STD VIII

COMBUSTION AND FUELS

Q1. WHAT IS COMBUSTION?

A1. THE PHENOMENON OF BURNING OF A SUBSTANCE IN THE PRESENCE OF OXYGEN TO EMIT HEAT, LIGHT AND ENERGY IS CALLED COMBUSTION.

* A SUBSTANCE THAT UNDERGOES COMBUSTION IS CALLED COMBUSTIBLE SUBSTANCE. Eg. WOOD, COAL, PETROL.

Q2. WHAT DO YOU UNDERSTAND BY IGNITION TEMPERATURE?

A2.THE TEMPERATURE TO WHICH A SUBSTANCE MUST BE HEATED BEFORE IT BEGINS TO BURN OR CATHES FIRE, IS CALLED AS ITS IGNITION TEMPERATURE.

Q3. WHY DOES A PAPER CUP CONTAINING WATER NOT BURN WHEN PLACED OVER A FLAME?

A3. A PAPER CUP CONTAINING WATER DOES NOT BURN WHEN PLACED OVER A FLAME BECAUSE THE WATER TAKES AWAY THE HEAT FROM THE CUP AND DOESNOT ALLOW THE PAPER CUP TO REACH ITS IGNITION TEMPERATURE.

Q4. WHY SHOULD THE IGNITION TEMPERATURE OF A FUEL NOT BE BELOW ROOM TEMPERATURE?

A4. THE IGNITION TEMPERATURE OF A FUEL SHOULD NOT BE BELOW ROOM TEMPERATURE BECAUSE THE FUEL WOULD CATCH FIRE VERY EASILY AND THUS WOULD BE DANGEROUS TO HANDLE.

Q5. DEFINE CALORIFIC VALUE OF A FUEL.

A5. THE AMOUNT OF HEAT GIVEN OUT BY A UNIT MASS OF A FUEL ON COMPLETE

COMBUSTION IN AIR (OR OXYGEN) IS KNOWN AS THE CALORIFIC VALUE OF THE FUEL.

*ITS IN KJ/gm.

Q6.EXPLAIN WITH THE A DIAGRAM ,WHAT IS BIOGAS?WHAT ARE THE GASES OBTAINED?

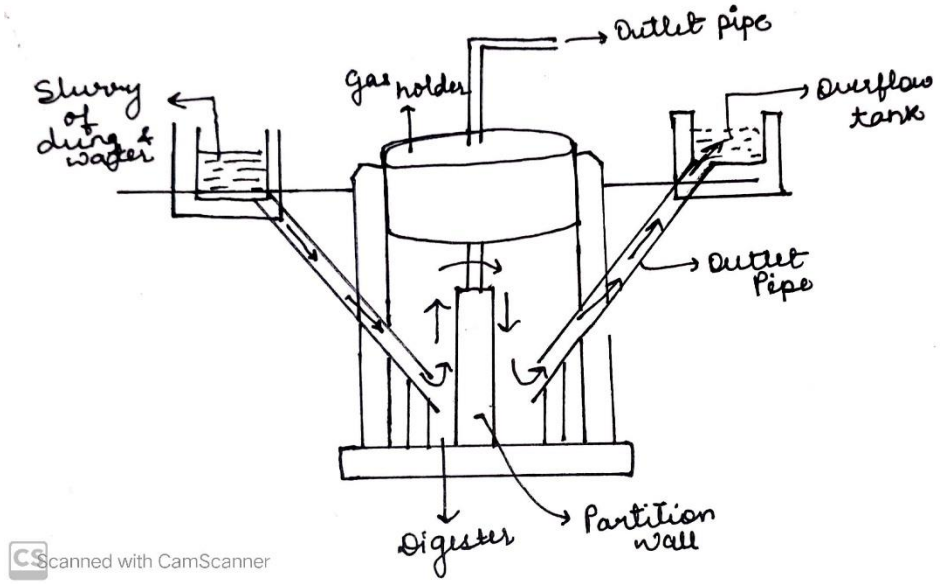
A6. BIOGAS IS A GASEOUS FUEL WHICH IS OBTAINED BY THE ANAEROBIC FERMENTATION OF ORGANIC MATTER.

*THE FERMENTATION TAKES PLACE IN AN UNDERGROUND TANK CALLED, DIGESTER.

*ON FERMENTATION OF THE DUNG, BIOGAS IS EVOLVED AND IS COLLECTED IN THE GAS HOLDER.

*THE GASES OBTAINED ARE METHANE(CH_4), H_2, H_2S(HYDROGEN SULPHIDE).

*METHANE IS THE MAIN CONSTITUENT OF BIOGAS.



Q7. WHY IS METHANE CALLED A CLEAN FUEL?

A7. METHANE IS CONSIDERED AS A CLEAN FUEL AS-

*IT BURNS COMPLETELY TO GIVE CARBON DIOXIDE AND WATER VAPOUR.

*NO HARMFUL GASES ARE RELEASED AND NO RESIDUE AS SOOT IS LEFT BEHIND.

$$CH_4 + O_2 \rightarrow CO_2 + 2H_2O + HEAT$$

Q8. THOUGH COAL IS THE MOST WIDELY FOUND FOSSIL FUEL, IT IS NOT PREFERRED TO BE USED. WHY?

A8. THIS IS SO BECAUSE-

1. COAL CONTAINS COMPOUNDS OF NITROGEN AND SULPHUR AS IMPURITIES, WHICH ALSO BURN TO FORM THE OXIDES OF THESE ELEMENTS. THESE OXIDES ARE ACIDIC AND POLLUTE THE ATMOSPHERE.

2. IN AN INSUFFICIENT SUPPLY OF AIR, COAL BURNS TO FORM CARBON MONOXIDE, WHICH IS A POISONOUS GAS .

$$2C + O_2 \rightarrow 2CO$$ (IN INCOMPLETE COMBUSTION)

3. A LOT OF SOOT AND ASH IS FORMED WHEN COAL IS BURNT.

Q9. MENTION SOME FACTORS THAT SHOULD BE CONSIDERED WHILE CHOOSING A FUEL?

A9. *IT SHOULD HAVE A MODERATE IGNITION TEMPERATURE (BUT NOT LOWER THAN ROOM TEMPERATURE).

*IT SHOULD HAVE A MODERATE CALORIFIC VALUE.

*ON COMBUSTION , IT SHOULD NOT PRODUCE HARMFUL SUBSTANCES LIKE SOOT ,ASH AND POISONOUS GASES.

*IT SHOULD NOT LEAVE ANY RESIDUE AFTER BEING BURNT.

*IT SHOULD BE CHEAP AND EASILY AVAILABLE AND EASY TO TRANSPORT AND STORE.

Q10. DESCRIBE A CANDLE FLAME.

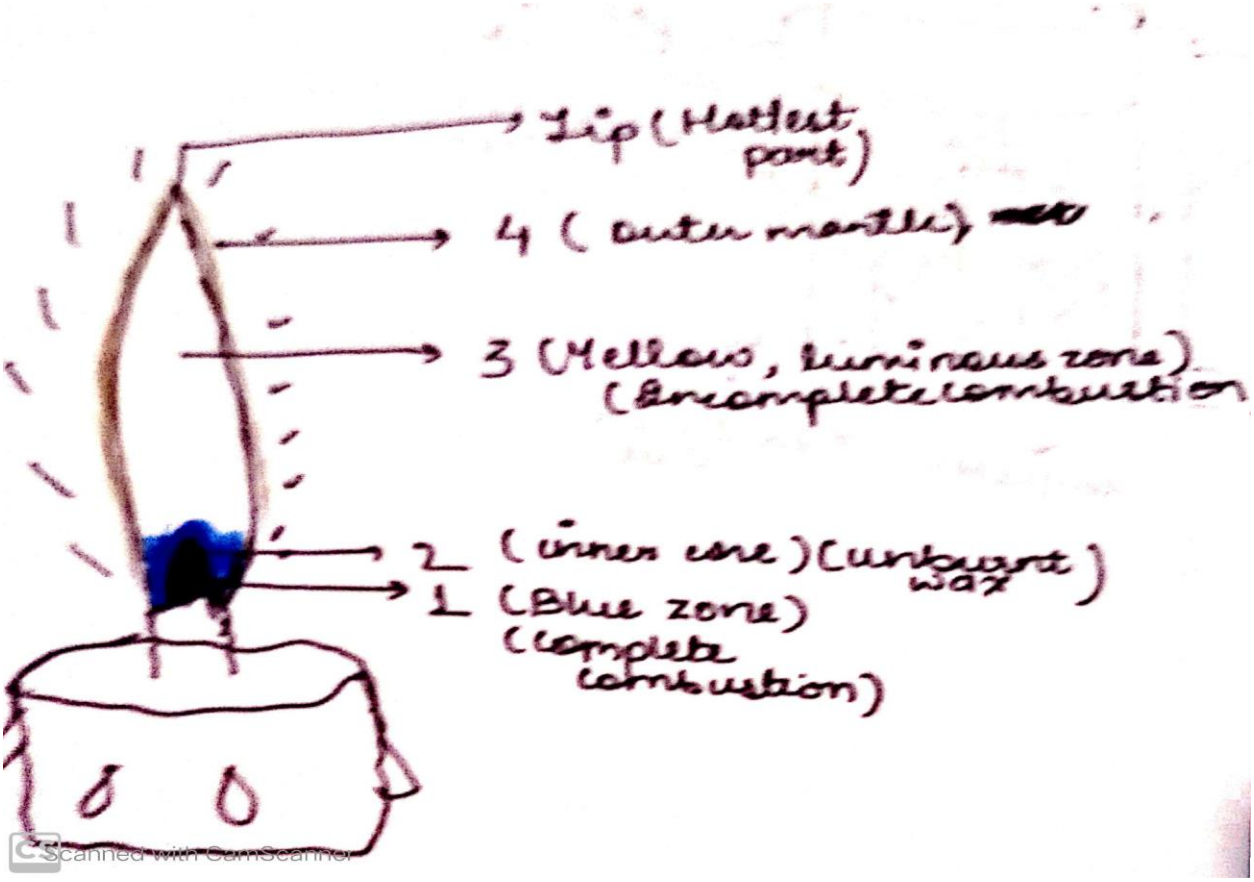
A10. 1. THE BRIGHT BLUE REGION ,WHERE THE WAX BURNS COMPLETELY.THIS IS THE REGION WHERE THE COMPLETE COMBUSTION OF WAX TAKES PLACE.

2. THE DARK INNER CORE ,CONTAINS UNBURNT VAPOURS OF WAX.

3. THE LUMINOUS REGION(YELLOW) CONTAINS UNBURNT CARBON PARTICLES THAT BEGIN TO GLOW..THIS IS THE REGION OF INCOMPLETE COMBUSTION.

4. AN OUTER MANTLE THAT SURROUNDS THE ENTIRE FLAME.

5. THE TIP IS THE HOTTEST PART OF THE CANDLE.



Q11. DRAW A DIAGRAM TO EXPLAIN THE FRACTIONAL DISTILLATION OF PETROLEUM.

A11. *PETROLEUM CONTAINS A LARGE NUMBER OF COMPONENTS WITH DIFFERENT BOILING POINTS.THEY ARE SEPARATED BY FRACTIONAL DISTILLATION.

*FRACTIONAL DISTILLATION IS CARRIED OUT IN HIGH STEEL TOWERS IN OIL REFINERIES.

*THE CRUDE OIL IS VAPORISED AT ABOUT 400°C AND THE VAPOURS ARE FED INTO THE BASE OF THE TOWER.

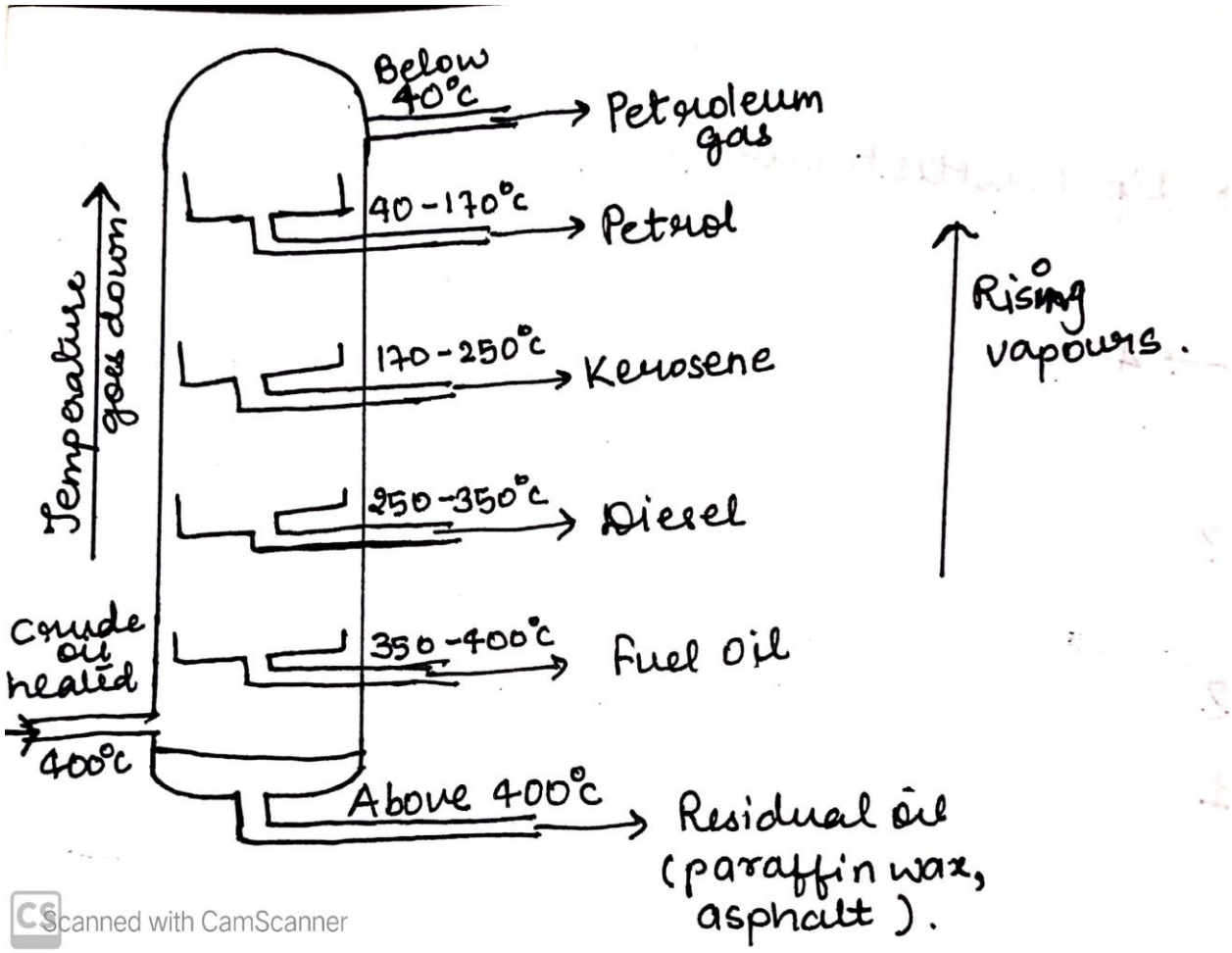
*AS THE VAPOURS RISE, THEY ARE COOLED ON SHELVES, FIXED TO THE TOWER.

*THE FRACTION WITH THE HIGHEST BOILING POINT CONDENSES IN THE LOWERMOST REGION.

*THE LIQUID COLLECTS IN A COOLING TRAY AND IS LED OUT.

*THE LOWER BOILING COMPONENTS RISE UP THE TOWER AND CONDENSE IN SUBSEQUENT STAGES IN DECREASING OREDER OF THE BOILING POINT.

*THE UNCONDENSED GAS, CALLED PETROLEUM GAS, COMES OUT OF THE TOWER. THE RESIDUE LEFT ON BOILING ON THE CRUDE OIL CONTAINS ASPHALT, PARAFFIN WAX AND LUBRICATING OIL.



Q12. NAME THREE GASES FUELS AND THEIR SOURCES.

A12. *BIOGAS - IT IS OBTAINED FROM THE ANAEROBIC FERMENTATION OF CATTLE DUNG AND DOMESTIC SEWAGE.

*NATURAL GAS- IT COLLECTS OVER PETROLEUM IN PETROLEUM WELLS.

*L.P.G. - IT IS THE LOWEST BOILING FRACTION(MOST VOLATILE) IN PETROLEUM REFINING.

Q13.WRITE "GOOD", "BEST" AND "UNSUITABLE" FOR THE GIVEN FUELS.GIVE REASONS TO SUPPORT YOUR ANSWER.

FUELS	CALORIFIC VALUE (kJ/g)	IGNITION TEMPERATURE (in °C)	YOUR VIEW
A	55	20	
B	80	70	
C	60	90	
D	100	5	
E	150	50	

A13. *'A' IS AN UNSUITABLE FUEL BECAUSE THE i ^{o}C IS VERY LOW AND SO IT CAN CATCH FIRE EASILY.

*'B' IS GOOD BECAUSE ITS i ^{o}C IS QUITE HIGH AND IT HAS FAIR CALORIFIC VALUE

*'C' IS UNSUITABLE BECAUSE THE CALORIFIC VALUE IS GOOD BUT THE i ^{o}C IS VERY HIGH.

*'D' IS UNSUITABLE BECAUSE i ^{o}C IS VERY LOW AND HENCE CAN CATCH FIRE SPONTANEOUSLY.

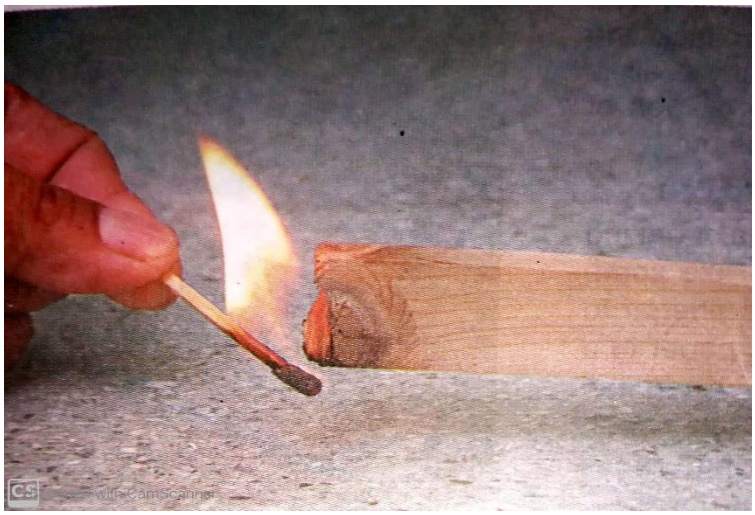
*'E' IS ALSO UNSUITABLE BECAUSE CALORIFIC VALUE IS VERY HIGH AND WILL BE EXPLOSIVE.

DO IT YOURSELF.

1. IS N2 SUPPORTER OR NONSUPPORTER OF COMBUSTION?

2. WHY CAN'T WE USE HYDROGEN AS A DOMESTIC FUEL?

3. WHICH WILL TAKE LONGER TIME TO BURN-A BIG CHUNK OF WOOD OR WOOD SHAVINGS?WHY?



4. WHY IS C.N.G. PREFERRED OVER PETROL OR DIESEL, IN VEHICLES?