

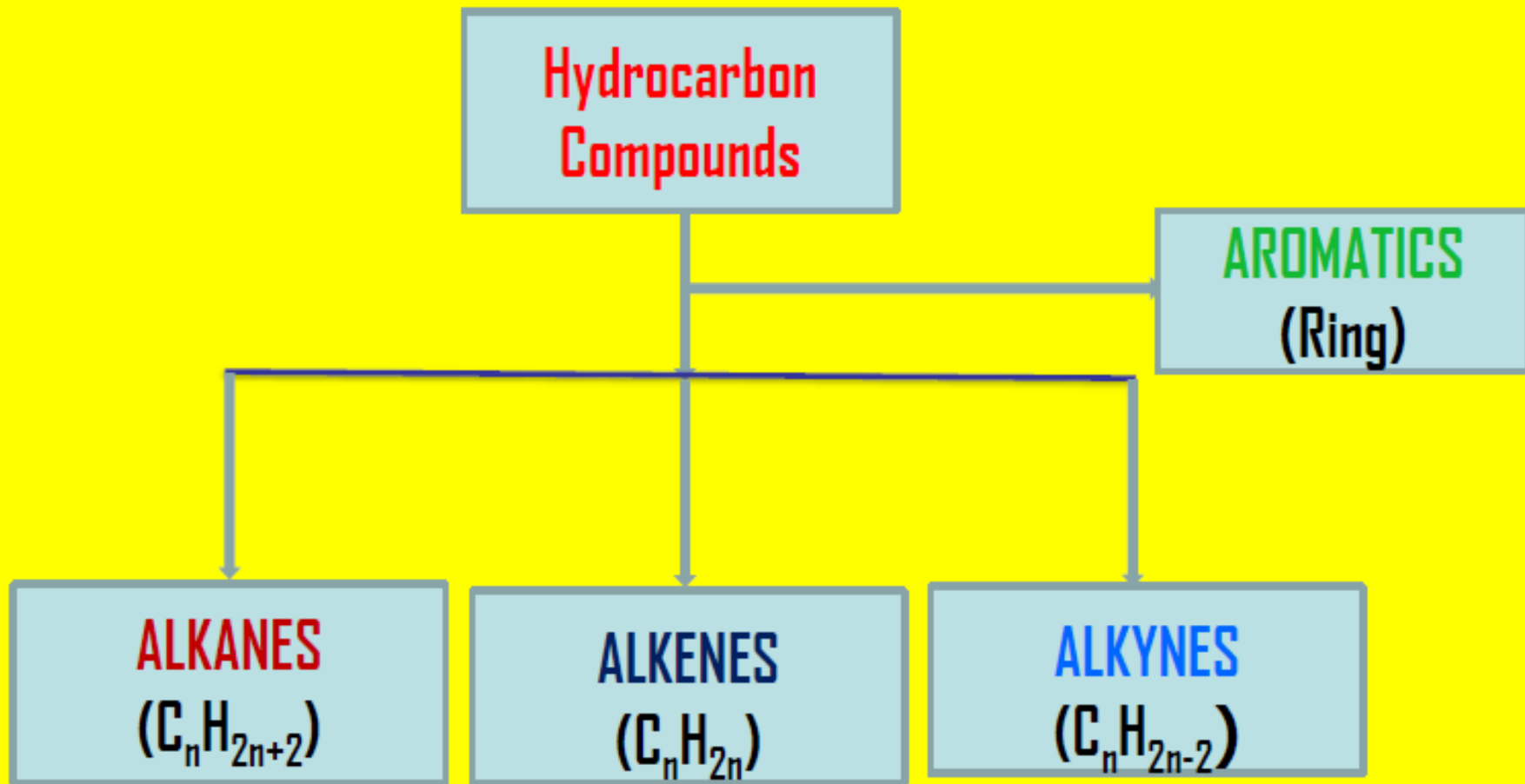
# LPG PRODUCT KNOWLEDGE

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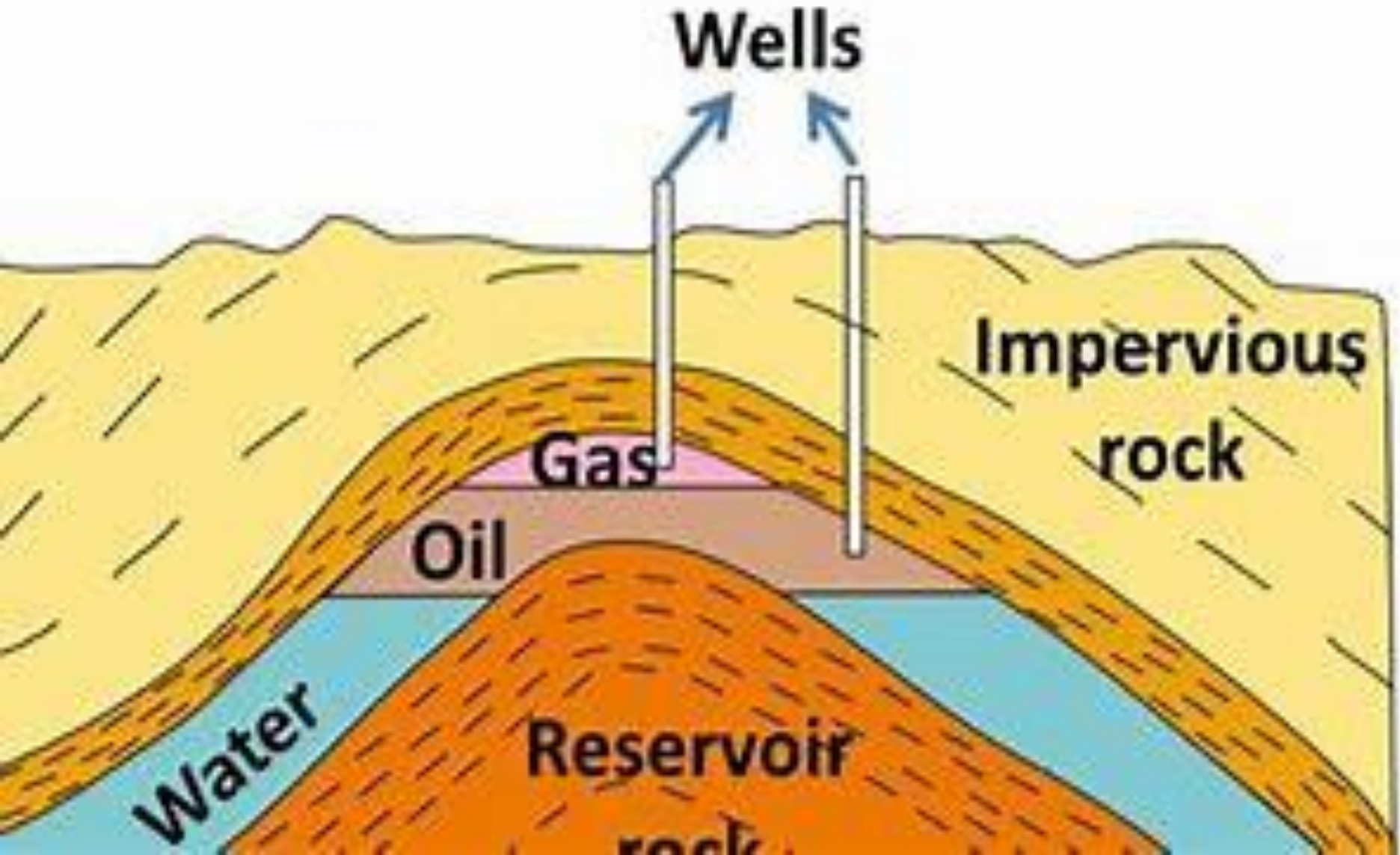
# LPG FORMATION

- LPG is a family of **Petroleum Products** (natural gas, petrol, kerosene, diesel, asphalt etc)
- Petroleum products are called **Hydrocarbons (Oil & Gas)**
- Hydrocarbons are made of Hydrogen and Carbon
- Hydrocarbons are :
  - substances formed under the ground in sedimentary rocks
  - formed from animals and plants died many years (million of years) ago

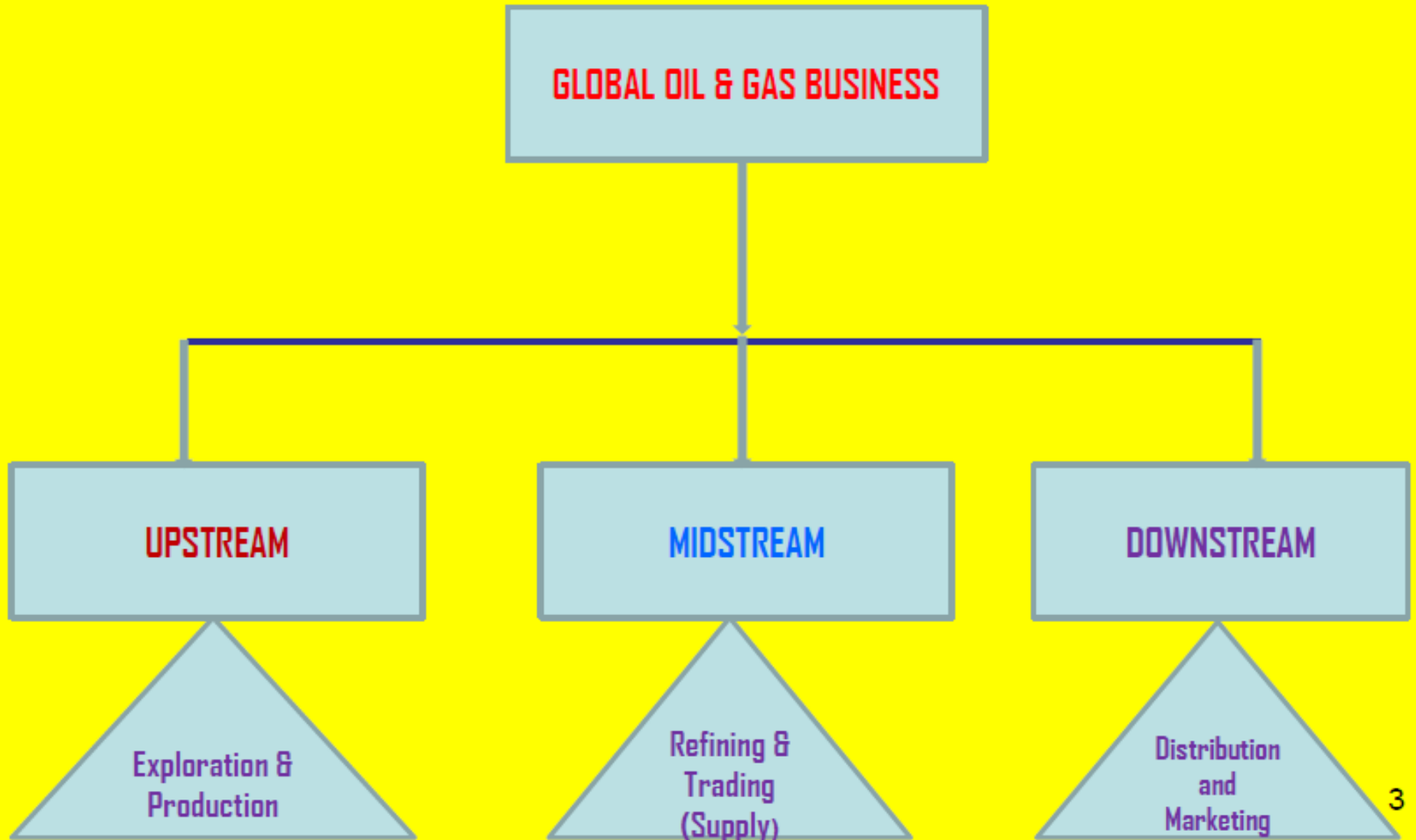
# Groups of Hydrocarbons



# Oil & Gas Deposits

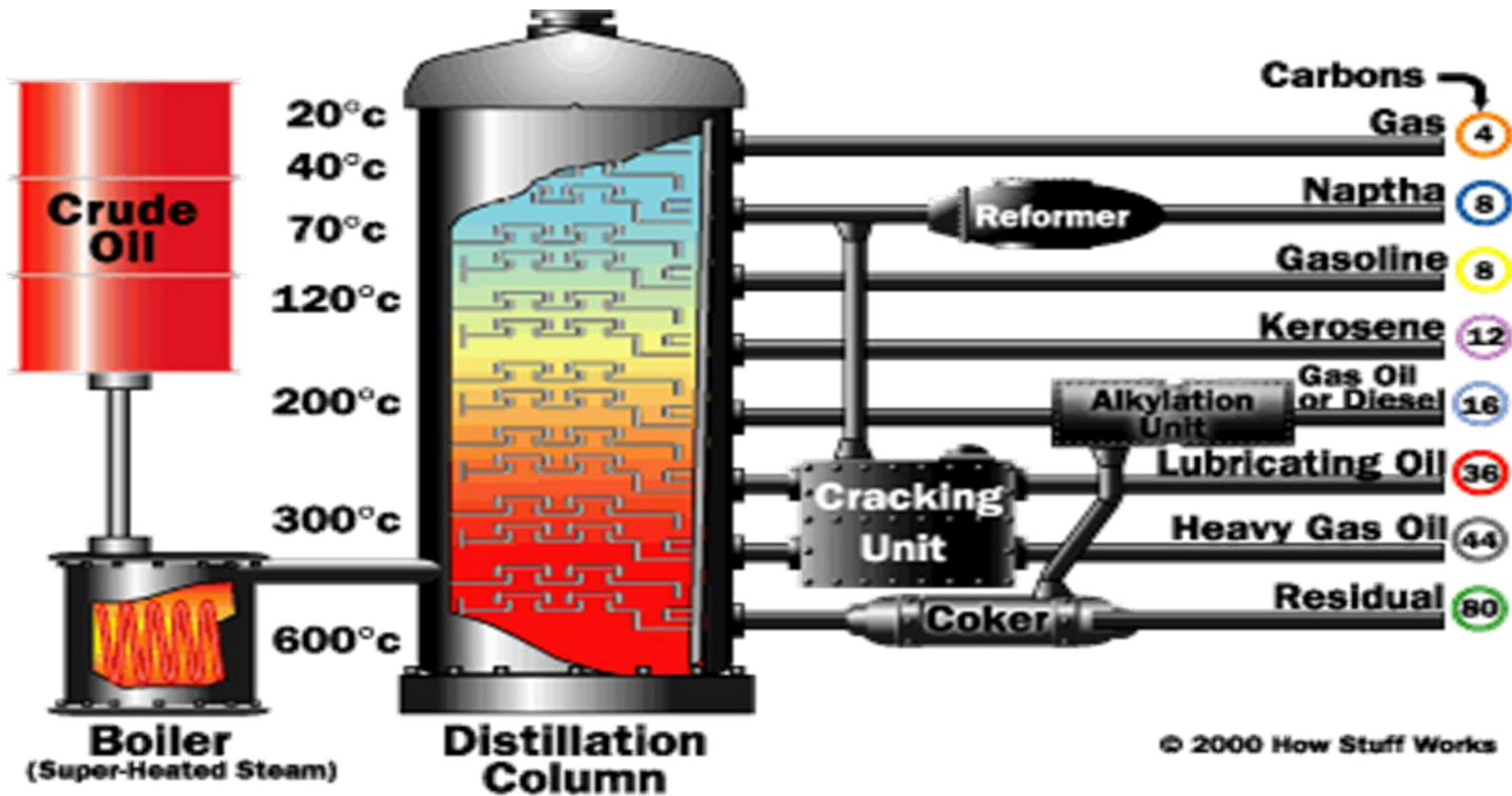


# Oil & Gas Business



# LPG PRODUCTION PROCESS

- LPG is predominantly produced from **Crude Oil** refining process (Distillation) as per below:



# LPG Family Members (Alkanes)

S/N	Chemical Name	Molecular Formula	COMMON NAME
1	Methane	CH <sub>4</sub>	Natural Gas
2	Ethane	C <sub>2</sub> H <sub>6</sub>	Natural Gas/LPG
3	Propane	C <sub>3</sub> H <sub>8</sub>	Liquefied Petroleum Gas (LPG)
4	Butane	C <sub>4</sub> H <sub>10</sub>	Liquefied Petroleum Gas (LPG)
5	Pentane	C <sub>5</sub> H <sub>12</sub>	Petrol
6	Hexane	C <sub>6</sub> H <sub>14</sub>	Petrol/Kerosene
7	Heptane	C <sub>7</sub> H <sub>16</sub>	Kerosene
8	Octane	C <sub>8</sub> H <sub>18</sub>	Kerosene/Diesel
9	Nonane	C <sub>9</sub> H <sub>20</sub>	Diesel

# KEY PROPERTIES OF LPG & NATURAL GAS

S/N	PROPERTY	UNIT	BUTANE	PROPANE	NATURAL GAS
	Chemical Formula	N/A	C <sub>4</sub> H <sub>10</sub>	C <sub>3</sub> H <sub>8</sub>	CH <sub>4</sub>
1	Boiling Point (Liquid)	Deg.Cent.	0	-41	-161
2	Density of Liquid @ 15 Deg.C	Kg/L	0.58	0.49	0.43
3	Density of Vapor @ 15 Deg.C	Kg/CM	2.5	1.89	0.68
4	Vapor Pressure	Bar	4.83	14.34	344
5	Flammability Range	v/V	1.9% to 9%	2% to 9%	5% to 15%
6	Calorific Value	KWh/Kg	13.64	14.4	15.4
7	Odor	N/A	Nil	Nil	Nil
8	Color	N/A	Colorless	Colorless	Colorless
9	Toxicity	N/A	None	None	None



# Butane & Propane Key Quality Features Comparison



## BUTANE

1. Has relatively lower heating effect (**calorific value**) compared to Propane
2. Produces relatively higher level of soot during burning ( **more pollutant**)
3. Contains relatively higher level of residues such as Sulphur (**short life of accessories**)
4. Has relatively **poor flow rate** in cold weather
5. Requires relatively lower infrastructure investment cost
6. Has relatively lower production cost

## PROPANE

1. Has relatively higher heating effect (**calorific value**) compared to Propane
2. Produces relatively lower level of soot during burning ( **less pollutant**)
3. Contain relatively lower level of residues such as Sulphur (**long life of accessories**)
4. Has relatively **good flow rate** even in cold weather
5. Requires relatively higher infrastructure investment cost
6. Has relatively higher production cost

# LPG USES :

- LPG Product is used for :
  - Domestic cooking
  - Domestic and industrial heating
  - Industrial manufacturing (petrochemicals)
  - Domestic lighting
  - Automotive (cars)
  - Aviation (aircrafts)
  - Ballooning (tourism)

# LPG STORAGE & HANDLING METHODS

## ➤ Storage tanks/containers (Pressure Vessels) system

- ✓ Sphere tanks
- ✓ Bullets tanks
- ✓ Cylinders containers

## ➤ Transportation system

- ✓ Ships
- ✓ Pipelines
- ✓ Locomotives/Trains
- ✓ Trucks

# Storage Systems

- **Sphere Storage Tank System** has the following KEY Items :
  - Shell structure (to contain product)
  - Safety Relief Valve (to vent excessive pressure in tank)
  - Support Column ( to hold the tank in place)
  - Gauging system (to indicate quantity of product in the tank)
  - Water sprinklers (cooling)



# Storage Systems

- **Bullet Storage Tank System** has the following KEY items:
  - Shell structure (to contain product)
  - Safety Relief Valve (to vent excessive pressure in tank)
  - Support Column (to hold the tank in place)
  - Gauging system (to indicate quantity of product in the tank)
  - Water sprinklers (cooling)



# Storage Systems

- **Cylinder Container System** has the following KEY items:
  - Shell structure (to contain product)
  - Safety Relief Valve (to vent excessive pressure in tank)
  - Regulator ( to regulate flow of LPG)
  - Transfer hose (to move LPG from cylinder to the cooking stove)



# LPG TRANSPORTATION SYSTEM

- LPG product is transported by ships called **Gas Carriers**
- Unlike oil tankers, gas carriers carry product at **positive pressure**
- LPG product is transported either under :
  - Pressurized condition
  - Semi-refrigerated condition
  - Refrigerated condition



# LPG Transportation



- **Pipelines** are used to transport LPG product
- LPG product is transported either under :
  - Pressurized condition
  - Semi-refrigerated condition
  - Refrigerated condition





# LPG Transportation

- **Rail Trains** can be used to transport bulk LPG product using **ISO Tanks**
- LPG product is transported either under :
  - Pressurized condition
  - Semi-refrigerated condition
  - Refrigerated condition



# LPG Transportation



- **Road tankers** can be used to transport LPG product in bulk
- LPG product is transported either under :
  - Pressurized condition
  - Semi-refrigerated condition
  - Refrigerated condition

# HSE MANAGEMENT IN LPG

- LPG product is a **high pressure product**
- High pressure means **LPG can move fast** and **catch fire very easily**
- **Leakage and Heat** are the main **Hazards** in storing and handling LPG
- **Safety risks** from Hazards are **Fire, Explosion, Suffocation** and **Cold burn**
- Regular inspections and vigilance of LPG facilities help to minimize **Hazards – LEAKAGE and HEAT**
- Regular training in HSE management help to minimize **Hazards**
- **Odor** additive/chemical (**Ethyl Mercaptan**) is added in LPG liquid stream as detective agent through human smelling
- **Safety Relief Valves** are installed in the LPG containers to reduce excessive pressure build up in the LPG container