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Medical

RPFT

Registered Pulmonary Function Technologist - 2025

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Question: 925

A technologist sets up a nebulizer for a bronchodilator test with albuterol (2.5 mg/mL). To deliver 0.5 mg, the nebulizer runs at 0.2 mL/min. How long should it operate?

A. 1.2 seconds
B. 6.0 seconds
C. 4.8 seconds
D. 2.4 seconds

Answer: B

Explanation: Volume needed: 0.5 mg ÷ 2.5 mg/mL = 0.2 mL. Nebulizer output: 0.2 mL/min = 0.003333 mL/s. Time = 0.2 mL ÷ 0.003333 mL/s = 60 s ÷ 10 = 6 s.

Question: 926

A 60-year-old patient undergoes body plethysmography. The technician records a panting maneuver with a mouth pressure change of 1.5 cmH2O and a box volume change of 0.04 L. Using Boyle's law, calculate the FRC (Patm = 1000 cmH2O, PH2O = 47 cmH2O).

A. 2.0 L
B. 3.0 L
C. 2.54 L
D. 3.5 L

Answer: C

Explanation: FRC = (?V / ?P) × (Patm - PH2O) = (0.04 / 1.5) × (1000 - 47) ˜ 0.0267 × 953 ˜ 2.54 L. This calculation uses Boyle's law, accounting for the pressure-volume relationship during the closed-shutter maneuver in body plethysmography. The result is consistent with typical FRC values in adults.

Question: 927

During a CPET, a 50-year-old female's ECG shows atrial fibrillation at 70% workload. SpO2 is 95%, and blood pressure is 150/80 mmHg. What is the most appropriate action?

A. Continue and monitor ECG
B. Reduce workload by 15%
C. Stop the test immediately
D. Administer supplemental oxygen

Answer: C

Explanation: Atrial fibrillation during CPET is an absolute contraindication to continuing, as it indicates cardiac instability. Stopping the test is necessary for safety. Continuing or reducing workload is unsafe, and oxygen is not indicated for arrhythmia.

Question: 928

While performing a quality control check on a directional valve used in a spirometry circuit, the technologist notices a 10% reduction in measured forced vital capacity (FVC) when using a 3-liter calibration syringe. The valve's resistance is within specifications. What is the most likely cause of this discrepancy?

A. Improper valve orientation causing backflow
B. Leak in the valve's diaphragm
C. Obstruction in the valve's inspiratory port
D. Sticking of the valve's one-way flap

Answer: A

Explanation: Improper valve orientation causing backflow is the most likely cause of a 10% reduction in FVC during a calibration check. If the directional valve is incorrectly oriented, exhaled air may partially re-enter the inspiratory pathway, reducing the measured volume. A leak in the diaphragm would cause inconsistent volume loss, not a consistent 10% reduction. An obstruction in the inspiratory port would primarily affect inspiratory volumes, not FVC. A sticking one-way flap would cause erratic measurements, not a systematic reduction.

Question: 929

A PFT lab's inventory control system shows a 20% shortage of methacholine vials. What is the most appropriate action?

A. Order additional methacholine
B. Continue testing with available stock
C. Switch to mannitol challenge tests

D. Suspend bronchial provocation testing

Answer: A

Explanation: A 20% shortage of methacholine vials risks disrupting bronchial provocation testing. Ordering additional methacholine ensures continuity of testing. Switching to mannitol or suspending tests is unnecessary if restocking is feasible.

Question: 930

During a bronchodilation study, a 60-year-old female with COPD has a pre-bronchodilator FEV1 of 1.2 L (50% predicted) and FVC of 2.4 L (70% predicted). Post-bronchodilator (400 µg albuterol), FEV1 is 1.4 L and FVC is 2.6 L. Is this a significant bronchodilator response per ATS/ERS criteria?

A. No, neither FEV1 nor FVC meets significance
B. Yes, both FEV1 and FVC meet significance
C. Yes, FEV1 meets significance but FVC does not
D. Yes, FVC meets significance but FEV1 does not

Answer: C

Explanation: ATS/ERS criteria define a significant bronchodilator response as an increase of =12% and =200 mL in FEV1 or FVC from baseline. For FEV1: (1.4 - 1.2) / 1.2 = 16.7% (>12%) and 200 mL (=200 mL), so FEV1 meets significance. For FVC: (2.6 - 2.4) / 2.4 = 8.3% (<12%), so FVC does not meet significance.

Question: 931

A pulse oximeter during a CPET shows SpO_2 of 99% despite the patient desaturating to 90% on a previous test. The waveform is normal, and the sensor is clean. What is the most likely cause and troubleshooting step?

A. Patient improvement; confirm with ABG
B. New sensor calibration; recalibrate the device
C. Methemoglobinemia; perform co-oximetry
D. Sensor site change; move to earlobe

Answer: C

Explanation: Methemoglobinemia can falsely elevate SpO_2 readings, as methemoglobin absorbs light similarly to oxyhemoglobin. Co-oximetry confirms methemoglobin levels. Recalibration or sensor site changes are unnecessary with a normal waveform. Patient improvement is possible but requires ABG confirmation.

Question: 932

A 65-year-old male's spirometry flow-volume loop shows a scooped expiratory curve. His FEV1 is 1.5 L (60% predicted), and FVC is 3.0 L (80% predicted). What is the most likely diagnosis?

A. Asthma
B. Vocal cord dysfunction
C. Pulmonary fibrosis
D. Emphysema

Answer: D

Explanation: A scooped expiratory flow-volume loop with reduced FEV1 (60%) and normal FVC (80%) suggests emphysema, characterized by airway collapse and obstruction. Asthma may show reversibility, pulmonary fibrosis reduces FVC, and vocal cord dysfunction affects inspiratory curves.

Question: 933

During a CPET, a 55-year-old male reaches a VO2 max of 25 mL/kg/min. His ECG shows ST-segment depression of 2 mm in leads V5–V6, and blood pressure is 200/110 mmHg. What is the most appropriate action?

A. Continue testing to confirm VO2 max
B. Reduce workload and monitor ECG
C. Administer sublingual nitroglycerin
D. Stop the test immediately

Answer: D

Explanation: ST-segment depression of 2 mm and blood pressure of 200/110 mmHg are absolute indications to stop CPET due to risk of myocardial ischemia and hypertensive crisis. Continuing or reducing workload is unsafe, and administering nitroglycerin is beyond the technologist's scope without physician direction.

Question: 934

During a CPET, the technologist notices the cycle ergometer's workload fluctuates between 95 and 105 watts at a set 100 watts. The pedaling rate is steady at 60 rpm. What is the most likely cause?

A. Inconsistent flywheel resistance
B. Malfunctioning torque sensor
C. Loose drive belt
D. Power supply instability

Answer: B

Explanation: A malfunctioning torque sensor is the most likely cause of workload fluctuations in a cycle ergometer. The sensor measures applied force, and a malfunction causes inconsistent workload readings despite steady pedaling. Inconsistent flywheel resistance would cause mechanical irregularities. A loose drive belt would produce slippage, not precise fluctuations. Power supply instability affects the entire system, not just workload.

Question: 935

A 70-year-old male's ECG during a 6MWT shows sinus rhythm at 100 bpm with frequent atrial premature contractions (APCs) and a prolonged QTc of 480 ms. What is the most appropriate action?

A. Administer supplemental oxygen
B. Stop the test and refer to cardiology
C. Continue the test with ECG monitoring
D. Switch to a CPET for better monitoring

Answer: B

Explanation: Frequent APCs and a prolonged QTc (480 ms, normal <450 ms in males) during a 6MWT suggest potential arrhythmia risk or underlying cardiac pathology, especially in a 70-year-old. Stopping the test and referring to cardiology for further evaluation is the safest action. Oxygen is irrelevant to ECG findings. Continuing the test risks worsening arrhythmias, and CPET is more strenuous and inappropriate given the findings.

Question: 936

During routine quality control of a blood gas analyzer, a technologist runs a Level 2 control solution with known values: pH = 7.400, PCO_2 = 40.0 mmHg, PO_2 = 100.0 mmHg. The results are: pH = 7.410, PCO_2 = 41.2 mmHg, PO_2 = 98.5 mmHg. The lab's acceptable ranges are pH ±0.015, PCO_2 ±3 mmHg, PO_2 ±5 mmHg. What action should the technologist take?

A. Accept results; analyzer is within specifications
B. Recalibrate for PCO_2; repeat control testing
C. Recalibrate for PO_2; repeat control testing
D. Service the analyzer; all parameters are out of range

Answer: B

Explanation: Compare the results to the acceptable ranges. For pH: |7.410 – 7.400| = 0.010, within ±0.015. For PCO_2: |41.2 – 40.0| = 1.2 mmHg, within ±3 mmHg. For PO_2: |98.5 – 100.0| = 1.5 mmHg, within ±5 mmHg. All parameters are within limits, but PCO_2 is close to the upper limit (41.2 vs. 43 mmHg max). Per NBRC quality control standards, consistent drift toward the limit suggests potential calibration drift. Recalibrating for PCO_2 and repeating control testing ensures reliability before patient testing.

Question: 937

During a CPET, the cycle ergometer's workload is set to 150 watts, but a dynamometer measures 135 watts at 60 rpm. The flywheel resistance is verified. What is the most likely cause?

A. Inaccurate torque calibration
B. Loose flywheel bolts
C. Misaligned drive chain
D. Worn brake pads

Answer: A

Explanation: Inaccurate torque calibration is the most likely cause of a cycle ergometer underdelivering workload (135 watts instead of 150 watts). The torque sensor measures applied force, and miscalibration reduces reported workload. Loose flywheel bolts or a misaligned drive chain would cause mechanical irregularities. Worn brake pads would cause variable resistance, not a consistent 10% error.

Question: 938

A 62-year-old female with heart failure undergoes a shuttle walk test. Pre-test: SpO2 93%, HR 85 bpm, BP 135/85 mmHg. Post-test: SpO2 85%, HR 120 bpm, BP 150/90 mmHg, distance 250 m (55% predicted). What is the primary clinical implication?

A. Exercise-induced desaturation

B. Cardiac limitation
C. Normal exercise response
D. Ventilatory limitation

Answer: A

Explanation: SpO_2 drop from 93% to 85% during the shuttle walk test indicates exercise-induced desaturation, likely due to ventilation-perfusion mismatch in heart failure. HR and BP increases are normal, not indicative of cardiac or ventilatory limitation alone. The reduced distance suggests limitation, but desaturation is primary.

Question: 939

A technician performs an arterial blood gas (ABG) sample collection from a 55-year-old patient with pulmonary fibrosis. The sample is collected from the radial artery, but the syringe is not immediately placed on ice. The results show pH = 7.42, PaO_2 = 65 mmHg, and $PaCO_2$ = 38 mmHg. What is the most likely impact of the delay in icing the sample?

A. Falsely elevated $PaCO_2$
B. Falsely lowered PaO_2
C. Falsely elevated PaO_2
D. No significant impact

Answer: B

Explanation: Failure to immediately place an ABG sample on ice allows continued cellular metabolism, which consumes oxygen and produces carbon dioxide. This typically results in a falsely lowered PaO_2 and a potential increase in $PaCO_2$. The PaO_2 of 65 mmHg may be lower than the true value, underestimating the patient's oxygenation status. The impact is significant in patients with already compromised gas exchange, such as pulmonary fibrosis.

Question: 940

A 62-year-old patient with suspected COPD undergoes arterial blood gas (ABG) analysis. The results show pH 7.36, $PaCO_2$ 48 mmHg, PaO_2 72 mmHg, HCO_3^- 27 mEq/L, and SaO_2 92%. The technologist notices the sample was delayed in analysis by 30 minutes without ice preservation. How should the reliability of these results be evaluated?

A. Accept results as valid; delay does not affect ABG parameters significantly
B. Recalibrate analyzer and repeat test to confirm values

C. Reject results; delayed analysis without ice likely caused inaccurate PaO_2 and $PaCO_2$
D. Verify with pulse oximetry to confirm SaO_2 and accept other parameters

Answer: C

Explanation: Delayed analysis of an arterial blood gas sample without ice preservation can lead to continued cellular metabolism, which consumes oxygen and produces carbon dioxide. This typically results in a falsely decreased PaO_2 and increased $PaCO_2$. A 30-minute delay without cooling is significant enough to question the reliability of these results, necessitating a repeat sample with proper handling (iced and analyzed within 15 minutes). Verifying with pulse oximetry only addresses SaO_2, not PaO_2 or $PaCO_2$, and recalibration does not address sample handling errors.

Question: 941

A patient's static lung volumes via helium dilution show an FRC of 2.8 L, while plethysmography shows 3.5 L. The patient has COPD. What explains the discrepancy?

A. Inconsistent patient effort
B. Helium analyzer calibration error
C. Gas trapping in obstructive disease
D. Plethysmograph pressure drift

Answer: C

Explanation: In COPD, gas trapping causes helium dilution to underestimate FRC compared to plethysmography, which captures all lung volumes, including trapped gas. Calibration errors or pressure drift are less likely without specific evidence. Inconsistent effort would affect both methods similarly.

Question: 942

A 65-year-old patient with COPD undergoes a 6-minute walk test (6MWT) with pulse oximetry. Baseline SpO2 is 94%, dropping to 87% at 4 minutes. What is the most appropriate action?

A. Stop the test and administer supplemental oxygen
B. Continue the test without intervention
C. Repeat the test with a higher baseline SpO2
D. Switch to a cardiopulmonary exercise test

Answer: A

Explanation: A SpO2 drop to 87% during the 6MWT indicates significant desaturation (ATS guideline threshold: <88%). The test should be stopped, and supplemental oxygen administered to restore SpO2 to ≥90%. Continuing the test risks hypoxia, repeating the test does not address the desaturation, and switching to a CPET is inappropriate during an active test.

Question: 943

A quality control test on an isothermal lung analog yields a DLCO measurement of 22 mL/min/mm Hg, while the expected value is 25 mL/min/mm Hg (±5%). The technologist confirms the gas mixture and breath-hold time are correct. What should be done next?

A. Adjust the analyzer's CO sensor gain
B. Repeat the test with a longer breath-hold
C. Recalibrate the temperature sensor
D. Check for leaks in the gas delivery system

Answer: D

Explanation: A DLCO reading 12% below the expected value (outside ±5%) suggests a system issue, most likely a leak in the gas delivery system, which reduces the effective CO concentration. Adjusting the CO sensor gain is premature without identifying a leak. Temperature sensor calibration affects gas volume but has minimal impact on DLCO. A longer breath-hold is inappropriate as the standard 10-second hold was used.

Question: 944

A 55-year-old patient's ABG results show pH = 7.30, PaO2 = 55 mmHg, PaCO2 = 50 mmHg, and HCO3- = 24 mEq/L. What is the primary acid-base disorder?

A. Uncompensated respiratory acidosis
B. Compensated respiratory acidosis
C. Uncompensated metabolic acidosis
D. Compensated metabolic acidosis

Answer: A

Explanation: The low pH (7.30) and elevated PaCO2 (50 mmHg) indicate respiratory acidosis. The HCO3- (24 mEq/L) is near normal, suggesting no significant renal compensation, making it uncompensated. Metabolic acidosis would show a lower HCO3-, and compensated disorders would have a normalized pH.

Question: 945

A patient with asthma performs home spirometry using a portable device. Results show FEV_1 2.5 L (70% predicted) with a coefficient of variation (CV) of 12%. The ATS/ERS guideline for acceptable variability is <8%. What should the technologist recommend?

A. Accept results as home devices are less precise
B. Instruct patient to improve technique and repeat testing
C. Switch to pulse oximetry for monitoring
D. Validate results with in-lab spirometry

Answer: B

Explanation: A CV >8% indicates unacceptable variability in home spirometry, suggesting inconsistent technique or effort. The technologist should coach the patient on proper technique (e.g., forceful exhalation, tight mouthpiece seal) and repeat testing. Home devices can achieve acceptable precision with proper use. Pulse oximetry does not replace spirometry, and in-lab testing is a secondary step.