

COMPREHENSIVE MOCK EXAM 17

Supplemental to: Clinical Ultrasound Board Review 2026-2027

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ARDMS SPI (Sonography Principles and Instrumentation) Examination, Inteleos -- 110 questions, single-best-answer, four options (A-D), domain-weighted per official ARDMS SPI Content Outline v17.3

Board-Review Questions

1. Biomedical engineering logs which specific transducer serial number was used for every completed exam. If a manufacturer later issues a recall for a specific probe serial number, what does this logging practice allow the facility to do?

- A.** Verify the transducer's Curie point rating retroactively
- B.** Identify every prior patient exam that used the specific recalled transducer
- C.** Automatically reformat the transducer's identification chip
- D.** Verify HIPAA-compliant access logs for the transducer

2. A quality committee randomly selects a sample of completed exams each month and has a second radiologist review the images and report for diagnostic accuracy, independent of the original interpreting physician. What is this ongoing program called?

- A.** A tissue-mimicking phantom QA test
- B.** A peer review program for random case-accuracy auditing
- C.** A new-hire competency checklist
- D.** A practice quality improvement (PQI) project

3. Before installing a scheduled software upgrade to the ultrasound system, the department follows a specific procedure to reroute patients to other equipment and notify staff of the planned outage window in advance. How does this differ from the facility's unplanned system-failure downtime plan?

- A.** It is functionally identical to the unplanned downtime plan in every respect
- B.** It applies only to hardware failures, never to software
- C.** It addresses a scheduled, advance-notice outage, rather than an unexpected failure
- D.** It eliminates the need for any unplanned downtime plan at all

4. Once a year, every sonographer in the department must perform a supervised return demonstration of core scanning skills on a model or phantom, separate from the one-time competency check completed when she was first hired. What does this recurring requirement represent?

- A.** The one-time new-hire competency checklist performed at hiring only

- B.** A practice quality improvement (PQI) project, a different type of activity
- C.** An annual recurring skills return-demonstration, distinct from the one-time new-hire check
- D.** Ongoing continuing medical education (CME) coursework credits

5. Biomedical engineering maintains a running record of every software patch and version update applied to each ultrasound system, along with the date each was installed. What is the primary purpose of this record?

- A.** A running record of each system's software history for troubleshooting/compliance
- B.** The transducer's fractional bandwidth, an unrelated frequency-range ratio
- C.** The transducer's Curie point rating, an unrelated heat property
- D.** The transducer's effective radiating area, an unrelated surface spec

6. Before beginning a gallbladder ultrasound, the sonographer confirms the patient has fasted for the required period before the exam. What is the primary purpose of this confirmation?

- A.** Ensuring gallbladder distension by confirming fasting (NPO) status
- B.** The transducer's disinfection classification, an unrelated concept
- C.** HIPAA-compliant image access, an unrelated privacy concept
- D.** Electrical leakage-current safety, an unrelated safety check

7. Before scanning a patient whose weight approaches the exam table's rated capacity, the sonographer confirms the table's weight limit is not exceeded. What does this verification primarily address?

- A.** The transducer's disinfection classification, an unrelated concept
- B.** HIPAA-compliant image access control, an unrelated privacy concept
- C.** Electrical leakage-current safety, an unrelated safety check
- D.** Confirming the table's rated weight limit is not exceeded

8. To access the ultrasound department's PACS and electronic medical record system, staff must enter a password and also approve a push notification on a separate registered device. What is this login requirement called?

- A.** The Spaulding classification
- B.** HIPAA-compliant image access control alone, without any additional step
- C.** Two-factor authentication for system access
- D.** Electrical leakage-current testing

9. The facility maintains a written plan describing the specific steps staff must take if patient data is suspected to have been accessed by an unauthorized party, distinct from the plan for responding to an unplanned equipment failure. What does this plan address?

- A.** Unplanned equipment failure and system downtime
- B.** A data-breach/cybersecurity-incident response plan
- C.** Transducer disinfection classification
- D.** Electrical leakage-current safety testing

10. A department has a confidential process for staff to report a colleague suspected of practicing while impaired, distinct from a routine performance review. What is the primary purpose of this policy?

- A.** Evaluating transducer maintenance records, an unrelated equipment task
- B.** Protecting patient safety via early identification of an impaired colleague
- C.** Verifying continuing education credit completion, an unrelated process
- D.** Calibrating a quality metrics dashboard, an unrelated administrative task

11. At the end of each shift, the outgoing sonographer verbally reviews any pending or urgent cases with the incoming sonographer before leaving. What does this practice primarily support?

- A.** Transducer disinfection classification compliance, an unrelated concept
- B.** Electrical leakage-current safety, an unrelated safety check
- C.** Continuity of care via structured shift-to-shift handoff communication

D. HIPAA-compliant image access control, an unrelated privacy concept

12. In shear-wave elastography, the system uses a focused acoustic push pulse to generate a localized tissue displacement, which then propagates outward as a shear wave whose speed is measured. What physical phenomenon is intentionally used here to generate that initial displacement?

- A.** Acoustic radiation force, deliberately applied to generate tissue displacement for elastography
- B.** The piezoelectric effect, converting mechanical strain into an electrical signal
- C.** The Doppler shift, measuring a frequency change from tissue motion
- D.** Snell's Law, describing refraction at a tissue interface

13. A coded excitation transmit pulse's frequency continuously increases (or decreases) across the duration of a single pulse, rather than staying at one fixed frequency. What is this type of frequency-swept pulse called?

- A.** A chirp pulse, a frequency-swept pulse used in coded excitation
- B.** A sinusoidal pulse, staying at one fixed frequency throughout
- C.** A continuous-wave pulse, with no defined pulse duration
- D.** A harmonic pulse, describing a received frequency multiple

14. A system has a pulse repetition period (PRP) of 250 microseconds. Using the standard relationship, what is the approximate pulse repetition frequency (PRF)?

- A.** Approximately 250 Hz, an incorrect application of the formula
- B.** Approximately 25,000 Hz, an incorrect application of the formula
- C.** Approximately 4,000 Hz (PRF equals 1 divided by PRP)
- D.** Approximately 0.4 Hz, an incorrect application of the formula

15. A target lies at a depth of 7.7 cm, and the system assumes a propagation speed of 1540 m/s. Using the standard range equation, what is the approximate round-trip travel time for the pulse to reach this target and return?

- A.** Approximately 100 microseconds (2 x depth divided by speed)
- B.** Approximately 50 microseconds, an incorrect application of the formula
- C.** Approximately 200 microseconds, an incorrect application of the formula
- D.** Approximately 10 microseconds, an incorrect application of the formula

16. A beam passes sequentially through three tissue layers, each attenuating the signal by a certain number of decibels. How is the total attenuation across all three layers calculated from the three individual dB values?

- A.** By multiplying the three individual dB values together
- B.** By averaging the three individual dB values
- C.** By dividing the largest dB value by the smallest one
- D.** By adding the three dB values, since dB along a path is additive

17. A beam travels through 2 cm of tissue A (attenuating 0.4 dB/cm/MHz) and then 3 cm of tissue B (attenuating 0.6 dB/cm/MHz) at a transmitted frequency of 5 MHz. What is the approximate total attenuation across both tissues combined?

- A.** Approximately 5 dB total, an incorrect application of the rule
- B.** Approximately 13 dB total, summing each tissue's own attenuation
- C.** Approximately 25 dB total, an incorrect application of the rule
- D.** Approximately 1 dB total, an incorrect application of the rule

18. Two intensity values are compared: 4 mW/cm² and 40 mW/cm², a tenfold difference. Using the power-ratio decibel formula (10 x log of the ratio), what is the approximate decibel difference between these two values?

- A.** Approximately 10 dB
- B.** Approximately 1 dB
- C.** Approximately 100 dB
- D.** Approximately 0.1 dB

19. A transducer's usable frequency range extends from a lower limit of 2 MHz to an upper limit of 6 MHz. What is this transducer's bandwidth, expressed simply as the difference between these two limits?

- A.** 2 MHz, an incorrect application of the subtraction
- B.** 6 MHz, an incorrect application of the subtraction
- C.** 12 MHz, an incorrect application of the subtraction
- D.** 4 MHz, the upper limit minus the lower limit

20. Intensity can be expressed in the clinical convention of milliwatts per square centimeter (mW/cm^2) or in the SI convention of watts per square meter (W/m^2). What do these two expressions represent?

- A.** Two entirely unrelated physical quantities that cannot be converted between each other
- B.** The same underlying physical quantity (intensity), expressed in two different unit conventions
- C.** Two different physical quantities that happen to share the same numeric value
- D.** A distinction that applies only to Doppler intensity, never to B-mode intensity

21. For beamforming calculations, a curved or flat array's transmitted wavefronts are modeled as though they originate from a single fixed point behind or within the array, regardless of the array's specific physical shape. What is this general reference point concept called?

- A.** The kerf, an unrelated inter-element gap
- B.** The acoustic center, an effective point-source used in beamforming
- C.** The dead zone, an unrelated near-field imaging limitation
- D.** The half-value layer, an unrelated attenuation-depth measure

22. A source delivers 0.02 watts of acoustic power continuously for 5 seconds. Using the standard formula relating energy, power, and time, what is the total energy delivered?

- A.** 0.004 joules, an incorrect application of the formula
- B.** 0.1 watts, restating power rather than calculating energy
- C.** 250 joules, an incorrect application of the formula

D. 0.1 joules, using energy equals power multiplied by time

23. When forming a B-mode image, returning echo signals from multiple elements are combined while preserving their relative timing/phase information, rather than simply adding their magnitudes together regardless of arrival time. What is this phase-preserving combination process called?

- A.** Incoherent summation, ignoring phase and combining magnitudes only
- B.** Coherent summation, combining signals while preserving phase/timing information
- C.** The Doppler equation, an unrelated velocity-frequency relationship
- D.** The range equation, an unrelated distance-time relationship

24. An array has an element pitch of 0.2 mm at a transmitted wavelength of 0.5 mm. Comparing this pitch to half the wavelength (0.25 mm), does this design satisfy the standard grating-lobe-avoidance guideline?

- A.** Yes, since the pitch (0.2 mm) is smaller than half the wavelength (0.25 mm)
- B.** No, since the pitch is larger than the full wavelength
- C.** The guideline does not apply to this array type at all
- D.** Grating lobes are entirely unrelated to element pitch

25. Coupling gel is formulated so its own acoustic impedance closely matches that of soft tissue, beyond simply eliminating the air gap at the skin surface. What additional benefit does this impedance-matching property provide?

- A.** It increases the transducer's Curie point
- B.** It eliminates the need for an internal acoustic matching layer within the transducer itself
- C.** It increases the transducer's operating frequency
- D.** It further minimizes reflection right at the gel-skin interface itself

26. In a completely pure, homogeneous liquid with no microscopic gas bubbles or particles present, cavitation is far less likely to occur even at a given acoustic pressure than in a liquid containing tiny pre-existing gas bubbles. What do these pre-existing microscopic bubbles or particles provide?

- A.** The piezoelectric effect necessary for cavitation
- B.** The Doppler shift necessary for cavitation
- C.** A cavitation nucleus, a pre-existing site facilitating bubble growth
- D.** The Curie point necessary for cavitation

27. Ultrasound contrast microbubbles, when insonated, can generate a returning signal at exactly half the transmitted frequency, distinct from harmonic frequencies (which are multiples above the transmitted frequency). What is this half-frequency signal called?

- A.** The fundamental frequency, the transmitted frequency itself
- B.** The Nyquist frequency, an unrelated sampling-rate concept
- C.** The second harmonic frequency, a multiple above, not below
- D.** The subharmonic frequency, at exactly half the transmitted frequency

28. Instead of using an added acoustic lens bonded to a flat piezoelectric element, some single-element transducers are manufactured with the piezoelectric material itself ground into a curved (concave) shape, so the element's own geometry provides a fixed focus. What is this focusing approach called?

- A.** Dynamic aperture focusing, an unrelated array-based technique
- B.** Apodization-based focusing, an unrelated array-based technique
- C.** Electronic phased focusing, an unrelated array-based technique
- D.** Geometric (curved-element) focusing, built into the crystal's shape

29. An annular array's concentric ring elements are driven with individually timed electronic delays, allowing the focal depth to be adjusted electronically, in addition to the array's inherent mechanical steering requirement. What does this added electronic delay capability provide?

- A.** Electronically adjustable focal depth, layered onto the annular array's standard mechanical steering
- B.** Complete elimination of the need for any mechanical steering at all
- C.** A fixed focal depth that can never be changed once manufactured

D. Electronic steering in the azimuthal plane, replacing mechanical steering entirely

30. An endocavity transducer's handle includes physical freeze and image-capture buttons built directly into the handle itself, allowing the operator to trigger these functions without reaching for the system console. What does this design represent?

- A.** The transducer's acoustic output calibration certificate, unrelated here
- B.** The transducer's operating frequency range specification, unrelated here
- C.** The transducer's biocompatibility rating, an unrelated safety spec
- D.** On-handle control buttons, distinct from console-only controls

31. A simple, single-element (non-array) transducer is manufactured to operate at either of two selectable fixed frequencies, without using electronic beam steering or focusing across multiple elements. What does this design represent?

- A.** A true time delay phased array
- B.** A row-column addressed (RCA) matrix array
- C.** A synthetic aperture imaging array
- D.** A multi-frequency single-element (non-array) transducer

32. As part of a specific high-level disinfection system's validated QA process, the non-latex probe cover material used with that system is periodically tested for tensile strength and puncture resistance. What does this specific testing address?

- A.** The transducer's acoustic output calibration certificate, unrelated here
- B.** The transducer's operating frequency range specification, unrelated here
- C.** Probe-cover material integrity (tensile strength/puncture resistance) QA
- D.** The transducer's biocompatibility rating, an unrelated safety spec

33. An endocavity transducer's insertion tip is manufactured with a smooth, rounded, tapered shape rather than a flat or sharp-edged end. What is the primary purpose of this tip design?

- A.** To increase the transducer's operating frequency
- B.** To improve patient comfort and ease of insertion
- C.** To increase the transducer's fractional bandwidth
- D.** To eliminate the need for any coupling gel

34. A miniature transducer is mounted on the tip of a catheter and advanced into the right atrium to image cardiac structures from within the heart itself, distinct from a similar catheter-based probe used to image from within a blood vessel. What is this cardiac-specific catheter probe called?

- A.** An intravascular ultrasound (IVUS) catheter transducer
- B.** A transesophageal echocardiography (TEE) probe
- C.** An intracardiac echocardiography (ICE) catheter transducer
- D.** A transrectal probe

35. In a piezocomposite transducer element, small ceramic rods are embedded in a polymer matrix using a specific geometric arrangement in which the ceramic is continuous in one dimension and the polymer surrounds it in the other two. What is this specific arrangement called?

- A.** A 0-3 connectivity pattern, a different composite geometry
- B.** A 2-2 connectivity pattern, a different composite geometry
- C.** A 3-3 connectivity pattern, a different composite geometry
- D.** A 1-3 connectivity pattern (rods continuous, surrounded by polymer)

36. Facility protocol for a particular endocavity transducer's high-level disinfection system specifies that the probe must be stored fully submerged in a specific solution between the disinfection cycle and its next clinical use, rather than simply air-dried. What does this specific storage requirement address?

- A.** Maintaining that disinfection system's required wet storage condition
- B.** The transducer's Curie point rating, an unrelated heat property
- C.** The transducer's fractional bandwidth, an unrelated frequency ratio
- D.** The transducer's effective radiating area, an unrelated surface spec

37. For research purposes, some transducers offer a mode that outputs the raw radiofrequency (RF) signal data collected by each element, before any beamforming or image processing is applied, rather than only the final processed image. What does this raw data output option provide?

- A.** Only the fully processed final B-mode image, with no additional data
- B.** Only the transducer's calibration certificate information
- C.** Only the transducer's identification and model number
- D.** Unprocessed per-element RF signal data collected prior to beamforming and image processing

38. A specialized transducer is designed to operate at a comparatively low frequency specifically to allow the beam to penetrate through the temporal bone for transcranial imaging, since higher frequencies would be almost entirely reflected/absorbed by bone. What does this frequency choice specifically address?

- A.** Maximizing axial resolution for superficial structures
- B.** Achieving adequate penetration through the temporal bone window
- C.** Minimizing the transducer's physical footprint size
- D.** Eliminating the need for any acoustic window at all

39. To generate a shear wave for elastography, a transducer transmits several acoustic pulses in rapid succession as a single grouped event, rather than the single, isolated pulses used for standard B-mode imaging. What is this grouped multi-pulse transmission called?

- A.** Burst-mode transmission (rapid pulses fired as one grouped event)
- B.** Continuous-wave transmission, an unrelated single ongoing signal
- C.** Single-pulse pulse-echo transmission, the standard B-mode approach
- D.** Harmonic-only transmission, an unrelated receive-filtering concept

40. A curved-array transducer is specifically designed and applied against the perineum, rather than inserted transvaginally or transrectally, to image pelvic floor structures in a patient who cannot tolerate or does not require internal probe insertion. What is this application called?

- A.** A transvaginal application

- B.** A transrectal application
- C.** A transperineal application
- D.** An intraoperative application

41. A transducer's housing is rated to withstand full temporary submersion in water without allowing water ingress into the internal electronics, a specification distinct from its high-level disinfection compatibility. What type of rating describes this water-ingress protection level?

- A.** A Spaulding classification rating
- B.** A biocompatibility rating
- C.** An electromagnetic compatibility (EMC) rating
- D.** An IPX (ingress protection) water-resistance rating

42. A specialized high-frequency transducer is designed with a very low acoustic output specifically for imaging the eye, given the eye's unique sensitivity to acoustic bioeffects compared to other organs. What does this probe's design specifically account for?

- A.** Maximizing penetration depth for whole-abdomen imaging
- B.** The eye's distinct output-safety considerations, requiring very low acoustic output
- C.** Eliminating the need for any coupling gel during the exam
- D.** Maximizing frame rate for cardiac imaging applications

43. Around the outer edge of an array's active elements, a ring of inactive piezoelectric material is included specifically to reduce unwanted diffraction effects at the aperture's physical edge. What is this peripheral inactive ring called?

- A.** The kerf, an unrelated inter-element gap
- B.** A guard ring, a peripheral inactive ring reducing edge diffraction
- C.** The virtual apex, an unrelated convex-array reference point
- D.** The acoustic stack, an unrelated layered-assembly concept

44. An endocavity probe's manufacturer specifies the shaft's total insertable length, which determines how far the transducer tip can reach during a given procedure. What does this specification represent?

- A.** The shaft length spec, determining insertion reach
- B.** The transducer's Curie point rating, an unrelated heat property
- C.** The transducer's fractional bandwidth, an unrelated frequency ratio
- D.** The transducer's effective radiating area, an unrelated surface spec

45. A small-footprint curved array is specifically designed for abdominal imaging in infants and young children, distinct from both a standard adult abdominal curvilinear probe and a pediatric cardiac micro-convex probe. What does this probe's smaller footprint specifically accommodate?

- A.** The smaller body size and limited acoustic window in pediatric imaging
- B.** Maximum penetration depth needed for a large adult abdomen
- C.** Transrectal insertion specifically
- D.** Intracardiac catheter-based imaging specifically

46. After the sonographer places calipers on the renal cortex in two locations, the system automatically calculates the average cortical thickness, distinct from overall renal length. What software feature does this describe?

- A.** Automated renal length measurement
- B.** Automated splenic index calculation
- C.** Automated bladder-volume calculation
- D.** Automated renal cortex thickness measurement

47. A small text label in the corner of the screen continuously displays which specific version of the standardized exam protocol is currently loaded, such as "Renal Protocol v3." What is this label called?

- A.** An on-screen exam-protocol version-number display
- B.** The focal-zone position indicator, an unrelated focus-depth marker
- C.** The color box boundary, an unrelated Doppler region-of-interest tool

D. The depth-scale marker, an unrelated centimeter ruler

48. After the sonographer places calipers on the left ventricular internal diameter in diastole and systole, the system automatically flags the values if they fall outside a normal reference range. What software feature does this describe?

- A.** Automated ejection fraction calculation via Simpson's biplane method
- B.** Automated aortic-valve-area calculation
- C.** Automated LV mass calculation
- D.** Automated cardiac chamber dimension measurement with a normal-range flag

49. Within the reporting software, the interpreting physician selects a button that routes a specific study to a subspecialist colleague for an additional independent read before the report is finalized. What is this feature called?

- A.** A structured second-opinion consultation request feature
- B.** Modality worklist integration for scheduling data only
- C.** An ellipsoid volume formula for organ measurement only
- D.** DICOM lossy compression for file-size reduction only

50. After several serial resistive index measurements are stored for the same vessel, the system calculates and displays the numeric rate of change per week, rather than simply plotting the raw values on a graph. What does this numeric output represent?

- A.** The pulse repetition frequency used during acquisition
- B.** The absolute RI value from the most recent single exam only
- C.** The Doppler angle correction applied to the measurement
- D.** A calculated RI-trend rate of change (slope), rather than a raw value graph alone

51. While reviewing a frozen image, the sonographer speaks aloud a short description, and the system converts her speech directly into a typed text annotation placed on the image, without the operator using a keyboard. How does this differ from a simple voice-command control feature?

- A.** It converts spoken words directly into typed text annotations, rather than triggering a fixed system command
- B.** It performs an identical function to voice-command control, just under a different name
- C.** It requires the operator to type the annotation manually afterward regardless
- D.** It only works for freezing the image, never for annotation text

52. The system automatically calculates cardiac output at each of a patient's serial echocardiogram visits and displays how this value has changed over time, rather than showing only the single most recent measurement. What does this longitudinal display represent?

- A.** A single-exam cardiac output calculation only, with no serial component
- B.** Automated ejection fraction calculation only
- C.** A serial (longitudinal) cardiac-output trend display across multiple visits
- D.** Automated aortic-valve-area calculation only

53. A wireless transducer's battery indicator shows not only its current charge level, but also an estimate of how much its maximum charge capacity has degraded compared to when the battery was new. What does this additional information represent?

- A.** The battery's long-term health/degradation status, beyond current charge
- B.** The transducer's fractional bandwidth
- C.** The current charge level alone, with no degradation information
- D.** The transducer's operating frequency range

54. Based on the position and orientation of fetal structures identified on the image, the system automatically suggests whether the fetus is in a cephalic, breech, or transverse position. What is this software feature called?

- A.** Automated fetal heart-rate calculation
- B.** Automated fetal presentation auto-detection software
- C.** Automated nuchal translucency measurement

D. Automated gestational sac size measurement

55. The system compares the gestational age calculated from the patient's reported last menstrual period to the gestational age calculated from the current ultrasound measurements, and displays a warning if the two values differ significantly. What is this warning called?

- A.** A gestational-age discrepancy alert (LMP-based vs ultrasound-based dating)
- B.** An automated fetal presentation alert, an unrelated OB feature
- C.** An automated nuchal translucency alert, an unrelated OB feature
- D.** An automated amniotic fluid index alert, an unrelated OB feature

56. After the sonographer captures a sagittal image of the endometrium, software analyzes the image and classifies the endometrial pattern as trilaminar or non-trilaminar. What is this software feature called?

- A.** Automated ovarian volume calculation
- B.** Automated endometrial thickness measurement
- C.** Automated endometrial pattern classification software
- D.** Automated cervical length measurement

57. Before beginning certain procedures, the patient reviews and signs a consent form directly on a touchscreen pad connected to the ultrasound workstation, which then stores the signed form with the exam record. What does this integration represent?

- A.** An ellipsoid volume formula, an unrelated calculation
- B.** Modality worklist integration for scheduling only
- C.** Digital consent-signature capture integrated with the ultrasound workstation
- D.** DICOM lossy compression, an unrelated file-size technique

58. If an exam must be paused partway through, such as for a patient emergency, the system automatically records the time, reason, and duration of the pause before scanning resumes. What is this record called?

- A.** An exam-interruption log recording pause time, reason, and duration
- B.** A structured report-generation template, an unrelated documentation feature
- C.** An ellipsoid volume formula, an unrelated organ-volume calculation
- D.** A modality worklist entry, an unrelated scheduling feature

59. Analyzing the liver's overall echo pattern and its attenuation relative to a reference structure, software provides an estimated grade of hepatic steatosis (fatty liver). What is this software feature called?

- A.** Automated splenic index calculation
- B.** Automated portal vein diameter measurement
- C.** Automated gallbladder wall thickness measurement
- D.** Automated hepatic steatosis grading software

60. The system detects that the transmit focal zone is currently positioned well above the region of interest the operator appears to be examining, and displays a brief on-screen prompt suggesting the focal zone be adjusted. What does this prompt address?

- A.** Electrical leakage-current safety, an unrelated patient-shock check
- B.** HIPAA-compliant image access control, an unrelated privacy concept
- C.** A focus-depth mismatch between the transmit focal zone and the ROI
- D.** The Spaulding classification of the transducer, an unrelated concept

61. After the sonographer places calipers on the inferior vena cava in a longitudinal view during both quiet respiration and a sniff maneuver, the system automatically calculates the percentage of diameter collapse. What software feature does this describe?

- A.** Automated splenic index calculation
- B.** Automated IVC diameter/collapsibility calculation
- C.** Automated portal vein diameter measurement
- D.** Automated renal cortex thickness measurement

62. When the operator selects the obstetric preset, a brief on-screen popup reminds her of the applicable MI/TI output limits specific to that exam type before scanning begins. What does this reminder represent?

- A.** Electrical leakage-current safety testing, an unrelated safety check
- B.** HIPAA-compliant image access control, an unrelated privacy concept
- C.** An exam-type-specific safety-reminder popup tied to the selected preset
- D.** The Spaulding classification of the transducer, an unrelated concept

63. After the sonographer measures the closed cervix length in a pregnant patient, the system compares the value to a defined threshold and flags the study if the measurement suggests an increased risk of preterm labor. What software feature does this describe?

- A.** Automated amniotic fluid index calculation, an unrelated OB metric
- B.** Automated nuchal translucency measurement, an unrelated OB metric
- C.** Automated fetal presentation detection, an unrelated OB feature
- D.** Automated cervical length measurement with a preterm-risk threshold flag

64. A small on-screen readout continuously displays the transducer's current transmit power output as a percentage of the system's maximum allowable output (for example, 100% or 50%). What does this readout show?

- A.** The current Doppler angle correction applied, an unrelated velocity parameter
- B.** The current dynamic range setting, an unrelated display parameter
- C.** The current transmit power as a percentage of maximum output
- D.** The current persistence level, an unrelated temporal-averaging setting

65. After the sonographer places calipers on the fetal nuchal translucency measurement, the system can integrate this value with maternal age and serum marker results, when entered, to calculate an aneuploidy risk estimate. What does this integration represent?

- A.** Automated endometrial pattern classification, an unrelated OB feature
- B.** Automated fetal presentation detection, an unrelated OB feature

- C. Automated gestational-age discrepancy alerting, an unrelated OB feature
- D. Automated nuchal translucency measurement with integrated risk calculation

66. After the sonographer images the biliary tree, software analyzes the pattern of ductal dilation and classifies it as predominantly intrahepatic, extrahepatic, or both. What is this software feature called?

- A. Automated pancreatic duct diameter measurement
- B. Automated common bile duct diameter measurement alone
- C. Automated biliary tree dilation-pattern classification software
- D. Automated portal vein diameter measurement

67. After the sonographer places calipers around each visible follicle in an ovary during a fertility-related exam, the system automatically counts and sizes the follicles present. What is this software feature called?

- A. Automated ovarian volume calculation alone
- B. Automated ovarian follicle counting software
- C. Automated endometrial pattern classification
- D. Automated cervical length measurement

68. After the sonographer enters key findings into the structured worksheet, the system generates a suggested impression paragraph summarizing those findings in narrative form, which the physician then edits and finalizes. What is this feature called?

- A. An ellipsoid volume formula for organ measurement only
- B. Modality worklist integration for scheduling data only
- C. A structured-impression auto-draft generation feature
- D. DICOM lossy compression for file-size reduction only

69. After the sonographer enters the peak systolic velocities from the internal carotid artery and the common carotid artery, the system automatically calculates a percentage stenosis estimate using a standard velocity-ratio-based method. What software feature does this describe?

- A.** Automated splenic index calculation, an unrelated organ metric
- B.** Automated renal cortex thickness measurement, an unrelated organ metric
- C.** Automated carotid stenosis percentage auto-calc from entered velocities
- D.** Automated portal vein diameter measurement, an unrelated vascular metric

70. Before ending her shift, the sonographer types a brief note into a dedicated field summarizing which exams remain pending review, for the next sonographer to see. What is this field called?

- A.** An exam handoff note field for shift-change communication
- B.** A structured report-generation template, an unrelated documentation feature
- C.** An ellipsoid volume formula, an unrelated organ-volume calculation
- D.** A modality worklist entry, an unrelated scheduling feature

71. After the sonographer measures both splenic and renal parenchymal echogenicity, the system calculates a ratio between the two, used as one supportive indicator of hepatic steatosis when the liver is compared similarly. What is this ratio called?

- A.** A spleen-to-kidney echogenicity ratio calculation
- B.** An automated splenic index calculation
- C.** An automated renal length measurement
- D.** An automated portal vein diameter measurement

72. A small on-screen icon indicates whether the currently displayed image is using tissue harmonic processing or fundamental-frequency imaging. What is this icon called?

- A.** The focal-zone position indicator, an unrelated focus-depth marker
- B.** A live harmonic-versus-fundamental toggle-status indicator
- C.** The color box boundary, an unrelated Doppler region-of-interest tool

D. The depth-scale marker, an unrelated centimeter ruler

73. After the sonographer images the placenta, software analyzes its position relative to the internal cervical os and its appearance, then suggests a grade/classification for the report. What is this software feature called?

- A.** Automated amniotic fluid index calculation
- B.** Automated placental location/grade classification software
- C.** Automated fetal presentation detection
- D.** Automated nuchal translucency measurement

74. If a signed procedural consent form is on file but the scheduled exam is delayed beyond a defined time window, the system displays a reminder that the consent may need to be reconfirmed before proceeding. What does this reminder address?

- A.** HIPAA-compliant image access control, an unrelated privacy concept
- B.** Electrical leakage-current safety, an unrelated patient-shock check
- C.** The Spaulding classification of the transducer, an unrelated concept
- D.** A consent-expiration/reconfirmation reminder tied to a validity window

75. Alongside an automatically calculated measurement value, the system also displays a plus-or-minus range reflecting the estimated precision of that specific measurement. What does this additional range represent?

- A.** A displayed measurement-precision range alongside the calculated value
- B.** The Doppler angle correction applied to the measurement, unrelated here
- C.** The current persistence level, an unrelated temporal-averaging setting
- D.** The current dynamic range setting, an unrelated display parameter

76. An on-screen prompt walks the sonographer through the specific sequence of images required for a standardized limited abdominal aorta screening protocol, distinct from the general full-abdomen protocol checklist. What does this specific prompt sequence represent?

- A.** Modality worklist integration for general scheduling
- B.** DICOM lossy compression, an unrelated file-size technique
- C.** An ellipsoid volume formula, an unrelated calculation
- D.** A protocol-specific guided image sequence for a limited screening exam

77. A patient presents with sudden, painless, complete vision loss in one eye. Doppler of the affected orbit shows absent flow in a specific artery supplying the retina, with normal flow in the adjacent ophthalmic artery branches. What does this suggest?

- A.** Normal retinal arterial flow, without any abnormality present
- B.** Central retinal vein occlusion, a venous rather than arterial process
- C.** Orbital varix, a positional venous abnormality unrelated to sudden vision loss
- D.** Central retinal artery occlusion, with absent flow in that specific artery

78. A patient presents with sudden, painless, blurred vision. Doppler of the affected eye shows a dilated, tortuous retinal vessel with markedly diminished, sluggish venous flow, while the corresponding retinal artery shows preserved flow. What does this suggest?

- A.** Central retinal artery occlusion, an arterial rather than venous process
- B.** Central retinal vein occlusion, with sluggish flow in the dilated vein
- C.** A normal retinal vascular examination, without abnormality
- D.** An orbital varix, an unrelated positional venous finding

79. A patient reports a bulging sensation behind one eye that worsens when bending forward or performing a Valsalva maneuver. Doppler shows a venous structure in the orbit that distends and shows increased flow specifically during this maneuver. What does this describe?

- A.** Central retinal artery occlusion, an unrelated arterial process
- B.** An orbital varix, a venous structure that distends with Valsalva/positional maneuvers
- C.** Central retinal vein occlusion, an unrelated distinct venous process
- D.** A normal orbital vascular examination

80. A patient with a palpable thyroid nodule and suppressed TSH undergoes ultrasound, which shows the nodule to be markedly hypervascular on color Doppler, with surrounding thyroid tissue appearing relatively less vascular by comparison. What does this pattern, combined with the suppressed TSH, suggest?

- A.** A simple colloid cyst, an avascular benign finding
- B.** Diffuse Graves' disease affecting the entire gland uniformly
- C.** An autonomously functioning ("hot") thyroid nodule
- D.** Hashimoto's thyroiditis, a diffuse inflammatory process

81. A patient with Graves' disease undergoes thyroid ultrasound, which shows diffuse, intense, uniform hypervascularity throughout the entire gland on color Doppler, often described using a specific descriptive term. What is this diffuse hypervascular pattern called?

- A.** The macaroni sign, a vasculitis wall-thickening finding
- B.** The whirlpool sign, an ovarian-torsion finding
- C.** The lyre sign, a carotid body tumor finding
- D.** The "thyroid inferno" pattern (diffuse glandular hypervascularity)

82. A patient with Hashimoto's thyroiditis undergoes thyroid ultrasound. Compared to the uniform, intense hypervascularity seen in Graves' disease, what vascularity pattern is more typically seen in Hashimoto's thyroiditis?

- A.** A more variable, patchy vascularity pattern, generally less intense and uniform than Graves' disease
- B.** An identical "thyroid inferno" pattern in every case, indistinguishable from Graves' disease
- C.** Complete absence of any detectable vascularity throughout the gland
- D.** Vascularity confined exclusively to a single focal nodule, with no diffuse component

83. Two breast masses are compared: one shows minimal, peripheral color Doppler flow with a smooth, oval, well-circumscribed shape; the other shows disorganized, penetrating internal vascularity with an irregular, spiculated margin. What does this vascularity comparison help support?

- A.** That both masses are equally likely to be benign
- B.** That vascularity pattern has no bearing on the assessment of either mass
- C.** A benign appearance (first) versus a more suspicious appearance (second)
- D.** That the first mass is more concerning than the second

84. A patient presents with a tender, palpable, cord-like structure just under the skin of the breast. Ultrasound shows a superficial, non-compressible, thrombosed vein with no flow on Doppler, distinct from the deeper breast parenchyma. What condition does this describe?

- A.** A simple fibroadenoma
- B.** A normal superficial breast vein
- C.** A deep venous thrombosis of the breast parenchyma itself
- D.** Mondor's disease, superficial breast vein thrombophlebitis

85. A male patient presents with unilateral breast enlargement and tenderness. Ultrasound shows a fan-shaped area of hypoechoic, non-cystic subareolar tissue with mild internal color Doppler flow. What does this Doppler finding support?

- A.** An active, likely benign process (such as gynecomastia), rather than an entirely avascular simple cyst
- B.** That the tissue is entirely avascular, most consistent with a simple cyst
- C.** That the finding is unrelated to any breast tissue process
- D.** That malignancy has already been definitively excluded by this finding alone

86. Following recent surgery, a patient develops a fluid collection at the incision site. One collection shows a simple anechoic appearance with no internal or wall Doppler flow; a second, in a different patient, shows a complex collection with a thickened, hyperemic wall. What does this Doppler comparison help distinguish?

- A.** That both collections are equally likely to represent a simple seroma
- B.** That Doppler has no role in distinguishing these two collection types
- C.** A simple seroma (first) versus a more likely abscess (second, hyperemic)

D. That the first collection is more concerning than the second

87. Shortly after thyroidectomy, a patient develops rapidly increasing neck swelling and difficulty breathing. Ultrasound with color Doppler at the surgical bed shows a focal jet of arterial flow extending into an expanding hematoma. What does this specific finding suggest?

- A.** A normal, expected postoperative seroma with no bleeding
- B.** A simple, non-expanding hematoma with no active source
- C.** Active arterial bleeding into the postoperative hematoma, a surgical emergency
- D.** A normal thyroid remnant with preserved vascularity

88. A parathyroid lesion is found to be unusually large, with irregular margins, local invasion into adjacent strap muscle, and prominent internal vascularity on Doppler, distinct from the smaller, more uniformly hypoechoic appearance of a typical parathyroid adenoma. What does this combination of features raise concern for?

- A.** A typical, small, benign parathyroid adenoma
- B.** Parathyroid carcinoma, given the size, invasion, and vascularity
- C.** A normal parathyroid gland
- D.** A simple thyroid colloid nodule, an unrelated structure

89. A midline submental neck mass in a child shows heterogeneous internal echoes with scattered fat and debris on grayscale imaging, with minimal internal color Doppler flow aside from a small mural focus. How does this appearance help distinguish it from a thyroglossal duct cyst in the same general location?

- A.** Sonographically identical to a thyroglossal duct cyst in every respect
- B.** Confirmation that the mass is a lymphatic malformation, not any other entity
- C.** Confirmation of a branchial cleft cyst, a lateral rather than midline structure
- D.** Heterogeneous fat/debris suggesting a dermoid, unlike a thyroglossal cyst's fluid

90. A child with Kawasaki disease undergoes echocardiographic surveillance, which includes Doppler evaluation of the coronary arteries for focal dilation. What is the primary purpose of this specific surveillance?

- A.** To detect coronary artery aneurysms, a recognized complication of Kawasaki disease
- B.** To assess for aortic regurgitation specifically, unrelated to Kawasaki disease
- C.** To calculate the child's renal resistive index, an unrelated organ system
- D.** To assess for patent ductus arteriosus, an unrelated congenital finding

91. On ultrasound of a child with intussusception, a discrete mass is identified at the leading edge of the intussusceptum, with its own distinct internal Doppler flow pattern separate from the surrounding bowel wall. What does identifying this specific mass, called a lead point, help explain?

- A.** A possible structural cause (lead point) for the intussusception
- B.** That the intussusception is definitely idiopathic, with no structural cause
- C.** The child's renal resistive index
- D.** The gallbladder wall thickness

92. A premature neonate develops abdominal distension and bloody stools. Ultrasound shows echogenic foci within the bowel wall itself and gas within the portal venous system, with Doppler showing diminished flow to the affected bowel segment. What condition does this combination suggest?

- A.** A normal, healthy neonatal bowel examination
- B.** Necrotizing enterocolitis, with pneumatosis and portal venous gas
- C.** Pyloric stenosis, an unrelated distinct entity
- D.** Intussusception, an unrelated distinct entity

93. An infant with projectile vomiting undergoes ultrasound, which shows a thickened, elongated pyloric muscle. What is the primary role of color Doppler in this specific evaluation?

- A.** Doppler is the primary diagnostic tool, more important than the muscle thickness/length measurements themselves
- B.** Doppler excludes the diagnosis entirely if any flow is seen within the muscle

- C. Doppler is required to calculate the infant's renal resistive index during the same exam
- D. Doppler plays a secondary, supportive role, since pyloric stenosis is primarily a grayscale measurement-based diagnosis

94. An ovarian mass containing fat, hair, and calcification on grayscale imaging shows minimal to no internal color Doppler flow within these components, though a small mural nodule may show some vascularity. What type of ovarian mass does this most likely represent?

- A. A simple functional ovarian cyst, without fat/hair/calcification
- B. A mature cystic teratoma (dermoid), typically minimal internal flow
- C. Ovarian torsion, an unrelated acute vascular process
- D. A hypervascular malignant ovarian mass, with prominent flow

95. An ovarian cyst with homogeneous, low-level internal echoes (a "ground-glass" appearance) and no internal color Doppler flow is identified in a patient with chronic pelvic pain and painful periods. What does this appearance most likely represent?

- A. An endometrioma, typically avascular with ground-glass echoes
- B. Ovarian hyperstimulation syndrome, an unrelated distinct entity
- C. A hypervascular malignant ovarian mass
- D. Pelvic congestion syndrome, an unrelated distinct entity

96. A patient with heavy, painful periods undergoes ultrasound, which shows diffuse uterine enlargement with a heterogeneous myometrium and diffusely increased, disorganized vascularity throughout the myometrium, rather than a single discrete vascular mass. What condition does this diffuse pattern suggest?

- A. A single, discrete uterine fibroid
- B. Adenomyosis, with diffuse myometrial involvement
- C. A normal uterus with no abnormality
- D. An ovarian dermoid, an unrelated distinct structure

97. A patient with a large cervical fibroid develops worsening pelvic pain and is found to have a distended, fluid-filled uterine cavity above the fibroid on ultrasound. What does this combination suggest the fibroid is causing?

- A.** No functional effect on the uterine cavity at all
- B.** Obstruction of uterine outflow, causing fluid above the fibroid
- C.** Direct extension of the fibroid into the ovaries
- D.** A finding unrelated to the fibroid's location

98. A patient with chronic, dull pelvic pain that worsens with prolonged standing is found on Doppler to have chronically dilated, incompetent ovarian veins with reversed flow, present over multiple exams rather than an acute finding. How does this chronic pattern differ from acute ovarian vein thrombosis?

- A.** It is functionally identical to acute ovarian vein thrombosis in every respect
- B.** It shows absent flow throughout, identical to a thrombosed vein
- C.** It is an acute, sudden-onset finding rather than a chronic one
- D.** It reflects a chronic, dilated, refluxing venous pattern rather than an acute thrombotic occlusion

99. An incidental finding on scrotal ultrasound shows a small, round, freely mobile, calcified structure outside the testicle itself, within the scrotal sac, with no internal Doppler flow. What is this finding called?

- A.** A scrotal pearl (an extratesticular calcified body, avascular)
- B.** A testicular seminoma, an intratesticular malignant mass
- C.** A varicocele, a dilated venous plexus
- D.** A hydrocele, a simple fluid collection

100. A varicocele is evaluated with the patient standing and performing a Valsalva maneuver, and the maximum venous diameter and degree of reflux are used to assign a severity grade. What does this grading process primarily rely on?

- A.** The testicle's own internal resistive index alone
- B.** The presence or absence of testicular torsion

- C. The epididymis's echogenicity alone
- D. The maximum venous diameter and reflux degree during Valsalva

101. Multiple tiny, non-shadowing echogenic foci are scattered diffusely throughout both testicles on grayscale imaging, without an associated discrete mass. What is this incidental finding called?

- A. A varicocele, a distinct venous finding
- B. A hydrocele, a distinct fluid-collection finding
- C. Testicular torsion, a distinct vascular emergency
- D. Testicular microlithiasis (diffuse tiny non-shadowing echogenic foci)

102. A small, well-defined, anechoic cystic structure is identified in the head of the epididymis, separate from the testicle itself, with no internal Doppler flow. What is this finding most likely to represent?

- A. A hydrocele surrounding the testicle, a different location
- B. A varicocele of the pampiniform plexus, a venous finding
- C. A spermatocele, a cystic dilation within the epididymal head
- D. A testicular seminoma, a solid intratesticular mass

103. On transrectal ultrasound, a focal hypoechoic area within the peripheral zone of the prostate shows increased color Doppler flow compared to the surrounding gland, distinct from the diffuse glandular hyperemia seen in acute prostatitis. What does this focal finding raise concern for?

- A. Normal peripheral zone tissue, without any suspicious feature
- B. A focal lesion suspicious for prostate cancer, given its distinct hypervascularity
- C. Diffuse acute prostatitis, an unrelated pattern
- D. Benign prostatic hyperplasia confined to the transition zone

104. A bladder mass is identified on ultrasound, and color Doppler shows a discrete feeding vessel extending from the bladder wall into the base of the mass. What is the clinical significance of identifying this specific vascular feature?

- A.** It confirms the mass is definitely benign
- B.** It helps characterize a mass suspicious for a bladder tumor with its own vascular supply
- C.** It indicates the mass is a simple blood clot with no true vascular supply
- D.** It is an incidental finding unrelated to the mass itself

105. An infant with prenatally diagnosed hydronephrosis undergoes postnatal renal ultrasound, which shows a dilated renal pelvis with a normal-caliber ureter, and Doppler shows an elevated resistive index in the affected kidney compared to the normal side. What does this combination suggest?

- A.** Ureteropelvic junction (UPJ) obstruction, with elevated RI reflecting the obstruction
- B.** A normal postnatal renal ultrasound, without abnormality
- C.** Renal artery embolism, an unrelated acute vascular process
- D.** Nutcracker syndrome, an unrelated renal-vein finding

106. A solid renal mass in an adult shows prominent, disorganized internal color Doppler flow with irregular, tortuous vessels, distinct from the more uniform vascular pattern of a typical angiomyolipoma. What does this vascular irregularity help raise concern for?

- A.** Renal cell carcinoma, given the disorganized, irregular vascular pattern described
- B.** A simple renal cyst, an entirely avascular finding
- C.** A normal renal pyramid, an unrelated anatomic structure
- D.** Renal artery stenosis, an unrelated vascular finding

107. An adrenal mass is being characterized, and its vascularity and any washout pattern on contrast-enhanced imaging are assessed to help distinguish between two common possibilities. What differential is this vascularity/washout assessment primarily helping to distinguish?

- A.** Renal cell carcinoma versus a simple renal cyst, an unrelated organ
- B.** Hepatocellular carcinoma versus a hepatic hemangioma, an unrelated organ
- C.** A benign adrenal adenoma versus an adrenal metastasis
- D.** Testicular torsion versus epididymitis, an unrelated organ system

108. A focal liver lesion shows a distinct rim of increased color Doppler flow around its periphery, with a relatively less vascular center, in a patient with a known history of colon cancer. What does this specific peripheral rim vascularity pattern help suggest?

- A.** A pattern suggestive of hepatic metastasis, given the rim vascularity
- B.** A pattern classic for focal nodular hyperplasia's central spoke-wheel vessel
- C.** A pattern classic for a simple hepatic cyst
- D.** A pattern classic for a hepatic hemangioma alone

109. A focal liver lesion in a cirrhotic patient shows increased arterial-phase vascularity followed by washout on delayed-phase imaging, distinct from a benign lesion's sustained enhancement pattern. What does this specific enhancement pattern suggest?

- A.** A simple hepatic cyst, an entirely avascular lesion
- B.** Hepatocellular carcinoma (HCC), given the arterial hypervascularity with delayed washout
- C.** A normal region of hepatic parenchyma
- D.** Focal nodular hyperplasia, which does not typically washout on delayed imaging

110. Following a percutaneous liver biopsy, the patient develops acute abdominal pain and a falling blood count. Doppler along the biopsy tract shows a focal jet of active flow extending from a hepatic vessel into the surrounding tissue. What does this finding suggest?

- A.** Active bleeding along the biopsy tract, a recognized post-biopsy complication
- B.** A normal, expected post-biopsy tract appearance with no bleeding
- C.** Normal hepatic artery flow, unrelated to the biopsy itself
- D.** A hepatic artery aneurysm unrelated to the recent biopsy

Answers

- 1. B.** Logging which specific transducer serial number was used for each exam allows the facility to identify every prior patient exam that used a specific recalled probe, supporting recall response and patient notification if needed. This is unrelated to the Curie point, chip reformatting, or HIPAA access logs.
- 2. B.** A peer review program randomly samples completed exams for independent second-physician review of diagnostic accuracy, an ongoing quality-assurance mechanism distinct from phantom QA testing (equipment performance), a new-hire competency checklist (onboarding), or a PQI project (a structured improvement initiative on a specific practice issue).
- 3. C.** A scheduled software-upgrade downtime procedure addresses a planned, advance-notice outage with time to reroute patients, distinct from an unplanned failure requiring an immediate contingency response. The two procedures are not identical, planned downtime can apply to software as well as hardware upgrades, and having a planned-downtime procedure does not eliminate the separate need for an unplanned-failure plan.
- 4. C.** An annual recurring skills return-demonstration reassesses core scanning skills on an ongoing basis, distinct from the one-time competency check performed when a sonographer is first hired. This is not the same as the initial new-hire checklist, a PQI project (a different type of quality activity), or CME credits (coursework rather than a hands-on skills demonstration).
- 5. A.** A software patch/version-update log tracks each system's software history, supporting troubleshooting when an issue arises and demonstrating compliance during audits. This record is unrelated to fractional bandwidth, the Curie point, or effective radiating area, which are transducer specifications, not system software records.
- 6. A.** Confirming appropriate NPO (fasting) status before a gallbladder ultrasound helps ensure adequate gallbladder distension, since eating stimulates gallbladder contraction and can compromise image quality and diagnostic accuracy. This confirmation is unrelated to disinfection classification, HIPAA access, or electrical safety.
- 7. D.** Confirming a patient's weight does not exceed the exam table's rated capacity addresses both patient safety (avoiding table failure) and equipment safety (avoiding damage), a straightforward but important verification. This is unrelated to disinfection classification, HIPAA access, or electrical leakage-current safety.
- 8. C.** Requiring both a password and a separate approval step (such as a push notification to a registered device) is two-factor authentication, an access-control mechanism beyond a single password alone. This is distinct from the Spaulding classification (disinfection) and electrical leakage-current testing (a different safety domain), and represents an additional step beyond basic HIPAA access control alone.

- 9. B.** A data-breach/cybersecurity-incident response plan describes the specific steps to take if patient data is suspected to have been accessed by an unauthorized party, distinct from a plan addressing unplanned equipment failure and system downtime, the Spaulding classification, or electrical safety testing, which address different concerns entirely.
- 10. B.** An impaired-practitioner reporting policy exists primarily to protect patient safety by enabling early identification and support for a colleague suspected of practicing while impaired, a distinct professional-conduct concern from transducer maintenance, CE credit tracking, or quality metrics.
- 11. C.** A structured shift-to-shift handoff, reviewing pending or urgent cases before the outgoing sonographer leaves, supports continuity of patient care by ensuring the incoming sonographer is aware of anything requiring follow-up. This is unrelated to disinfection classification, electrical safety, or HIPAA access control.
- 12. A.** Shear-wave elastography deliberately applies acoustic radiation force via a focused push pulse to generate a localized tissue displacement, which then propagates as a measurable shear wave -- a diagnostic application of the same steady, unidirectional force that is otherwise considered an unintentional bioeffect elsewhere. The piezoelectric effect, Doppler shift, and Snell's Law are unrelated phenomena, not the mechanism generating this displacement.
- 13. A.** A chirp pulse continuously sweeps its frequency (up or down) across the pulse duration, a specific pulse design used in coded excitation to improve signal-to-noise ratio and penetration. A sinusoidal pulse stays at one fixed frequency, a continuous-wave pulse has no defined pulse duration at all, and a harmonic pulse describes a received frequency multiple, not a transmit pulse design.
- 14. C.** PRF equals 1 divided by PRP: $1 / 0.00025 \text{ seconds} = 4,000 \text{ Hz}$, the standard reciprocal relationship. The other values do not correctly apply this formula to the given PRP.
- 15. A.** Round-trip time equals $2 \times \text{depth} / \text{propagation speed}$: $(2 \times 0.077 \text{ m}) / 1540 \text{ m/s} = 0.0001 \text{ seconds}$, or approximately 100 microseconds. The other values do not correctly apply this formula to the given depth and assumed speed.
- 16. D.** Because decibels are logarithmic values, total attenuation across sequential tissue layers is calculated by adding the individual dB values together, rather than multiplying, averaging, or dividing them -- a direct consequence of the additive property of logarithms applied to sequential multiplicative losses.
- 17. B.** Using the 0.5 dB/cm/MHz-style rule for each tissue: tissue A = $0.4 \times 5 \times 2 = 4 \text{ dB}$; tissue B = $0.6 \times 5 \times 3 = 9 \text{ dB}$; total = $4 + 9 = 13 \text{ dB}$, following the additive property of sequential dB losses. The other values do not correctly sum these two tissue-specific attenuation calculations.
- 18. A.** Using $10 \times \log(40/4) = 10 \times \log(10) = 10 \times 1 = 10 \text{ dB}$, consistent with the standard rule that a tenfold power/intensity ratio corresponds to a 10 dB difference. The other values do not correctly apply the power-ratio decibel formula to this tenfold ratio.

- 19. D.** Bandwidth, expressed simply as the difference between the upper and lower frequency limits, equals $6\text{ MHz} - 2\text{ MHz} = 4\text{ MHz}$. The other values do not correctly represent this simple subtraction of the stated limits.
- 20. B.** Milliwatts per square centimeter and watts per square meter both express the same underlying physical quantity, intensity, just using different unit conventions (clinical versus SI), with a fixed mathematical conversion factor between them. They are not unrelated quantities, do not merely share a coincidental numeric value, and this unit distinction is not limited to Doppler intensity alone.
- 21. B.** The acoustic center is the general reference point from which an array's transmitted wavefronts are modeled as originating for beamforming calculations, applicable regardless of the array's specific physical shape (flat, curved, or otherwise). The kerf, dead zone, and half-value layer are unrelated concepts describing different transducer or beam properties.
- 22. D.** Energy equals power multiplied by time: $0.02\text{ watts} \times 5\text{ seconds} = 0.1\text{ joules}$, the standard formula relating these three quantities. The other values either misapply the formula or restate the given power value rather than calculating total energy.
- 23. B.** Coherent summation combines signals from multiple elements while preserving their relative phase/timing information, which is essential for proper beamforming and image formation in B-mode imaging. Incoherent summation instead ignores phase and combines only signal magnitudes, and the Doppler and range equations are unrelated formulas, not summation methods.
- 24. A.** Since the element pitch (0.2 mm) is smaller than half the wavelength (0.25 mm), this design satisfies the standard grating-lobe-avoidance guideline of keeping element spacing at or below roughly half a wavelength. The guideline does apply here, the pitch is well below (not above) a full wavelength, and grating lobes are directly, not independently, related to element pitch relative to wavelength.
- 25. D.** Beyond simply eliminating the air gap, coupling gel formulated to closely match soft tissue's acoustic impedance further minimizes reflection specifically at the gel-skin interface itself, improving overall energy transmission into the body. This property is unrelated to the Curie point or operating frequency, and does not eliminate the separate need for an internal acoustic matching layer within the transducer itself.
- 26. C.** Pre-existing microscopic gas bubbles or particles serve as a cavitation nucleus, a site that facilitates bubble formation and growth under acoustic pressure; without such a nucleus, a pure homogeneous liquid resists cavitation even at a given pressure that would readily produce cavitation in the presence of nuclei. This is unrelated to the piezoelectric effect, Doppler shift, or Curie point, which are distinct, unrelated physical concepts.
- 27. D.** The subharmonic frequency is a signal generated at exactly half the transmitted frequency, a phenomenon particularly associated with contrast microbubble oscillation, distinct from harmonic frequencies (integer multiples above the transmitted frequency). The fundamental frequency is the

transmitted frequency itself, the second harmonic is a multiple above (not below) it, and the Nyquist frequency is an unrelated sampling-rate concept.

28. D. Geometric (curved-element) focusing shapes the piezoelectric material itself into a curved (concave) form, so the element's own geometry provides a fixed focus without requiring a separate added acoustic lens. Dynamic aperture, apodization, and electronic phased focusing are distinct, unrelated array-based focusing/steering techniques, not this single-element geometric approach.

29. A. Adding individually timed electronic delays to an annular array's concentric ring elements provides electronically adjustable focal depth, layered onto the array's inherent mechanical steering requirement (since annular arrays still require mechanical sweeping to form an image). This does not eliminate mechanical steering, does not produce a permanently fixed focus, and does not provide azimuthal electronic steering, which annular arrays cannot do by design.

30. D. Integrating freeze and capture buttons directly into the probe handle allows the operator to trigger these functions without reaching for the console, a distinct hardware/workflow design choice from acoustic output calibration, operating frequency specifications, or biocompatibility ratings, which are unrelated transducer properties.

31. D. A multi-frequency single-element (non-array) transducer offers two selectable fixed frequencies without using array-based electronic beam steering or focusing, a simpler design context distinct from RCA arrays, synthetic aperture imaging, or true time delay phased arrays, all of which involve multiple elements and electronic steering.

32. C. Periodic tensile strength and puncture resistance testing of the probe cover material verifies the cover will maintain a reliable barrier throughout its use, a specific QA check distinct from acoustic output calibration, operating frequency specifications, or the transducer's own biocompatibility rating.

33. B. A smooth, rounded, tapered insertion tip on an endocavity transducer primarily improves patient comfort and ease of insertion during the procedure. This design choice is unrelated to operating frequency, fractional bandwidth, and does not eliminate the separate need for coupling gel.

34. C. An intracardiac echocardiography (ICE) catheter transducer is advanced into the heart itself (such as the right atrium) to image cardiac structures from within, distinct from an IVUS catheter (used within a blood vessel), a TEE probe (positioned in the esophagus, outside the heart), or a transrectal probe (an entirely different anatomic application).

35. D. A 1-3 connectivity pattern describes piezocomposite rods that are continuous in one dimension (typically the thickness direction) while surrounded by polymer in the other two dimensions, the most common piezocomposite arrangement for medical transducers. The 0-3, 2-2, and 3-3 patterns describe different, less common composite geometries.

36. A. A wet-storage requirement, keeping the probe fully submerged in a specific solution between disinfection and next use, maintains that specific disinfection system's validated storage conditions until

the probe's next clinical use. This requirement is unrelated to the Curie point, fractional bandwidth, or effective radiating area, which are distinct transducer specifications.

37. D. A raw RF data output option provides unprocessed per-element signal data collected before any beamforming or image processing is applied, useful for research applications requiring access to the underlying signal rather than only the final processed image. This is distinct from outputting only the processed B-mode image, calibration certificate information, or basic identification data.

38. B. A comparatively low operating frequency is specifically chosen for transcranial transducers to achieve adequate penetration through the temporal bone window, since higher frequencies would be almost entirely reflected or absorbed by bone. This frequency choice is not primarily about maximizing superficial axial resolution, minimizing footprint size, or eliminating the need for an acoustic window (a low-frequency transducer still requires one, just a bone-penetrable one).

39. A. Burst-mode transmission fires several acoustic pulses in rapid succession as a single grouped event, used to generate the acoustic radiation force needed for shear-wave elastography, distinct from the single, isolated pulses used in standard B-mode imaging. Continuous-wave, single-pulse pulse-echo, and harmonic-only transmission describe different, unrelated transmission modes.

40. C. A transperineal application applies the probe externally against the perineum to image pelvic floor structures, an option for patients who cannot tolerate or do not require internal probe insertion, distinct from transvaginal or transrectal applications (both internal) or an intraoperative application (used during surgery).

41. D. An IPX (ingress protection) rating specifies a transducer housing's water-resistance level, such as tolerance for full temporary submersion, a specification distinct from the Spaulding classification (disinfection level), biocompatibility rating (tissue-contact safety), or EMC rating (electromagnetic interference behavior).

42. B. An ophthalmic-specific transducer's very low acoustic output design specifically accounts for the eye's distinct output-safety considerations, since the eye is considered more sensitive to acoustic bioeffects than most other organs. This design does not aim to maximize whole-abdomen penetration, does not eliminate the need for coupling gel, and is not focused on maximizing cardiac frame rate.

43. B. A guard ring is a peripheral ring of inactive piezoelectric material surrounding an array's active elements, specifically included to reduce unwanted diffraction effects occurring at the aperture's physical edge. The kerf, virtual apex, and acoustic stack are distinct, unrelated transducer-construction concepts, not this peripheral edge feature.

44. A. An endocavity probe's specified shaft insertable length determines how far the transducer tip can reach during a given procedure, a distinct mechanical specification from the Curie point, fractional bandwidth, or effective radiating area, which describe different transducer properties entirely.

- 45. A.** A small-footprint pediatric abdominal curved array accommodates the smaller body size and more limited acoustic window available in infants and young children, distinct from a standard adult abdominal probe (designed for larger body habitus) or a pediatric cardiac micro-convex probe (designed for the intercostal cardiac window specifically, not general abdominal imaging).
- 46. D.** Automated renal cortex thickness measurement calculates average cortical thickness from placed calipers, distinct from overall renal length, splenic index, or bladder volume, which measure different structures or dimensions entirely.
- 47. A.** An on-screen exam-protocol version-number display continuously shows which specific protocol version is currently loaded, a distinct on-screen element from the focal-zone indicator, color box boundary, or depth-scale marker, which convey different information.
- 48. D.** Automated cardiac chamber dimension measurement with normal-range flagging compares placed LV diameter calipers to a reference range and flags abnormal values, distinct from ejection fraction (a different calculated value), aortic-valve-area, or LV mass calculations, which use different measurements and formulas.
- 49. A.** A structured second-opinion consultation request feature routes a specific study to a subspecialist colleague for independent review before finalization, distinct from modality worklist integration, the ellipsoid volume formula, or DICOM compression, which serve unrelated purposes.
- 50. D.** A calculated RI-trend rate of change (slope) provides a numeric summary of how quickly a value is changing across serial exams, distinct from simply displaying the most recent absolute value, the Doppler angle correction, or the PRF used during acquisition, which are unrelated parameters.
- 51. A.** Voice-to-text annotation dictation converts spoken words directly into typed text placed on the image, distinct from a fixed voice-command feature that triggers a specific system action (such as freeze) rather than generating free-text content. This feature does not require manual typing afterward, and is not limited to freezing the image alone.
- 52. C.** A serial (longitudinal) cardiac-output trend display shows how a patient's calculated cardiac output has changed across multiple visits over time, distinct from a single-exam calculation alone, ejection fraction, or aortic-valve-area calculations, which are different values entirely.
- 53. A.** Battery long-term health/degradation status estimates how much a battery's maximum capacity has declined compared to when new, additional information beyond the simple current charge level alone. This is unrelated to operating frequency range or fractional bandwidth, which are unrelated transducer specifications.
- 54. B.** Automated fetal presentation auto-detection software analyzes fetal structure position and orientation to suggest cephalic, breech, or transverse presentation, distinct from fetal heart-rate calculation, nuchal translucency measurement, or gestational sac size measurement, which assess different parameters.

- 55. A.** A gestational-age discrepancy alert compares LMP-based and ultrasound-based dating and warns when they differ significantly, a distinct clinical decision-support feature from fetal presentation, nuchal translucency, or amniotic fluid index alerts, which address different assessments.
- 56. C.** Automated endometrial pattern classification software analyzes a captured image to classify the endometrial pattern as trilaminar or non-trilaminar, distinct from endometrial thickness measurement (a linear caliper value), ovarian volume calculation, or cervical length measurement, which assess different structures.
- 57. C.** Digital consent-signature capture integrates a touchscreen signing process directly with the ultrasound workstation, storing the signed form with the exam record, distinct from modality worklist integration (pulling scheduling data), the ellipsoid volume formula, or DICOM compression.
- 58. A.** An exam-interruption log automatically records the time, reason, and duration of a pause in scanning, a distinct workflow/QA record from a structured report template, the ellipsoid volume formula, or a modality worklist entry, which serve different purposes.
- 59. D.** Automated hepatic steatosis grading software analyzes liver echo pattern and relative attenuation to estimate a fatty-liver grade, distinct from splenic index, portal vein diameter, or gallbladder wall thickness measurements, which assess different structures or values.
- 60. C.** A focus-depth-mismatch prompt addresses a detected misalignment between the transmit focal zone and the region of interest being examined, unrelated to electrical safety, HIPAA access control, or the Spaulding classification, which address different concerns entirely.
- 61. B.** Automated IVC diameter/collapsibility calculation derives percentage diameter collapse from calipers placed during quiet respiration and a sniff maneuver, distinct from splenic index, portal vein diameter, or renal cortex thickness measurements, which assess different structures.
- 62. C.** An exam-type-specific safety-reminder popup tied to a selected preset (such as reminding applicable MI/TI limits when the obstetric preset is chosen) is a distinct workflow safety feature from electrical leakage-current testing, HIPAA access control, or the Spaulding classification, which address unrelated concerns.
- 63. D.** Automated cervical length measurement with a preterm-labor-risk threshold flag compares the measured closed cervix length to a defined threshold, distinct from nuchal translucency measurement, fetal presentation detection, or amniotic fluid index calculation, which assess different parameters.
- 64. C.** A transmit-power-percentage readout shows how close the system's current output is to its maximum allowable level, a distinct on-screen element from the Doppler angle correction, dynamic range setting, or persistence level, which are unrelated display/processing parameters.
- 65. D.** Automated nuchal translucency measurement with integrated risk-calculation capability combines the measured NT value with maternal age and serum marker results to estimate aneuploidy risk, distinct

from fetal presentation detection, gestational-age discrepancy alerting, or endometrial pattern classification, which address different assessments.

66. C. Automated biliary tree dilation-pattern classification software analyzes imaged ductal dilation and classifies it as intrahepatic, extrahepatic, or both, distinct from a simple CBD diameter measurement alone, pancreatic duct measurement, or portal vein diameter measurement, which assess different structures.

67. B. Automated ovarian follicle counting software counts and sizes calipered follicles during a fertility-related exam, distinct from ovarian volume calculation alone, endometrial pattern classification, or cervical length measurement, which assess different parameters.

68. C. A structured-impression auto-draft generation feature creates a suggested narrative impression paragraph from entered structured findings, which the physician then edits, distinct from modality worklist integration, the ellipsoid volume formula, or DICOM compression, which serve unrelated purposes.

69. C. Automated carotid stenosis percentage auto-calculation applies a standard velocity-ratio-based method to entered ICA and CCA peak systolic velocities to estimate percentage stenosis, distinct from renal cortex thickness, splenic index, or portal vein diameter measurements, which assess different structures.

70. A. An exam handoff note field lets the outgoing sonographer summarize pending or urgent cases for the incoming sonographer, a distinct workflow-communication feature from a structured report template, the ellipsoid volume formula, or a modality worklist entry.

71. A. A spleen-to-kidney echogenicity ratio calculation compares measured splenic and renal echogenicity as one supportive indicator used alongside similar liver comparisons for hepatic steatosis assessment, distinct from splenic index, renal length measurement, or portal vein diameter measurement, which are different calculations.

72. B. A live harmonic-versus-fundamental toggle-status indicator shows whether tissue harmonic processing or fundamental-frequency imaging is currently active, a distinct on-screen element from the focal-zone indicator, color box boundary, or depth-scale marker, which convey different information.

73. B. Automated placental location/grade classification software analyzes placental position relative to the internal cervical os and its appearance to suggest a classification, distinct from amniotic fluid index calculation, fetal presentation detection, or nuchal translucency measurement, which assess different parameters.

74. D. A consent-expiration/reconfirmation reminder alerts staff when a signed consent form is on file but the exam has been delayed beyond a defined validity window, a distinct workflow-safety feature from electrical leakage-current safety, the Spaulding classification, or HIPAA access control, which address unrelated concerns.

- 75. A.** A displayed measurement-precision range alongside an automatically calculated value conveys the estimated precision of that specific measurement, distinct from the Doppler angle correction, persistence level, or dynamic range setting, which are unrelated display/processing parameters.
- 76. D.** A protocol-specific guided image sequence walks the operator through the specific images required for a limited screening protocol (such as a focused aortic screening exam), distinct from general modality worklist scheduling integration, the ellipsoid volume formula, or DICOM compression, which serve unrelated purposes.
- 77. D.** Absent flow in the central retinal artery, with normal flow in surrounding ophthalmic artery branches, in a patient with sudden painless complete vision loss, describes central retinal artery occlusion, an ocular vascular emergency. This is not a normal exam, is not the venous process of central retinal vein occlusion, and is unrelated to an orbital varix, a positional venous finding.
- 78. B.** A dilated, tortuous retinal vein with sluggish flow and preserved arterial flow, in a patient with sudden painless blurred vision, describes central retinal vein occlusion. This is not the arterial process of central retinal artery occlusion, is not a normal exam, and is unrelated to an orbital varix, a distinct positional venous finding.
- 79. B.** A venous orbital structure that distends and shows increased flow specifically during Valsalva or positional maneuvers describes an orbital varix, a distinct entity from central retinal artery or vein occlusion (both involving the retinal vessels themselves, not this positional venous distension) and from a normal exam.
- 80. C.** A markedly hypervascular thyroid nodule with suppressed TSH is characteristic of an autonomously functioning ("hot") nodule producing excess thyroid hormone, distinct from a simple avascular colloid cyst, diffuse Graves' disease (uniform whole-gland involvement rather than a single nodule), or Hashimoto's thyroiditis (a diffuse inflammatory process).
- 81. D.** The "thyroid inferno" pattern describes diffuse, intense, uniform hypervascularity throughout the entire gland characteristic of Graves' disease, distinct from the macaroni sign (Takayasu arteritis), whirlpool sign (ovarian torsion), or lyre sign (carotid body tumor), which are unrelated named signs in different clinical contexts.
- 82. A.** Hashimoto's thyroiditis typically shows a more variable, patchy vascularity pattern, generally less intense and uniform than the classic "thyroid inferno" of Graves' disease. The two conditions are not indistinguishable by this pattern, complete absence of vascularity is not typical, and Hashimoto's characteristically shows a diffuse (not single focal nodule) pattern.
- 83. C.** Minimal peripheral vascularity with a smooth, well-circumscribed shape supports a benign appearance, while disorganized, penetrating internal vascularity with an irregular, spiculated margin supports a more suspicious appearance -- vascularity pattern is one of several features considered together with morphology. The two masses are not equally likely to be benign, vascularity does have

bearing on assessment, and the first (not second) mass is the less concerning one based on the description given.

84. D. A tender, superficial, non-compressible, thrombosed vein under the skin of the breast with no Doppler flow describes Mondor's disease, superficial breast vein thrombophlebitis. This is not a normal vein (which would show flow and compressibility), is not a deep venous process (Mondor's involves superficial veins), and is not a fibroadenoma, an unrelated solid mass.

85. A. Mild internal color Doppler flow within fan-shaped, hypoechoic, non-cystic subareolar tissue in a male patient supports an active, likely benign process such as gynecomastia, rather than an entirely avascular simple cyst. This finding does not indicate the tissue is entirely avascular, is not unrelated to breast tissue processes, and does not by itself definitively exclude malignancy.

86. C. A simple anechoic collection with no internal or wall flow is more consistent with a postoperative seroma, while a complex collection with a thickened, hyperemic wall is more suspicious for an abscess - Doppler wall vascularity is a useful distinguishing feature between the two. The two collections are not equally likely to be simple seromas, Doppler does have a distinguishing role here, and the first (not second) collection is the less concerning one based on the description.

87. C. A focal arterial jet extending into an expanding postoperative neck hematoma, with rapidly worsening swelling and breathing difficulty, indicates active arterial bleeding, a surgical emergency requiring immediate intervention. This is not a normal expected seroma, is not a simple non-expanding hematoma without an active source, and does not describe a normal thyroid remnant.

88. B. A large parathyroid lesion with irregular margins, local invasion into adjacent muscle, and prominent vascularity raises concern for parathyroid carcinoma, distinct from a typical small, uniformly hypoechoic, non-invasive parathyroid adenoma. This is not a typical benign adenoma, a normal gland, or an unrelated thyroid nodule given the invasive features described.

89. D. A midline cystic neck mass containing heterogeneous fat and debris, rather than simple anechoic fluid, suggests a dermoid cyst, distinguishing it from a thyroglossal duct cyst, which typically shows simple, homogeneous fluid content in the same midline location. This appearance is not identical to a thyroglossal duct cyst, does not confirm a lymphatic malformation, and a branchial cleft cyst is a lateral (not midline) structure, making it an unlikely explanation for this location.

90. A. Doppler surveillance of the coronary arteries in Kawasaki disease specifically screens for coronary artery aneurysms, a well-recognized and potentially serious complication of this condition. This surveillance is not primarily for aortic regurgitation, renal resistive index (an unrelated organ system), or patent ductus arteriosus, an unrelated congenital finding.

91. A. Identifying a discrete mass with its own distinct Doppler flow pattern at the leading edge of an intussusceptum (a lead point) helps explain a possible underlying structural cause for the intussusception, beyond the more common idiopathic cases seen in young children. This finding does

not confirm the process is idiopathic (the opposite), and is unrelated to renal resistive index or gallbladder wall thickness.

92. B. Echogenic foci within the bowel wall (pneumatosis), portal venous gas, and diminished bowel perfusion on Doppler, in a premature neonate with abdominal distension and bloody stools, describes necrotizing enterocolitis (NEC), a serious neonatal emergency. This is not a normal bowel exam, and is distinct from pyloric stenosis or intussusception, which have different characteristic findings.

93. D. Pyloric stenosis is primarily diagnosed by grayscale measurements of pyloric muscle thickness and length, with color Doppler playing a secondary, supportive role rather than being the primary diagnostic criterion. Doppler is not more important than the grayscale measurements, does not exclude the diagnosis based on any flow being present, and is not required to calculate an unrelated renal resistive index during this exam.

94. B. An ovarian mass containing fat, hair, and calcification with minimal internal Doppler flow (aside from a possible vascular mural nodule) is characteristic of a mature cystic teratoma (dermoid), distinct from a simple functional cyst (which lacks these complex components), ovarian torsion (a different acute vascular process), or a hypervascular malignant mass (which would show more prominent internal flow).

95. A. An ovarian cyst with homogeneous, low-level "ground-glass" internal echoes and no internal Doppler flow, in a patient with chronic pelvic pain and dysmenorrhea, is characteristic of an endometrioma ("chocolate cyst"). This is distinct from ovarian hyperstimulation syndrome, a hypervascular malignant mass (which would show internal flow), or pelvic congestion syndrome, a different venous entity.

96. B. Diffuse uterine enlargement with a heterogeneous myometrium and diffusely increased, disorganized vascularity throughout the myometrium (rather than confined to one discrete mass) is characteristic of adenomyosis. This is distinct from a single discrete fibroid (a focal, not diffuse, process), a normal uterus, or an ovarian dermoid, an unrelated structure.

97. B. A distended, fluid-filled uterine cavity above a large cervical fibroid suggests the fibroid is obstructing normal uterine outflow, causing fluid accumulation proximal to the obstruction. This is not a finding of no functional effect, does not describe direct extension into the ovaries, and is directly related to (not unrelated to) the fibroid's location.

98. D. Chronically dilated, incompetent ovarian veins with reversed flow, present consistently over multiple exams, reflect a chronic, dilated, refluxing venous pattern (as in pelvic congestion) rather than an acute thrombotic occlusion. This is not functionally identical to acute thrombosis, does not show absent flow throughout, and is a chronic (not acute, sudden-onset) pattern by definition.

99. A. A small, round, freely mobile, calcified, avascular structure outside the testicle within the scrotal sac is called a scrotal pearl, an incidental extratesticular calcified body. This is distinct from a seminoma

(an intratesticular malignant mass), a varicocele (a dilated venous plexus), or a hydrocele (a simple fluid collection).

100. D. Varicocele grading relies on the maximum venous diameter and degree of reflux observed during a Valsalva maneuver, standing measurements used to assign a severity grade. This grading does not rely on the testicle's own resistive index alone, the presence of torsion (an unrelated acute process), or epididymal echogenicity alone.

101. D. Multiple tiny, diffusely scattered, non-shadowing echogenic foci throughout both testicles, without an associated discrete mass, describes testicular microlithiasis, an incidental finding distinct from a varicocele (a venous finding), a hydrocele (a fluid collection), or testicular torsion (an acute vascular emergency).

102. C. A small, well-defined, anechoic cystic structure in the epididymal head, separate from the testicle, with no internal Doppler flow, describes a spermatocele, distinct from a hydrocele (surrounding the testicle itself), a varicocele (a venous plexus finding), or a seminoma (a solid intratesticular malignant mass).

103. B. A focal hypervascular hypoechoic area within the peripheral zone, distinct from the diffuse glandular hyperemia of acute prostatitis, raises concern for a focal lesion suspicious for prostate cancer, warranting further evaluation. This is not normal peripheral zone tissue, is not the diffuse pattern of acute prostatitis, and is not confined to the transition zone as in benign prostatic hyperplasia.

104. B. Identifying a discrete feeding vessel extending from the bladder wall into the base of a mass helps characterize a lesion suspicious for a bladder tumor with its own vascular supply, a helpful distinguishing feature from an avascular blood clot. This finding does not confirm benignity, does not indicate a simple avascular clot (the opposite), and is directly relevant to (not incidental to) characterizing the mass.

105. A. A dilated renal pelvis with a normal-caliber ureter and an elevated resistive index compared to the normal side, in an infant with prenatally diagnosed hydronephrosis, suggests ureteropelvic junction (UPJ) obstruction, with the elevated RI reflecting increased intrarenal resistance from the obstruction. This is not a normal postnatal exam, is not explained by renal artery embolism (an unrelated acute arterial process), and is not nutcracker syndrome, an unrelated renal-vein finding.

106. A. Prominent, disorganized internal vascularity with irregular, tortuous vessels in a solid renal mass raises concern for renal cell carcinoma, distinct from the more uniform vascular pattern typically seen in a benign angiomyolipoma. This is not a simple avascular cyst, a normal renal pyramid, or renal artery stenosis, which are unrelated findings.

107. C. Vascularity and contrast washout pattern assessment of an adrenal mass primarily helps distinguish a benign adenoma (typically showing rapid washout) from an adrenal metastasis (typically showing slower or absent washout), a common and clinically important adrenal-mass differential. This

is not the differential for renal cell carcinoma versus a cyst, HCC versus hemangioma (unrelated liver differentials), or testicular torsion versus epididymitis, an unrelated organ system.

108. A. A distinct peripheral rim of vascularity around a relatively less vascular center, in a patient with a known primary malignancy such as colon cancer, is a pattern suggestive of hepatic metastasis, distinct from FNH's central spoke-wheel pattern, a simple avascular cyst, or a hepatic hemangioma's own characteristic (typically peripheral nodular, progressively filling-in) pattern.

109. B. Arterial-phase hypervascularity followed by delayed-phase washout, in a cirrhotic patient, is a characteristic enhancement pattern of hepatocellular carcinoma (HCC), distinct from a simple avascular cyst, normal parenchyma, or focal nodular hyperplasia, which characteristically does not washout on delayed imaging.

110. A. A focal jet of active flow extending from a hepatic vessel into surrounding tissue along a recent biopsy tract, with acute pain and a falling blood count, indicates active bleeding along the biopsy tract, a recognized post-biopsy complication requiring prompt recognition. This is not a normal expected post-biopsy appearance, is not simply normal unrelated hepatic artery flow, and is not an aneurysm unrelated to the recent biopsy given this acute presentation.