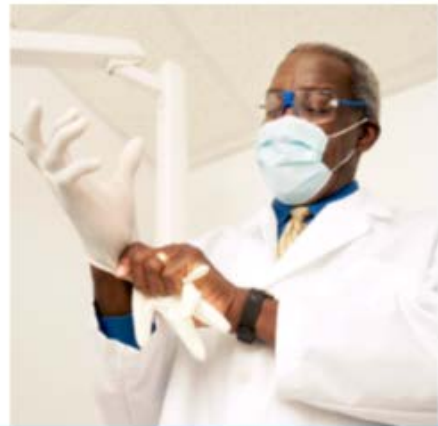


**JCNDE** JOINT COMMISSION  
ON NATIONAL  
DENTAL EXAMINATIONS



# INBDE Item Development Guide

## National Board Dental Examinations



# DRAFT DOCUMENT

January, 2019

***NOTE: INBDE development is an innovative effort. The statements appearing in this document are practical in nature, and intended to guide INBDE development. It is expected that specific decisions may change and evolve over time, as additional information becomes available that enables the Joint Commission to optimize and fine-tune its approach. As changes are made they will be incorporated into this document.***

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# Introduction

This publication of the Joint Commission on National Dental Examinations (Joint Commission) provides Integrated National Board Dental Examination (INBDE) item development guidelines to INBDE Test Construction Team (TCT) volunteers. This Item Development Guide serves the following functions:

- helps test constructors construct high quality examination items in support of the Joint Commission's examination programs.
- informs dental and academic communities of interest concerning the item development process for the INBDE.
- encourages participation in the Joint Commission's item development and review activities.
- broadens the Joint Commission's base of item writers, item reviewers, and future test constructors.
- provides a foundation for development efforts as TCTs work to replenish the Joint Commission's item pool with current knowledge in a variety of item formats.

The INBDE is a new examination that is intended to replace Part I and Part II of the Joint Commission's National Board Dental Examinations. As such, this represents an opportunity for the Joint Commission to advance its item development practices, incorporating the latest information in dentistry as well as recent advances within the testing profession. As an INBDE Test Constructor you play a critical role in this effort, helping to create the content that will appear on examination forms.

To assist you in understanding the INBDE and how to write items for this examination, information in this guide is presented in three sections covering the following major areas:

- Section One: INBDE Fundamentals and Overview of the Item Development Process
  - The purpose of the INBDE, and the relationship between test purpose, clinical relevance, and the concept of integration.
  - The Domain of Dentistry that serves as the content domain for the INBDE.
  - The structure of the test specifications for the INBDE.
  - The INBDE item development and review process.
- Section Two: General Item Writing Principles
  - Item writing principles to inform item development.
  - Fairness and sensitivity considerations to help create items that are fair to all examinees.
- Section Three: Writing INBDE Items
  - Item presentation considerations involving INBDE content.
  - INBDE itemsets/cases and how to use the new, INBDE Patient Box.
  - Model items that serve as exemplars for INBDE item writing.
  - The type of information stored on each INBDE item, and how to make appropriate item classification decisions.

## **Important Note on Copyright Agreement / Confidentiality**

All Joint Commission test constructors are expected to complete the Department of Testing Services (DTS) Contributor Agreement Form. This form can be found in Appendix E. Test security is critical, as the items written by TCT volunteers appear in examinations that are used to inform licensure decisions.

# Section One: INBDE Fundamentals and Overview of the Item Development Process

## Integration, Clinical Relevance, and Examination Purpose

The purpose of the INBDE is derived from the bylaws of the Joint Commission on National Dental Examinations, and can be stated as follows:

The INBDE is a written examination, exclusive of clinical demonstrations, for the purpose of assisting state boards in determining qualifications of dentists who seek licensure to practice in any state, district or dependency of the United States, which recognizes the National Board Dental Examinations.

In developing the INBDE, Clinical Relevance and Integration are two key concepts that inform all decision making concerning this examination. The Joint Commission defines Clinical Relevance as follows:

**Clinical Relevance** refers to factors that impact patient outcomes in clinical/professional contexts. This includes all aspects of patient care and also encompasses considerations involving how dentists approach the practice of dentistry (Practice Relevance), and keep up with the profession and advances that impact the profession (Professional Relevance). Broadly speaking, for the INBDE Clinical Relevance involves the actual experiences of entry-level, general dentists, practicing independently, as they work to improve patient outcomes. Clinical relevance is maximized in the INBDE when there is a strong degree of fidelity between the content of examination items, the knowledge and cognitive skills required to answer those items, and the actual experiences of entry-level, practicing general dentists.

Similarly, the Joint Commission defines Integration as follows:

**Integration** brings to bear knowledge of basic, clinical, and/or behavioral sciences along with cognitive skills to understand and solve problems in clinical/professional contexts.

The INBDE requires examinees to bring to bear basic and/or behavioral science knowledge and cognitive skills in clinical/professional contexts in a way that informs the licensure decision for safe, independent, entry-level competency in the general practice of dentistry. Clinical relevance and alignment with test purpose are the key considerations in establishing content and the items that will appear on the examination. Integration is viewed as a means of implementing and promoting this perspective; as such, integration is secondary to clinical relevance and alignment with test purpose.

In summary, examination purpose drives all considerations, clinical relevance is the best way to achieve the exam purpose, and integration provides a strong means of achieving clinical relevance.

In keeping with this perspective, the Joint Commission has endorsed the following:

- Each item in the INBDE MUST have clinical relevance. Items that lack clinical relevance should NOT appear on the examination. Each item in the INBDE should be presented in a way that maximizes its similarity to how a general dentist might encounter the issue.
- The primary goal of integration is to establish the clinical relevance of examination content, to inform licensure decisions.
- ALL items on the INBDE must be tied to the test purpose (regardless of whether they are integrated or not).

- The foundation upon which the INBDE rests is the most recent comprehensive practice analysis. Test specifications for the INBDE are rooted in this practice analysis, which places Foundation Knowledge areas within the context of Clinical Content areas. Given this, the INBDE as a whole is integrated, given the design elements in place. By definition, all items designed to measure a Foundation Knowledge area within the context of an INBDE Clinical Content area (i.e., items that are consistent with the test specifications) are “integrated.”
- Integration does NOT mean simply taking items from Part I and Part II “as is,” and placing them together in a single examination.

The purpose of the exam, and the concepts of clinical relevance and integration are all intricately connected to the tasks that are performed by entry-level general practitioners and the context within which practitioners operate.

## **The Domain of Dentistry**

The Domain of Dentistry was established to help support development efforts for the Integrated National Board Dental Examination (INBDE). As noted previously, the INBDE requires examinees to bring to bear basic and/or behavioral science knowledge and cognitive skills in clinical/professional contexts in a way that informs the licensure decision for safe, independent, entry-level competency in the general practice of dentistry. The Domain of Dentistry provides a single, integrated content domain for the INBDE, to maximize the clinical relevance of examination content.

The Domain of Dentistry represents the Clinical Content areas and Foundation Knowledge areas required for the safe, independent, general practice of dentistry by entry-level practitioners. It contains 56 Clinical Content (CC) areas and 10 Foundation Knowledge (FK) areas. The CC areas are grouped into three component sections:

- 1) Diagnosis & Treatment Planning
- 2) Oral Health Management
- 3) Practice and Profession

These FK areas and CC areas are presented in Figures 1 through 4 in the pages that follow. Appendix A: Foundation Knowledge for the General Dentist provides a thorough explanation of each of the FK areas, including examples of where the dental disciplines fit into this framework. Similarly, Appendix B: Relationship Between Foundation Knowledge Areas and NBDE Parts I and II, illustrates how the FK areas relate to NBDE Parts I and II.

The Domain of Dentistry represents a new, holistic perspective that stands in contrast to the Joint Commission’s previous focus on item writing for specific dental disciplines and specific subject areas within the biomedical sciences. This new approach places these disciplines and biomedical science areas within the context of the demonstration of Clinical Content areas. This is why the INBDE is referred to as an integrated examination. It is important to note that the dental disciplines and biomedical science areas have not been lost in this process. In fact, the clinical relevance of these areas has been maximized and promoted by placing these areas within the context of the performance of Clinical Content areas.

## **Structure of Test Specifications**


While Figures 1 through 4 depict the FK areas and CC areas separately, it is important to note that these elements are intricately related. In short, the FK areas describe the critical knowledge areas and skills that are required to successfully perform the tasks corresponding to those CC areas. The Joint Commission has conducted empirical studies involving this framework, to derive the test specifications for the INBDE. Figure 5 presents these specifications at an overall level, based on an INBDE form containing 500 items. During INBDE TCT meetings, your Assessment Specialist will share more detailed information with you to provide insight into the areas to which you are asked to write items.

**Figure 1. INBDE Foundation Knowledge Areas**

## Foundation Knowledge Areas (2018)

The successful entry-level general practitioner is focused on the prevention, diagnosis, and management of oral disease, and the promotion and maintenance of general health. This requires application of knowledge in the following areas:

FK1	Molecular, biochemical, cellular, and systems-level development, structure and function
FK2	Physics and chemistry to explain normal biology and pathobiology
FK3	Physics and chemistry to explain the characteristics and use of technologies and materials
FK4	Principles of genetic, congenital and developmental diseases and conditions and their clinical features to understand patient risk
FK5	Cellular and molecular bases of immune and non-immune host defense mechanisms
FK6	General and disease-specific pathology to assess patient risk
FK7	Biology of microorganisms in physiology and pathology
FK8	Pharmacology
FK9	Behavioral sciences, ethics, and jurisprudence
FK10	Research methodology and analysis, and informatics tools



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**Figure 2. Clinical Content Areas: Diagnosis and Treatment Planning (DTP)**

#	Diagnosis and Treatment Planning
1	Interpret patient information and medical data to assess and manage patients.
2	Identify the chief complaint and understand the contributing factors.
3	Perform head and neck and intraoral examinations, interpreting and evaluating the clinical findings.
4	Use clinical and epidemiological data to diagnose and establish a prognosis for dental abnormalities and pathology.
5	Recognize the normal range of clinical findings and distinguish significant deviations that require monitoring, treatment, or management.
6	Predict the most likely diagnostic result given available patient information.
7	Interpret diagnostic results to inform understanding of the patient's condition.
8	Recognize the manifestations of systemic disease and how the disease and its management may affect the delivery of dental care.
9	Recognize the interrelationship between oral health and systemic disease, and implement strategies for improving overall health.
10	Select the diagnostic tools most likely to establish or confirm the diagnosis.
11	Collect information from diverse sources (patient, guardian, patient records, allied staff, and other healthcare professionals) to make informed decisions.
12	Formulate a comprehensive diagnosis and treatment plan for patient management.
13	Discuss etiologies, treatment alternatives, and prognoses with patients so they are educated and can make informed decisions concerning the management of their care.
14	Understand how patient attributes (e.g., gender, age, race, ethnicity, and special needs), social background and values influence the provision of oral health care at all stages of life.
15	Interact and communicate with patients using psychological, social, and behavioral principles.



**Figure 3. Clinical Content Areas: Oral Health Management (OHM)**

#	Oral Health Management
16	Prevent, recognize and manage medical emergencies (e.g., cardiac arrest).
17	Prevent, recognize and manage dental emergencies.
18	Recognize and manage acute pain, hemorrhage, trauma, and infection of the orofacial complex.
19	Prevent, diagnose and manage pain during treatment.
20	Prevent, diagnose and manage pulpal and periradicular diseases.
21	Prevent, diagnose and manage caries.
22	Prevent, diagnose and manage periodontal diseases.
23	Prevent, diagnose and manage oral mucosal and osseous diseases.
24	Recognize, manage and report patient abuse and neglect.
25	Recognize and manage substance abuse.
26	Select and administer or prescribe pharmacological agents in the treatment of dental patients.
27	Anticipate, prevent, and manage complications arising from the use of therapeutic and pharmacological agents in patient care.
28	Diagnose endodontic conditions and perform endodontic procedures.
29	Diagnose and manage the restorative needs of edentulous and partially edentulous patients.
30	Restore tooth function, structure, and esthetics by replacing missing and defective tooth structure, while promoting soft and hard tissue health.
31	Perform prosthetic restorations (fixed or removable) and implant procedures for edentulous and partially edentulous patients.
32	Diagnose and manage oral surgical treatment needs.
33	Perform oral surgical procedures.
34	Prevent, diagnose and manage developmental or acquired occlusal problems.
35	Prevent, diagnose and manage temporomandibular disorders.
36	Diagnose and manage patients requiring modification of oral tissues to optimize form, function and esthetics.
37	Evaluate outcomes of comprehensive dental care.
38	Manage the oral esthetic needs of patients.

**Figure 4. Clinical Content Areas: Practice and Profession (PP)**

#	Practice and Profession
39	Evaluate and integrate emerging trends in health care.
40	Evaluate social and economic trends and adapt to accommodate their impact on oral health care.
41	Evaluate scientific literature and integrate new knowledge and best research outcomes with patient values and other sources of information to make decisions about treatment.
42	Practice within the general dentist's scope of competence and consult with or refer to professional colleagues when indicated.
43	Evaluate and utilize available and emerging resources (e.g., laboratory and clinical resources, information technology) to facilitate patient care, practice management, and professional development.
44	Conduct practice activities in a manner that manages risk and is consistent with jurisprudence and ethical requirements in dentistry and healthcare.
45	Recognize and respond to situations involving ethical and jurisprudence considerations.
46	Maintain patient records in accordance with jurisprudence and ethical requirements.
47	Conduct practice related business activities and financial operations in accordance with sound business practices and jurisprudence (e.g., OSHA and HIPAA).
48	Develop a catastrophe preparedness plan for the dental practice.
49	Manage, coordinate and supervise the activity of allied dental health personnel.
50	Assess one's personal level of skills and knowledge relative to dental practice.
51	Adhere to standard precautions for infection control for all clinical procedures.
52	Use prevention, intervention, and patient education strategies to maximize oral health.
53	Collaborate with dental team members and other health care professionals to promote health and manage disease in communities.
54	Evaluate and implement systems of oral health care management and delivery that will address the needs of patient populations served.
55	Apply quality assurance, assessment and improvement concepts to improve outcomes.
56	Communicate case design to laboratory technicians and evaluate the resultant restoration or prosthesis.

Figure 5. INBDE Hypothetical Overall Test Specifications

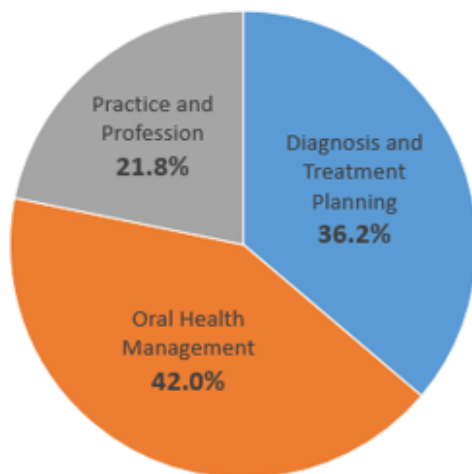
## The Domain of Dentistry

**The Domain of Dentistry**  
Percentage of INBDE Test Items, by Clinical Component Section and Foundation Knowledge Area

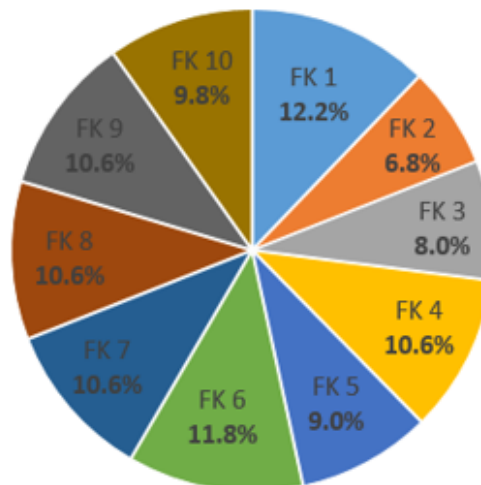
Clinical Component Section	FK 1	FK 2	FK 3	FK 4	FK 5	FK 6	FK 7	FK 8	FK 9	FK 10	Total
Diagnosis and Treatment Planning	5.0%	2.2%	1.8%	4.6%	3.6%	5.2%	4.2%	3.2%	3.0%	3.4%	36.2%
Oral Health Management	6.8%	4.4%	4.4%	4.2%	4.2%	3.8%	4.2%	4.4%	2.8%	2.8%	42.0%
Practice and Profession	0.4%	0.2%	1.8%	1.8%	1.2%	2.8%	2.2%	3.0%	4.8%	3.6%	21.8%
Total	12.2%	6.8%	8.0%	10.6%	9.0%	11.8%	10.6%	10.6%	10.6%	9.8%	100.0%

## INBDE Test Specifications (500 items)

**Clinical Content Area**



**Foundation Knowledge Area**



As an INBDE item writer, it is your task to represent the aforementioned integration of Foundation Knowledge areas and Clinical Content areas in the items you write, always working to maximize the clinical relevance of examination content in accordance with the overall test specifications. Your work as an item writer is critical to the overall performance of the examination.

## The INBDE Item Development Process

In writing items, it may be helpful for test constructors to also have a sense of the overall development process that will be employed for the INBDE. In short, to further improve the quality of INBDE items and their overall performance, the Joint Commission is increasing the comprehensiveness of its item review process. More specifically, the following reviews will take place to improve item quality and functioning:

- Content Accuracy
- Item Classification
- Editorial
- Fairness and Sensitivity
- Legal/Intellectual Property
- Item Performance
- Item Progress Review
- Case Material Quality Review
- General Dentist Review

The Joint Commission is currently exploring different procedures to optimize item reviews. Reviews may be conducted by either the original item writing TCT, or other TCTs and/or individuals. Each of these reviews is described below, and is subject to change based on outcomes achieved and the decisions of the Joint Commission. It is best to think of INBDE item development as a dynamic and fluid process, as opposed to a discrete event that occurs within meetings.

**Content Accuracy Subject Matter Expert (SME) Review.** Subject Matter Experts (SMEs) who are external to the original item writing TCT will review items for accuracy and currency, and provide feedback to the TCT. These SME reviewers will be assigned to items based on how items have been classified. Once the areas of expertise relevant to an item are accurately identified, SMEs in that area will be asked to review that item for content accuracy.

**Item Classification.** Item classification reviews are performed to specify the areas of content expertise identified for the item. This review is similar to how a librarian classifies material into subject areas using a defined taxonomy. The classification review will include all metadata for the item.

**Editorial Review.** Items will be reviewed for grammar, style, formatting, and alignment with item-writing guidelines. Similarly, item stimulus materials must be legible and in accordance with modern dental practice. Editorial review comments and feedback will be returned to TCTs.

**Fairness and Sensitivity Review.** Items will be reviewed based on fairness and cultural sensitivity considerations, in alignment with the item writing guidelines. While the original item writing TCT will be trained on fairness and sensitivity considerations (i.e., a fairness and sensitivity review takes place as part of the original item writing process), a supplemental review will further improve items from this perspective as well. Comments and feedback will be returned to TCTs.

**Legal/Intellectual Property (IP) Review.** Joint Commission staff will seek guidance from the ADA Division of Legal Affairs concerning the articulation of any guiding principles that might be helpful to avoid legal issues involving examination content. This could include, for example, issues arising around privacy and the use of intellectual property. Individuals who submit images and materials to the Joint Commission are responsible for verifying intellectual property rights.

**Item Performance Review.** TCTs will review item statistics and any available examinee feedback, and make adjustments if warranted. Adjustments may cause the updated item to be considered an entirely new item. Items are continuously evaluated for statistical performance. Items that do not meet the statistical performance guidelines will be reviewed SMEs to either edit the item or remove it from circulation. SMEs will review the item

stem, distractors, and statistics to attempt to determine why the item is performing poorly using the guidelines in this booklet. Items that are edited to be republished will be considered new items.

**Item Progress Review.** The item writing TCT will update items based on comments from the various reviews, and is ultimately responsible for the item. If significant changes are made to a new item, the TCT may elect to initiate a second review cycle or request separate individual reviews. Alternatively, operating in parallel with the authoring TCT could be a second TCT of similar structure that operates independently and in parallel with the original TCT. This parallel TCT could take all item review feedback and make any necessary changes to the item. Similarly, this parallel TCT is responsible for the item performance review as well.

**Case Material Quality Review.** This TCTs work precedes the work of the item writing TCTs. The team reviews case material submissions to determine if those materials are of sufficient quality to serve as the basis for item writing, makes a recommendation to accept or reject the materials, and then prepares accepted materials for use by TCTs. The structure of this team is already in place and consists of four members who are dental experts and practitioners. An editorial/graphics staff member is available to support this team. An intellectual property review is included as part of this team's responsibility. The TCT meets in person initially and, after at least one in-person meeting, may elect to use remote collaboration technology. This team will require its own guidelines for selection and review of cases.

**General Dentist Review.** The INBDE is designed for licensure purposes, to help state boards understand whether a candidate possesses the necessary cognitive skills to enter the profession and safely practice dentistry. The general dentist is thus of focal importance to this examination program. As such, general dentists will review items to help confirm item content is clinically relevant and applicable to the work of practicing dentists. It should also be noted that general dentists will also be enlisted to help serve as an input to the item writing process (e.g., item idea generation).

Subsequent to the above reviews, one or more **Form Assembly TCTs** will assemble test forms based on the test specifications for the INBDE.

## Section Two: General Item Writing Principles

To assist you in the item writing process, it is first necessary to discuss some key considerations in writing high quality items for a high stakes examination such as the INBDE. In essence, it is important to present questions in a consistent, standard format that has been informed by research, to facilitate accurate and precise measurement of candidate dental skills. With this goal in mind, the discussion will now turn to general item writing principles, focusing on the following topics:

- Writing effective item stems
- Writing effective item response options
- Applying editorial guidelines appropriately
- Considering fairness and sensitivity issues when writing items

Item writing principles provide information concerning how to approach the creation of items. There are a variety of item formats used in both large and small scale assessments. In general, the array of item formats available is conducive to a wide spectrum of cognitive tasks, from information retrieval to critical thinking and problem solving.

Traditional multiple-choice items are considered by experts to be the most versatile and useful of objective test items. They are effective in measuring not only a candidate's knowledge and understanding, but also more complex cognitive processes such as application, analysis, synthesis, and evaluation. In order to be effective, items must be written well. The INBDE relies exclusively on multiple-choice items, some of which are presented in isolation (standalone items) while others are presented together in groups that are accompanied by a common set of stimuli (case materials, including radiographic images, etc.).

There are a few essential parts to the multiple-choice item. The **stem** is the introductory question or partial statement that the examinee must answer or complete. The stem is typically followed by three to five **response options** marked by the letters A, B, C, D, and E. One of the response options—the **key**—is the correct (or best) response to the stem. The incorrect or inferior response options are known as **distractors**. In many cases, common misconceptions and observed mistakes make excellent distractors. In general, the effective performance of a test item is directly related to the discriminating quality of the distractors.

### Writing Stems

The stem of a multiple-choice item provides the examinee with a prompt that requires a response. Before reading any of the response options, examinees should have a strong understanding of what is being asked and—depending on candidate skill levels—possible response alternatives. Examinees should not have to read the response options in order to understand the stem. In most cases this can be accomplished by:

1. setting up a problem or set of circumstances within the stem or through reference to stimulus materials.
2. making sure the stem contains at least one verb.

### Questions and Incomplete Statements

Although some research indicates that stems written in the form of a question are more effective than those written as partial statements, both are acceptable for multiple-choice items. The argument for the question-form stem lies in the belief that a question communicates more completely the problem or circumstances of the item. Seeing the stem in question form helps examinees conceptualize the item's context.

The following is an example of an item written in a poorly formed incomplete sentence.

Trigeminal neuralgia (tic douloureux)

- A. can be in the form of prolonged episodes of pain in one side of the face.
- B. is a dull pain when pressure is applied over the affected area.
- C. is a paralysis of one side of the face.
- D. is characterized by sharp pain when light pressure is applied to the affected area.
- E. manifests as uncontrollable twitching of one eye.

Because the stem lacks a verb, it communicates no context to the examinees. The stem is unfocused, and response options leading from unfocused stems are often heterogeneous. If the candidate covers the distractors, he or she will not know what is being asked.

Below is the same question, which has been rephrased to include a verb to provide an indication of what specific concept the candidate will be expected to know.

Trigeminal neuralgia (tic douloureux) is characterized by

- A. dull pain when pressure is applied over the affected area.
- B. paralysis of one side of the face.
- C. prolonged episodes of pain in one side of the face.
- D. sharp pain when light pressure is applied to the affected area.
- E. uncontrollable twitching of one eye.

An even more effective item construct is to write the stem in the form of a complete question, as follows:

Which symptom best characterizes trigeminal neuralgia (tic douloureux)?

- A. Dull pain when pressure is applied over the affected area
- B. Paralysis of one side of the face
- C. Prolonged episodes of pain in one side of the face
- D. Sharp pain when light pressure is applied to the affected area
- E. Uncontrollable twitching of one eye

## Keeping It Simple

The stem should be as brief as possible, including only the information needed to solve the problem. In many cases irrelevant material should be omitted because it adds to an examinee's reading time. The extra time it takes a candidate to answer a question may reduce the number of items the candidate has time to answer, which is used to evaluate performance. Below is an example of an item containing more information than is necessary to answer the item.

Bruxism, the rhythmic grinding of teeth in other than chewing movements of the mandible, can result in overdevelopment of a muscle of mastication. Which muscle might be overdeveloped in a patient with bruxism?

- A. Buccinator
- B. Geniohyoid
- C. Glossopharyngeal
- D. Lateral pterygoid
- E. Masseter

Below is the same item with the unnecessary information omitted from the stem.

When a patient bruxes the teeth, which muscles might become overdeveloped?

- A. Buccinator
- B. Geniohyoid
- C. Glossopharyngeal
- D. Lateral pterygoid
- E. Masseter

The additional information included in the first example, known as "teaching", may also inadvertently clue another item later on.

An exception to this rule would be situations where providing additional details increases the correspondence between the content of the question and how the dentist would encounter the situation in practice. Including these details can sometimes help with clinical relevance, because in the clinic dentists must be able to quickly distinguish between 1) information that is directly relevant to the patient's condition, and 2) information that might appear relevant on the surface but is simply not germane. Good examinations and test questions appropriately balance these two competing interests.

Generally, statements of a controversial nature do not make good objective items, though there are instances when knowledge of different viewpoints on controversial issues may be important. When this is the case, the item should clearly state whose opinion or what authority is to be used as the basis for answering.

## Positively- and Negatively-Worded Item Stems

Generally, stems that are worded positively are more effective than those worded negatively. However, it is sometimes appropriate to ask examinees to distinguish the one incorrect response among several correct alternatives. In these cases, *exceptions* may be used. Generally speaking, these items should be used sparingly and only when a concept cannot be addressed by using a positively-stated stem.

Each of the following is a part of the initial periodontal treatment plan EXCEPT one. Which is the EXCEPTION?

- A. Eliminating surgical pockets
- B. Extracting hopeless teeth
- C. Performing occlusal adjustment
- D. Providing home-care instructions
- E. Scaling and root planing

Note that the words “EXCEPT” and “EXCEPTION” have been capitalized. This helps the examinee to understand that the item has been worded negatively.

## Making Stems Inclusive

Avoid repeating the same word or phrase in multiple response options. Where possible, this information should appear in the stem. For example, consider rewriting the item below to remove the word “tissue” from the options and including it in the stem instead.

Histologically, the normal dental pulp most closely resembles

- A. dense connective tissue.
- B. endothelial tissue.
- C. granulomatous tissue.
- D. loose connective tissue.
- E. nervous tissue.

The following is an example of a rewrite of the item to include the word “tissue” in the stem while removing it from the response options.

Histologically, the normal dental pulp most closely resembles which tissue?

- A. Dense connective
- B. Endothelial
- C. Granulomatous
- D. Loose connective
- E. Nervous



## Writing Response Options (Answers and Distractors)

Item writers should use the number of response options (distractors plus the correct answer) that makes sense given item content and the concept or skill to be evaluated. Items with three to five options are acceptable. The majority of INBDE items involve four response options. Items with three options are good for situations where there are no other reasonable options to choose. A maximum number of five responses is allowed, if the TCT agrees that all distractors are plausible.

### Correct Responses and Best Responses

A multiple-choice item can ask for either the *correct* response or the *best* response. While both formats are appropriate, requiring examinees to choose the best alternative obliges them to make finer distinctions than that between correct and incorrect. “Best response” items can therefore assess higher levels of learning. For this format to assess at higher levels, it is particularly important that the distractors be at least plausible. The following is an example of a “correct response” item.

Which antibiotic shows an incidence of approximately 8% cross-allergenicity with penicillin?

- A. Bacitracin
- B. Cephalexin
- C. Neomycin
- D. Tetracycline
- E. Vancomycin

The following is an example of a “best response” item.

Which statement best describes the purpose of potassium sulfate in a mix of irreversible hydrocolloid?

- A. It acts as a filler material.
- B. It controls consistency of the mix.
- C. It helps produce a hard, dense stone cast surface.
- D. It keeps the mix from separating.
- E. It retards the setting of the hydrocolloid.

Response options, both the key and the distractors, can be in the form of words, phrases, sentences, numbers, equations, images, or symbols.

### Keeping Response Options Similar

One of the greatest challenges for item writers involves assembling three or more homogeneous response options. Writing distractors that bear superficial resemblance to the correct response (key) gives minimal clues to examinees and helps to ensure a more reliable item. The following is an item whose response options might alert less knowledgeable, but savvy, examinees to the correct response.

When does sensitivity to percussion occur in acute pulpitis?

- A. At the onset
- B. Before there is any pain
- C. Only rarely
- D. When the inflammation involves the periodontal ligament space

Alternative D is cued as it stands out as the longest and most specific of the response options. While an examinee might not be sure of the particulars, the context of the response options may tip him/her off. The following is an item written more effectively because of its homogeneous response options.

Which local anesthetic is subject to inactivation by plasma esterases?

- A. Bupivacaine
- B. Lidocaine
- C. Mepivacaine
- D. Prilocaine
- E. Tetracaine

It is important to avoid writing a correct response and one distractor that are opposites of each other, thus, canceling each other out and eliminating the other distractors in examinees' minds. In the following example, alternatives A and B cancel each other out.

Which best determines the mechanical and physical properties of any restorative material?

- A. Bonding strength
- B. External structure
- C. Internal structure
- D. Resistance to shear

However, an item with two pairs of alternatives can be an effective testing tool. In the following item, options A and B, and options D and E make plausible pairs without cueing the poorly-prepared examinee.

If a susceptible person were given tetanus antitoxin, what kind of immunity would result?

- A. Artificial active
- B. Artificial passive
- C. Innate
- D. Natural active
- E. Natural passive

### **Avoiding Overlapping Alternatives**

Each response option in an item must be distinct from the others. Ranges should be mutually exclusive and should not overlap. Ranges that overlap can potentially cause more than one response to be at least partially correct. Numbers and ranges should be listed chronologically. Ranges should be equal or similar to one another in interval, or should be based on groupings that are meaningful given the item content and the concept to be evaluated.

The following is an item written with overlapping responses (e.g., C and D overlap with regard to 3 years). Additionally, the responses are not in numerical order and have inconsistent time intervals.

During which age range should a child be brought to a dentist for a first visit?

- A. 0 to 1 year
- B. 2 to 3 years
- C. 3 to 5 years
- D. 5 to 7 years
- E. 6 to 12 years

This item is rewritten to eliminate overlap as follows:

During which age range should a child be brought to a dentist for a first visit?

- A. 1 to 2 years
- B. 3 to 4 years
- C. 5 to 6 years
- D. 7 to 8 years
- E. 9 to 10 years

### **Making Response Options Specific**

In order for distractors to be effective, they must include specific options and solutions. The distractors “*all of the above*” and “*none of the above*” are not used on the INBDE.

### **Writing Plausible Distractors**

Because distractors are designed to tempt poorly prepared examinees, they should be plausible, though incorrect (or less correct) possibilities. Distractors are effective when they represent commonly held misconceptions about a subject. Implausible or humorous distractors do nothing to distinguish differences between prepared and unprepared examinees. The following is an item with inappropriate distractors.

The patron saint of dentistry, recognized as the patroness of those suffering from toothache, is

- A. Eva Marie Saint.
- B. Jill St. John.
- C. Sault Sainte Marie.
- D. St. Apollonia.
- E. St. Joan of Arc.

The following item includes more plausible distractors.

Which legally protects health professionals who provide emergency treatment at the scene of an accident?

- A. Americans with Disabilities Act
- B. Good Samaritan Act
- C. Health Professional Protection Act
- D. Occupational Safety and Health Act
- E. States' Human Rights Act

## Editorial Guidelines

### Avoiding the Use of Absolute Terms

Just as there are few absolutes in life, there are few absolutes in dentistry. Terms such as *always*, *never*, *all*, and *none* should be used sparingly and only to make very specific points. These terms have the potential to provide cues to the poorly prepared examinee.

### Avoiding Repetition of Key Terms

Repeating a key word from the stem and in the correct response, known as “echoing,” will tip off or “cue” unprepared examinees. The following is an item with a key word repeated.

Pulp testers used for evaluating a tooth’s sensitivity to pain stimulate which receptors?

- A. Cold
- B. Heat
- C. Pain
- D. Pressure
- E. Touch

The item can be improved as follows by removing the cued word, “pain,” from the stem:

Pulp testers evaluate a tooth’s sensitivity to which receptors?

- A. Cold
- B. Heat
- C. Pain
- D. Pressure
- E. Touch

### Consistent Grammar

Grammar and word use should be correct and consistent in all alternatives. The following item contains a grammar error that alerts examinees to the correct response.

A widening of the periodontal ligament space seen along one side of a tooth represents the radiographic manifestation of an

- A. Burkitt lymphoma.
- B. fibrous dysplasia.
- C. metastatic breast carcinoma.
- D. multiple myeloma.
- E. osteosarcoma.

The item is improved easily by changing the indefinite article (“an”) in the stem.

A widening of the periodontal ligament space seen along one side of a tooth represents the radiographic manifestation of a/an

- A. Burkitt lymphoma.
- B. fibrous dysplasia.
- C. metastatic breast carcinoma.
- D. multiple myeloma.
- E. osteosarcoma.

### Consistent Construction

Response options should be similar in construction and of approximately equal length. The following is an *ineffective* item since the correct response stands out as the longest, most specific response.

Which best describes the purpose of potassium sulfate in a mix of irreversible hydrocolloid?

- A. Controls consistency of the mix
- B. Filler
- C. Helps produce a hard, dense stone cast surface
- D. Reactor
- E. Retarder

This item has been improved in the example below by ensuring the response options, including the key, are of a similar length and construction.

Which best describes the purpose of potassium sulfate in a mix of irreversible hydrocolloid?

- A. Acts as a filler material.
- B. Controls the consistency of the mix
- C. Helps produce a hard, dense stone cast surface
- D. Provides a dense stone cast surface
- E. Retards the setting of the hydrocolloid

## Fairness and Sensitivity Considerations

In developing item stems and response options, it is critical to present the information in a manner that treats examinees fairly and allows examinees' skills to be accurately assessed. To write valid items that appropriately address fairness considerations, TCT members are encouraged to read the 2009 Educational Testing Service (ETS) report entitled "ETS Guidelines for Fairness Review of Assessments" located at the following URL: ([http://www.ets.org/Media/About\\_ETS/pdf/overview.pdf](http://www.ets.org/Media/About_ETS/pdf/overview.pdf)). Material appearing below is largely derived from that source.

The following highlights the core issues involved in building fair and valid examination content. Before proceeding, it is first necessary to define a few key terms in order to properly understand the concept of fairness as it relates to testing.

### Test Purpose

All tests are developed to fulfill a purpose. This purpose helps establish what content should be included in the test, what constructs will be measured, and how those constructs should be defined.

### Constructs

Constructs represent specific Knowledge, Skills, Abilities, or Other characteristics (KSAOs), or sets of related KSAOs, that a test has been designed to measure. Tests are designed to yield scores on constructs of interest relative to the stated test purpose.

### Variance

Variance refers to variability or differences among test scores. If all test takers receive the same score, the variance is zero. Systematic variance in scores that occurs due to individual differences in the intended, target construct is termed construct relevant variance. Testing professionals seek to maximize this source of variance. Systematic variance in scores that is unrelated to the target construct is termed construct irrelevant variance. This type of variance serves to bias outcomes, and thus testing professionals seek to minimize the factors that account for this source of variance.

### Validity

Validity involves an evaluation of the available evidence that is in place to support the interpretation and use of examination scores to fulfill the purpose to which examination scores are targeted. When accumulated evidence is complete and provides coherent and plausible explanations, the corresponding validity argument in favor of test usage is strengthened.

### Fairness

Fairness is a social concept that has been defined in different ways, some of which can lead to contradictory conclusions. For present purposes, tests that are regarded as fair are those that are equally valid for different groups. Efforts to improve test fairness involve working to reduce or eliminate bias due to variability in test scores that is unrelated to the construct that is the target of measurement (i.e., reducing bias due to construct irrelevant variance). Practices that reduce construct irrelevant variance help to increase the purity of construct measurement. This in turn enhances validity. It should be noted that the presence of group differences in test scores does not necessarily indicate that bias is present, unless those differences can be attributed to construct irrelevant variance.

In summary, test scores are used to make inferences about the Knowledge, Skills, Abilities, or Other characteristics (KSAOs) of test takers. In a fair and valid test, variability in test scores would only be caused by differences in the *construct-related* KSAOs of test takers. If, however, a test inadvertently measures *construct-irrelevant* factors, these factors can bias scores and potentially compromise the validity of the test. Since the purpose of the test helps define what construct(s) should be measured, this purpose can be used to ascertain

which factors contribute variance relevant to the construct(s), and which could contribute construct-irrelevant variance.

### **Overarching Fairness Review Directive**

As established by the purpose of the respective examination, TCTs should create items that avoid all three sources of construct-irrelevant variance: cognitive, affective, and physical.

### **Cognitive Construct-Irrelevant Variance**

When knowledge or skill not related to the construct is required or provides an advantage to correctly answer an item.

**Example:** Literary terminology in a basic science item may interfere with a test-taker's ability to answer the item correctly, even if they have the KSAOs necessary to interpret the actual basic science content. The required comprehension of the literary terminology by the test taker introduces construct-irrelevant variance to the measurement of basic science knowledge. Conversely, if an item were intended to measure reading comprehension of a literary passage discussing a basic science, the inclusion of literary terminology could be appropriate.

### **Affective Construct-Irrelevant Variance**

When test content evokes strong emotions that interfere with the test-taker's ability to answer an item.

**Example:** Violent content in a case scenario or reading passage may alter the test-taker's emotional state, thereby interfering with concentration and the ability to correctly answer corresponding test items. The test-taker's exposure to the questionable content introduces construct-irrelevant variance to the measurement of case interpretation or reading comprehension skills. Conversely, if an item were intended to measure comprehension involving traumatic case scenarios, the inclusion of violent explanatory content could be appropriate.

### **Physical Construct-Irrelevant Variance:**

When certain aspects of a test interfere with the test taker's physical ability to answer an item.

**Example:** Visually-impaired test takers may have difficulty fully comprehending a graph with labels in a small font, even if they have the KSAOs necessary to interpret the actual content of the graph. The test-taker's inability to read the small font introduces construct-irrelevant variance to the measurement of graph interpretation skills. Conversely, if an item were intended to measure visual discrimination skills, the inclusion of small but meaningful details within the graph could be appropriate.

Appendix C provides a Fairness Review Checklist for use by TCT members, to assist in the development of fair examination items.

# Section Three: Writing INBDE Items

## Item Presentation Considerations Involving Content

In writing INBDE items, the following general principles apply:

- Consider the appropriate amount of information to present to the candidate to evaluate the concept to be tested. Do not include too much additional information that is irrelevant to the concept being tested.
- Conversely, additional information may be warranted to develop a typical clinical scenario, and to avoid inadvertently providing clues to a candidate concerning the correct response. An example of the latter would involve including information about patient blood pressure only for items where the correct response relies heavily on knowledge of patient blood pressure. The presence of blood pressure information in an item would alert candidates to the fact that blood pressure was important to identifying the correct response. Sometimes providing additional information can help to evaluate whether a candidate can “detect the signal from the noise.”
- When making decisions concerning content, bear in mind that examinees will typically have one minute or less to read, comprehend, and respond to an item (the first item in an itemset/case – a Patient Box and/or image(s) associated with 3 to 6 items - is a noteworthy exception to this rule).
- Avoid terminology that may not be consistently understood by examinees. Language should be simple, universally recognized, and concise. Avoid the use of regionalisms or slang. This examination is intended to measure dental cognitive skills, not language skills.
- For technical terms outside the scope of dentistry (e.g., psychological/behavioral science terms), avoid using the technical term if possible, and describe the concept instead.
- Focus each item on one concept to be tested. If an item looks complicated and contains multiple concepts, consider simplifying it or splitting it into multiple items. For example, if an item asks about both diagnosis and treatment, consider restructuring to ask about either the diagnosis or treatment. If an item asks about medication options and dosages, consider restructuring it to ask about either the medication or dosage.
- Response options are alphabetized or listed in chronological order by default, but should appear in a logical sequence.
- In items where each response option builds on the previous one, the shortest response option should appear first, and each subsequent addition should be presented next. For example:
  - A. Diagnose only
  - B. Diagnose and treat only
  - C. Diagnose, treat, and manage
- Write items that will require the examinee to think critically, applying logic and reason to identify the correct response.
- Refer to a tooth as “tooth 27” as opposed to “tooth #27.”
- If the Clinical Content area says “Interpret diagnostic results to inform understanding of the patient’s condition,” (CC7), then the image should be a real clinical image and not a drawing.
- INBDE Items should be constructed so as to measure the KSAOs judged necessary for safe, entry-level practice.
- Keep the Just Qualified Candidate (JQC) in mind when writing items and determining item difficulty for the INBDE. The JQC is a hypothetical examinee whose knowledge, skills, and abilities (KSAs) represent the lowest level that would still be considered acceptable to pass the INBDE. More specifically:
  - The JQC is a candidate, currently pursuing an approved training program in dentistry, who possesses the minimally acceptable level of knowledge, cognitive skills, and ability in the biomedical, dental, clinical dental, and behavioral sciences—including the areas of professional



- ethics and patient management—that is necessary for the safe, entry-level general practice of dentistry.
- The best questions are ones that a JQC would answer correctly, while someone who fell *just below* the JQC skill threshold, would answer them incorrectly.

## ItemSets/Cases and the Patient Box

As noted previously, the INBDE relies exclusively on multiple-choice items, some of which are presented in isolation (standalone items) while others are presented together in groups that are accompanied by a common set of stimuli (case materials including radiographic images, photographs, charts, etc.). The latter are referred to as “itemsets” or “cases.” **Itemsets** are defined as a group of 3 to 6 items associated with a Patient Box only, and **cases** are defined on the INBDE as groups of 3 to 6 items associated with a Patient Box plus an image or other stimulus. Stimulus material associated with an INBDE case may include one or more of the following:

- photograph
- radiograph
- lab report
- chart
- drawing
- prescription

The associated number of test items involved can vary depending upon the complexity of the stimulus material. In contrast to NBDE I and II cases and testlets, which often involve ten or more items; INBDE itemsets and cases should only involve a small number of items (three to six).

The INBDE does not at present contain a predetermined number or percentage of items to be allocated to standalones as opposed to these item sets. TCTs should select the presentation method that makes the most sense given the concept to be tested. In short, choose the type of item (standalone with a Patient Box and/or image, standalone without a Patient Box, itemset, or case) that is best to test the examinee’s knowledge.

For the INBDE, the Joint Commission has introduced a new tool, the **Patient Box**, which has a tremendous impact on how items involving patients are presented to test takers. Figure 6 presents an example of a Patient Box, while Figure 7 presents a description of the information to be provided in each area of the Patient Box. The Patient Box is important when working with itemsets.

**Figure 6. The INBDE Patient Box**

<b>Patient</b>
Female, 28 years old.
<b>Chief Complaint</b>
"I haven't been able to open my mouth for two days."
<b>Background and/or Patient History</b>
Three days prior, left mandibular third molar extraction
<b>Current Findings</b>
Maximum opening is 10 mm

Figure 7. Description of Patient Box Information

Data	Description	Format / Value	Example
<b>Patient</b>	<p><b>Gender</b> and <b>age</b> of the patient.</p> <p><b>Ethnicity</b> (optional)</p>	<p><b><u>This section is required.</u></b></p> <p>Male or Female, ## years old.</p> <p>Ethnicity may also be included, if relevant.</p>	<p>Female, 28 years old</p>
<b>Chief Complaint</b>	<p><b>Complaint</b> in the patient’s (or guardian’s) own words describing the main symptom or reason the patient is seeking dental care.</p> <p>After analysis, this may or may not turn out to be a symptom of the most urgent or critical issue.</p> <p>The diagnosis or treatment plan is not included in the complaint.</p>	<p><b><u>This section is required.</u></b></p> <p>One or more <b>symptoms</b> and the <b>duration</b> of those symptoms.</p> <p>If quoted directly from the patient, enclose in quotation marks and put in the first person.</p> <p>If someone is speaking for the patient, attribute the information to that person (e.g., the mother of a pediatric patient).</p>	<p>“I’ve been unable to open my mouth for two days.”</p>
<b>Background and/or Patient History</b>	<p><b>History of medical conditions</b></p> <p><b>Current medications.</b> Other treatments.</p> <p><b>History of dental diagnoses and treatment</b></p> <p><b>Allergies</b></p> <p><b>Social history</b>, such as tobacco use, occupation, living arrangements (e.g., for a geriatric patient)</p>	<p><b><u>This section may be left blank.</u></b></p> <p>The information is assumed to be provided by the treating dentist and be factual.</p> <p>If the information is provided from another source, identify the source.</p> <p>Put data in the sequence listed when it is provided.</p> <p>List each condition and medication on a new line.</p>	<p>Three days prior, left mandibular third molar extraction.</p>
<b>Current Findings</b>	<p>Data provided by dental professionals during the current visit, including:</p> <ul style="list-style-type: none"> <li>- <b>Height and Weight</b></li> <li>- <b>Vital signs</b> (e.g., blood pressure, glucose level)</li> <li>- <b>Results of diagnostic tests</b></li> <li>- <b>Assessment of patient condition</b> (e.g., swelling or lack of swelling, sites of bleeding, maximum opening)</li> </ul>	<p><b><u>This section may be left blank.</u></b></p> <p>Height and weight may be included if relevant (optional).</p> <p>Vital signs and diagnostic tests may be summarized as “Stable” or “Within normal limits.”</p>	<p>Maximum opening is 10 mm</p>

The Patient Box has a number of key benefits:

- Permits the candidate to focus on the content of the question, as opposed to how items are worded.
- Simplifies the item writing process for item writers, allowing them to focus on the concept being tested.
- Reduces bias and is fairer to examinees by lowering language requirements and providing a purer, more valid assessment of dental skills.
- Presents concepts to be tested within the context of an actual patient, thereby increasing the correspondence between test content and the actual experiences of practicing entry-level dentists.

The Patient Box facilitates development by providing a platform for asking question that greatly simplifies the process, incorporating elements that facilitate the direct assessment of examinee skill levels, avoiding unnecessary verbiage. The Patient Box can be used for both standalone items and for itemsets/cases. Examinees will be instructed to always consider the Patient Box in their responses, and a tutorial provided at the beginning of the examination will instruct examinees on how to appropriately interpret information provided in the Patient Box. Similarly, pre-examination materials (e.g., the INBDE Examination Guide) will also include information concerning the Patient Box.

The following principles apply when using the Patient Box:

- Items involving a patient should include a Patient Box. However, item writers are discouraged from including a patient where doing so would simply add unnecessary verbiage to an item that is already clinically relevant. Omit the Patient Box if a patient scenario is unnecessary.
- When utilized, the Patient Box should contain as much information about the patient and treatment situation as possible. Do not duplicate Patient Box information in the stem and distractors.
- The Patient Box should occupy roughly the same size on a test administration screen for all questions. However, there may be exceptions.
- Put the components of the Patient Box in the same sequence listed in Figure 7. For example, under *Background and/or Patient History*, consistently sequence medical history and medications prior to presenting history of dental diagnoses and treatment.
- It is not necessary to include all components in the Patient Box. Please refer to Description of Patient Box Information in Figure 7 to help determine which information must be included and what may be left out as you develop a Patient Box.
- Begin new information in the Patient Box on a new line and with a capital letter, with the exception of medications.
- Refer to medications with both generic and trade names (if applicable). Generic names are listed first and are not capitalized. Brand/trade names follow the generic name and are placed in parentheses, capitalized, and with the registered trademark symbol (®). For example: acetaminophen (Tylenol®).
- Do not include the trade name for brands that are no longer on the market. In these instances, use the generic name only.
- Exclude dosage information for medications unless the dosage is relevant for that item. Exceptions to this rule would include specific medications that have a typical lower and higher dosage that is dependent upon the condition, and where it is important to distinguish which dosage level is used. This includes aspirin.
- Use verbiage that is most likely to be used by a patient in the Chief Complaint area, as this should be stated in the patient's/guardian's own words. For example, this will often be the trade name for medications because patients are likely to be more familiar with these names:
  - Chief Complaint: "I am wondering if my Coumadin prescription is causing my mouth to bleed."
  - Patient Background: Medications: warfarin (Coumadin®)
- Use currently-prescribed medications that candidates would be expected to be familiar with.

- Verify that the situation and item are relevant to a general dentist, occur in common practice, and are within the dental scope of practice. The touchstone is **clinical relevance**.
- Language used in the Patient Box should be consistent with what is heard and used in practice in real world clinical settings.
- If the patient appearing in the Patient Box has diabetes, please include the type: type 1 or type 2.
- Abbreviate BP and Temp. These are common abbreviations and there is little risk that they will be misinterpreted in this context. For Height/Weight, use this format: 6' 1", 230 lbs. It is not necessary to spell out 6 feet, 1 inch, 230 pounds.
- Verify that information in the Patient Box is consistent with the item stem, stimulus material, distractors, and the correct answer.
  - Examples:
    - If the patient has an allergy to a medication, consider that the correct answer for the item may be impacted.
    - If a distractor recommends that the patient stop smoking, the Patient Box should mention that the patient is a smoker.
    - If a photograph shows a bearded patient, the patient should be presented as Male.
- For itemsets and cases, be aware that the Patient Box will be shared by all items in the group. The Patient Box should therefore include information that is pertinent to all of the items in the itemset/case, and should be consistent with all of the associated items. If additional information needs to be provided for an item in the group, it can be provided in the stem.
- Verify that enough information is provided in the Patient Box and/or stimulus materials to diagnose and treat the patient. Enough information should be provided so the examinee can provide a correct response to the item.
- Do not refer to "this patient" in the wording of the stem. Examinees should **always** consider data in the Patient Box, just as they should always consider the context of the patient in practice.
- The fact that the Patient Box is standardized means that any changes from what is typically presented will become very salient to the examinee, and may signal to the examinee the importance of the new information (thereby inadvertently providing clues to how to respond to the item). For this reason, it is necessary to sometimes include extraneous information in the Patient Box. For example, an item that requires the examinee to recognize an emergency blood pressure issue will stand out if it is the only item on the exam that includes information concerning patient blood pressure.

## Images and Itemset/Case Materials

For the INBDE, there is no requirement that each set of items associated with a stimulus must be presented with the full set of case materials, as is currently required for NBDE Part II (e.g., radiographs, dental charts, and clinical photographs). Only the images necessary to answer the questions need to be presented. This position is consistent with recent guidelines indicating that the selection of images for a given patient should be targeted toward patient needs. Similarly, with respect to the submission of case materials to the JCNDE, the JCNDE now accepts single images from submitters in addition to accepting full sets of case materials.

Images can vary with respect to the information they are capable of providing. In constructing items, the fundamental question to ask for each item is as follows:

***Would an entry-level candidate who possesses the necessary knowledge be able to answer this question correctly, given the quality of the image presented?***

Images appearing on the Joint Commission's examinations should be of sufficient quality to enable examination results to properly reflect candidate skill levels. Image quality and acceptability involves numerous factors, including the following:

- Resolution
- Size
- Clarity/sharpness
- Contrast
- Color accuracy

Other factors to consider when providing images:

- The presentation of dental charts and notations should be consistent with what is used in current dental practice and at dental schools (e.g., a missing tooth is typically blanked out, not marked out with a "X").
- Do not number teeth in photographs and radiographs.
- Provide "right" and "left" indicators on radiographs.
- Radiographs and other stimulus materials must be of diagnostic quality.
- Radiographs and other stimulus materials cannot be used without copyright permission. TCs are responsible for verifying, obtaining permission for, and obtaining copyright for any images used.
- Radiographs and other stimulus materials that may identify a patient require the patient's permission for use on the INBDE. The dentist is responsible for obtaining patient authorization for the use of images.
- PNG, TIF, and JPG formats for images are accepted, though PNG and TIF image formats are preferred.
- Images should be submitted individually, and not embedded in a Word document or PowerPoint presentation.

In viewing images on screen during item development, TCTs should bear in mind that candidates do not have the same level of control when working with images during test administration sessions. For example, candidates have no ability to adjust image contrast or lighting in the test center, and candidates do not have the ability to change image size (e.g., zoom). This must be considered when writing items involving images.

## Model Items

The preceding discussion has highlighted important information necessary to develop high quality items for the INBDE. To assist item writers, Appendix D presents model items that illustrate the concepts and principles that have been discussed. Item writers can rely on these model items as exemplars when writing INBDE items.

## Item Information and Classification Decisions

INBDE items are stored in the Joint Commission's item bank. Item banks serve as a repository for examination items, and include a tremendous amount of information concerning each item. The Joint Commission's item bank for the INBDE will include the following information for each item:

- Unique item identifier
- Item stem
- Item response options, including the key and distractors
- Foundation Knowledge area(s) associated with item (there may be more than one)
- Clinical Content area(s) associated with item (there may be more than one)
- Concept tested by the item/rationale
- Cognitive level associated with the item
- References to associated stimulus materials
- Item performance information (e.g., item difficulty, item discrimination)
- Changes to the item over time

In considering the INBDE, the Joint Commission has specifically required that items be classified based on the Foundation Knowledge and Clinical Content areas tested, as well as the concept tested, item type, and cognitive level. Item classification decisions are made to enable the Joint Commission to track content coverage and provide flexibility for reporting results (e.g., to failing candidates).

## Assigning Foundation Knowledge Areas and Clinical Content Areas

INBDE items must adhere closely to the test specifications approved by the Joint Commission. The assignment of items to Foundation Knowledge areas and Clinical Content areas represents an important task that enables the Joint Commission to ultimately assemble test forms that properly reflect the content domain and comply with test specifications. The following general principles apply when assigning Foundation Knowledge areas and Clinical Content areas to items:

- Items should be classified consistently, in a manner that facilitates operations and is consistent with the test purpose.
- An item can relate to multiple Foundation Knowledge areas and, by extension, multiple disciplines.
- An item can relate to multiple Clinical Content areas.
- Each item will be assigned a single Foundation Knowledge area and a single Clinical Content area, for test specification purposes. Items relating to multiple Foundation Knowledge areas and/or Clinical Content areas will be assigned a single Foundation Knowledge area and a Clinical Content area at the discretion of the Test Construction Team.

### **Concept Tested and Item Type**

Information concerning the concept tested, or the item writer's rationale, focuses on the specific topic area or piece of knowledge that is being evaluated by a given test question. The concept tested reflects the point of the question. This information is helpful in honing the item so it is focused purely on its intended evaluative target. It is also very helpful to item reviewers. The concept being tested may appear clear to the individual who wrote the item; however, an external item reviewer may see something completely different. The concept tested can help external reviewers to refine an item so that it more closely matches its intended purpose.

### **Cognitive Level**

A level is assigned to each item to gauge the thought processes and level of cognition required to respond. Cognitive levels reflect the manner in which knowledge is being assessed, rather than the empirical difficulty of the content. The cognitive level is based on the tasks required of the examinee. Items are classified according to the following three cognitive levels:

**Level 1 – Understanding/Recall.** Recall of specific facts. Understanding items elicit knowledge of specific facts, terminology, sequences, methodology, principles, theories, and structures in a different context.

*Identifiers:* acquire, define, identify, recall, recognize

**Level 2 – Application.** Application Items elicit the application of specific facts, terminology, sequences, methodology, principles, theories, and structures in a complex manner. Candidates must interpret information and apply acquired knowledge.

*Identifiers:* apply, choose, classify, develop, relate, organize, differentiate

**Level 3 – Reasoning/Analysis.** Reasoning items elicit understanding or the ability to identify and interpret specific data, terminology, sequences, methodology, principles, theories, and structures. Candidates must apply acquired knowledge and reason through to determine next steps.

*Identifiers:* analyze, synthesize, interpret, evaluate

In assigning a cognitive level to an item, the item writer must consider the cognitive skills of an entry-level dentist. Mislevy (1993) cautions that item writers, as experts, use different cognitive strategies in responding to a problem or circumstance than a novice. An expert works from an extensive knowledge base and often processes information in a less complex manner (e.g., recognition of problem elements and recall of a solution, as opposed to complex analysis to derive the solution). In turn, the novice uses more complex cognitive operations to address a problem. In item development, the item writer should be sensitive to the cognitive skills of the entry level professional, and should code the cognitive level correspondingly.



# Conclusion

The Joint Commission hopes that the material presented in this Item Development Guide is helpful to item writers as they construct INBDE items. Feedback on this guide and the INBDE development process is welcome, and can be submitted to the Joint Commission via the following email address: [nbexams@ada.org](mailto:nbexams@ada.org).

## Submission of Items and Case Materials

As noted previously, all INBDE Test Constructors are expected to complete a Department of Testing Services (DTS) Contributor Agreement Form. The required form appears in Appendix E.

If you would like to submit items for the Integrated National Board Dental Examination, or if you have any questions, please contact the Department of Testing Services at the following address:

*Joint Commission on National Dental Examinations  
Department of Testing Services  
211 East Chicago Avenue  
Chicago, IL 60611-2637*

## A Final Note of Thanks

The Joint Commission appreciates the significant contributions of the many individuals who spend numerous hours writing items for the Joint Commission's examination programs. The contributions of these individuals are extremely important, and have a direct impact on the public health. The Joint Commission thanks its Test Construction Teams for their dedication and commitment as they work to build high quality examination items for use in Joint Commission testing programs.

If you are not currently a Joint Commission Test Constructor, the Joint Commission invites you to consider participating in this vital endeavor. You can learn more about becoming a Test Constructor on the American Dental Association's website: <https://www.ada.org/en/education-careers/admission-tests-and-dental-exams/test-construction-information>

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