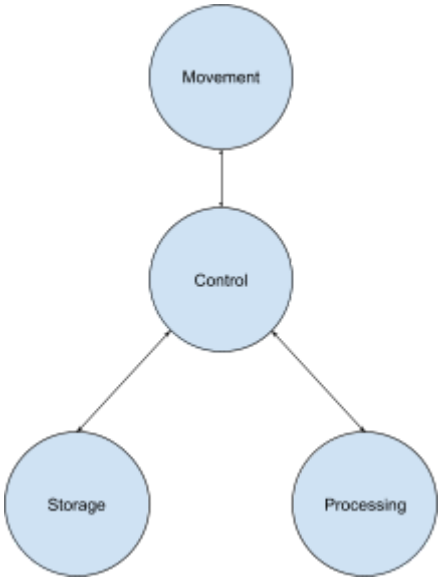
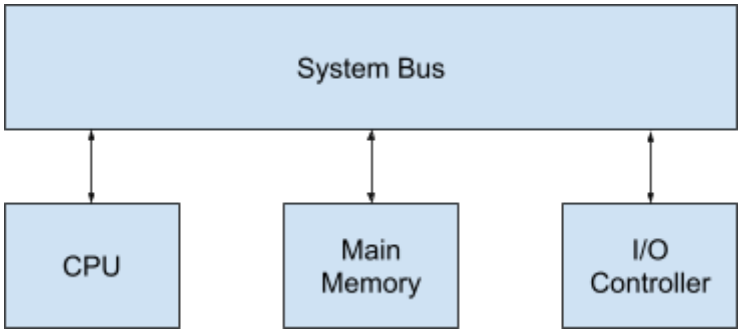
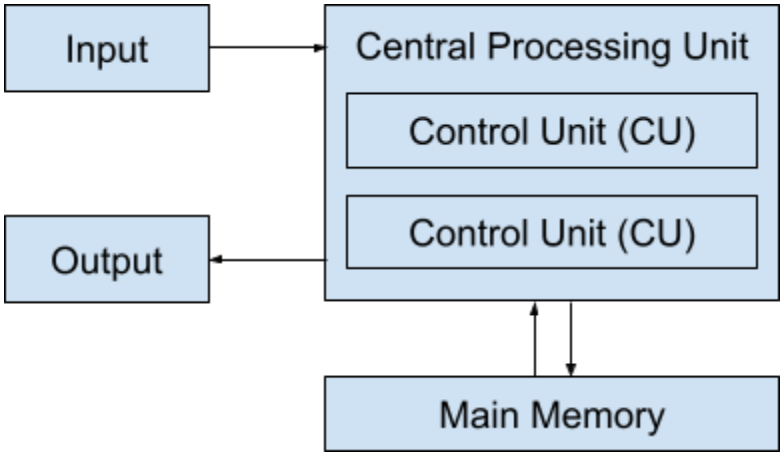
1. Computer Architecture is the attributes of the design which determine the way in which programs will be executed
   Computer Organisation is the physical layout of the CPU and the way in which the components are interconnected
2. Data processing
   Data storage
   Data movement
   Control
3. 

4. 

5. Control Unit (CU): Controls the other components of the CPU, and sequences the logic
   Arithmetic and Logic Unit (ALU): Contains the adder-subtractor circuits
   Registers: Very fast but low capacity memory which stores the input or output of the ALU
   CPU Interconnections: Connects the Registers and ALU to the CU
6. Vacuum Tubes were used instead of transistors, and they were manually programmed by rewiring the connections between them
7. The ENIAC was a first generation computer which used decimal rather than binary, and was manually programmed by rewiring
8. The stored-program concept was created by John Von Neumann, and is how computers work today, rather than being physically programmed, the instructions are stored in memory along with the data the program will use

9. 

10. An ALU performs mathematical operations, such as addition or subtraction, whereas a CU is responsible for controlling ALUs, and sequencing the logic inside the CPU
11. The IAS had 5 Kilobytes of memory, split into 40, 1000 bit words. Each word could either be a Number word or an Instruction word. A number word had a sign bit, and 39 data bits, and an Instruction word had a left and right instruction, each with 8 bits for the opcode and 12 bits for addressing
12. See 11
13. There are two different types of word, as both data and instructions need to be stored in the shared main memory
14. In an instruction, an Opcode denotes which instruction should be performed, depending upon the instruction set of a CPU (e.g. x86 or ARM) and the address is the location in memory that stores a piece of data needed by the instruction
15. One advantage is that the processor can be reprogrammed at will, without manual rewiring, allowing for a wider range of applications. Without the Von Neumann architecture, computers would be completely different, for example it would not be possible to create a program that creates programs, e.g. a compiler or assembler. A disadvantage of the architecture is that instructions and data are stored in one block of shared memory, meaning that the memory cannot be perfectly suited to either (e.g. using larger words for data than instructions), but this can be mitigated by using the Harvard architecture, which has separate program and data memories. Additionally, using a shared program and data memory means that they are sharing the bandwidth of the memory, and as such slowdowns might occur if lots of data is needed from memory.