The purpose of this study guide is to provide candidates with information on topics that may be covered on the certifying examination of the American Board of Oral and Maxillofacial Radiology. It is by no means a complete listing of topics that will appear on the examination, nor is it to be implied that any topic not listed here will not appear on an examination. The document is not intended to be used for evaluating radiology programs or as a curriculum guideline for oral and maxillofacial radiology programs. Its sole purpose is to give candidates guidance when preparing for the examination.

Examination Format

The examination takes place over the course of two days and consist of 3 examinations in Radiation Physics and Imaging Techniques, Radiation Biology and Protection, and Radiographic Interpretation.

On the first day, the morning will be devoted to a written examination on Radiation Physics and Imaging Techniques. During the afternoon of the first day, candidates will interpret 8 cases of radiographs and write radiographic reports for these. The written radiographic report should include:

1. An identification of the type(s) of image(s).
2. A description of the abnormality(ies).
3. A differential interpretation/diagnosis, where appropriate.
4. A definitive interpretation/diagnosis, where appropriate.
5. Recommendations for additional studies, tests or investigations, radiographic or otherwise, and why such information would be useful.

On the second day, a written examination on Radiation Biology and Protection will be conducted in the morning. In the afternoon, 8 additional cases will be presented for interpretation.

At some point during the 2 day examination period, a case-based oral examination of the candidate will be conducted by the Board of Directors. The candidate will have the opportunity to preview 4 sets of images for 15 minutes. The Board of Directors will then question the candidate about the images for 1 hour. Projected images of the previewed cases will be shown during the oral examination. Questions may address any aspect of the images and/or related topics.

All test materials will be provided for the candidate with the exception of pens and pencils. Candidates are permitted to use magnification when viewing the images, but they must furnish
the magnifier themselves. Candidates may bring a “simple” calculator for basic math, but no laptop computers or “sophisticated” calculators with memory will be permitted.

Candidates must achieve 70% or better on the Radiation Physics and Imaging Techniques and Radiation Biology and Protection portions of the examination. To pass the Interpretation portion of the examination, candidates must pass both the written as well as oral subsections. To pass the Interpretation written examination, candidates must pass 12 of 16 cases as determined by a majority of the Directors. To pass the Interpretation oral examination, candidates must pass 3 of 4 cases as determined by a majority of the Directors.

Candidates who fail to achieve a score of 70% on the Radiation Physics and Imaging Techniques or Radiation Biology and Protection portions of the examination, or fail the Interpretation portion will be permitted to retake that one section until the expiration of their eligibility status. Candidates who fail to achieve passing scores in two or more sections must repeat the entire examination.

**TOPIC LIST**

**Radiation Physics and Imaging Techniques**

1. **Physics**

   A. General characteristics and properties of various energies
      1. Electricity
      2. Magnetic fields
      3. Electromagnetic radiation

   B. Properties of ionizing radiation
      1. Natural
         a. Principles of radioactivity and radionuclides
         b. Alpha, beta, neutron and gamma radiation
         c. Principles of exponential decay, half-life, specific activity
      2. Man-made

   C. X-ray production
      1. Components of an x-ray machine and their function(s)
         a. X-ray tube
         b. Operating panel
         c. High voltage components, transformers
         d. Tube rating, wave form, rectification
      2. X-ray generation
         a. Electron-target interactions
         b. X-ray emission spectrum
            i. Factors affecting x-ray beam intensity
            ii. Factors affecting x-ray beam quality
         c. Beam restriction and scatter reduction

   D. Interaction of ionizing radiation with matter
      1. Five basic interactions
      2. Differential attenuation
3. Exponential attenuation

E. Radiographic film
   1. Components and their function(s)
   2. Film types
      i. Film characteristics
      ii. Intensifying screens
   3. Handling and storage
   4. Formation of the latent image

F. Processing the latent image
   1. Processing chemistry
   2. Automatic vs. manual processing
   3. Quality assurance
   4. Statutory regulations for working with and disposal of chemical hazards

G. Image quality
   1. Geometric factors
   2. Subject factors

2. Imaging Technology

   A. Plain film techniques, including conventional tomography
      1. Intraoral
      2. Extraoral

   B. Computer technology
      1. Components and their function(s)
      2. Terminology
      3. Information processing
         i. Image processing
         ii. Image archiving
         iii. Image transmission
         iv. Networking technology

   C. Digital imaging
      1. Components and their function(s)
      2. Image acquisition
      3. Image characteristics
      4. Storage phosphor technology

   D. Computed tomography
      1. Basic principles
      2. Components and their function(s)
      3. Operational modes
      4. Image characteristics
      5. Factors affecting image quality
E. Magnetic resonance imaging
   1. Basic principles
   2. Components and their function(s)
   3. Image characteristics
   4. Signal parameters
   5. Basics of pulse sequencing

F. Ultrasound imaging
   1. Basic principles
   2. Components and their function(s)

G. Nuclear Medicine imaging
   1. Properties of radiopharmaceuticals
   2. Basic principles of imaging
      i. Gamma camera
      ii. Single photon emission computed tomography (SPECT)
      iii. Positron emission tomography (PET)

H. Contrast studies
   1. Indications and basic techniques
   2. Properties of contrast agents
   3. Complications or adverse reactions to procedures

Radiation Biology, Protection, and Safety

1. Radiation Biology

   A. Molecular and cellular radiobiology
      1. Effects of radiation on macromolecules
      2. Effects of radiation on water
      3. Direct vs. indirect effects
      4. Target-hit models
      5. Dose-response relationships
      6. Repair mechanisms

   B. Factors affecting radiosensitivity
      1. Physical factors
         i. LET
         ii. RBE
         iii. Fractionation
      2. Biological factors
         i. Oxygen effect
         ii. Age
         iii. Gender
         iv. Cell cycle
         v. Law of Bergonie and Tribondeau
C. Basic principles of radiation oncology
   1. Indications
   2. Goals
   3. Usual doses
   4. Consequences and complications

D. Early effects on organisms
   1. Acute radiation syndrome
   2. Lethal doses
   3. Local tissue damage
      i. Reproductive effects
         a. Germ cells
         b. Cytogenetic effects
      ii. Somatic effects
         a. Hematological effects
         b. Gastrointestinal effects
         c. CNS effects
   4. Effects on skin

E. Late effects on organisms
   1. Carcinogenesis, mutagenesis
   2. Growth and development
   3. Biological risk estimates for ionizing radiation
   4. Stochastic vs. non-stochastic effects

F. Biological effects of ultrasound

G. Biological effects of magnetic fields and radio waves

2. Radiation Protection

A. Radiation detection and measurement

B. Exposure and dose in radiology
   1. Basic terminology
   2. Risk assessment
   3. Comparison of risks among oral and maxillofacial imaging procedures
   4. Maximum permissible dose
      i. Occupational
      ii. Nonoccupational
   5. Patient doses in oral and maxillofacial imaging
   6. Analysis of techniques
      a. ROC curves (Az)
      b. Sensitivity, specificity, positive predictive value, negative predictive value, accuracy

C. Minimization of occupational exposure

D. Minimization of unnecessary patient exposure
   1. Selection criteria
   2. Technical excellence
E. Office/clinic design for safety
   1. Statutory responsibilities
   2. Design parameters
   3. Protective barriers

Image Interpretation

A. Normal anatomy and development

B. Description of the radiographic features of diseases, conditions or abnormalities as they appear on various types of images

C. Analysis of radiographic features of diseases, conditions or abnormalities so that a differential diagnosis/interpretation can be developed

D. Recommend additional studies, tests or investigations, radiographic or otherwise, and why such information would be useful.

E. Recommend treatment options, and comment on disease prognosis.

An attempt is made to evenly distribute the interpretive cases among the following categories:

1. Neoplastic diseases
2. Inflammatory diseases
3. Reactive diseases, trauma
4. Developmental disorders
5. Systemic diseases
6. Odontogenic cysts and tumors

11/05