Self Assessment – Module F Hemodynamics

1) Stroke volume of the heart is determined by what three factors?
   a) **PRELOAD**
   b) **AFTERLOAD**
   c) **CONTRACTILITY**

2) Name the three types of catheters inserted into the heart or blood vessels to measure blood pressures. Explain if they are inserted into arteries or veins.

   a) **CENTRAL VENOUS CATHETER – VENOUS**
   b) **PULMONARY ARTERY CATHETER – VENOUS**
   c) **ARTERIAL LINE – ARTERY**

3) Trace the blood flow through the heart, beginning and ending with the left ventricle. Write in the blood pressures as you go along.

Trace the Blood Flow	Pressures **(mm Hg)**	Mean Pressures **(mm Hg)**
1. Left Ventricle	120/0	
2. AORTIC VALVE		
3. AORTA AND OTHER ARTERIES	**120/80**	**80 TO 100**
4. ARTERIOLES	**30**	
5. SYSTEMIC CAPILLARIES	**20**	
6. SYSTEMIC VENULES	**10**	
7. SYSTEMIC VEINS	**10**	
8. RIGHT ATRIUM	**2-6**	
9. TRICUSPID VALVE		
10. RIGHT VENTRICLE	**25/0**	
11. PULMONIC VALVE		
12. PULMONARY ARTERY	**25/8**	
13. PULMONARY ARTERIOLE		
14. PULMONARY CAPILLARY		
15. PULMONARY VENULES	**8-10**	
16. PULMONARY VEINS		
17. LEFT ATRIUM	**5**	
18. MITRAL VALVE		
19. Left Ventricle	120/0	

1) Name the three factors that influence/determine blood pressure

   a) BP = **SVR** x **SV** x **HR**

2) It is not good to have a blood pressure too low or too high. Explain the problems associated with each.
   HYPOTENSION: REDUCES PERFUSION TO THE TISSUE AND REDUCES OXYGEN DELIVERY
   HYPERTENSION: STRAINS THE HEART (INCREASED AFTERLOAD) AND WILL EVENTUALLY LEAD TO HEART FAILURE.

3) Explain which pressures are used to measure the following

   a) Preload on the right side of the heart **CVP**

   b) Afterload on the right side of the heart **PVR**

   c) Preload on the left side of the heart **PCWP**

   d) Afterload on the left side of the heart **SVR**

4) List the three causes of hypovolemia
   a) **HEMORRHAGE**
   b) **DEHYDRATION**
   c) **THIRD SPACING (FLUID LEAKING OUT OF THE VASCULAR SPACE AND INTO THE INTERSTITIAL SPACE**

5) Name two advantages or reasons for inserting an A-line catheter
   CONTINUOUS BLOOD PRESSURE MONITORING
   FREQUENT BLOOD SAMPLING

6) How is the cardiac index calculated? **CO/BSA**

7) Name the nomogram used to determine the body surface area (BSA) **DUBOIS**

8) Name the two parameters that must be known to determine the body surface area

9) State the normal value for each of the following:

   a) Stroke Volume **60 TO 130 mL/BEAT**

   b) Cardiac Output **5 to 8 L/MIN**

   c) Cardiac Index **2.5 to 3.5 L/MIN/M^2**

10) When a CVP catheter is inserted, where does it end up? **LARGE PERIPHERAL OR CENTRAL VEIN; RIGHT ATRIUM**

11) When a PAP catheter is inserted, where does it end up? **PULMONARY ARTERY**

12) Given the following information, calculate the SVR.
    BP 180/90   CVP 12 mm Hg   CO 4.5 L/min   PAP 44/32   PCWP 15 mm Hg
    YOU DON'T HAVE TO DO THIS (YET).

$$SVR = \frac{(MAP - CVP)}{CO} \times 80$$

$$MAP = \frac{(2\ DIASTOLIC) + SYSTOLIC}{3}$$

$$MAP = \frac{(2 \times 90) + 180}{3} = \frac{180 + 180}{3} = \frac{360}{3} = 120$$

$$SVR = \frac{(120 - 12)}{4.5} \times 80 = \frac{108}{4.5} \times 80 = 24 \times 80 = 1{,}920$$

13) If a patient blood pressure is 140/90, what would be the pulse pressure?
    140-90=50 mm Hg

14) Pulmonary capillary wedge pressure (PCWP) tells us what's going on in the
    a) Right heart
    b) Lungs
    c) Left heart
    d) Liver

15) List the normal values for the following

    a) CVP **2-6 mm Hg**
    b) Arterial Blood Pressure **120/80 mm Hg**
    c) PAP **25/8 mm Hg**
    d) Mean Arterial Pressure **80-100 mm Hg**
    e) MPAP **10-20 mm Hg**
    f) PCWP **4-12 mm Hg (TWICE CVP)**

16) Given a blood pressure of 140/80, calculate the mean arterial blood pressure (MAP).

$$MAP = \frac{(2\ DIASTOLIC) + SYSTOLIC}{3}$$

$$MAP = \frac{(2 \times 80) + 140}{3} = \frac{160 + 140}{3} = \frac{300}{3} = 100$$

17) Given a pulmonary artery pressure of 30/10, calculate the mean pulmonary artery pressure (MPAP)

$$MPAP = \frac{(2\ DIASTOLIC) + SYSTOLIC}{3}$$

$$MPAP = \frac{(2 \times 10) + 30}{3} = \frac{20 + 30}{3} = \frac{50}{3} = 16.7$$

18) What is the normal mean arterial blood pressure? **80 TO 100 mm Hg**

19) What is the normal mean pulmonary artery pressure? **10 TO 20 mm Hg**

20) Name the two semilunar valves of the heart
    a) **AORTIC**
    b) **PULMONIC**

21) Name the two A-V (cusped) valves of the heart
    a) **MITRAL (BICUSPID)**
    b) **TRICUSPID**