Direct Square Law

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

____ 1. With digital imaging, using twice as much mAs as needed will result in an image with _____ brightness and _____ patient exposure.
a. Appropriate; increased
b. Appropriate; appropriate
c. Excessive; increased
d. Excessive; appropriate

____ 2. Knowing that 6 mAs is appropriate for a knee examination done at 40" SID, how much mAs should be used at 56" SID?
a. 1.5 mAs
b. 3 mAs
c. 12 mAs
d. 24 mAs

____ 3. Knowing that 16 mAs is appropriate for a knee examination done at 100 cm SID, how much mAs should be used at 50cm SID?
a. 32 mAs
b. 8 mAs
c. 4 mAs
d. 64mAs

____ 4. Knowing that 16 mAs is appropriate for a knee examination done at 100 cm SID, how much mAs should be used at 200 cm SID?
a. 32 mAs
b. 8 mAs
c. 4 mAs
d. 64mAs

____ 5. Which of the following is the correct formula for the mAs/distance compensation formula?
a. $mAs_1/mAs_2 = SID_1/SID_2$
b. $mAs_1/mAs_2 = SID_2/SID_1$
c. $mAs_1/mAs_2 = (SID_1)^2/(SID_2)^2$
d. $mAs_1/mAs_2 = (SID_2)^2/(SID_1)^2$

____ 6. What type of relationship does mAs have with SID when the goal is to keep the exposure to the IR constant?
a. direct proportional
b. direct but not proportional
c. inverse proportional
d. inverse but not proportional

____ 7. The mAs/distance compensation formula describes the relationship between _____ and _____.
a. SID; mAs needed to compensate for changes in SID
b. SID; kVp needed to compensate for changes in SID

c. SID; exposure time needed to compensate for changes in SID
d. SID; milliamperage needed to compensate for changes in SID

____ 8. When the SID is decreased from 72 inches SID to 40 inches SID, the radiation reaching the IR _____, requiring a(n) _____ in mAs to compensate.
a. increases; decrease
b. decreases; increase
c. increases; increase
d. decreases; decrease

____ 9. When the SID is increased from 36 inches SID to 72 inches SID, the mAs must be _____ to maintain exposure to the IR.
a. decreased
b. increased
c. kept the same
d. increased by a factor of 2

____ 10. If 12 mAs produce appropriate SNR at 36 inches SID, how much mAs is needed at 72 inches SID to maintain that amount of exposure to the IR?
a. 3 mAs
b. 6 mAs
c. 24 mAs
d. 48 mAs

____ 11. If 32 mAs produce appropriate SNR at 72 inches SID, how much mAs is needed at 36 inches SID to maintain that amount of exposure to the IR?
a. 8 mAs
b. 16 mAs
c. 64 mAs
d. 128 mAs

____ 12. If 16 mAs produce appropriate SNR at 72 inches SID, how much mAs is needed at 48 inches SID to maintain that amount of of exposure to the IR?
a. 7 mAs
b. 11 mAs
c. 24 mAs
d. 36 mAs

____ 13. If 10 mAs produce appropriate SNR at 40 inches SID, how much mAs is needed at 48 inches SID to maintain that amount of exposure to the IR?
a. 7 mAs
b. 8 mAs
c. 12 mAs
d. 14 mAs

____ 14. A satisfactory radiograph is made using 20 mAs at 40 inches SID. How much mAs is needed to produce a similar radiograph at 60 inches SID?
a. 30 mAs
b. 35 mAs

c. 45 mAs
d. 55 mAs

____ 15. With digital imaging, if lower than needed kVp is set, the image will have _____ brightness and _____ quantum mottle (noise).
a. very low; increased
b. appropriate; increased
c. excessive; decreased
d. unacceptable; decreased

Direct Square Law
Answer Section

MULTIPLE CHOICE

1. ANS: A
   With digital imaging, using twice as much mAs as needed will result in an image with appropriate brightness (due to the computer making the adjustment) and increased patient exposure.

   PTS: 1 OBJ: 3
2. ANS: C
   As a rule of thumb, changing from 40" SID to 56" SID requires twice as much mAs.

   PTS: 1 OBJ: 9
3. ANS: C PTS: 1 OBJ: 9
4. ANS: D PTS: 1 OBJ: 9
5. ANS: C
   $mAs_1/mAs_2 = (SID_1)^2/(SID_2)^2$ is the formula for the mAs/distance compensation formula, describing the relationship between the mAs and SID.

   PTS: 1 OBJ: 10
6. ANS: A
   SID and the mAs required to maintain exposure to the IR have a direct proportional relationship (as the SID increases, the mAs required to maintain exposure to the IR increases by a proportional amount).

   PTS: 1 OBJ: 10
7. ANS: A
   The mAs/distance compensation formula describes the relationship between SID and mAs needed to compensate for changes in SID.

   PTS: 1 OBJ: 10
8. ANS: A
   When the SID is decreased from 72 inches SID to 40 inches SID, the radiation reaching the IR increases, requiring a decrease in mAs to compensate.

   PTS: 1 OBJ: 10
9. ANS: B
   When the SID is increased from 36 inches SID to 72 inches SID, the mAs must be increased to maintain exposure to the IR (but not by a factor of 2).

   PTS: 1 OBJ: 10
10. ANS: D
    If the SID is increased by a factor of 2 (doubled), the beam intensity will be one fourth ($1/2^2$) of the original, requiring a 4× increase in mAs to maintain SNR.

    PTS: 1 OBJ: 10
11. ANS: A

Decreasing the SID by a factor of 2 requires a decrease in mAs by a factor of 4 (2^2).

PTS: 1 OBJ: 10

12. ANS: A
Before actually calculating the answer, it is important to think through that decreasing the SID will require a decrease in mAs to maintain density. Using the mAs/distance compensation formula, $mAs_1/mAs_2 = (SID_1)^2/(SID_2)^2$, $16/X = 72^2/ 48^2$.

PTS: 1 OBJ: 10

13. ANS: D
Before actually calculating the answer, it is important to think through that increasing the SID will require an increase in mAs to maintain SNR. Using the mAs/distance compensation formula, $mAs_1/mAs_2 = (SID_1)^2/(SID_2)^2$, $10/X = 40^2/ 48^2$.

PTS: 1 OBJ: 10

14. ANS: C PTS: 1 REF: Page 127

15. ANS: B
With digital imaging, if too low kVp is set, the image will have appropriate brightness (due to the computer making the adjustment) and increased quantum mottle.

PTS: 1 REF: p.152