Chapter 29

1. The term *preprocessing* is best used to describe all those computer algorithms which are

designed to:

a. prepare the image for display according to the parameters of the human eye

b. refine the characteristics of the image

c. prepare the acquired data for entry into the computer system

d. correct for flaws and limitations in the image acquisition system being used

2. In the active matrix array of a DR receptor plate, differences in resistance for varying lengths

of wires coming from the hundreds of detector elements cause:

a. data clipping

b. gain offsets

c. pixel drop-out

d. heel effect

3. “Dead” pixels in the image caused by the failure of individual detector elements (dels) can

be filled in with data by averaging the pixel values surrounding them. This mathematical

process is called:

a. Interpolation

b. Extrapolation

c. Median summing

d. Alternative algorithms

4. Which of the following flaws is unique to the CR reader or processor, (not shared by DR)?

a. Light guide variations

b. Electronic response offsets

c. Electronic gain offsets

d. The anode heel effect

e. Variable scintillator thickness

5. Background exposure to a CR cassette, and small amounts of electrical current flowing

through a DR detector system when no exposure is taking place, are examples of:

1. Mottle
2. The heel effect
3. Light noise
4. Dark noise

6. Flat-field uniformity corrections are necessitated because of all of the following *except:*

a. light guide variations

b. electronic response and gain offsets

c. data clipping

d. variable scintillator thickness

7. In a digital image histogram graph, the vertical height of any data point along the plotted curve

(measured against the *y* axis of the graph), indicates the:

a. pixel value (brightness)

b. number of pixels possessing the value

c. S1

d. S2

e. image contrast

8. Which of the following systems requires the greatest amount of preprocessing functions?

a. direct digital radiography (DR)

b. computed radiography (CR)

c. digital fluoroscopy (DF)

d. conventional screen/film radiography (S/F)

9. On an image histogram, an unusual spike to the *left* of the main bell-shaped lobe of the curve

most likely represents:

a. bone disease

b. a large metallic object

c. air in the lungs

d. background density

e. fog density

10. A list of the pixel values that make up the “ideal” histogram shape for an image of a

particular body part is called a permanent:

a. exposure indicator (EI)

b. look-up table (LUT)

c. volume of interest (VOI)

d. rescaling chart

11. An algorithm designed to accentuate soft tissue densities will locate the values of interest

(VOI) on the histogram:

a. higher

b. lower

c. farther to the left

d. farther to the right

12. The computer distinguishes the anatomy of interest from background densities during:

a. automated exposure field recognition

b. automated rescaling

c. exposure

d. field uniformity corrections

13. A *submatrix* that is passed over the original image matrix executing a mathematical function

on it is called a(n):

1. Subroutine
2. Subpixel
3. Interpolation
4. Kernel

14. *Segmentation failure* is another term for errors in:

a. partitioned pattern recognition

b. histogram analysis

c. automated rescaling

d. automatic exposure control

15. For a large abdomen which completely covers the image receptor plate, the expected shape

of the original histogram will appear:

a. with no spikes, only the main lobe

b. with a single spike to the left of the main lobe

c. with a single spike to the right of the main lobe

d. with spikes both on the left and the right of the main lobe

16. Partitioned pattern recognition software is used for:

a. segmentation

b. gradation processing

c. rescaling

d. noise correction

17. *Exposure field recognition* is normally done as part of:

a. histogram analysis

b. rescaling

c. noise reduction

d. gradation processing

18. To analyze the histogram, the computer scans inward from both the right and left ends of the

histogram looking for:

1. field edges
2. bins
3. pixels
4. landmarks

19. Many systems present the histogram with an “S”-shaped exposure response curve overlying

the histogram. The steeper the slope of this curve, the:

a. darker the image

b. lighter the image

c. higher the image contrast

d. longer the image gray scale

20. *Rescaling (processing)* is best described as an attempt by the computer system to:

a. make a low-contrast raw digital image appear like a conventional radiograph

prior to any post-processing

b. conform a post-processed digital image to the human eye just prior to display

c. correct for flaws in the acquisition of the original digital image

d. refine the digital image according to specific guidelines for the particular anatomy

21. A histogram analysis algorithm that begins storing pixel values only when a certain

minimum number of pixels holding these values is present is a(n) \_\_\_\_\_\_\_\_\_\_ algorithm:

1. threshold
2. alternate
3. segmentation
4. procedural

22. A reference histogram that evolves by averaging it with the previous 50 procedures is called

a(n) \_\_\_\_\_\_\_\_\_ histogram:

1. neural
2. a priori
3. median averaging
4. interpolation

23. Re-mapping the brightness and gray scale of the image so that it appears like a conventional

radiograph is called:

1. gradation processing
2. rescaling
3. segmentation
4. interpolation

24. The bins of data from an *acquired* image to be used for rescaling are labeled as \_\_\_ values:

a. S

b. QP

c. I

d. D

e. pixel

25. Incoming pixel values can be made to fit a pre-set range by adjusting the degree by which

they are:

1. rounded
2. segmented
3. multiplied
4. summed

26. Because the range of the Q scale is far beyond the discernment of the human eye, this allows

for \_\_\_\_\_ of the image:

1. data clipping
2. normalizing
3. windowing
4. noise reduction

27. Which of the following can computerized processing *not* do to the acquired image histogram:

a. Change the average brightness

b. Match the range of pixel values to the ideal histogram

c. Change the pixel counts in each bin or file

d. Match the high and low points to the ideal histogram

28. As a result of rescaling a particular view, the “for processing” Q values that will be fed into

gradation processing LUTs:

1. are always the same
2. differ according to preprocessing parameters
3. differ according to the initial set radiographic technique
4. differ according to windowing

29. Histogram analysis errors:

a. are part of uniformity corrections

b. are not necessarily related to the radiographic technique used

c. are not related to exposure field recognition failures

d. are limited to rescaling of the image

30. Rescaling the image is primarily a process of \_\_\_\_\_\_\_\_\_\_ the acquired data set:

a. geometrically sorting

b. numerically counting

c. algebraically re-labeling

d. electronically amplifying

31. Histogram analysis can fail to identify key landmarks when a bizarre data set results in an

unexpected \_\_\_\_\_\_\_\_.

1. Histogram shape
2. Histogram position
3. Pixel count
4. Volume of interest

32. Histogram analysis failure is less common with DR systems because, unlike CR processors,

the DR algorithms include \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the data set for processing:

1. Only the main histogram lobe
2. Only the exposed dels
3. Only the volume of interest containing anatomy
4. All pixel values across the detector plate

33. For a particular image pixel, rescaling operations affect all of the following EXCEPT its:

1. Brightness level
2. Location in the matrix
3. Density
4. Pixel value

34. After histogram analysis and rescaling are completed, the computer “knows” where to insert

these modified values in the image because prior to these operations, a log was kept

recording each:

1. Pixel’s contrast level
2. Physical attenuation coefficient
3. Value’s pixel count
4. Value’s location in the spatial matrix

35. The range of acquired image data, from within the anatomy, used to analyze and rescale the

digital image ranges from:

1. 1.0 to 4.0
2. 1 to 100
3. SMIN to SMAX
4. Q1 to Q1580

36. All of the following are steps of preprocessing EXCEPT:

a. Field uniformity corrections

b. Histogram analysis

c. Gradation processing

d. Del drop-out corrections

37. Which of the following best fits the concept of processing the image to a diagnostic quality:

a. Gradation processing

b. Histogram analysis

c. Rescaling

d. Detail processing

38. For CR, since multiple views can be taken on one PSP plate, processing software first scans

across the receptor plate to determine the number of views taken and where their borders

are. This process is called:

a. LUT application

b. Field uniformity correction

c. Exposure field recognition

d. Segmentation

39. In DR systems, dead dels (or pixels) can result from \_\_\_\_\_\_\_\_\_ failure within the detector

elements:

a. Absorption

b. Emission

c. Electronic

d. Chemical

40. To eliminate “dead” spots in the image, the computer uses \_\_\_\_\_\_\_ reduction software:

a. Noise

b. Artifact

c. Contrast

d. Pixel

41. The inability of a CR system to identify and separate different exposures taken on a single

CR plate is known as:

a. Histogram analysis failure

b. Segmentation failure

c. Automated rescaling failure

d. Exposure field recognition failure

1. Depending on the degree to which incoming pixel values are rounded up or down, they can be made to fit a pre-set range of:
   1. D values
   2. S values
   3. I values
   4. X values
2. More severe rounding results in \_\_\_\_\_\_ pixel values:
   1. More
   2. Fewer
   3. Higher
   4. Lower
3. In the displayed image, fewer pixel values appears as:
   1. Increased brightness
   2. Decreased brightness
   3. Increased gray scale
   4. Decreased gray scale
4. A “raw” digital image directly from the image receptor has extremely:
   1. High contrast
   2. Low contrast
   3. High brightness
   4. Low sharpness
5. For digital imaging, the final display image nearly always has ideal brightness and contrast \_\_\_\_\_\_\_\_\_ radiographic technique used on initial exposure:
   1. Based entirely on
   2. Mostly because of
   3. Regardless of
6. For the *acquired* histogram, “bins” of data from the acquired image to be used for rescaling are designated as \_\_\_ values:
   1. S
   2. Q
   3. I
   4. D
7. For *rescaling* of the image, to align the acquired image data with the output scale of the permanent LUT, the range of S values from the incoming histogram must \_\_\_\_\_\_ the number of Q values in the permanent LUT:
   1. Slightly exceed
   2. Far exceed
   3. Exactly match
   4. Be less than
8. To rescale the image, a computer algorithm remaps incoming \_\_\_ values to \_\_\_ values:
   1. S to Q
   2. Q to S
   3. D to S
   4. S to D
9. It is the Q values that will later fed into the anatomical LUT for:
   1. Preprocessing
   2. Rescaling
   3. Gradation processing
   4. Detail processing
10. Rescaling always corrects for brightness because the acquired histogram is always re-aligned to the \_\_\_\_\_ range:
    1. Dynamic
    2. I value
    3. S value
    4. Q value
11. Rescaling operations affect each pixel throughout the image which holds a particular initial value, regardless of its:
    1. Brightness level
    2. Location in the matrix
    3. Density
    4. Pixel value
12. Physicists define \_\_\_ values as the finalized “for presentation” values after all postprocessing operations are complete.
    1. S
    2. Q
    3. Qk
    4. QP
13. To minimize confusion, we use “Q” values for all \_\_\_\_\_\_\_\_ values:
    1. Acquisition-corrected
    2. Incoming (to the computer)
    3. Rescaled
    4. Fully processed for display
14. The shape of the image histogram is primarily determined by:
    1. the anatomy radiographed
    2. the technique set for exposure
    3. the contrast of the displayed image
    4. the brightness of the displayed image
15. The histogram may be used to determine each of the following EXCEPT:
    1. pixel counts for each pixel value or gray shade
    2. values of interest range
    3. median (average) pixel value
    4. contrast of displayed image
16. Grayscale of the displayed image is best determined by:
    1. the width of the histogram
    2. the height of the histogram
    3. the left-to-right position of the histogram
    4. observation or measurement at the monitor

58. The bins of data from an *acquired* image to be used for rescaling are labeled as \_\_\_ values:

a. S

b. QP

c. I

d. pixel

59. The *histogram* plots the number of pixels counted against the:

a. pixel values

b. pixel contrast

c. pixel location

d. pixel frequency

60. For any imaging system using digital processing, exposure field recognition errors or

histogram analysis errors can cause the final image to have:

a. excessive darkness

b. excessive brightness

c. excessively low contrast

d. excessively high contrast

e. any of the above