Chapter 9

1. Inside the x-ray tube, the is utilized:

a. transformer

b. generator

c. DC commutator motor

d. simple induction motor

e. none of these

2.The x-ray tube envelope is composed of a heat resistant material called:

a. pyrex glass

b. leaded glass

c. bakelite

d. thorium-impregnated tungsten

3. The milliamperage stations are activated, heating up the filament and boiling off electrons in

the x-ray tube each time you:

a. turn on the machine

b. engage the rotor switch

c. engage the exposure switch

d. release the exposure switch

4. Tungsten is used in x-ray tube anodes because:

a. it has a very large nucleus to slow down passing electrons and release x-rays

b. it has lots of orbital electrons for projectile electrons from the filament to “run into”

c. it has a very high melting point so it can withstand constant electron bombardment

d. all of these reasons

e. none of these reasons

5. What is the process of “boiling off” electrons from the x-ray tube filament called?

a. space charge production

b. electron emission

c. thermionic emission

d. heat transmission

6. Which of the following is *not* an absolutely necessary condition for the production of x-rays:

a. a source of electrons

b. a means of delerating electrons

c. a means of accelerating electrons

d. A vacuum tube

7. The primary purpose of the filament current in an x-ray tube is to:

a. produce x-rays at the anode

b. produce thermionic emission

c. complete the high-voltage circuit across the tube

d. maintain the filament at a steady temperature to prevent thermal shock

8. In an induction motor, only the rotates:

a. rotor

b. wire loop

c. stator

d. electromagnet

e. none of these

9. In an induction motor:

a. the rotor is a permanent (artificial) magnet

b. only the rotor has windings

c. both the rotor and the stator may have windings

d. neither the rotor nor the stator have windings

10. In an induction motor, an electrical current is initially *induced* in:

a. only the rotor

b. only the stator

c. both the rotor and the stator

d. neither the rotor nor the stator

11. To cause an induction motor to run, an EMF is initially applied to:

a. only the rotor

b. only the stator

c. both the rotor and the stator

d. neither the rotor nor the stator

12. mA, mAs and kVp are all actually units measuring characteristics of the:

a. x-ray beam produced

b. interactions caused in the anode

c. image qualities that result from an exposure

d. electricity that is used in the x-ray tube

13. Which part of the x-ray tube is made of thorium-impregnated tungsten:

a. the focusing cup

b. the filament

c. the target surface of the anode

d. the body of the anode disc

e. the anode shank

14. Which of the following would be defined as the area of heat dispersion on the x-ray tube

anode:

a. the focal spot

b. the focusing cup

c. the focal track

d. the target

e. the space charge

15. When the exposure switch is engaged, which electrical current is applied to the filament in

the x-ray tube?

a. the primary current

b. the filament current

c. the tube current

d. the high amperage current

16. The difference in charge between the cathode and anode during an x-ray exposure is called

a(n):

a. power gradient

b. amperage gradient

c. space charge

d. potential difference

17. For thoriated tungsten, the minimum temperature at which thermionic emission occurs is

about:

a. 100 degrees C (212 F)

b. 1000 degrees C (1800 F)

c. 2000 degrees C (3700 F)

d. 3000 degrees C (5400 F)

18. The temperature of the filament in the x-ray tube is directly related to the:

a. exposure time

b. quantity of x-rays produced

c. speed of the electron stream

d. speed of the anode rotation

19. Tungsten is the principle material used in the:

a. target of the rotating anode

b. window of the x-ray tube

c. x-ray tube filament

d. a & c only

e. b & c only

20. Reduction of the focal spot size can be accomplished by:

a. increasing the set mAs

b. increasing anode rotation speed

c. using a smaller filament

d. decreasing the focusing cup voltage

21. The thin, flattened surface of the x-ray tube envelope which allows for minimum absorption

of x-rays is called the:

a. window

b. diaphragm

c. primary shutter

d. collimator

e. focusing cup

22. The amount of space charge generated at the cathode is controlled primarily by the:

a. set amperage

b. set kVp

c. tube current

d. amount of hysteresis

23. In the rotating anode, the use of molybdenum for the anode stem material helps prevent:

a. heat damage to the ball bearings

b. pitting of the anode

c. thermal expansion of the anode

d. excessive prep (rotoring) time

24. Which of the following is the correct sequence of materials traversed by the x-ray beam after

it leaves the anode disc:

a. aluminum, glass, oil

b. glass, oil, aluminum

c. oil, aluminum, glass

d. oil, glass, aluminum

25. Which of the following affects focal spot size?

a. anode angle

b. anode rotation speed

c. filament size

d. a & b only

e. a & c only

26. As mA increases, it can have an *indirect* effect on increasing image blur due to its impact on:

a. focal track size

b. electromagnetic induction

c. focal spot blooming

d. heating of the anode

27. The amount of heat storage capacity of a rotating anode depends on the anode’s:

a. disc diameter

b. rotational speed

c. prep (rotoring) time

d. a & b only

e. a & c only

28. The material often added to a rotating anode disc to reduce surface defects and improve

rotational balance is:

a. copper

b. silver

c. lead

d. rhenium

e. thorium

29. When the radiographer changes from a small to a large focal spot, she is actually:

a. using a larger filament

b. increasing the cathode-anode distance

c. increasing the diameter of the anode

d. increasing the bevel angle of the anode

30. The equilibrium established by balancing of the collective repulsion of the electron cloud around the filament with the rate of electron emission by the filament is called the:

a. thermionic emission

b. space charge effect

c. anode heel effect

d. Rayleigh effect

31. The efficiency and life span of the filament wire is improved by the addition of:

a. rhenium

b. copper

c. silver

d. thorium

e. lead

32. Because of its resistance to vaporizing at high temperatures in a vacuum, which of the

following is used as lubricating material around the ball bearings in the anode stem:

a. powdered silver

b. liquid oil

c. powdered graphite

d. grease

33. A reduction in the set kVp will most likely:

a. reduce the speed of the electron stream

b. decrease the size of the space charge

c. increase the filament temperature

d. a & b only

e. a & c only

34. Which of the following is a portion of the induction motor that operates within the vacuum of

the enclosed x-ray tube?

a. the stator

b. the anode disc

c. the rotor

d. the focusing cup

35. Which of the following, when increased, causes the space charge around the filament to

expand:

a. mA station

b. kVp

c. exposure time

d. line voltage (LV)

36. As an x-ray tube ages, the glass envelope may suddenly crack (and the vacuum may be lost). What is the most likely cause for this:

a. cumulative thermal shock from sudden heating and cooling of the glass

b. arcing of the electron stream down to tungsten deposited on the window

c. simple aging of the glass itself

d. subjecting a “cold” x-ray tube to a high exposure technique without warming it up

37. Even with proper use and normal function, over time the entire focal track of the x-ray tube

anode:

a. becomes roughened

b. is melted

c. becomes pitted

d. begins to retain electrical charge

38. Which of the following is an appropriate warm-up technique for an x-ray tube, to be repeated

three times:

a. 600 mA at 5 seconds and 50 kVp, at 5-second intervals

b. 100 mA at 1 second and 120 kVp, at 5-second intervals

c. 200 mA at 1 second and 70 kVp, at 5-second intervals

d. 300 mA t 3 seconds and 70 kVp, at 1-second intervals

39. Which of the following is true throughout the work day, even if procedures are not being

performed, any time the *power* to an x-ray machine is on?

a. the filament is kept warm

b. the anode is heated to a stand-by temperature

c. the induction motor is kept at a minimal rotation rpm

d. the x-ray tube is constantly vacuumed

40. Which of the following is *not* an essential component of the modern x-ray tube:

a. a photocathode

b. a vacuum envelope

c. a heated filament

d. a rotating anode