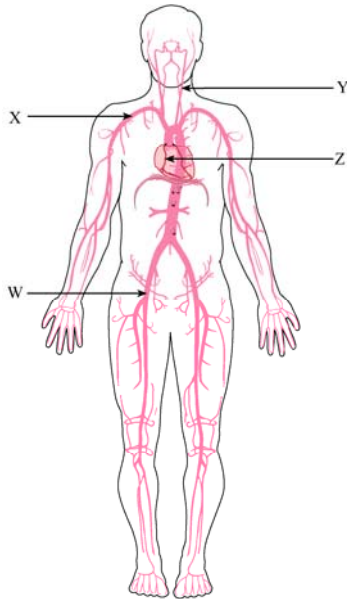


Circulatory System and Blood

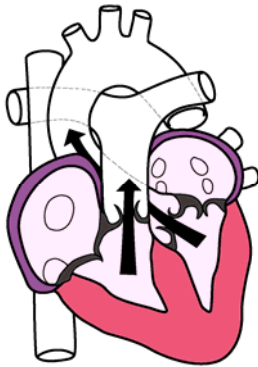
1.



Identify the arteries in the diagram and give one function for each.

- W - Iliac artery- supplies oxygenated blood the legs**
X- Subclavian artery- supplies oxygenated blood the arms
Y – Carotid artery- supplies oxygenated blood the head
Z –Coronary (or cardiac) artery- supplies oxygenated blood the heart

2.



The heart shown is in the process of

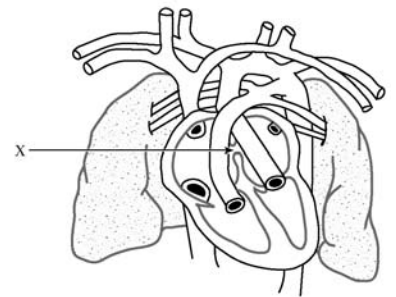
- A. atrial and ventricular systole.
 B. atrial and ventricular diastole.
 C. atrial systole and ventricular diastole.
D. atrial diastole and ventricular systole.

3. In the fetus, the function of the structure labelled X is to (1 mark)

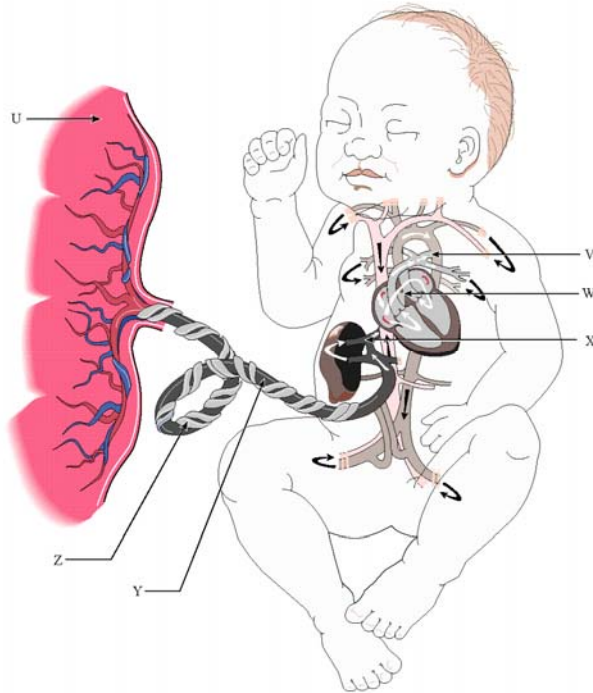
- A. take blood to the lungs.
 B. ensure adequate blood flow to the brain.
 C. return blood from the placenta to the heart.
D. direct some of the blood away from the lungs.

What would be the consequences of this structure persisting after childbirth. (2 marks)

- **Oxygenated blood would mix with deoxygenated blood**
- **Baby would appear bluish in color**
- **Inadequate supply of O₂ and child would get tired very easily**



4.



Identify the structures in the diagram below and describe one function for each. (12 marks).

The blood vessel found in adults that contains oxygen levels similar to the blood vessel labelled Y is the

A. renal vein.

B. pulmonary vein.

C. pulmonary artery.

D. hepatic portal vein.

U

- Placenta
- Organ that exchanges nutrient, wastes and gases between maternal blood and fetal blood

V

- arterial duct
- Connects pulmonary artery and aorta thus diverting blood away from the lungs

W

- oval opening
- Opening between the left and right atria that diverts blood away from the lungs

X

- venous duct
- connects umbilical vein with vena cava and returns blood back to the heart

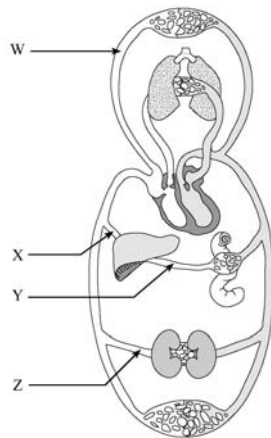
Y

- umbilical vein
- Supplies fetus with nutrients and O₂ from the mother's blood

Z

- umbilical artery
- takes away CO₂ and metabolic wastes from the fetus into the mother's blood

5.



Identify the blood vessels in the diagram above (4 marks), and list 3 differences in the composition of blood in blood vessels X and Y (3 marks)

W Jugular (or subclavian) vein

X hepatic vein

Y hepatic portal vein

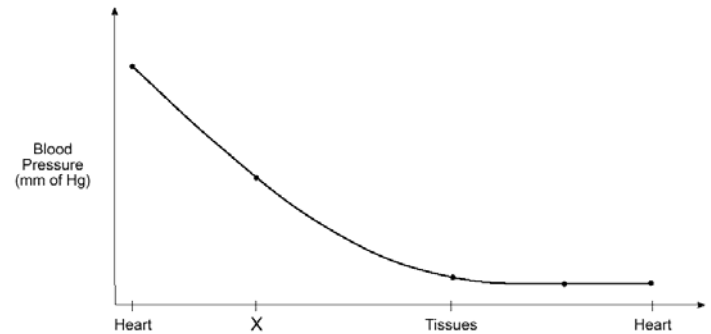
Z renal vein

Differences

- 1) Y has greater glucose concentration
- 2) X has greater concentration of formed elements (i.e. albumin, fibrinogen, globulins)
- 3) X has greater concentration of nitrogenous wastes (urea, uric acid)

6. The reading taken at X would be at the
a) renal artery.
 b) pulmonary vein.
 c) posterior vena cava.
 d) peritubular capillaries.

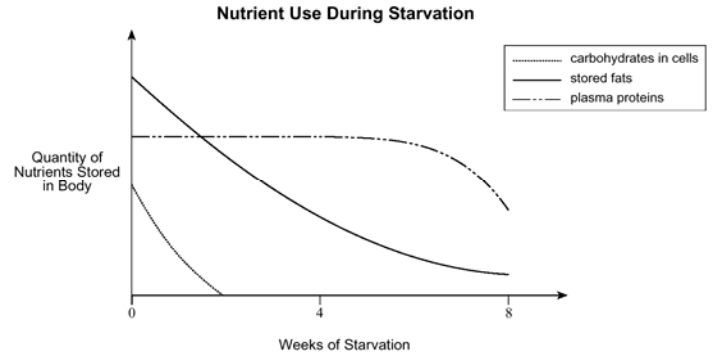
A person's blood pressure was measured at five blood vessels and plotted on the graph below.



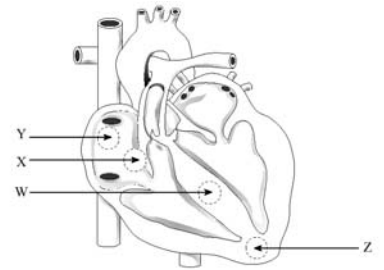
7. a) Describe **one** function of each of the following. (3 marks)
 - Red blood cells: **transport oxygen and carbon dioxide**
 - White blood cells: **fight infection**
 - Platelets: **aid clotting**
 b) Where are red blood cells produced? (1 mark)

Red bone marrow

8. The graph illustrates how the body consumes stored nutrients during a prolonged period of starvation. After eight weeks,
 A. blood pressure will increase.
B. fluids will accumulate in tissues.
 C. glycogen production will increase.
 D. hemoglobin will not release oxygen.

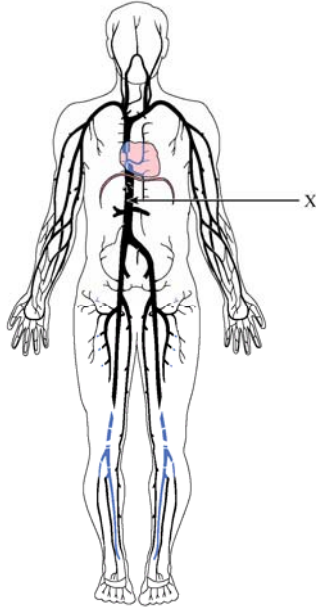


9. Which area indicated in the diagram is the location of the AV node?
 A. W
B. X.
 C. Y
 D. Z



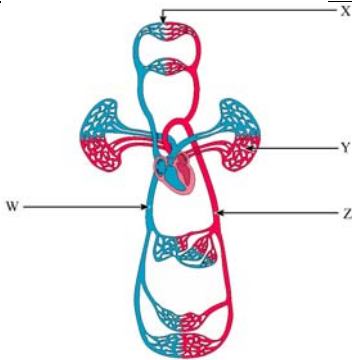
10. Describe how the structure of each of the following aids in its function (3 marks)
- a) artery
- **thick layer of smooth muscle to absorb pressure from beating heart**
- b) vein
- **contain valves to maintain the one-way direction of blood flow**
 - **veins have thin walls and are therefore elastic; allows for excess blood to be stored in the blood**
- b) capillary
- **one cell thick ∴ allows for diffusion of materials in and out of cells**

11.



- The structure labelled **X** is the
- A. iliac artery.
 B. hepatic vein.
 C. carotid artery.
D. posterior vena cava.

12.



- In the diagram above, the blood pressure is highest at
- A. W
 B. X
 C. Y
D. Z

13. Which of the following blood vessels is represented by the diagram?

- A. Lymph vessel.
B. Carotid artery.
 C. Hepatic portal vein.
 D. Peritubular capillary.

Blood capillaries and lymph capillaries both

- A. filter bacteria.
 B. have one-way valves.
 C. contain red blood cells.

D. have walls which are one-cell thick.

- one-way valves
- thin elastic layer
- near skeletal muscle

The characteristics above describe which type of vessel?

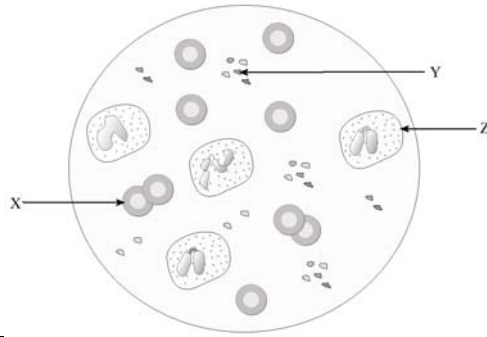
- A. vein.**
 B. artery
 C. arteriole
 D. capillary



14. Blood vessel **U** is a(n)
 A. vein.
 B. artery.
 C. venule.
D. capillary.

BLOOD VESSEL	PRESSURE (mm of mercury)	VELOCITY (cm/sec.)
S	less than 5	15
T	20	80
U	10	2
V	40	100

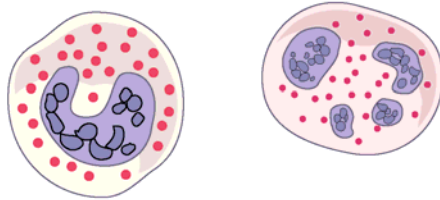
15.



Name structures **X**, **Y** and **Z** and provide a function of each. (3 marks: 1 mark for each name)

X red blood cell (or erythrocyte)
Y platelet (or thrombocyte)
Z white blood cell (or leukocyte)

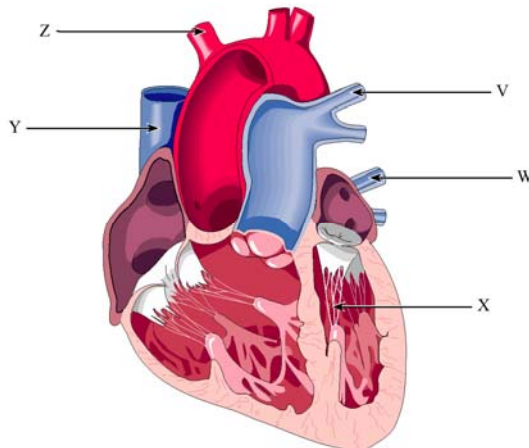
16.



The blood cells shown in the diagram above function to

- A. clot the blood.
B. fight infection.
 C. buffer the blood.
 D. transport oxygen.

17.



The function of the structure labelled **X** is to

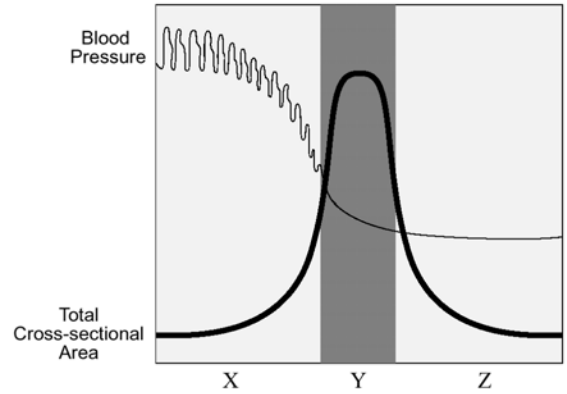
A. initiate heartbeat.
 B. channel blood to the ventricles.
 C. carry blood to the heart muscle.
D. prevent the valves from inverting.

The anterior (superior) vena cava is labelled

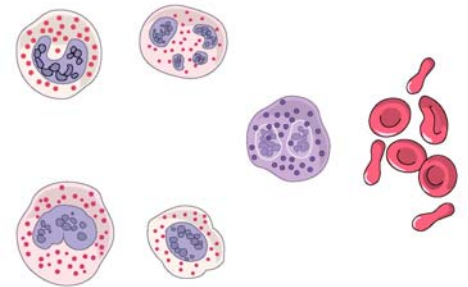
A. V
 B. W
C. Y
 D. Z

18. The graph shows blood pressure and cross-sectional area of vessels in various parts of the circulatory system. What kind of blood vessel would have the characteristics found in area Z?

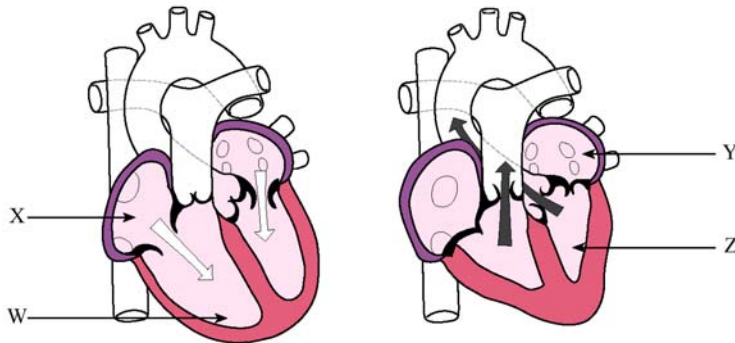
- A. Vein.**
- B. Artery.
- C. Arteriole.
- D. Capillary.



19. The blood cells shown in the diagram would **not** be able to
- A. carry oxygen.
 - B. fight infection.
 - C. initiate a blood clot.**
 - D. carry carbon dioxide.



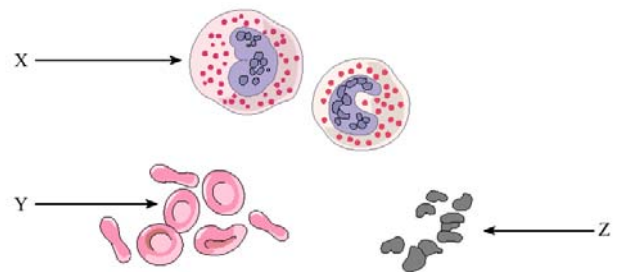
- 20.



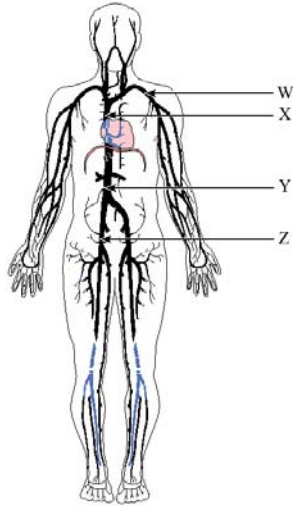
Systole of the ventricles is occurring at A. W B. X C. Y **D. Z**

21. Identify each blood component indicated in the diagram below and give **one** function of each. (6 marks: 1 mark each for name and 1 mark each for function)

See 7 & 15



22. Lymph fluid is returned to the circulatory system in the vessel labeled



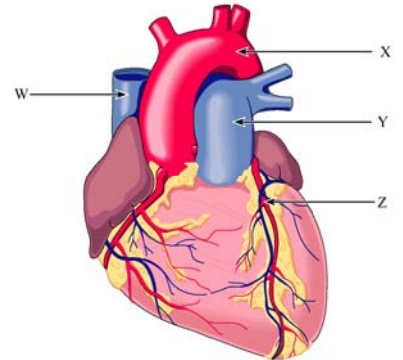
- A. W
B. X
C. Y
D. Z

23. a) Which blood vessel in the diagram directly supplies the heart tissue with oxygen and nutrients?

- A. W B. X C. Y **D. Z**

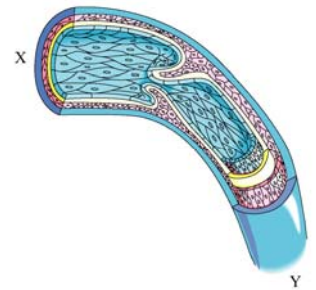
- b) The sequence of structures through which the nerve impulse passes to cause contraction of the heart is

- A. AV node – SA node – Purkinje fibres.
B. Purkinje fibres – AV node – SA node.
C. Purkinje fibres – SA node – AV node.
D. SA node – AV node – Purkinje fibres.



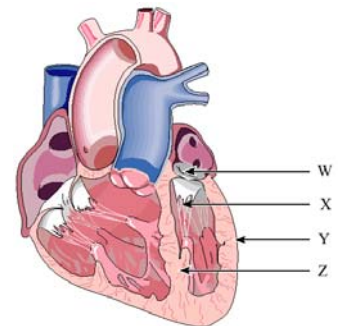
24. The blood vessel shown carries blood between organs at locations X and Y. Blood flow through the vessel would be from the

- A. heart at X to the kidneys at Y.
B. intestine at Y to the liver at X.
C. heart at Y to the kidneys at X.
D. intestine at X to the liver at Y.

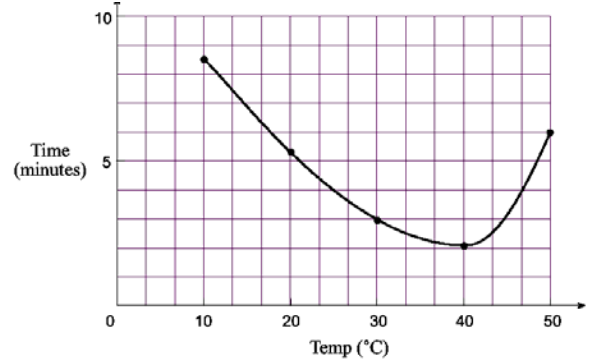


25. The chordae tendineae are indicated by the letter

- A. W
B. X
C. Y
D. Z



26. An experiment was performed to determine the effect of changing temperature on the speed of blood clotting. Whole blood was placed in labelled test tubes. The tubes were then placed in water baths of various temperatures. Time required for a clot to form was then measured. The results are graphed below. (6 marks: 2 marks each)

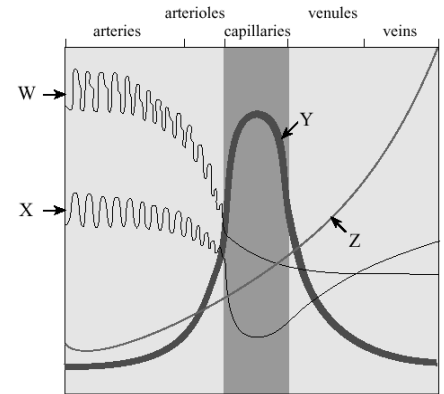


Give the clotting times observed at 10°C, 40°C and 50°C and explain why these clotting times occur.

- a) 10°C:
slowest clotting rate due to low temperature; activation energy required for this chemical reaction is not easily achieved
 - b) 40°C :
fastest clotting rate due to optimal temperature for action of enzymes
 - c) 50°C:
temperature has increased and activation energy is more easily achieved but enzymes that speed up this reaction are becoming denatured
-
27. State **one** function of each of the following heart structures.
- a) SA node: (1 mark)
 - **initiates the impulse that causes the atria to contract**
 - b) Coronary arteries: (1 mark)
 - **supply oxygenated blood to the heart**
 - c) Atrioventricular valves: (1 mark)
 - **prevent back flow of blood between atria and ventricles when the ventricles contract**
 - d) Right ventricle: (1 mark)
 - **pump deoxygenated blood from the heart to the lungs**
-
28. Trace the flow of red blood cells through the heart of a mature human, naming all the valves, vessels and chambers, starting with venous blood entering the heart and arterial oxygenated blood leaving the heart. (7 marks: 1/2 mark for each item, 1/2 mark for proper sequence)
- Vena cava → right atrium → atrioventricular (tricuspid) valve → right ventricle → pulmonary semilunar valve → pulmonary trunk → pulmonary artery → lungs → pulmonary veins → left atrium → atrioventricular (bicuspid or mitral) valve → left ventricle → aorta**
-
29. a) Explain why people with "O negative" type blood are termed universal donors, yet are limited in the blood they can receive. (2 marks)
- **Type O negative lacks A, B and Rh antigens**
 - **Therefore antibodies made by the recipient will not have an antigen to bind to (no agglutination)**
- b) If an Rh negative mother has a second Rh positive child, there may be fetal erythroblastosis.
- i) Explain the cause of erythroblastosis. (2 marks)
 - **During delivery of the first child the mother's immune system may have come in contact with the baby's blood and thus made Rh antibodies**
 - **The mother's antibodies may cross the placenta and attack the child's red blood cells**
 - ii) State **one** way that erythroblastosis could be prevented and describe how this method works. (2 marks)
 - **give the mother a shot of Rh immune globulin (like an injection of antibodies) just after the birth of every child**
 - **thus the injection will attack any of the baby's blood that has entered the mother's body and the mother's immune response will not be activated**

30. Which letter represents a graph indicating the total cross-sectional area of the body's blood vessels?

A. W
B. X
C. Y
D. Z



- 31.

a) The graph above shows changes in arterial blood pressure over time. Which letter would indicate ventricular systole?

A. W B. X **C. Y** D. Z

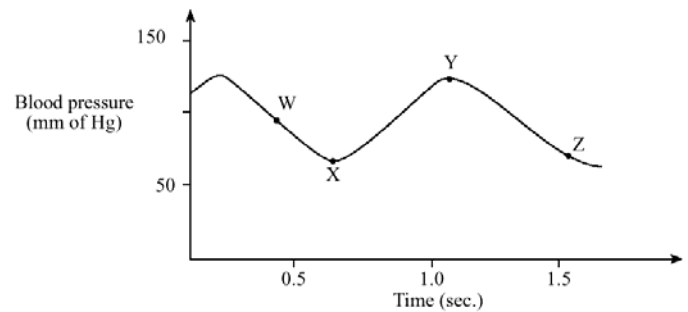
b) Which of the following is a characteristic of systemic circulation?

A. Highly oxygenated arterial blood.

B. Increased blood pressure in the veins.

C. Low carbon dioxide concentration in the veins.

D. Increased concentration of reduced hemoglobin (HHb) in the arterial blood.



32. a) Explain why there is a sharp drop in pressure as blood moves from arteries to capillaries. (1 mark)
- **Total cross sectional area increases and the force from the ventricles is spread out**
- b) Give an advantage of having low pressure in capillaries. (1 mark)
- **Low blood pressure in the capillaries allows for molecules to move in and out of the interstitial fluid**

33. A blood pressure reading 120/80 mm of Hg is considered normal.

a) Explain what could cause an individual to have a resting systolic pressure reading 160 mm of Hg (2 marks)

- **A systolic pressure of 160 is considered high blood pressure (hypertension)**

Any one of the following for your second mark

- **Caused by too much salt in the diet and thus the retention of excess water**
- **Caused by excess production of the hormone renin by the kidneys which causes an increase in salt and water retention**
- **Caused by atherosclerosis – plaque buildup in the arteries**
- **Caused by stress**

b) Is it possible to have a blood pressure reading 120/140 mm of Hg? Explain. (2 marks)

- **No, in this situation 120 refers to the systolic pressure and 140 refers to the diastolic pressure**

Systolic pressure coincides with the contraction of ventricles and diastolic pressure coincides with relaxation of the ventricles thus systolic pressure should always be greater than diastolic pressure

34. Certain tissues of the heart are responsible for its rhythmic contraction. Name these tissues and explain how they work to regulate and co-ordinate a rhythmic contraction of the heart. (4 marks)
- **SA Node**
 - **Sends out an impulse every 0.85 s that initiates the heartbeat and causes the atria to contract**
 - **AV Node**
 - **Receives signal from SA node and passes it along to the Purkinje fibers which then causes the ventricles to contract**
35. A person's arm was scraped. Within a few minutes, the region became inflamed. The area became **reddish** in colour (not due to bleeding), slightly **swollen** and **warm** to the touch. Explain the physiological cause of these symptoms. (5 marks)
- **Bradykinin is released by injured cells**
 - **Bradykinin causes mast cells to release histamine**
 - **Histamine causes localized heat, redness and the capillaries to dilate and become enlarged (swelling)**
 - **The dilated capillaries increase permeability of fluids thus allowing the blood to wash the wound out from pathogens**
 - **Increased temperature increases the rate of enzymes involved in the clotting function**

36.

BODY PARTS	AT REST mL ³ /min	LIGHT EXERCISE mL ³ /min	FAIRLY STRENUOUS EXERCISE mL ³ /min	MAXIMUM EXERTION mL ³ /min
Heart muscles	250	350	750	1000
skeletal muscles	1200	4500	12500	22000
kidneys	1100	900	600	250
gut	1400	1100	600	300
skin	500	1500	1900	600
brain	750	750	750	750
all other regions	600	400	400	100
TOTAL	5800	9500	17500	25000

The table above shows the blood flow for different parts of the human body, at rest during different levels of physical activity. Explain and give reasons for the figures for each of the following:

- a) kidneys (2 marks)
- **during increased activity the medulla oblongata receives information about changes in blood content (i.e. CO₂ concentration)**
 - **the medulla oblongata then sends a signal to the autonomic system which reduces the activity of certain internal organs like the kidney thus reducing the demand for blood by these organs**
- b) brain (1 mark)
- **The brain needs a continuous supply of blood and oxygen but is not affected by increased activity**
- c) Compare and contrast the blood flow to the heart and skeletal muscles. (3 marks)
- **The heart is a muscle that is always working and therefore needs a constant supply of blood even at rest**
 - **As activity increases heart rate increases to supply blood to all the working muscles as well as the more active heart**
 - **At maximum exertion blood flow to the heart increases 4 times but blood flow to skeletal muscles increases by 18 times this is because the mass of skeletal muscles is that much greater than the heart and therefore require that much more blood as well as the fact that the skeletal muscles were inactive beforehand**