

X-ray Physics final  
Date Unknown

Choose the single best answer unless otherwise indicated.

MATCHING: Match the estimated average whole-body radiation dose (rads) with their man made origin.

MAN MADE SOURCE	ANNUAL DOSE
1. Fallout /	a. 1
2. Radiopharmaceuticals /	b. 4
3. Diagnostic x-rays /	c. 10
4. Miscellaneous /	d. 80

MATCHING: - Match the units of radiation measurement with the ?tions under which the measurements are made.

CONDITIONS	UNITS OF MEASUREMENT
5. The quantity of radioactive material /	a. rem
6. Intensity of x or gamma rays /	b. roetgens
7. Exposure of a radiation monitor /	c. curies
8. Radiation absorbed by patient /	d. rads

9. Per your classroom instruction, at what size does a body become sufficiently thick to warrant the use of a grid?
- 1 cm
  - 12 cm
  - 20 cm
  - 24 cm

10. For any given x-ray examination the number of x-rays reaching the film is directly related to the time the tube is energized and the:
- total filtration (inherent plus added)
  - kVp setting
  - temperature of the developer solution
  - tube current

11. Regarding dorsoplantar radiography of the forefoot, due to the inherent shape of the part, the best solution to create a more uniformly exposed x-ray would require the use of:
- split screens
  - sectional filtration
  - gradient screens

12. How many heat units are generated when x-raying a 10 cm neck in the lateral view (tube is positioned 72 inches from the film) with exposure values of 70 kVp, 100 mA, and 0.1 seconds?
- 7 H.U.
  - 70 H.U.
  - 700 H.U.
  - 7000 H.U.

13. Radiographic workers (x-ray technicians and doctors) are primarily protected from the isotropic production of x-rays by the:
- inverse square law
  - lead lined tube housing
  - vacuum inside the glass envelope
  - lead content of the glass envelope
  - the insulating oil which surrounds the glass envelope

14. The added filtration required by Federal regulations is placed between the:
- anode and cathode
  - collimator and tube housing
  - collimator and patient
  - patient and the grid
  - grid and the film
15. Which of the following factors would yield the most radiation protection for the patient being exposed?
- utilizing a high ratio grid
  - using a high kVp, low mAs technique
  - decreased focal film distance (FFD)
  - using the small focal spot
16. X-rays
- travels in parallel paths
  - travel at the speed of sound
  - travel at a speed directly proportional to the mAs
  - travel at a speed inversely proportional to the kVp
  - travel at the speed of light
17. The line focus principle is most important when using the focal spot.
- small
  - large
18. When selecting exposure factors on a single phase x-ray machine it is most important to enter on the console the:
- kVp before the mA
  - mA before the kVp
  - time of exposure before all other factors
  - the selection order is irrelevant
19. Kilovoltage controls the \_\_\_\_\_ of the electrons flowing from the cathode to the anode.
- number
  - direction
  - speed
  - focusing
20. Milliamperage controls the \_\_\_\_\_ of the electrons flowing from the cathode to the anode.
- number
  - direction
  - speed
  - focusing
21. Given the current state of fluoroscopic equipment, a fluoroscopic study will result in \_\_\_\_\_ exposure as a comparable plain film study of the same body part.
- more
  - less
  - the same
22. A radiographic study which brings into focus only those objects in a plane of interest is:
- tomography
  - plain films
  - bone scan
  - magnetic resonance

23. A spinning top is used to check the accuracy of a timing device on a full wave rectified single phase x-ray machine. The resulting film demonstrates 24 "dots" of exposure. The actual time of exposure was:

- a. 1/100 second
- b. 1/20 second
- c. 1/10 second
- d. 2/10 second
- e. 1/2 second

24. An imaging procedure which demonstrates the distribution of hydrogen protons within the body is:

- a. mammography
- b. complex motion tomography
- c. computerized axial tomography
- d. diagnostic ultrasound
- e. magnetic resonance
- ab. videofluoroscopy
- ac. magnetometry

25. Given two different radiographic exposures of the abdomen; exposure A is 70 kVp/50 mAs, exposure B is 80 kVp/25 mAs. Which one had the greatest percentage of Compton interactions?

- a. Exposure A
- b. Exposure B

26. T/F At this point in time (excluding specific contraindications) it is felt there are no harmful effects from magnetic resonance imaging.

27. All of the following are specific contraindications for magnetic resonance except:

- a. intracranial vascular clips
- b. sheet metal workers with embedded metal shavings
- c. patients with pacemakers
- d. cochlear implants
- e. hip prosthesis

28. T/F Some radiation damage is irreversible.

29. The dose of standard radiation necessary to produce a given effect divided by the dose of test radiation which produces the same effect defines the:

- a. linear energy transfer
- b. relative biologic effectiveness
- c. law of Bergonie and Tribondeau
- d. radiation absorbed dose
- e. dose fractionation

30. T/F According to Bushong there is evidence to suggest females are more radiosensitive than males.

31. What is the greatest problem associated with the radiolysis of water?

- a. development of free radicals
- b. production of macromolecules (protein bound water)
- c. Bremsstrahlung production
- d. Liberation of deuterium

32. What are the cardinal principles of radiation protection? (CHOOSE MORE THAN ONE)

- a. time
- b. KVP
- c. Distance
- d. mAs
- e. shielding

33. In the formula to determine maximum permissible dose, the value "n" represents:
- the half-life of diagnostic x-rays
  - the average age a patient would most likely first be x-rayed
  - the tenth value layer (TVL) for lead shielding
  - the minimum starting age for employment as a radiation worker
  - the correction factor for the inverse square law, assuming most exposures are taken at 40"
34. What is the single most important source of scatter radiation during radiography?
- x-ray tube
  - collimator
  - patient
  - grid
  - cassette
35.  T/F The diagnostic ultrasound beam oscillates at a frequency greater than necessary for audible sound.
36.  T/F X-rays can travel through a vacuum.
37.  T/F Diagnostic ultrasound can travel through a vacuum.
38.  T/F Diagnostic ultrasound beams of higher frequencies result in the deepest penetration of matter.
39.  T/F If an x-ray room is properly designed a secondary barrier may require no lead shielding.
40.  T/F In the state of Missouri, as in all states, the Bureau of Radiation Health inspector has the right by law to inspect your x-ray equipment during reasonable hours.
41.  T/F Some states have legislated specific exposure values for various average-sized body parts which may not be exceeded.
42. What is the most likely source of error in the imaging chain?
- operator error in setting exposure values
  - fluctuating incoming line voltage
  - operator error in estimating patient body habitus
  - processing errors

#### SUPERTECH PROBLEMS

FOR PROBLEMS 43 -46 YOU MAY ASSUME THE FOLLOWING: YOU HAVE A HIGH FREQUENCY X-RAY MACHINE, RARE EARTH SCREENS, AND A 12:1 GRID RATIO. AT 40" YOUR TOTAL CORRECTION FACTOR IS -3.

43. You have a 66 year old male patient who has fallen and injured his hip. Your examination suggests dislocation of the iliofemoral joint. Measurement through the hip is 22 cm. What will your factors be?
- Bucky, 40" FFD, KVP 80, MAS 25
  - Bucky, 60" FFD, KVP 80, MAS 25
  - Nonbucky, 40" FFD, KVP 80, MAS 25
  - Nonbucky, 72" FFD, KVP 80, MAS 12
44. A 20 year old male patient is complaining of a sinus symptoms. Transillumination of the maxillary sinuses shows opacity on the right side. Measurement for a Water's projection is 21 cm.
- Bucky, 36" FFD, KVP 86, MAS 18
  - Bucky, 40" FFD, KVP 86, MAS 18
  - Nonbucky, 40" FFD, KVP 86, MAS 50
  - Nonbucky, 72" FFD, KVP 86, MAS 200

45. Your first day in practice brings a 15 year old female who fell off a new pair of 4" spiked heels. There is marked swelling over the lateral malleolus. YOU DO NOT OWN AN EXTREMITY CASSETTE due to lack of initial funds, therefore you are using Measurement for the AP ankle is 10 cm.

- a. Bucky, 40" FFD, KVP 63, MAS 20
- b. Bucky, 40" FFD, KVP 63, MAS 12.5
- c. Nonbucky, 40" FFD, KVP 63, MAS 1.7
- d. Nonbucky, 40" FFD, KVP 63, MAS 2.5

46. The carpenter who is finishing the lease/hold improvements in your new office mentions he has wrist pain and loss of strength when hammering overhead. You think there may be a carpal tunnel obstruction. YOU STILL DON'T HAVE THAT EXTREMITY CASSETTE (but plan to get it with your first insurance collection.) The wrist measurement for this view is 8 cm. What factors would you use to create a carpal tunnel view?

- a. Bucky, 40" FFD, KVP 60, MAS 20
- b. Bucky, 40" FFD, KVP 60, MAS 10
- c. Nonbucky, 40" FFD, KVP 60, MAS 2.5
- d. Nonbucky, 40" FFD, KVP 60, MAS 1.5

THAT'S ALL. I HOPE YOU HAVE FOUND THE CLASS INTERESTING AND CHALLENGING. REMEMBER, TAKE QUALITY FILMS! THANK YOU FOR THE PRIVILEGE TO HAVE BEEN YOUR INSTRUCTOR.

#### Answers

\* these answers have not been verified and may not be correct

LA 2.C 3.D 4.B 5.C 6.B 7.A 8.D 9.? 10.? 11.B 12.C 13.B 14.? 15.B 16.E 17.A 18.B 19.C 20.A  
21.A 22.A 23.D 24.E 25.B 26.T 27.? 28.F 29.? 30.F 31.? 32.ACD 33.D 34.C 35.T 36.T 37.F  
38.F 39.T 40.T 41.T 42.D 43.A 44.B 45.C 46.D