

Geometric Factors

Multiple Choice

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

1. 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

2. 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

3. In order to preserve the true shape of the part in the image, what three factors should be properly aligned?
 1. X-ray tube.
 2. Image receptor.
 3. Object-to-image distance.
 4. Anatomic part.
 - a. 1, 2, and 3.
 - b. 1, 3, and 4.
 - c. 2, 3, and 4.
 - d. 1, 2, and 4.

True/False

Indicate whether the statement is true or false.

4. Distortion is misrepresentation of the size or shape of the anatomy being imaged.
5. When the image is distorted, spatial resolution or recorded detail is also reduced.
6. When the foot is placed directly on the image receptor, there is no OID.
7. Because it reduced recorded detail, it is always best to minimize shape distortion in radiographic imaging.
8. Image contrast and contrast resolution are the same.
9. Because overexposure of the digital image receptor typically produces an image with appropriate brightness and no quantum noise, all studies should be done with a little more exposure than needed.

10. Scatter radiation is not a significant concern with digital imaging because the computer can adjust the image brightness and contrast.

Short Answer

11. Unequal magnification of different portions of the same object is termed
12. Another name for size distortion is
13. The distance between the subject or part and the IR is referred to as
14. The unsharp, “fuzzy” appearance of margins of anatomic structures within the radiographic image is called
15. A change from the small focal spot to the large focal spot results in
16. With a large OID, the reduction of excessive magnification is accomplished by
17. An increase in OID will result in
18. If a radiographic image appears blurred, what aspect of image quality is affected?
19. The principal means of controlling involuntary motion is to
20. What is the first step to reduce patient motion?
21. What is the effect of magnification on spatial resolution?
22. Which quality factor is a key to visibility of detail?
23. Magnification is affected by:
24. If the image size measures 4.6 inches and the magnification factor is 1.42, what is the size of the object?
25. Shape distortion can be created by:
26. What effect will using a higher grid ratio have on recorded detail?
27. What effect will increasing SID have on recorded detail?
28. What effect will using a slower speed imaging system have on recorded detail?
29. Providing clear instructions to the patient is a primary method for reducing unsharpness due to:
30. 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)?
31. The smallest detail that can be detected in an image refers to:

32. The ability of the system to differentiate between two small objects that have similar subject contrast refers to:
33. During the selection of the focal spot size, the radiographer is really determining the:
34. When the SID is divided by the SOD, what is the result called?
35. The property of the x-ray beam that impacts the unsharpness on the radiograph is beam:
36. The most detrimental factor to maximum recorded detail is:
37. The misrepresentation of the size of an object is:
38. In order to image a structure that is located anteriorly in the body, it is best radiographed to minimize magnification by doing a _____ projection.
39. Using a small focal spot size may be prohibited due to the:
40. The relationship of the focal spot size, SID, and OID specifically impacts the _____ of the image.

**Geometric Factors
Answer Section**

MULTIPLE CHOICE

- 1. ANS: B PTS: 1
- 2. ANS: B PTS: 1
- 3. ANS: D

Any misalignment of the CR among these three factors—tube, part, or image receptor—alters the shape of the part recorded in the image.

PTS: 1 REF: 98 OBJ: 12

TRUE/FALSE

- 4. ANS: T
Distortion is misrepresentation of the size or shape of the anatomy being imaged.

PTS: 1 REF: 97 OBJ: 12

- 5. ANS: T
When the image is distorted, spatial resolution or recorded detail is also reduced.

PTS: 1 REF: 97 OBJ: 12

- 6. ANS: F
Even when the part is placed directly on the image receptor, there is always some distance between the anatomy being imaged and the image-recording material, even if very small.

PTS: 1 REF: 97-98 OBJ: 12

- 7. ANS: F
Even though shape distortion does reduce recorded detail, there are times that it can be used as an advantage, such as angling the tube to eliminate superimposition of parts.

PTS: 1 REF: 98 OBJ: 12

- 8. ANS: F
Image contrast describes the appearance of the anatomy, whereas contrast resolution determines how well similar tissues can be distinguished.

PTS: 1 REF: 104 OBJ: 16

- 9. ANS: F
Even though the overexposed digital image may appear to be of good quality, the patient has been unnecessarily exposed to excessive radiation, a serious infraction of the radiographer's code of ethics.

PTS: 1 REF: 105 OBJ: 18

- 10. ANS: F
Even though the computer can adjust the image, scatter radiation is an important issue with digital imaging because these image receptors are much more sensitive to low-energy x-ray photons (such as scattered photons) than film-screen.

PTS: 1

REF: 99

OBJ: 18

SHORT ANSWER

11. ANS:
distortion.

PTS: 1

12. ANS:
magnification.

PTS: 1

13. ANS:
object-image receptor distance (OID).

PTS: 1

14. ANS:
penumbra.

PTS: 1

15. ANS:
decreased resolution.

PTS: 1

16. ANS:
increasing the SID.

PTS: 1

17. ANS:
increased magnification.

PTS: 1

18. ANS:
Spatial resolution

PTS: 1

19. ANS:
decrease in exposure time (seconds).

PTS: 1

20. ANS:
Communicate with the patient about the procedure and what the patient needs to do to help.

PTS: 1

21. ANS:
Magnification decreases resolution.

PTS: 1

22. ANS:
Contrast

PTS: 1

23. ANS:
b and c
Both the OID and SID affect magnification, although OID has the greatest effect.

PTS: 1

24. ANS:
3.24 inches
In order to determine object size, the image size is divided by the magnification factor.

PTS: 1

25. ANS:
a and b only
Shape distortion results from misalignment or angulation of the tube, part or image receptor.

PTS: 1

26. ANS:
No effect on recorded detail
Grid ratio affects density and contrast but has no effect on recorded detail.

PTS: 1

27. ANS:
Increased recorded detail
Increasing SID increases recorded detail by reducing the amount of geometric unsharpness and decreasing size distortion.

PTS: 1

28. ANS:
Increased recorded detail
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

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

PTS: 1

30. ANS:
0.042 mm
Geometric unsharpness is calculated by multiplying focal spot size by OID and then dividing by SOD.

PTS: 1

31. ANS:
spatial resolution.
Spatial resolution refers to the smallest structure that can be visualized in an image.

PTS: 1

32. ANS:

contrast resolution.

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

33. ANS:

actual size of the filament used.

When selecting large or small focal spot at the console, what's really being selected is the large or small cathode filament.

PTS: 1

34. ANS:

Magnification factor

The magnification factor formula is SID divided by SOD.

PTS: 1

35. ANS:

divergence.

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

36. ANS:

motion.

Motion of the tube, part, or image receptor has the most detrimental effect on the recorded detail of the radiographic image.

PTS: 1

37. ANS:

magnification.

One aspect of distortion is magnification, or size distortion.

PTS: 1

38. ANS:

posterior-anterior

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

PTS: 1

39. ANS:

amount of heat produced by x-ray exposure.

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

40. ANS:

geometric unsharpness

Focal spot size, source to image receptor distance and object to image receptor distance impact the image's geometric unsharpness.

PTS: 1