Mammography ARRT

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Practice Questions

Try all 30 first, then check the answer key at the back.

1. The upper outer quadrant (UOQ) of the breast contains the greatest volume of glandular tissue. Approximately what percentage of breast cancers originate in this quadrant?

A. 50%
B. 25%
C. 15%
D. 10%

2. Which factor most directly determines the spatial resolution of a digital mammography system?

A. kVp setting
B. Compression force applied
C. Detector pixel pitch
D. Antiscatter grid ratio

3. Which component of the mammographic X-ray tube is the source of X-rays?

A. Cathode filament
B. Anode disk
C. Beryllium window
D. Collimator

4. What is the primary purpose of the Mammography Quality Standards Act (MQSA)?

A. To ensure high-quality mammography for early detection of breast cancer
B. To regulate the price of mammography services
C. To certify radiologists in mammography interpretation
D. To establish insurance reimbursement rates for mammography

5. Which margin characteristic is most associated with a benign breast mass?

A. Circumscribed (well-defined)
B. Spiculated
C. Indistinct
D. Angular

6. Which of the following is the PRIMARY purpose of obtaining informed consent before a mammogram?

A. To ensure the patient understands the procedure, risks, and benefits before agreeing
B. To satisfy the radiologist's scheduling requirements
C. To document the patient's insurance information
D. To confirm the patient has fasted prior to the exam

7. In a standard craniocaudal (CC) view, the X-ray beam is directed:

A. From lateral to medial
B. From medial to lateral
C. From superior to inferior
D. From inferior to superior

8. Which SI unit is used to express absorbed dose of ionizing radiation?

A. Gray (Gy)
B. Sievert (Sv)
C. Becquerel (Bq)
D. Coulomb per kilogram (C/kg)

9. The axillary tail of Spence is an extension of breast tissue that projects toward which anatomical region?

A. Sternum
B. Axilla
C. Clavicle
D. Abdomen

10. In mammography, contrast resolution is MOST influenced by which of the following?

A. X-ray beam energy (kVp)
B. Focal spot size
C. Source-to-image distance
D. Detector pixel pitch

11. What is the primary purpose of using a molybdenum (Mo) filter with a molybdenum (Mo) anode in screen-film mammography?

A. To increase the overall X-ray output
B. To transmit characteristic X-rays and attenuate bremsstrahlung above ~20 keV
C. To harden the beam for dense breast tissue
D. To reduce patient dose by removing low-energy photons

12. Which federal agency is responsible for enforcing the Mammography Quality Standards Act (MQSA)?

A. Centers for Medicare and Medicaid Services (CMS)
B. Nuclear Regulatory Commission (NRC)
C. Food and Drug Administration (FDA)
D. Joint Commission on Accreditation of Healthcare Organizations (JCAHO)

13. On mammography, which density descriptor indicates the HIGHEST masking risk for malignancy?

A. Almost entirely fatty (ACR a)
B. Extremely dense (ACR d)
C. Scattered fibroglandular (ACR b)
D. Heterogeneously dense (ACR c)

14. When a patient arrives for her first mammogram and appears anxious, the most appropriate technologist response is to:

A. Proceed quickly to minimize the patient's wait time
B. Instruct the patient to sit quietly until called
C. Explain each step of the procedure in plain language before beginning
D. Refer the patient to a counselor before imaging

15. What is the typical angle of the image receptor in a mediolateral oblique (MLO) view?

A. 0–10 degrees
B. 30–60 degrees
C. 70–80 degrees
D. 90 degrees

16. A mammography unit delivers a mean glandular dose of 3 mGy per exposure. What is the equivalent dose in rad?

A. 0.03 rad
B. 0.3 rad
C. 3 rad
D. 30 rad

17. The sebaceous glands located on the areola that enlarge during pregnancy and lactation are called:

A. Glands of Zeis
B. Meibomian glands
C. Apocrine glands
D. Montgomery glands

18. Quantum mottle in a mammographic image is primarily caused by:

A. Electronic noise in the detector
B. Statistical fluctuation in the number of x-ray photons detected
C. Patient motion during exposure
D. Grid cutoff artifact

19. For imaging a large, dense breast, which anode/filter combination is most appropriate in screen-film mammography?

A. Mo/Mo
B. Mo/Rh
C. W/Mo
D. Mo/Rh or Rh/Rh

20. Under MQSA, mammography may only be performed at a facility that holds which of the following?

A. A state health department license only
B. A valid FDA certificate
C. JCAHO accreditation
D. A radiologist's personal certification

21. Which calcification morphology is typically benign and associated with fibrocystic change?

A. Pleomorphic
B. Fine linear branching
C. Round/punctate
D. Amorphous

22. Before performing a screening mammogram, the technologist should ALWAYS ask the patient about:

A. Dietary habits and current medications
B. Breast symptoms, prior surgeries, and family history of breast cancer
C. Physical activity level and body weight
D. Pregnancy history only

23. On a properly positioned MLO view, the pectoralis major muscle should be visible:

A. Down to or below the level of the posterior nipple line
B. Only in the upper third of the image
C. Only at the axillary tail region
D. It should not be visible on the MLO view

24. Effective dose takes into account both tissue weighting factors and radiation weighting factors. What is its SI unit?

A. Gray (Gy)
B. Roentgen (R)
C. Rad
D. Sievert (Sv)

25. On a mammogram, a normal nipple typically appears as a:

A. Dome-shaped soft-tissue density at the skin surface
B. Dense oval mass deep in the breast
C. Calcified nodule at the areolar margin
D. Low-density lucent area at the breast center

26. The ACR mammography accreditation phantom is designed to simulate:

A. A 3 cm compressed breast of 100% fatty tissue
B. A 6 cm compressed breast of 100% glandular tissue
C. A 5 cm compressed breast of 50% adipose and 50% glandular tissue
D. A 4.5 cm compressed breast of approximately 50% adipose and 50% glandular tissue

27. In digital mammography systems, tungsten (W) anode tubes are commonly used with rhodium or silver filters. What is the main advantage over Mo/Mo?

A. Higher X-ray output permits lower mAs and faster acquisitions at adequate exposure
B. W produces characteristic X-rays at the same energy as Mo
C. W anode tubes are cheaper to manufacture
D. W eliminates the need for a grid

28. Which of the following organizations is an FDA-approved accreditation body for mammography facilities under MQSA?

A. The American College of Radiology is NOT approved
B. The Joint Commission only
C. The Nuclear Regulatory Commission
D. The American College of Radiology (ACR)

29. Coarse heterogeneous calcifications on mammography are classified as which BI-RADS morphology category?

A. Typically benign
B. High suspicion
C. Fine pleomorphic
D. Intermediate concern

30. A patient states she may be pregnant. Regarding screening mammography, the technologist should:

A. Cancel the exam immediately without consulting the radiologist
B. Proceed without modification because fetal dose from mammography is negligible
C. Double the compression to reduce scatter reaching the fetus
D. Inform the radiologist and document the possible pregnancy; proceed if clinically indicated

Answer Key & Explanations

1. A — 50%
About 50% of breast cancers arise in the upper outer quadrant because it contains the largest amount of glandular tissue of any single quadrant, including the axillary tail of Spence.

2. C — Detector pixel pitch
Spatial resolution in digital mammography is primarily determined by detector pixel pitch (the center-to-center spacing between detector elements). Smaller pixel pitch yields higher spatial resolution and finer detail rendition.

3. A — Cathode filament
The cathode filament, when heated by current, emits electrons via thermionic emission. These electrons are accelerated toward the anode, where their deceleration produces X-rays. The anode is the target, not the source of electrons.

4. A — To ensure high-quality mammography for early detection of breast cancer
MQSA was enacted in 1992 to ensure that all women receive high-quality mammography services to improve the early detection of breast cancer. It establishes standards for equipment, personnel, and quality assurance.

5. A — Circumscribed (well-defined)
Circumscribed margins indicate a well-defined boundary between the mass and surrounding tissue, which is a hallmark of benign lesions such as cysts and fibroadenomas. Spiculated, indistinct, and angular margins are suspicious for malignancy.

6. A — To ensure the patient understands the procedure, risks, and benefits before agreeing
Informed consent ensures patients voluntarily agree to a procedure after receiving adequate information about its nature, risks, benefits, and alternatives. It protects both the patient's autonomy and the technologist's legal standing.

7. C — From superior to inferior
The CC view is obtained with the beam directed superiorly to inferiorly (craniocaudal), compressing the breast from top to bottom. This provides a view of the breast from above looking down.

8. A — Gray (Gy)
The gray (Gy) is the SI unit of absorbed dose, defined as 1 joule of energy deposited per kilogram of tissue. The sievert is used for equivalent/effective dose, not absorbed dose.

9. B — Axilla
The axillary tail (tail of Spence) is a projection of glandular tissue that extends from the upper outer quadrant toward the axilla, passing through an opening in the deep fascia known as the foramen of Langer.

10. A — X-ray beam energy (kVp)
Contrast resolution depends primarily on kVp because lower kVp increases the difference in attenuation

between soft-tissue structures, enhancing subject contrast in mammographic images.

11. B — To transmit characteristic X-rays and attenuate bremsstrahlung above ~20 keV
The Mo K-edge (~20 keV) means the Mo filter strongly absorbs photons just above 20 keV while passing the Mo characteristic X-rays (~17.5 and 19.6 keV). This creates a near-monoenergetic beam ideal for contrast in soft tissue.

12. C — Food and Drug Administration (FDA)
The FDA is the primary federal agency responsible for enforcing MQSA. The FDA certifies facilities, oversees accreditation bodies, and conducts inspections of mammography facilities.

13. B — Extremely dense (ACR d)
Extremely dense breast tissue (ACR category d) substantially lowers mammographic sensitivity because dense fibroglandular tissue can obscure masses, representing the highest masking risk of the four density categories.

14. C — Explain each step of the procedure in plain language before beginning
Effective communication reduces patient anxiety and improves cooperation. Explaining the procedure in advance helps the patient feel informed and in control, which can also improve image quality by reducing motion.

15. B — 30–60 degrees
The MLO image receptor is typically angled at 30–60 degrees from vertical, matching the angle of the pectoralis major muscle. The exact angle varies by patient body habitus to ensure maximum breast tissue visualization.

16. B — 0.3 rad
1 Gy = 100 rad, so 3 mGy = 0.003 Gy × 100 = 0.3 rad. Remembering the conversion factor (1 Gy = 100 rad) is essential for dose calculations.

17. D — Montgomery glands
Montgomery glands (tubercles of Montgomery) are modified sebaceous glands on the areola; they secrete an oily substance that lubricates and protects the nipple-areola complex, and they become more prominent during pregnancy and lactation.

18. B — Statistical fluctuation in the number of x-ray photons detected
Quantum mottle arises from random variations in the number of x-ray photons reaching the detector. At low exposure levels fewer photons are detected, increasing the relative statistical fluctuation and perceived graininess.

19. D — Mo/Rh or Rh/Rh
Rhodium has a K-edge at ~23 keV, producing a slightly harder beam that penetrates dense tissue better while keeping dose acceptable. Mo/Rh or Rh/Rh are standard choices for thick, dense breasts when Mo/Mo provides insufficient penetration.

20. B — A valid FDA certificate
MQSA requires every mammography facility to hold a valid FDA certificate before performing mammography. The FDA certificate is issued after the facility achieves accreditation from an FDA-approved accreditation body.

21. C — Round/punctate
Round and punctate calcifications form within acini and are typically associated with fibrocystic change or adenosis. They are considered benign or probably benign (BI-RADS 2 or 3) depending on distribution.

22. B — Breast symptoms, prior surgeries, and family history of breast cancer
A targeted breast history—including current symptoms (lumps, pain, discharge), prior surgeries, implants, and family/personal cancer history—guides positioning, technique selection, and interpretation. This information is essential for a clinically meaningful exam.

23. A — Down to or below the level of the posterior nipple line
A well-positioned MLO view should show the pectoralis major muscle extending down to or below the posterior nipple line (PNL), indicating that sufficient posterior breast tissue has been included.

24. D — Sievert (Sv)
Effective dose is expressed in sieverts (Sv). It accounts for the type of radiation (radiation weighting factor) and the radiosensitivity of the exposed tissues (tissue weighting factor).

25. A — Dome-shaped soft-tissue density at the skin surface
The nipple is imaged as a rounded or dome-shaped soft-tissue density at the anterior skin surface of the breast; it must be in profile on at least one view to avoid being mistaken for a mass or to prevent missing a retraction.

26. D — A 4.5 cm compressed breast of approximately 50% adipose and 50% glandular tissue
The ACR phantom mimics a 4.5 cm compressed breast composed of roughly equal parts adipose and glandular tissue, providing a clinically relevant test object for routine quality control.

27. A — Higher X-ray output permits lower mAs and faster acquisitions at adequate exposure
Tungsten anodes have much higher melting points and thermal conductivity, enabling higher tube loading. The resulting higher output allows shorter exposure times, reducing motion blur. Digital detectors can take advantage of higher mean energies, and silver filters can shape the spectrum appropriately.

28. D — The American College of Radiology (ACR)
The American College of Radiology (ACR) is one of the FDA-approved accreditation bodies for mammography facilities. The ACR accreditation program evaluates clinical images, phantom images, equipment, and quality control records.

29. D — Intermediate concern
Coarse heterogeneous calcifications are classified under 'intermediate concern' in the ACR BI-RADS lexicon. They are more variable in size and shape than fine pleomorphic calcifications and carry a moderate suspicion for malignancy.

30. D — Inform the radiologist and document the possible pregnancy; proceed if clinically indicated
The absorbed fetal dose from mammography is extremely low (< 0.03 mGy), but the decision to proceed should be made by the radiologist in consultation with the patient. Documentation and physician oversight are required before imaging a possibly pregnant patient.

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