

Special Considerations

- **Biomechanics of Trauma**
- **Multiple Organ Dysfunction Syndrome (MODS)**
- **Shock**
 - » **Cardiogenic**
 - » **Distributive**
 - » **Hypovolemic**
 - » **Neurogenic**
 - » **Septic**
- **Systemic Inflammatory Response Syndrome (SIRS)**

INTRODUCTION

Understanding how to interpret arterial blood gases (ABGs) is essential for the trauma nurse. On the TCRN examination, you will be asked to interpret ABGs. The first chart that follows is designed to assist you in determining the correct answer by reminding you of the normal values for ABG interpretation.

The second chart assists with critical thinking regardless of how a question might be presented. The chart contains common causes of respiratory and metabolic issues you will likely find on your TCRN exam.

Ordinarily, questions about ABG interpretation are presented one of two ways. First, you are asked to choose a set of numbers that match a given physiologic state, say respiratory acidosis. A second type of question may provide you with a set of numbers, then ask for the interpretation. A third type of question sometimes provides information that will lead you to identify the patient's problem, you are then asked to match a set of ABG results to that entity. The third type of question may be quite difficult to answer. The chart simplifies learning and saves time.

As an example, if your patient is in the compensatory stage of shock, the patient will exhibit respiratory alkalosis because of tachypnea and blowing off carbon dioxide. In late stages of shock, the patient will exhibit metabolic acidosis.

If a patient suffers from a flail chest, it is extraordinarily painful. The patient is unlikely to breathe normally, and will retain carbon dioxide.

Normal Values for ABGs

pH (acidosis) 7.35 – 7.45 (alkalosis)

CO₂ (alkalosis) 35 – 45 (acidosis)

HCO₃ (acidosis) 23 – 27 (alkalosis)

PO₂ 80 – 100

If compensated, pH of 7.35 – 7.40 = acidosis

If compensated, pH of 7.40 – 7.45 = alkalosis

The third chart is a review of classifications of blood loss in hemorrhagic shock.

Respiratory Acidosis—Retention of Carbon Dioxide	Respiratory Alkalosis—Hyperventilation
Common Causes	Common Causes
Abdominal Distention Aspiration Asthma Bronchiectasis Central Nervous System Disorders Chest Trauma Drug Overdose Emphysema Flail Chest Head Trauma Mechanical Hypoventilation Neuromuscular Disorders Obesity Oversedation/Anesthesia Pneumonia Pneumothorax Pulmonary Edema Restrictive Lung Disease Sleep Apnea	Anxiety/Fear/Pain ARDS Asthma Atelectasis Cerebrovascular Accident CNS Disorders Congestive Heart Failure High Altitude Hypoxemia Infections/Sepsis/Fever Pneumonia Pulmonary Embolism Salicylate Overdose Tumors

Metabolic Acidosis—Gain of Metabolic Acids or Loss of Base	Metabolic Alkalosis—Gain of Base or Loss of Metabolic Acids
Common Causes	Common Causes
Administration of Exogenous Acids Anaerobic Metabolism (Lactic Acidosis) Carbon Anhydrase deficiency Diabetic Ketoacidosis Diarrhea Drainage of Pancreatic Juices Drug Overdose Ethylene Glycol Methanol Overwhelming Sepsis Paraldehyde Renal Failure Rhabdomyolysis Salicylate Overdose Starvation	Administration of Steroids and/or Diuretics Cushing Syndrome Excess Administration of Sodium Bicarbonate Excess Ingestion of Antacids Increased Levels of Aldosterone Low Potassium and/or Chloride Massive Blood Transfusions (Increased Citrate) Nasogastric Suctioning/Lavage Vomiting

Hemorrhagic Shock in Injured Patients				
	Class I	Class II	Class III	Class IV
Blood loss (ml)	Up to 750	750–1500	1500–2000	> 2000
Blood loss (%)	Up to 15%	15–30%	30–40%	> 40%
Pulse rate	< 100	> 100	> 120	> 140
Blood pressure	Normal	Normal	Decreased	Decreased
Pulse pressure	Normal or increased	Decreased	Decreased	Decreased
Respiratory rate	14–20	20–30	30–40	> 35
Urine output (ml/hr)	> 30	20–30	5–15	Negligible
Central nervous system	Slightly anxious	Mildly anxious	Anxious; confused	Confused; lethargic
Fluid replacement (3:1 rule)	Crystalloid	Crystalloid	Crystalloid and blood	Crystalloid and blood
American College of Surgeons, Committee on Trauma (2012). <i>Advanced trauma life support</i> (9th ed.). Chicago, IL: ENA.				

SECTION 3: QUESTIONS

1. **Which of the following statements is true about vehicle versus pedestrian injuries?**
 - A. Adults are likely to turn toward the vehicle just before impact
 - B. The adult victim tends to be thrown away from the impact, striking the ground
 - C. The adult victim tries to turn away from an impact
 - D. The adult victim tends to be thrown onto the street immediately
2. **A sympathetic response to stimuli results in**
 - A. Heightened awareness, increased blood pressure, bronchial dilation, and increased glucogenesis
 - B. Dilated pupils, bronchial relaxation, increased gastric motility, normal urine output
 - C. Vasodilatation, increased blood pressure, decreased gastric secretions, pupils at 3 mm
 - D. Increased respiratory depth, increased heart rate, decreased gastric motility, sphincter dilation
3. **When evaluating a patient for possible hemorrhagic shock, the three primary areas to consider are**
 - A. Isolated head injuries upper thigh, and abdomen
 - B. Chest, upper thigh, and isolated head injuries
 - C. Abdomen, pelvis, and chest
 - D. Isolated head injuries, abdomen, and chest
4. **Your patient is a construction worker who was seen in the ED after falling into a trench. He sustained a left fractured tibia and fibula and a fractured left scapula. He required a splenectomy and was just admitted to your care. The nursing supervisor tried to get a bed in the ICU, but none was available. Your initial assessment results are as follows:**

EKG: ST at 126 with isolated PVC
BP: 84/50
Skin pale, cool, clammy
RR 26, breath sounds clear, slightly diminished RLL
O₂: 2 L/min via NC
Mentation: Responds to questions slowly, oriented to self and time CVP 4

Which of the following conditions do you believe this patient is developing?

 - A. Cardiogenic shock
 - B. Hypovolemic shock
 - C. Septic shock
 - D. Left ventricular failure
5. **Which of the following would be considered a cause of distributive shock?**
 - A. Neurogenic shock
 - B. Cardiac tamponade
 - C. Aortic stenosis
 - D. Pregnancy
6. **The main components of the Trauma Triad of Death include**
 - A. Hypotension, bradycardia, and progressive shock
 - B. Coagulopathy, hypothermia, and metabolic acidosis
 - C. Progressive, autoregulation, and hypoperfusion
 - D. Anaphylaxis, resuscitation, and decompensated

7. **By definition, systemic inflammatory response syndrome (SIRS) must be comprised of two or more variables identified by the American College of Chest Physicians (ACCP) and the Society of Critical Care Medicine (SCCM). Which of the following variables was not identified in the definition of SIRS?**
 - A. Fever of more than 38°C (100.4°F) or less than 36°C (96.8°F)
 - B. Respiratory rate of more than 20 breaths per minute or arterial carbon dioxide tension (PaCO₂) of less than 32 mmHg
 - C. Abnormal white blood cell count (>12,000/μL or <4,000/μL or >10% immature [band] forms)
 - D. A heart rate of more than 80 beats per minute
8. **When describing the amount of exterior deformation of a vehicle sustained in a collision, the commonly used term is**
 - A. Crush
 - B. Intrusion
 - C. Incursion
 - D. Collision two
9. **When considering the use of permissive hypotension during resuscitation, which statement below is a risk factor that must be considered prior to implementation of the therapy:**
 - A. The therapy increases the likelihood of hypothermia
 - B. Permissive hypotension will exacerbate a head injury
 - C. Risks associated with acidosis will increase
 - D. Coagulopathies will likely increase
10. **Administration of one unit of platelets elevates the platelet count approximately**
 - A. 1,000–40,000u/dL
 - B. 5,000–10,000 u/dL
 - C. 3g/dL
 - D. 5%
11. **When evaluating a patient for possible hemorrhagic shock, the three primary areas to consider that are prone to hemorrhage are the**
 - A. Isolated head injuries, upper thigh, and abdomen
 - B. Chest, upper thigh, and isolated head injuries
 - C. Abdomen, pelvis, and chest
 - D. Isolated head injuries, abdomen, and chest
12. **The ratio of heart rate in bpm to systolic blood pressure measured in mmHg is known as**
 - A. Pulse pressure
 - B. Systemic vascular resistance
 - C. Shock index
 - D. Impedance
13. **There are multiple impacts that take place during a motor vehicle collision. When a victim sustains head, chest, and abdominal injuries, the injuries usually occur during the**
 - A. First impact
 - B. Second impact sequence
 - C. Third impact sequence
 - D. Fourth impact sequence
14. **In trauma patients, the INR may be useful in identifying trauma-induced coagulopathy early. The INR value that would indicate this condition is an**
 - A. INR of 3.5
 - B. INR of 1.5
 - C. INR of 2.7
 - D. INR of 2.3

15. **Administering uncrossed blood in an emergency has always been controversial. Recommendations now include Massive Transfusion Protocols that suggest the resuscitation rooms are stocked and reserved prior to patient arrival with**
 - A. O negative blood for males
 - B. O positive blood for females
 - C. O negative blood for females and children
 - D. Only O positive blood
16. **Which of the following arterial blood gases would likely be found in a patient with early hypovolemic shock:**
 - A. Respiratory alkalosis
 - B. Respiratory acidosis
 - C. Metabolic acidosis
 - D. Metabolic alkalosis
17. **While participating in a cardiac arrest on your unit, you note a colleague is performing chest compressions on an adult at a rate of approximately 90 per minute. According to the 2015 American Heart Association Guidelines for CPR and ECC Update, the correct rate for performing chest compressions is**
 - A. 80–90 per minute
 - B. 80 per minute
 - C. 100–120 per minute
 - D. At least 100 per minute
18. **Determine the pulse pressure for a patient who has a pulse of 78, a BP of 115/85, and a respiratory rate of 12.**
 - A. 42
 - B. 37
 - C. 30
 - D. 103
19. **What is the mean arterial pressure (MAP) for a patient with a blood pressure of 134/60 and a heart rate of 70?**
 - A. 64
 - B. 52
 - C. 85
 - D. 47
20. **An adult patient has fallen from the balcony of a sixth-floor apartment to the street below. Falls from this height usually result in a mortality rate of**
 - A. 100%
 - B. 70%
 - C. 50%
 - D. 35%
21. **Calculate the cardiac output for a patient with a heart rate of 76 and a stroke volume of 65 ml.**
 - A. 57%
 - B. 4.94 L/min
 - C. 1,285 ml/min
 - D. 2.85 liters

22. **Blood component replacement therapy for DIC may include all but which of the following?**
- A. FFP
 - B. Cryoprecipitate
 - C. Amicar
 - D. Platelets
23. **How does low-molecular-weight heparin (LMWH) differ from unfractionated heparin?**
- A. It is more difficult to administer
 - B. There are more side effects with LMWH
 - C. LMWH is more stable
 - D. Unfractionated heparin is easier to administer
24. **Hemoglobin is primarily phagocytized in the**
- A. Liver
 - B. Gallbladder
 - C. Spleen
 - D. Pancreas
25. **Due to a data entry error an 18-year-old mother with A negative blood type received a transfusion of Rh-positive platelets following a placental abruption. As a trauma nurse, you know it would be appropriate to administer**
- A. Neostigmine
 - B. FFP
 - C. RhoGAM
 - D. CuroSurf
26. **Your patient was practicing Parkour and attempting to jump across the roofs of buildings about 30 feet in the air, but then missed, and fell to the ground. Other than the head, what is the second deadliest part of the body this patient might land on when striking the street between the buildings?**
- A. The back
 - B. The buttocks
 - C. The calcanea
 - D. The left side
27. **A function of a red blood cell is**
- A. Cell humoral mediation
 - B. To function as a macrophage
 - C. To initiate hemostasis
 - D. Carbonic acid dissociation
28. **Use of the colloid Hetastarch may affect your patient in which of the following ways?**
- A. Hetastarch may elevate serum amylase levels
 - B. Hetastarch may decrease serum potassium levels
 - C. Hetastarch may increase capillary permeability
 - D. Hetastarch may cause acute tubular necrosis
29. **Which of the following fluids can accelerate systemic inflammation in trauma patients by activating neutrophils?**
- A. Colloids
 - B. Crystalloids
 - C. Osmotic diuretics
 - D. Hypertonic saline

30. Which of the following IV fluids actually suppresses inflammation?
- A. Hypertonic saline
 - B. Normal saline
 - C. Hetastarch
 - D. D₅W
31. Which of the following statements is true regarding the administration of colloids?
- A. As hydrostatic pressure decreases, pores increase in size to let particles through
 - B. You can give smaller amounts of fluid (about 250 ml) and achieve the same effect you would with 4 liters of crystalloids
 - C. Edema takes a much shorter time to resolve
 - D. Colloids are neuroprotective
32. Patients who are stung by bees numerous times are in danger of developing
- A. Kidney failure
 - B. Anemia
 - C. Long QT interval
 - D. Hydrocephalus
33. Emergency medical services has radioed your ED and is in route with a victim of a police shooting. When the patient arrives, the patient is found to have been shot in the hip and mid abdomen. You ask what type of ammunition was used and the police officer states, "frangible." As a trauma nurse, you know this type of bullet
- A. Is identical to a full metal jacket bullet
 - B. A soft nose bullet
 - C. A hollow point bullet
 - D. Designed to break apart on impact
34. Stroke volume is comprised of which of the following factors?
- A. Viscosity, blood volume, and impedance
 - B. Cardiac output, heart rate, and compliance
 - C. Contractility, preload, and afterload
 - D. Systemic impedance, heart rate, and compliance
35. You are using the PQRST method of pain assessment for your patient complaining of chest pain. The "S" in this mnemonic stands for
- A. Sensitivity
 - B. Severity
 - C. Standard
 - D. Symptoms
36. During inspiration your patient has a paradoxical rise in jugular venous pressure. This phenomenon is commonly associated with
- A. Mitral stenosis
 - B. Right heart failure
 - C. An anterior wall MI
 - D. Increased ventricular compliance
37. Stimulation of the parasympathetic nerve fibers in the heart will result in
- A. An increased heart rate
 - B. An adrenergic response, causing a decreased blood flow to the extremities
 - C. An increase in conduction and a major effect on the force of ventricular conduction
 - D. The release of acetylcholine

38. **Dobutamine is used to improve cardiac output primarily by**
- A. Causing profound peripheral vasodilation
 - B. Acting on alpha-adrenergic receptors in the heart
 - C. Acting on beta1 adrenergic receptors in the heart
 - D. Acting on both alpha- and beta-adrenergic receptors in the cardiovascular tissue
39. **Alpha-adrenergic effects of norepinephrine include**
- A. Increased force of myocardial contraction
 - B. Peripheral arteriolar vasoconstriction
 - C. Increased AV conduction time
 - D. Central venous vasodilation
40. **Which of the following blood types is the universal donor for packed red blood cells (PRBCs)?**
- A. Type AB negative
 - B. Type A
 - C. Type B
 - D. Type O negative
41. **Which of the following would be an appropriate definition of anaphylactic shock?**
- A. Systemic vasodilation that causes low blood pressure, which is by definition 30% lower than the person's baseline or below standard values
 - B. Anaphylaxis is the recurrence symptoms within 1–72 hours with no further exposure to the allergen
 - C. Anaphylactic shock does not involve an allergic reaction but is due to direct mast cell degranulation.
 - D. An overreaction and misdirection of immune responses
42. **In sepsis, endotoxins stimulate production of tumor necrosis factor (TNF). The TNF, in turn, stimulates**
- A. Neutrophil activation and platelet aggregation
 - B. Parathyroid hormone production
 - C. Increased CO₂ retention
 - D. Increased CPP
43. **Which of the following statements about anaphylaxis is correct?**
- A. The condition of anaphylaxis requires the patient to be sensitized
 - B. Anaphylaxis does not need IgE antibodies for a hypersensitivity reaction to occur
 - C. There are five classifications of anaphylaxis, all are extreme emergencies
 - D. An anaphylactoid response is identical to anaphylaxis
44. **It is critical to rapidly identify septic patients. They are defined as those with infection that has been confirmed or suspected by an experienced care provider, and the presence of two or more criteria for systemic inflammatory response syndrome. These criteria include a heart rate above 90 beats per minute, temperature below 36°C or above 38°C, either a respiratory rate above 20 breaths per minute or a CO₂ partial pressure less than 32 mmHg, and a WBC count either less than 4,000 cells/mm³ or with greater than 10% immature (band) forms. To meet the criteria for septic shock, the patient would have a systolic blood pressure below 90 mmHg after a 20–30 ml/Kg fluid bolus and a lactate level above**
- A. 4 mmol/L
 - B. 20 L
 - C. 35 mmHg
 - D. 15 mm³

45. In trauma patients, the INR may be useful in identifying trauma-induced coagulopathy early. The INR value that would indicate this condition is an
- A. INR of 3.5
 - B. INR of 1.5
 - C. INR of 2.7
 - D. INR of 2.3
46. The term *Massive Transfusion* generally means a patient who
- A. Has received > 10 units of PRBCs within 24 hours of admission
 - B. Has received at least five units of PRBs and five additional blood components
 - C. Received three combinations of one unit PRBCs, three units of plasma, and three units of platelets
 - D. Received at least five different blood components in the last four hours since admission
47. Calculate the shock index (SI) for a patient with the following vital signs; HR: 120, RR: 22, BP 84/60.
- A. 2
 - B. 1.43
 - C. 0.39
 - D. 0.70
48. Airbag injuries commonly associated with motor vehicle crashes are
- A. LeFort I and II fractures
 - B. Blowout orbital injuries
 - C. Facial lacerations
 - D. Tympanic membrane rupture and tinnitus
49. Packed red blood cells will elevate hemoglobin levels by _____ and hematocrit levels by _____ per unit.
- A. Three grams per dL; 4%
 - B. Five grams per dL; 5%
 - C. Two grams per dL; 2%
 - D. One gram per dL; 3%
50. Your adult patient fell from a ladder and has sustained a closed femur fracture. Which of the following values closely represents the estimated blood loss for this patient?
- A. 3,000 mL
 - B. 500 mL
 - C. 1,000 mL
 - D. 2,000 mL
51. When a patient receives banked blood, it is treated with citrate to prevent coagulation. Which of the following statements is true about the use of this preservative?
- A. Citrate binds with calcium and makes it inactive
 - B. The liver is unable to metabolize citrate
 - C. The patient is likely to develop hypercalcemia
 - D. Blood with citrate must always be warmed
52. After a successful resuscitation, the patient has achieved ROSC but is comatose (lacking meaningful response to verbal commands). Which of the following TTM interventions is recommended for this patient?
- A. Maintain a constant temperature between 32°C and 35°C (89.6°F and 95.2°F) for at least 24 hours
 - B. Maintain oxygen saturation levels of at least 93%
 - C. Waveform capnography reading of 10
 - D. Transport to Cath lab immediately

53. **When performing CPR on an adult, it is optimal to target your compression depth from**
- A. 1.5 to 2.5 inches
 - B. 2 to 2.4 inches
 - C. 2.5 to 3 inches
 - D. A minimum of 1.5 to 2 inches
54. **Your patient exhibits ST segment depression on his EKG along with moderate, substernal chest pain. These findings indicate a possible**
- A. Anteroseptal MI
 - B. Myocardial ischemia
 - C. Lateral wall MI
 - D. Pericardial tamponade
55. **A low CVP reading may actually represent**
- A. Pulmonary hypertension
 - B. Increased contractility
 - C. Biventricular failure
 - D. Cardiac tamponade
56. **You are caring for a patient who will be admitted for observation for a possible pulmonary contusion sustained from a bicycle accident. The patient refused to wait for a wheelchair. While ambulating, the patient suddenly complains of chest pain. You note that while describing the pain, the patient clenches his fist over the sternal area. This gesture is commonly associated with ischemic chest pain and is known as**
- A. Prinzmetal's sign
 - B. Frazier's sign
 - C. Homans' sign
 - D. Levine's sign
57. **The fluid of choice for trauma resuscitation is**
- A. 5% albumin
 - B. Lactated Ringer's
 - C. 0.9% normal saline
 - D. 0.45% normal saline
58. **Your patient was an unrestrained passenger in a lateral impact car crash. The patient was a "far side" impact victim. Which of the following statements is true regarding the injuries likely to be suffered by this patient?**
- A. This patient is unlikely to suffer an intrusion injury
 - B. This patient is likely to suffer rotational and lateral injuries
 - C. This patient is very likely to suffer shear injuries
 - D. The severity of lateral injury will increase
59. **Which of the following fluids can accelerate systemic inflammation in trauma patients by activating neutrophils?**
- A. Colloids
 - B. Crystalloids
 - C. Osmotic diuretics
 - D. Hypertonic saline
60. **An IV fluid not considered to be a colloid would be**
- A. 0.2% normal saline
 - B. Mannitol
 - C. Dextran
 - D. Hetastarch

61. Which IV fluid listed below is least likely to be used for resuscitation?
 - A. 5% albumin
 - B. 25% albumin
 - C. Dextrose 5% in water (D₅W)
 - D. Lactated Ringer's
62. A patient suffering from spinal shock would be expected to exhibit which of the following symptom:
 - A. Loss of autonomic function
 - B. An increase in urine production
 - C. Loss of reflexes above the site of injury
 - D. Heightened proprioceptive sensation
63. Which of the following statements is true regarding the use of damage-control resuscitation:
 - A. The amount of crystalloid use will be reduced
 - B. Only packed red blood cells may be used
 - C. Hemodilution is a likely result
 - D. The risk of disease transmission is increased
64. Usually, the earliest measureable sign of shock is considered to be
 - A. Deterioration of level of consciousness
 - B. Tachycardia
 - C. Restlessness
 - D. Dysrhythmias
65. The shock state best described as decreased cellular perfusion resulting from failure of a central pump is known as
 - A. Obstructive shock
 - B. Hypovolemic shock
 - C. Distributive shock
 - D. Cardiogenic shock
66. Which of the following substances will not initiate an anaphylactoid reaction?
 - A. Dextran
 - B. Thiamine
 - C. Opiates
 - D. Milk
67. On occasion, intraosseous placement is necessary. To ensure the needle is placed correctly
 - A. The needle needs to be held at 90° perpendicular to the injection site
 - B. There must not be a return of marrow when aspirated
 - C. Extravasation of fluid will occur when 40 ml of fluid is pushed
 - D. The needle will stand up unassisted
68. The universal donor for plasma is blood
 - A. Type B negative
 - B. Type O positive
 - C. Type AB negative
 - D. Type O negative
69. Fresh frozen plasma must be given within what period of time to be effective?
 - A. Two hours
 - B. 30 minutes
 - C. Six hours
 - D. Three hours

70. **Type II HIT patients are at great risk for developing**
- A. Generalized bleeding
 - B. Pericarditis
 - C. Thrombosis
 - D. Limb amputation
71. **Hemoglobin is primarily phagocytized in the**
- A. Liver
 - B. Gallbladder
 - C. Spleen
 - D. Pancreas
72. **A microbial phenomenon characterized by an inflammatory response to the microorganisms or the invasion of normally sterile tissue by those organisms is known as**
- A. Septicemia
 - B. SIRS
 - C. MODS
 - D. Infection
73. **An elderly female is admitted to your unit with tachycardia (HR 132), RR 30, BP 90/65, T 96.4°F. Her white count is 17,600. The patient states she was treated for a “kidney infection” two weeks ago. She denies pain at this time. This patient probably is suffering from**
- A. MODS
 - B. A kidney stone
 - C. SIRS
 - D. Appendicitis
74. **The systemic response to infection defined as the presence of SIRS in addition to a documented or presumed infection is known as**
- A. A SIRS sustained response
 - B. Sepsis
 - C. Bacteremia
 - D. A mediated response
75. **The presence of bacteria within the bloodstream is known as**
- A. Bacteremia
 - B. An inflammatory response
 - C. Septic shock
 - D. Septicemia
76. **A state of physiologic dysfunction in which two or more organ systems are not capable of maintaining homeostasis is known as**
- A. Cell-mediated sepsis
 - B. Cellular ischemia
 - C. End-organ hypoperfusion
 - D. Multiple organ dysfunction syndrome
77. **A sepsis-induced state with hypotension, despite adequate fluid resuscitation, is called**
- A. Secondary sepsis-induced hypotension
 - B. Severe sepsis
 - C. Primary sepsis-induced hypotension
 - D. Septic shock

- 78. The pH of banked blood is**
- A. 6.5
 - B. 7.3
 - C. 6.8
 - D. 7.1
- 79. Classification of a moderate collision would include all but one of the characteristics listed below. As a trauma nurse, you know characteristics of a moderate collision would not include**
- A. A door might be jammed, but no entrapment exists
 - B. An undrivable vehicle
 - C. Door intrusion of less than four to six inches
 - D. Minimal wheelbase reduction
- 80. What is one cause of autonomic hyperreflexia?**
- A. Diarrhea
 - B. Suctioning
 - C. Constipation
 - D. Warm breeze
- 81. The presence of a systolic blood pressure of less than 90 mmHg or a reduction of more than 40 mmHg from baseline in the absence of other causes of hypotension is known as**
- A. Septic shock
 - B. Secondary hypotension
 - C. Sepsis-induced hypotension
 - D. End-organ hypoperfusion
- 82. An important nursing consideration when administering mannitol to your patient is**
- A. Higher doses are required for patients suffering from rhabdomyolysis
 - B. Mannitol is not to be used in head-injured patients
 - C. Mannitol must be administered using an inline 5 micron filter
 - D. Mannitol causes ototoxicity if administered rapidly
- 83. If your patient is hypokalemic, what changes would you expect to see on an EKG tracing?**
- A. Peaked T waves
 - B. U waves
 - C. Shortened QT intervals
 - D. Absent P waves
- 84. Lactate is a marker for cellular hypoxia. Certain conditions that cause inadequate oxygen delivery may elevate the lactate level. Which of the following conditions should not cause an elevation in lactate levels?**
- A. Septic shock
 - B. Seizures
 - C. Diabetes mellitus
 - D. Hypothermia
- 85. Epinephrine and norepinephrine may be used in the ED to treat hypotension. Which of the following actions of these vasopressors will increase blood glucose?**
- A. Lower peripheral insulin resistance
 - B. Increase insulin secretion
 - C. Decrease lipolysis
 - D. Increase liver glycogenolysis

- 86. Your patient was stung by a bee and had an anaphylactic reaction. She has received epinephrine both via EpiPen and intravenously because she had severe airway obstruction due to swelling. Epinephrine is given for anaphylactic reactions because**
- A. It prevents localized edema
 - B. It promotes temporary changes in ST segments
 - C. It prevents third space fluid loss
 - D. It promotes bronchodilation and inhibits additional mediator release
- 87. Which of the following medications would you anticipate using to improve the pumping action of the heart when a patient is developing cardiogenic shock?**
- A. Dobutamine
 - B. Epinephrine
 - C. Diltiazem
 - D. Isoproterenol
- 88. Generalized myocardial depression usually occurs when**
- A. The potassium level reaches 5.2
 - B. The sodium level is 145
 - C. The pH is <7.20
 - D. The magnesium level is 4.0
- 89. Use of whole blood in damage-control resuscitation**
- A. Is not likely to cause hypothermia
 - B. Decreases the risk of disease transmission over packed cells
 - C. Must be used within 24–48 hours to assure maximum effectiveness
 - D. Has a universal donor
- 90. If a victim is ejected from a vehicle involved in a motor vehicle crash, the victim is _____ times more likely to be killed than if the victim was restrained in the vehicle at the time of the crash.**
- A. 10
 - B. 25
 - C. 5
 - D. 30
- 91. Which of the following statements is false about the concept of preload?**
- A. Preload is increased by sympathetic stimulation
 - B. Preload is a systolic phenomenon
 - C. Hypervolemia increases preload
 - D. Renal problems increase preload
- 92. Which of the following statements about motor vehicle crashes involving older adults is true:**
- A. The MVCs are primarily related to speed and alcohol consumption
 - B. Merging into traffic is smoother due to the experience of the driver
 - C. Normal age-related physiological changes significantly contribute to MVCs
 - D. There are less sternal fractures in older adults because of increased seatbelt use

SECTION 3: ANSWERS

- 1. Correct answer: C**
Adult victims of vehicle versus pedestrian collisions tend to turn away from the impact. They often are thrown onto the hood and windshield of the vehicle before sliding to the ground with potentially additional injuries. Impact is usually lateral and posterior. Children tend to turn toward the point of impact, suffering a combination of head, chest, and/or lower extremity injuries.
- 2. Correct answer: A**
A sympathetic response to stimuli results in heightened awareness, increased blood pressure, bronchial dilation, and increased glucogenesis. Other responses include dilated pupils for increased visual acuity, increased heart rate, increased myocardial contractility, increased blood pressure, increased respiratory rate, decreased gastric motility, decreased gastric secretion, decreased urine output, decreased insulin production, and decreased renal blood flow.
- 3. Correct answer: C**
When assessing a patient for the possibility of hemorrhagic shock, there are three primary areas to consider: the chest, abdomen, and pelvis. Isolated head injuries will not cause hemorrhagic shock.
- 4. Correct answer: B**
This patient appears to be decompensating and developing hypovolemic shock. He is in sinus tachycardia and his systolic blood pressure is only 84 and his CVP is 4, RR is 26, skin is cool and clammy, and his mentation is diminished.
- 5. Correct answer: A**
Neurogenic, septic, and anaphylactic are types of distributive shock. In distributive shock, there is a maldistribution that does not allow for normal flow to peripheral tissues, resulting in decreased cellular perfusion. Cardiac tamponade, pregnancy, and aortic stenosis are causes of obstructive shock.
- 6. Correct answer: B**
The main components of the Trauma Triad of Death include coagulopathy, hypothermia, and metabolic acidosis. When patients are hypothermic, thrombin production is impaired and platelet function is inhibited. A state of acidosis also impairs thrombin production. Due to hemodilution, the body's ability to produce clotting factors is diminished.
- 7. Correct answer: D**
A heart rate of more than 80 beats per minute was not identified as a variable for the definition of SIRS.
- 8. Correct answer: A**
When describing the amount of exterior deformation of a vehicle sustained in a collision, the commonly used term is *crush*. This term describes the description of dispersal of energy. The more crush, the greater the amount of energy that is absorbed by the vehicle and a lesser amount of energy transferred to occupants.
- 9. Correct answer: B**
Use of permissive hypotension will exacerbate a head injury by decreasing perfusion and thus oxygen and nutrient delivery. Also, permissive hypotension should never be used for elderly or pediatric patients. In actuality, permissive hypotension decreases the likelihood of hypothermia, reduces risks associated with hypothermia, and decreases coagulopathies.
- 10. Correct answer: B**
One unit of platelets elevates the platelet count approximately ,5000–10,000 u/dL.
- 11. Correct answer: C**
When assessing a patient for the possibility of hemorrhagic shock, there are three primary areas to consider: the chest, abdomen, and pelvis. Isolated head injuries will not cause hemorrhagic shock.

12. Correct answer: C

The ratio of heart rate in bpm to systolic blood pressure measured in mmHg is known as the shock index (SI). Some clinicians use it to assess blood loss and degree of hypovolemic shock and the potential need for transfusions. The most commonly used scale is

Group I	= SI < 0.6	No Shock
Group II	= SI ≥ 0.6 to < 1	Mild Shock
Group III	= SI ≥ 1 to < 1.4	Moderate Shock
Group IV	= SI ≥ 1.4	Severe Shock

For example, a patient with a heart rate of 130 and a systolic blood pressure of 90, would have a shock index of 1.44, indicating severe shock. $130 \div 90 = 1.44$.

13. Correct answer: B

There are multiple impacts that take place during a motor vehicle collision. When a victim sustains head, chest, and abdominal injuries, the injuries usually occur during the second impact. The victim continues in motion and will collide with the interior of the vehicle unless acted on by resistance such as an airbag or seatbelt.

Front seat occupants may sustain one of two types of injury patterns. If the victim sustains an “up and over” path, the head and chest strike the dashboard and windshield. The victim may also travel “down and under” the steering wheel or dashboard, suffering lower extremity or pelvic injuries. Many times, this type of injury occurs because the seatbelt is placed over the abdomen.

14. Correct answer: B

In trauma patients, the INR may be useful in identifying trauma-induced coagulopathy early. The INR value that would indicate this condition is an INR of 1.5.

15. Correct answer: C

Administering uncrossed blood in an emergency has always been controversial. Recommendations now include Massive Transfusion Protocols that suggest the resuscitation rooms are stocked and reserved prior to patient arrival with O negative blood for females and children, and O positive blood for male traumas. There is a larger donor pool for O positive and a much smaller pool for O negative donors.

16. Correct answer: A

Patients in the early stage of hypovolemic shock demonstrate respiratory alkalosis primarily due to tachypnea. CO₂ is blown off resulting in an alkalotic state.

17. Correct answer: C

While participating in a cardiac arrest on your unit, you note a colleague is performing chest compressions on an adult at a rate of approximately 90 per minute. The correct rate for performing chest compressions on an adult is 100–120 per minute, according to the 2015 American Heart Association guidelines for CPR and ECC. It is also good practice to allow the chest to fully recoil after each compression.

18. Correct answer: C

A pulse pressure is the difference between the systolic blood pressure and the diastolic blood pressure—in this case, 30. This measurement is significant because if the patient has a narrow pulse pressure, it would indicate systemic compensatory vasoconstriction due to a decrease in arterial pressure (the stroke volume falls and the systolic pressure decreases). Another way to look at this phenomenon is to think of the high systemic vascular resistance causing an increase in diastolic pressure.

19. Correct answer: C

The MAP is a mean pressure that takes into account that the diastolic phase of the cardiac cycle comprises two-thirds of the cycle. The calculation for the MAP is $MAP = 2(DBP) + (SBP)/3$; in this case, 85. If you took the average of the two pressures, it would not account for the importance of the diastolic

phase. The heart rate is not entered into this calculation. Patients should maintain a MAP of at least 60 to ensure perfusion to the brain and kidneys.

When the heart rate is over 100, the diastolic phase may be less than one-half the cardiac cycle. Electronic machines are calibrated to take variables into consideration, and the digitally displayed MAP readings are highly accurate.

20. Correct answer: C

An adult patient has fallen from the balcony of a fourth floor apartment to the street below. Falls from this height usually result in a mortality rate of 50%. A fall is rated as severe if greater than three times the height of a victim. Children have a 50% mortality rate for falls from the sixth floor.

According to the CDC and 2011 Guidelines for Field Triage of Injured Patients, any victim meeting the following criteria need to be transported immediately to a trauma center:

- falls
 - » adults: > 20 feet (one story = 10 feet)
 - » children: > 10 feet or two to three times the height of the child
- high-risk auto crash
 - » intrusion, including roof: > 12 inches occupant site; > 18 inches any site
 - » ejection (partial or complete) from automobile
 - » death in same passenger compartment
 - » vehicle telemetry data consistent with a high risk for injury
- automobile versus pedestrian/bicyclist thrown, run over, or with significant (> 20 mph) impact or
- motorcycle crash > 20 mph

21. Correct answer: B

Normal cardiac output should be 4 to 8 L/min. The formula for calculating this value is: $CO = HR \times SV$. In this case, $76 (HR) \times 65 (SV) = 4,940 \text{ ml/min}$. Converted to liters, this value would equal 4.94 L/min.

22. Correct answer: C

Blood component (factor) replacement therapy for DIC does not include aminocaproic acid (Amicar). Amicar is used to inhibit fibrinolysis, not replace clotting factors. It is used in the treatment of DIC, but it may change a simple bleeding issue into DIC. It must be used in combination with heparin. DIC is usually treated with FFP, cryoprecipitate, and platelets. Cryoprecipitate contains more than 5–10 times more fibrinogen than FFP. A good rule of thumb is to give 10 units of cryoprecipitate for every 3 units of FFP. If the patient is actively bleeding, platelets are commonly used.

23. Correct answer: C

Low-molecular-weight heparin is more stable than unfractionated heparin. LMWH (i.e., Lovenox) is so stable and predictable that PTTs are not required. It is also easy to administer at home.

24. Correct answer: A

Hemoglobin is phagocytized primarily in the liver. Hemoglobin is comprised of two parts. The first part is “heme” that causes the reddish color and contains iron and porphyrin. The second part is a protein called “globin.” Hemoglobin combines with oxygen to form oxyhemoglobin. Hemoglobin also binds with CO_2 and carries it to alveoli to be expired. When the hemoglobin is phagocytized in the liver, it breaks down into the heme and globin.

25. Correct answer: C

Due to a data entry error an 18-year-old mother with A- blood type, received a transfusion of Rh-positive platelets following a placental abruption, and it would be appropriate to administer RhoGAM®. Assuming that the mother was not given RhoGAM® after her last pregnancy and the father of this fetus is Rh positive, then there is a 50% possibility that the fetus will be Rh positive and the mother may have developed IgG antibodies to this pregnancy. The risk of maternal memory B cells being triggered to produce antibodies to the Rho(D) antigen increase with the introduction of Rh positive blood. Antigen presenting cells like neutrophils, monocytes, macrophages, B-cells and T_h cells take that antigen and present it on the surface to T_h cells. These T_h cells present the antigen to primary B cells

that create an IgG antibody to match the antigen and create memory cells or antibody factories that go dormant until exposed to that antigen again. With subsequent exposures, the anti-Rho(D) factories (plasma B cells) can go into production faster than before because the maternal immune system (memory cells) already recognizes the problem and has the blueprint for the solution (antibody). This would not be a problem, but the very thing we like about IgG (able to cross the placenta to provide immunity to the fetus) is the very thing that in this case will kill the fetus. As the antibodies for the Rho(D) antigen (found on all fetal RBCs) cause the fetal RBC to lyse, and the fetus becomes severely anemic. The massive destruction of RBC leads to hyperbilirubinemia as hemoglobin is released into vascular circulation with the potential of causing neurologic injury. As oxygen-carrying capacity decreases, hypoxemia increases hypoxia at the tissue level. All of these elements increases the risk for fetal death.

RhoGAM® is a Rh immune globulin. It is thought to attack the Rho(D) antigen on RBC in the maternal bloodstream. This would prevent activation of maternal immune response and resultant Rho(D) antigen antibody production. The method of action is either that the cells are destroyed before detection, hidden with globulin/antigen binding before detection, or the binding of the globulin to the antigen blocks T_H cells from binding and initiating the immune response cascade.

With each exposure to Rh positive blood, the immune response becomes faster with higher production of antibodies. This mother should be carefully monitored throughout this and any subsequent pregnancy for any possible change in fetal status indicating hemolytic anemia.

26. Correct answer: B

Your patient was practicing Parkour and attempting to jump across the roofs of buildings about 30 feet in the air, missed, then fell to the ground. Other than the head, the second deadliest part of the body to land on would be the buttocks. Energy would be transmitted to the pelvis, then the abdomen, followed by the thorax. There is the possibility of injury to so many vital structures. If the patient had landed on the back, some of the energy would dissipate and potentially reduce severity. If this patient had fallen feet first, energy would be absorbed by the lower extremities, limiting damage to vital structures. If this patient had landed on the side, there certainly could have been damage to the pelvis, and some vital structures, but the patient would have a better chance of survival.

27. Correct answer: D

A red blood cell has multiple functions, including carbonic acid dissociation to form bicarbonate ions. The RBC provides oxygen transport via hemoglobin and carbon dioxide transport via carboxyhemoglobin. The RBC buffers protons by binding with hemoglobin to form acid hemoglobin.

28. Correct answer: A

Hetastarch may elevate serum amylase levels, but the levels will return to normal within a week after administration. Hetastarch will not increase serum potassium levels or increase capillary permeability. Hetastarch must be used with caution in patients in anaphylactic or septic shock because capillary permeability is already increased. Dextran may cause acute tubular necrosis.

29. Correct answer: B

Crystalloids, particularly lactated Ringer's solution, can accelerate systemic inflammation in trauma patients by activating neutrophils. These neutrophils destroy surrounding tissue by way of oxidative burst, then release hydrogen peroxide into the tissue, leading to acute respiratory distress syndrome (ARDS) and multiple organ failure (MOF/MODS).

30. Correct answer: A

Hypertonic saline suppresses inflammation, helps correct electrolyte imbalances, and pulls water back to the intravascular space from the cells and interstitial spaces.

31. Correct answer: C

Colloids are used for volume expansion. Particles suspended in colloids don't break down into smaller pieces in water and most won't fit through most capillary pores, so therefore they stay in the vascular bed.

32. Correct answer: A

Patients who are stung by bees numerous times are in danger of developing kidney failure. Bee stings have proteins in the venom that act as enzymes. The enzymes lyse the cells, and the cellular debris accumulates very quickly and actually clogs the kidneys. The patient then dies from kidney failure. Any patient who has been stung multiple times needs to be monitored for at least two weeks after the incident.

33. Correct answer: D

A frangible bullet is designed to break apart on impact. The bullet shatters or disintegrates. The result is a projectile that can help eliminate over penetration because it does not expand or deform like a hollow point bullet.

34. Correct answer: C

Stroke volume is comprised of contractility, preload, and afterload. Viscosity, blood volume, and impedance represent the components of afterload. Myocardium is sensitive to changes, especially increased afterload. With only minute changes in afterload, the stroke volume can fall significantly.

35. Correct Answer: B

The PQRST pain assessment method is used to collect assessment data regarding chest pain in a logical manner that ensures complete assessment data is gathered.

- The P in the acronym stands for “provokes.” Does any activity specifically provoke the pain?
- Q represents the “quality of the pain.” Typical adjectives used include *sharp, stabbing, squeezing, pressure, tightness, dull, indigestion-like, and pulsating*.
- R is “radiation,” meaning that pain starts at one location and ends at another location. For example, pain may radiate from the chest to the jaw, a specific arm, the back, and/or abdomen.
- S stands for “severity of the pain.” Some patients may have altered pain sensation from other disease processes such as diabetes, neuropathies, and multiple sclerosis and may not present with typical symptoms for a myocardial infarction.
- T stands for “time.” The duration of the pain is important when considering antithrombotics as treatment, because this is highly time sensitive and will impact success of the treatment.

36. Correct answer: B

During inspiration your patient has a paradoxical rise in jugular venous pressure. This phenomenon is commonly associated with right heart failure. Blood flow to the right ventricle is impaired because of a decrease in compliance or possibly fluid in the pericardial space. Blood backs up into the venous system, causing the increase in jugular venous pressure.

37. Correct answer: D

Stimulation of the parasympathetic nerve fibers in the heart will result in the release of acetylcholine. The acetylcholine binds to parasympathetic receptors. These receptors are classified into two types: muscarinic and nicotinic. Muscarinic parasympathetic receptors are located in the heart and smooth muscle. Nicotinic receptors are found at the neuromuscular junction, the central nervous system, and adrenal medulla.

38. Correct answer: C

Dobutamine is used to improve cardiac output by acting on beta-1 adrenergic receptors in the heart. It may cause minimal peripheral vasodilation but primarily acts to increase contractility, coronary blood flow, and heart rate to improve cardiac output. Dopamine acts on alpha-adrenergic receptors in the heart. Norepinephrine is a catecholamine that acts on both alpha- and beta-adrenergic receptors in the cardiovascular tissue.

39. Correct answer: B

Alpha-adrenergic effects of norepinephrine include peripheral arteriolar vasoconstriction. Increased force of myocardial contraction and increased AV conduction time are the effects of beta-adrenergic sympathetic stimulation.

40. Correct answer: D

The blood type that is the universal donor for packed red blood cells (PRBCs) is type O negative. Keep in mind that a patient with Rh negative blood and who may carry children in the future must receive Rh negative blood. A patient with Rh positive blood may receive both Rh negative and Rh positive blood.

41. Correct answer: A

Anaphylactic shock is one of three classifications of anaphylaxis. It is a systemic vasodilation that causes low blood pressure, which is by definition 30% lower than the person's baseline or below standard values.

Biphasic anaphylaxis is the recurrence of symptoms within 1–72 hours with no further exposure to the allergen. Pseudoanaphylaxis or anaphylactoid reactions are a type of anaphylaxis that does not involve an allergic reaction but is due to direct mast cell degranulation. *Nonimmune anaphylaxis* is the current term used by the World Allergy Organization.

42. Correct answer: A

In sepsis, endotoxins stimulate production of tumor necrosis factor (TNF). TNF, in turn, stimulates neutrophil activation and platelet aggregation. In addition, TNF stimulates increased capillary permeability and promotes the release of IL-1, IL-6, and IL-8.

43. Correct answer: A

The condition of anaphylaxis requires the patient to be sensitized by exposure to the antigen at least once and their reaction mediated through immunoglobulin E (IgE) antibodies. An anaphylactoid reaction doesn't need the presence of IgE-3. Examples of substances causing anaphylactic reactions include: antibiotics (penicillin, cephalosporins), foods (milk, egg whites, shellfish, nuts, chocolate, grains, beets), and foreign proteins (latex, venom, glue). Other potential causes of anaphylaxis may include anesthetics, egg-based vaccines, exercise, and cold.

44. Correct answer: A

Keep in mind that the half-life of lactate is around 20 minutes, even in septic patients. If the lactate is persistently elevated, it's not because the body can't get rid of it, but because the body continues to produce it.

It is critical to rapidly identify septic patients. They are defined as those with infection that has been confirmed or suspected by an experienced care provider, and the presence of two or more criteria for systemic inflammatory response syndrome. These criteria include a heart rate above 90 beats per minute, temperature below 36°C or above 38°C, either a respiratory rate above 20 breaths per minute or a CO₂ partial pressure less than 32 mmHg, and a WBC count either less than 4,000 cells/mm³ or with greater than 10% immature (band) forms. To meet the criteria for septic shock, the patient would have a systolic blood pressure below 90 mmHg after a 20–30 ml/Kg fluid bolus and a lactate level above 4 mmol/L.

45. Correct answer: B

In trauma patients, the INR may be useful in identifying trauma-induced coagulopathy early. The INR value that would indicate this condition is an INR of 1.5.

46. Correct answer: A

The term *Massive Transfusion* generally means a patient who has received > 10 units of PRBCs within 24 hours of admission. Having said that, several trauma surgeons have recently recommended changing the definition to include patients who have received 10 units of PRBCs within 6 hours.

47. Correct answer: B

The shock index (SI) for a patient with the following vital signs; HR: 120, RR: 22, BP 84/60 is 1.43. Heart rate of 120 divided by systolic BP of 84 = 1.43. This patient is in severe shock.

48. Correct answer: D

Tympanic membrane rupture and tinnitus are airbag injuries commonly associated with motor vehicle crashes. Keep in mind that patients with respiratory compromise, such as asthmatics, may develop issues secondary to the powder used in airbags. Patients may also sustain alkali injury in the eyes.

49. Correct answer: D

Use of packed red blood cells during resuscitation will raise hemoglobin levels by 1 gram per dL and hemoglobin by 3% per unit.

50. Correct answer: C

Your adult patient fell from a ladder and has sustained a closed femur fracture. A loss of 1,000 mL closely represents the estimated blood loss for this patient because this is an average for a patient with a closed femur fracture. The blood volume for an adult range between 4,700 and 5,500 mL.

51. Correct answer: A

When a patient receives banked blood, it is treated with citrate to prevent coagulation. The citrate binds with calcium, making it inactive, possibly worsening bleeding. The patient may become hypocalcemic, evidenced by dysrhythmias, tremors, and seizures. Usually about three grams of citrate is added per unit of blood. The liver can metabolize about 3 grams of citrate every 5 minutes. If the patient receives blood more often, they may suffer from citrate toxicity and hypocalcemia so the patient must be carefully monitored. Calcium gluconate or calcium chloride may need to be administered.

52. Correct answer: A

Your patient suffered a cardiac arrest and has achieved ROSC but is comatose (lacking meaningful response to verbal commands). According to the 2015 American Heart Association guidelines for CPR and ECC, targeted temperature management (TTM) is to maintain a constant temperature between 32°C and 35°C (89.6°F and 95.2°F) for at least 24 hours.

53. Correct answer: B

Chest compressions tend to be too shallow or too deep. If too shallow, the compression may be ineffectual. If too deep, the compression may actually cause an injury. According to the 2015 American Heart Association guidelines for CPR and ECC, compression depth should be targeted at 2 to 2.4 inches.

54. Correct answer: B

ST segment depression usually indicates myocardial ischemia. This patient also exhibited substernal chest pain, another finding seen with ischemia.

55. Correct answer: B

A low CVP reading may represent increased contractility. The heart is able to eject its contents more easily, reducing the pressure in the right atrium.

56. Correct answer: D

You are caring for a patient who will be admitted for observation for a possible pulmonary contusion sustained from a bicycle accident. The patient refused to wait for a wheelchair. While ambulating, the patient suddenly complains of chest pain. You note that while describing the pain, the patient clenches his fist over the sternal area. This gesture is commonly associated with ischemic chest pain and is known as Levine's sign. It is thought that the clenched fist occurs because pain is referred primarily to the left forearm. Patients suffering from acute coronary syndrome, an MI, or angina pectoris often produce this gesture.

57. Correct answer: B

The fluid of choice for trauma resuscitation is Lactated Ringer's (LR). LR is an isotonic crystalloid solution, so the fluid is similar to extracellular fluid. The lactate in the LR is converted to bicarbonate in the liver and helps buffer acidosis.

58. Correct answer: A

Your patient was an unrestrained passenger in a lateral impact car crash. The patient was a "far side" impact victim. This patient is unlikely to suffer an intrusion injury. The energy may be partially absorbed by the car interior and the seatbelt. If the patient was the driver and suffered a "near side" crush from intrusion, possible injuries could include shearing injuries, fractured clavicle; lateral pelvic, head, and neck injuries; and abdominal injuries.

- 59. Correct answer: B**
Crystalloids, particularly Lactated Ringer's solution, can accelerate systemic inflammation in trauma patients by activating neutrophils. These neutrophils destroy surrounding tissue by way of oxidative burst, then release hydrogen peroxide into the tissue, leading to acute respiratory distress syndrome (ARDS) and multiple organ failure (MOF/MODS).
- 60. Correct answer: A**
An IV fluid not considered to be a colloid would be 0.2% normal saline. Colloids include human albumin (a natural protein that's separated from plasma) and hetastarch (HES), a synthetic starch derived from hydroxyethyl glucose. Additional colloids include mannitol (an alcohol sugar) and dextran (a polysaccharide).
- 61. Correct answer: C**
Dextrose 5% in water (D₅W) is not used for resuscitation because its glucose is metabolized and quickly becomes hypotonic. In fact, D₅W is a good source of free water.
- 62. Correct answer: A**
A patient suffering from spinal shock would be expected to exhibit a loss of autonomic function. Urine production would decrease, loss of reflexes would be noted below the site of injury, and there would be a decrease of proprioceptive and possibly cutaneous sensation.
- 63. Correct answer: A**
When utilizing damage-control resuscitation, the amount of crystalloid use will decrease. Damage-control resuscitation may utilize plasma, platelets, and packed red blood cells.
- 64. Correct answer: B**
Usually, the earliest measureable sign of shock is considered to be tachycardia. When the MAP decreases, it in turn stimulates the sympathetic nervous system via the baroreceptor reflex. To maintain the cardiac output, the heart rate is increased.
- 65. Correct answer: D**
The shock state best described as decreased cellular perfusion resulting from failure of a central pump is known as cardiogenic shock.
- 66. Correct answer: D**
Milk will not initiate an anaphylactoid response, but will cause an anaphylactic response. An anaphylactoid reaction can occur following a single, first-time exposure to certain agents in nonsensitized patients. Anaphylactoid substances cause a direct breakdown of the mast cell and basophil membranes. An anaphylactoid reaction doesn't need the presence of IgE antibodies for a hypersensitivity reaction to occur. Substances which may cause an anaphylactoid response include NSAIDs, aspirin, radiopaque contrast media, fluorescein opiates, thiamine, and dextran. Additional triggers include sulfites, perfumes, bleach, wine, and beer.
- 67. Correct answer: D**
On occasion, intraosseous placement is necessary. To ensure the needle is placed correctly, it should stand up on its own. A lack of bone marrow presence does not necessarily mean failed placement, but if no marrow is present, placement is confirmed. A small push (5–10 ml) should result in minimal resistance and no extravasation.
- 68. Correct answer: C**
The universal donor for fresh frozen plasma is blood type AB negative.
- 69. Correct answer: C**
Fresh frozen plasma must be used within six hours. FFP takes 20 minutes to thaw.
- 70. Correct answer: B**
Type II HIT patients are at great risk for developing pericarditis. Type II HIT is sometimes called "white clot syndrome." Thrombi are primarily venous in origin and can lead to DVT, pulmonary emboli, thrombotic stroke, limb ischemia, and myocardial infarction.

71. Correct answer: A

Hemoglobin is phagocytized primarily in the liver. Hemoglobin is comprised of two parts. The first part is "heme" that causes the reddish color and contains iron and porphyrin. The second part is a protein called "globin." Hemoglobin combines with oxygen to form oxyhemoglobin. Hemoglobin also binds with CO₂ and carries it to alveoli to be expired. When the hemoglobin is phagocytized in the liver, it breaks down into the heme and globin.

72. Correct answer: D

A microbial phenomenon characterized by an inflammatory response to the microorganisms or the invasion of normally sterile tissue by those organisms is known as infection.

73. Correct answer: C

SIRS is a systemic infection that can present in the elderly with hypothermia and even a WBC of 4,000 or 12,000. MODS is usually the result of a direct injury to an organ. A kidney stone or appendicitis should present with pain and tenderness.

74. Correct answer: B

The systemic response to infection defined as the presence of SIRS in addition to a documented or presumed infection is known as sepsis.

75. Correct answer: A

The presence of bacteria within the bloodstream is known as bacteremia. An individual with bacteremia does not necessarily develop sepsis or SIRS.

76. Correct answer: D

A state of physiologic dysfunction in which two or more organ systems are not capable of maintaining homeostasis is known as multiple organ dysfunction syndrome (MODS).

77. Correct answer: D

A sepsis-induced state with hypotension despite adequate fluid resuscitation is called septic shock.

78. Correct answer: D

The pH of banked blood is 7.1. The acidosis may contribute to the development of dysrhythmias.

79. Correct answer: B

As a trauma nurse, you know a moderate collision has a lower risk of severe injuries. Door intrusion is a maximum of 4--6 inches, there is little or no wheelbase reduction, and occupants are not trapped.

80. Correct answer: C

Autonomic hyperreflexia, also known as autonomic dysreflexia, is caused by numerous stimuli such as bowel or bladder dysfunction, cool breezes, a clogged urinary catheter, and constipation.

81. Correct answer: C

The presence of a systolic blood pressure of less than 90 mmHg or a reduction of more than 40 mmHg from baseline in the absence of other causes of hypotension is known as sepsis-induced hypotension.

82. Correct answer: C

An important nursing consideration when administering mannitol to your patient is mannitol must be administered using an inline 5 micron filter. Mannitol may crystalize at low temperatures. The filter is also required if using mannitol with > 15 g/100mL (0.15%) solutions. Be cautious when giving mannitol to a patient in renal failure because the mannitol may cause hyperosmolarity.

83. Correct answer: B

A U wave is seen in patients who are hypokalemic. A peaked T wave, a shortened QT interval, and an absent P wave are seen with hyperkalemia.

84. Correct answer: D

Lactate is a marker for cellular hypoxia. Certain conditions that cause inadequate oxygen delivery may elevate the lactate level. Conditions that cause inadequate oxygen delivery may elevate the lactate

level are septic shock, profound dehydration, diabetes mellitus, seizures, hyperthermia, trauma, and prolonged tourniquet application. A level above 4.0 mmol/L is associated with a 27% mortality rate, compared with a mortality rate of 7% for patients with a lactate level of 2.5–4.0 mmol/L and a death rate below 5% for those with a lactate level below 2.5 mmol/L.

85. Correct answer: D

Epinephrine and norepinephrine may be used in the ED to treat hypotension. The following actions of these two vasopressors will increase blood glucose by increasing liver glycogenolysis and stimulating glycogenesis. In addition, epinephrine and norepinephrine increase peripheral insulin resistance, increase lipolysis, and suppress insulin secretion.

86. Correct answer: D

Epinephrine is given for anaphylactic reactions because it promotes bronchodilation and inhibits additional mediator release. Epinephrine counteracts the bronchoconstrictive and vasodilator actions of histamine by stimulating alpha, beta-1, and beta-2 receptors. Epinephrine is also useful in treating hay fever and urticaria.

87. Correct answer: A

Dobutamine is an inotrope and will improve the pumping action of the heart. This alpha-, beta1-, and beta2-agonist will increase contractility and cardiac output, with little or no concomitant increase in myocardial oxygen consumption. Dobutamine has a very mild vasodilatory effect, though high doses can cause ischemia.

88. Correct answer: C

Generalized myocardial depression usually occurs when the pH is < 7.2. It is not recommended that the patient be treated with bicarbonate. Rather, fixing the underlying injury is more beneficial.

89. Correct answer: C

Whole blood must be used within 24–48 hours to assure maximum effectiveness. Whole blood does lack a universal donor, and increases the risk of disease transmission. Whole blood is not used in large quantities in DCR, so there is less likelihood of hypothermia and issues with coagulopathy.

90. Correct answer: B

If a victim is ejected from a vehicle involved in a motor vehicle crash, the victim is 25 times more likely to be killed than if they were restrained in the vehicle at the time of the crash. Other considerations with victims who are ejected are that the victim may suffer greater injury by striking the ground or other object after ejection. About half of ejected victims sustain spinal injuries. The distance between the vehicle and the patient may indicate how fast the vehicle was traveling and may be used to calculate how much energy was absorbed by the victim.

91. Correct answer: B

As a trauma nurse, you know preload is a diastolic phenomenon. It is modulated by a variation in intravascular volume. The inertia of flowing blood fills the heart chambers during diastole and, as a consequence, stretch the myocardial fibers, storing mechanical energy in them.

Frank-Starling Law

An increase in stretched fibers during diastole have more mechanical energy stored in them and, therefore, contract with a higher force during the following ejection phase. This can be caused by pharmacologic agents (inotropes). Positive inotropes increase the contractility during the entire electromechanical systole (pre-ejection period + ejection phase). Negative inotropes decrease the contractility of the entire electromechanical systole (pre-ejection period + ejection phase).

Preload

Increases Preload

- Decreased muscle stretch after heart surgery
- Heart failure
- Hypervolemia

- Renal problems
- Sympathetic stimulation
- Vasoconstriction

Decreases Preload

- Decreased fill time
- Diuresis/Dehydration
- Hemorrhage
- Hyperthermia and sepsis must also be considered
- Hypovolemia
- Surgery
- Vasodilation
- Vomiting/Diarrhea

Afterload

Afterload is the impedance, or resistance a ventricle must overcome to eject its contents.

Increases Afterload

- Aortic stenosis
- Effects of vasopressive agents
- Hypertension
- Hypervolemia
- Hypothermia
- Vasoconstriction

Decreases Afterload

- Effects of nitrates
- Hyperthermia
- Low BP
- Sepsis
- Vasodilatation

92. Correct answer: C

Normal age-related physiological changes significantly contribute to MVCs. Primarily, these changes include vision, perception, hearing, and flexibility.