



SNS COLLEGE OF TECHNOLOGY

Vazhiampalayam, Coimbatore-35

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DEPARTMENT OF CHEMISTRY

COURSE NAME : 19CHB101- CHEMISTRY FOR ENGINEERS

I YEAR / I SEMESTER

UNIT : 3. FUELS AND COMBUSTION

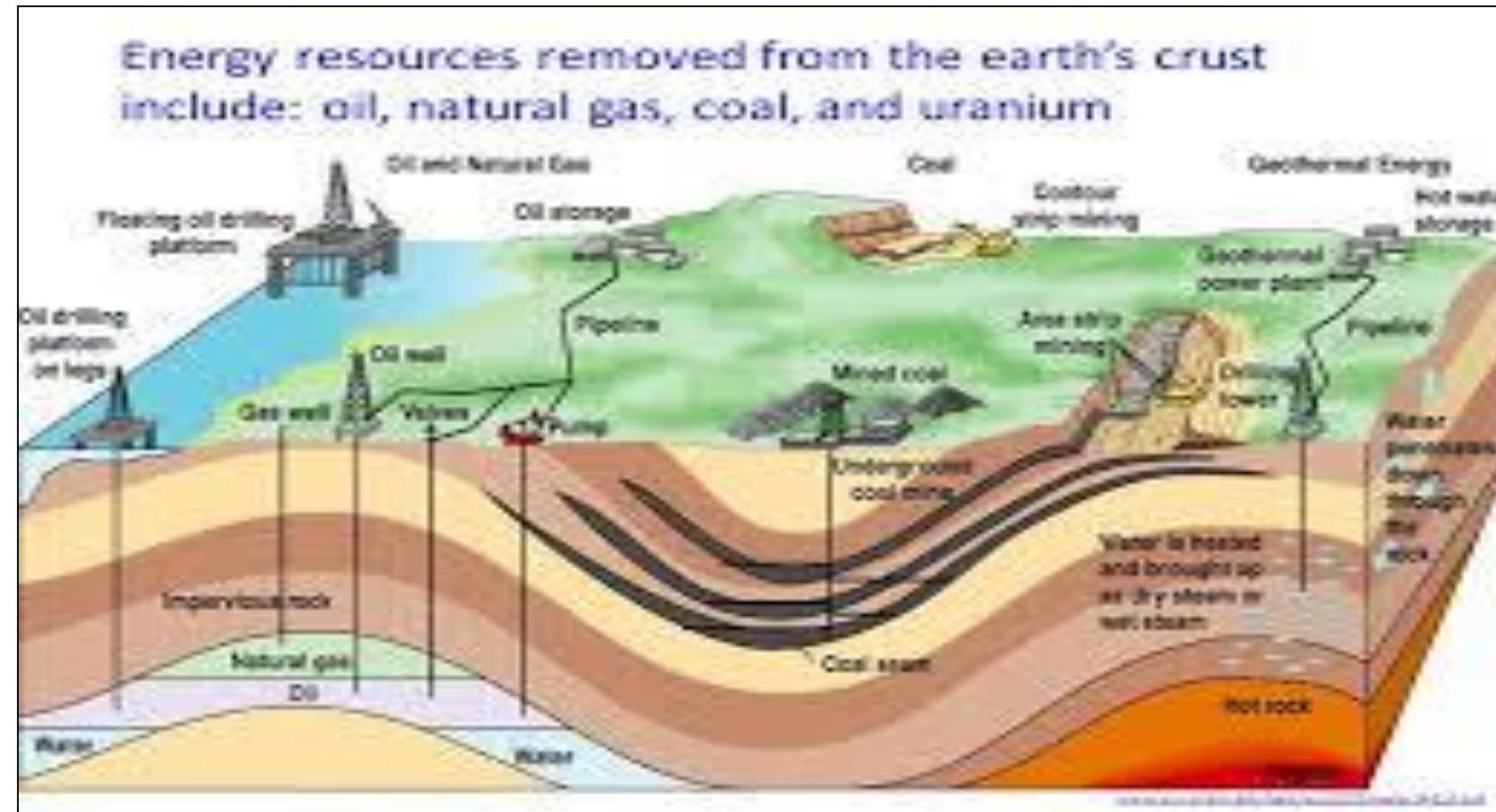
TOPIC : 3. PETROLEUM-REFINING



BRAINSTORMING WITH RECAP



LIQUID FUEL- PETROLEUM



- It is a naturally occurring liquid - Earth's surface
- Petroleum is a fossil fuel.
- It is formed in sedimentary rock under intense heat and pressure.
- Petroleum is used as fuel to power vehicles, heating units, and machines of all sorts, being converted into plastics and other materials.

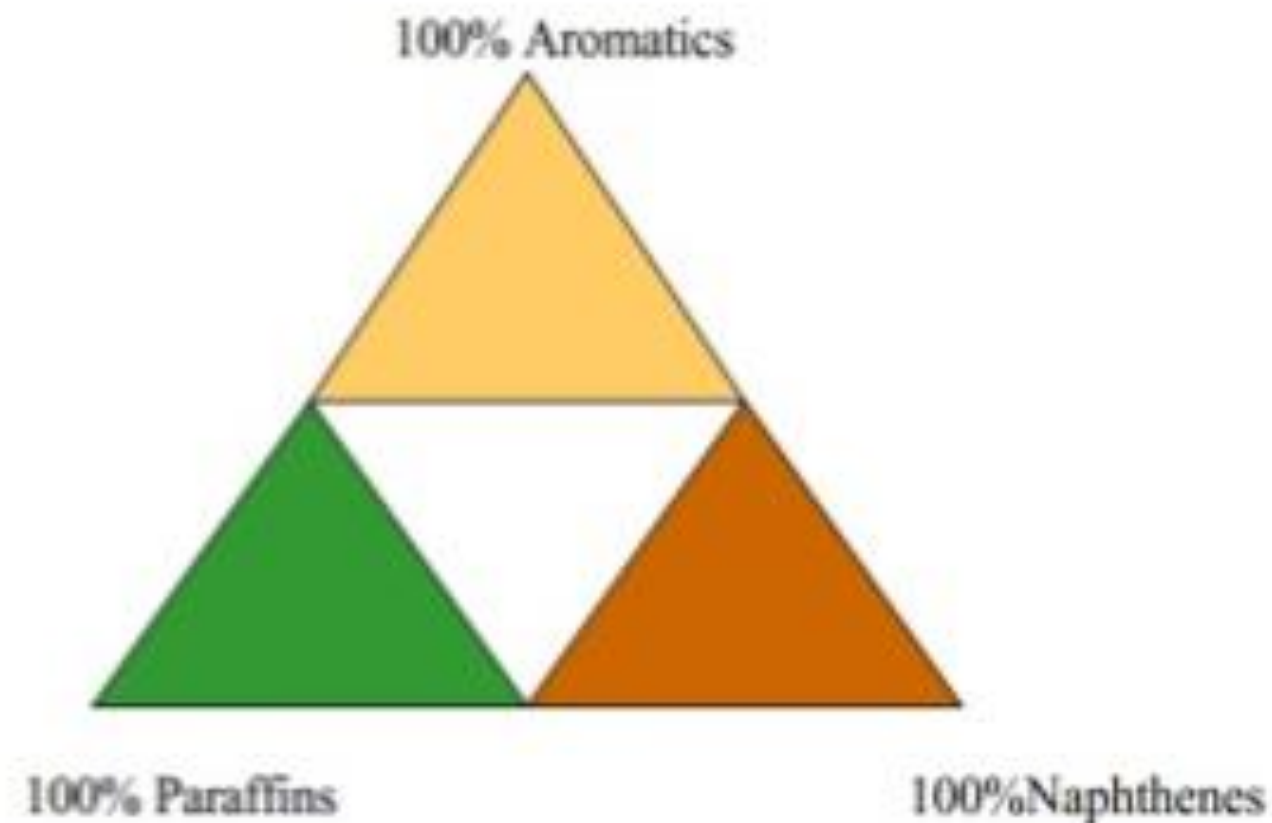
Composition

- Containing mixture of paraffinic olefinic
- Aromatic hydrocarbons with minor amounts of organic compounds like N, O and S.
- The average composition is C =80 - 87 %, H =11-15%, S = 0.1 -3.5%, (N +O) = 0.1- 0.5%.



CLASSIFICATION

The first crude oil classification is by the types of hydrocarbons (paraffins, naphthenes, and aromatics). This rating is important to the refinery since the value of the crude oil decreases from classification 1 to 6.



Crude Classifications (in order of decreasing value):

- 1) Paraffinic Crudes
 - paraffins + naphthenes > 50%
 - paraffins > naphthenes
 - paraffins > 40%
- 2) Naphthenic Crudes
 - paraffins + naphthenes > 50%
 - naphthenes > paraffins
 - naphthenes > 40%
- 3) Paraffinic – Naphthenic Crudes
 - aromatics < 50%
 - paraffins < 40%
 - naphthenes < 40%
- 4) Aromatic – Naphthenic Crudes
 - aromatics > 50%
- 5) Aromatic - Intermediate Crudes
 - aromatics > 50%
 - paraffins > 10%
- 6) Aromatic – Asphaltic Crudes
 - naphthenes > 25%
 - paraffins < 10%



REFINING OF PETROLEUM



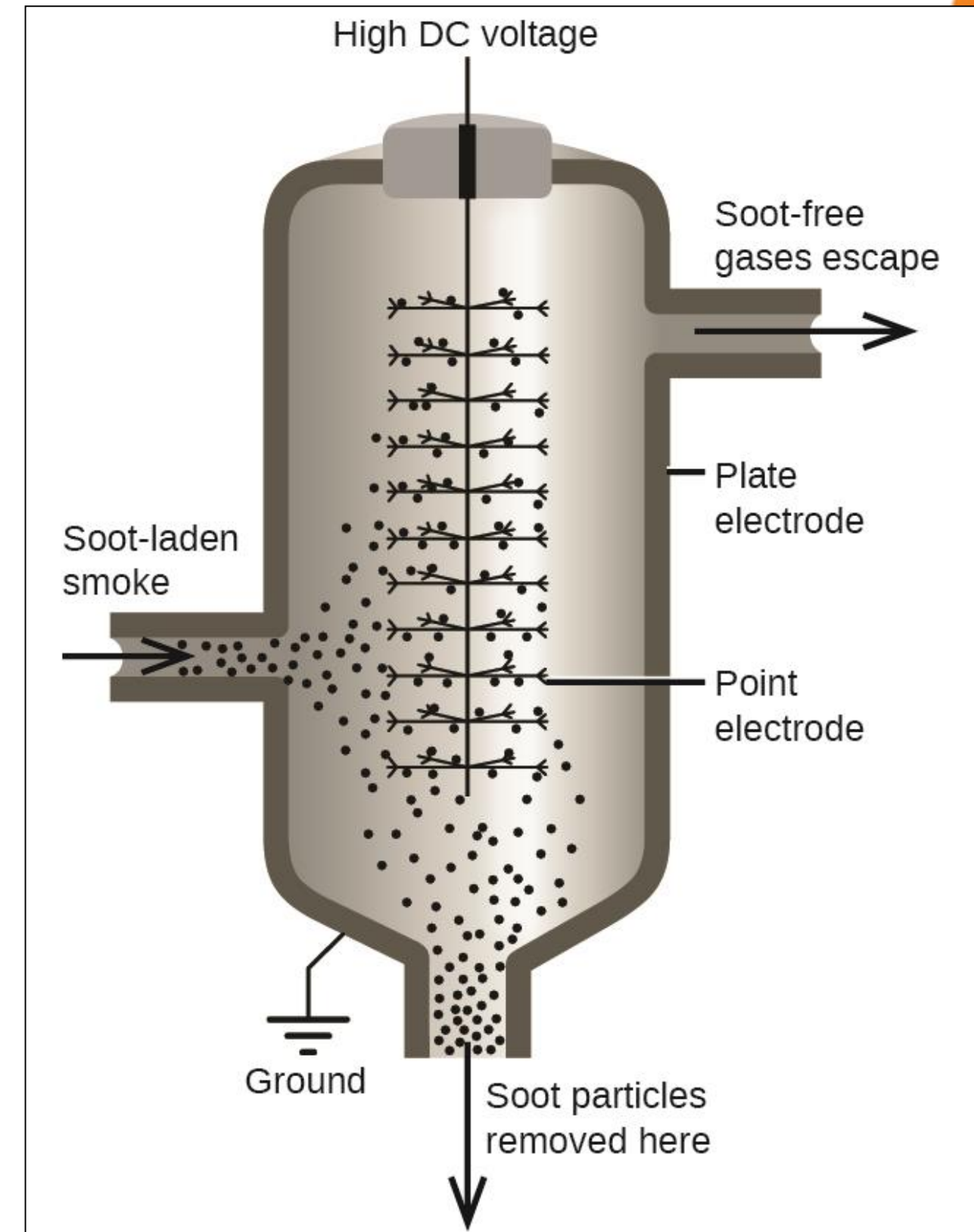
- ❑ The crude oil obtained from the earth crust contains water, sulphur and some unwanted impurities.
- ❑ After removal of water, sulphur and these impurities, the crude oil is separated into various useful fractions by fractional distillation and finally converted into desired specific products having different boiling points.
- ❑ The process is called "Refining of Petroleum" and the refining plants are called "Oil refineries".
- ❑ The process of refining involves the following steps.





REFINING OF PETROLEUM

- ❑ **Step -I: Separation of water (Cottrell's process)**
- ❑ The crude oil from the oil well is an extremely stable emulsion of oil and salt water.
- ❑ The crude oil is allowed to flow between two highly charged electrodes, where colloidal water droplets coalesce to form large drops, which is then separated out from the oil.





REFINING OF PETROLEUM



Step - II: Removal of harmful impurities

- a) The presence of NaCl and MgCl in the crude oil can corrode the refining equipment, hence these salts are removed by electrical desalting and dehydration methods.
- b) The sulphur compounds present in the crude oil is removed by treating oil with copper oxide, which results in the formation of copper sulphide (solid), which is then removed by filtration.





Activity

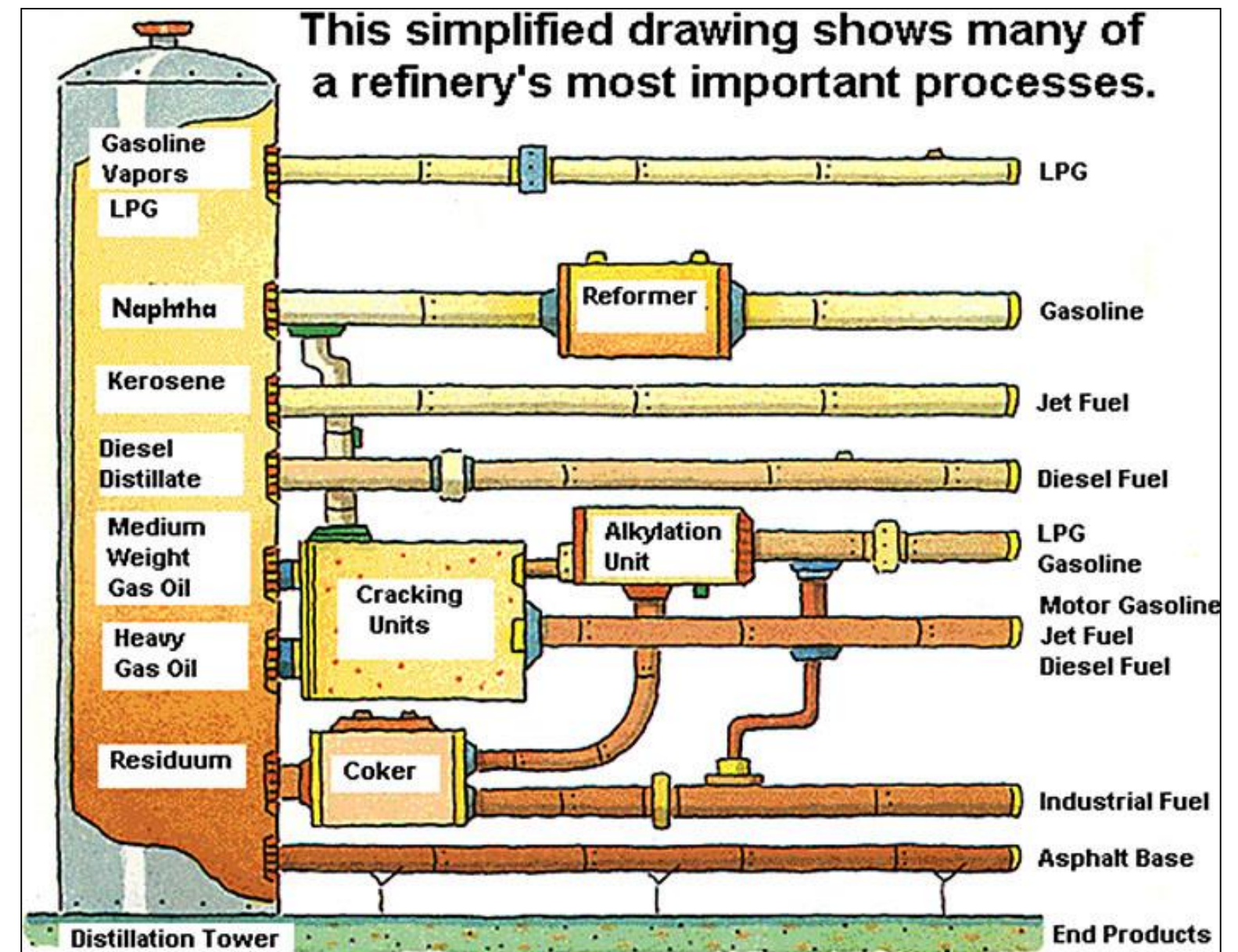




REFINING OF PETROLEUM

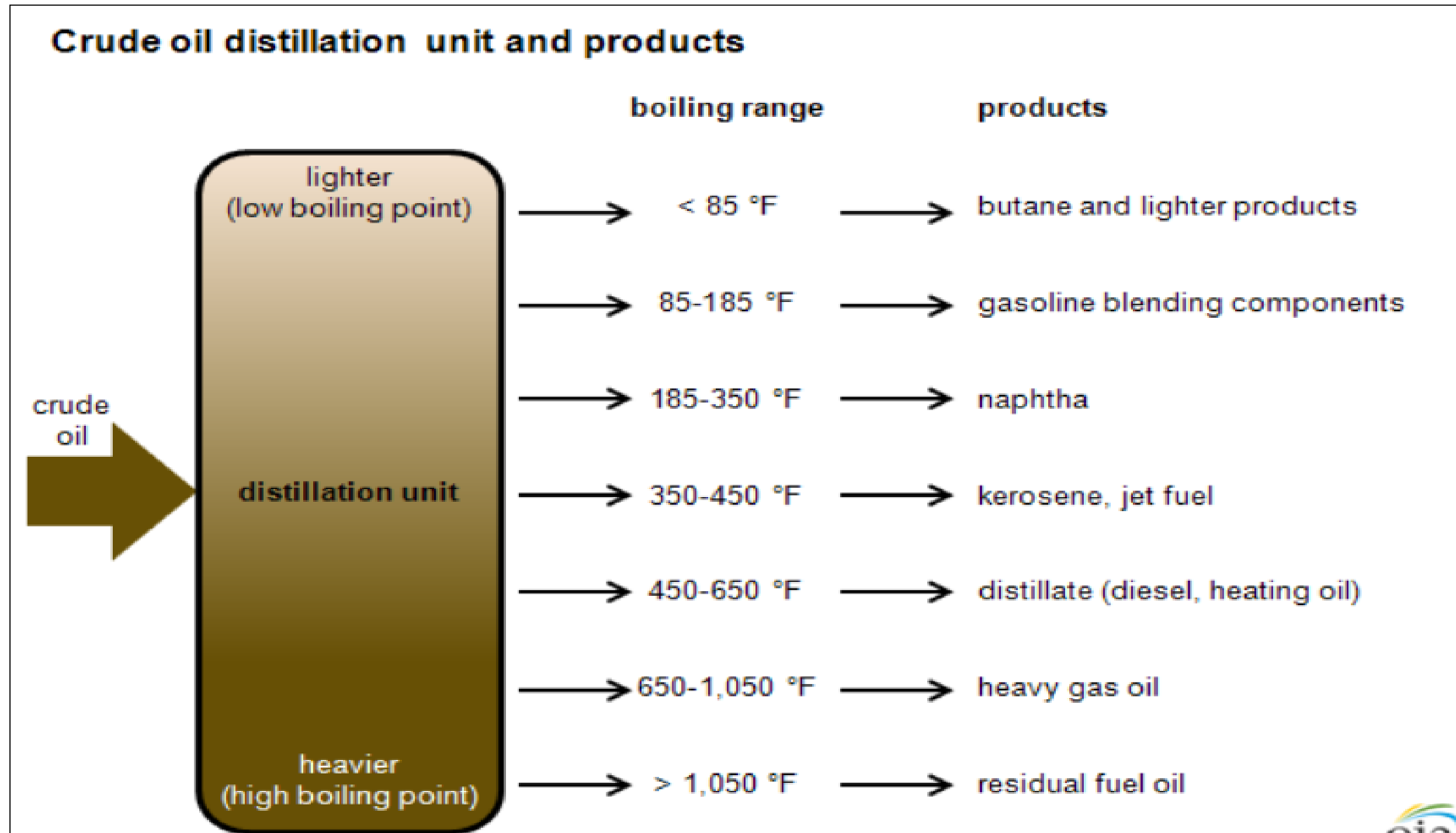
Step - III: Fractional distillation

- ❑ The crude oil is then heated to about 400°C in an iron retort, whereby all volatile substances (except asphalt or coke) are evaporated.
- ❑ The hot vapors are then passed up a fractionating column, which is a tall cylindrical tower containing a number of horizontal stainless steel trays at short distances.
- ❑ Each tray is provided with small chimney covered with a loose cap.





FRACTIONAL DISTILLATION





VARIOUS REACTIONS /COMPOSITIONS /USES



S.No	Name of the fractions	Boiling range (°C)	Composition of Hydrocarbons	Uses
1	Uncondensed gases	Below 30°C	C1 to C4	As domestic and industrial fuel under the name LPG
2	Petroleum ether	30- 70 °C	C5 to C7	As a solvent.
3	Gasoline (or) petrol	40 - 120 °C	C5 to C9	As motor fuel, solvent and in dry cleaning.
4	Naphtha (or }solvent spirit	120. - 180 °C	C9 to C10	As solvent and in dry cleaning.
5	Kerosene oil.	180 - 250 °C	C10 to C16	As fuel for jet engines and an illuminant.
6	Diesel oil (or) gas oil	250 320 °C	C10 to C18	As Diesel engine fuel.
7	Heavy oil.	320 - 400 °C	C17 to C30	Production of gasoline by Cracking process.

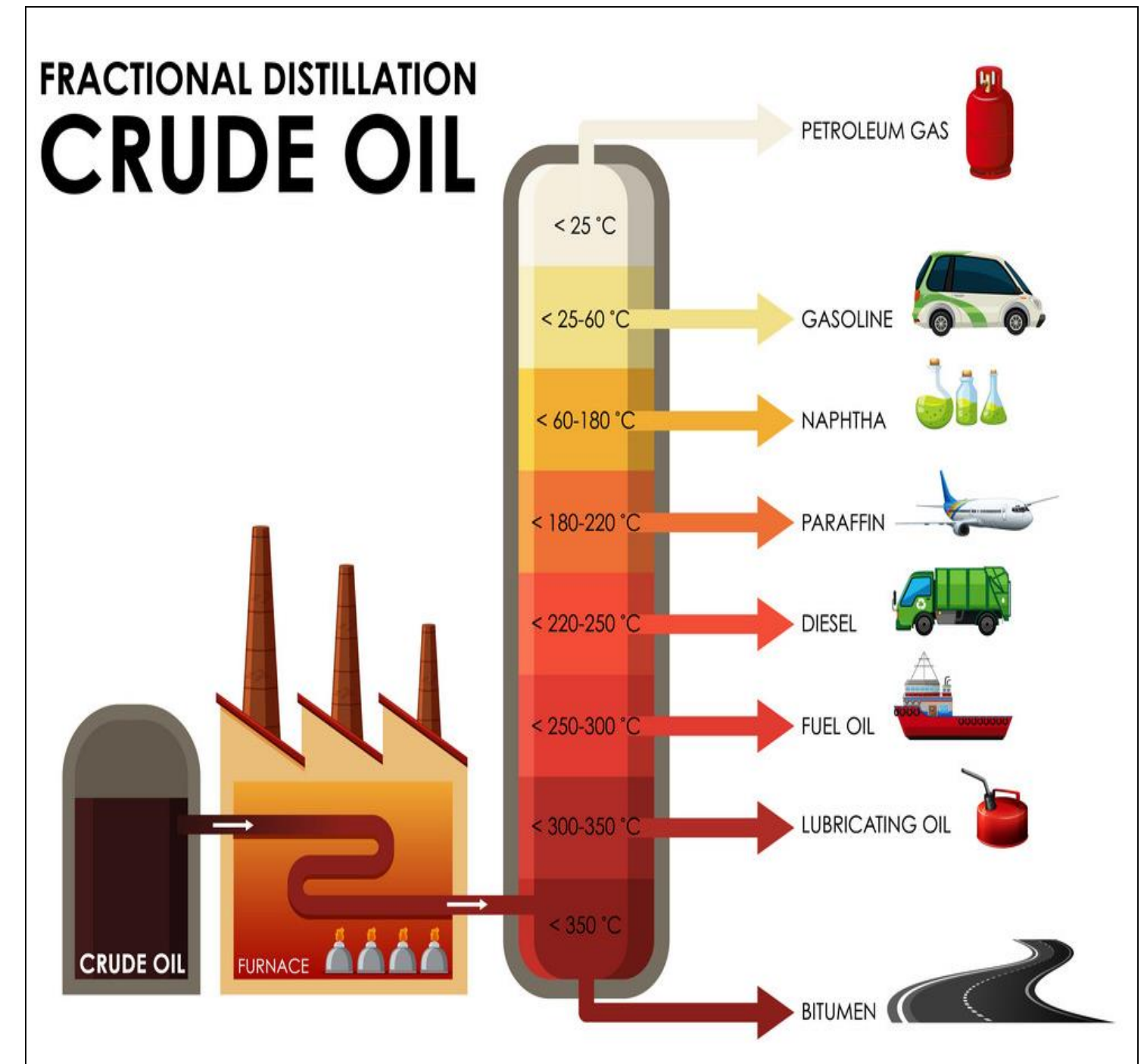




VARIOUS FRACTIONS RECOVERED FROM HEAVY OIL



S.No	Name of the fractions	Boiling range (°C)	Composition of Hydrocarbons	Uses
1	Lubricating oil	-	C17 to C20	Used as lubricants
2	Petroleum jelly (Vaseline)	-	-	Used in medicines and cosmetics
3	Paraffin wax	-	C20 to C28	Used in candles, wax paper, boot polish, etc
4	Grease	-	-	Used as lubricants.
5	Asphalt or bitumen	Above 400°C	C30 and above	Used for making roads, water proof roofing, etc





ASSESSMENT



1. Draw a flow chart of various reactions /compositions /uses

1. List the recovered products from heavy oil



SUMMARY



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3. P.C.Jain & Monicka Jain, “Engineering Chemistry” , Dhanapat Rai Publising Company Pvt. Ltd. 2017.
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THANK YOU