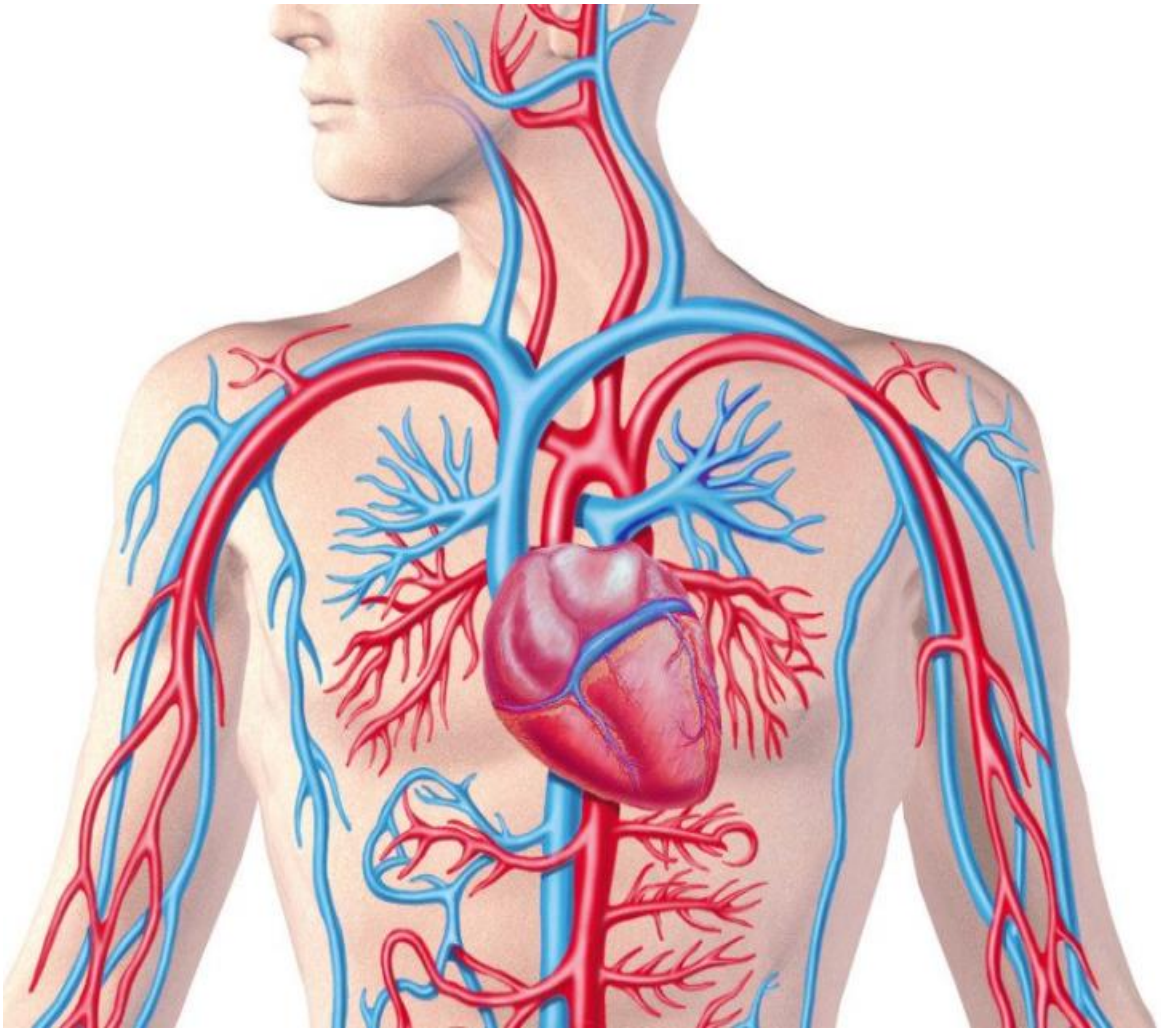
THE BLOOD CIRCULATORY SYSTEM



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Assignment A

Heart and Circulatory System

The heart is a pump, usually beating about 60 to 100 times per minute. With each heartbeat, the heart sends Blood throughout our bodies, carrying oxygen to every cell. After delivering the oxygen, the blood returns to the heart. The heart then sends the blood to the lungs to pick up more oxygen. This cycle repeats over and over again.

What Does the Circulatory System Do?

The circulatory system is made up of blood vessels that carry blood away from and towards the heart. **A**rteries carry blood away from the heart and veins carry blood back to the heart. The circulatory system carries oxygen, nutrients, and hormones to cells, and removes waste products, like carbon dioxide. These roadways travel in one direction only, to keep things going where they should.

What Are the Parts of the Heart?

The heart has four chambers — two on top and two on bottom:

- The two bottom chambers are the right ventricle and the left ventricle. These pump blood out of the heart. A wall called the interventricular septum is between the two ventricles.

- The two top chambers are the right atrium and the left atrium. They receive the blood entering the heart. A wall called the interatrial septum is between the atria.

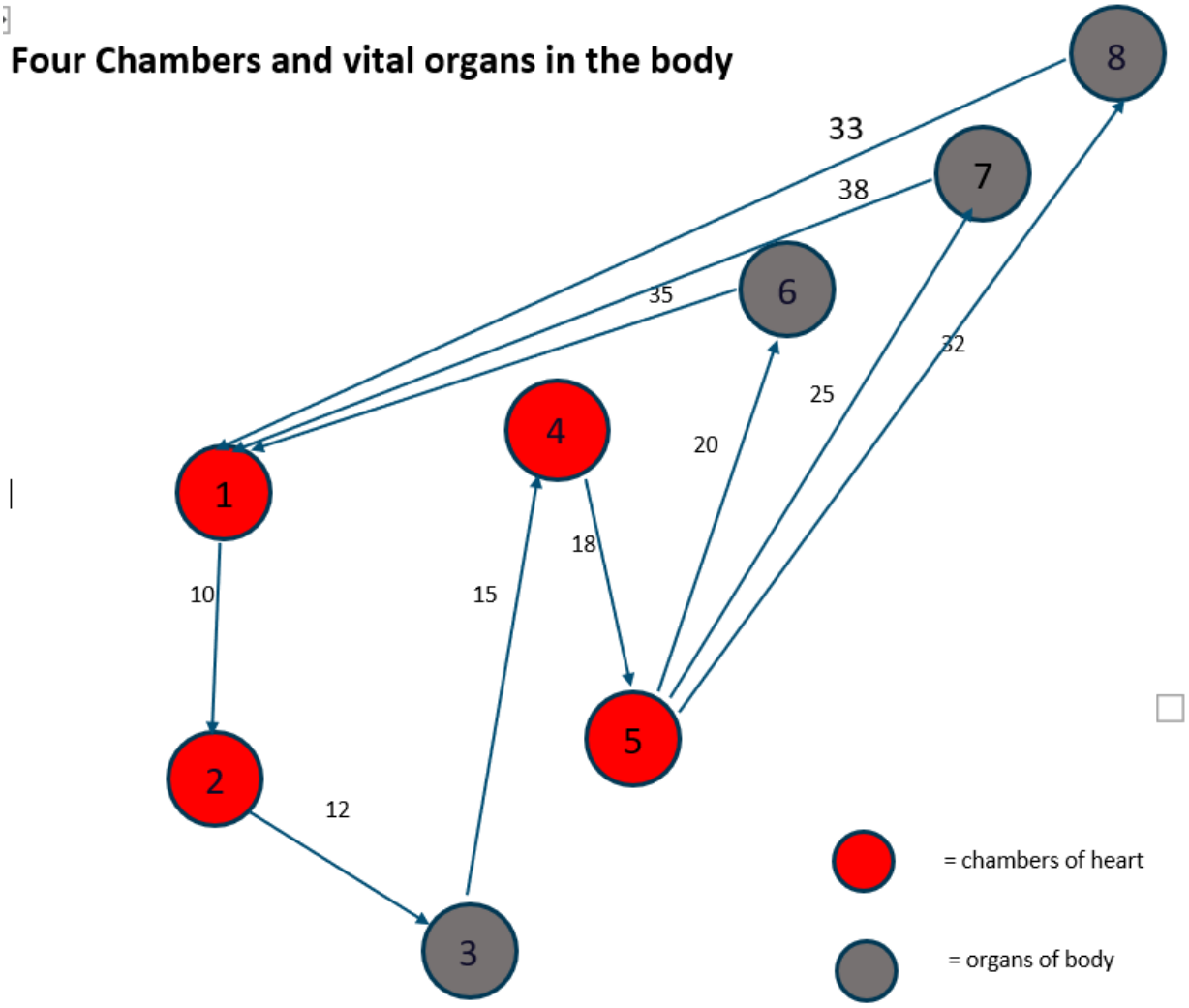
  Question

  "The blood circulatory system (cardiovascular system) delivers nutrients and oxygen to all cells in the body. It consists of the heart and the blood vessels running through the entire body. The arteries carry blood away from the heart; the veins carry it back to the heart." - www.ncbi.nlm.nih.gov

  I. Using the Graph Theory, write a program to simulate human blood circulatory system. Your program should demonstrate four chambers of heart, other vital organs in the body, flow rate, distances, directions, etc. (Make necessary assumptions)

  II. Represent Red blood cells, white blood cells, and Platelets using separate data structures. They should be able to traverse through above mentioned organs. Based on their lifespans, show some profiling information of different cell types. (e.g calculate the probability and number of times a red blood cell traverse each important organ in a human body.)

Chambers and vital organs in the Body Representing in the Graph



1.Right Atrium
2.Right Ventricle
3.Lungs
4.Left Atrium
5.Left Ventricle
6.Brain
7.Liver
8.Kidney

Traverse Each Organ path

01.Brain

Rightattrium -> Rightventrical -> Lungs -> Leftattrium -> Leftventrical -> Brain

02.Liver

Rightattrium -> Rightventrical -> Lungs -> Leftattrium -> Leftventrical -> Liver

03.Kidney

Rightattrium -> Rightventrical -> Lungs -> Leftattrium -> Leftventrical -> Kidney

Code Details

For each cell create structures.

```
struct RedBloodCells{
    float redbloodcells_amount;
    int redblood_lifespan;
    int redblood_distance;
};
struct WhiteBloodCells{
    float whitebloodcells_amount;
    int whiteblood_lifespan;
    int whiteblood_distance;
};
struct PlateletsBloodCells{
    float platelets_amount;
    int platelets_lifespan;
    int platelets_distance;
};
```

Then create graph for representing blood circulatory system. Then traverse all vertex in the graph and find the path of the suitable vital organs.

Next create calculation by using the assumption.

Assumptions

- Use the three parts of the body such that Brain, Liver, Kidney in this program.
- Assume that red cells, white cells, platelets lifespan.

```
red.redblood_lifespan=110;//days
white.whiteblood_lifespan=15;
platelets.platelets_lifespan=9;
```

- And also assume that red cells, white cells, platelets travers the distance per day.
- Next calculate the total traversal distance of each cells in its lifespan.

```
totalRedcellsDistance=red.redblood_distance*red.redblood_lifespan;
printf("Total Traversal Distance Of RedBlood cells In Its Lifespan:%d\n",totalRedcellsDistance);
totalWhitecellsDistance=white.whiteblood_distance*white.whiteblood_lifespan;
printf("Total Traversal Distance Of WhiteBlood cells In Its Lifespan:%d\n",totalWhitecellsDistance);
totalplateletsDistance=platelets.platelets_distance*platelets.platelets_lifespan;
printf("Total Traversal Distance Of WhiteBlood cells In Its Lifespan:%d\n",totalplateletsDistance);
```

- Then assume several weights between each vertex in this graph weight=distance.
- Next calculate the total weights in each organ cycle.

  Ex:-brain->10+12+15+18+20+35=110
- Find the how many numbers of times in each cells travers each organ for, Total traversal distance of each cells in its lifespan is divided by total weight in each organ cycle.

Ex:-Brain

```
numberOfTimesTraverseRedcellsBrain=(totalRedcellsDistance/pathOfBrainweight); //number of times each cells travers to the organ
numberOfTimesTraverseWhitecellsBrain=(totalWhitecellsDistance/pathOfBrainweight);
numberOfTimesTraverseplateletsBrain=(totalplateletsDistance/pathOfBrainweight);

printf("\n\n----------Number of times each cells traverse to the Brain----------\n\n");
printf("    Red Cells  :%f\n",numberOfTimesTraverseRedcellsBrain);
printf("    White Cells:%f\n",numberOfTimesTraverseWhitecellsBrain);
printf("    Platelets  :%f\n",numberOfTimesTraverseplateletsBrain);
```

- And also assume that out of blood 5 liters and 2 liters store in Brain and 2 liters store in Liver and 1-liter store in Kidney.
- Assume that, it was considered that five liters of blood were going through the body of a man every day.
- The number of RedBloodCells contain this blood sample=600 and the number of WhiteBloodCells contain this blood sample=100 and the number of Platelets contain this blood sample=150
- Then the calculate the number of each cells in each organ.

    Ex:-Brain

        Number of red cells = (600*2)/5

        Number of White cells = (100*2)/5

        Number of Platelets = (150*2)/5

- Then find the probability in each organ

    Ex:-Brain

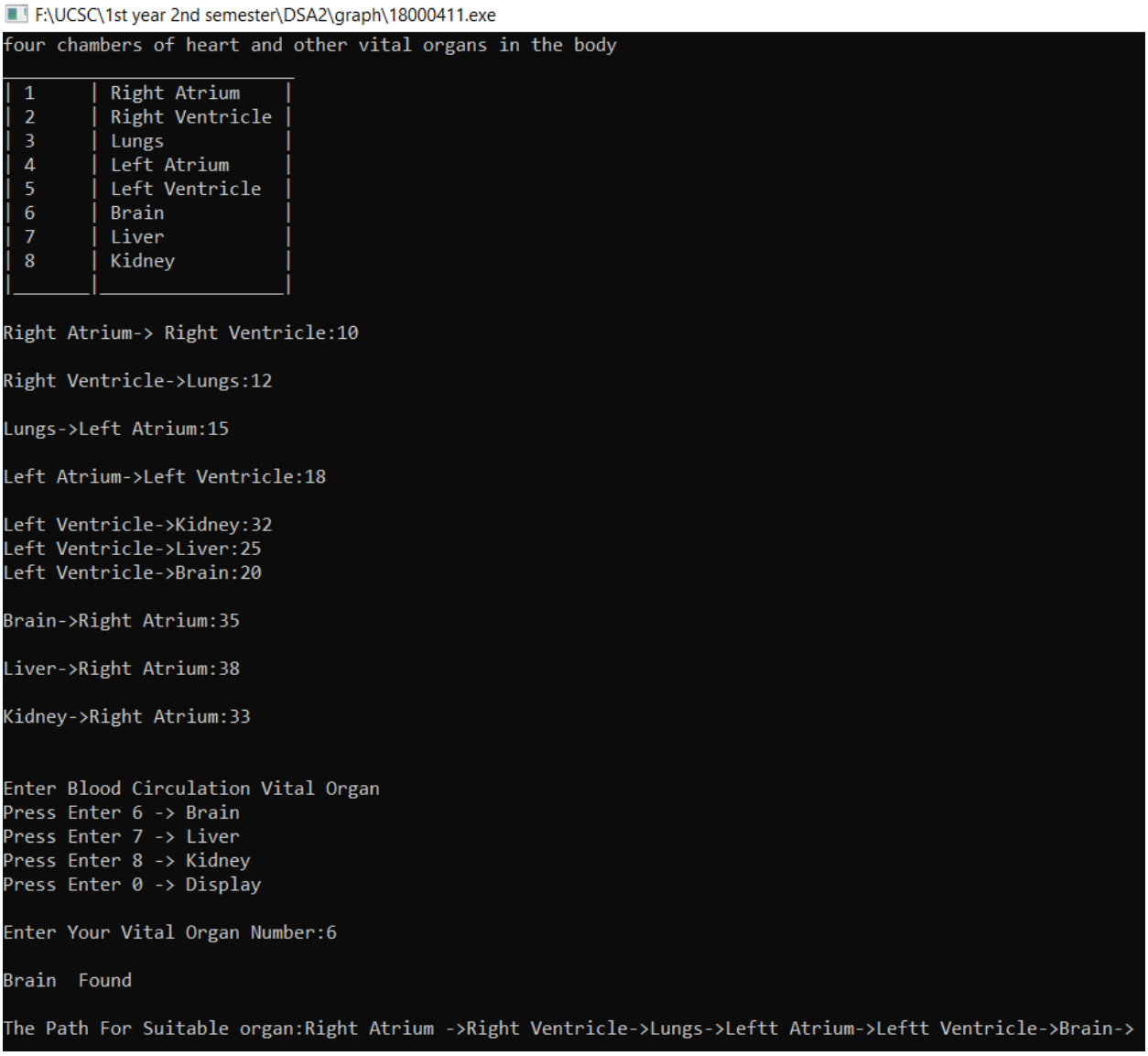
        Probability = (2/5)*100

        Liver = (2/5)*100

        Kidney = (1/5)*100

After the graph was printed. When we were provided with the necessary organs, we were guided from Right atrium to that organ.

Output



```
Enter Blood Circulation Vital Organ
Press Enter 6 -> Brain
Press Enter 7 -> Liver
Press Enter 8 -> Kidney
Press Enter 0 -> Display

Enter Your Vital Organ Number:7

Liver  Found

The Path For Suitable organ:Right Atrium ->Right Ventricle->Lungs->Leftt Atrium->Leftt Ventricle->Liver->

Enter Blood Circulation Vital Organ
Press Enter 6 -> Brain
Press Enter 7 -> Liver
Press Enter 8 -> Kidney
Press Enter 0 -> Display

Enter Your Vital Organ Number:8

Kidney  Found

The Path For Suitable organ:Right Atrium ->Right Ventricle->Lungs->Leftt Atrium->Leftt Ventricle->Kidney->

Enter Blood Circulation Vital Organ
Press Enter 6 -> Brain
Press Enter 7 -> Liver
Press Enter 8 -> Kidney
Press Enter 0 -> Display

Enter Your Vital Organ Number:0

The Total Weight Of Brain:110
The Total Weight of Liver:118
The Total Weight Of Kidney:120

Total Traversal Distance Of RedBlood cells In Its Lifespan:44000
Total Traversal Distance Of WhiteBlood cells In Its Lifespan:750
Total Traversal Distance Of WhiteBlood cells In Its Lifespan:675
```

```
----------Number of times each cells traverse to the Brain----------

    Red Cells  :400.000000
    White Cells:6.000000
    Platelets  :6.000000


----------Number of times each cells traverse to the Liver----------

    Red Cells  :372.000000
    White Cells:6.000000
    Platelets  :5.000000


----------Number of times each cells traverse to the Kidney----------

    Red Cells  :366.000000
    White Cells:6.000000
    Platelets  :5.000000

Probability of the blood store in the Brain : 40.000000
Probability of the blood store in the Liver : 40.000000
Probability of the blood store in the Kidney: 20.000000

Number of RedBlood Cells in Brain : 240.000000
Number of whiteBlood Cells in Brain :40.000000
Number of platelets in Brain        :60.000000

Number of RedBlood Cells in Liver :240.000000
Number of whiteBlood Cells in Liver :40.000000
Number of platelets in Liver        :60.000000

Number of RedBlood Cells in Kidney :120.000000
Number of whiteBlood Cells in Kidney :20.000000
Number of platelets in Kidney        :30.000000
--------------------------------
Process exited after 10.66 seconds with return value 0
Press any key to continue . . .
```