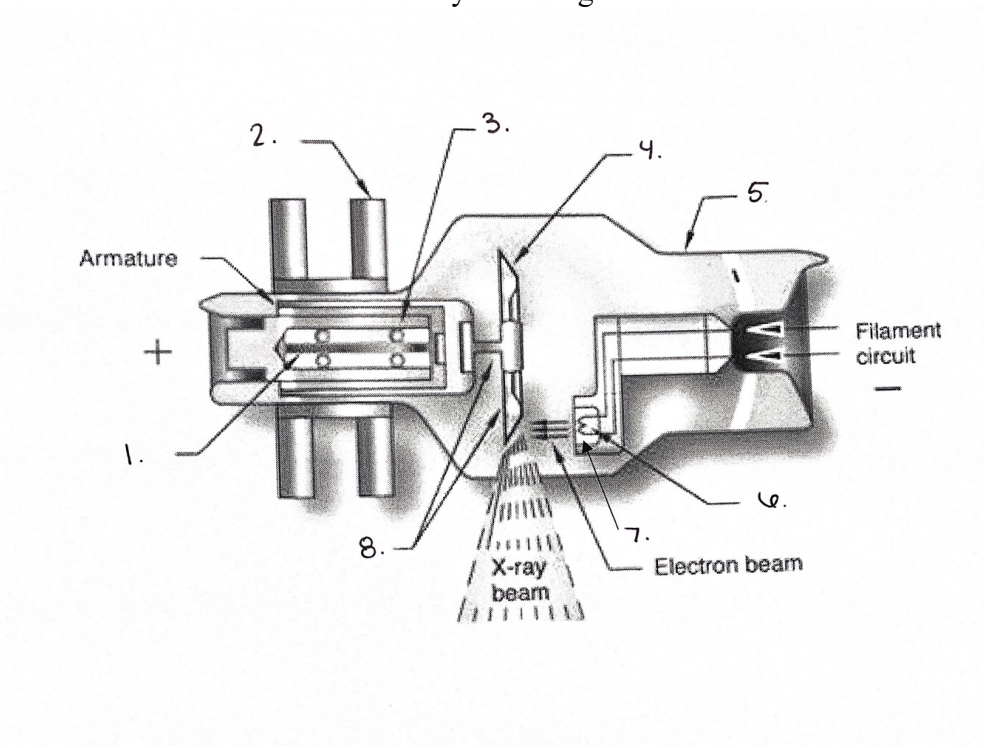
Reading Hospital School of Health Sciences
Medical Imaging Program

MI132 – Imaging Principles and Equipment
Unit 3 Study Guide
2022

1. What four conditions must exist for x-rays to be produced?

2. Identify each of the labeled items on the x-ray tube diagram below:



3. Answer the following regarding the above components:
    a. Which item is part of the induction motor? Where is it located (inside/outside the envelope)?

        - How does the induction motor operate?

b. Which of the items in the diagram above is made of thoriated tungsten?

- Why is tungsten the material of choice?
- Why is thorium added?

c. Which of the items is responsible for keeping the electrons in a tight stream as they move from cathode to anode?

d. Tube failure will occur when which of the above items is vaporized and breaks?

e. Which of the numbered items is made of glass and/or metal?

f. Which of the above acts as a "switch" in a grid-controlled x-ray tube?

h. What is #8 composed of and why?

4. What are the negative and positive parts of the x-ray tube? What parts does each contain?

5. What is/are the purpose(s) of each of the following in an x-ray tube:
   a. Rotating Anode -
   b. Protective housing -
   c. Glass envelope -

c. Filament -

6. What is the purpose of oil in the protective housing?

7. Leakage radiation should not exceed _____.

8. Define the following terms:

   a. Leakage radiation

   b. Thermionic emission

   c. Space charge

9. Explain the relationship between the strength of the filament current, the size of the thermionic cloud, and the size of the filament.

10. Why is tungsten the material normally used as a general purpose tube's target material? What material is added to the target to add mechanical stability?

11. What is the most common cause of x-ray tube failure?

12. Calculate heat units for the following:

   a. 100 mA; 60 kVp; 0.05 sec; single-phase rectified unit

   b. 1,000 mA, 120 kVp; 0.02 sec; high frequency unit

13. Determine if the following exposures are safe using the appropriate chart.

    a. 150 mA; 80 kVp; 0.5 sec; single-phase unit; low speed; 0.6 mm focal spot

    b. 700 mA; 100 kVp; 0.5 sec; three-phase unit; high speed; 1.0 mm focal spot

14. Using the anode cooling chart, how long would it take for the anode to cool from 275,000 HU to 100,000 HU?

15. Calculate the length of time necessary for the anode to cool completely after 10 exposures of 1,000 mA, 0.05 sec at 80 kVp are taken on a single phase generator.