

**1 – Cellular Adaptations, Cell Injury, and Cell Death**

1.1) Which of the following is NOT characteristic of reversible cell injury?

- a) Reduced oxidative phosphorylation
- b) ATP depletion
- c) Cellular shrinking
- d) Changes in ion concentrations
- e) Water influx

1.2) Which of the following is NOT a characteristic of irreversible cell injury?

- a) Necrosis, which is always pathologic or apoptosis
- b) Intracellular accumulations (e.g. lipids) or calcification
- c) Structural changes (e.g. mitochondrial densities)
- d) Profound disturbances in membrane function
- e) Adaptable mitochondrial dysfunction

*Match the cellular response normally seen in cells with the stimuli (description):*

- |                                                        |                                               |
|--------------------------------------------------------|-----------------------------------------------|
| 2.1) Chronic irritation (chemical or physical)         | a) Hyperplasia/Hypertrophy                    |
| 2.2) Increased demand, increased trophic stimulation   | b) Atrophy                                    |
| 2.3) Reduced oxygen supply, chemical injury, infection | c) Metaplasia                                 |
| 2.4) Metabolic alterations, genetic or acquired        | d) Injury/Necrosis/Apoptosis                  |
| 2.5) Decreased nutrients, stimulation                  | e) Calcifications/Intracellular accumulations |

3) Which of the following describes hyperplasia?

- a) Increase in the number of cells (mitosis) in an organ or tissue
- b) Decrease in the number of cells (mitosis) in an organ or tissue
- c) Increase in individual cell size in an organ or tissue
- d) Decrease in individual cell size in an organ or tissue
- e) Reversible change in which one adult cell is replaced by another adult cell type

4.1) Most forms of pathologic hyperplasia are caused by excessive hormonal stimulation or growth factors acting on target cells. If a patient had hyperplasia of the endometrium, which of the following is the most likely?

- a) Increased risk of miscarriage
- b) Decreased risk of miscarriage
- c) Increased risk of endometrial cancer
- d) Decreased risk of endometrial cancer
- e) Increased risk of neurologic disease

4.2) Infection from which of the following is associated with hyperplasia?

- a) Papillomavirus
- b) Enterobacteria
- c) Staphylococci
- d) Streptococci
- e) Hook worms

5.1) Which of the following describes hypertrophy?

- a) Increase in the number of cells (mitosis) in an organ or tissue
- b) Decrease in the number of cells (mitosis) in an organ or tissue
- c) Increase in individual cell size in an organ or tissue
- d) Decrease in individual cell size in an organ or tissue
- e) Reversible change in which one adult cell is replaced by another adult cell type

5.2) In the heart, the stimulus for hypertrophy is usually chronic hemodynamic overload, resulting from either hypertension or faulty valves. During cardiac muscle hypertrophy, \_\_\_\_ myosin heavy chains are replaced by \_\_\_\_ myosin heavy chains, which leads to \_\_\_\_ ATPase activity and a slower, more efficient contraction.

- a)  $\alpha$ ;  $\beta$ ; Increased
- b)  $\alpha$ ;  $\beta$ ; Decreased
- c)  $\beta$ ;  $\alpha$ ; Increased
- d)  $\beta$ ;  $\alpha$ ; Decreased

5.3) Atrial natriuretic factor (ANF) serves to reduce hemodynamic load. In the embryonic heart, the gene for ANF is expressed in both the atrium and the ventricle. After birth, \_\_\_\_ expression of the gene is down regulated. Cardiac hypertrophy is associated with a(n) \_\_\_\_ of ANF gene expression.

- a) Atrial; Decrease
- b) Atrial; Increase
- c) Ventricular; Decrease
- d) Ventricular; Increase

6.1) Which of the following types of atrophy is involved in marasmus?

- a) Decreased workload
- b) Loss of innervation
- c) Diminished blood supply
- d) Inadequate nutrition (protein-calorie)
- e) Loss of endocrine stimulation
- f) Aging (senile atrophy)
- g) Pressure

6.2) Which of the following types of atrophy is involved in ischemia?

- a) Decreased workload
- b) Loss of innervation
- c) Diminished blood supply
- d) Inadequate nutrition (protein-calorie)
- e) Loss of endocrine stimulation
- f) Aging (senile atrophy)
- g) Pressure

6.3) Which of the following is associated with cachexia, seen in patients with chronic inflammatory diseases and cancer?

- a) Decreased workload
- b) Loss of innervation
- c) Diminished blood supply
- d) Inadequate nutrition (protein-calorie)
- e) Loss of endocrine stimulation
- f) Aging (senile atrophy)
- g) Pressure

6.4) Which cellular organelle contains acid hydrolases (e.g. cathepsins) and other enzymes to degrade endocytosed proteins from the extracellular environment and the cell surface as well as some cellular components during atrophy?

- a) Smooth ER
- b) Rough ER

- c) Golgi
  - d) Mitochondria
  - e) Lysosomes
- 6.5) The \_\_\_\_-proteasome pathway is responsible for the degradation of many cytosolic and nuclear proteins.
- a) Ubiquitin
  - b) Ouabain
  - c) Angiotensin
  - d) Methionine
  - e) Decarboxylase
- 6.6) Which of the following opposes proteasome-mediated protein degradation?
- a) Thyroid hormone
  - b) Cytokines
  - c) Glucocorticoids
  - d) Dexamethasone
  - e) Insulin
- 6.7) Atrophy may be accompanied by residual bodies, such as lipofuscin granules, which can turn tissue what color?
- a) Yellow
  - b) Blue
  - c) Brown
  - d) White
  - e) Red
- 7.1) Which of the following describes metaplasia?
- a) Increase in the number of cells (mitosis) in an organ or tissue
  - b) Decrease in the number of cells (mitosis) in an organ or tissue
  - c) Increase in individual cell size in an organ or tissue
  - d) Decrease in individual cell size in an organ or tissue
  - e) Reversible change in which one adult cell is replaced by another adult cell type
- 7.2) Which of the following is the most common stem cell reprogramming change involved in respiratory tract cancer?
- a) Squamous to columnar
  - b) Squamous to cuboidal
  - c) Columnar to squamous
  - d) Columnar to cuboidal
  - e) Cuboidal to squamous
- 7.3) In Barrett esophagus, metaplasia occurs as a result of refluxed gastric acid. Which of the following changes occurs?
- a) Squamous to columnar
  - b) Squamous to cuboidal
  - c) Columnar to squamous
  - d) Columnar to cuboidal
  - e) Cuboidal to squamous
- 8.1) Which of the following is associated with cell death and NOT specifically with reversible cell injury?
- a) Membrane blebs

- b) Clumping of chromatin
  - c) Swelling of ER
  - d) Swelling of mitochondria
  - e) Myelin figures
- 8.2) Which of the following is NOT associated with cell death?
- a) Nuclear condensation (pyknosis)
  - b) Nuclear fragmentation (karyorrhexis)
  - c) Dissolution of the nucleus (karyolysis)
  - d) Decrease in intracellular  $\text{Ca}^{++}$
  - e) Amorphous mitochondrial densities
- 8.3) Which of the following causes of cell injury involves a single amino acid substitution in hemoglobin S in sickle cell anemia?
- a) Oxygen deprivation
  - b) Physical agents
  - c) Chemical agents and drugs
  - d) Infectious agents
  - e) Immunologic reactions
  - f) Genetic derangements
  - g) Nutritional imbalances
- 9) Which of the following is NOT a principle relevant to most forms of cell injury?
- a) The cellular response to injurious stimuli depends on the type of injury, its duration, and its severity
  - b) The result of cell injury involves an increase in ATP production and decrease in intracellular  $\text{Ca}^{++}$
  - c) Cell injury results from functional and biochemical abnormalities in one or more of several essential cellular components
  - d) The consequences of cell injury depend on the type, state, and adaptability of the injured cell
- 10.1) Depletion of ATP to <5% to 10% of normal levels has widespread effects on many critical cellular systems. Which of the following is NOT a condition which may lead to depletion of ATP?
- a) Activity of the plasma membrane energy-dependent sodium pump is reduced
  - b) Failure of the  $\text{Ca}^{++}$  pump
  - c) Cellular energy metabolism is altered
  - d) Increase in protein synthesis followed by necrosis
  - e) Unfolding or misfolding of existing proteins
- 10.2) Ischemia reduces oxidative phosphorylation in mitochondria, resulting in a decrease in ATP production. Which of the following would NOT follow as a morphologic consequence?
- a) Increased anaerobic glycolysis
  - b) Increase in pH and glycogen
  - c) Decrease in protein synthesis
  - d) Influx of  $\text{Ca}^{++}$ ,  $\text{H}_2\text{O}$ , and  $\text{Na}^{++}$
  - e) Efflux of  $\text{K}^+$
- 11.1) Which of the following would NOT cause mitochondrial damage?
- a) Increase in cytosolic  $\text{Ca}^{++}$

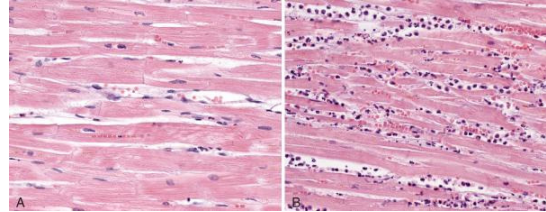
- b) Oxidative stress
  - c) Retention of cytochrome c
  - d) Breakdown of phospholipids through the phospholipase A2 and sphingomyelin pathways
  - e) Lipid breakdown products (e.g. free fatty acids and ceramide)
- 11.2) Which of the following most likely occurs if cytochrome c is released into the cytosol?
- a) Apoptosis
  - b) Hypertonicity
  - c) Hypotonicity
  - d) Increased extracellular Ca<sup>++</sup>
  - e) Decreased intracellular K<sup>+</sup>
- 12) Cell injury often results in increased intracellular calcium and this in turn mediates a variety of deleterious effects. Which of the following is NOT activated by calcium?
- a) ATPases
  - b) Phospholipases
  - c) Proteases
  - d) Endonucleases
  - e) ATP synthase
- 13.1) Some energy producing processes produce reactive oxygen species (free radicals) that can cause damage to cells. Which of the following is NOT a mechanism of free radical generation?
- a) Absorption of radiant energy
  - b) Enzymatic metabolism of exogenous chemicals or drugs
  - c) During creation of ATP via glycolysis
  - d) Free electron donation from transition metals (e.g. copper, iron)
  - e) Reduction-oxidation reactions during normal metabolic processes
- 13.2) Which of the following is NOT a mechanism by which free radicals cause cell injury?
- a) Lipid peroxidation of membranes
  - b) Oxidative modification of proteins
  - c) Lesions in DNA
  - d) Reactions with  $\beta$ -carotene
  - e) Reactions with thymine
- 13.3) Which of the following is NOT involved in free radical neutralization?
- a) Superoxide dismutase (SOD)
  - b) Nitric oxide (NO)
  - c) Vitamins A, C, and E
  - d) Glutathione peroxidase and reductase
  - e) Fenton (ferritin)
- 14.1) The two patterns of reversible cell injury are cellular swelling and fatty change. Which of the following would NOT be an ultrastructural change seen in such a cell?
- a) Decreased lysosomal activity
  - b) Plasma membrane alterations
  - c) Mitochondrial changes
  - d) Dilation of the ER
  - e) Nuclear alteration

14.2) Which of the following would NOT be an ultrastructural change seen in a reversibly injured cell?

- a) Blebbing
- b) Microvilli distortion
- c) Myelin figured
- d) Amorphous densities
- e) Cell shrinking
- f) Loosening of intracellular attachments

15.1) In the image to the right, A is normal myocardium and B is myocardium with coagulation necrosis. Which of the following can be discerned in B, suggesting necrosis?

- a) Eosinophilia
- b) Myeline figures
- c) Blebbing
- d) Cell swelling
- e) Apoptosis



*Match the following description with the term:*

- |                                                  |                 |
|--------------------------------------------------|-----------------|
| 15.2) Nuclear shrinkage and increased basophilia | a) Karyolysis   |
| 15.3) Nucleus undergoes fragmentation            | b) Pyknosis     |
| 15.4) Basophilia of the chromatin may fade       | c) Karyorrhexis |

16.1) Which of the following occurs as a result of release of activated pancreatic enzymes and can leave white, chalky deposits representing calcium soap?

- a) Coagulative necrosis
- b) Liquefactive necrosis
- c) Causeous necrosis
- d) Fat necrosis
- e) Gangrenous necrosis

16.2) Which of the following implies preservation of the basic outline of the involved cell for a span of at least some days?

- a) Coagulative necrosis
- b) Liquefactive necrosis
- c) Causeous necrosis
- d) Fat necrosis
- e) Gangrenous necrosis

16.3) Which of the following has a cheesy, yellow-white appearance at the area of necrosis and is encountered most often in foci of tuberculous infection?

- a) Coagulative necrosis
- b) Liquefactive necrosis
- c) Causeous necrosis
- d) Fat necrosis
- e) Gangrenous necrosis

16.4) Which of the following is characteristic of focal bacterial or, occasionally, fungal infections, because microbes stimulate the accumulation of inflammatory cells?

- a) Coagulative necrosis
- b) Liquefactive necrosis
- c) Causeous necrosis
- d) Fat necrosis

- e) Gangrenous necrosis
- 17.1) Which of the following types of cell injury involves anaerobic energy generation stopping after glycolytic substrates are exhausted, or glycolytic function becoming inhibited by the accumulation of metabolites?
- a) Ischemic
  - b) Hypoxic
  - c) Ischemic reperfusion
  - d) Chemical induced
- 17.2) When blood flow is restored to cells that have been previously made ischemic but have not died, injury is often exacerbated and proceeds at an accelerated pace.
- a) True
  - b) False
- 17.3) Increased generation of oxygen free radicals from parenchymal and endothelial cells and from infiltrating leukocytes would cause damage in which of the following cell injury mechanisms?
- a) Ischemic
  - b) Hypoxic
  - c) Ischemic reperfusion
  - d) Chemical induced
- 17.4) Chemically induced cell injury from carbon tetrachloride (CCl<sub>4</sub>) and acetaminophen (Tylenol) affect which organ?
- a) Brain
  - b) Kidneys
  - c) Pancreas
  - d) Spleen
  - e) Liver
- 17.5) CCl<sub>4</sub> is converted by P-450 to which highly reactive toxic free radical?
- a) CCl<sub>2</sub>
  - b) CCl<sub>3</sub>
  - c) CCl<sub>5</sub>
  - d) CCl<sub>6</sub>
  - e) Cl<sup>+</sup>
- 18.1) Like tissue necrosis, cell apoptosis causes inflammation.
- a) True
  - b) False
- 18.2) Which of the following is considered physiologic apoptosis, NOT pathologic apoptosis?
- a) Cell death from cytotoxic anticancer drug damage to DNA
  - b) Cell death due to damage from viral hepatitis
  - c) Cell death in tumors
  - d) Cell death induced by cytotoxic T cells
  - e) Pathologic atrophy in parenchymal organs after duct obstruction
- 18.3) Which of the following is NOT a morphologic feature of cells undergoing apoptosis?
- a) Hypoxia
  - b) Cell shrinkage

- c) Chromatin condensation
  - d) Formation of cytoplasmic blebs and apoptotic bodies
  - e) Phagocytosis of apoptotic cells or cell bodies, usually by macrophages
- 18.4) Certain cellular alterations permit the early recognition of dead cells by macrophages. What is the result of this process?
- a) Protein hydrolysis involving the activation of caspases
  - b) Swelling of cellular mitochondria
  - c) Phagocytosis without the release of cytokines
  - d) Ubiquitin destruction of cellular components
  - e) Destruction of surrounding tissue
- 18.5) Which of the following is inhibitory to the Fas (extrinsic) apoptosis pathway?
- a) FasL
  - b) FADD
  - c) FLIP
  - d) Pro Caspase-8
  - e) Active Caspase-8
- 18.6) Which of the following is inhibitory to the mitochondrial (intrinsic) apoptosis pathway?
- a) Cytochrome c
  - b) Bcl-2
  - c) Apaf-1
  - d) IAPs
  - e) Pro Caspase-9
  - f) Active Caspase-9
  - g) AIF
- 18.7) Expression of the CD-31 marker (PECAM-1) does which of the following?
- a) Prevents neutrophils from binding to macrophages
  - b) Allows neutrophils to bind to macrophages
  - c) Prevents neutrophils from being phagocytized
  - d) Allows neutrophils to be phagocytized
  - e) Is only expressed on the surface of cancer cells
- 18.8) Which of the following caspases is an executioner and not an initiator of apoptosis?
- a) CASP2
  - b) CASP8
  - c) CASP9
  - d) CASP10
  - e) CASP3, CASP6, CASP7

*Match the type of apoptosis with the involved item:*

- 18.9) Apoptosis After Growth Factor Deprivation a) p53
- 18.10) DNA Damage-Mediated Apoptosis b) Granzyme B
- 18.11) Apoptosis Induced by Tumor Necrosis Factor Family of Receptors c) FasL
- 18.12) Cytotoxic T-Lymphocyte-Mediated Apoptosis d) Bcl

19) The \_\_\_\_\_ ER is involved in metabolism of various chemicals via cytochrome P-450 and cells exposed to these chemicals show \_\_\_\_\_ of ER. Mitochondrial and cytoskeletal abnormalities are also apparent in injured cells.

- a) Rough; Atrophy



- b) Rough; Hypertrophy
- c) Smooth; Atrophy
- d) Smooth; Hypertrophy

*Match the abnormality which results in intracellular accumulations in nonneoplastic cells with the resultant disease:*

- 20.1) Abnormal metabolism a) Lysosomal storage diseases
  - 20.2) Mutations causing alterations in protein folding and transport b) Hemosiderosis
  - 20.3) Deficiencies in critical enzymes c) Alpha1-antitrypsin deficiency
  - 20.4) Inability to degrade phagocytosed particles d) Fatty change in liver
- 21.1) How do intracellular hyaline deposits, such as reabsorption droplets, Russell bodies, and Mallory alcoholic hyaline, appear when stained histologically with hematoxylin and eosin?
- a) Homogeneous and pink
  - b) Homogenous and purple
  - c) Disperse and pink
  - d) Disperse and purple
- 21.2) Which of the following diseases would most likely show glycogen abnormalities if tissues, such as the descending loop of Henle and liver cells, are stained with periodic acid shiff (PAS)?
- a) Chronic hypertension
  - b) Congestive heart failure
  - c) Abdominal aortic aneurysm
  - d) Rheumatoid arthritis
  - e) Diabetes mellitus
- 21.3) Hemosiderin is a hemoglobin-derived, golden yellow-to-brown, granular or crystalline pigment that can indicate a local excess of which of the following?
- a) Oxygen
  - b) CO<sub>2</sub>
  - c) Iron
  - d) Macrophages
  - e) Ca<sup>++</sup>
- 21.4) Bilirubin is hemoglobin-derived and the normal major pigment found in bile. If found in excess, what color does it change the skin?
- a) Black
  - b) White
  - c) Red
  - d) Yellow
  - e) Blue
- 22.1) The deposition of calcium salts in otherwise normal tissues is known as \_\_\_\_ calcification, and it almost always results from \_\_\_\_ secondary to some disturbance in calcium metabolism.
- a) Dystrophic; Hypercalcemia
  - b) Dystrophic; Hypocalcemia
  - c) Metastatic; Hypercalcemia
  - d) Metastatic; Hypocalcemia
- 22.2) Which of the following would NOT be associated with metastatic calcification?

- a) Increased secretion of parathyroid hormone (PTH)
- b) Destruction of bone tissue
- c) Vitamin D-related disorders
- d) Renal failure
- e) Aortic stenosis

## 2 – Acute and Chronic Inflammation

- 1) Which of the following is associated with acute inflammation?
  - a) Neutrophils
  - b) Macrophages
  - c) Lymphocytes
  - d) Tissue fibrosis
  - e) Tissue necrosis
- 2) Acute inflammation may be triggered by infections, trauma, physical or chemical agents, tissue necrosis, foreign bodies, and immune reactions. Which of the following is NOT seen in acute inflammation?
  - a) Alterations in vascular caliber
  - b) Decrease in blood flow
  - c) Structural changes in the microvasculature (edema)
  - d) Plasma proteins and leukocytes leaving the circulation
  - e) Leukocyte focusing to eliminate the offending agent
- 3) Vascular changes associated with acute inflammation include \_\_\_\_ (from histamine and NO) and \_\_\_\_ vascular permeability.
  - a) Vasoconstriction; Decreased
  - b) Vasoconstriction; Increased
  - c) Vasodilation; Decreased
  - d) Vasodilation; Increased

*Match the endothelial molecule (leukocyte adhesion molecule) with its major role:*

- |                                                                        |                 |
|------------------------------------------------------------------------|-----------------|
| 4.1) Rolling, adhesion to activated endothelium (neutrophils, T cells) | a) ICAM-1       |
| 4.2) Adhesion (eosinophils, monocytes, lymphocytes)                    | b) P-selectin   |
| 4.3) Leukocyte migration through endothelium                           | c) E-selectin   |
| 4.4) Rolling (neutrophils, monocytes, lymphocytes)                     | d) VCAM-1       |
| 4.5) Adhesion, arrest, transmigration (all leukocytes)                 | e) GlyCAM-1     |
| 4.6) Lymphocyte homing to high endothelial venules                     | f) CD31 (PECAM) |
- 4.7) Mediators such as histamine, thrombin, and platelet activating factor (PAF) stimulate the redistribution of which of the following from its normal intracellular stores in granules (Weibel-Palade bodies) to the cell surface?
    - a) P-selectin
    - b) E-selectin
    - c) ICAM-1
    - d) VCAM-1
    - e) CD31
  - 4.8) Cytokine activation of endothelium (with neutrophils) involves which of the following?
    - a) IL-1 and IL-2
    - b) IL-3

- c) IL-4 and IL-5
  - d) TH-1 cells and TH-2 cells
  - e) IL-1 and TNF
- 5) Which of the following is NOT a general principle of the chemical mediators of inflammation?
- a) Mediators originate either from plasma or from cells
  - b) The production of active mediators is triggered by microbial products or by host proteins
  - c) Most mediators perform their biologic activity by initially binding to specific receptors on target cells
  - d) One mediator can stimulate the release of other mediators by target cells themselves
  - e) Mediators can act on one or few target cell types
  - f) Once activated and released from the cell, most of these mediators last a long time (long-lived)
  - g) Most mediators have the potential to cause harmful effects

*Match the mediator or acute inflammation with the source and action:*

	<i>Source</i>	<i>Vascular Leakage</i>	<i>Chemotaxis &amp; Other</i>	
6.1) Mast cells, platelets	+	-		a) Histamine, serotonin
6.2) Plasma substrate	+	-, pain		b) Leukotrienes C4, D4, E4
6.3) Plasma protein via liver	+	-, opsonic fragment		c) Nitric oxide
6.4) Macrophages	+	+, leukocyte adhesion		d) Chemokines
6.5) Mast, phospholipids	other	-, vasodilation, pain, fever		e) IL-1, TNF
6.6) Leukocytes	-	+, leukocyte adhesion		f) Bradykinin
6.7) Leukocytes, mast cells	+	-, bronchoconstrict, vasoconstrict		g) PAF
6.8) Leukocytes	+	-, endothelial damage, tissue damage		h) C3a
6.9) Leukocytes, mast cells	+	+, bronchoconstrict, leukocyte prime		i) C5a
6.10) Macrophages, other	-	+, acute-phase reactions		j) Leukotriene B4
6.11) Leukocytes, others	-	+, leukocyte activation		k) O <sub>2</sub> metabolites
6.12) Macrophages, endoth.	+	+, vasodilation, cytotoxicity		l) Prostaglandins

7.1) Nitric oxide (NO) is synthesized from what amino acid by the enzyme nitric oxide synthase (NOS)?

- a) Alanine
  - b) Arginine
  - c) Asparagine
  - d) Lysine
  - e) Tryptophan
- 7.2) NO causes vasodilation by what mechanism?
- a) Constriction of smooth muscle
  - b) Relaxation of smooth muscle
  - c) Constriction of striated muscle
  - d) Relaxation of striated muscle
- 7.3) Which of the following is NOT true regarding NO?
- a) NO acts on target cells through induction of GMP
  - b) NO reduces platelet adhesion
  - c) NO reduces leukocyte adhesion

- d) NO promotes leukocyte rolling
  - e) NO decreases inflammation
- 8) Which of the following is NOT true regarding contribution to inflammation?
- a) Lysosomal constituents increase vascular permeability and tissue damage
  - b) Oxygen free radicals amplify the cascade that elicits the inflammatory response
  - c) Neuropeptides help initiate and propagate the inflammatory response
  - d) The response to hypoxia decreases vascular permeability
  - e) The response to necrotic cells is pro-inflammatory
- 9) One possible outcome of acute inflammation is resolution, with the other outcomes being chronic inflammation and fibrosis (loss of function). Which of the following is NOT associated with resolution?
- a) Clearance of injurious stimuli
  - b) Clearance of mediators and acute inflammatory cells
  - c) Replacement of injured cells
  - d) Normal function
  - e) Angiogenesis
- 10.1) Which of the following appears, histologically, as an eosinophilic meshwork of threads or sometimes as an amorphous coagulum?
- a) Serous inflammation
  - b) Fibrinous inflammation
  - c) Suppurative or purulent inflammation
  - d) Ulcers
- 10.2) Which of the following is characterized by the production of large amounts of pus consisting of neutrophils, necrotic cells, and edema fluid?
- a) Serous inflammation
  - b) Fibrinous inflammation
  - c) Suppurative or purulent inflammation
  - d) Ulcers
- 10.3) Which of the following is marked by the outpouring of a thin fluid that, depending on the size of injury, is derived from either the plasma or the secretions of mesothelial cells lining the peritoneal, pleural, and pericardial cavities?
- a) Serous inflammation
  - b) Fibrinous inflammation
  - c) Suppurative or purulent inflammation
  - d) Ulcers

*Match the type of chronic inflammation with the associated disease:*

- |                                                      |                              |
|------------------------------------------------------|------------------------------|
| 11.1) Persistent infections                          | a) Silicosis                 |
| 11.2) Prolonged exposure to potentially toxic agents | b) Rheumatoid arthritis      |
| 11.3) Autoimmunity                                   | c) <i>Treponema pallidum</i> |

- 12) Unlike acute inflammation, chronic inflammation is characterized by tissue destruction, induced by the persistent offending agent or by the inflammatory cells. It is also characterized by the cells involved, which include all of the following EXCEPT:
- a) Lymphocytes
  - b) Plasma cells
  - c) Macrophages
  - d) Neutrophils

- e) Eosinophils
  - f) Mast cells
- 13) A granuloma is a focus of chronic inflammation consisting of a microscopic aggregation of macrophages. Which of the following is an immune granuloma and NOT a foreign body granuloma?
- a) Talc
  - b) Sutures
  - c) Microbes
  - d) Soil
  - e) Glass
- 14) A patient presents with an infection of the hand and red streaks along the arm and into the axilla, with painful nodules in the axilla. This is due to a secondary inflammation of the \_\_\_\_\_, which \_\_\_\_\_ in flow due to the infection.
- a) Blood; Increased
  - b) Blood; Decreased
  - c) Lymph; Increased
  - d) Lymph; Decreased
- 15) Which of the following is NOT a systemic effect of inflammation?
- a) Fever
  - b) Increased acute-phase proteins
  - c) Leukocytosis
  - d) Decreased pulse and blood pressure
  - e) Cytokine release (IL-1 and TNF)
- 16) Which of the following would be associated with defective inflammation?
- a) Infections
  - b) Allergies
  - c) Asthma
  - d) Psoriasis
  - e) Vitiligo

### 3 – Tissue Renewal and Repair: Regeneration, Healing, and Fibrosis

- 1) Which of the following is NOT capable of regeneration?
- a) Epithelial tissue
  - b) Cardiac tissue
  - c) Skin
  - d) Liver
  - e) Kidney
- 2.1) Which of the following is the correct order of the cell cycle?
- a) G1 => S => G2 => M
  - b) G2 => S => G1 => M
  - c) G1 => M => G2 => S
  - d) G2 => M => G1 => S
  - e) G1 => G2 => S => M
  - f) G1 => G2 => M => S
- 2.2) Which of the following is NOT a cell cycle checkpoint?
- a) Restriction checkpoint

- b) G0 checkpoint
  - c) G2 checkpoint
  - d) Anaphase checkpoint
  - e) Postreplication checkpoint
- 2.3) Which part of the cell cycle has the most redundancies, is tightly regulated by proteins called cyclins, and associated enzymes called cyclin-dependent kinases (CDKs)?
- a) Between G0 and G1
  - b) Between G1 and S
  - c) Between S and G2
  - d) Between G2 and M
  - e) Between M and G1
- Match the following cell types with their proliferative activity:*
- 3.1) Epidermis & GI tract epithelium                      a) Stable cells (quiescent)
- 3.2) Neurons & cardiac myocytes                              b) Labile cells (cycling)
- 3.3) Hepatocytes                                                      c) Permanent cells (nondividing)
- 4) Which of the following cell types is pluripotent?
- a) Quiescent
  - b) Labile
  - c) Permanent
  - d) Adult stem cell
  - e) Embryonic stem cell
- 5) Pluripotent cells can give rise to all types of tissues in the body.
- a) True
  - b) False
- 6.1) Which of the following growth factors comes from mesenchymal cells and functions to replicate hepatocytes?
- a) Epidermal Growth Factor (EGF)
  - b) Transforming Growth Factor- $\alpha$  (TGF- $\alpha$ )
  - c) Hepatocyte Growth Factor (HGF)
  - d) Vascular Endothelial Growth Factor (VEGF)
  - e) Platelet-Derived Growth Factor (PDGF)
  - f) Fibroblast Growth Factor (FGF)
- 6.2) Which of the following growth factors comes from platelets, macrophages, endothelial cells, and smooth muscle and functions as a chemotactic for PMNs, macrophages, fibronblast, and smooth muscle? It also functions to stimulate production of MMPs, stimulate angiogenesis, and wound contraction.
- a) Epidermal Growth Factor (EGF)
  - b) Transforming Growth Factor- $\alpha$  (TGF- $\alpha$ )
  - c) Hepatocyte Growth Factor (HGF)
  - d) Vascular Endothelial Growth Factor (VEGF)
  - e) Platelet-Derived Growth Factor (PDGF)
  - f) Fibroblast Growth Factor (FGF)
- 6.3) Which of the following growth factors comes from macrophages, mast cells, and T cells and functions in angiogenesis, wound repair, and hematopoiesis?
- a) Epidermal Growth Factor (EGF)
  - b) Transforming Growth Factor- $\alpha$  (TGF- $\alpha$ )

- c) Hepatocyte Growth Factor (HGF)
  - d) Vascular Endothelial Growth Factor (VEGF)
  - e) Platelet-Derived Growth Factor (PDGF)
  - f) Fibroblast Growth Factor (FGF)
- 6.4) Which of the following growth factors comes from platelets, macrophages, saliva, urine, milk, and plasma and functions to stimulate keratinocyte migration and granule tissue formation?
- a) Epidermal Growth Factor (EGF)
  - b) Transforming Growth Factor- $\alpha$  (TGF- $\alpha$ )
  - c) Hepatocyte Growth Factor (HGF)
  - d) Vascular Endothelial Growth Factor (VEGF)
  - e) Platelet-Derived Growth Factor (PDGF)
  - f) Fibroblast Growth Factor (FGF)
- 6.5) Which of the following growth factors comes from mesenchymal cells and increases vascular permeability and vasculogenesis?
- a) Epidermal Growth Factor (EGF)
  - b) Transforming Growth Factor- $\alpha$  (TGF- $\alpha$ )
  - c) Hepatocyte Growth Factor (HGF)
  - d) Vascular Endothelial Growth Factor (VEGF)
  - e) Platelet-Derived Growth Factor (PDGF)
  - f) Fibroblast Growth Factor (FGF)
- 6.6) Which of the following growth factors comes from mesenchymal cells and enhances proliferation of epithelial and endothelial cells?
- a) Epidermal Growth Factor (EGF)
  - b) Transforming Growth Factor- $\alpha$  (TGF- $\alpha$ )
  - c) Hepatocyte Growth Factor (HGF)
  - d) Vascular Endothelial Growth Factor (VEGF)
  - e) Platelet-Derived Growth Factor (PDGF)
  - f) Fibroblast Growth Factor (FGF)
- 6.7) Which of the following growth factors comes from macrophages, mast cells, and lymphocytes and functions in chemotaxis and regulation of cytokines?
- a) Tumor Necrosis Factor (TNF)
  - b) Transforming Growth Factor- $\beta$  (TGF- $\beta$ )
  - c) Keratinocyte Growth Factor (KGF)
  - d) Insulin-like Growth Factor (IGF-1)
  - e) Interleukin-1 (IL-1)
  - f) Interferons
- 6.8) Which of the following growth factors comes from fibroblasts and stimulates keratinocyte migration, proliferation, and differentiation?
- a) Tumor Necrosis Factor (TNF)
  - b) Transforming Growth Factor- $\beta$  (TGF- $\beta$ )
  - c) Keratinocyte Growth Factor (KGF)
  - d) Insulin-like Growth Factor (IGF-1)
  - e) Interleukin-1 (IL-1)
  - f) Interferons

- 6.9) Which of the following growth factors comes from macrophages and T cells and activates macrophages as well as regulates cytokines?
- a) Tumor Necrosis Factor (TNF)
  - b) Transforming Growth Factor- $\beta$  (TGF- $\beta$ )
  - c) Keratinocyte Growth Factor (KGF)
  - d) Insulin-like Growth Factor (IGF-1)
  - e) Interleukin-1 (IL-1)
  - f) Interferons
- 6.10) Which of the following growth factors comes from platelets, T cells, macrophages, fibroblast, and smooth muscle cells and is a growth inhibitor for most epithelial cells?
- a) Tumor Necrosis Factor (TNF)
  - b) Transforming Growth Factor- $\beta$  (TGF- $\beta$ )
  - c) Keratinocyte Growth Factor (KGF)
  - d) Insulin-like Growth Factor (IGF-1)
  - e) Interleukin-1 (IL-1)
  - f) Interferons
- 6.11) Which of the following growth factors comes from lymphocytes and fibroblasts, activates macrophages, and inhibits fibroblast proliferation?
- a) Tumor Necrosis Factor (TNF)
  - b) Transforming Growth Factor- $\beta$  (TGF- $\beta$ )
  - c) Keratinocyte Growth Factor (KGF)
  - d) Insulin-like Growth Factor (IGF-1)
  - e) Interleukin-1 (IL-1)
  - f) Interferons
- 6.12) Which of the following growth factors comes from macrophages and fibroblasts and stimulates synthesis of proteoglycans?
- a) Tumor Necrosis Factor (TNF)
  - b) Transforming Growth Factor- $\beta$  (TGF- $\beta$ )
  - c) Keratinocyte Growth Factor (KGF)
  - d) Insulin-like Growth Factor (IGF-1)
  - e) Interleukin-1 (IL-1)
  - f) Interferons
- 7) Which of the following is true regarding target cell signal transduction by growth factors?
- a) It stimulates the transcription of genes that were silent in the resting cells
  - b) It blocks the transcription of genes that were active in the resting cells
  - c) The genes regulate the entry of the cells into the cell cycle
  - d) The genes block the entry of the cells into the cell cycle
  - e) A & C
  - f) B & D
- 8) Which of the following signaling modes uses blood vessels and is associated with several cytokines?
- a) Autocrine signaling
  - b) Paracrine signaling
  - c) Endocrine signaling
- 9.1) Which of the following describes the JAK/STAT signal transduction pathway?



- a) Receptors with intrinsic tyrosine kinase activity
  - b) Receptors lacking intrinsic tyrosine kinase activity that recruit kinases
  - c) Seven transmembrane G-protein-coupled receptors (GPCRs)
  - d) Steroid hormone receptors
- 9.2) Which of the following signal transduction pathways includes cytokines such as interleukin-2 (IL-2)?
- a) Receptors with intrinsic tyrosine kinase activity
  - b) Receptors lacking intrinsic tyrosine kinase activity that recruit kinases
  - c) Seven transmembrane G-protein-coupled receptors (GPCRs)
  - d) Steroid hormone receptors
- 9.3) Which of the following is associated with the cAMP signal transduction pathway?
- a) Receptors with intrinsic tyrosine kinase activity
  - b) Receptors lacking intrinsic tyrosine kinase activity that recruit kinases
  - c) Seven transmembrane G-protein-coupled receptors (GPCRs)
  - d) Steroid hormone receptors
- 9.4) Vitamin D utilizes which of the following signal transduction pathways?
- a) Receptors with intrinsic tyrosine kinase activity
  - b) Receptors lacking intrinsic tyrosine kinase activity that recruit kinases
  - c) Seven transmembrane G-protein-coupled receptors (GPCRs)
  - d) Steroid hormone receptors
- 9.5) Which of the following is associated with the IP<sub>3</sub> signal transduction pathway?
- a) Receptors with intrinsic tyrosine kinase activity
  - b) Receptors lacking intrinsic tyrosine kinase activity that recruit kinases
  - c) Seven transmembrane G-protein-coupled receptors (GPCRs)
  - d) Steroid hormone receptors
- 10) Which of the following is NOT true regarding regeneration of mammalian tissue?
- a) Quiescent cells such as cardiac myotubes reenter the cell cycle
  - b) Stem cells in the area of injury differentiate efficiently
  - c) There is a rapid fibroproliferative response and scar formation after wounding
  - d) Regeneration is complete (not compensatory growth)
  - e) Regeneration involves cell hypertrophy and hyperplasia
- 11.1) Which of the following extracellular matrix (ECM) fibrous structural proteins is the most common protein in the animal world and is composed of a triple helix of three polypeptide  $\alpha$  chains?
- a) Collagen
  - b) Elastin
  - c) Fibrillin
  - d) Elastic fibers
- 11.2) The ECM contains cell adhesion molecules (CAMs). Which of the following families of CAMs are generally involved in calcium-dependent homotypic interactions?
- a) Immunoglobulin
  - b) Cadherins
  - c) Integrins
  - d) Selectins
- 11.3) Which of the following families of CAMs participate in both homotypic and heterotypic cell-to-cell interactions due to the types of ligands they bind?

- a) Immunoglobulin
  - b) Cadherins
  - c) Integrins
  - d) Selectins
- 11.4) Which of the following families of CAMs have broader ligand specificity and are responsible for many events involving cell adhesion?
- a) Immunoglobulin
  - b) Cadherins
  - c) Integrins
  - d) Selectins
- 11.5) Which of the following families of CAMs function in adhesion of leukocytes to endothelial cells?
- a) Immunoglobulin
  - b) Cadherins
  - c) Integrins
  - d) Selectins
- 11.6) Hyaluronic acid (HA) is a component of the ECM and is bound by what surface glycoprotein on leukocytes, allowing T cells to remain bound to endothelium at sites of inflammation?
- a) CD3
  - b) CD4
  - c) CD34
  - d) CD44
  - e) CD31
- 11.7) Proteoglycans, such as heparan sulfate, chondroitin sulfate, and dermatan sulfate, are a component of the ECM and made from glycosaminoglycans (GAGs). Which of the following is NOT a function of proteoglycans?
- a) They can be integral member proteins
  - b) They bind with fibroblast growth factor
  - c) They bind leukocyte surface markers
  - d) They modulate cell growth
  - e) They modulate cell differentiation
- Match the type of collagen with the location it is found:*
- 12.1) Found in the basement membrane      a) Type I
  - 12.2) Found in cartilage and discs      b) Type II
  - 12.3) Found in hollow organs      c) Type III
  - 12.4) Found in hard and soft tissue      d) Type IV
- Match the type of collagen with the associated genetic disorder:*
- 12.5) Achondrogenesis, Spondyloepiphyseal Dysplasia      a) Type I
  - 12.6) Alport Syndrome      b) Type II
  - 12.7) Osteogenesis imperfect, Ehlers-Danlos Syndrome      c) Type III
  - 12.8) Vascular Ehlers-Danlos Syndrome      d) Type IV
- 13.1) Which of the following growth factors appears to be the most important in scar formation during the fibroblast migration and proliferation stage?
- a) EFG
  - b) PDGF

- c) FGF
  - d) TNS
  - e) TGF- $\beta$
- 13.2) Which of the following is the most true regarding scar formation (net collagen accumulation)?
- a) Depends on increased collagen synthesis only
  - b) Depends on decreased degradation only
  - c) Depends on either increased collagen synthesis or decreased degradation
  - d) Depends on both increased collagen synthesis and decreased degradation
  - e) Depends on neither increased collagen synthesis nor decreased degradation
- 13.3) What is the function of matrix metalloproteinases (MMPs) in scar formation and tissue remodeling?
- a) Remodels collagen
  - b) Remodels other non-collagen ECM proteins
  - c) Both A & B
  - d) Degrades collagen
  - e) Degrades other non-collagen ECM proteins
  - f) Both D & E
- 14) Which of the following is true when comparing healing by second intention (separated edges) to healing by first intention (opposed edges)?
- a) Significant granulation and wound contraction are seen in first intention
  - b) A scab forms within 24 hours in first intention
  - c) A fibrous union is seen in first intention, weeks after injury
  - d) In first intention, mitosis near the wound is seen in 3-7 days
  - e) In first intention, new capillaries form in 3-7 days
- 15) Which of the following contributes to wound tensile strength toward the end of healing?
- a) Increased collagen synthesis
  - b) Decreased collagen degradation
  - c) Structural collagen fiber modification
  - d) Decreased collagen cross-linking
  - e) Decreased collagen fiber size
- 16.1) Which of the following drugs would NOT retard wound healing?
- a) Steroids
  - b) Cytotoxic medications
  - c) Vitamins (A, C)
  - d) Intensive antibiotic therapy
- 16.2) Which of the following would NOT retard wound healing?
- a) Obesity
  - b) Malnutrition
  - c) Protective dressings
  - d) Diabetes
  - e) Keloidosis
- 17) Which of the following wound healing complications can lead to wound dehiscence and ulceration?
- a) Deficient scar formation

- b) Excessive formation of the repair components
  - c) Formation of contractures
- 18) Which of the following differentiates fibrosis from normal wound healing?
- a) Cutaneous scar-cell proliferation
  - b) Cell-cell interactions
  - c) Cell-matrix interactions
  - d) ECM deposition
  - e) Immune and autoimmune reactions

#### **4 – Hemodynamic Disorders, Thromboembolic Diseases, and Shock**

- 1.1) What is the term for extravasation of water into the interstitial space?
- a) Hyperemia
  - b) Hemorrhage
  - c) Edema
  - d) Embolism
  - e) Infarction
- 1.2) Anasarca is a \_\_\_\_ and \_\_\_\_ edema with subcutaneous tissue swelling.
- a) Mild; Localized
  - b) Mild; Generalized
  - c) Severe; Localized
  - d) Severe; Generalized
- 1.3) Which of the following would NOT cause edema?
- a) Decreased hydrostatic pressure
  - b) Reduced plasma colloid osmotic pressure (hypoproteinemia)
  - c) Lymphatic obstruction
  - d) Sodium retention
  - e) Inflammation
- 1.4) Finger pressure over substantially edematous subcutaneous tissue displaces the interstitial fluid and leaves a finger-shaped depression. This is called:
- a) Lower limb edema
  - b) Sacral edema
  - c) Periorbital edema
  - d) Pitting edema
  - e) Pulmonary edema
- 2) Which of the following types of edema is more commonly known as ascites?
- a) Hydrothorax
  - b) Hydrocephalus
  - c) Hydrosalpinx
  - d) Hydropericardium
  - e) Hydroperitoneum
- 3.1) In heart failure, which of the following would NOT increase, leading to edema?
- a) Renin and angiotensin II
  - b) Aldosterone
  - c) Renal Na<sup>+</sup> reabsorption and retention
  - d) Antidiuretic hormone (ADH)
  - e) Cardiac output

- 3.2) In congestive heart failure (CHF) of the left ventricle, edema will develop in the \_\_\_\_ system. In CHF of the right ventricle, edema will develop in the \_\_\_\_ system.
- Circulatory; Pulmonary
  - Pulmonary; Circulatory
  - Circulatory; Hepatic
  - Hepatic; Circulatory
- 3.3) A deep vein thrombosis (DVT) causes edema by what mechanism?
- Inflammation
  - Lymphatic obstruction
  - Reduced plasma colloid osmotic pressure
  - Sodium retention
  - Increased hydrostatic pressure
- 3.4) During surgery, an anesthesiologist notices the patient's blood pressure has dropped. Which of the following could be given to increase plasma colloid osmotic pressure?
- Globulins
  - Vitamin K
  - Albumins
  - Steroids
  - Fibrinogens
- 3.5) The parasite filariasis (mosquito vectored) induces lower limb and external genitalia elephantiasis by which of the following mechanisms?
- Inflammation
  - Sodium retention
  - Reduced plasma colloid osmotic pressure
  - Lymphatic obstruction
  - Increased hydrostatic pressure
- 4) In hyperemia, which is caused by arterial dilation such as during exercise or inflammation, tissues are \_\_\_\_ because of increased \_\_\_\_ blood. In congestion, such as during CHF or venous obstruction, tissues are \_\_\_\_ because of increased \_\_\_\_ blood.
- Red; Oxygenated; Blue; Deoxygenated
  - Red; Deoxygenated; Blue; Oxygenated
  - Blue; Oxygenated; Red; Deoxygenated
  - Blue; Deoxygenated; Red; Oxygenated
- 5.1) Which of the following is most likely associated with skin purpura (>3mm hemorrhages) as opposed to petechiae (1-2mm hemorrhages)?
- Thrombocytopenia
  - Amyloidosis
  - Defective platelet function
  - Increased intravascular pressure
  - Clotting factor defecits
- Match the ecchymoses (bruise) product with the associated color:*
- 5.2) Bilirubin            a) Red-Blue
- 5.3) Hemoglobin        b) Gold-Brown
- 5.4) Hemosiderin      c) Blue-Green
- Match the hemostatic effect with the associated description/effect:*
- 6.1) Secretion of inhibitors of plasminogen activator (PAIs)            a) Antiplatelet effect



d) VII

e) II

*Match the coagulation cascade blockers with their description:*

9.1) Breaks down fibrin and interferes with its polymerization a) Antithrombin III

9.2) Neutralizes thrombin and other coagulation factors b) Protein C & S

9.3) Vitamin K dependent, inactivates factors Va and VIIIa c) Plasminogen

10.1) Which of the following is NOT part of the Virchow thrombosis triad?

a) Abnormal blood flow

b) Hypercoagulability

c) Reduction of clotting factors

d) Endothelial injury

10.2) Mutations to which of the following clotting factors cause hypercoagulable states most commonly?

a) I and II

b) II and XII

c) XII and V

d) V and II

e) XIII

10.3) Of the secondary (acquired) causes of thrombosis, which of the following is NOT considered high risk?

a) Prolonged bed rest

b) Atrial fibrillation

c) Prosthetic cardiac valves

d) Cancer

e) Smoking

*Match the thrombi with their description/morphology:*

11.1) Arterial thrombi in heart chambers or in the aortic lumen a) Vegetations

11.2) Occlusive and superimposed on an atherosclerotic plaque b) Mural thrombi

11.3) In lower extremities > 90% of the time c) Arterial thrombi

11.4) Associated with cardiac valves and endocarditis d) Venous thrombi

11.5) Lines of Zahn can be most commonly seen (microscopically) in thrombi of which organ?

a) Liver

b) Kidney

c) Brain

d) Heart

e) Spleen

12) Which of the following post-thrombus processes involves the thrombi inducing inflammation and fibrosis?

a) Propagation

b) Embolization

c) Dissolution

d) Organization and recanalization

13) Which of the following is commonly associated with arterial thrombosis and not venous thrombosis?

a) Inactivity

- b) Atherosclerosis
  - c) Cardiac failure stasis
  - d) Prothrombin gene mutation
  - e) Hypercoagulation disorders
- 14) Disseminated intravascular coagulation (DIC) is common in patient with gram-negative sepsis and acute promyelocytic leukemia. DIC has a high mortality rate and is a potential complication of any disease with widespread activation of which of the following?
- a) Fibrin
  - b) Thrombin
  - c) Tissue Factor
  - d) Fibrinogen
  - e) Hageman Factor
- 15) Pulmonary emboli are not commonly fatal and arise from DVT in > 95% of cases. What percentage of pulmonary circulation must be obstructed before right-sided heart failure (sudden death) occurs?
- a) > 95%
  - b) > 90%
  - c) > 80%
  - d) > 70%
  - e) > 60%
- 16) Systemic (arterial) emboli commonly arise from \_\_\_\_ and most commonly lodge in the lower limbs and sometimes the brain.
- a) Cardiac mural emboli
  - b) Cardiac valvular emboli
  - c) Deep vein emboli
  - d) Renal emboli
  - e) Hepatic emboli
- 17) Amniotic fluid emboli arise from the infusion of amniotic fluid or fetal tissue into the maternal circulation via a tear in the placental membranes or rupture of uterine veins. They are associated with a mortality rate of:
- a) 0 – 20%
  - b) 20 – 40%
  - c) 40 – 60%
  - d) 60 – 80%
  - e) 80 – 100%
- 18.1) How much air is required (in general) to have a clinical effect as an air emboli?
- a) 0.1 cc
  - b) 1 cc
  - c) 10 cc
  - d) 100 cc
  - e) 1 L
- 18.2) Caisson disease, a chronic form of decompression sickness, commonly affects all of the following EXCEPT:
- a) Femur (heads)
  - b) Tibia



c) Humerus

d) Scapula

18.3) SCUBA divers who surface too quickly can get decompression sickness (DCS). According to Henry's Law, as the diver surfaces, the partial pressure of gas in their blood \_\_\_\_ and thus the amount of gas in their blood must decrease and \_\_\_\_ the vasculature.

a) Decrease; Enter

b) Decrease; Exit

c) Increase; Enter

d) Increase; Exit

19.1) Which of the following is NOT a clinical finding in fat embolisms, which have a 10% fatality?

a) Pulmonary insufficiency

b) Neurologic symptoms

c) Thrombocytopenia and anemia

d) Tachypnea

e) Bradycardia

19.2) Which of the following is the most likely to cause a fat emboli?

a) Setting a shoulder dislocation

b) Healing of a chemical burn

c) Healing of a heat burn

d) A broken femur

e) Congestive heart failure

20) Which of the following is most likely associated with anemic (white) infarction and not hemorrhagic (red) infarction?

a) Venous occlusions (ovarian torsion)

b) Loose tissues (lungs)

c) Tissues with dual circulations (small intestine, lungs)

d) Solid organs with end-arterial circulation (heart, spleen, kidney)

e) Tissues that were previously congested because of sluggish venous outflow

f) When flow is re-established to a site of previous arterial occlusion and necrosis

21) In contrast to a septic (e.g. bacterial) infarction with large inflammatory response, a bland infarction is non-hemorrhagic.

a) True

b) False

*Match the types of shock with the description:*

22.1) Associated with systemic microbial infection

a) Hypovolemic

22.2) Loss of vascular tone and peripheral pooling of blood

b) Cardiogenic

22.3) Loss of blood or plasma volume

c) Septic

22.4) Myocardial pump failure

d) Neurologic

22.5) Patients who are in septic shock will have systemic \_\_\_\_\_ and thus a(n) \_\_\_\_\_ in peripheral vascular resistance. These patients will also have decreased myocardial contractility, although their cardiac index (CI) may be normal (compensatory).

a) Vasodilation; Decrease

b) Vasodilation; Increase

c) Vasoconstriction; Decrease

d) Vasoconstriction; Increase

23.1) Which of the following organs is least likely to be affected by shock, with necrosis being a common complication?

- a) Spleen
- b) Brain
- c) Lungs
- d) Kidneys
- e) GI tract
- f) Adrenals
- g) Heart

23.2) Which of the following is a sign of septic shock and NOT a sign of hypovolemic or cardiogenic shock?

- a) Hypotension
- b) Weak, thready pulse
- c) Tachycardia
- d) Cool, clammy, cyanotic skin
- e) Vasodilation

23.3) Cardiogenic shock associated with extensive myocardial infarction and gram-negative shock carry mortality rates of up to:

- a) 5%
- b) 25%
- c) 50%
- d) 75%
- e) 95%

## Answer Key

**Pathology #1**

1.1) C  
 1.2) E  
 2.1) C  
 2.2) A  
 2.3) D  
 2.4) E  
 2.5) B  
 3) A  
 4.1) C  
 4.2) A  
 5.1) C  
 5.2) B  
 5.3) D  
 6.1) D  
 6.2) C  
 6.3) D  
 6.4) E  
 6.5) A  
 6.6) E  
 6.7) C  
 7.1) E  
 7.2) C  
 7.3) A  
 8.1) E  
 8.2) D  
 8.3) F  
 9) B  
 10.1) D  
 10.2) B  
 11.1) C  
 11.2) A  
 12) E  
 13.1) C  
 13.2) D  
 13.3) B  
 14.1) A  
 14.2) E  
 15.1) A  
 15.2) B  
 15.3) C  
 15.4) A  
 16.1) D  
 16.2) A  
 16.3) C

16.4) B  
 17.1) A  
 17.2) A  
 17.3) C  
 17.4) E  
 17.5) B  
 18.1) B  
 18.2) D  
 18.3) A  
 18.4) C  
 18.5) C  
 18.6) D  
 18.7) C  
 18.8) E  
 18.9) D  
 18.10) A  
 18.11) C  
 18.12) B  
 19) D  
 20.1) D  
 20.2) C  
 20.3) A  
 20.4) B  
 21.1) A  
 21.2) E  
 21.3) C  
 21.4) D  
 22.1) C  
 22.2) E

**Pathology #2**

1) A  
 2) B  
 3) D  
 4.1) C  
 4.2) D  
 4.3) F  
 4.4) B  
 4.5) A  
 4.6) E  
 4.7) A  
 4.8) E  
 5) F  
 6.1) A  
 6.2) F  
 6.3) H

6.4) I  
 6.5) L  
 6.6) J  
 6.7) B  
 6.8) K  
 6.9) G  
 6.10) E  
 6.11) D  
 6.12) C  
 7.1) B  
 7.2) B  
 7.3) D  
 8) D  
 9) E  
 10.1) B  
 10.2) C  
 10.3) A  
 11.1) C  
 11.2) A  
 11.3) B  
 12) D  
 13) C  
 14) C  
 15) D  
 16) A

**Pathology #3**

1) B  
 2.1) A  
 2.2) B  
 2.3) B  
 3.1) B  
 3.2) C  
 3.3) A  
 4) E  
 5) A  
 6.1) B  
 6.2) E  
 6.3) F  
 6.4) A  
 6.5) D  
 6.6) C  
 6.7) E  
 6.8) C  
 6.9) A  
 6.10) B

6.11) F  
 6.12) D  
 7) E  
 8) C  
 9.1) B  
 9.2) B  
 9.3) C  
 9.4) D  
 9.5) A  
 10) D  
 11.1) A  
 11.2) B  
 11.3) A  
 11.4) C  
 11.5) D  
 11.6) D  
 11.7) C  
 12.1) D  
 12.2) B  
 12.3) C  
 12.4) A  
 12.5) B  
 12.6) D  
 12.7) A  
 12.8) C  
 13.1) E  
 13.2) D  
 13.3) F  
 14) A  
 15) C  
 16.1) C  
 16.2) E  
 17) A  
 18) E

**Pathology #4**

1.1) C  
 1.2) D  
 1.3) A  
 1.4) D  
 2) E  
 3.1) E  
 3.2) B  
 3.3) E  
 3.4) C  
 3.5) D

4) A  
 5.1) B  
 5.2) C  
 5.3) A  
 5.4) B  
 6.1) F  
 6.2) E  
 6.3) C  
 6.4) B  
 6.5) D  
 6.6) A  
 7.1) C  
 7.2) F  
 7.3) E  
 7.4) E  
 7.5) A  
 7.6) B  
 7.7) D  
 7.8) C  
 7.9) E  
 7.10) C  
 7.11) B  
 8) A  
 9.1) C  
 9.2) A  
 9.3) B  
 10.1) C  
 10.2) D  
 10.3) E  
 11.1) B  
 11.2) C  
 11.3) D  
 11.4) A  
 11.5) D  
 12) D  
 13) B  
 14) B  
 15) E  
 16) A  
 17) B  
 18.1) D  
 18.2) D  
 18.3) B  
 19.1) E  
 19.2) D  
 20) D

21) A  
 22.1) C  
 22.2) D  
 22.3) A  
 22.4) B  
 22.5) A  
 23.1) A  
 23.2) E  
 23.3) D

Please let me know if there are any errors  
and I will fix them.

**Email James Lamberg**  
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These questions were created directly from the PowerPoint presentations, ISP modules, and/or applicable material with reference to the required textbook(s).

*There may be mistakes, flaws, and incorrect answers.*

The most recent versions of these quizzes are posted on my website. If you think these quizzes are a good resource, please help me make them better.