



To what would you compare it in the human body?

What is this?

- A. Shell
- B. Skin
- C. Skull
- D. Hair

Pictures by Jason Clopper



What is this?

To what would you compare it in the human body?

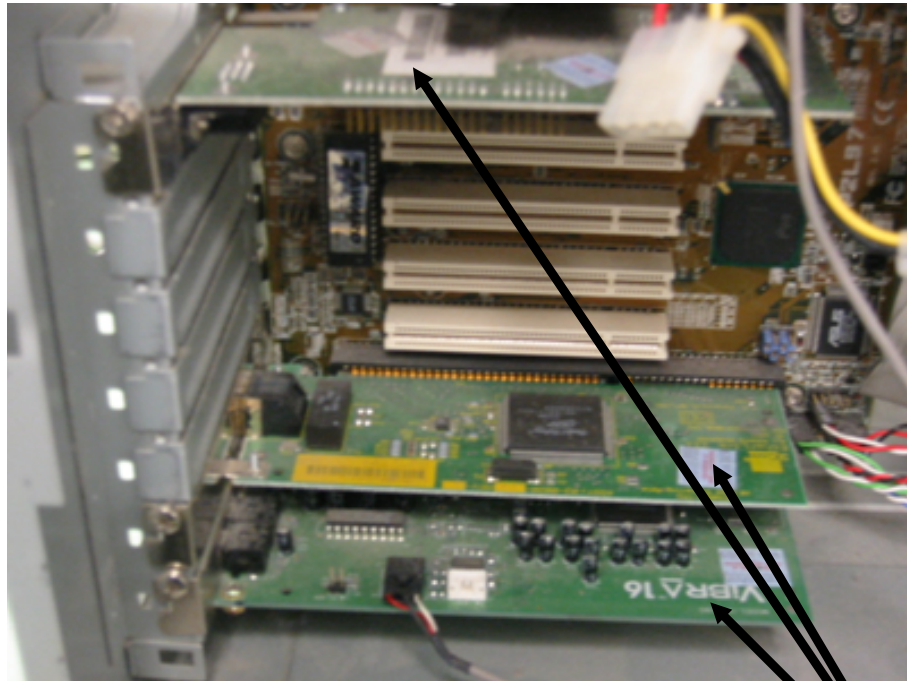
- A. Shell
- B. Skin
- C. Skeleton
- D. Legs



What is this?

To what would you compare it in the human body?

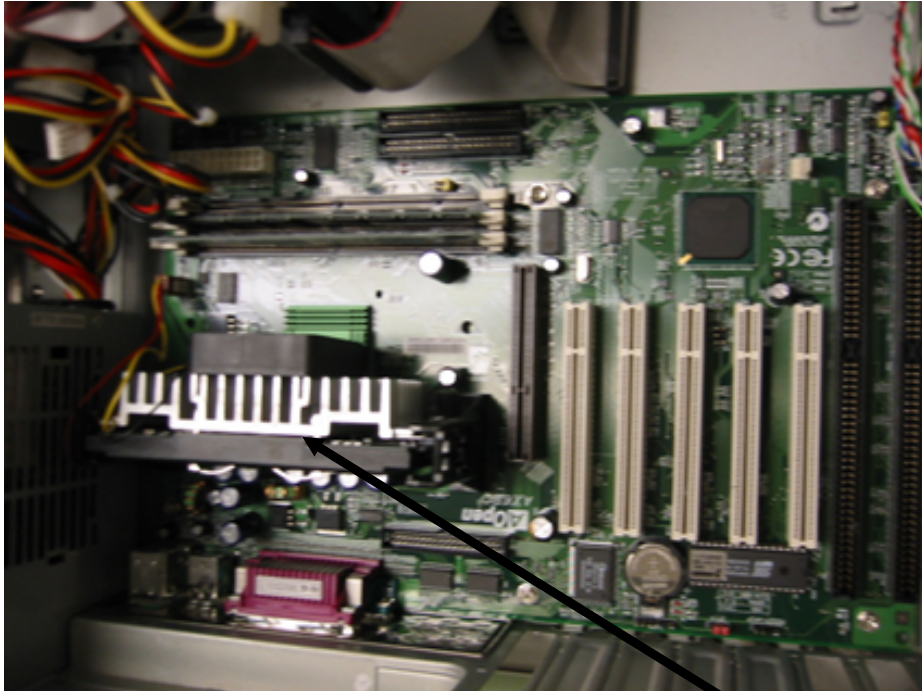
- A. Brain
- B. Heart
- C. Muscles
- D. Arms



To what would you compare it in the human body?

What are these?

- A. Brain
- B. Heart
- C. Muscles
- D. Arms

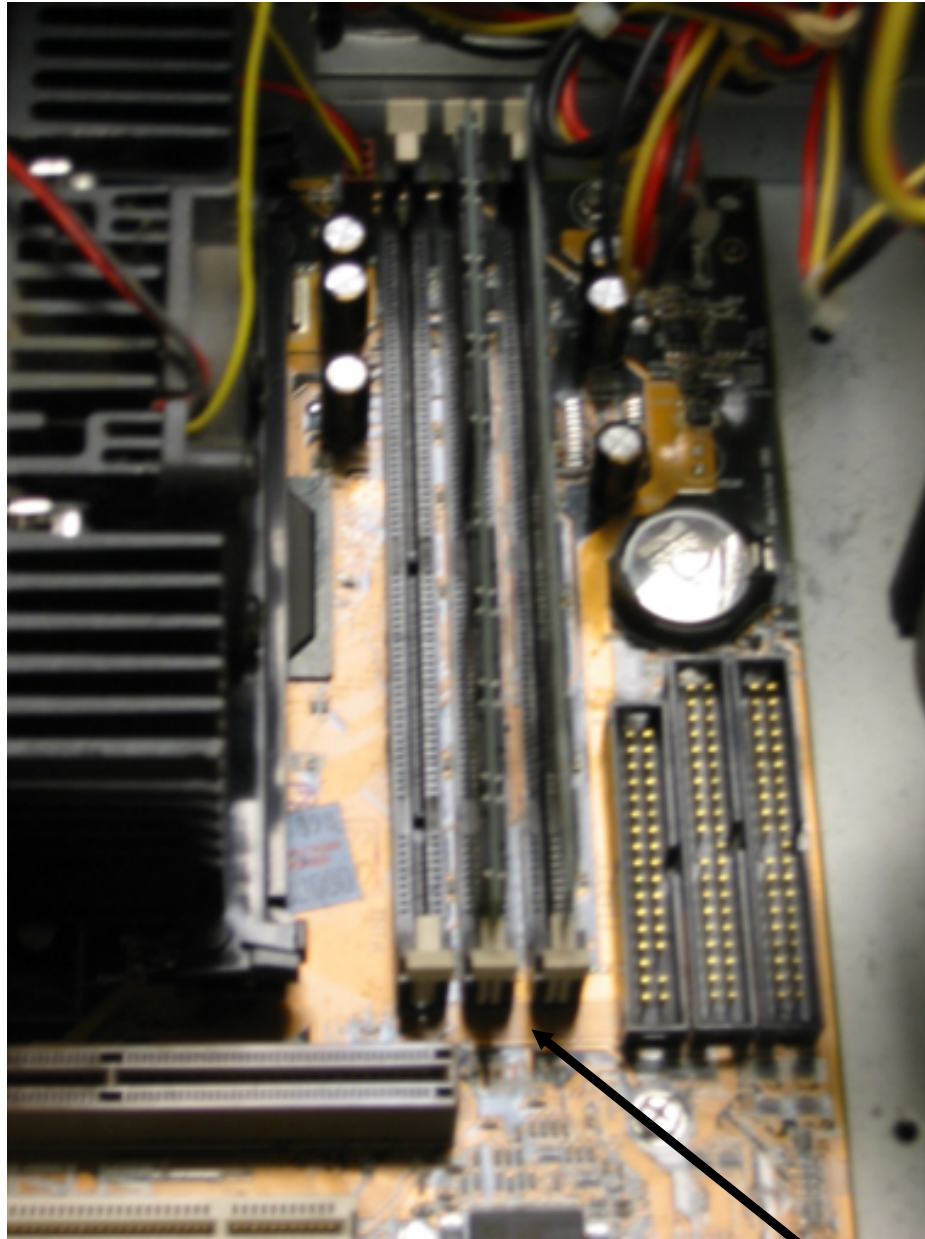


What is this?

To what would you compare it in the human body?

- A. Brain
- B. Heart
- C. Muscles
- D. Arms





To what would you compare it in the human body?

- A. Brain
- B. Short-term memory
- C. Long-term memory
- D. Nose

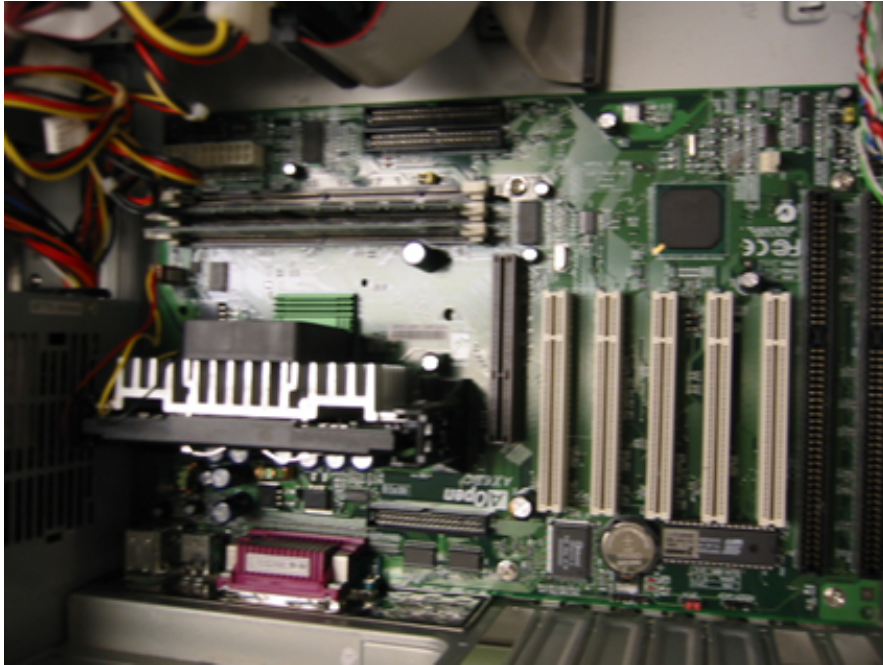
What are these?



To what would you compare it in the human body?

- A. Brain
- B. Short-term memory
- C. Long-term memory
- D. Nose

What are these?



To what would you compare it in the human body?

What is this?

- A. Brain
- B. Heart
- C. Circulatory System
- D. Nervous System



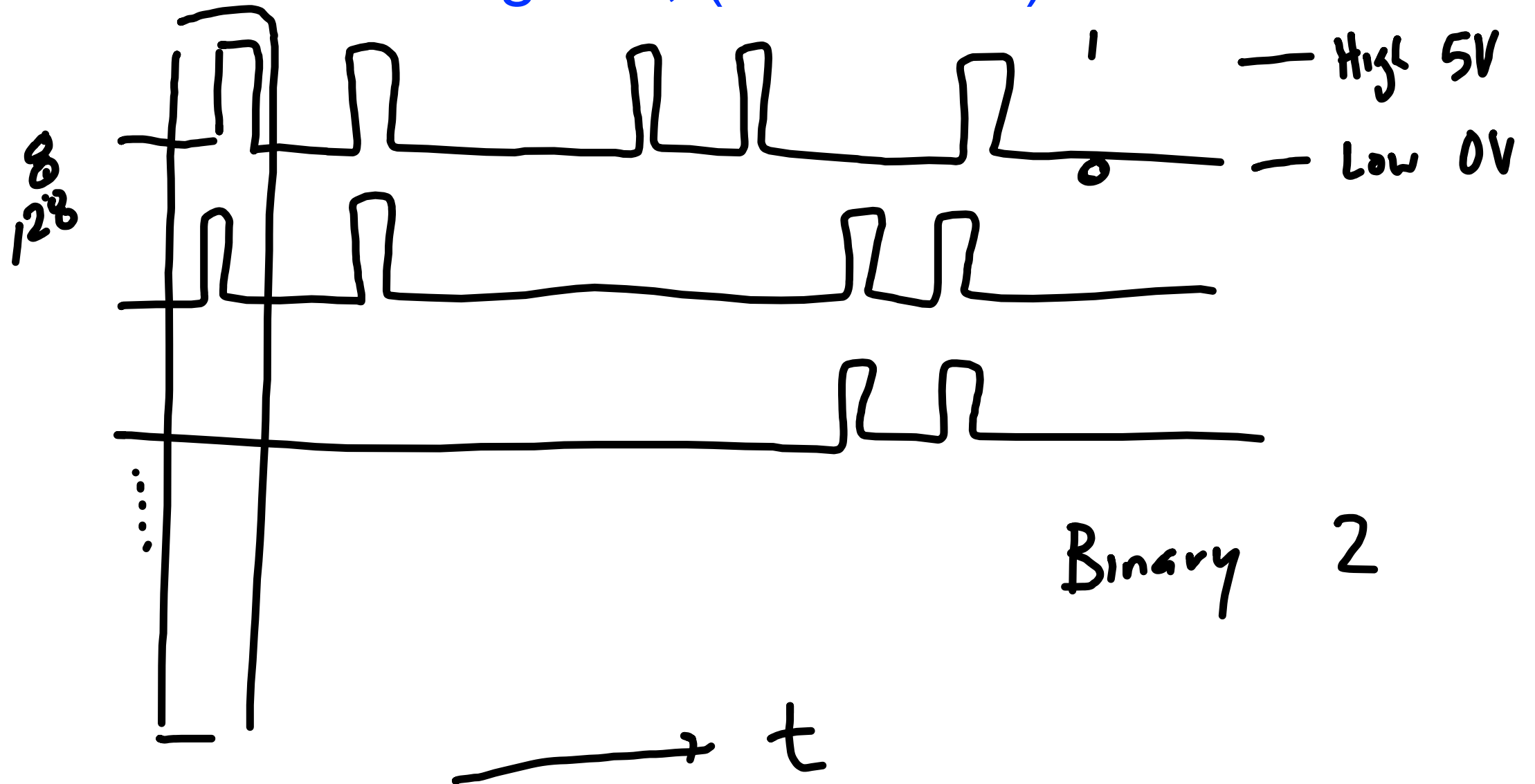


To what would you compare it in the human body?

What is this?

- A. Brain
- B. Bus
- C. Circulatory System
- D. Nervous System

## Busses and signals, (1s and 0s)



# Binary Numbers

Converting from base 10 to base 2, base 8, base 16

12345

10010100110

$$\begin{aligned} 5 \times 1 &= 5 \times 10^0 \\ 4 \times 10 &= 4 \times 10^1 \\ 3 \times 100 &= 3 \times 10^2 \\ 2 \times 1000 &= 2 \times 10^3 \\ 1 \times 10000 &= 1 \times 10^4 \end{aligned}$$

The diagram illustrates the conversion of the decimal number 5663 to binary. It includes a table of powers of 2, a long division of 5663 by 2, and a final binary representation.

MSB	4096	2048	1024	512	256	128	64	32	16	8	4	2	1	Bits
	1	0	1	1	0	0	0	1	0	1	0	0	1	LSB

Long Division:

```

    4096
  5663 / 2 = 2831
    4096
  -----
    1024
    512
  -----
    32
    8
  -----
    1
  
```

Final Binary Representation: 101100010001





65536	
32768	
16384	
8192	1
4096	0
2048	0
1024	0
512	0
256	0
128	0
64	0
32	1
16	1
8	1
4	0
2	0
1	1

Dec to Binary [4 #s] → Hex Oct

Subtraction Method

Look up → (Division Method)

$$\begin{array}{r}
 12345 \\
 - 8192 \\
 \hline
 4153 \\
 - 4096 \\
 \hline
 57
 \end{array}$$

11000000111001<sub>2</sub>

$$\begin{array}{r}
 57 \\
 32 \\
 \hline
 25 \\
 16 \\
 \hline
 9 \\
 8 \\
 \hline
 1 \\
 0
 \end{array}$$

3

5 digit dec → Bin, Oct, Hex

8pt 2pt each

12345  
 ↳

2	0	1
2	3	
2	6	
2	12	
2	24	
2	48	
2	96	
2	192	
2	385	
2	771	
2	1543	
2	3086	
2	6172	
2	12345	

1  
1  
0  
0  
0  
0  
0  
0  
0  
1  
1  
1  
0  
0  
0  
1

[4 #s) → Hex OCT  
 Subtraction Method  
 Look<sub>up</sub> → (Division Method)  
 → 11000000111001<sub>2</sub>

<sup>^</sup>0<sup>^</sup>1<sup>^</sup>1 000000111001  
<sup>^</sup>3<sup>^</sup>0<sup>^</sup>0<sup>^</sup>7<sup>^</sup>1

0011000000111001

12345 =

bin

dec/oct

000

0

001

1

010

2

011

3

100

4

101

5

110

6

111

7

12345 = 30071<sub>8</sub>

011000000111001      ^0011000000111001^  
                                  3    0    3    9

$$12345 = 3039_{16} = 30071_8$$

$0x3039$

Bin	Dec/Hex	Dec	Hex
0000	-	0	0
0001	-	1	1
0010	-	2	A
0011	-	3	B
0100	-	4	C
0101	-	5	D
0110	-	6	E
0111	-	7	F
1000	-	8	
1001	-	9	
1010	-	10	
1011	-	11	
1100	-	12	
1101	-	13	
1110	-	14	
1111	-	15	



$011000000111001_2$      $0011000000111001_2$   
 $\wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge \quad \wedge$   
 $3 \quad 0 \quad 0 \quad 7 \quad 1 \quad 3 \quad 0 \quad 3 \quad 9$

$$12345 = 30071_8 = 3039_{16} = 3039H = 0x3039$$

Bin	Dec/Hex	Bin	Dec	Hex
000	0	1000	8	8
001	1	1001	9	9
010	2	1010	10	A
011	3	1011	11	B
100	4	1100	12	C
101	5	1101	13	D
110	6	1110	14	E
111	7	1111	15	F