Inverse and Direct Square Laws

Multiple Choice

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

1. 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

2. 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

3. Changes in SID affect (no compensation in mAs):
   a. brightness
   b. contrast
   c. beam intensity
   d. all of the above

4. If the intensity of radiation at 36 inches is 480 mR, what is the intensity if the SID is increased to 72 inches?
   a. 360 mR
   b. 240 mR
   c. 120 mR
   d. 60 m R

5. 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

6. When the SID is decreased from 90 inches SID to 30 inches SID, the mAs must be _____ to maintain exposure to the IR.
   a. decreased by a factor of 3
   b. increased by a factor of 3
   c. kept the same
   d. decreased by a factor of 9
   e. increased by a factor of 9

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

8. What type of relationship does distance have with x-ray beam intensity?
   a. direct proportional
   b. direct but not proportional
   c. inverse proportional
   d. inverse but not proportional

9. When a known mAs at 72 inches SID produces appropriate exposure to the IR, 1/4 of the mAs can be used at:
   a. 36 inches SID
   b. 48 inches SID
   c. 56 inches SID
   d. 60 inches SID

10. When the distance is decreased from 72 inches SID to 40 inches SID, the radiation reaching the measuring device:
    a. increases
    b. decreases
    c. stay the same
    d. increases by a factor of 0.4

Inverse and Direct Square Laws
Answer Section

MULTIPLE CHOICE

1. 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
2. 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
3. ANS: D
   Changes in SID affect beam intensity (inverse square law) as well as distortion and recorded detail.

   PTS: 1 OBJ: 9
4. ANS: C
   If the distance is increased by a factor of 2 (doubled), the beam intensity will be one fourth ($1/2^2$) of the original.

   PTS: 1 OBJ: 10
5. 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
6. ANS: D
   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
7. 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 density.

   PTS: 1 OBJ: 10
8. ANS: C
   Distance and beam intensity have an inverse proportional relationship (as the distance increases the beam intensity decreases by a proportional amount).

   PTS: 1 OBJ: 10
9. ANS: A
   A useful tip is that changing from 72 inches SID to 56 inches SID can be compensated for by reducing the mAs in half.

   PTS: 1 OBJ: 10
10. ANS: A

Reducing the distance results in greater exposure to the IR, but not by a factor of 0.4.

PTS: 1 OBJ: 10