initial treatment?

- Do not write questions that expect the test-taker to recognize specific theorists by names. It is acceptable to write questions related to the application of their theories, such as those related to child development.
- Questions should not provide cues that make it easier for test-takers who guess at the correct answer. Practice reviewing and editing options to ensure the correct response blends in with the other options by being similar in length and complexity. What to look for:
  - If a significant term used in the stem is only repeated in the key, try to remove the term or repeat it in at least one of the distractors.
If the correct response is longer and contains more detail than the distractors, try to fix by either shortening the key or adding more detail to at least one distractor.

**SAMPLE QUESTION**

When working to create parallel structure among the options, try to ensure balance in their complexity. For example, if one option includes an “and” or even a comma, so should another option, especially if one of those options is the correct response.

<table>
<thead>
<tr>
<th>Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx Xxxxxx:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. aaaaaa aaaaaa aaaaa aaaaaaa aaaaaa.</td>
</tr>
<tr>
<td>b. bbbbbbb and bbbbbbb bbbbb bbbbbbb.</td>
</tr>
<tr>
<td>c. cccccc and cccccc cccccc cccccc cccccc.</td>
</tr>
<tr>
<td>d. ddddd dddddddd dddddd dddddd dddddd dddddd.</td>
</tr>
</tbody>
</table>

- When options containing numeric ranges, ensure that they are distinct with no overlap to avoid the possibility that two options are correct. *(see Example 4, pg. 23)*
- Verify that the option identified as the key (correct response), is the ONLY correct option.

**Additional guidelines that promote sensitivity and fairness:**

- Persons are not defined by their disease or disability. For example, use “a child with diabetes” instead of “the diabetic child.” This person-centered orientation is more appropriate for ensuring the fair representation of individuals.
- Children do not come exclusively from two-parent families, and two-parent families are not exclusively comprised of a father and a mother. The individual responsible for the child’s care may not even be a parent. Use the terms caregiver(s), parent(s), or mother or father equally to promote balance and representation within your items and in our exam banks.
- A physician may not be the only healthcare professional on the team prescribing care, medications or treatments. For that reason, it is more appropriate, where applicable, to use the term healthcare provider as opposed to physician.
- Specific words, when included in the stem, are capitalized to help ensure that the test-taker does not overlook emphasis related to the question’s task. These terms include the following words: MOST, BEST, NEXT, FIRST, FIRST-LINE, INITIAL, PRIORITY, IMMEDIATE, and CONTRAINDICATION.

**Rule #2: Distract with your distractors**

The incorrect responses in a multiple-choice question are called distractors. They are intended to distract by appealing to those test-takers who do not have the knowledge and are likely to be guessing. Strong distractors strengthen questions and help to differentiate between those who possess the knowledge from others that do not. Work to ensure distractors have some plausibility, because if any are easily dismissed or discounted, then the odds are improved for those who are guessing. Each distractor should be incorrect under any plausible interpretation. The exception to this is when the stem’s task is asking that the test-taker identify the BEST or
MOST appropriate option. In these questions, options are correct, just not the BEST. Remember when writing a question that asks for the BEST or MOST appropriate option, the reference and evidence-based practice must support the key, as opposed to being based on the item writer’s opinion.

When crafting distractors, it can be helpful to consider commonly mistaken or misunderstood aspects related to what is being tested—such as concepts that are confusing to students. Another way of developing distractors is to include information that is correct but related to another or similar problem. It can also be effective to base distractors on an exaggeration of a correct action or finding.

When a question is constructed with each of the options containing a list, such as three risk factors (see example below), include one term from the key’s list in each of the other options. This helps improve the “distraction of the distractors.” Also try to include one term from the distractors in other options. These techniques reduce the likelihood that a test-taker who lacks full knowledge but recognizes one of the listed terms in the key will get the question correct.

**EXAMPLE: Overlap between options decreases likelihood of getting the question correct based on knowing ONLY one of the elements in the key**

<table>
<thead>
<tr>
<th>Which of the following are risk factors for Sudden Infant Death Syndrome (SIDS)?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. maternal smoking during pregnancy, overheating, and winter season</td>
<td>&lt;small&gt;<strong>KEY</strong>&lt;/small&gt;</td>
</tr>
<tr>
<td>b. firstborn, maternal smoking during pregnancy, and frequent awakening</td>
<td></td>
</tr>
<tr>
<td>c. frequent awakening, overheating, and recent immunizations</td>
<td></td>
</tr>
<tr>
<td>d. firstborn, recent immunizations, and winter season</td>
<td></td>
</tr>
</tbody>
</table>

Additional rules when creating distractors:

- **DO NOT** use universal terms such as “never” or “always” to make an option incorrect. Few things in life are absolutes and universal truths, so using these terms can contribute to the test-taker quickly dismissing the distractor. The same applies to using qualifiers such as “usually,” “often,” “rarely,” “seldom,” or “commonly.”
- **DO NOT** try to be tricky to create a distractor, such as a distractor that is based on a minor distinction. *(Remember the purpose of the question is to identify those who possess the required knowledge, not to trick the test-taker!)*
- **DO NOT** make up information to create a distractor, such as inventing a name for a nonexistent medication or lab test.

**Rule #3:** Ensure each item’s legal defensibility

The correct response to any item used in the exam must be supported in a current PNCB-approved pediatric reference. This requirement is part of ensuring the exam’s legal defensibility. To further validate accuracy and currency, all newly written items will also be reviewed by other subject matter experts from both the Exam and Form Review Committees.

PNCB provides a list of approved references for each of the certification exams on the study resources webpage on their website. These are the references used to support exam content; inclusion of any textbook as a reference is based on committee recommendation. **PNCB does not endorse nor have any proprietary relationship with the textbooks or handbooks included in the published, recommended reference lists.**
If a test-taker challenges his or her exam results, PNCB may be called upon to defend the scoring, a process that may include validating the accuracy of items as supported by their references. For that reason, questions written for the exam MUST be referenced to the one of the textbooks included on PNCB’s recommended reference list. While the most recent edition of any recommended text is preferred, one edition back (but no older than 7 years) can be used.

There are a few exceptions to exclusively using textbooks identified on PNCB’s exam reference lists, such as using nationally recognized guidelines, which are evidence- or consensus-based, such as those from AAP, AAPA, CDC, and FDA. If using a guideline as a reference, the link to the guideline must be included in the reference section of your item submission. If your item writing efforts are for PNCB’s other certification-related products, such as continuing education modules, journal articles may be used as references.

When documenting the reference for an item, you will need to provide the name of the textbook, the edition, and the specific page numbers where content supports the correct response. However, the reference citation may also include support for the incorrectness of distractors. **Record the full citation for the reference that supports an item early in your writing process so you won’t need to backtrack when it’s time to submit your item.**

Legal defensibility also includes that your items must be original work. Items that you submit may not be copied from another source such as review material or textbook. When crafting the wording for your item avoid using wording that is verbatim from the cited reference. A little wordsmithing can often address this challenge.

**Rule #4: Apply PNCB style when formatting questions**

While your items will be reviewed and edited by other volunteer subject matter experts and PNCB staff, it is very helpful if you can learn and incorporate the appropriate style into the questions as you write them.

**Basic formatting and style requirements**

A. When the stem is written as an open stem for sentence completion, the following apply:
   - there is NO punctuation at the end of the stem *(avoid inserting a colon)*
   - the first word in each option begins with a lowercase letter
   - each option is punctuated at the end with a period
   - each option flows with the stem *(see sample below)*
   - options are similar in structure, grammar, complexity and length

<table>
<thead>
<tr>
<th>Sample OPEN STEM QUESTION with sentence completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>The style rules for formatting an item written with an open stem include</td>
</tr>
<tr>
<td>a. placing a colon at the end of the stem.</td>
</tr>
<tr>
<td>b. ending the stem with a question mark.</td>
</tr>
<tr>
<td>c. punctuating each option with a period at the end.</td>
</tr>
<tr>
<td>d. beginning the first word of each option with an uppercase letter.</td>
</tr>
</tbody>
</table>
B. When the stem is written as an open stem, but the four options are single words or terms, such as names of medications, microorganisms, or diagnoses, the following apply:

- a colon is placed at the end of the stem
- the options do NOT end with a period

<table>
<thead>
<tr>
<th>Sample OPEN STEM QUESTION with options as a list</th>
</tr>
</thead>
<tbody>
<tr>
<td>When the options in an open stem question are a list of single terms, the stem ends punctuated with a:</td>
</tr>
<tr>
<td>a. colon &lt;&lt;KEY</td>
</tr>
<tr>
<td>b. comma</td>
</tr>
<tr>
<td>c. question mark</td>
</tr>
<tr>
<td>d. period</td>
</tr>
</tbody>
</table>

C. When the stem is written as a closed stem, the following apply:

- stem ends in a question mark
- the first word of each option begins with a lower-case letter, unless each option is a complete sentence
- options end with a period ONLY when each option is a complete sentence
- if each option is a complete sentence, the first word in each option is capitalized and each option ends with a period
- each option flows with the stem (see sample below)
- options are similar in structure, grammar, complexity and length

<table>
<thead>
<tr>
<th>Sample CLOSED STEM QUESTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>When an item is written with a closed stem, which of the following BEST describes the formatting requirements?</td>
</tr>
<tr>
<td>a. stems end with a colon</td>
</tr>
<tr>
<td>b. options begin with an uppercase letter</td>
</tr>
<tr>
<td>c. stems end with a question mark &lt;&lt;KEY</td>
</tr>
<tr>
<td>d. options are written as complete sentences</td>
</tr>
</tbody>
</table>

D. When to ask “what” versus “which”?

“What” is appropriately used in a question when there is only one possible correct answer. “Which” is appropriately used when there are many possible answers, but the focus of the question is only on the one possibility included as the key.

<table>
<thead>
<tr>
<th>Examples: STEMS USING ‘WHAT’ vs. ‘WHICH’</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What</strong> is the normal range for blood glucose?</td>
</tr>
<tr>
<td><strong>For which</strong> of the following infants is the monthly administration of palivizumab (Synagis) injections recommended?</td>
</tr>
<tr>
<td>The monthly administration of palivizumab (Synagis) injections is recommended for <strong>which</strong> of the following infants?</td>
</tr>
</tbody>
</table>
E. Work to ensure your item’s options are similar in structure, grammar, complexity and length. Review the table below for examples of a few different approaches to achieving parallel structure. Notice among all the examples how the key blends in among the distractors.

<table>
<thead>
<tr>
<th>Examples: Creating parallel structure in options</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Using lead verbs to create parallel structure</strong></td>
<td>When examining an apprehensive 2 year old, which of the following techniques is BEST?</td>
</tr>
<tr>
<td>a. make eye contact and focus on the child</td>
<td>a. <strong>make</strong> eye contact and focus on the child</td>
</tr>
<tr>
<td>b. begin with the child seated in the caregiver’s lap &lt;&lt; key</td>
<td>b. <strong>begin</strong> with the child seated in the caregiver’s lap &lt;&lt; key</td>
</tr>
<tr>
<td>c. have the caregiver position the child on the exam table</td>
<td>c. <strong>have</strong> the caregiver position the child on the exam table</td>
</tr>
<tr>
<td>d. provide explanations throughout the examination procedure</td>
<td>d. <strong>provide</strong> explanations throughout the examination procedure</td>
</tr>
<tr>
<td><strong>Beginning or ending pairs of options with the same term</strong></td>
<td>A child has returned from placement of a ventriculoperitoneal (VP) shunt. Positioning the child in which position is MOST appropriate?</td>
</tr>
<tr>
<td>a. flat on operated side</td>
<td>a. <strong>flat</strong> on operated side</td>
</tr>
<tr>
<td>b. flat on unoperated side &lt;&lt;key</td>
<td>b. flat on unoperated side &lt;&lt;key</td>
</tr>
<tr>
<td>c. supine with head of bed elevated 45 degrees</td>
<td>c. <strong>supine</strong> with head of bed elevated 45 degrees</td>
</tr>
<tr>
<td>d. supine with head of bed elevated 90 degrees</td>
<td>d. <strong>supine</strong> with head of bed elevated 90 degrees</td>
</tr>
<tr>
<td>A 6 month old has an excoriated, erythematous rash in the diaper area with pinpoint satellite lesions. Which topical treatment would be MOST appropriate?</td>
<td></td>
</tr>
<tr>
<td>a. 1% hydrocortisone cream</td>
<td>a. 1% hydrocortisone <strong>cream</strong></td>
</tr>
<tr>
<td>b. mupirocin ointment</td>
<td>b. mupirocin <strong>ointment</strong></td>
</tr>
<tr>
<td>c. nystatin ointment &lt;&lt;key</td>
<td>c. nystatin ointment &lt;&lt;key</td>
</tr>
<tr>
<td>d. tacrolimus cream</td>
<td>d. tacrolimus <strong>cream</strong></td>
</tr>
<tr>
<td><strong>Creating options pairs, such as two options addressing testing and two related to treatment with medications</strong></td>
<td>For an adolescent presenting with a scaly, copper-penny colored rash limited to the torso, palms of hands, and soles of feet, which is the next BEST step?</td>
</tr>
<tr>
<td>a. obtain a scrapped skin culture of the rash</td>
<td>a. obtain a scrapped skin <strong>culture</strong> of the rash</td>
</tr>
<tr>
<td>b. obtain a treponemal automated test &lt;&lt;key</td>
<td>b. obtain a treponemal automated test &lt;&lt;key</td>
</tr>
<tr>
<td>c. prescribe topical steroids</td>
<td>c. <strong>prescribe</strong> topical steroids</td>
</tr>
<tr>
<td>d. prescribe oral antifungals</td>
<td>d. prescribe <strong>oral antifungals</strong></td>
</tr>
</tbody>
</table>
F. Avoid repeating the same words at the beginning of each option. When this occurs, the item can usually be revised by moving the repeated words into the stem.

Example: Repeated words in options fixed by moving into the stem

<table>
<thead>
<tr>
<th>ORIGINAL</th>
<th>IMPROVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>When educating the parents of a newborn with physiologic jaundice, it</td>
<td>When educating the parents of a newborn with physiologic jaundice, it</td>
</tr>
<tr>
<td>is important to include that bilirubin levels</td>
<td>is important to include that bilirubin levels peak on which of the</td>
</tr>
<tr>
<td>a. peak at the second post-natal day.</td>
<td>following post-natal days?</td>
</tr>
<tr>
<td>b. peak at the third post-natal day.</td>
<td>a. second</td>
</tr>
<tr>
<td>c. peak at the fifth post-natal day.</td>
<td>b. third</td>
</tr>
<tr>
<td>d. peak at the seventh post-natal day.</td>
<td>c. fifth</td>
</tr>
<tr>
<td></td>
<td>d. seventh</td>
</tr>
</tbody>
</table>

☆IMPROVED with MORE CONCISE STEM☆

On which post-natal day do bilirubin levels peak in a newborn with physiologic jaundice?

a. second
b. third
c. fifth
d. seventh

G. When a stem asks for verbal responses by the nurse, caregiver, or a child, the options should be written within quotation marks. Most importantly, the options should be written using words that would be appropriately used by the individual providing the response.

Examples: Sample questions: inappropriate and appropriate caregiver responses

Options A and C include wording that family would not likely use

Prior to starting a patient on bosentan (Tracleer), education is provided to the family. Which statement by the family demonstrates their understanding?

a. “It is a phosphodiesterase type 5 inhibitor.”
b. “It is necessary to follow renal function tests monthly.”
c. “It is an endothelin A&B receptor blocker.” <key>
d. “It is administered 3 times daily.”

IMPROVED Version

The caregivers received education regarding bosentan (Tracleer) which their child with pulmonary artery hypertension will be taking at home. Which of the following statements demonstrates their understanding?

a. “We need to watch for changes in the color of our child’s urine and stool.” <key>
b. “Our child will need to be given the medication at exactly the same times every day.”
c. “We will have monthly blood work appointments to check our child’s kidney function.”
d. “Our child is expected to still have occasional episodes of shortness of breath and weakness.”
**Advanced formatting and style requirements**

A. When medications have recognizable brand names, the generic name is listed first and written in lowercase, followed by the capitalized brand name contained in parentheses.

   **Example:**  
   (A) atomoxetine (Strattera)  
   (B) clonidine (Catapres)  
   (C) methylphenidate (Concerta)  
   (D) paroxetine (Paxil)

B. When including the name of a bacterium or bacteria in an item, the genus name is italicized and the first letter capitalized, and the species name is italicized, but not capitalized.

   **Example:**  
   (A) Adenovirus  
   (B) *Chlamydia trachomatis*  
   (C) Group B streptococcus  
   (D) *Neisseria gonorrhoeae*

C. The use of the term “radiograph” is standard, as opposed to x-ray.

D. When terms are readily recognized by their acronym or abbreviation, the term appears first followed by the acronym or abbreviation contained within parentheses. An acronym or abbreviation is only used in a stem if it is then used again in the stem or within any options.

E. When providing laboratory values, include the unit of measurement. For example:

<table>
<thead>
<tr>
<th>Laboratory Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin</td>
</tr>
<tr>
<td>Lead level</td>
</tr>
<tr>
<td>Vitamin D</td>
</tr>
</tbody>
</table>

F. Format the following measurements as:

<table>
<thead>
<tr>
<th>Examples of Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>Temperature</td>
</tr>
</tbody>
</table>

G. For volume measurements, milliliters (mL) is standard use as opposed to ounces. The exception is when reporting PO formula feeding, which is provided with both ounces and milliliters. **Example:** 4 oz (120 mL)
SECTION 2: Item Writing Guidance through Examples

Examples of Items, Stems, Options, and Editing

A review to help build item writing skills

Building item writing skills takes practice. Each year it is important to review this manual before you begin your item writing assignment to refresh your memory of the item writing principles covered in Section 1. Learning to critique items can also help with your skill development. Critiquing your items before they are submitted to PNCB is an important step in ensuring that they comply with style requirements.

In this section, example questions are provided for you to critique and identify item flaws by applying what you have learned in Section 1. Following the 12 example questions, these questions are repeated along with information about the flaws and suggestions for modifying a few of the items.

Enjoy applying your knowledge. This practice should prove helpful in potentially recognizing flaws should you make them in your items.

When options are included in the examples below, the key is bolded.

Example 1:

After providing education to caregivers about the administration of levothyroxine (Synthroid) to their infant, which of the following statements indicates that teaching was effective?

A. “We will start by administering one capsule daily.”
B. “We will expect blood testing every six months to check the thyroid.”
C. “This medication will be started after our baby turns one.”
D. “This medication will stimulate gluconeogenesis, protein synthesis, and basal metabolism.”

Item Flaw(s):

Example 2:

Which of the following is the MOST likely result if a child with type 1 diabetes misses a meal?

A. increase in protein synthesis
B. increase in glycogen storage
C. increase in insulin level
D. decrease in blood glucose

Item Flaw(s):
Example 3:

When providing preoperative care, which of the following interventions are MOST essential to ensure the child’s safety?

A. verify identification band, document allergies, maintain NPO status
B. check laboratory values, prepare operative site, assess child’s coping mechanisms
C. confirm consent, remove personal belongings, administer preoperative medication
D. provide age-appropriate explanations, document current height and weight, remove nail polish

Item Flaw(s):

Example 4:

The onset of action for regular insulin is expected within:

A. 5-10 minutes
B. 15-30 minutes
C. **30-60 minutes**
D. 45-60 minutes

Item Flaw(s):

Example 5:

When providing guidance to a caregiver who has called concerned about her child’s ankle pain after tripping over a toy, which of the following actions is the PRIORITY?

A. apply ice to the ankle
B. have the child rest and give ibuprofen
C. determine amount of pain while weightbearing
D. **have the child rest, elevate the leg, and apply ice**

Item Flaw(s):
Example 6:

Your teenage patient requests a copy of the radiograph of his tibia/fibula fracture so he can post it on Facebook. Your response is:

A. Sure, I'll print you a copy
B. You need to have your parent’s permission
C. **You need to request a copy from medical records**
D. Sure, do you need a copy of my notes as well?

**Item Flaw(s):**

Example 7:

**Stem:** A mother brings her 4 month old in for a well-child visit and is seeking advice on what she can do to help her child’s development. Which of the following activities does not promote cognitive development?

**Item Flaw(s):**

Example 8:

A 13 month old has been fed whole milk since 9 months of age and currently has a Hgb of 10 g/dL. Which laboratory test will BEST evaluate this child for iron deficiency?

A. serum ferritin and CRP
B. serum transferring receptor concentration (TfR1)
C. **complete blood count**
D. peripheral smear of the red blood cells

**Item Flaw(s):**
Example 9:

**Stem:** Which population of adolescents has the lowest level of contraceptive use?

---

Example 10:

When assessing heart sounds of a child, the nurse hears fixed splitting. This is an important manifestation of:

A. atrial septal defect
B. ventral septal defect
C. truncus arteriosus
D. patent ductus arteriosus

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Example 11:

A child is seen in the clinic. His parents report that over several days he has periorbital edema, especially in the morning, poor appetite, and a decreasing amount of urine that looks like coke. The nurse should evaluate this child for which disease process?

A. pyelonephritis
B. nephrotic syndrome
C. vesicoureteral reflux
D. acute glomerulonephritis
Example 12:

Jason weighs 7.50 kg and is evaluated as being 10% dehydrated. The doctor orders IV fluids at one and one half maintenance. How many mL’s of fluid should Jason receive over a 24-hour period?

A. 375 mL per 24 hr.
B. 750 mL per 24 hr.
C. 1125 mL per 24 hr.
D. 1500 mL per 24 hr.

**Take the Challenge!**

Before looking at the PNCB answers for the examples provided above, try to rewrite the stems in Examples 10, 11 and 12. Compare your revisions to those we drafted.

Examples, Answers and Teaching Points

Example 1:

After providing education to caregivers about the administration of levothyroxine (Synthroid) to their infant, which of the following statements indicates that teaching was effective?

A. “We will start by administering one capsule daily.”
B. “We will expect blood testing every six months to check the thyroid.”
C. “This medication will be started after our baby turns one.”
D. “This medication will stimulate gluconeogenesis, protein synthesis, and basal metabolism.”

Flaw(s) and Teaching Points:

- **Key is not a statement that would be made by a caregiver** > When a question asks about effective teaching, the caregiver’s statements should be in words a caregiver would use. While caregivers often develop expertise and master the use of some medical terminology, it is very unlikely they would make a statement as included in Option D, the correct response.
Example 2:

Which of the following is the MOST likely result if a child with type 1 diabetes misses a meal?

A. increase in protein synthesis  
B. increase in glycogen storage  
C. increase in insulin level  
D. decrease in blood glucose

Flaw(s) and Teaching Points:

➢ Key does not blend in with other options > The correct response should ALWAYS blend in among the other options. In this case the stem stands out as the distractors all begin with “increase” and the key is the only option that begins with “decrease”.

An easy way to fix this is to change one of the distractors to also begin with “decrease” creating two options that begin with “increase”, and two with “decrease”.

This question is included for teaching purposes and is too easy for any of the PNCB certification exams. When writing questions, remember that questions should test knowledge at a level appropriate to determine certification.

Example 3:

When providing preoperative care, which of the following interventions are MOST essential to ensure the child’s safety?

A. verify identification band, document allergies, maintain NPO status  
B. check laboratory values, prepare operative site, assess child’s coping mechanisms  
C. confirm consent, remove personal belongings, administer preoperative medication  
D. provide age-appropriate explanations, document current height and weight, remove nail polish

Flaw(s) and Teaching Points:

➢ Test-taker knowing only one intervention can get the question correct > When each option contains a list, make sure to include elements from the list in other options so that the test-taker does not get the question correct by recognizing only one of the elements in the list. See this technique implemented below:

A. verify identification band, document allergies, maintain NPO status  
B. maintain NPO status, prepare operative site, assess child’s coping mechanisms  
C. confirm consent, document allergies, administer preoperative medication  
D. provide age-appropriate explanations, verify identification band, remove nail polish

Options that contain a list should ideally be limited to no more than three elements. If the list is longer, consider putting a few of the elements in the stem.

As with the previous example, this item is too easy for PNCB certification exams.
Example 4:

The onset of action for regular insulin is expected within:

A. 5-10 minutes  
B. 15-30 minutes  
C. **30-60 minutes**  
D. 45-60 minutes

**Flaw(s) and Teaching Points:**

➢ **Overlap in time within options makes more than one option correct** > To avoid this mistake, make sure ranges are unique.

Example 5:

When providing guidance to a caregiver who has called concerned about her child’s ankle pain after tripping over a toy, which of the following actions is the PRIORITY?

A. apply ice to the ankle  
B. have the child rest and give ibuprofen  
C. determine amount of pain while weightbearing  
D. **have the child rest, elevate the leg, and apply ice**

**Flaw(s) and Teaching Points:**

➢ **More than one response is correct** > Option A is also correct as the question is written.  
➢ **Key stands out containing more detail** > The key should blend in among the other options. In this case the key contains three elements, which means more detail. The test-taker who is guessing is more likely to pick option D because of the detail. The remedy is to ensure that at least one other option contains 3 actions.
Example 6:

Your teenage patient requests a copy of the radiograph of his tibia/fibula fracture so he can post it on Facebook. Your response is:

A. Sure, I’ll print you a copy
B. You need to have your parent’s permission
C. **You need to request a copy from medical records**
D. Sure, do you need a copy of my notes as well?

**Flaw(s) and Teaching Points:**

- **Use of “your” in the stem** > When a question asks what “you” would do, it asks for a judgement NOT the appropriate action or response. And, when it asks what the test-taker would do, well, there is not an incorrect response.
- **Options are not parallel** > If one option is written as a question, another option should be written asking a question. This would provide balance with two statements, and two questions among the answer choices.
- **Responses should be within quotations** > If option choices are intended as verbal responses, then they should be within quotations and should also use words appropriate to the person providing the response.

**One version of a stem revision:**

An adolescent with a fracture requests a copy of the radiograph to post on social media. The appropriate response is to

A. provide a printed copy based on verbal request after removing identifiers.
B. explain that any copy of the radiograph must be provided directly to parents.
C. **Advise that medical record requests must be submitted in writing.**
D. direct the adolescent and parents to radiology for a copy of the radiograph.

Example 7:

**Stem:** A mother brings her 4 month old in for a well-child visit and is seeking advice on what she can do to help her child’s development. Which of the following activities does not promote cognitive development?

**Flaw(s) and Teaching Points:**

- **Negatively worded stem** > PNCB exams DO NOT use negatively worded stems, such as asking “Which of the following DOES NOT...” or “All of the following EXCEPT...” While these are easier questions to write, the reason for excluding this style is test-taker fairness. An anxious test-taker can easily overlook the negative term when attempting to “think in reverse” to identify an exception.
Example 8:

A 13 month old has been fed whole milk since 9 months of age and currently has a Hgb of 10 g/dL. Which laboratory test will BEST evaluate this child for iron deficiency?

A. serum ferritin and CRP  
B. serum transferring receptor concentration (TfR1)  
C. complete blood count  
D. peripheral smear of the red blood cells

Flaw(s) and Teaching Points:

➢ Unnecessary information > Lighten the reading load by eliminating unnecessary information.

Sometimes item writers will try to add a clinical context in an effort to increase the item’s cognitive level. In this case, it does not change that this is a recall level question. Because it is a simple recall question, the first sentence can be eliminated and the reference to “this child” removed. The stem then becomes, “Which laboratory test will BEST evaluate for iron deficiency?”

Example 9:

Stem: Which population of adolescents has the lowest level of contraceptive use?

Flaw(s) and Teaching Points:

➢ Test important knowledge that is clinically relevant > Consider what knowledge is more relevant clinically.

By changing the stem to focus on clinically pertinent contraceptive options, rather than identifying an ethnic group, the question becomes more clinically relevant. See revisions provided below.

One version of a stem revision:  
Latino adolescents prefer which method of contraception?
Example 10:

When assessing heart sounds of a child, the nurse hears fixed splitting. This is an important manifestation of:

A. atrial septal defect
B. ventral septal defect
C. truncus arteriosus
D. patent ductus arteriosus

**Flaw(s) and Teaching Points:**

- **Stem not direct in posing question and includes unnecessary information** > Lighten the reading load by eliminating unnecessary information.

  In this question, since the “nurse” is the test-taker, it is not necessary to include in the stem. It can be helpful when critiquing an item is to ask what the question is asking and consider if there is a more direct way to ask that question. Sometimes the item writer may put a question into a clinical scenario, which is not needed. See stem revision below for a more direct question.

**One version of a stem revision:**

When auscultating a child’s heart sounds, fixed splitting of the $S_2$ sound is considered a manifestation of:

A. atrial septal defect
B. ventral septal defect
C. truncus arteriosus
D. patent ductus arteriosus
Example 11:

A child is seen in the clinic. His parents report that over several days he has periorbital edema, especially in the morning, poor appetite, and a decreasing amount of urine that looks like coke. The nurse should evaluate this child for which disease process?

A. pyelonephritis  
B. nephrotic syndrome  
C. vesicoureteral reflux  
D. acute glomerulonephritis

Flaw(s) and Teaching Points:

➢ Use of gender > Avoid introducing gender if it is not necessary.  
➢ Unnecessary information > Lighten the reading load by eliminating unnecessary information.  

In this question, where the child is seen is not important and can be removed. Also, since the “nurse” is the test-taker, it is not necessary to include in the stem.  

One version of a stem revision:

A child recently treated for strep throat has had a poor appetite over several days, decreasing amounts of urine that is now cola-colored, and periorbital swelling that is especially evident in the morning. These symptoms are MOST consistent with:

A. pyelonephritis  
B. nephrotic syndrome  
C. vesicoureteral reflux  
D. acute glomerulonephritis
Example 12:

Jason weighs 7.50 kg and is evaluated as being 10% dehydrated. The doctor orders IV fluids at one and one half maintenance. How many mL’s of fluid should Jason receive over a 24-hour period?

A. 375 mL per 24 hr.
B. 750 mL per 24 hr.
C. 1125 mL per 24 hr.
D. 1500 mL per 24 hr.

Flaw(s) and Teaching Points:

➢ Use of name > Do NOT identify the child, staff or caregivers by a name.
➢ Unnecessary information > Lighten the reading load by eliminating unnecessary information.

The objective of the question is to assess knowledge of the appropriate fluid maintenance rate for an infant of that weight, and to then calculate at 1.5 times. To answer this question correctly it is not necessary to know that the infant is evaluated at 10% dehydrated.

➢ Repeated information in each option > When information is repeated in each option, consider if it can be added to the stem to avoid the repetition. The 24-hour period was already mentioned in the stem, so it was removed from the options.

One version of a revision:

An infant weighing 7.5 kg has IV fluids ordered for 1.5 times the maintenance rate. How many mL of fluid should be given over a 24-hour period?

A. 375 mL
B. 750 mL
C. 1125 mL
D. 1500 mL
Section 3: Developing Questions and Refining Skills

Developing your question

After receiving your PNCB assignment, the first step in the process of item writing is to review the content outline to identify an area, and write down the:

- general content area or clinical problem you wish to focus on;
- specific behavior (e.g., assessment, diagnosis, treatment, management, or referral) you are interested in testing;
- rationale (in terms of clinical outcomes) or an objective for a question. Think about why it is important to be able to assess, diagnose, order the correct diagnostic study, treat, manage, or appropriately refer for the specific problem.

The basic idea for the clinical content or behavior to be assessed can come from several sources. You may have been asked to write items on a specific topic or you may already have some ideas in mind. Other ideas can come from:

- personal clinical experience
- courses or classes taken
- current literature (journals and review articles)
- textbooks
- common mistakes in practice
- frequently confused concepts
- clinical practice guidelines, or evidence-based reviews
- outdated beliefs or practice
- recent clinical advances or discoveries
- medication side effects and interactions

Explore your topic idea and consider creating a list of knowledge related to the topic that is important to know. Reading about the topic in textbooks can be helpful in focusing on the most important aspects that your question might assess.

One style of question used in PNCB’s exams incorporates a clinical-based scenario into the stem of the question. This foundational part of the stem provides essential background information and precedes the definition of the test-taker’s task. This “scenario” is referred to as the clinical stem.

**Developing a clinical stem**

In general, the clinical stem should be the longest part of an item, containing the essential information required to select the correct option. As you develop this part of the stem you may need to edit it several times to remove “window dressing” and unnecessary details. Information that may be significant includes: age, gender, medical history, presenting symptoms, and laboratory values/examination results. As a rule, the stem should not include irrelevant information unless it is linked to misconceptions regarding the management-treatment decision represented in any of the distractors.
Below are two examples of the types of clinical stem used in items:

Example: A 2 month old [age] presents with bilious vomiting [symptom] for 24 hours. Physical examination is unremarkable [examination result], and there is no weight loss [examination result].

Example: A 14-year-old [age], mildly obese, otherwise healthy male [gender] presents with a limp and pain in the right knee that has been increasing in intensity for the past few days [symptom]. There is no history of trauma [clinical history]. Physical examination is significant for external rotation and limited abduction of the right hip and knee [examination result].

Reminder> Appropriate use of age and gender: In the second example above, the inclusion of age and gender in the stem are appropriate since the prevalence of slipped capital femoral epiphysis (SCFE) is greater among adolescent males. Remember to avoid the introduction of age and/or gender when it is not relevant.

Finalizing the stem to define the test-taker’s task: lead-in question or incomplete sentence

You have a choice of two ways to format the ending of your stem: as a lead-in question or as an incomplete statement that immediately follows the clinical stem. Each serves as the link to the answer options. PNCB does not prefer one style over the other. Most item writers use both styles.

Incomplete statements and lead-in questions should be short and to the point, clearly directing the test-taker to the desired cognitive task. Using the first stem from above, the two options below show the final development of the stem to define a task for the test-taker, one written as an incomplete statement or open stem, and the other written as a closed stem:

<table>
<thead>
<tr>
<th>Open Stem Question:</th>
<th>Closed Stem Question:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Stem + Incomplete Statement (options will complete sentence)</td>
<td>Clinical Stem + Lead-in Question</td>
</tr>
<tr>
<td>A 2 month old presents with bilious vomiting for 24 hours. Physical examination is unremarkable, and there is no weight loss. The MOST appropriate diagnostic study to establish the diagnosis of malrotation is</td>
<td>A 2 month old presents with bilious vomiting for 24 hours. Physical examination is unremarkable, and there is no weight loss. What is the MOST appropriate diagnostic study to establish the diagnosis of malrotation?</td>
</tr>
</tbody>
</table>

Developing the test-taker’s task

As discussed previously (pg. 5), it is more appropriate for PNCB’s exams to have more questions that are directed at assessing higher cognitive levels such as those that require application or analysis of knowledge, as opposed to questions that rely on memory or rote recall. Below are examples of questions that follow the clinical stem, formatted as either a lead-in closed stem question or as a parallel open-stem style, that are more likely to assess higher level cognitive processes.
### Examples of questions (lead-in and sentence completion) used with clinical stems to develop test items with higher cognitive levels

#### Assessment
- Which of the following findings indicates a need for further assessment?
- Which assessment finding is a PRIORITY concern?
- The MOST important history information is...
- Which of the following would be the MOST appropriate initial question?
- Which of the following is the MOST important piece of information to gather from this child?
- What should be interpreted from this data?
- Which of the following tests should be ordered?
- Which of the following abnormal findings should be expected when performing the assessment?
- Which of the following findings needs further investigation?
- Which of the following is an expected finding?
- Which is the MOST important factor to consider?
- Which of the following laboratory results would be expected for this child?

#### Diagnosis
- The MOST likely diagnosis is...
- The MOST likely cause is...
- Which of the following findings would help support this diagnosis?
- Which of the following is the MOST common presenting sign of xxxx?
- These signs and symptoms are MOST consistent with...
- This finding is MOST likely...
- The vital signs are suggestive of which of the following?
- This clinical description is indicative of...
- Associated risks include which of the following?
- Which of the following manifestations should be expected?
- Which of the following symptoms would be expected with this diagnosis?

#### Management
- Which of the following is appropriate management?
- Which is the MOST important first step?
- Which of the following is the BEST treatment choice?
- The NEXT step in management is...
- After xxxx, the BEST action would be to...
- Which of the following treatments is MOST appropriate?
- Which of the following is an appropriate nursing intervention?
- The best INITIAL management includes...
- Which of the following is the MOST appropriate medication?
- Which of the following would be recommended or prescribed?
- Which of the following is the MOST appropriate NEXT step to add in treatment?
- Which exam finding will require a referral to a(n) xxxx?
- Monitoring for which of the following common complications is indicated?
### Examples of questions (lead-in and sentence completion) used with clinical stems to develop test items with higher cognitive levels

<table>
<thead>
<tr>
<th>Priorities</th>
<th>Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Which of the following findings is the most IMMEDIATE concern?</td>
<td>• Which of the following is the MOST appropriate advice?</td>
</tr>
<tr>
<td>• Which of the following evaluations should occur FIRST?</td>
<td>• The BEST anticipatory guidance includes...</td>
</tr>
<tr>
<td>• The IMMEDIATE action should be to initiate...</td>
<td>• The caregiver’s readiness to learn can best be assessed by asking which</td>
</tr>
<tr>
<td>• Which of the following laboratory tests should be performed FIRST?</td>
<td>of the following questions?</td>
</tr>
<tr>
<td>• Which of the following is the FIRST intervention?</td>
<td>• Which of the following should be included in teaching?</td>
</tr>
<tr>
<td>• Which of the following would be the PRIORITY in the plan of care?</td>
<td>• Which of the following statements demonstrates an understanding of the</td>
</tr>
<tr>
<td>• What is the MOST appropriate NEXT step?</td>
<td>diagnosis and treatment plan?</td>
</tr>
<tr>
<td></td>
<td>• Which of the following is the MOST important information to address</td>
</tr>
<tr>
<td></td>
<td>caregiver concerns about xxxx?</td>
</tr>
</tbody>
</table>

When developing the options for the question, take care to ensure grammatically consistent links between the question and the options.

### Item Shells

Item writers, especially when new to the process, can jumpstart their creativity and develop ideas for questions by using an item shell. Haladyna and Shindoll (1989) have suggested that the use of item shells can be helpful to beginning item writers. An item shell is a “hollow” item containing a structure or framework that is used to write similar items by exchanging certain details to create a new question. An example of an item shell format is:

> Which of the following is the MOST common side effect associated with long-term use of [INSERT MEDICATION]?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td><strong>KEY</strong> [correct side effect]</td>
</tr>
<tr>
<td>B.</td>
<td><strong>DISTRACTOR</strong> [plausible side effect]</td>
</tr>
<tr>
<td>C.</td>
<td><strong>DISTRACTOR</strong> [plausible side effect]</td>
</tr>
<tr>
<td>D.</td>
<td><strong>DISTRACTOR</strong> [plausible side effect]</td>
</tr>
</tbody>
</table>

Using this question as an item shell, this same stem could be used to create multiple questions by substituting a different medication usually taken for longer periods, and then creating a new key and distractors.

Clinical stems adapt well to item shells too. Simply create new stems by changing the lead-in question at the end of the stem. In the example below, consider all the other questions that might be asked related to this clinical stem other than asking about the most appropriate diagnostic study.
EXAMPLE

A 2 month old presents with bilious vomiting for 24 hours. Physical examination is unremarkable, and there is no weight loss. What is the MOST appropriate diagnostic study to establish the diagnosis of malrotation?

Item shells can also be created by identifying multiple elements in the stem that could be changed. In the stem above, a new question could be created by changing elements such as the age of the child, the symptoms, the period of symptoms, and perhaps the lead-in question or diagnosis. The steps for creating an item shell from an item you have written is to:

1. Identify the stem
2. Underline key words or phrases that indicate the content of the item
3. Identify potential variations for each key word or phrase (e.g., age of child, disease, treatment, complications, type of accident, vital signs)
4. Select one (or more) of the variations
5. Write the stem with the variation
6. Write the correct answer
7. Write plausible distractors

An additional way to write new items is to create a different version of an item, whereby you keep the stem the same (or modify it only slightly), but change the key and some of the distractors, thereby developing a new item. The original and new version of the item would not appear on the same exam form together; however, the similar versions may appear on different exam forms.

Below is an exercise that provides three questions. Create an item shell from each question. In the area to the right of each question, write a new item, modifying the stem, key, and distractors as appropriate.

<table>
<thead>
<tr>
<th>EXERCISE: Use an item shell to create new items by changing information</th>
</tr>
</thead>
<tbody>
<tr>
<td>For each of the following, identify the key words or phrases that represent the content of the item in the stem. Select a variation for the key word(s) and write a new stem using the variation along with a new correct answer, and distractors.</td>
</tr>
</tbody>
</table>
| 1. Which of the following conditions would restrict a high school student from participating in wrestling? | New Stem: _________________________________
|   a. asthma | _________________________________
|   b. absence of one testicle | _________________________________
|   c. facial herpes simplex | _________________________________
|   d. controlled epileptic seizures | _________________________________ |
|   a. _________________________________ |   b. _________________________________
|   c. _________________________________ |   d. _________________________________ |
EXERCISE: Use an item shell to create new items by changing information

2. Which of the following medications is MOST effective in the treatment of localized impetigo?
   a. Topical Bacitracin
   b. Oral Penicillin VK
   c. Oral Amoxicillin/clavulanic acid (Augmentin®)
   d. Topical Mupirocin (Bactroban®)

   New Stem: _________________________________
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

   a. __________________________
   b. __________________________
   c. __________________________
   d. __________________________

3. Which is the MOST appropriate recommendation for a child with irritable bowel syndrome?
   a. adhere to a low-residue diet
   b. begin a trial of an antispasmodic drug
   c. empty the bowel daily
   d. apply cold compresses to the abdomen

   New Stem: _________________________________
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

   a. __________________________
   b. __________________________
   c. __________________________
   d. __________________________

Examples of Item Shells

The chart below provides more information about developing item shells that includes considering the desired objective or test-taker’s task to create the appropriate lead-in question. [Adapted from Haladayna & Shindoll (1989)]

<table>
<thead>
<tr>
<th>TEST-TAKER’S TASK</th>
<th>CLINICAL STEM</th>
<th>LEAD-IN QUESTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make correct diagnosis</td>
<td>Information about disease or injury</td>
<td>What is the correct diagnosis for this child?</td>
</tr>
<tr>
<td>Evaluate situation and anticipate consequences</td>
<td>Combination of information about situation</td>
<td>What is the MOST common (cause, complication, symptom, consequence) of this (procedure, drug therapy, problem)?</td>
</tr>
<tr>
<td>Select most effective treatment</td>
<td>Information about disease or injury and suggested diagnosis</td>
<td>Which of the following treatments is appropriate?</td>
</tr>
<tr>
<td>Evaluate potential causes and select correct one</td>
<td>Describe symptoms of child’s disease or problem</td>
<td>What is the MOST likely cause of the (disease or problem)?</td>
</tr>
<tr>
<td>Evaluate alternative treatments and select step to be implemented</td>
<td>Diagnosis, history, and information about patient management</td>
<td>What is the appropriate drug therapy at the time of treatment? What is the NEXT step in the management of this child’s care?</td>
</tr>
<tr>
<td>Identify symptoms or characteristics of a disease or injury</td>
<td>Information about a specific disease or condition</td>
<td>What set of symptoms can be expected?</td>
</tr>
<tr>
<td>Determine information needed to make correct diagnosis</td>
<td>Medical history given for particular problem</td>
<td>What additional information is necessary for a proper diagnosis?</td>
</tr>
<tr>
<td>Determine unwanted event or complication likely for given problem and/or treatment</td>
<td>Disease or problem and treatment described</td>
<td>What is the MOST likely complication of this (procedure, treatment, drug therapy)?</td>
</tr>
</tbody>
</table>
## Section 4: Critiquing your Items before Submission

<table>
<thead>
<tr>
<th>Does your item:</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Provide a clear task for test-taker without reading options? (p. 7)</td>
<td></td>
</tr>
<tr>
<td>□ AVOID use of teaching statements? (p. 7)</td>
<td></td>
</tr>
<tr>
<td>□ Minimize reading load by eliminating unnecessary words? (p. 6)</td>
<td></td>
</tr>
<tr>
<td>□ Promote fairness using person-centered language? (p. 10)</td>
<td></td>
</tr>
<tr>
<td>□ Assess for higher cognitive levels of application and analysis? (p. 4-5)</td>
<td></td>
</tr>
<tr>
<td>□ Include relevant details to allow knowledgeable test-takers to select the correct response? (p. 6, 7)</td>
<td></td>
</tr>
<tr>
<td>□ Include four options that relate and flow with the stem? (p. 12-13)</td>
<td></td>
</tr>
<tr>
<td>□ Provide parallel structure to blend the key in with other options? (p. 10, 14)</td>
<td></td>
</tr>
<tr>
<td>□ AVOID use of “none of the above” or “all of the above”? (p. 3)</td>
<td></td>
</tr>
<tr>
<td>□ Offer mutually exclusively options when numeric ranges are used? (p. 10)</td>
<td></td>
</tr>
<tr>
<td>□ Include plausible but incorrect distractors, and avoid “giveaways”? (p. 6, 10-11)</td>
<td></td>
</tr>
<tr>
<td>□ AVOID the use of “universal” terms such as ALWAYS, ALL, or NEVER, minor distinctions, or being tricky to make distractor incorrect? (p. 11)</td>
<td></td>
</tr>
<tr>
<td>□ Include appropriate punctuation?</td>
<td></td>
</tr>
<tr>
<td>- Closed stems end with “?” (p. 3, 13, 30)</td>
<td></td>
</tr>
<tr>
<td>- If options are complete sentences, they end in periods.</td>
<td></td>
</tr>
<tr>
<td>- If options are phrases, the first letter of first word in each option is lower case, and options end without punctuation.</td>
<td></td>
</tr>
<tr>
<td>- Open stems end without punctuation when options are written to complete the sentence begun in the stem. Each options’ first word begins with a lower-case letter, and each option ends with a period. (p. 3, 12, 30)</td>
<td></td>
</tr>
<tr>
<td>- Open stems end in a colon if the options are single terms, such as medications, conditions or microorganisms, and each option ends without punctuation. (p. 13)</td>
<td></td>
</tr>
<tr>
<td>□ Assess knowledge that is important and relevant to practice, and <em>delves beyond the ordinary</em>? (p. 2, 5)</td>
<td></td>
</tr>
<tr>
<td>□ Identify a correct response (key) for each question and each question has ONLY one correct response? (p. 3, 23)</td>
<td></td>
</tr>
<tr>
<td>□ Represent individuals fairly without potential bias (e.g., gender, cultural)? (p. 9-10)</td>
<td></td>
</tr>
<tr>
<td>□ Provide a complete reference citation for each item including the page number(s)? (p. 11-12, 29)</td>
<td></td>
</tr>
<tr>
<td>□ Include a reference citation that supports the key? (p. 11-12)</td>
<td></td>
</tr>
<tr>
<td>□ Include the content outline area that each item belongs too? (p. 4)</td>
<td></td>
</tr>
<tr>
<td>- Example: I.A.2</td>
<td></td>
</tr>
</tbody>
</table>
How your items are submitted to PNCB will vary based on whether you are writing for exams, exam prep products, or continuing education (CE) modules. Instructions received with your PNCB assignment will include details on how your items are to be submitted.

Questions? We’re here to help! Email us at itemwriting@pncb.org.

Below are links to key support resources for your item writing efforts, such as exam content outlines and approved reference lists.

<table>
<thead>
<tr>
<th>Exams and Products</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>Visual Guide to the Basics of Item Writing</td>
</tr>
<tr>
<td>CPN Exam</td>
<td>Content Outline and Approved Reference List</td>
</tr>
<tr>
<td>CPNP-AC Exam</td>
<td>Content Outline and Approved Reference List</td>
</tr>
<tr>
<td>CPNP-PC Exam</td>
<td>Content Outline and Approved Reference List</td>
</tr>
<tr>
<td>PMHS Exam</td>
<td>Content Outline and Approved Reference List</td>
</tr>
</tbody>
</table>

Thank you!

Volunteering your time and expertise to support PNCB’s programs is greatly appreciated. Thank you so much for making a difference for your profession, pediatrics, peers and future colleagues.