MULTIPLE CHOICE

ECHO - MIXED EXAM - ANSWER KEY

PROPOSED FOR REVIEW - questions are the author's verbatim Q&A; distractors are auto-selected from other answers in the same bank and must be checked by a subject-matter reviewer (a distractor could coincidentally be correct). Not authoritative assessment content.

1. From the parasternal short-axis view at the level of the papillary muscles, which two papillary muscles are normally visualized?

A. Anteromedial and posterolateral
B. Anterior and inferior
C. Anterolateral and posteromedial
D. Septal and lateral

2. Which of the following is the approximate upper limit of normal end-diastolic interventricular septal thickness in an adult male by 2D echocardiography?

A. 0.6 cm
B. 1.0 cm
C. 2.0 cm
D. 1.5 cm

3. Foreshortening of the left ventricle during apical imaging most commonly produces which of the following errors?

A. Underestimation of LV volumes and overestimation of ejection fraction
B. Overestimation of LV mass with normal ejection fraction
C. Overestimation of LV volumes and underestimation of ejection fraction
D. No effect on volumes when contrast is used

4. At what level is the parasternal short-axis view used to obtain the standard M-mode measurement of left ventricular internal dimensions?

A. Just below the tips of the mitral valve leaflets (mid-ventricular level)
B. At the level of the LV apex
C. At the level of the aortic valve
D. At the level of the papillary muscles tips

5. During which phase of the cardiac cycle are all four cardiac valves closed and ventricular volume remains constant while pressure rises sharply?

A. Isovolumic contraction
B. Isovolumic relaxation
C. Rapid ventricular filling
D. Rapid ventricular ejection

6. Which structure connects the main pulmonary artery to the aorta during fetal life and normally closes shortly after birth?

A. Ductus arteriosus
B. Ductus venosus
C. Ligamentum teres
D. Foramen ovale

7. Which vessel returns oxygenated blood from the lungs to the left atrium?

A. Pulmonary veins
B. Pulmonary arteries
C. Superior vena cava
D. Inferior vena cava

8. Pressure half-time is most commonly used to estimate the severity of which valvular lesion?

A. Mitral stenosis

B. Tricuspid regurgitation
C. Aortic stenosis
D. Pulmonary stenosis

9. Adding anterior angulation to the apical four-chamber view to bring the left ventricular outflow tract and aortic valve into the image creates which view?

A. Apical three-chamber (apical long-axis) view
B. Apical five-chamber view
C. Apical two-chamber view
D. Subcostal four-chamber view

10. Which echocardiographic finding is most suggestive of a hemodynamically significant atrial septal defect?

A. Left atrial enlargement with concentric LV hypertrophy
B. Right atrial and right ventricular enlargement with paradoxical septal motion
C. Aortic root dilation with eccentric LV hypertrophy
D. Isolated left ventricular dilation

11. A peak tricuspid regurgitation velocity of 3.5 m/s in a patient with no significant RV outflow obstruction predicts an estimated right ventricular systolic pressure of approximately which value, assuming an RA pressure of 10 mmHg?

A. 59 mmHg
B. 79 mmHg
C. 19 mmHg
D. 39 mmHg

12. Which artifact most commonly produces apparent prosthetic valve regurgitation when none is truly present?

A. Reverberation artifact from the prosthetic material projecting beyond the valve
B. Refraction artifact between the LV and the lung
C. Slice thickness artifact in M-mode
D. Range ambiguity from a deep target

13. Pressure recovery distal to a stenotic aortic valve causes Doppler to do which of the following?

A. Underestimate the true transvalvular gradient
B. Overestimate the true transvalvular gradient compared with cardiac catheterization
C. Eliminate the transvalvular pressure gradient entirely
D. Have no effect on the measured gradient

14. On a standard M-mode through the left ventricle, the LV internal diameter in diastole (LVIDd) is measured at which point of the cardiac cycle?

A. At the onset of the QRS complex
B. At the peak of the T wave
C. At the end of the P wave
D. At the nadir of the septal motion

15. Which of the following is the BEST single best initial echocardiographic indicator of right ventricular systolic function in adults?

A. Left ventricular ejection fraction by Simpson biplane
B. Left atrial volume index
C. Mitral annular plane systolic excursion (MAPSE)
D. Tricuspid annular plane systolic excursion (TAPSE)

16. Which echocardiographic finding suggests elevated pulmonary artery systolic pressure?

A. Increased early diastolic flow propagation velocity by color M-mode
B. Increased peak tricuspid regurgitation velocity used to estimate RV systolic pressure
C. Decreased aortic valve area on continuity equation
D. Increased mitral regurgitation velocity used to estimate LA pressure

17. Pulsus paradoxus, defined as an exaggerated inspiratory drop in systemic systolic pressure, is most closely associated with which condition?

A. Constrictive pericarditis
B. Hypertrophic cardiomyopathy
C. Restrictive cardiomyopathy
D. Cardiac tamponade

18. Coarctation of the aorta classically occurs at which anatomic location?

A. At the aortic root just above the sinotubular junction
B. Just distal to the origin of the left subclavian artery, near the ductal insertion
C. Just proximal to the bifurcation into the common iliac arteries
D. At the level of the diaphragmatic hiatus

19. An increased M-mode mitral E-point to septal separation (EPSS) greater than 1 cm most often indicates which of the following?

A. Mitral stenosis
B. Normal hyperdynamic LV
C. Aortic regurgitation jet impingement
D. Reduced left ventricular systolic function

20. Which structure is the most common embryologic remnant of the sinus venosus seen in the right atrium?

A. Chiari network
B. Trabecula septomarginalis
C. Crista terminalis
D. Moderator band

21. Which tissue Doppler finding favors constrictive pericarditis over restrictive cardiomyopathy?

A. Reversed E to A ratio at the mitral valve
B. Increased isovolumic relaxation time
C. Markedly reduced medial mitral annular e prime velocity
D. Preserved or increased medial mitral annular e prime velocity

22. Which finding on echocardiography is most specific for severe chronic aortic regurgitation?

A. Mildly dilated aortic root
B. Increased left atrial volume
C. Mild fluttering of the anterior mitral leaflet in diastole
D. Holodiastolic flow reversal in the proximal descending thoracic aorta

23. Which type of atrial septal defect is the most common?

A. Coronary sinus
B. Sinus venosus
C. Ostium secundum
D. Ostium primum

24. A mosaic, multicolored pattern in a color Doppler jet most commonly indicates which finding?

A. Laminar flow at normal velocity
B. Absence of flow
C. Tissue motion artifact
D. Turbulent, high-velocity flow with aliasing

25. Right ventricular infarction is most commonly associated with infarction of which left ventricular wall?

A. Anterior wall
B. Lateral wall
C. Apical wall
D. Inferior wall

26. The E/e prime ratio is used to estimate which hemodynamic parameter?

A. Aortic valve area
B. Left ventricular filling pressure
C. Right atrial pressure
D. Mean pulmonary artery pressure

27. A normally functioning bileaflet mechanical aortic prosthesis is expected to have what type of forward flow pattern by spectral Doppler?

A. A continuous diastolic flow pattern with no systolic peak
B. Slightly elevated peak velocity, typically 2 to 3 m/s, with a brief acceleration
C. Peak velocity greater than 5 m/s indicating obstruction in all patients
D. Peak velocity less than 1 m/s identical to a normal native aortic valve

28. Which PISA-derived effective regurgitant orifice area is most consistent with severe primary mitral regurgitation?

A. 0.10 to 0.19 cm squared
B. 0.20 to 0.39 cm squared
C. Less than 0.10 cm squared
D. Greater than or equal to 0.40 cm squared

29. Which technical maneuver most effectively differentiates a true LV apical thrombus from near-field clutter on the apical four-chamber view?

A. Image only in the subcostal window
B. Switch to continuous-wave Doppler at the apex
C. Use a high-frequency transducer or ultrasound-enhancing contrast agent and image in multiple planes
D. Increase overall gain and depth

30. Which mitral inflow pattern is most consistent with restrictive cardiomyopathy?

A. Equal E and A waves with normal deceleration time
B. Mid-diastolic and presystolic flow with no discrete A wave
C. Reduced E wave with prominent A wave
D. Tall E wave, small A wave, and shortened deceleration time

31. Which clinical condition can make the pressure half-time method UNRELIABLE for estimating mitral valve area?

A. Significant aortic regurgitation
B. Trace tricuspid regurgitation
C. Bradycardia with sinus rhythm
D. Mild mitral regurgitation

32. Which sonographic feature best differentiates an apical thrombus from a near-field artifact?

A. The thrombus is only visible with color Doppler and not on 2D
B. The thrombus crosses anatomic boundaries and changes with gain
C. The thrombus moves with the transducer and disappears with depth changes
D. The thrombus has distinct borders, is visible in multiple views, and is adjacent to an abnormally contracting wall

33. A 60-degree Doppler angle of insonation will cause the measured velocity to be:

A. Approximately one-quarter of the true velocity
B. Approximately twice the true velocity
C. Equal to the true velocity
D. Approximately one-half of the true velocity

34. A patient with hypertrophic cardiomyopathy demonstrates a dynamic left ventricular outflow tract gradient. The continuous-wave Doppler signal across the LVOT typically shows which waveform shape?

A. Holodiastolic decelerating envelope
B. Late-peaking dagger-shaped systolic envelope
C. Symmetric V-shaped systolic envelope
D. Early-peaking rounded systolic envelope

35. Which condition makes the Teichholz (M-mode) method of estimating left ventricular ejection fraction unreliable?

A. Mild mitral annular calcification
B. Mild concentric LV hypertrophy with normal wall motion
C. Sinus tachycardia at 110 beats per minute
D. Regional wall motion abnormalities such as those after a myocardial infarction

36. Which apical view best visualizes the anteroseptal and inferolateral (posterior) LV walls together with the LVOT and aortic valve?

A. Apical two-chamber view
B. Apical four-chamber view
C. Apical five-chamber view
D. Apical three-chamber (apical long-axis) view

37. The left anterior descending coronary artery primarily supplies which region of the left ventricle?

A. Anterior wall and anterior interventricular septum
B. Right ventricular free wall
C. Lateral wall

D. Inferior wall and posterior septum

38. Mitral valve area by the Hatle pressure half-time method is calculated using which formula?

A. MVA equals 220 divided by pressure half-time
B. MVA equals pressure half-time divided by 220
C. MVA equals 759 divided by pressure half-time
D. MVA equals 220 times pressure half-time

39. In severe aortic regurgitation, which Doppler finding is expected on continuous-wave interrogation of the regurgitant jet?

A. Short pressure half-time of the regurgitant signal
B. Late-peaking systolic envelope
C. Absent diastolic Doppler signal
D. Prolonged pressure half-time of the regurgitant signal

40. Which Doppler modality is limited by aliasing when interrogating high velocities?

A. Pulsed-wave Doppler
B. Continuous-wave Doppler
C. B-mode
D. M-mode

41. Which mitral inflow pattern is most consistent with impaired LV relaxation (grade I diastolic dysfunction)?

A. E/A ratio greater than 2 with short deceleration time
B. Fused E and A waves at fast heart rates
C. E/A ratio between 0.8 and 1.5 with normal deceleration time
D. E/A ratio less than 0.8 with prolonged deceleration time

42. Color Doppler displays moving blood by which property?

A. Signal amplitude without directional information
B. Tissue motion velocity within each pixel
C. Peak velocity along the entire beam, encoded as a spectral trace
D. Mean velocity and direction within each pixel, encoded as color

43. Which term best describes a segment of myocardium that shows no inward motion and no wall thickening during systole?

A. Hyperkinetic
B. Dyskinetic
C. Akinetic
D. Hypokinetic

44. A sinus venosus atrial septal defect is most often associated with which anomaly?

A. Bicuspid aortic valve
B. Patent ductus arteriosus
C. Cleft mitral valve
D. Partial anomalous pulmonary venous return

45. In the parasternal long-axis view, which feature distinguishes a pericardial effusion from a pleural effusion?

A. The pleural effusion is anterior to the right ventricle
B. The pericardial effusion is always larger than the pleural effusion
C. The pleural effusion shows respirophasic variation while the pericardial does not
D. The pericardial effusion tapers anterior to the descending thoracic aorta

46. What is the most common location of a ventricular septal defect?

A. Inlet septum
B. Muscular septum
C. Perimembranous (membranous) septum
D. Outlet (infundibular) septum

47. Which echocardiographic finding best distinguishes a true left ventricular thrombus from an artifact or near-field clutter?

A. A linear echo that moves with the mitral valve apparatus
B. An echogenic focus that disappears with harmonic imaging
C. A mobile echo seen only in one apical view

D. Discrete echo-density visible in two orthogonal views, adjacent to an akinetic or aneurysmal wall segment

48. Where do left atrial thrombi most commonly form, especially in patients with atrial fibrillation?

A. Left atrial appendage
B. Roof of the left atrium between the pulmonary veins
C. Fossa ovalis region of the interatrial septum
D. Posterior mitral annulus

49. In most patients, the posterior descending artery (PDA) arises from which vessel, defining right coronary dominance?

A. Left circumflex artery
B. Right coronary artery
C. Left main coronary artery
D. Left anterior descending artery

50. Which finding distinguishes rheumatic mitral stenosis from degenerative (calcific) mitral annular disease with severe annular calcification?

A. Restricted posterior leaflet without commissural involvement in rheumatic disease
B. Calcification limited to the chordae tendineae in rheumatic disease
C. Commissural fusion with leaflet tip thickening and doming in rheumatic disease
D. Annular calcification only, with normal leaflet motion in rheumatic disease