

**Constructing Written Test Questions For the Basic and Clinical Science
Third Edition-National Board of Medical Examiners**

Complete Issue Available at <http://www.nbme.org/publications/item-writing-manual-download.html>

Guidelines for Basic Science Item Content

- Test application of knowledge using experimental and clinical vignettes. Make sure that examinees can answer the question based on an understanding of basic science; experience in patient care should not be necessary.
- Focus items on key concepts and principles that are essential information (without access to references) for all examinees to understand.
- Test material that is relevant to learning in clinical clerkships.
- Avoid items that *only* require recall of isolated facts (This helps identify those examinees who have memorized a substantial body of factual information, but are unable to use that information effectively).
- Avoid esoteric or interesting topics that are not essential.

For example:

- Instead of asking examinees to identify the muscles innervated by a cranial nerve, provide a set of physical findings and ask examinees to identify the most likely site of the lesion.
- Instead of asking for a description of respiratory acidosis or alkalosis, provide values for arterial blood gases (and other patient findings as needed) and ask examinees to identify the most likely pathophysiologic explanation.

Basic Science Recall Item Stem:

What area is supplied with blood by the posterior inferior cerebellar artery?

Basic Science Application of Knowledge Item Stem:

A 62-year-old man develops left-sided limb ataxia, Horner's syndrome, nystagmus, and loss of appreciation of facial pain and temperature sensations. What artery is most likely to be occluded?

Example:

<p>Acute intermittent porphyria is the result of a defect in the biosynthetic pathway for:</p> <ul style="list-style-type: none"> A. Collagen B. Corticosteroid C. Fatty acid D. Glucose E. Heme F. Thyroxine (T4) 	<p>An otherwise healthy 33-year-old man has mild weakness and occasional episodes of steady, severe abdominal pain with some cramping but no diarrhea. One aunt and a cousin have had similar episodes. During an episode, his abdomen is distended, and bowel sounds are decreased. Neurologic examination shows mild weakness in the upper arms. These findings suggest a defect in the biosynthetic pathway for</p> <ul style="list-style-type: none"> A. Collagen B. Corticosteroid C. Fatty acid D. Glucose E. Heme F. Thyroxine (T4)
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Item Templates

The following template could be used to generate a series of questions related to gross anatomy:

A (*patient description*) is unable to (*functional disability*). Which of the following is most likely to have been injured?

This is a question that could be written using this template:

A 65-year-old man has difficulty rising from a seated position and straightening his trunk, but he has no difficulty flexing his leg. Which of the following muscles is most likely to have been injured?

- A. **Gluteus maximus**
- B. Gluteus minimus
- C. Hamstrings
- D. Iliopsoas
- E. Obturator internus

Many basic science questions can be presented within the context of a patient vignette. The patient vignettes may include some or all of the following components:

- Age, Gender (e.g., A 45-year-old man)
- Site of Care (e.g., comes to the emergency department)
- Presenting Complaint (e.g., because of a headache)
- Duration (e.g., that has continued for 2 days).
- Patient History (with Family History?)
- Physical Findings
- +/- Results of Diagnostic Studies
- +/- Initial Treatment, Subsequent Findings, etc.

Sample Lead-ins and Option Lists

Which of the following is (abnormal)?

Options sets could include sites of lesions; list of nerves; list of muscles; list of enzymes; list of hormones; types of cells; list of neurotransmitters; list of toxins, molecules, vessels, spinal segments.

Which of the following findings is most likely?

Options sets could include list of laboratory results; list of additional physical signs; autopsy results; results of microscopic examination of fluids, muscle or joint tissue; DNA analysis results; serum levels.

Which of the following is the most likely cause?

Options sets could include list of underlying mechanisms of the disease; medications that might cause side effects; drugs or drug classes; toxic agents; hemodynamic mechanisms, viruses, metabolic defects.

Which of the following should be administered?

Options sets could include drugs, vitamins, amino acids, enzymes, hormones.

Which of the following is defective/deficient/nonfunctioning?

Options sets could include list of enzymes, feedback mechanisms, endocrine structures, dietary elements, vitamins.

Use of Case Clusters

A case cluster consists of a brief case presentation, followed by a series of three multiple choice questions. Each question addresses a somewhat different aspect of the case, looking at the clinical situation from a variety of perspectives.

A 34-year-old woman has had severe watery diarrhea for the past four days. Two months earlier she had infectious mononucleosis. She abuses drugs intravenously and has antibodies to HIV in her blood. Physical examination shows dehydration and marked muscle weakness.

1. Laboratory studies are most likely to show:
 - A. Decreased serum K⁺ concentration
 - B. Decreased serum Ca²⁺ concentration
 - C. Increased serum HCO₃⁻ concentration
 - D. Increased serum Na⁺ concentration**
 - E. Increased serum pH

2. In evaluating the cause of the diarrhea, which of the following is most appropriate?
 - A. Colonic biopsy to identify *Giardia lamblia*
 - B. Culture of the oral cavity for *Candida albicans*
 - C. Duodenal biopsy to identify *Entamoeba histolytica*
 - D. Gastric aspirate to identify *Mycobacterium avium-intracellulare*
 - E. Stool specimen to identify *Cryptosporidium***

3. Further studies to evaluate her HIV infection show the ratio of helper T lymphocytes to suppressor T lymphocytes to be 0.3. This occurs because HIV:
 - A. induces proliferation of helper T lymphocytes
 - B. induces proliferation of suppressor T lymphocytes
 - C. Infects cells with CD4 receptors**
 - D. infects macrophages
 - E. stimulates the synthesis of leukotriene

Considerations

- Avoid “cueing” — providing hints at the answers to earlier questions in later questions.
- Avoid “hinging” — creating questions where students must know the answer to one question in order to answer other questions — unless the topic to be tested is so important that the item writer is willing to have students receive either all of the points or none of the points associated with a cluster.
- Adopt a “team approach” to prepare case clusters where the items draw on information from several basic science disciplines — this requires substantial breadth of knowledge.