# 1) Explain about addictive manufacturing and its applications?

Additive Manufacturing (AM) refers to a process by which digital 3D design data is used to build up a component in layers by depositing material.

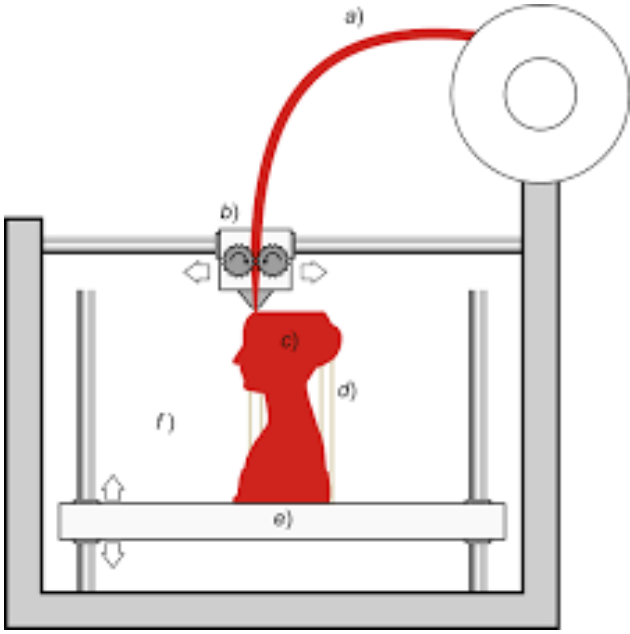
<u>Applications:</u>

Architecture and Construction

in Maritime Industry

Health care , automotives, textile,

Food industry, robotics etc.



2) Write down different types of 3D printing technologies?

There are various 3D printing methods which were developed to build 3D structures and objects.

A. Selective Laser Sintering (SLS)
B. Fused deposition modeling (FDM)
C. Stereo lithography(SLA)
D. Digital Light Processing(DLP)
E. Selective laser melting (SLM)
F. Laminated object manufacturing (LOM)
G. Digital Beam Melting (EBM)

# 3)What is thermo plastic material and its properties?

- The material that softens when heated above the glass transition temperature or melting temperature and becomes hard after cooling is called thermoplastics.
- Thermoplastics can be reversibly melted by heating and solidified by cooling in limited number of cycles without affecting the mechanical properties

# PROPERTIES OF THERMOPLASTICS

- High Strength And Toughness
- Better Hardness
- Chemical Resistance
- Durability
- Self-lubrication
- Transparency and Water Proofing

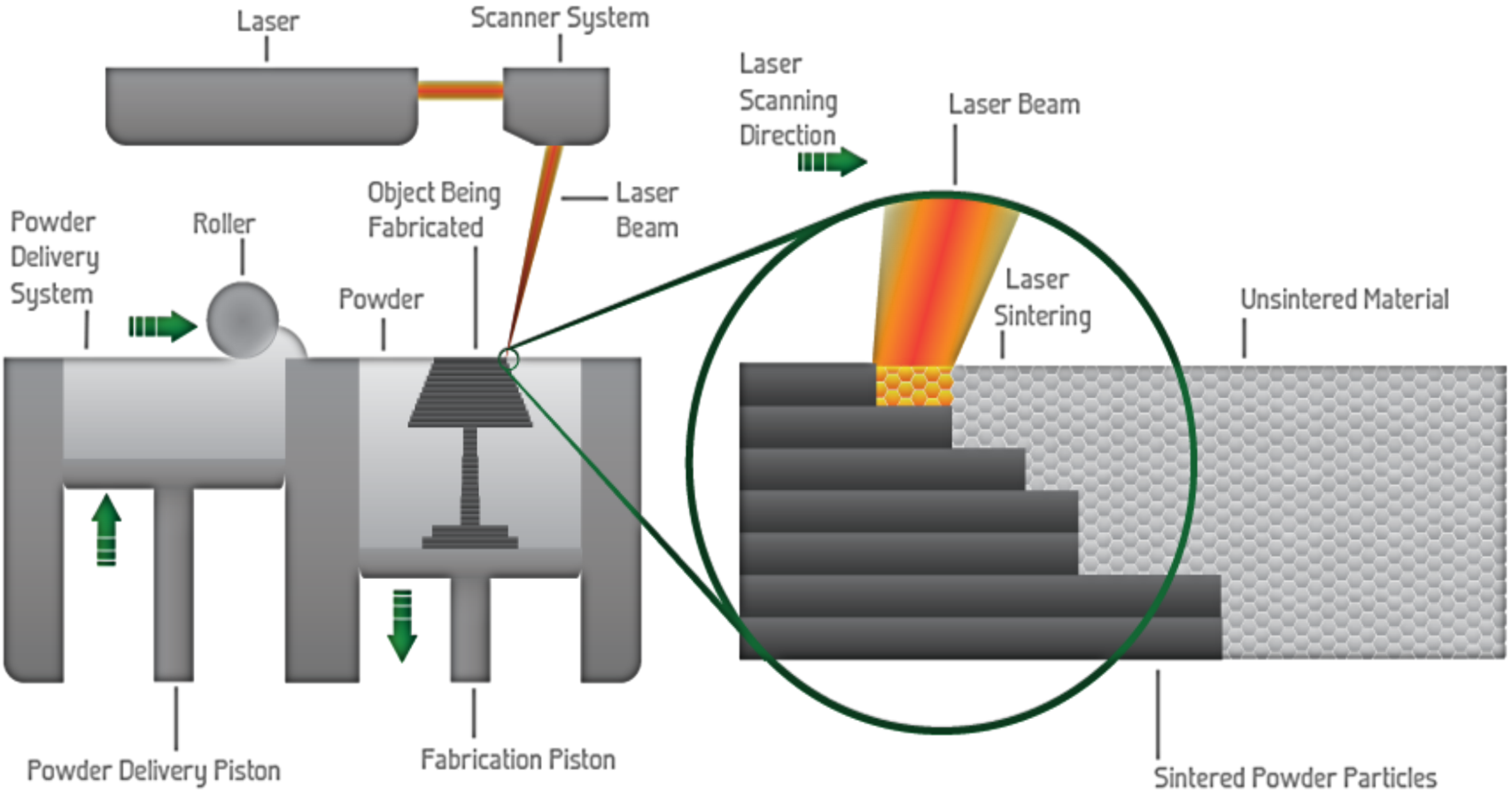
**(**List out advantages and disadvantages of thermoplastics)**

# 4) Types of thermo plastic materials and their melting temperatures?

| MATERIAL | MELTING TEMPERATURE (IN $^{O}$C) |
|---|---|
| Acrylonitrile Butadiene Styrene (ABS) | Its glass transition temperature is ~105 °C. ABS is amorphous and therefore has no true melting point; however 230°C is the standard for printing. |
| Acetals | 175 |
| Acrylics | 160 |
| Cellulosics | 260-270 |
| Polyamides | 250-260 |
| Polycarbonates | 155 |
| Polyethylene | 240 |
| Polystyrenes | 240 |
| Polyvinyl Chloride (PVC) | 110-260 |
| Liquid Crystal Polymers (LCP) | 280-300 |

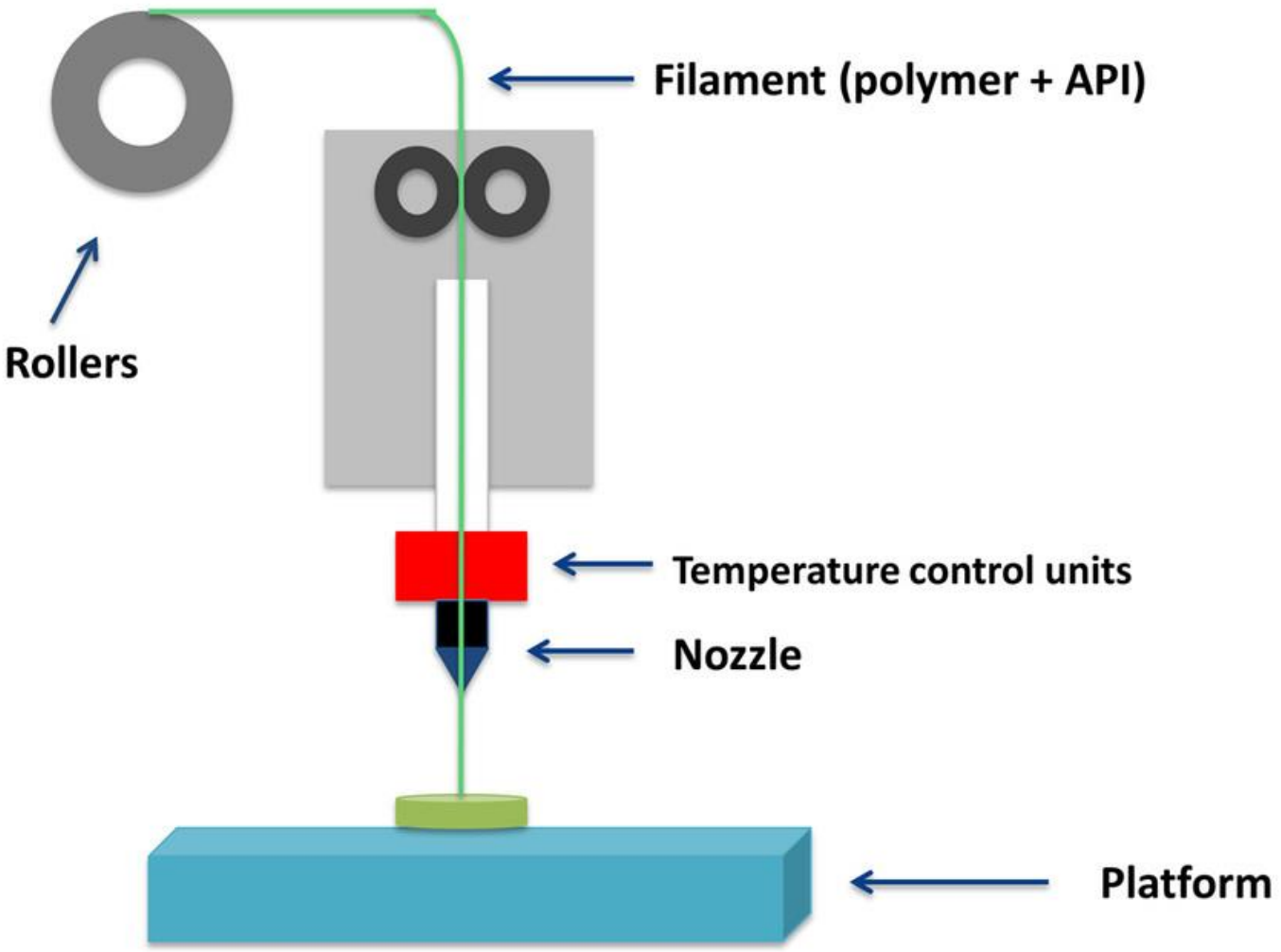
5) In detail explain various 3D printing process such as i) FDM ii) SLA iii) SLS

## Selective Laser Sintering (SLS)



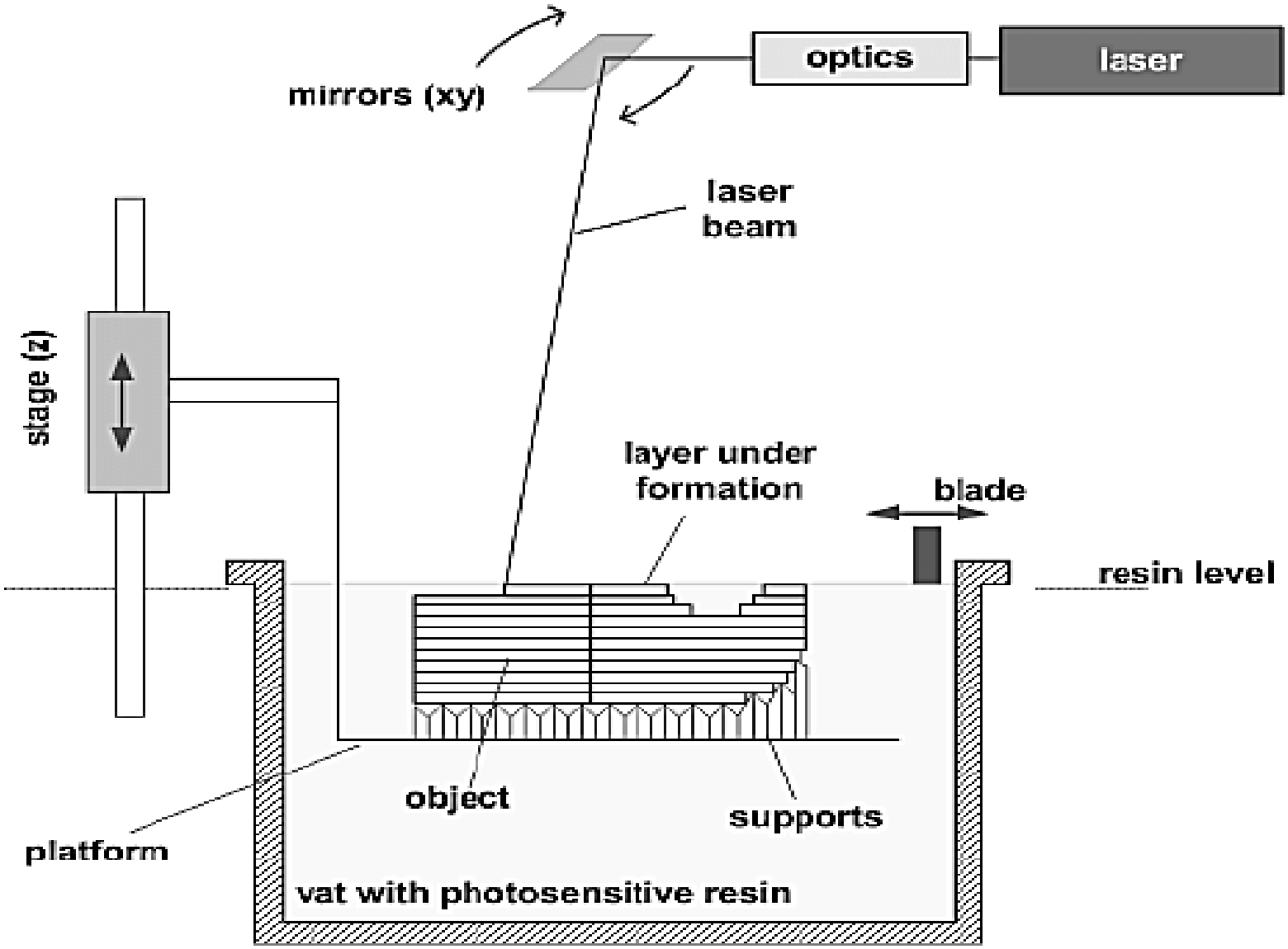
- This builds objects by using a laser to selectively fuse together successive layers of a cocktail of powdered wax, ceramic, metal, nylon or one of a range of other materials.
- The laser fuses small particles of plastic, metal, ceramic or glass powders into a 3-dimensional mass.
- Using SLS, parts with complex interior components can also be printed and there is no problem of removing supports and damaging the part. As a result, time is saved on assembly.

# Fused deposition modeling (FDM)



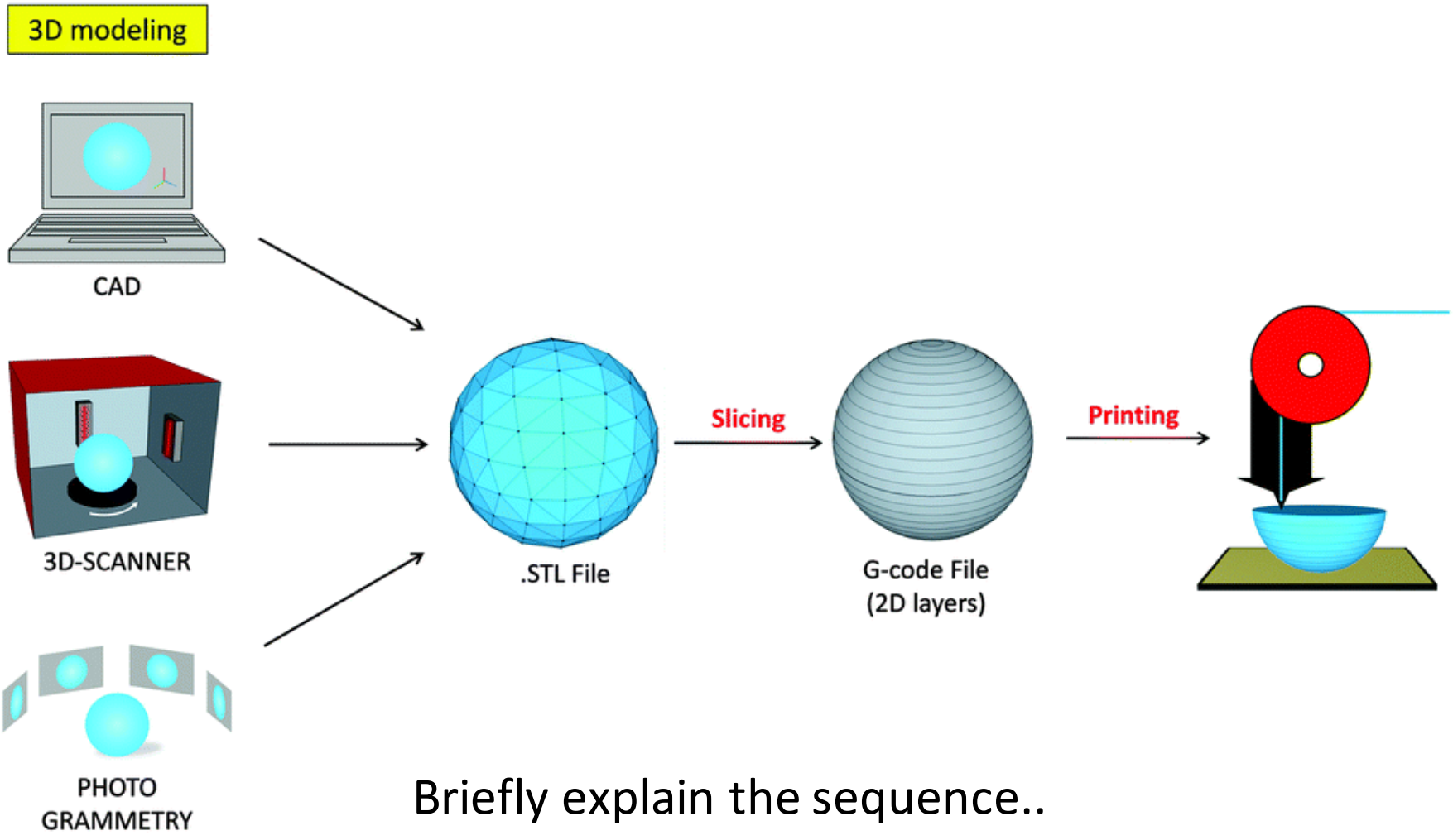
- This method uses a plastic filament or metal wire as input material to an extrusion nozzle. The nozzle is heated to melt the material and can be moved in both horizontal and vertical directions by CAM.
- The material hardens immediately after extrusion from the nozzle. FDM process is less accurate. The process can also be time consuming for some particular geometry. Moreover the material used in FDM is limited to thermos plastic.

# Stereo lithography(SLA)



- SLA is used mostly to create models, prototypes and patterns. Being a laser based process; it uses ultraviolet laser and a vat of resin to build parts.
- The laser beam marks the design onto the surface of the liquid polymer. Exposure to the ultraviolet laser causes the chains of atoms in the polymer gum to connect together.

6) Draw the block diagram, explaining the detail process to print a CAD model in 3D printer?




Briefly explain the sequence..