1. Real mode – it is operating mode of CPUs where the memory addreses used are the real memory addresses, any software can access any and all memory when running in real mode (1 MB limit of memory). All x86 CPUs startup in real mode after a reset for backward compatibility.

   Protected mode – another operating mode that hides the real memory address space, and uses virtual address spaces for every running program. This mode allows the operating system to restrict applications to only a specific address space so applications don't alter each other's memory. This virtual memory also allows for paging, moving blocks of memory to the ROM to free up more RAM, this maintains the illusion of the big virtual address space given to every process. Of course these bocks will move back to the RAM when used.

   So the difference is real mode gives all applications access to the real memory addresses and devices, whereas protected mode enables the OS to protect the memory and devices from simultaneous write, allows for application restriction (both in terms of address space and in opcodes it can run) and extends the available memory through paging.

2. The A20 line is an electric line in the system bus that transmits the 21$^{st}$ bit of the address bus, it is used when the size of memory is over 1 MB. During startup of x86 processors they run in real mode and A20 is disabled (because of backwards compatibility to a wrap around in the addresses), and when the CPU goes into protected mode it enables A20 to allow for address space bigger than 1 MB.

3. The bios is stored on a dedicated flash memory chip on the motherboard (in older systems on ROM)

4. Upon startup the processor starts executing commands from the address 0xFFFF0 in the BIOS memory, this is the end of the bios memory and it just contains a jump to the real BIOS.

5. The bios has a configuration in a chip (CMOS RAM, which has a battery to maintain the configuration when power is off) that stores the date, time and system configuration needed to start the computer (such as hardware configuration). This configuration is called Extended System Configuration Data (ESCD).

6. Power on self-test is a stage in the computer startup wherein the BIOS runs routines that are designed to test the components of the computer and if all routines are successful the BIOS can continue to run the bootstrap loader. Some of these test routines are: verifying the BIOS code, verifying the main memory, running the BIOS of other devices (such as GPU), identifying bootable devices, gives a UI for changing system configuration, initializing all buses and devices. If any of these fail the computer will stop the startup and report where the error is through beeps from a motherboard attached speaker.

7. Unified extensible firmware interface (UEFI) is a replacement for BIOS (but is more like a lightweight OS), UEFI has backwards compatibility to the things BIOS can do, but also has many more modern features: supporting boot from larger hard drives (bigger than 2 TB), it's faster,

has graphics and supports mouse cursor, has network capability (for remote troubleshooting or configuring), has more than 1 MB of memory to run in. UEFI also allows for booting over the network. The UEFI can run UEFI applications, which are independent of the system manufacturer, meaning the UEFI is modular and can be extended to do more things. An example of a UEFI application is an OS loader (e.g. GRUB) that runs the OS. UEFI also provides a shell which can be used to run UEFI applications or get information about the system (and even edit text files). UEFI also supports secure startup which allows to check the validity of the OS to ensure malware doesn't tamper with startup.