

Example: Foundational Science in Diagnosis or Management

1.

A previously healthy 20-year-old woman, who is a sophomore in college, is brought to the emergency department by her roommates because of an 8-hour history of weakness and vomiting blood and a 2-day history of dizziness. She has no history of similar symptoms. She says she overeats in response to the stress of her classes. She induces vomiting after consuming a significant amount of food because she feels "too full" and "out of control." She now vomits almost daily. She feels she is slightly overweight. She is physically active and exercises moderately two to three times weekly. She does not use laxatives or diuretics. She has many friends and enjoys going out socially. She takes no medications. She drinks three to four beers on weekends and does not use illicit drugs. She appears uncomfortable and is tearful and mildly diaphoretic. She is 157 cm (5 ft 2 in) tall and weighs 59 kg (130 lb); BMI is 24 kg/m². Temperature is 37.5°C (99.5°F), pulse is 115/min and regular, and blood pressure is 100/68 mm Hg. Examination shows tender parotid glands bilaterally and poor dentition. Results of laboratory studies are most likely to show which of the following in this patient?

	K⁺	Cl⁻	HCO₃⁻
(A)	Decreased	decreased	decreased
(B)	Decreased	decreased	increased
(C)	Decreased	increased	decreased
(D)	Increased	decreased	increased
(E)	Increased	increased	decreased
(F)	Increased	increased	increased

Answer: B

Underlying Foundational Science: In addition to recognizing the clinical presentation of anorexia nervosa, the examinee is expected to recognize the physiologic abnormalities in serum electrolytes that would occur due to losses in the GI tract.

2.

A 47-year-old woman comes to the office because of a 2-month history of progressive weakness and numbness of her right leg. She has a 3-year history of type 2 diabetes mellitus treated with metformin. She has worked as a stock person in a storeroom for 12 years; she often moves and lifts heavy objects and sometimes crawls into tight spaces. On neurologic examination, muscle strength is 5-/5 in the hip extensor, thigh abductor, hamstring, and gastrocnemius muscles on the right and intact on the left. Muscle strength is intact in the iliopsoas, thigh adductor, quadriceps, and tibial anterior muscles bilaterally. Deep tendon reflexes are 1+ in the right ankle and 2+ in the left ankle. Sensation to light touch is mildly decreased over the lateral and inferior aspects of the right foot. Sensation otherwise is intact. Which of the following is the most likely diagnosis?

- (A) Common peroneal neuropathy
- (B) Femoral neuropathy
- (C) L2 radiculopathy
- (D) L4 radiculopathy
- (E) Obturator neuropathy
- (F) S1 radiculopathy

Answer: F

Underlying Foundational Science: The presentation of S1 radiculopathy in this patient requires the examinee to interpret findings in the neurologic and musculoskeletal exam in order to determine both the condition (radiculopathy or neuropathy) and the dermatomal level affected.

3.

A 16-year-old boy with VATER syndrome is brought to the physician because of 2-week history of harsh cough that began with a common cold. He receives no medications. His temperature is 37°C (98.6°F), pulse is 70/min, respirations are 20/min, and blood pressure is 112/64 mm Hg. Examination shows a harsh vibratory sound in the mid anterior chest with forced expiration. A systolic murmur is heard best at the lower left sternal border. There is mild scoliosis. Spirometry shows an FVC of 2.54 L (78% of predicted) and a slow vital capacity of 2.88 L (85% of predicted). A flow volume loop shows scooping on the expiratory limb. Which of the following is the most likely cause of the discrepancy between this patient's forced and slow vital capacity measurements?

- (A) Bronchospasm
- (B) Laryngeal braking
- (C) Subglottic mass
- (D) Tracheal collapse
- (E) Upper airway compression

Answer: D

Underlying Foundational Science: Interpretation of the spirometry data and the patient's clinical presentation requires the examinee to determine the etiology of the respiratory physiology conveyed in this presentation.

4.

A 27-year-old man is examined in the intensive care unit 1 day after he sustained a closed head injury, liver laceration, and pelvic fracture in a motor vehicle collision. He is intubated and mechanically ventilated. He is receiving intravenous midazolam and 5% dextrose in lactated Ringer solution. His temperature is 37.8°C (100°F), pulse is 95/min, and blood pressure is 100/70 mm Hg. Cardiopulmonary examination shows no abnormalities. The abdomen is soft. He withdraws appropriately to painful stimuli. Laboratory studies show:

Hematocrit	28%
Leukocyte count	13,000/mm ³
Serum	
Na ⁺	138 mEq/L
K ⁺	3.5 mEq/L
Cl ⁻	102 mEq/L
HCO ₃ ⁻	24 mEq/L
Urea nitrogen	20 mg/dL
Glucose	220 mg/dL
Creatinine	1 mg/dL

Which of the following is the most likely mechanism of these laboratory findings?

- (A) Decreased uptake of glucose by insulin-sensitive tissues
- (B) Exogenous production of glucose by bacteria
- (C) Impaired excretion of glucose by the kidneys
- (D) Increased infusion of intravenous glucose
- (E) Insulin deficiency

Answer: A

Underlying Foundational Science: The examinee is expected to have a fundamental understanding of endocrinologic mechanisms in the presentation of hyperglycemia stress response in the setting of trauma, at the cellular level.