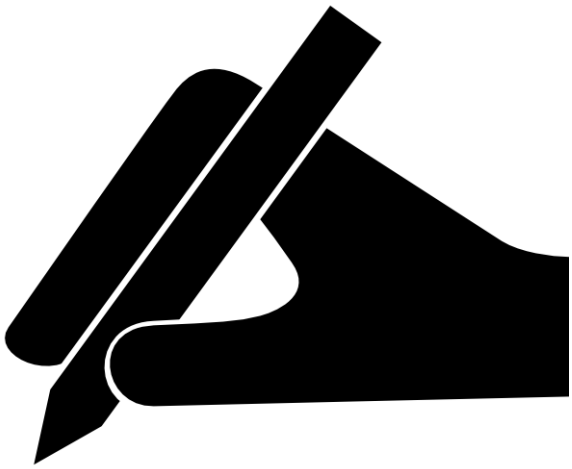
PNCB®

PEDIATRIC NURSING CERTIFICATION BOARD

ITEM WRITING MANUAL



Revised February 2021

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. If you are later invited to write questions for CE modules, then your ability to write items helps to assess learning as a part of ongoing continuing competence.

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 are either not approved for use by the exam committee or if approved for pretesting, do not perform well statistically. This may be due to flaws such as unclear stems, implausible distractors, or distractors that are potentially correct (you'll learn more about these later in the manual). By working to develop, improve, and refine your item writing skills, you can increase the likelihood that your items will successfully progress to use as scored items in PNCB's exams. As a volunteer, we know you want your contributions to count.

This manual contains important guidance to help build your item writing skill; however, the reality is that it will require devoting time to identify strong ideas for items and to develop the content into questions that appropriately assesses knowledge worthy of determining certification. As is true with many things in life, this process comes easier to some than others. It does promise to exercise unique cognitive abilities that will likely prove helpful to your nursing practice. This is because determining the right question to ask and the best way to frame it, is a skill needed for accurate assessment, diagnosis, and management, as well as for assessing test-takers' knowledge to establish qualifications for certification. In other words, asking the right question *matters*.

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. Each year before you begin your item writing assignment, it is also important to review the manual again to refresh your memory on item writing principles and PNCB style and practices.

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. 19)

Section 3: Refining Skills and Developing Clinical Stems (pg. 31)

Section 4: Critiquing your Items before Submission (pg. 38)

Section 5: The Documented Item and Resource Links (pg. 39)

Throughout this manual, 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, 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 purpose of test questions is to differentiate between test-takers who have the knowledge and those who do not. Fairness is important in test questions, and items should never be written to be "tricky". Items should be developed such that the test-takers with the knowledge get the question correct, and those without the knowledge get the question wrong.

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 begun in the stem.

EXAMPLES of OPEN versus CLOSED STEMS	
Closed Stem	**A young adolescent male is considering strength training to enhance muscle mass. Which guidance is MOST appropriately provided?** a. workouts should focus on 1-2 muscle groups on any exercise day b. powerlifting should be delayed until later in reproductive maturation **< key** c. strength training should occur at least five times a week to be effective d. other forms of exercise should be avoided on days that strength training is done
Open Stem	**Appropriate guidance for a young adolescent male considering strength training to enhance muscle mass includes that** a. workouts should focus on 1-2 muscle groups on any exercise day. b. powerlifting should be delayed until later in reproductive maturation. **< key** c. strength training should occur at least five times a week to be effective. d. other forms of exercise should be avoided on days that strength training is done.

Other components of a question are the:

Key correct option/response

Distractors incorrect options/responses

SAMPLE QUESTION	
STEM>>	The MOST important reason to frequently review a child's use of a peak expiratory flow device is because
DISTRACTOR>> **DISTRACTOR>>** **KEY>>** **DISTRACTOR>>**	a. noncompliance is prevalent. b. values and technique vary by brand. c. technique and effort affect measurements. d. personal best measurement must be validated. } **OPTIONS**

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

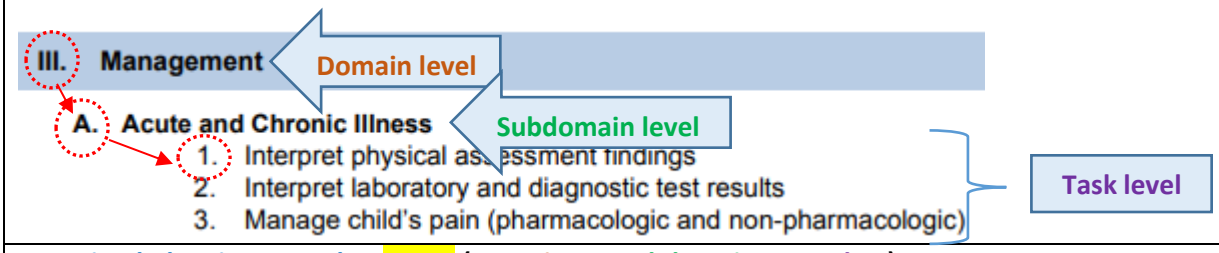
For each certification exam, PNCB conducts initial and on-going role delineation/job analysis studies to determine the knowledge, skills, and abilities necessary for each nursing role. The final products of this research include the **content outline** which identifies the major domains of knowledge or content covered in the exam and the **test specifications** (e.g., how many questions are asked for each major area of the exam). To ensure the validity and defensibility of exams, questions included in any exam must assess knowledge related to specific areas on the content outline.

PNCB maintains a bank of questions for each of its exams. Based on the knowledge a question assesses, it is classified (mapped) to the respective area on the exam's content outline. The inventory of items by areas in the content outline is tracked and your annual item writing assignment will reflect needs in the exam's bank. Thus, the **content outline** is an essential document used by the test developers who assemble the exams, PNCB staff, item writers, and individuals preparing to take the exam. Please take a moment to review the content outline for the exam you will write to, which is located on the exam's *Study Resources* page at the www.pncb.org website.

Fairness is an important requirement for test questions, and that accountability begins with the item writer. One aspect of **fairness** is that each item's content must be congruent with knowledge reflected in the exam's content outline. When writing an item, you're required to record the content area for which the item is written, to the lowest level that applies within the outline (see table below).

EXAMPLE: Using the content outline to map items to their lowest level

Excerpt from content outline (CPN)



Question below is mapped to III.A.1 (Domain III., Subdomain A., Task 1.)

A child presents with headache, fever, and a circumferential ring rash on the forearms that itches. Assessment reveals swollen joints and the rash is warm to the touch. When obtaining the child's health history, it is MOST important to ask whether the child has

a. had a tick bite recently. **< key**
b. been on a field trip with the school.
c. had physical contact with a cat.
d. been in contact with anyone with a similar rash.

Another aspect of fairness is ensuring that questions assess knowledge appropriate for the exam's purpose and the role. For example, both the CPN and PMHS exams address knowledge that experienced pediatric nurses and mental health specialists should possess. The CPNP-AC and CPNP-PC questions, however, are written to encompass knowledge expected for newly certified advanced practice nurses in these areas. For any exam, questions should represent what is most prevalent and realistic to 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 is information that is readily accessible in work references. Examples include immunizations required for specific international travel or certain formulas that are used for calculations.

Understanding Cognitive Levels for Item Writing

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:**

Complexity	**ANALYSIS**	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. In the PNCB exams, analysis questions often include a patient scenario.
	APPLICATION	Questions that have the test-taker use information or knowledge in a specific 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 frequently include a patient scenario; however, the amount of data and problem-solving is less than an analysis-based question.
	RECALL	Questions that require recollection of terms, facts, or other information that may be memorized.

PNCB's ability to assess the candidate's knowledge, skills or abilities is strengthened by questions that require higher-level thinking Thus, questions that require the test-taker to apply knowledge or analyze information to identify a correct response are more relevant and valuable to the exam's purpose than questions that require only recall of information. This is why working to hone your skills as an item writer to ask the *best* question for the knowledge being tested is so important. Writing higher cognitive level questions requires delving into topics to understand the related knowledge and to determine what is most relevant to practice and clinical decision-making.

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. For example, analysis questions require knowledge of multiple concepts to answer, which is evident in the last sample. To answer the question the test-taker must understand the importance of independence to an adolescent, as well as the differences between the types of devices, in order to select the device that best meets this developmental need.

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

Section 3 of this manual (pg. 31) contains extensive information about developing scenario-based questions that begin with creating a "clinical stem." Scenario-based questions are typically 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 child's diagnosis.

Developing item content

Writing well-developed items for exams important enough for establishing credentials takes time and effort. That effort includes exploring topic ideas (based on your item writing assignment) and considering how it relates to your practice experience, as well as perusing references. While journal articles may be reviewed for content ideas, questions must still be referenced to PNCB approved references (specific to the exam you are writing for). It takes some mulling and pondering, and then 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	
Objective: *Test-takers should know specific techniques for making a small child comfortable during a physical exam.*	**Item:** Which of the following is the best position for an apprehensive toddler during a physical exam? a. reclining on examiner's and caregiver's laps as they sit knee to knee <<key b. seated on the exam table and allowed to remain upright c. reclining on exam table holding comfort object *d.* reclining on exam table with head in caregiver's lap

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
- is easily readable by eliminating extraneous information not needed to answer the question
- establishes a clear task/expectation for the test-taker

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, but incorrect, and not 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 critiquing and editing your item several times before its final submission is a necessary part of creating quality items. While your strong knowledge of pediatric practice is a true asset to this endeavor, it is usually the investment in time and effort that 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 phrasing included in many stems. By following this phrase with a noun/subject to define *what* "which of the following" is referring to, the stem becomes more directed. See how this is accomplished in the revised version of the item in the table below.

EXAMPLE: Making the stem more direct	
ORIGINAL	**REVISED**
An adolescent presents with a pierced navel that is swollen, erythematous, and has purulent exudate. Which of the following is the MOST appropriate? **a. prescribe oral antibiotic therapy** b. remove jewelry from navel c. prescribe topical therapy d. cleanse with peroxide	An adolescent presents with a pierced navel that is swollen, erythematous, and has purulent exudate. Which of the following **ACTIONS** is MOST appropriate?" The addition of the noun after "Which of the following" improves the directness of the question, as test-takers now understand that they are identifying "**appropriate ACTIONS**". If option B had been a treatment, as are the other options, then ACTIONS could have been replaced with TREATMENT.

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 in the following 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 stated stems

A negatively stated question requires an active shift in logic for the test-taker, who must now focus on recognizing a single exception. This shift requires the test-taker to recognize several correct options but select an option that is incorrect. Because of this required shift in logic and the risk that the test-taker will overlook the "negative" word in the stem (which happens), this style of question is considered somewhat unfair.

Examples of negatively worded stems
• All of the following studies are used to establish the diagnosis of malrotation **EXCEPT**: • Which of the following is **NOT** a diagnostic study used to diagnose malrotation? • Which is the **LEAST** likely cause of….

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

The only negative stem questions that are allowed are related to knowledge that is specifically learned in that context. For example, knowing certain CONTRAINDICATIONS (to therapies, medications, etc.) is knowledge important and relevant to clinical practice, and therefore, questions asking about these are accepted.

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. At times this takes a bit of creativity in editing and

arranging words. Try your best, although sometimes it seems unavoidable. The challenge often is related to the English language lacking a gender-neutral possessive pronoun, and "their" cannot be grammatically used for a singular child. The exception to this is when the question's context is related to gender identity requiring the use of a gender neutral or gender inclusive pronouns.

Be careful to avoid introducing a child's gender in an option when it was not previously introduced in the stem, as this can be confusing to the test-taker. If it can't be resolved with editing, then introduce the child's gender in the stem.

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…

Including the terms "nurse" or "nurse practitioner" may be appropriately used in questions written for professional practice topics, such as those assessing knowledge about licensure, regulations, or ethics.

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 write the question to ask for 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"; refer to "the child", if needed.
- Keep questions focused on a single objective. Avoid trying to assess as much as possible about the test-taker's abilities from a single clinical situation.

  For example, a stem that asks, "What is the diagnosis and best treatment plan based on current condition?" is addressing two objectives. Focusing on a single objective is more appropriate. Thus, this question should ask either about the diagnosis OR about treatment, but <u>not</u> both.

- When an item includes a scenario, address the child's status first, followed by 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. Readability is also improved with breaking the question up into 2 sentences. (Do keep in mind that most clinical scenario questions are limited to 3 sentences.)

Example 1: Question First	Example 2: Child First <<PREFERRED
Which is the BEST initial treatment for a 10 year old who 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?	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?

- Present patient-related data in the stem, such as presenting concerns or exam findings in a logical sequence. For example, assessment findings that are included might be sequenced from head-to-toe.

EXAMPLE: Sequencing physical exam findings in a logical order
A caregiver presents for concerns with infant's tiring with feeding, diaphoresis, and heavy breathing. Vital signs include a HR 175 bpm, RR 60/min, SpO_2 97% in RA, and BP 80/50. Physical examination reveals acyanosis, rales over bilateral lung fields, a harsh, blowing, 3/6 holosystolic murmur, liver edge 3 cm below the right costal margin, and 2+ pulses in all extremities although slightly cool. The MOST likely diagnosis is: a. atrial septal defect b. coarctation of the aorta c. ventricular septal defect <Key d. truncus arteriosus

- 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. Carefully review and edit options to ensure the correct response blends in among the distractors 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 remedy it by including 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.	Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxx: a. aaaaaa aaaaaaaaaa. b. bbbbbb **and** bbbbbbb bbbbb bbbbbbb. c. cccccccccc **and** ccccccc cccccccc ccccccccc. d. ddddd ddddddddd dddddd ddddddddddddd.

- 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, pgs. 20 and 25)*
- 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. **Person-centered** orientation is more appropriate for ensuring the fair representation of individuals. For example, instead of referring to "the diabetic child", use "a child with diabetes".
- 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. Vary your use of the terms **caregiver(s)**, **parent(s)**, or **mother** or **father**, to promote balance and representation within your items and within 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 those that do not. Work to ensure distractors have some plausibility, because when a distractor is easily dismissed or discounted, the odds improve for guessing correctly. However, it is critical that distractors 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 this type question, options may be correct, just not the BEST. Remember, when writing a question that asks for the BEST or MOST appropriate option, the key must be supported by a reference citation and evidence-based practice, 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 the knowledge 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, such as a differential diagnosis.

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. Also try to include one term from the distractors in other options. This technique reduces the likelihood that a test-taker who only has partial knowledge will get the question correct based on recognizing only one element.

EXAMPLE: Overlap between options decreases likelihood of getting the question correct based on knowing ONLY one of the elements in the key
Which of the following are risk factors for Sudden Infant Death Syndrome (SIDS)? a. maternal smoking during pregnancy, overheating, and winter season **<< KEY** b. firstborn, maternal smoking during pregnancy, and frequent awakening c. frequent awakening, overheating, and recent immunizations d. firstborn, recent immunizations, and winter season

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 must be referenced to a PNCB approved reference: (1) from a textbook included on the approved list for the exam; or (2) citied from a **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 "Notes" field of your item submission, as well as the title of the document, and the publication date and accessed date.)

When citing from a textbook, while the most recent edition is preferred, one edition back (but no older than 7 years) can be used. When documenting an item's reference citation, 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. **PNCB suggests that you record the reference**

citation 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. Also, once you submit your question to PNCB, it is owned by PNCB, who then has ***exclusive rights*** to its use.

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 a **closed stem**, the following apply:
- stem ends in a question mark
- when options are phrases, the first word of each option begins with a lower-case letter
- when options are complete sentences, the first word is capitalized, and the option ends with a period
- each option flows with the stem *(see sample below)*
- options should be similar in structure, grammar, complexity, and length

Sample CLOSED STEM QUESTION
When an item is written with a closed stem, which of the following BEST describes the formatting requirements? a. stems end with a colon b. options begin with an uppercase letter c. stems end with a question mark **<<KEY** d. options are written as complete sentences

B. 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 should be similar in structure, grammar, complexity, and length

Sample OPEN STEM QUESTION with sentence completion
The style rules for formatting an item written with an open stem include a. placing a colon at the end of the stem. b. ending the stem with a question mark. c. punctuating each option with a period at the end. **<<KEY** d. beginning the first word of each option with an uppercase letter.

C. When the stem is written as an **open stem**, but the four options are single words or terms, such as names of medications, microorganisms, diagnoses, or diagnostic procedures, the following apply:

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

Sample OPEN STEM QUESTION with options as a list
When the options in an open stem question are a list of single terms, the stem ends punctuated with a: a. colon **<<KEY** b. comma c. question mark d. period

D. When to ask "**what**" versus "**which**"?

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

Examples: STEMS USING 'WHAT' vs. 'WHICH"
What is the normal range for blood glucose? **For which** of the following infants is the monthly administration of palivizumab (Synagis) injections recommended? The monthly administration of palivizumab (Synagis) injections is recommended for **which** of the following infants?

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.

Examples: Creating parallel structure in options	
Using **lead verbs** to create parallel structure	When examining an apprehensive 2 year old, which of the following techniques is BEST? a. **make** eye contact and focus on the child b. **begin** with the child seated in the caregiver's lap **<< key** c. **have** the caregiver position the child on the exam table d. **provide** explanations throughout the examination procedure
	Continued next page

Examples: Creating parallel structure in options (*continued)*	
Beginning or ending **pairs** of options with the same term	A child has returned from placement of a ventriculoperitoneal (VP) shunt. Positioning the child in which position is MOST appropriate? a. **flat** on operated side b. **flat** on unoperated side **<<key** c. **supine** with head of bed elevated 45 degrees d. **supine** with head of bed elevated 90 degrees A 6 month old has an excoriated, erythematous rash in the diaper area with pinpoint satellite lesions. Which topical treatment would be MOST appropriate? a. 1% hydrocortisone **cream** b. mupirocin **ointment** c. nystatin **ointment <<key** d. tacrolimus **cream**
Creating options pairs, such as two options addressing **testing** and two related to **treatment** with medications	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? a. obtain a scrapped skin **culture** of the rash b. obtain a treponemal automated **test <<key** c. **prescribe** topical steroids d. **prescribe** oral antifungals

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	
ORIGINAL	**IMPROVED**
When educating the parents of a newborn with physiologic jaundice, it is important to include that bilirubin levels a. **peak at the** second **post-natal day**. b. **peak at the** third **post-natal day.** c. **peak at the** fifth **post-natal day.** d. **peak at the** seventh **post-natal day.**	When educating the parents of a newborn with physiologic jaundice, it is important to include that bilirubin levels **peak** on which of the following **post-natal days**? a. second b. third c. fifth d. seventh **☆IMPROVED with MORE CONCISE STEM☆** On which **post-natal day** do bilirubin levels **peak** in a newborn with physiologic jaundice?

G. When a stem asks for verbal responses by the nurse/nurse practitioner, 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, when appropriate, 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 used in the 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:

Laboratory Results	
Hemoglobin	**13.4 g/dL**
Lead level	**4.1 mcg/dL**
Vitamin D	**10.8 ng/mL**

F. Format the following measurements as:

Examples of Measurements	
Height	48 in (122 cm)
Weight	8 lb (3.6 kg)
Temperature	102° F (38.9° C)

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

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?

Item Flaw(s)

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

Item Flaw(s)

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

Item Flaw(s)

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.

Item Flaw(s)

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: Refining Skills and Developing Clinical Stems

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 knowledge (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

VALIDITY

Regardless of the source of inspiration for a question, to be valid for use on an exam it MUST relate to an area in the content outline. Validity is also supported by identifying an approved reference with the page citation(s) that support the correct response.

**If used, must have a citation from a PNCB approved reference for the exam.*

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, laboratory values, and physical examination findings. 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*]**, who is mildly obese and 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:

Open Stem Question: Clinical Stem **+** Incomplete Statement *(options will complete sentence)*	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
Closed Stem Question: Clinical Stem **+** Lead-in Question	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?

Developing the test-taker's task

As discussed previously (pg. 5), it is most 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? • Which of the following assessments should be obtained FIRST? • The MOST important history information is… • Which of the following questions would be the MOST appropriate to ask initially? • Which of the following information is MOST important to obtain from this child? • What should be interpreted from this data? • Which of the following tests should be ordered? • Which of the following abnormal findings is expected when performing the assessment? • Which of the following findings requires further investigation? • Which of the following findings is expected? • Which factor is the MOST important to consider? • Which of the following laboratory results are 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 presentations is MOST common in xxxx? • These signs and symptoms are MOST consistent with… • The vital signs are suggestive of which of the following conditions? • This clinical description is indicative of… • Which of the following risks is associated with xxxx? • Which of the following manifestations should be anticipated? • Which of the following symptoms would be expected with this diagnosis? • Which of the following children is at GREATEST risk for…?
Management	• Appropriate management includes: • Which is the MOST important first step? • The NEXT step in management is to… • After xxxx, the next BEST action is… • Which of the following treatments is MOST appropriate? • Which of the following interventions is indicated? • The best INITIAL management includes… • Which of the following medications is the MOST appropriate? • Which of the following actions is recommended? • The addition of which of the following treatments is the MOST appropriate NEXT step?? • Which exam finding requires a referral to a(n) xxxx? • Monitoring for which of the following complications is indicated? • Which of the following responses is likely to be the MOST beneficial? • Which of the following interventions is likely to be the MOST effective?

Examples of questions (lead-in and sentence completion) used with clinical stems to develop test items with higher cognitive levels	
Priorities	• Which of the following findings is the PRIORITY concern? • Which of the following evaluations should occur FIRST? • The IMMEDIATE action should be to initiate… • Which of the following laboratory tests should be obtained FIRST? • Which of the following interventions should be implemented FIRST? • Which of the following interventions is the PRIORITY in the plan of care? • What is the MOST appropriate NEXT step? • Which potential complication is MOST significant?
Guidance	• Which of the following recommendations is the MOST appropriate? • The BEST anticipatory guidance includes… • The caregiver's readiness to learn can best be assessed by asking which of the following questions? • Which information should be included in teaching? • Which of the following statements BEST demonstrates an understanding of the diagnosis and treatment plan? • Which of the following is the MOST important information to address caregiver concerns about xxxx?

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]?
>
> A. **KEY** [correct side effect]
>
> B. **DISTRACTOR** [plausible side effect]
>
> C. **DISTRACTOR** [plausible side effect]
>
> D. **DISTRACTOR** [plausible side effect]

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.

EXERCISE: Use an item shell to create new items by changing information	
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.	
1. Which of the following conditions would restrict a high school student from participating in wrestling? a. asthma b. absence of one testicle c. facial herpes simplex d. controlled epileptic seizures	New Stem: _____ _____ _____ 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. _____

(Source: Haladyna, T. M. (1994). Developing and Validating Multiple-Choice Test Items. Hillsdale, N.J.: Lawrence Erlbaum, Inc.)

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)]

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

Section 4: Critiquing your Items before Submission

QUICK ASSESSMENT: PRIORITY edits are needed if…	HOW TO FIX?
1) Key does not blend-in because it is:	→ Blend-in key:
○ only option that includes an important term also in stem	○ add term to another option (p. 11)
○ more complex and detailed than the other options	○ simplify the key or make another option more complex (p. 11)
○ distinct from other options (*Example*: distractors are topical medications and key is administered PO)	○ create parallel structure (*Example*: make 2 options topical medications 2 given PO) (p. 15-16)
2) Distractor is easily dismissed (give-away) by the test-taker who is guessing	→ Replace with a plausible distractor (p. 12); *only test-takers with the knowledge should answer correctly!*
3) Stem asks what "YOU" should do	→ Instead ask the appropriate action (p. 10)
4) Stem contains unnecessary details (e.g., care setting) or introductory/teaching statements?	→ Remove unneeded information to make succinct and improve reading load (p. 7-8)

Additional Assessments: **Does your item…**			Page(s)
STEM		☐ Provide a clear task for the test-taker without reading options?	8
		☐ Include relevant information needed to determine the correct response?	8
		☐ Assess for higher cognitive levels of application or analysis?	5
		☐ Provide presenting symptoms or exam findings in a sensible order (e.g., head-to-toe)?	11
OPTIONS and DISTRACTORS		☐ Include four options that relate and flow with the stem?	14
		☐ Provide parallel structure between the options, such as beginning with a lead verb?	15
		☐ AVOID use of "none of the above" or "all of the above"	4
		☐ Offer mutually exclusive options when options are numeric ranges?	12
		☐ Provide plausible but incorrect distractors?	7, 12
		☐ AVOID the use of "universal" terms such as ALWAYS, ALL, or NEVER, minor distinctions, or being tricky to make a distractor incorrect?	13
GENERAL	AVOID USING	☒ negative stems except to ask about CONTRAINDICATIONS?	9
		☒ terms such as "nurse" or "patient" or naming individuals?	10
		☒ gender or a specific-age when not critical to content?	9-10
	USE	☐ person-centered language to represent individuals?	12
		☐ age-groups when feasible?	9
		☐ either caregiver, parent, mother, and father, varying among items, to promote representation of different types of families and roles	12
		☐ appropriate punctuation as indicated for **closed** and **open stem questions**?	14
DEFENSE-ABILITY		☐ Assess knowledge that is relevant and important to practice?	5
		☐ Have ONLY one correct response?	3
		☐ Provide a reference citation to include the specific page number(s) that support the key, and the citation is from a current PNCB-approved reference (not > than 7 years old)?	13
		☐ Include mapping to the relevant area on the exam's content outline? **Example:** I.A.2	4

Section 5: The Documented Item and Resource Links

How your items are submitted to PNCB will vary based on whether you are writing for exams, practice tests, 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 volunteer@pncb.org.

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

Exams and Products	Resources
ALL	Visual Guide to the Basics of Item Writing
CPN Exam	Content Outline and Approved Reference List
CPNP-AC Exam	Content Outline and Approved Reference List
CPNP-PC Exam	Content Outline and Approved Reference List
PMHS Exam	Content Outline and Approved Reference List

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.