

YR 2 PATHOLOGY UNIT EXAMINATION 1 -- November 16, 1998.

CHOOSE THE SINGLE BEST ANSWER FOR QUESTIONS 1 - 100.

1. How would you characterize the histologic alterations shown in **PHOTO #1** (from kidney, medium magnification)?
  - A. Infarction
  - B. Abscess
  - C. Chronic inflammation
  - D. Malignant hypertension
  - E. Nephrotic syndrome
  
2. Most likely gross appearance of the kidney shown in **PHOTO #1**:
  - A. No gross alteration (i.e. grossly normal)
  - B. Enlargement
  - C. Liquified areas
  - D. Depressed cortical scars
  - E. A pale, cone-shaped area with a congested border
  
3. Most likely process depicted in **PHOTO #2** (bowel wall shown at intermediate magnification):
  - A. Coagulation necrosis
  - B. Caseous necrosis
  - C. Hemorrhagic necrosis
  - D. A scar
  - E. Bacterial infection

4. Disease or lesion most likely depicted in **PHOTO 3**:
- A. Fungal infection
  - B. Pompe's disease
  - C. An infarct
  - D. Staphylococcal abscess
  - E. Hyalinized scar
5. Cause of the alterations shown in **PHOTO 4**:
- A. Diabetes
  - B. Thrombo-embolism
  - C. Deposition of protein derived from circulation
  - D. Release of enzymes from damaged cells
  - E. Hypertension
6. How are the histologic alterations in **PHOTO 5** (kidney) best characterized?
- A. Hyperplasia with hypertrophy
  - B. Atrophy
  - C. Acute inflammation
  - D. Infarction
  - E. Fibrinoid necrosis
7. Which of the following is present in **PHOTO 5** (kidney)?
- A. Organizing thrombus
  - B. Hyalin
  - C. Liquefactive necrosis
  - D. Autolysis
  - E. Fatty change

8. Which of the following best characterizes the photomicrograph of myocardium shown in **PHOTO 6**?
- A. Myocardial infarct, 3-4 weeks old
  - B. Benign hypertension
  - C. Diphtheria
  - D. Coagulation necrosis
  - E. Granulomatous inflammation
9. Most likely cause of the liver findings shown in **PHOTO 7**:
- A. Acute inflammation
  - B. Chronic inflammation
  - C. Circulatory alteration
  - D. Abnormal intracellular accumulation
  - E. Abnormal intercellular accumulation
10. Most likely to be observed on histologic examination of the liver in **PHOTO 7**:
- A. Dystrophic calcification
  - B. Mallory hyalin
  - C. Prussian Blue staining of hepatocytes
  - D. Hepatocyte swelling
  - E. Thrombo-emboli
11. Most likely to be present in the area depicted by the arrow in **PHOTO 8**:
- A. Lipofuscin
  - B. Amyloid
  - C. Purulent exudate
  - D. Pompe's disease
  - E. Collagen

12. **PHOTO 9** shows an aortic valve, as viewed from the ascending aorta. On palpation, the leaflets are hard and nodular. The deposits were densely basophilic in histologic sections. What is the most likely cause of the changes?
- A. Pancreatitis
  - B. Aging
  - C. Marfan syndrome
  - D. "Benign hypertension"
  - E. Chronic ischemia
13. What other pathologic change is most likely in the patient corresponding to **PHOTO 9**?
- A. Myocardial necrosis
  - B. Left ventricular thickening
  - C. Aortic dissection
  - D. Increased lipofuscin in cardiac myocytes
  - E. Hypercalcemia
14. The hepatocytes in (see arrows) **PHOTO 10** show:
- A. Apoptosis
  - B. Atrophy
  - C. Metaplasia
  - D. Lethal hypoxic injury
  - E. Cell injury caused by a toxin
15. Most likely cause of the abnormalities shown in **PHOTO 11** (colon at intermediate magnification, lumen to left):
- A. Hypercalcemia
  - B. Ischemia
  - C. Persistent inflammation
  - D. Congenital deficiency of coagulation factor
  - E. Circulating amyloid precursor substance

16. Most likely outcome of the abnormalities shown in **PHOTO 11** (colon):
- A. Septicemia
  - B. Chronic bleeding
  - C. Metaplasia
  - D. Gradual deposition of hyalin
  - E. Metastatic calcification
17. Most likely site of origin of the tissue in photomicrograph **PHOTO 12**:
- A. Keloid
  - B. Fibrinous exudate
  - C. Granuloma
  - D. A wound healing by secondary intention
  - E. Middle of a renal infarct at 3 days
18. Which combination of substances is likely to be present in greatest abundance in the tissue shown in **PHOTO 12**?
- A. Fibrin split products and plasmin
  - B. Bradykinin and histamine
  - C. C3a and LTD<sub>4</sub>
  - D. Interferon gamma and IL-1
  - E. VEGF and metalloproteinases
19. Most likely interpretation of **PHOTO 13**:
- A. Liquefactive necrosis
  - B. Healing wound
  - C. Granuloma
  - D. Coagulation necrosis
  - E. Fibrinoid necrosis

20. Best interpretation of histologic findings in **PHOTO 14** (skin):
- A. Abscess
  - B. Keloid
  - C. Wound in substrate stage
  - D. Wound in remodeling stage
  - E. Chronic inflammation
21. Least likely to be a consequence of diabetes:
- A. Impaired PMN chemotaxis
  - B. Vacuolated hepatocytes
  - C. Lysosomal mucopolysaccharide accumulation
  - D. Amyloid deposition
  - E. Arteriolar hyalin
22. Synthesis would be inhibited by aspirin:
- A. Leukotriene B<sub>4</sub>
  - B. Arachidonic acid
  - C. Phospholipase A-2
  - D. 5-lipoxygenase-1
  - E. Thromboxane A<sub>2</sub>
23. A component of azurophilic granules:
- A. Platelet activating factor
  - B. Myeloperoxidase
  - C. Alpha-1-antitrypsin
  - D. Nitric oxide
  - E. NADPH oxidase

24. Correct statement about chemokines:
- A. Are not chemotactic
  - B. They are eicosanoids
  - C. They are complement derivatives
  - D. Some cause neutrophil activation
  - E. Some cause neutrophil proliferation
25. Least likely to be observed in granulation tissue:
- A. Dense collagen
  - B. Capillary sprouts
  - C. Inflammatory cells
  - D. Fibroblasts
  - E. Edema
26. Not a factor which impairs restitution of normal tissue structure following an inflammatory event:
- A. Extensive necrosis
  - B. Poor perfusion
  - C. Chronic infection
  - D. Tissue is comprised of labile cell populations
  - E. Organization of exudates
27. Which of the following would most likely be derived from a mast cell?
- A. PGE<sub>2</sub>
  - B. Histamine
  - C. Bradykinin
  - D. Nitric oxide
  - E. TNF

28. Most likely to be observed in a granuloma:
- A. Amyloid
  - B. Fibrosis
  - C. Suppuration
  - D. Fibrinous exudates
  - E. Retained underlying architecture of necrotic tissue
29. Most likely to be observed with neutrophils (PMN) following activation:
- A. Change in nuclear shape
  - B. Decreased cytosolic calcium
  - C. Phospholipase C activation
  - D. Secretion of growth factors
  - E. Increased number of cytoplasmic granules
30. What is the most likely functional deficit in the congenital disorder of inflammatory cell function known as chronic granulomatous disease?
- A. Inability to organize areas of caseous necrosis
  - B. Inability to assemble microtubules
  - C. Inability to neutralize free radical species
  - D. Decreased generation of superoxide
  - E. Decreased catalase activity
31. Fibrin split products result directly from the activity of:
- A. Hageman factor
  - B. Complement
  - C. Fibrinogen
  - D. Thrombin
  - E. Plasmin



32. The capillary sprouts formed in wound healing originate from adjacent:
- A. Small arteries
  - B. Arterioles
  - C. Capillaries
  - D. Venules
  - E. Small veins
33. Oxygen dependent bactericidal mechanism of polymorphonuclear neutrophilic leukocytes:
- A. Lysozyme
  - B. Lactoferrin
  - C. Defensins (arginine rich cationic proteins)
  - D. H<sub>2</sub>O<sub>2</sub> production
  - E. Hydrogen ion
34. The initial angiogenic stimulus following wounding is provided by:
- A. Platelet derived growth factor (PDGF)
  - B. Transforming growth factor-beta (TGF- $\beta$ )
  - C. Epidermal growth factor (EGF)
  - D. Tumor necrosis factor (TNF)
  - E. Basic fibroblast growth factor (b-FGF)
35. The prolonged angiogenic stimulus following wounding is provided by:
- A. Platelet derived growth factor (PDGF)
  - B. Transforming growth factor-beta (TGF- $\beta$ )
  - C. Epidermal growth factor (EGF)
  - D. Interleukin-1 (IL-1)
  - E. Vascular endothelial growth factor (VEGF)

36. Mediators of the immediate, transient phase of increased vascular permeability include all of the following except:
- A. Histamine
  - B. Serotonin (5-HT)
  - C. Bradykinin
  - D. Interferon-gammã (IFN-gammã)
  - E. Leukotrienes (LTC<sub>4</sub>, D<sub>4</sub>, E<sub>4</sub>)
37. The immediate, sustained phase of increased vascular permeability:
- A. May follow exposure to x-rays
  - B. May exhibit degeneration of the endothelial cell lining of vessels
  - C. May involve arteries
  - D. May be mediated by free radicals released from leukocytes
  - E. Is mediated by histamine
38. In the Fenton reaction proper, which of the following conversions occur:
- A. Superoxide to hydrogen peroxide
  - B. Hydroxyl to superoxide
  - C. Hydrogen peroxide to hydroxyl
  - D. Hydrogen peroxide to superoxide
  - E. Iron accepts an electron
39. Which is unlikely to occur in vacuolar degeneration of renal epithelium due to a reduced supply of oxygen?
- A. Gaps in the plasmalemma
  - B. Clumping of nuclear chromatin
  - C. A decreased intracellular pH
  - D. Disaggregation of polyribosomes
  - E. Mitochondrial swelling

40. Each of the following is indicative of cell death EXCEPT:
- A. Autolysis
  - B. Mitochondrial calcification
  - C. Cytocavitary dilatation
  - D. Nuclear fragmentation
  - E. Nuclear pyknosis
41. When nuclear DNA collected from dead cells shows a step-ladder pattern on agar gel electrophoresis, it is an indication that cell death was from:
- A. Fibrinoid necrosis
  - B. Coagulative necrosis
  - C. Apoptosis
  - D. Liquefaction necrosis
  - E. Autolysis
42. Which of the following is a glycogen storage disease:
- A. Gaucher's disease
  - B. von Gierke's disease
  - C. Fabry's disease
  - D. Niemann-Pick disease
  - E. Hunter's disease
43. Glycogen within a cell may be suggested by the:
- A. Prussian blue reaction
  - B. Sudan Black stain
  - C. DOPA reaction
  - D. Periodic acid-Schiff stain
  - E. Presence of increased cytoplasmic eosinophilia

44. The substance that accumulates in "brown atrophy" of the heart is:
- A. Deposited in the endoplasmic reticulum
  - B. Derived from lipid peroxidation
  - C. Stained with eosin
  - D. Hemosiderin
  - E. Derived from transthyretin
45. Complications of idiopathic hemochromatosis include each of the following EXCEPT:
- A. Darkened skin
  - B. Diabetes mellitus
  - C. Liver cirrhosis
  - D. Nephrotic syndrome
  - E. Liver cancer
46. Features of Marfan's syndrome include each of the following EXCEPT:
- A. Autosomal recessive inheritance
  - B. Floppy mitral valve
  - C. Tall, thin stature
  - D. Ectopia lentis
  - E. Dissecting aortic aneurysm
47. Most likely consequence of heart failure:
- A. Decreased plasma oncotic pressure
  - B. Increased plasma volume
  - C. Renal tubular hyalin accumulation
  - D. Decreased plasma renin
  - E. Increased glomerular filtration rate

48. Least likely to be a feature of hepatic passive congestion:
- A. Cell death
  - B. Vascular engorgement by rbc's
  - C. Liver enlargement
  - D. Diffuse bright red tissue coloration
  - E. Increased capillary hydrostatic pressure
49. Least likely to occur or be observed with an organized thrombus:
- A. Embolization
  - B. Formation of capillary channels
  - C. Deposition of collagen
  - D. Inflammatory cells
  - E. Fibroblasts
50. Most likely syndrome caused by pulmonary embolism:
- A. Right heart failure
  - B. Pulmonary hypertension
  - C. Pulmonary infarction
  - D. Sudden death
  - E. Clinically silent
51. Parameter which is most likely to be different between septic shock and hypovolemic shock in the early stages:
- A. Blood pressure
  - B. Heart rate
  - C. Peripheral resistance
  - D. Urine output
  - E. Cerebral function

52. Least likely to predispose to thrombosis:
- A. Factor V mutation
  - B. Increased PGI<sub>2</sub>
  - C. A surgical procedure
  - D. Deficient protein C
  - E. Defective plasminogen activator
53. Most common source of arterial thromboemboli:
- A. Lungs
  - B. Heart
  - C. Ascending aorta
  - D. Brachial artery
  - E. Bone marrow
54. Therapy which is most likely to mitigate the short term consequences of arterial thrombosis:
- A. Aspirin
  - B. Heparin
  - C. Plasminogen activator
  - D. Anti-thrombin III
  - E. protein S
55. Not a feature or mechanism of primary hemostatic plug formation:
- A. Release of ADP from platelets
  - B. Platelet shape change
  - C. fibrin polymerization
  - D. Release of TxA<sub>2</sub> from platelets
  - E. Reversibility

56. Pathologic finding which is most likely in a kidney after many years of systemic "benign" hypertension:
- A. Tubular atrophy
  - B. Amyloid
  - C. Fibrinoid necrosis
  - D. Hyaline droplets in tubular epithelial cells
  - E. Coagulation necrosis of tubular epithelial cells
57. Choose the correct sequence for the morphologic alterations (1-6) below in the pathologic evolution of a myocardial infarction:
- 1. Granulation tissue
  - 2. PMN infiltration
  - 3. Hyalinization
  - 4. Myocyte apoptosis
  - 5. Macrophage infiltration
  - 6. Granuloma formation
- A. 3 to 2 to 1 to 4
  - B. 2 to 5 to 1 to 3
  - C. 4 to 5 to 2 to 1
  - D. 1 to 5 to 6 to 3
  - E. 4 to 2 to 5 to 1
58. Least likely to be observed in hepatic fatty change due to alcohol consumption:
- A. Increased liver size
  - B. Change in liver color
  - C. Hepatic failure
  - D. Clear cytoplasmic vacuoles in hepatocytes
  - E. Hepatocyte enlargement

59. Most likely histologic finding in a bowel infarct:
- A. Muscular hypertrophy
  - B. Metaplasia
  - C. Intracellular hyalin
  - D. Hemorrhage
  - E. Extracellular hyalin
60. A breast tissue sample demonstrates a very firm, gritty area. Dystrophic calcification is observed on histologic exam. Which of the following is most likely?
- A. Amyloidosis
  - B. Recent lactation
  - C. Active bacterial infection
  - D. Bone disease
  - E. Prior trauma to the area
61. When considering laboratory test volumes in the US, which following statement most accurately depicts current statistics?
- A. Approximately 57.9% of all testing is performed in hospital based laboratories
  - B. The percentage of laboratory tests performed in physician office laboratories exceeds the test volume of hospital laboratories
  - C. The percentage of laboratory tests performed in physician office laboratories exceeds the test volume of hospital laboratories only in qualitative test volumes
  - D. Approximately 60% of all testing performed in the US is performed by laboratory-based certified Medical Technologists



62. Plasma binding proteins:
- A. Such as transferrin are only involved in transport functions
  - B. Do not include hemoglobin and myoglobin
  - C. Are only affected by protein calorie malnutrition
  - D. Are increased in acute severe dehydration
  - E. Are not affected by pregnancy
63. Visible hemolysis (>20 mg/dl) may interfere with some laboratory tests because:
- A. Many assays use light absorption and calorimetric reactions
  - B. Higher concentrations of extra cellular substances such as potassium will cause artificial decreases in plasma concentration
  - C. Of the release of white cell lytic enzymes only
  - D. Of the glycation of free hemoglobin fragments
  - E. We are not able to identify hemolysis until the test has been performed
64. Biological variation may cause artificial elevations/decreases in test results. Factors associated with this phenomenon are:
- A. Changes in posture, where total blood volume increases 20% when changing from a lying to an upright position
  - B. Prolonged bed rest will cause increased fluid excretion, thereby increasing albumin and other proteins 10%
  - C. Strenuous exercise causes significant increases in circulating liver enzymes due to increased permeability secondary to decreased ATP
  - D. Circadian and seasonal variation which only affect biological substances under endocrine control
  - E. Not associated with diet

65. When comparing geographical utilization of a particular test or group of tests, which one of the following statements is(are) TRUE?
- A. Of all justification for Point of Care testing turn-around-time (TAT) is probably the least significant reason for implementation
  - B. Accurate and affordable technology is a significant factor for in office test menu
  - C. Part A Medicare Reimbursement determines test availability
  - D. Geographical distribution of laboratory tests is homogeneous throughout the U.S.
  - E. Utilization patterns of laboratory tests are based on state by state legislation.
66. Inappropriate laboratory utilization can be defined as:
- A. Utilizing specific clinically relevant laboratory tests only
  - B. Use of screening tests in high prevalence populations
  - C. Use of organ specific panels in the absence of clinical indication
  - D. Use of organ specific panels in the outpatient setting
  - E. Use of near patient testing
67. Standards that do not apply to limited physicians' office laboratory testing sites include:
- A. Proficiency testing
  - B. FDA "Home Brew" standards
  - C. Quality Control
  - D. CLIA 88 personnel standards
  - E. Medicare Reimbursement Guidelines

68. Prolonged contact of serum with the clot may lead to preanalytical variation. In order to diminish the potential for preanalytical variation, the following precautions should be taken:
- A. Samples should be centrifuged immediately upon collection.
  - B. All stat samples should be collected in a gray top tube
  - C. Samples should be spun and separated in less than two hours after collection.
  - D. All samples for therapeutic drug monitoring should be collected in plasma separator tubes.
  - E. All clots should be aspirated with disposable pipettes prior to direct tube sampling.
69. Regarding Free-PSA measurements, which of these statements is(are) TRUE?
- A. When the total PSA is minimally increased (4.1-10.0 ng/mL), percent free PSA makes PSA a more specific test.
  - B. When the total PSA is in the normal range (2.5-4.0 ng/mL) percent free PSA makes PSA a more specific test.
  - C. When the total PSA is markedly elevated (>20.0 ng/mL) Percent free PSA differentiates between patients needing a Biopsy and patients who require clinical follow-up.
  - D. As a general rule, the lower the percent of free PSA, the better the prognosis.
  - E. Free PSA is not helpful in the evaluation of Benign Prostatic Hyperplasia vs malignancy

70. A 61 year old black female was referred to the metabolic clinic for the evaluation of discrepancies between glycosylated hemoglobin and whole blood glucose measurements performed at home. Her glucose concentration ranged from 40-120 ug/dL. Electrophoretic quantitation of glycosylated hemoglobin was 17% (reference 4.7%-7.3%) and fructosamine was normal. As laboratorian you would recommend:
- A. Measurement of fasting plasma glucose
  - B. Hemoglobin electrophoresis
  - C. Glycated albumin measurement
  - D. A two hour oral glucose tolerance test
  - E. Insulin therapy

DIRECTIONS: Match each inflammatory cell (71-75) with the appropriate statement provided (A-E). Use each item once only:

- A. Granules contain major basic protein
- B. Activated by interaction with antigen presenting cells
- C. Possesses two types of cytoplasmic granules
- D. Gives rise to epithelioid cells
- E. Has well developed rough endoplasmic reticulum

71. plasma cell

72. monocyte

73. eosinophilic leukocyte

74. lymphocyte

75. polymorphonuclear neutrophilic leukocyte

DIRECTIONS: Match each function of the inflammatory response from those listed (76-80) with the most likely mediator from those listed (A-F). Each alternative may be used once, more than once or not at all:

- A. Tumor necrosis factor (TNF)
- B. Thromboxane A<sub>2</sub>(TX A<sub>2</sub>)
- C. Interleukin-8 (IL-8)
- D. Oxygen metabolites (free radicals)
- E. Transforming growth factor- $\beta$  (TGF- $\beta$ )
- F. Leukotriene C<sub>4</sub>, D<sub>4</sub>, E<sub>4</sub> (LTC<sub>4</sub>, D<sub>4</sub>, E<sub>4</sub>)

76. Chemotaxis

77. Tissue damage

78. Increased vascular permeability

79. Fever

80. Vasoconstriction

DIRECTIONS:

Match each cell organelle (81-85) with its appropriate description/function from alternatives (A-J). Use each alternative once, more than once or not at all:

- A. RNA
- B. Enzymes of electron transfer
- C. Synthesis of proteins for export
- D. Storage of hydrolytic enzymes
- E. Poorly stained DNA in interphase nucleus
- F. Synthesis of steroid hormones
- G. Packaging of secretion granules
- H. Initial site of segregation of damaged organelles
- I. Inactive DNA in interphase nucleus
- J. Accumulation of undigestible, oxidized lipid

- 81. Primary lysosomes
- 82. Golgi apparatus
- 83. Lipofuscin
- 84. Euchromatin
- 85. Rough endoplasmic reticulum.

DIRECTIONS:

Match each situation (86-90) with the appropriate type of necrosis A-E. Use each alternative once only:

- A. Coagulation necrosis
- B. Caseous necrosis
- C. Fibrinoid necrosis
- D. Hemorrhagic necrosis
- E. Abscess

- 86. Necrosis in the lung due to pulmonary embolism

87. A form of liquefaction necrosis due to pyogenic infection
88. Necrosis of arteriolar walls in malignant hypertension
89. Necrosis in the heart due to sudden cessation of blood supply
90. Necrosis seen in the infectious disease tuberculosis

DIRECTIONS: Match each clinical setting (91-95) with its appropriate process A-D. Use each once only:

- A. Atrophy
- B. Hyperplasia
- C. Metaplasia
- D. Hypertrophy
- E. Apoptosis

91. Effect of excess estrogen on the endometrium
92. Effect of high blood pressure on the left ventricle
93. Effect of menopause on the endometrium
94. Effect of smoking on the bronchial mucosa.
95. Effect of glucocorticoids on T lymphocytes

DIRECTIONS: Match each statement (96-100) with its corresponding intercellular accumulation from those provided A-E. Use each alternative once only:

- A. Metastatic calcification
- B. Amyloid deposits
- C. Dystrophic calcification
- D. Excess basal laminar material
- E. Abnormal accumulation of proteoglycans

- 96. May occur in islets of Langerhans' in adult onset diabetes mellitus
- 97. A feature of primary hyperparathyroidism
- 98. An effect of diabetes mellitus on intra-renal arterioles
- 99. The result of fat necrosis.
- 100. The result of Marfan's syndrome



Match each patient with amyloid (101-105) with the corresponding precursors protein of the amyloid from those provided a-e. Use each alternative once only:

- a. Amylin
- b. Transthyretin
- c. Beta2 amyloid protein
- d. Calcitonin
- e. Beta2 microglobulin

- 101. an elderly patient with Alzheimer's disease
- 102. an elderly patient with type II (non-insulin dependent) diabetes mellitus
- 103. an elderly patient on dialysis for 5 years
- 104. a middle aged patient with a C-cell (interfollicular cell) tumor of the thyroid
- 105. an elderly patient with an enlarged heart and heart failure.

Ans: (1)c, (2)a, (3)e, (4)d, (5)b.

Match the inflammatory function/activity (106-110) to the most appropriate mediator (a-e).

- 106. junctional retraction
- 107. initial leukocyte adhesion
- 108. leukocyte transmigration
- 109. endothelial contraction
- 110. increased transcytosis

- a. E-selectin
- b. histamine
- c. VEGF
- d. TNF
- e. PECAM-1

Ans: (1)d, (2)a, (3)e, (4)b, (5)c.

Match the hemostatic function (111-115) to the most appropriate mediator (a-e):

- 111. vasoconstriction
- 112. platelet adherence
- 113. platelet aggregation
- 114. generates fibrin
- 115. anchors aggregated platelets

- a. ADP
- b. thrombin
- c. thromboxane A2
- d. Von Willebrand factor
- e. fibrin

Ans: (1)c, (2)d, (3)a, (4)b, (5)e.

Match the gross finding (1-5) to the best diagnosis (a-e):

- 116. liquefactive necrosis
- 117. hemorrhage with gangrene
- 118. pallor in cone-shaped area
- 119. firm, gritty, grey
- 120. endothelial cell death is prominent

- a. bowel infarct
- b. fat necrosis
- c. cerebral infarct
- d. spleen infarct
- e. fibrinoid necrosis

Ans: (1)c, (2)a, (3)d, (4)b, (5)e.

Match the process (1-5) to the mechanism or finding (a-e) with which it best fits:

- 121. apoptosis
- 122. reversible hypoxic injury
- 123. irreversible hypoxic injury
- 124. autophagy
- 125. re-perfusion injury

- a. residual bodies
- b. free radicals derived from inflammatory cells
- c. transglutaminase acts on cytoskeleton
- d. vacuolar generation
- e. cytoplasmic Trypan Blue staining

Ans: (1)c, (2)d, (3)e, (4)a, (5)b.