Chapter 28

1. Within the matrix of a displayed digital image, each single location designated by its column and row denotes a(n):
   1. Voxel
   2. Del
   3. Pixel
   4. Submatrix
2. Each pixel in a digital image is assigned a pixel value that becomes its \_\_\_\_\_\_\_\_\_ upon display:
   1. Brightness
   2. Sharpness
   3. Contrast
   4. Magnification
3. Which of the following correctly describes digital information:
   1. Continuous spectrum
   2. Infinite possible values
   3. Divisible to any fraction
   4. Discrete
4. Mathematically, digitization means \_\_\_\_\_\_\_\_ all measurements to or by the nearest available digital value in a pre-set scale:
   1. Adding
   2. Multiplying
   3. Dividing
   4. Rounding
5. All of the following are generic steps to digitizing any image EXCEPT:
   1. Attenuating
   2. Sampling
   3. Quantizing
   4. Scanning
6. Which of the following steps of digitization divides the image up into a matrix of pixel cells:
   1. Attenuating
   2. Sampling
   3. Quantizing
   4. Scanning
7. A CR reader is set to scan the PSP plate in a pre-designated number of rows and samplings per row. This is an example of:
   1. Scanning
   2. Quantizing
   3. Sampling
   4. Attenuating
8. In DR, since the number of available pixels is the number of detector elements embedded in the image receptor plate, collimation of the x-ray beam is analogous to:
   1. Attenuating
   2. Sampling
   3. Quantizing
   4. Scanning
9. During exposure, the opening through which measurements are taken is called the sampling:
   1. Field-of-view (FOV)
   2. Matrix
   3. Quantization measurement
   4. Aperture
10. For DR, the size of the sampling aperture is determined by:
    1. Collimation
    2. The laser beam
    3. The detector elements (dels)
    4. The bit depth
11. The assigning of a discrete numerical value to each cell from a pre-designated dynamic range is called:
    1. Quantizing
    2. Windowing
    3. Digitizing
    4. Attenuating
12. The *maximum* range of pixel values a hardware device such as a computer, display monitor, or DR detector can store, expressed as an exponent of the base 2, defines:
    1. Gray scale
    2. Dynamic range
    3. Bit depth
    4. Contrast
13. The human eye has a bit depth of 2 raised to the \_\_\_\_ power:
    1. 3rd
    2. 4th
    3. 5th
    4. 6th
14. The range of pixel values that the combined hardware and software of an image system makes available to buildup displayed images defines:
    1. Gray scale
    2. Dynamic range
    3. Bit depth
    4. Contrast
15. Dynamic range can be considered as the number of gray shades with which each \_\_\_\_\_\_\_ can be represented by the system:
    1. Pixel
    2. Del
    3. Voxel
    4. Matrix
16. Gray scale is the range of pixel values actually present in a(n) \_\_\_\_\_\_\_\_\_\_ image:
    1. Latent
    2. Acquired
    3. Displayed
    4. Stored
17. Windowing and other postprocessing features can be limited by insufficient:
    1. Gray scale
    2. Dynamic range
    3. Brightness
    4. Contrast
18. For the computer to process an image, modification of the analog image into digital form is

accomplished be a device called a(n):

a. ADC

b. SNR

c. CPU

d. CRT

1. For radiography, the brightness of a particular pixel within the image matrix of a digital

image is related to the:

a. percentage of hydrogen in the tissue

b. radionuclide uptake of the tissue

c. attenuation coefficient of the tissue

d. interface reflectivity of the tissue

20. In generic digital imaging terms, the range of the image gray scale is called:

a. window

b. window width

c. center

d. window level

21. In generic digital imaging terms, the average brightness level of the image is called:

a. window

b. window width

c. window level

d. density

22. For a digital image of a particular physical size, the use of a matrix size with a smaller

number of pixels will result in an image that is:

a. magnified

b. minified

c. resolved with more sharpness

d. darker

e. higher contrast

23 Analog images are best characterized as images which have:

a. a continuous number of gray shades

b. a discrete number of gray shades

c. been converted by an ADC

d. been transmitted by an electronic device

24. A very small cell within an image that has been assigned a particular gray shade or brightness

level is called a:

a. resolution point

b. pixel

c. photo spot

d. digital element

25. For digital imaging, each image frame displayed consists of a discrete number of rows and

columns of picture elements called the:

a. detection array

b. signal plate

c. display table

d. matrix

e. image raster

26. How many pixels are there altogether in a 1000 X 1000 matrix?

a. 2000

b. 100,000

c. 200,000

d. 1 million

27. For a given physical area in which an image is being displayed, the larger the number of

pixels in an image matrix, the:

a. greater the resolution in the image

b. greater the number of gray shades in the image

c. shorter the acquisition time

d. none of the above

e. all of the above

28. Which of the following modalities generally produces the sharpest images, due to large

image matrix size and very small pixels:

1. Nuclear medicine
2. Sonography
3. MRI and CT
4. DR and CR

29. Compared to workstations, display stations typically have:

a. print-out capability

b. image pre-processing controls

c. higher-cost display screens

d. lower-resolution display screens

30. A 10-bit ADC allows how many shades of gray or brightness levels to be displayed:

a. 10

b. 200

c. 256

d. 1024

31. The increased contrast resolution of digital imaging systems allows demonstration of tissue

with an inherent subject contrast as low as:

a. 0.1%

b. 1%

c. 10%

d. 20%

32. Which of the following would result in a displayed digital image which is *brighter:*

a. increased window level

b. decreased window width

c. increased window width

d. decreased window level

33. The principle limiting factor for the perception of contrast in an *analog* imaging system is:

a. the inherent poor contrast enhancement of analog systems

b. the limited range of gray levels that can be perceived by the human eye

c. the inability of the components to provide high spatial resolution

d. the inability of the components to detect large differences in tissue density

34. The selection of a narrow window width will:

a. decrease overall brightness of the image

b. increase contrast in the image

c. increase magnification of the central portion of the image

d. decrease the size of each pixel

35. Compared to conventional screen-film radiography, the greatest general advantage to all

digital imaging systems is the ability to:

a. improve sharpness in the image

b. reduce radiation exposure to patients

c. eliminate chemical processing

d. perform windowing and other post-processing operations on the image

36. The general term for making changes in the brightness and contrast of a digital image is:

a. automated re-scaling

b. image enhancement

c. windowing

d. histogram analysis

37. When compared to conventional screen-film radiography, digital radiography exhibits:

a. wider exposure latitude

b. lower contrast

c. superior detail

d. greater luminance

38. The percentage of original x-ray beam intensity absorbed by a voxel within the patient is its:

* 1. Pixel value
  2. Attenuation coefficient
  3. Density
  4. Brightness

1. Each pixel in a displayed radiographic image represents a(n) \_\_\_\_\_\_\_\_\_ within the patient:
   1. Del
   2. Voxel
   3. Tissue
   4. Pixel
2. Unlike CT scans, for DR and CR the 3D voxel sampled are in the shape of long, square tubes that pass, relative to the x-ray beam, \_\_\_\_\_\_\_\_\_ of the patient:
   1. Part way from the front to the back
   2. All the way from the front to the back
   3. Part way from side-to-side
   4. All the way from side-to-side
3. To assign a gray level to a pixel in the final image, within each voxel the attenuation coefficients for various tissues must be:
   1. Added
   2. Multiplied
   3. Averaged
   4. Data-clipped
4. To digitize measured pixel values, they must be:
   1. Amplified
   2. Summed
   3. Multiplied
   4. Rounded

43. Analog images are best characterized as images which have:

a. a continuous number of gray shades

b. a discrete number of gray shades

c. been converted by an ADC

d. been transmitted by an electronic device

1. For digital imaging, each frame displayed consists of a discrete number of rows and

columns of picture elements called the:

a. detection array

b. signal plate

c. display table

d. matrix

45. In a 12-bit analog-to-digital converter, each pixel will have how many possible values:

a. 256

b. 512

c. 1024

d. 4096

46. For digital radiography units, protocols for ideal brightness and grayscale are \_\_\_\_\_\_\_\_ for

each type of procedure selected at the console:

1. Manually set while setting technique
2. Manually set upon processing
3. Preselected
4. Automatically set by the display monitor