Radiographic Calculations

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

____ 1. If the mA doubles, the quantity of exposure will:
a. double.
b. be reduced 50%.
c. be indirectly proportional to the mA.
d. be indirectly proportional to the exposure time.

____ 2. What is the correct exposure time required to produce 50 mAs when using the 200 mA station?
a. 0.25 second
b. 4 seconds
c. 2.5 seconds
d. 0.4 second

____ 3. If an image were made using 500 mA, 100 milliseconds, and 75 kVp, what would the mAs be for this exposure?
a. 5 mAs
b. 50 mAs
c. 25 mAs
d. 500 mAs

____ 4. What is the correct exposure time required to produce 200 mAs when using the 200 mA station?
a. 200 ms
b. 0.1 seconds
c. 1000 ms
d. 10 seconds

____ 5. What is the mAs when 400 mA is used with a 50-millisecond exposure time?
a. 20
b. 200
c. 2
d. 2000

____ 6. A lateral thoracic spine on a 33-cm patient is usually taken using 200 mA (large focal spot), 0.25 sec, 86 kVp, 40-inch SID, 12:1 grid ratio. If the mA is increased to 400 to stop motion blur from tremors, which of the following technique changes will produce a radiographic exposure (EI) and contrast most similar to the original?
a. 0.13 sec, 86 kVp
b. 0.13 sec, 98 kVp
c. 0.65 sec, 76 kVp
d. 36-inch SID with no other change

____ 7. A lateral thoracic spine on a 33-cm patient is usually taken using 300 mA (large focal spot), 0.2 sec, 86 kVp, 40-inch SID, 12:1 grid ratio. If the mA is increased to 600 to stop motion blur from tremors, which of the following technique changes will produce a radiographic exposure(EI) and contrast most similar to the original?

a. 0.1 sec, 86 kVp
b. 0.1 sec, 98 kVp
c. 0.5 sec, 76 kVp
d. 72-inch SID with no other change

____ 8. With DR imaging, which of the following technique factors will produce an image with the greatest EI?

a. 300 mA, 0.5 second
b. 400 mA, 0.5 seconds
c. 100 mA, 0.5 second
d. 800 mA, 0.01 second

____ 9. If 20 mAs was used for all exposures, which kVp would produce the digital image with the greatest EI?

a. 70 kVp
b. 80 kVp
c. 90 kVp
d. 100 kVp

____ 10. Which of the following mA and exposure time combinations does not produce 12 mAs?

a. 200 mA @ 0.06 sec
b. 400 mA @ 0.03 sec
c. 600 mA @ 20 ms
d. 800 mA @ 0.15 sec

____ 11. An x-ray exposure is made using the following factors: 200 mA, 40 ms, 80 kVp, and 40 inches SID. In this case, which represents the value of the mAs?

a. .08
b. .8
c. 8
d. 80
e. 16,000

____ 12. Given the three sets of mAs calculations that follow, all three should yield the same exposure index:

Exposure 1: 200 mA × 0.05 ms
Exposure 2: 100 mA × 0.10 ms
Exposure 3: 400 mA × 0.025 ms
This is known as

a. the inverse square law.
b. the kVp/mAs ratio.
c. mA/mAs proportionality.
d. mAs reciprocity.

____ 13. A radiograph taken using 65 kVp @ 10 mAs is underexposed. (DI -3) Which technique would double the EI?

a. 65 kVp @ 5 mAs
b. 65kVp @ 20 mAs
c. 45 kVp @ 20 mAs
d. 75 kVp @ 40 mAs

____ 14. Given 40 mAs, doubling the mA produces the same result as:
a. doubling the time of exposure
b. doubling the SID
c. A and B
d. none of the above

____ 15. How much mAs is produced when the mA is 200 and the exposure time is 0.5 s?
a. 25 mAs
b. 50 mAs
c. 100 mAs
d. 200 mAs

____ 16. How much mAs is produced when the mA is 800 and the exposure time is 30 ms?
a. 24 mAs
b. 240 mAs
c. 2,4000 mAs
d. 24,000 mAs

____ 17. If the mA is 600 and exposure time is 10 ms, how can the mAs be doubled?
a. increase the mA to 1200
b. increase the time to 20 ms
c. increase the mAs to 24 mAs
d. all of the above

____ 18. Which of the following exposure factors produces 20 mAs?
a. 200 mA @ 1 s
b. 100 mA @ 2 s
c. 100 mA @ 0.5 s
d. 200 mA @ 100 ms

____ 19. What mA should be selected to produce 32 mAs using a 0.04 exposure time?
a. 128 mA
b. 200 mA
c. 400 mA
d. 800 mA

____ 20. 200 mA @ 80 ms (0.08 s) produces 16 mAs. Which of the following exposure factors maintains 16 mAs while using a shorter exposure time?
a. 100 mA @ 0.16 s
b. 200 mA @ 0.16 s
c. 400 mA @ 0.04 s
d. 400 mA @ 0.08 s

Radiographic Calculations
Answer Section

MULTIPLE CHOICE

1. ANS: A PTS: 1 REF: Page 78
2. ANS: A PTS: 1 REF: Page 126
3. ANS: B PTS: 1 REF: Page 78
4. ANS: A PTS: 1 REF: Page 126
5. ANS: A PTS: 1 REF: Page 33
6. ANS: A PTS: 1 REF: Page 34
7. ANS: A PTS: 1 REF: Page 34
8. ANS: B
   mA and exposure time, also expressed as their product (mAs), control radiographic density. 400 mA × 0.5 seconds (200 mAs) is the highest amount listed and will produce the greatest density.

   PTS: 1 OBJ: 1
9. ANS: D
   The higher the kVp, the greater amount of radiation reaching the image receptor and therefore, with film-screen imaging, the greater density.

   PTS: 1 OBJ: 5
10. ANS: D
    800 mA at 0.15 sec results in 120 mAs.

    PTS: 1 OBJ: 2
11. ANS: C PTS: 1
12. ANS: D
    Milliampere-seconds is the product of mA and time. Any combination of mA and time producing equivalent mAs values should produce equivalent exposures and therefore densities. This process is known as mAs reciprocity.

    PTS: 1 REF: p. 72
13. ANS: B
    A technique of 75 kVp @ 10 mAs would double the density while also widening the scale of contrast.

    PTS: 1 DIF: Difficult
    OBJ: Identify four image quality factors and how they influence the characteristics of a radiograph.
14. ANS: A
    Doubling the mA doubles the mAs, as does doubling the exposure time.

    PTS: 1 OBJ: 3
15. ANS: C
    In that mAs = mA × exposure time (in seconds), 200 × 0.5 = 100 mAs.

    PTS: 1 OBJ: 4
16. ANS: A

In that mAs = mA × exposure time (in seconds), 800 × 0.03 = 24 mAs.

PTS: 1 OBJ: 4

17. ANS: D

Doubling the mA, time, or mAs results in the same outcome.

PTS: 1 OBJ: 4

18. ANS: D

200 mA × 100 ms (0.10 s) = 20 mAs.

PTS: 1 OBJ: 4

19. ANS: D

If mAs = mA × seconds, mA = mAs/seconds, or 32/.04, which equals 800 mA.

PTS: 1 OBJ: 4

20. ANS: C

By doubling the mA and halving the seconds, 400 mA @ 0.04 s equals 16 mAs while shortening the exposure time.

PTS: 1 OBJ: 3