DR

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

____ 1. A material that absorbs x-ray energy and emits visible light in response is a
a. charge-coupled device (CCD)
b. photoconductor
c. thin film transistor (TFT)
d. scintillator

____ 2. Put the following sequence of events in this indirect capture system in order

1. The CCD converts the energy to an electronic signal
2. The light energy is then transmitted to the CCD
3. X-rays are absorbed by the scintillator and converted to light
4. Electronic signal is sent to the computer work station for processing and display
a. 1, 2, 3, 4
b. 2, 1, 3, 4
c. 3, 1, 2, 4
d. 4, 3, 1, 2

____ 3. The two methods for indirect capture in DR include
a. charge-coupled devices
b. photoconductors and TFT arrays
c. scintillator and TFT array
d. A and C

____ 4. Amorphous silicon is used as the
a. photoconductor for indirect capture DR imaging
b. photodetector for indirect capture DR imaging
c. photoconductor for direct capture DR imaging
d. photodetector for direct capture DR imaging

____ 5. In an indirect capture DR system, the electronic components that is configured in a network of detector elements is the
a. charge-coupled device (CCD)
b. photoconductor
c. thin film transistor (TFT)
d. scintillator

____ 6. Which of the following describes the extra step, and is therefore a limitation, of indirect-capture methods?
a. X-rays are converted to light and then to electrons
b. X-rays are converted directly to electrons
c. Electrons are converted to light, and then to x-rays
d. A and B

____ 7. Which of the following is true concerning direct capture DR imaging?

a. The DR direct-capture method does not use a scintillator
b. The DR direct-capture method uses a photoconductor and TFT array
c. The DR direct-capture method avoids the loss of resolution caused by indirect-capture methods
d. All of the above are true

____ 8. Part of the direct-capture DR system, the _____ absorbs x-rays and produces an electric signal
a. CCD
b. photoconductor
c. TFT
d. scintillator

____ 9. Amorphous selenium is used as the
a. photoconductor for indirect capture DR imaging
b. photodetector for indirect capture DR imaging
c. photoconductor for direct capture DR imaging
d. photodetector for direct capture DR imaging

____ 10. The DR detector array is typically located:
a. Inside the cassette
b. By the computer keyboard
c. On top of the table
d. Where you would normally find the Bucky tray

____ 11. DR imaging systems briefly store the electrical charge in the:
a. ADC
b. TFT
c. CRT
d. EST

____ 12. The _____ collects, amplifies and converts visible light to an electrical signal.
a. ADC
b. PMT
c. PSP
d. PSST

____ 13. The indirect conversion detector uses:
a. A scintillator
b. A photodetector
c. Amorphous selenium
d. A and B

____ 14. The ability of the detector to accurately capture the variety of photon intensities in the remnant radiation is:
a. Pixel depth
b. Dynamic range
c. ALARA
d. Pixel sensitivity

____ 15. Overexposing a digital image receptor may result in a quality image, but:
a. Quantum noise will be visible.
b. The SNR will be poor.
c. The ALARA principle has not been followed.

d. The system will not last as long as expected.

True/False
Indicate whether the statement is true or false.

____ 1. Both CR and DR are electronic detectors that combine image capture and image readout.
A. True
B. False

____ 2. The DR system does not require a separate reader unit.
A. True
B. False

____ 3. Exit radiation is converted to visible light with the direct conversion detector.
A. True
B. False

____ 4. Because digital imaging has a large dynamic range, significantly lower than necessary x-ray exposure will still result in a quality image.
A. True
B. False

____ 5. An image with high SNR will have decreased detail visibility.
A. True
B. False

DR
Answer Section

MULTIPLE CHOICE

1. ANS: D
   A scintillator is a material that absorbs x-ray energy and emits visible light in response.

   PTS: 1 REF: 159 OBJ: 2
2. ANS: C
   With this indirect capture, x-rays are absorbed by the scintillator and converted to light. This light energy is then transmitted to the CCD where it is converted to an electronic signal and sent to the computer work station for processing and display.

   PTS: 1 REF: 159 OBJ: 2
3. ANS: D
   Two methods for indirect capture in DR systems include using CCDs and devices using a scintillator and TFT array.

   PTS: 1 REF: 159 OBJ: 2
4. ANS: B
   Amorphous silicon is used as the photodetector for indirect capture DR imaging.

   PTS: 1 REF: 159 OBJ: 2
5. ANS: C
   The thin-film transistor the electronic component that is configured in a network of detector elements.

   PTS: 1 REF: 159 OBJ: 2
6. ANS: A
   One problem with the indirect-capture methods is that there is an extra step during which x-rays are converted to light, and then to electrons, which causes a loss of resolution.

   PTS: 1 REF: 160 OBJ: 2
7. ANS: D
   The DR direct-capture method does not use a scintillator. Rather, it uses a photoconductor and TFT array, thereby avoiding the loss of resolution caused by indirect capture.

   PTS: 1 REF: 161 OBJ: 3
8. ANS: B
   The photoconductor absorbs x-rays and produces an electric signal.

   PTS: 1 REF: 162 OBJ: 3
9. ANS: C
   Amorphous selenium is used as the photoconductor for direct capture DR imaging.

   PTS: 1 REF: 162 OBJ: 3

10. ANS: D
    The DR detector array takes the place of the Bucky tray, because there are no more cassettes needed with this system.

    PTS: 1 OBJ: 2
11. ANS: B
    The electrical charge is briefly stored in the TFT, or thin-film transistor array.

    PTS: 1 OBJ: 2
12. ANS: B
    The photomultipler tube (PMT) collects, amplifies, and converts visible light to an electrical signal.

    PTS: 1 OBJ: 3
13. ANS: D
    A detector that is the indirect conversion type uses a scintillator (to convert x-rays to light) and a photodetector. Amorphous selenium is found in the direct conversion type detector.

    PTS: 1 OBJ: 6
14. ANS: B
    Dynamic range describes how well the detector can capture small to large photon intensities.

    PTS: 1 OBJ: 7
15. ANS: C
    Overexposing the image receptor means that the patient was overexposed, going against the ALARA principle.

    PTS: 1 OBJ: 2

TRUE/FALSE

1. ANS: F
   Only DR combines image capture and readout. CR requires the image to go through a separate reader unit following image capture.

   PTS: 1 OBJ: 3
2. ANS: T
   The DR system sends the digital signal directly to the computer.

   PTS: 1 OBJ: 3
3. ANS: F
   Exit radiation is converted directly to an electrical signal with direct conversion detectors. Light is only involved with indirect conversion detectors.

   PTS: 1 OBJ: 6
4. ANS: F
   Digital imaging still requires sufficient exposure to produce a quality image. Too low of an exposure will result in an image with significant quantum noise.

   PTS: 1 OBJ: 7

5. ANS: F
An image with high SNR will have increased detail visibility due to the minimal amount of quantum noise.

PTS: 1 OBJ: 7