# Radiation Therapy Board Practice Exam (Sample)

## Study Guide


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# Questions

**1. How many hot ends do Indian club needles have?**

**A. Good seed**

**B. One hot end**

**C. Two hot ends**

**D. Even activity**

**2. During inspiration, how does the diaphragm move?**

**A. Caudally**

**B. Cephalad**

**C. An anterior direction**

**D. A posterior direction**

**3. What are the normal limits of BUN in mg/dL for adults?**

**A. 10-20**

**B. 30-40**

**C. 60-80**

**D. 100-110**

**4. Which modalities are commonly used for IGRT?**

**A. CT and MRI**

**B. PET and MRI**

**C. CT and Ultrasound**

**D. Ultrasound and MRI**

**5. In which region of the pharynx are the pharyngeal tonsils located?**

**A. Nasopharynx**

**B. Oropharynx**

**C. Hypopharynx**

**D. Parapharynx**

**6. How many joules are in 1 electron volt?**

**A. 1.6 x 10^-13 J**

**B. 1.6 x 10^-19 J**

**C. 1.6 x 10^13 J**

**D. 1.6 x 10^19 J**

**7. What influences the brightness of an image display on a viewing monitor?**

**A. signal intensity**

**B. window level**

**C. proton density**

**D. window width**

**8. Which type of skin cancer has the worst prognosis?**

**A. Basal cell**

**B. Squamous cell**

**C. Bowen's disease**

**D. Melanoma**

**9. Hair loss is usually permanent when the scalp is exposed to radiation doses exceeding how much?**

**A. 30 Gy**

**B. 45 Gy**

**C. 50 Gy**

**D. 60 Gy**

**10. What term describes the volume percentage of red blood cells in whole blood per 100 mL?**

**A. Erythrocytes**

**B. Leukocytes**

**C. Hematocrit**

**D. Hemoglobin**

# Answers

**1. B**
**2. A**
**3. A**
**4. C**
**5. A**
**6. B**
**7. B**
**8. D**
**9. D**
**10. C**

# Explanations

## 1. How many hot ends do Indian club needles have?

**A. Good seed**

**B. One hot end**

**C. Two hot ends**

**D. Even activity**

**Indian club needles are specialized acupuncture needles that are designed with specific features to enhance their functionality. These needles typically have one hot end, which is the end that is heated for the purpose of therapeutic treatment. The single heated end allows practitioners to provide heat into the acupuncture point or area being treated, which can enhance the overall effectiveness of the therapy by promoting blood circulation and alleviating pain. In contrast, the other options suggest varying attributes that do not accurately describe Indian club needles. 'Good seed' is not a relevant term in this context, while the suggestions of having 'two hot ends' or 'even activity' do not reflect the standard design characteristic of these needles, which emphasize the single heated end for treatment purposes. Therefore, the correct understanding of Indian club needles hinges on recognizing that they feature one hot end used specifically for their therapeutic effects.**

## 2. During inspiration, how does the diaphragm move?

**A. Caudally**

**B. Cephalad**

**C. An anterior direction**

**D. A posterior direction**

**During inspiration, the diaphragm plays a crucial role in the mechanics of breathing. As the diaphragm contracts, it moves in a caudal direction, which means it descends towards the abdominal cavity. This downward movement increases the vertical dimension of the thoracic cavity, creating a negative pressure that allows air to be drawn into the lungs. The diaphragm is a dome-shaped muscle that separates the thoracic cavity from the abdominal cavity. When it contracts, it flattens and lowers, thereby increasing the lung volume and facilitating air intake. This process is essential for efficient respiratory function. In contrast, during expiration, the diaphragm relaxes and moves upwards (cephalad), reducing the volume of the thoracic cavity and pushing air out of the lungs. Understanding the correct movement of the diaphragm during inspiration helps in grasping the fundamentals of respiratory physiology, which is crucial in areas such as radiation therapy, where the respiratory system can influence treatment planning and delivery.**

## 3. What are the normal limits of BUN in mg/dL for adults?

**A. 10-20**

**B. 30-40**

**C. 60-80**

**D. 100-110**

**The normal limits of Blood Urea Nitrogen (BUN) for adults typically range from 10 to 20 mg/dL. BUN is a waste product formed in the liver from protein metabolism and is excreted by the kidneys. Measuring BUN levels is a common practice to assess kidney function, hydration status, and the metabolic state of an individual. While values can vary slightly based on the laboratory and the specific population being assessed, the range of 10 to 20 mg/dL is widely accepted in clinical practice. Levels outside this range can indicate various medical conditions. Elevated BUN can suggest renal impairment, dehydration, or high protein intake, while decreased levels may suggest liver failure or malnutrition. Understanding these normal limits is crucial for interpreting laboratory results and managing patient care effectively.**

## 4. Which modalities are commonly used for IGRT?

**A. CT and MRI**

**B. PET and MRI**

**C. CT and Ultrasound**

**D. Ultrasound and MRI**

**Image-guided radiation therapy (IGRT) relies on various imaging modalities to ensure accurate delivery of radiation to the target area while minimizing exposure to surrounding healthy tissues. The choice of the correct modalities is integral to achieving effective treatment. CT (Computed Tomography) is extensively utilized in IGRT due to its ability to provide high-resolution images and detailed three-dimensional (3D) anatomical information. This capability is crucial for verifying the position of the tumor before and during treatment, allowing therapists to adjust patient positioning as necessary. CT imaging also aids in delineating the target volume, ensuring that radiation beams are precisely directed to the intended area. Ultrasound is another valuable tool in IGRT. It is particularly useful because it is real-time imaging and does not involve ionizing radiation, making it a safe choice for patients. Ultrasound can help in monitoring soft tissue tumors, guiding treatments, and verifying patient positioning throughout the treatment course. While other modalities like MRI (Magnetic Resonance Imaging) and PET (Positron Emission Tomography) provide important diagnostic information, they are not commonly used for the immediate purposes of IGRT during the active treatment phase. MRI does provide excellent soft tissue contrast but is less practical for daily positioning verification in radiation therapy due to**

## 5. In which region of the pharynx are the pharyngeal tonsils located?

**A. Nasopharynx**

**B. Oropharynx**

**C. Hypopharynx**

**D. Parapharynx**

**The pharyngeal tonsils, also known as adenoids, are located in the nasopharynx, which is the upper part of the pharynx situated behind the nose. This region is specifically designed to trap pathogens and play a crucial role in the immune response, particularly for airborne particles. The nasopharynx serves as a passageway for air from the nasal cavity to the oropharynx and is important for the functioning of the respiratory system. In contrast, the oropharynx, which lies below the nasopharynx, contains the palatine tonsils and lingual tonsils, focusing on protecting against oral pathogens, while the hypopharynx primarily leads to the esophagus and larynx, and the parapharynx refers to spaces adjacent to the pharynx rather than a distinct pharyngeal region. Thus, identifying the correct anatomical location of the pharyngeal tonsils as the nasopharynx is essential for understanding their role in immune function and the architecture of the pharyngeal region.**

## 6. How many joules are in 1 electron volt?

**A. 1.6 x 10^-13 J**

**B. 1.6 x 10^-19 J**

**C. 1.6 x 10^13 J**

**D. 1.6 x 10^19 J**

**One electron volt (eV) is defined as the amount of energy gained by an electron when it is accelerated through an electric potential difference of one volt. The relationship between electron volts and joules is based on the fundamental charge of the electron, which is approximately 1.6 x 10^-19 coulombs. Since energy (in joules) is calculated as the product of charge (in coulombs) and electric potential (in volts), for an electron accelerated through one volt, the energy is: Energy (J) = Charge (C) x Voltage (V) = (1.6 x 10^-19 C) x (1 V) = 1.6 x 10^-19 J. This conversion is essential in many fields of physics, including quantum mechanics and radiation therapy, as it relates the energy levels of particles and the energy of photons and other forms of radiation. Hence, the value of 1 electron volt is accurately represented as 1.6 x 10^-19 joules.**

## 7. What influences the brightness of an image display on a viewing monitor?

**A. signal intensity**

**B. window level**

**C. proton density**

**D. window width**

**The brightness of an image displayed on a viewing monitor is primarily influenced by the window level. In radiological imaging, the window level determines the midpoint of the range of densities displayed, effectively setting the brightness for the image. By adjusting the window level, the radiologist or technician can enhance the visibility of specific anatomical structures or tissues by increasing or decreasing the overall brightness of the image. Window width, while it affects the contrast of an image by determining the range of gray levels displayed, does not directly control brightness. Signal intensity relates to the raw data captured during imaging but does not singularly decide how bright the display appears. Proton density is relevant in certain imaging modalities, particularly MRI, but does not play a role in adjusting the brightness of the displayed image on a monitor. Thus, focusing on the window level is key for managing image brightness effectively during interpretation.**

## 8. Which type of skin cancer has the worst prognosis?

**A. Basal cell**

**B. Squamous cell**

**C. Bowen's disease**

**D. Melanoma**

**The type of skin cancer with the worst prognosis is melanoma. This is primarily due to its aggressive nature and the propensity for early metastasis compared to other skin cancers. Melanoma arises from melanocytes, the pigment-producing cells in the skin, and is less common than basal cell carcinoma and squamous cell carcinoma, but it is significantly more dangerous. When diagnosed early, melanoma can often be treated effectively, but as it progresses, it can quickly spread to other parts of the body, including vital organs, making treatment more difficult and reducing survival rates. The potential for metastasis is a key factor that affects the prognosis, as the presence of cancer cells in lymph nodes or distant organs can complicate treatment and lead to poorer outcomes. In contrast, basal cell carcinoma and squamous cell carcinoma are generally less aggressive and have high cure rates when detected early. Although they can cause significant local destruction and can be serious if left untreated, they are much less likely to metastasize compared to melanoma. Bowen's disease, which is a form of squamous cell carcinoma in situ, is typically confined to the epidermis and has an excellent prognosis with proper treatment. Therefore, the characteristics and behavior of melanoma make it the type of skin cancer with the worst**

## 9. Hair loss is usually permanent when the scalp is exposed to radiation doses exceeding how much?

**A. 30 Gy**

**B. 45 Gy**

**C. 50 Gy**

**D. 60 Gy**

**Hair loss, or alopecia, resulting from radiation therapy is influenced significantly by the dose of radiation received by the scalp. When the scalp is exposed to higher doses of radiation, the likelihood of permanent hair loss increases. At doses approaching or exceeding 60 Gy, the damage to hair follicles becomes more severe and is more likely to be irreversible. This is because radiation can cause significant cellular damage to the hair follicle stem cells, which are crucial for hair regeneration. The threshold for permanent alopecia is typically recognized at around this high dose due to the amount of damage it inflicts, disrupting the normal hair growth cycle and making it difficult, if not impossible, for hair to regrow. In contrast, lower doses can lead to temporary hair loss as the follicles may recover once the radiation treatment is completed. Therefore, understanding the relationship between radiation dose and the risk of permanent hair loss is crucial for both planning treatment and setting appropriate patient expectations.**

## 10. What term describes the volume percentage of red blood cells in whole blood per 100 mL?

**A. Erythrocytes**

**B. Leukocytes**

**C. Hematocrit**

**D. Hemoglobin**

**The term that describes the volume percentage of red blood cells in whole blood per 100 mL is known as hematocrit. This measurement is crucial in evaluating an individual's blood health, particularly in relation to anemia or polycythemia. Hematocrit indicates how much of the total blood volume is comprised of red blood cells, which are essential for transporting oxygen throughout the body. Erythrocytes refer to the red blood cells themselves rather than a measurement or volume percentage. Leukocytes are white blood cells, which play a role in the immune response but do not contribute to the hematocrit value. Hemoglobin is a protein found within red blood cells that carries oxygen; while closely related to red blood cell function, it is not a measure of the volume percentage of these cells in the blood. This distinction is essential for understanding blood composition and the physiological roles of its components.**