Geometric Factors

Multiple Choice
Identify the choice that best completes the statement or answers the question.

_____ 1. A digital image with decreased spatial resolution may be due to:
1. Increased central ray angulation
2. Decreased grid ratio
3. Decreased SID
   a. 1 & 2 only
   b. 1 & 3 only
   c. 2 & 3 only
   d. 1, 2, & 3

_____ 2. The relationship of the focal spot size, SID, and OID specifically impacts the _____ of the image.
   a. visibility of recorded detail
   b. image receptor unsharpness
   c. geometric unsharpness
   d. distortion

_____ 3. During the selection of the focal spot size, the radiographer is really determining the:
   a. angle of the anode used.
   b. actual size of the filament used.
   c. number of electrons available for tube current.
   d. distance the electrons travel from cathode to anode.

_____ 4. When the SID is divided by the SOD, what is the result called?
   a. Magnification factor
   b. Degree of unsharpness
   c. OID
   d. Image width

_____ 5. The property of the x-ray beam that impacts the unsharpness on the radiograph is beam:
   a. quality.
   b. quantity.
   c. divergence.
   d. restriction.

_____ 6. The most detrimental factor to maximum recorded detail is:
   a. increased OID.
   b. decreased SID.
   c. large focal spot size.
   d. motion.

_____ 7. The misrepresentation of the size of an object is:
   a. shape distortion.
   b. magnification.
   c. foreshortening.
   d. elongation.

_____ 8. In order to image a structure that is located anteriorly in the body, it is best radiographed to minimize magnification by doing a _____ projection.
   a. posterior-anterior
   b. anterior-posterior
   c. lateral
   d. oblique

_____ 9. Using a small focal spot size may be prohibited due to the:
   a. amount of heat produced by x-ray exposure.
   b. amount of exposure time used.
   c. SID used.
   d. speed of the film-screen system.

_____ 10. Magnification is affected by:
   a. AEC.
   b. OID.
   c. SID.
   d. b and c

_____ 11. If the image size measures 4.6 inches and the magnification factor is 1.42, what is the size of the object?
   a. 2.43 inches
   b. 3.24 inches
   c. 5.63 inches
   d. 6.53 inches

_____ 12. If the object size measures 6.2 inches and the image size measures 7.5 inches, what is the magnification factor?
   a. 0.83
   b. 1.21
   c. 1.30
   d. 13.7

_____ 13. Shape distortion can be created by:
   a. off-centering the central ray.
   b. angling the central ray.
   c. increasing the SID.
   d. a and b only

_____ 14. The SOD can be found by:
   a. adding SID and OID.
   b. adding the MF to the OID.
   c. subtracting the OID from SID.
   d. subtracting the SID from the MF.

_____ 15. What effect will increasing SID have on recorded detail?
   a. Increased recorded detail
   b. Decreased recorded detail

c. No effect on recorded detail

_____ 16. What effect will using a slower speed imaging system have on recorded detail?
    a. Increased recorded detail
    b. Decreased recorded detail
    c. No effect on recorded detail

_____ 17. Providing clear instructions to the patient is a primary method for reducing unsharpness due to:
    a. shape distortion.
    b. motion.
    c. geometric properties.
    d. size distortion.

_____ 18. What is the geometric unsharpness when the focal spot measures 0.8 mm, the SID is 40 inches (100 cm), and the OID is 2 inches (5 cm)?
    a. 0.042 mm
    b. 0.42 mm
    c. 4.2 inches
    d. 4.2 cm

_____ 19. The smallest detail that can be detected in an image refers to:
    a. contrast resolution.
    b. spatial resolution.
    c. geometric unsharpness.
    d. distortion.

_____ 20. The ability of the system to differentiate between two small objects that have similar subject contrast refers to:
    a. contrast resolution.
    b. spatial resolution.
    c. geometric unsharpness.
    d. distortion.

_____ 21. All of the geometric factors and those that determine the amount of image distortion are equally important for digital and film-screen imaging.
    a. True
    b. False

_____ 22. The relationship between SID and x-ray beam intensity is expressed in the _____ law.
    a. proportional square
    b. inverse square
    c. reciprocity
    d. target-distance

_____ 23. A variation in the size or shape of the image as compared with the subject it represents is called:
    a. resolution.
    b. distortion.
    c. unsharpness.
    d. fog.

_____ 24. Another name for size distortion is:
   a. enlargement.
   b. magnification.
   c. minification.
   d. flux gain.

_____ 25. The distance between the subject or part and the IR is referred to as:
   a. object-image receptor distance (OID).
   b. part-receptor distance (PRD).
   c. source-receptor distance (SRD).
   d. source-image receptor distance (SID).

_____ 26. A change from the small focal spot to the large focal spot results in:
   a. decreased resolution.
   b. magnification.
   c. distortion.
   d. increased contrast.

_____ 27. With a large OID, the reduction of excessive magnification is accomplished by:
   a. increasing the SID.
   b. increasing the kVp.
   c. decreasing the SID.
   d. decreasing the kVp.

_____ 28. An increase in OID will result in:
   a. increased magnification.
   b. increased image sharpness.
   c. loss of contrast.
   d. increased radiographic density.

_____ 29. Motion of the patient, the tube, or the IR during the exposure results in decreased:
   a. contrast.
   b. distortion.
   c. radiographic density.
   d. resolution.

_____ 30. If a radiographic image appears blurred, what aspect of image quality is affected?
   a. Density
   b. Contrast
   c. Spatial resolution
   d. Distortion

_____ 31. The principle means of controlling involuntary motion is to:
   a. decrease in SID.
   b. decrease in exposure time (seconds).
   c. increase in exposure time (seconds).
   d. increase in OID.

_____ 32. Which of the following minimize shape distortion?

1. Position plane of subject parallel to plane of IR.
2. Position plane of subject perpendicular to plane of IR.
3. Position the CR perpendicular to IR and subject.
   a. 1 and 2 only
   b. 1 and 3 only
   c. 2 and 3 only
   d. 1, 2, and 3

____ 33. Which of the following will increase spatial resolution?
1. Increase in SID
2. Increase in OID
3. Decrease in focal spot size
   a. 1 and 2 only
   b. 1 and 3 only
   c. 2 and 3 only
   d. 1, 2, and 3

____ 34. Which quality factor is a key to visibility of detail?
   a. SID
   b. Focal spot size
   c. Density
   d. Contrast

____ 35. Shape distortion is the result of:
   a. tube angulation greater than 15 degrees.
   b. unequal magnification of the actual shape of the structure.
   c. an SID that is too short.
   d. an SID that is too long.

____ 36. When a body part appears on a radiograph as shorter than it actually is, the term used is:
   a. penumbra.
   b. distortion.
   c. elongation.
   d. foreshortening.

____ 37. When a body part appears on a radiograph as longer than it actually is, the term used is:
   a. penumbra.
   b. distortion.
   c. elongation.
   d. foreshortening.

____ 38. The geometric factors that affect the formation of the image are:
1. SID.
2. OID.
3. focal spot.
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3

    d. 1, 2, and 3

____ 39. Which of the following would be considered involuntary motion by the patient?
    1. Tremors
    2. Peristalsis
    3. Breathing
    a. 1 and 2
    b. 1 and 3
    c. 2 and 3
    d. 1, 2, and 3

True/False

Indicate whether the statement is true or false.

____ 1. In order to produce a radiographic image with structural lines as accurate as possible, you must maximize the spatial resolution and distortion.
A. True
B. False

Geometric Factors
Answer Section

MULTIPLE CHOICE

1. ANS: B
    A reduction in spatial resolution may be the result of increasing tube angulation (shape distortion) or using a lower SID (size distortion). Grid ratio does not affect spatial resolution.

    PTS: 1   OBJ: 6
2. ANS: C
    Focal spot size, source to image receptor distance and object to image receptor distance impact the image's geometric unsharpness.

    PTS: 1
3. ANS: B
    When selecting large or small focal spot at the console, what's really being selected is the large or small cathode filament.

    PTS: 1
4. ANS: A
    The magnification factor formula is SID divided by SOD.

    PTS: 1
5. ANS: C
    Due to the divergence of the x-ray beam, a geometric relationship exists among the source of x-rays, the object, and the image receptor.

    PTS: 1
6. ANS: D
    Motion of the tube, part, or image receptor has the most detrimental effect on the recorded detail of the radiographic image.

    PTS: 1
7. ANS: B
    One aspect of distortion is magnification, or size distortion.

    PTS: 1
8. ANS: A
    The posterior-anterior (PA) projection will put the anterior surface of the body closest to the image receptor, reducing OID and magnification.

    PTS: 1
9. ANS: A
    Using a small focal spot size can be limited due to the amount of heat produced during the exposure being concentrated in a smaller area of the target.

PTS: 1
10. ANS: D
Both the OID and SID affect magnification, although OID has the greatest effect.

PTS: 1
11. ANS: B
In order to determine object size, the image size is divided by the magnification factor.

PTS: 1
12. ANS: B
The magnification factor is determined by dividing the image size by the object size.

PTS: 1
13. ANS: D
Shape distortion results from misalignment or angulation of the tube, part or image receptor.

PTS: 1
14. ANS: C
The source-to-object distance (SOD) can be calculated by subtracting the OID from the SID.

PTS: 1
15. ANS: A
Increasing SID increases recorded detail by reducing the amount of geometric unsharpness and decreasing size distortion.

PTS: 1
16. ANS: A
Using a slower speed imaging system will improve recorded detail, although additional exposure will have to be used to compensate for decreased density.

PTS: 1
17. ANS: B
Along with short exposure times and immobilization techniques, clear patient instructions can help to reduce or eliminate patient motion.

PTS: 1
18. ANS: A
Geometric unsharpness is calculated by multiplying focal spot size by OID and then dividing by SOD.

PTS: 1
19. ANS: B
Spatial resolution refers to the smallest structure that can be visualized in an image.

PTS: 1
20. ANS: A
Different from spatial resolution, contrast resolution is the system's ability to image structures that are very similar in terms of subject contrast.

PTS: 1
21. ANS: A
SID, OID, focal spot size, and all the factors that affect distortion are just as important for digital imaging as they are for film-screen.

PTS: 1
22. ANS: B   PTS: 1   REF: Page 79
23. ANS: B   PTS: 1   REF: Page 83
24. ANS: B   PTS: 1   REF: Page 83
25. ANS: A   PTS: 1   REF: Page 83
26. ANS: A   PTS: 1   REF: Page 87
27. ANS: A   PTS: 1   REF: Page 87
28. ANS: A   PTS: 1   REF: Page 83
29. ANS: D   PTS: 1   REF: Page 87
30. ANS: C   PTS: 1   REF: Page 86
31. ANS: B   PTS: 1   REF: Page 88
32. ANS: B   PTS: 1   REF: Page 89
33. ANS: B   PTS: 1   REF: Page 86
34. ANS: D   PTS: 1   REF: Page 80
35. ANS: B   PTS: 1   REF: Page 83
36. ANS: D   PTS: 1   REF: Page 85
37. ANS: C   PTS: 1   REF: Page 85
38. ANS: D   PTS: 1   REF: Page 86
39. ANS: A   PTS: 1   REF: Page 88

TRUE/FALSE

1. ANS: F
In order to produce a radiographic image with structural lines as accurate as possible, you must maximize the spatial resolution and minimize the distortion.

PTS: 1   OBJ: 1