Australasian Board Of Cardiovascular Perfusion

Australasian Diploma of Perfusion

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Final Examinations

Part 2 – Multiple Choice

(2 Hours)

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N.B. **Write your answers on the enclosed answer sheet.**

All questions have equal marks.

1. Haemoglobin O_2 saturation is:
   a. the partial pressure exerted by oxygen dissolved in solution
   b. the pO_2 where haemoglobin is 50% saturated with O_2
   c. the percent of O_2 bonding sites on haemoglobin that contain O_2
   d. the number of grams of haemoglobin per 100 ml of blood
   e. none of the above

2. On the oxygen dissociation curve, p50 is which of the following:
   a. The oxygen saturation necessary to obtain a pO2 of 50 torr.
   b. Approximately 27 torr.
   c. The pO2 necessary to obtain a 50 percent oxygen saturation.
   d. Approximately 50 mm Hg.
   e. 2 of the above

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3. Which of the following statements is false concerning the oxygen dissociation curve:
   a. a normal pO_2 of 90 mm Hg yields an O_2 saturation of 97 percent.
   b. an arterial pO_2 of 60 would yield an O_2 saturation of approximately 92 percent.
   c. a normal venous saturation of 75 percent reflects a pO_2 of approximately 40 mmHg
   d. all are true statements

4. Calculate O_2 transport based on the following data: paO_2 = 70 mmHg; SaO2 = 94 percent; CO = 4.1 L/min; Hgb = 14 gm%:
   a. 502 ml/min
   b. 698 ml/min
   c. 732 ml/min
   d. 886 ml/min

5. Patients in shock exhibit which of the following:
   a. Decrease in lactate levels
   b. O_2 consumption greater O_2 supply
   c. Decreased VO_2
   d. Lowered metabolic demand
   e. None of the above

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6. Which of the following VO2 (O2 consumption) values would be considered "normal" for a 1.5 m2 surface are a patient:
   a. 128 ml/min
   b. 192 ml/min
   c. 228 ml/min
   d. 350 ml/min
   e. 400 ml/min

7. The following O2 saturations were recorded upon insertion of the oximetric Swan-Ganz catheter: RA=80%; RV=71% ; PA=68%.
Which of the following might be indicated:
   a. Aortic insufficiency
   b. ASD
   c. VSD
   d. PDA
   e. These are normal findings

8. The following O_2 saturations were observed:
RA=60%; RV=92%; PA=80%.
Which of the following might be indicated:
   a. Acute ventricular septal rupture
   b. Severe mitral insufficiency
   c. Severe tricuspid insufficiency
   d. Anomalous pulmonary return
   e. Atrial Septal Defect

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9. Which of the following indices would be most reflective of the patient's metabolic status:
   a. Flow rate
   b. Temperature
   c. Venous saturation
   d. Use of specific wavelengths
   e. Body surface area

10. Carbon dioxide is _____ times more soluble than oxygen:
   a. 10
   b. 15
   c. 20
   d. 25
   e. 30

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11. The Henderson-Hasselbach equation:
   a. relates pH, pCO_2 and $[HCO_3^-]$
   b. may be used to estimate the bicarbonate concentration given pH, pCO_2 and temperature
   c. relates solubility and total blood CO_2 content
   d. a. and b.
   e. all of the above

12. Under resting conditions the percent basal VO_2 of the brain is____
and this organ receives approximately _____% of the cardiac output:
   a. 16-21% 15%
   b. 4-8% 23%
   c. 9-11% 4%
   d. 22-35% 12%

e. 5-10% 10%

13. All the following are characteristics of the O_2 dissociation curve except:
   a. Describes the relationship between pO_2 and saturation of haemoglobin
   b. Has a linear relationship of pO_2 and saturation of haemoglobin
   c. Uses the p50 as an indicator for position of curve
   d. Consists of distinct phases with specific characteristics
   e. varies according to changing metabolic conditions

14. Perfusion pressure is described as:
   a. the difference in dynamic pressure between two points on a tube with constant fluid movement
   b. the perpendicular force vector on the walls of a vessel created by the movement of fluid
   c. the pressure exerted by the surgeon on a perfusionist
   d. the difference in gas pressure between two liquids
   e. a and b

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15. A right shift of the oxygen haemoglobin curve occurs through all of the following, except:
   a. hypothermia
   b. increasing 2,3 DPG
   c. increasing CO_2
   d. declining pH
   e. none of the above

16. Which of the following statements is FALSE:
   a. RV coronary blood flow occurs in diastole
   b. Coronary blood flow is stable despite changes in pressure
   c. Reactive hyperemia is initiated by increase in metabolic demand
   d. The dephosphoralation of ATP and ADP most likely causes coronary vasodilation
   e. LV coronary blood flow occurs in diastole

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17. Which of the following is true of respiration:
   a. Intrapleural pressure is approximately -5 mmHg prior to expiration.
   b. Subatmospheric pressure exists in the lung and chest wall prior to inspiration.
   c. The contraction of the diaphragm increases thoracic cavity volume.
   d. Expiration occurs when atmospheric pressure slightly exceeds intrapleural pressure.
   e. 2 of the above

18. What percentage of total body oxygen consumption is used in the process of breathing at rest?
    a. 5%
    b. 10%
    c. 15%
    d. 20%
    e. 25%

19. Which of the following brain areas control breathing rhythm?
    a. Cortical area
    b. Medulla oblongata
    c. Cerebellum
    d. Pons
    e. Amygdalloid body

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20. Which of the following is the most powerful chemical stimulant for respiration?
    a. pCO_2
    b. pO_2
    c. pH
    d. N_2
    e. all of the above

21. The association between oxygen delivery (DO_2) and oxygen consumption (VO_2) during CPB is best expressed by:
    a. SvO_2
    b. Arterial blood gas from the membrane lung.
    c. Normal MAP and PAP limits during bypass.
    d. Extracorporeal blood flow.
    e. Lactate levels

22. The relationship between oxygen consumption and oxygen delivery can be changed during CPB by manipulating the:
    a. Haemoglobin
    b. Pump flow
    c. FiO_2
    d. Post oxygenator PO_2
    e. All of the above.

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23. During the latter part of gestation and after birth, red blood cells are produced by:
    a. bone marrow
    b. liver
    c. spleen
    d. lymph nodes
    e. none of the above

24. Erythropoietin is:
    a. a hormone that stimulates the production of RBCs
    b. formed mostly in the kidneys
    c. formed in the liver
    d. all of the above
    e. none of the above

25. The average life span of the red blood cell is about:
    a. 90 days
    b. 120 days
    c. 150 days
    d. 200 days
    e. 250 days

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26. Which is the normal leukocyte concentration in the blood of an adult:
    a. 300,000 per cubic mm
    b. 1,000 per cc
    c. 7,000 per cubic mm
    d. 5,200,000 per cubic mm
    e. 1,000,000 per cubic mm

27. Macrophages are:
    a. monocytes that have increased their diameter by as much as 500%
    b. capable of phagocytizing as many as 100 bacteria apiece
    c. mobile cells that are capable of wandering through tissues
    d. stationary cells located in the skin, lymph nodes, lungs, liver and other tissues
    e. all of the above

28. The heart sound S1 corresponds best with:
    a. Aortic valve closing
    b. Mitral valve closing
    c. Pulmonic valve closing
    d. Opening snap of the aortic valve
    e. none of the above

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29. The heart sound S2 corresponds best with:
    a. Pulmonic valve opening
    b. Tricuspid valve closing
    c. Mitral valve opening
    d. Aortic valve closing
    e. none of the above

30. A mitral stenosis patient:
    a. has a systolic ejection murmur
    b. has atrial systolic ejection intensification of the murmurs
    c. has a muffled S1
    d. has a lengthened S2-OS (opening snap) interval

e. Two of the above

31. The respiratory quotient:
a. reflects the ratio of O_2 absorption to CO2 removal.
b. is a direct measure of O_2 delivery to the tissues.
c. is normally 0.8
d. can be used to calculate total lactic acid production
e. all of the above

32. Which of the following is NOT a particularly valuable measurement in assessing renal function:
a. BUN
b. HgB
c. Creatinine clearance
d. Urine osmolality
e. none of the above

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33. Normal awake VO_2 is:
a. 138 ml/min/m^2
b. 210 ml/min/m^2
c. 340 ml/min/m^2
d. 660 ml/min/m^2
e. none of the above

34. An SVO_2 of 50 percent indicates which of the following:
a. Adequate Oxygen delivery for aerobic metabolism
b. Decreasing levels of acidity
c. Regional aerobic metabolism
d. Lactic acid production
e. All of the above

35. The "c" wave of the atrial pressure curve corresponds with which of the following:
a. Isovolumic contraction
b. Atrial kick
c. LV ejection
d. Contraction of ventricle
e. none of the above

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36. In a tube of laminar flow, the fastest fluid velocities will be in which of the following location:
a. Closest to the walls
b. 1 fluid layer distance from the wall
c. In the bulk flow area towards the center of the tube
d. All exhibit equal velocities
e. none of the above

37. Which of the following is/are NOT associated with turbulent flows:
    a. Increased blood flow velocities
    b. Increases in energy
    c. Increasing shear rates
    d. Increasing pressure drops
    e. All of the above

38. A steep downslope of an arterial pressure line might indicate which of the following:
    a. Increased pulmonary vascular resistance
    b. Poor contractility
    c. Decreased systemic vascular resistance
    d. Hypovolumia
    e. none of the above

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39. Which of the following pressures shows a good correlation to left atrial pressure?
    a. CVP
    b. PAD
    c. PCWP
    d. LVEDP
    e. RAP

40. Left ventricular preload is represented best by which of the following?
    a. LVEDP
    b. CVP
    c. PCPW
    d. PAD
    e. LAP

41. Which of the following is true for blood plasma?
    a. 100 mg/dl of glucose is within normal limits
    b. Sodium is the most abundant anion
    c. Osmolarity is about 1300 mosm/L
    d. All of the above
    e. Normal anion gap levels are 15-17 mg/dL

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42. Renal filtration of blood occurs in the :
    a. Ducts of Bellini
    b. Medulla
    c. Glomerulus
    d. Proximal tubules
    e. none of the above

43. The portion of the cardiac output that passes through both kidneys is:

a. Called the "renal fraction".
b. Normally about 21 percent.
c. About 1200 ml/min for a 70 kg man.
d. All of the above.
e. none of the above

44. The renal response to metabolic acidosis :

a. Is faster than the respiratory response.
b. Involves the secretion of hydrogen ions into the tubules.
c. Results in an decrease in pH
d. Is NOT as complete as the chemical buffering system's response
e. none of the above

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45. Generally during hypothermia and haemodilution, compared to normothermia and normal haematocrit, the amount of O_2 carried dissolved in plasma water is a significantly greater portion of the oxygen transfer because:

a. The pO_2 is decreased, solubility is increased and the haematocrit is increased.
b. The pO_2 is increased, the solubility is increased and the haematocrit is decreased.
c. The pO_2 is decreased, the solubility is decreased and the haematocrit is decreased.
d. The pO_2 is decreased and the pCO_2 is increased.
e. none of the above

46. RBCs existing in a low oxygen environment will elevate the 2,3 DPG level within to:

a. Shift the oxyhaemoglobin curve to the left.
b. Increase the affinity of haemoglobin with oxygen.
c. Decrease the affinity of haemoglobin with oxygen.
d. Make it easier to oxygenate haemoglobin.
e. none of the above

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47. Metabolic acidosis may be caused by:

a. Increased $PaCO_2$
b. Aerobic respiration at the cellular level
c. A prolonged decreased PvO_2
d. a and c
e. All of the above

48. Which of the following relies on the electrochemical gradient in determining net movement of solute:

a. facilitated diffusion
b. active transport
c. passive transport
d. osmosis
e. electrolysis

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49. Into which structure do the collecting tubules terminate:
    a. cortex
    b. juxtaglomerular apparatus
    c. papilla
    d. medulla
    e. none of the above

50. Autoregulation of GFR and RRBF occurs in the pressure range of which of the following:
    a. 30-80 mmHg
    b. 50-120 mmHg
    c. 100-150 mmHg
    d. 80-200 mmHg

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51. The majority of K+ secretion occurs in which of the following structure(s):
    a. proximal tubules
    b. loop of Henle
    c. distal tubules
    d. collecting tubules
    e. a and b

52. Which of the following could increase K+ secretion:
    a. increased aldosterone levels
    b. increased Na+ secretion
    c. chronic metabolic alkalosis
    d. use of Furosemide
    e. all of the above

53. Which phase of the cardiac cycle specifically accounts for 90 percent of the myocardial oxygen consumption:
    a. systole
    b. isovolumic contraction
    c. ejection
    d. diastolic filling
    e. atrial filling

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54. Cardiac output (CO) is defined by which of the following:
    a. Amount of blood entering into the heart per minute
    b. Amount of blood pumped out of the heart per minute
    c. Amount of blood pumped out of the right and left heart combined per minute
    d. Amount of blood remaining in the heart after each contraction
    e. none of the above

55. The average cardiac output for most adults is approximately:
a. 4 LPM
b. 5 LPM
c. 6 LPM
d. 7 LPM
e. 8 LPM

56. The average cardiac index (CI) is approximately:
a. 2 L/min/m2
b. 3 L/min/m2
c. 4 L/min/m2
d. 5 L/min/m2
e. 6 L/min/m2

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57. During exercise, cardiac output and oxygen consumption:
a. are inversely proportional
b. are directly proportional
c. are not related
d. both increase exponentially
e. none of the above

58. A normal response in compensating for hypovolaemic shock is:
a. arteriolar constriction
b. venous constriction
c. decreased heart rate
d. 2 of the above ____, ____
e. all of the above

59. Blood flow is:
a. Directly proportional to perfusion pressure
b. Inversely proportional to conduit length
c. Inversely proportional to vascular resistance
d. Inversely proportional to viscosity
e. All of the above

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60. The "functional" capillary pressure is approximately :
a. 50 mmHg
b. 35 mmHg
c. 17 mmHg
d. 10 mmHg
e. 8 mmHg

61. The most frequent complication of adult patients on ECLS is:
a. raceway tubing rupture
b. hypotension
c. hypertension
d. neurological injury

e. coagulopathy

62. All of the following ions are actively reabsorbed in the ascending loop of Henle except:
a. sodium
b. potassium
c. chloride
d. bicarbonate
e. all of the above

63. Reabsorption of sodium occurs mainly in the:
a. proximal tubule
b. distal tubule
c. loop of Henle
d. collecting ducts
e. all of the above

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64. The condition in which there is an abnormally low number of platelets in the blood is termed:
a. hypoplataemia
b. hypochromic anemia
c. thrombocytopenia
d. thrombocytosis
e. leucopenia

65. The diameter of a non-activated platelet usually ranges from:
a. 2-4 mm
b. 8-10 mm
c. 14-16 mm
d. 20-22 mm
e. 2-4 μm

66. Which of the following is/are true of the fetal/newborn heart:
a. More dependent on aerobic metabolism than anaerobic metabolism
b. Fully developed sympathetic innervation
c. Shorter action potentials and faster repolarization than the adult heart
d. Greater ventricular compliance than the adult heart
e. All of the above

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67. The average blood volume of a 3 kg neonate is:
a. 100-200 ml
b. 200-250 ml
c. 350-400 ml
d. 450-500 ml
e. 550-600 ml

68. Which of the following is NOT a feature of tetralogy of Fallot:
   a. VSD
   b. Overriding aorta
   c. Right ventricular outflow tract
   d. ASD
   e. RV hypertrophy

69. Repolarization is:
   a. When sodium ions are pumped out of the cell and potassium ions are pumped into the cell
   b. The recovery state
   c. Ionic balances are returning to normal
   d. All of the above
   e. None of the above

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70. The following partial pressures (in mmHg), $N_2 = 569$, $O_2 = 104$, $CO_2 = 40$, $H_2O = 47$, are found in:
   a. Atmospheric air
   b. Humidified air
   c. Alveolar air
   d. Expired air
   e. none of the above

71. All of the following statements about haemoglobin are true, except:
   a. Each RBC contains approximately 280 million molecules of haemoglobin
   b. Each molecule of haemoglobin contains 4 heme units
   c. Each heme unit contains one atom of iron
   d. Each atom of iron can combine with one atom of oxygen
   e. none of the above

72. In patients with sickle cell disease, sickling increases with all of the following, except:
   a. Hypoxia
   b. Acidosis
   c. Hyperthermia
   d. Increased 2, 3 DPG
   e. all of the above

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73. The positive electrode of a simple ECG set up to monitor Lead II is placed at:
   a. base of the heart
   b. apex of the heart
   c. below right breast
   d. below right clavicle
   e. right leg

74. Which is not a common cause of ECG artifact:
   a. muscle tremors
   b. loose electrodes
   c. patient movement
   d. battery-operated SAT monitors
   e. all are causes

75. An inverted T wave could be caused by which of the following:
   a. electrode reversal
   b. an ischaemic episode
   c. an acute MI
   d. increased K+
   e. none of the above

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76. Another name for Factor III is:
   a. Tissue thrombin
   b. Hageman factor
   c. Tissue factor
   d. Tissue fibrin
   e. Antihaemophiliac factor

77. A prolonged prothrombin time may be caused by a deficiency of which of the following:
   a. Factor VII
   b. Factor X
   c. Factor V
   d. Fibrinogen
   e. Prothrombin

78. The surface of platelet is:
   a. positively charged
   b. negatively charged
   c. neutrally charged
   d. has a reverse polarity
   e. none of the above

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79. Diabetes Insipidus is:
   a. an adult patient with insulin-dependent DM
   b. excretion of a dilute (tasteless) urine
   c. a result of osmotic diuresis
   d. the inhibition of insulin secretion from the beta cells in the pancreas
   e. none of the above

80. Which statements concerning Type II Diabetes Mellitus are correct?
   a. those individuals whose diabetes developed during childhood
   b. those individuals who are non-insulin dependent
   c. those adults who developed IDDM during adulthood

d. those individuals who require insulin to treat their diabetes
e. none of the above

81. A 70% increase in arterial pCO2 approximately____the cerebral blood flow.
a. halves
b. does not change
c. doubles
d. triples
e. none of the above

82. All of the following can be used as anticoagulants for CPB **except**:
a. low molecular weight heparin
b. hirudin
c. ancrod
d. antithrombin III
e. citrate

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83. At a normal resting HR, about ____% of the oxygen in the myocardial arterial blood is removed as the blood passes through the heart.
a .20
b. 50
c. 70
d. 90
e. none of the above

84. Oedema is caused by:
a. decreased capillary pressure
b. decreased plasma colloid osmotic pressure
c. decreased tissue colloid osmotic pressure
d. increased plasma oncotic pressure
e. none of the above

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85. Haemolysis occurs when the forces developed in squeezing the blood between the walls of the pumping chamber exceed:
a. the afterload in the systemic circuit
b. the resistance of the vessel wall
c. the Reynolds number of 2000
d. the mechanical resistance of the erythrocyte membrane
e. the viscous forces of whole blood

86. Willem Kolff is an extraordinary pioneer in cardiovascular medicine who amongst his other accomplishments contributed to the following;
a. the first disc oxygenator
b. the concept of bubble oxygenation
c. the first twin roller pump patent
d. the first haemodialyzer apparatus used to treat a human
e. none of the above

87. BSA is used in extracorporeal circulation to calculate;
a. cardiac output
b. gas to blood flow ratio
c. cardiac index
d. cardiac ejection fraction
e. cardiac time tension index

88. To increase the delivery of oxygen to the patient's tissue during cardiopulmonary bypass:
a. decrease the haematocrit
b. increase the tissue temperature
c. decrease the narcotic dose
d. increase the blood flow rate
e. decrease the FiO_2

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89. The following coronary arteries may be branches of the right coronary artery.
a. LAD
b. posterior descending artery
c. circumflex
d. a and b
e. a and c

90. Which of the following is <u>not</u> a vitamin K dependent clotting factor?
a. II
b. V
c. VII
d. IX
e. X

91. During the routine initiation of cardiopulmonary bypass, the venous reservoir volume is an indirect indicator of:
a. the volume in the patient
b. the amount of time before you collapse the reservoir or pump air
c. the arterial blood pressure
d. the patient's well-being
e. the adequacy of perfusion

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92. Increasing the velocity of blood flow through a blood oxygenator:
a. increases blood path membrane boundary layers.
b. cause less "secondary flow".
c. decreases blood path membrane boundary layers.
d. does not affect blood path membrane boundary layers.
e. does not affect "secondary flow".

93. "Secondary flow" in blood oxygenators is;
   a. gentle turbulence.
   b. employed to decrease oxygenation capability.
   c. used to break up laminar flow boundary layers.
   d. a and c
   e. all of the above

94. Decreasing a patient's tissue temperature about 10^{o}C will approximately decrease the patient's need for oxygen about
   a. 25 %
   b. 75 %
   c. 50 %
   d. 10 %
   e. 50 %

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95. During cardiopulmonary bypass, when the patient's tissue does not receive enough O_2 to meet the metabolic consumption of O_2,
   a. lactic acid may be produced
   b. the bicarbonate ion concentration may rise
   c. the bicarbonate ion concentration may fall
   d. a and b
   e. a and c

96. During "partial" cardiopulmonary bypass
   a. the patient's heart and lungs are processing a portion of the systemic venous return
   b. the extracorporeal circulation is processing a portion of the venous return
   c. the total blood flow in the peripheral aorta is the sum of the left ventricular cardiac output and the extracorporeal circulation blood flow
   d. the AV cannulation sites may vary from peripheral to central, and the chest may be open or closed
   e. all of the above

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97. Dramatically increasing the gas sweep rate during cardiopulmonary bypass using a membrane oxygenator will probably
   a. lower the arterial blood pCO_2 and raise the pH
   b. raise the arterial blood pCO_2 and lower the pH
   c. lower the arterial pO2
   d. a and b
   e. a and c

98. In a Potts' shunt, the following communication is created:
   a. Aorta to PA
   b. Superior vena cava to right PA
   c. Ascending aorta to right PA
   d. Descending aorta to left PA

e. none of the above

99. All of the following are types of ASDs, except:
a. Primum defect
b. Endocardial cushion defect
c. Infundibular defect
d. Sinus venosus defect
e. Secundum

100. The Lecompte surgical procedure has the following feature:
a. Ascending aorta behind PA bifurcation
b. Ascending aorta lateral to right PA
c. PA is placed behind aorta
d. Aortic arch is attached to PA
e. none of the above

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101. All of the following applies to Diprivan (propofol) except:
a. sedative-hypnotic
b. short-acting
c. earlier extubation than patients treated with versed
d. strong analgesic
e. reported to decrease oxygenator function

102. During deep hypothermic circulatory arrest, all of the following may be given except:
a. thiopental
b. methylprednisone
c. mannitol
d. glucose
e. muscle-relaxant

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104. The degree of spallation relates directly to which of the following:
a. Speed of the roller pump
b. Occlusiveness of the rollerpump
c. Tubing size
d. Tubing type
e. all of the above

103. Heparin's effect on anticoagulation is mediated through .
a. platelet factor III
b. calcium
c. AT III
d. cofactor III
e. c and d

105. All of the following are anticoagulants except:
   a. low molecular weight heparin
   b. hirudin
   c. ancrod
   d. desmopressin
   e. none of the above

106. Proper Intra Aortic Balloon Pump positioning should place the tip of the balloon:
   a. just distal to the right subclavian artery
   b. just proximal to the left common carotid artery
   c. approximately 5 cm distal to the right innominate
   d. just distal to the left subclavian artery
   e. in the central lumen of the aorta

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107. A single monitor determination for the analysis of the adequacy of perfusion would be:
   a. venous oxygen saturation
   b. arterial oxygen saturation
   c. arterial pH
   d. arterial reservoir volume
   e. mean arterial pressure

108. _____Law states that the volume of a gas at a constant temperature is equal inversely proportional to the pressure:
   a. Henry's
   b. Boyle's
   c. Charles
   d. Dalton's
   e. Gay-Lussac's

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109. _____Law states that the partial pressure of a gas in solution is equal to the pressure that the gas would exert if it occupied the total volume of a mixture:
   a. Henry's
   b. Boyle's
   c. Charles
   d. Dalton's
   e. Gay-Lussac's

110. Autologous blood transfusion results in all of the following advantages, except:
   a. Decreases homologous plasma and platelet use
   b. Decreases homologous red blood cell use
   c. Non-Immunogenic
   d. Decreases risk of transmitting blood borne disease to recipient

e. Preserves O_2 carrying capacity

111. The drip rate for anticoagulants used in autotransfusion should be:
a. 15 cc per 100 cc blood
b. 20 cc per 100 cc blood
c. 30 cc per 100 cc blood
d. 1 cc per 12 cc blood
e. 3 cc per 12 cc blood

112. Autotransfusion can be used in all of the following, except:
a. Gynecological procedures
b. Total hip replacements
c. Jehovah witnesses
d. Gun shot wounds to the abdomen
e. Blunt chest trauma

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113. Ultrafiltrators are devices that are made from all of the following materials, except:
a. polysulphone
b. polypropylene
c. polyacryonlite
d. silicone
e. None of the above

114. Haemofiltration or ultrafiltration conserves the following blood component(s), whereas this component(s) is probably lost in cell centrifugation and washing:
a. plasma proteins including clotting factors
b. white blood cells
c. platelets
d. a. and c.
e. all of the above

115. The usual ultrafiltrators allow molecules up to _____to undergo ultrafiltration:
a. 50 angstroms
b. 200 microns
c. 300 ml
d. 20,000 Daltons
e. 2,000 Daltons

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116. The greatest decrease in platelet count occurs at what point during CPB:
a. First few minutes
b. During ischaemic period
c. During reperfusion
d. The decrease is constant throughout cardiopulmonary bypass
e. platelet count doesn't drop

117. Which of the following is deemed to be the most significant factor in blood cell trauma during cardiopulmonary bypass:
   a. Arterial cannula design
   b. Pulsatile flow
   c. Cardiotomy suction
   d. Oxygenator design
   e. MAP

118. Which of the following does not contribute to blood cell trauma:
   a. Shear stress
   b. Wall impact
   c. Surface tension
   d. Viscosity
   e. All do contribute

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119. All of the following statements statements about heparin are true, except:
   a. It is strongly acidic
   b. Dissolves existing clots
   c. Stimulates antithrombin III activation
   d. Inhibits the action of factors IX and XI
   e. Heparin has the half-life of approximately 1-1.5 hours

120. Which of the following is a physiologic result of Intra Aortic Balloon Pump deflation:
   a. increased pressure head in the aorta
   b. decreased left ventricular wall tension
   c. increased perfusion of arch vessels
   d. greatly decreased dynamic work
   e. increased renal perfusion

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