Hello students I am Chandan Naik and today we will discuss about classification of fuels and their calorific value. So today's topic, we will cover classification of fuels comparison between solid, liquid and gaseous fuels, characteristics of good fuel and calorific value, and determination of calorific value. So what are Fuels? Fuel is a combustible substance which on combustion produce large amount of heat and can be used for various domestic as well as industrial purposes. The main constituent of fuel is carbon. Fuel obtained from Earth crust are known as fossil fuels and are non renewable. fossil fuels are coal, crude oil and natural gas. So fuels can be classified as primary fuels and secondary fuels. Primary fuels are also called natural fuels, and they occur in nature and I used either without processing or after processing to certain extent. There also known as fossil fuels. Secondary, fuels are also called as derived fuels and they are derived from primary fuels by further chemical processing. Examples include Coke, charcoal, kerosene, Producer gas, water, gas,etc. Depending on the physical state, primary and secondary fields are classified as solid, liquid and gaseous fuels. The examples of solid primary fuels are wood, peat, coal and dung. The example of liquid primary fuel includes crude oil and gaseous primary fuel is natural gas. The examples of solid secondary fuel includes Coke, charcoal, petroleum, Coke and coal briquette and examples of liquid secondary fuels are tar,kerosene, diesel and petrol, while gaseous secondary fuels are coal gas, water, gas, oil gas and bio gas. Solid fuels are easy to transport and store. Their cost Of production is low. There is also less risk of fire hazards in case of solid fuels. They possess moderate ignition temperature and the calorific value is lower compared to liquid and gaseous fuels. Solid fuels cannot be used in internal combustion of engines. For liquid fuels the calorific value is higher compared to solid fuels they burn without forming a dust ash and clinkers. liquid fuels are easy to transport through pipelines. Also, liquid fuels can be used in internal combustion of engines. Example, petrol and diesel.

In case of liquid fuels, great care must be taken to store them in closed containers because the risk of fire hazard is high. Gaseous fuel neither ash nor smoking produced. They can also be used in internal combustion engines. Example CNG and LPG. The thermal efficiency is high as compared to solid and liquid fuels. The calorific value of gaseous fuels is higher. Gaseous fuels are very inflammable and higher risk of fire hazard. Gaseous fuels are costly because they are derived from liquid and solid fuels, except for petrol gas. What are the good characteristics Of good fuel?. A good fuel should have high calorific value, moderate ignition temperature, low moisture content, moderate rate of combustion. The combustion product should be harmless and non polluting. The cost of fuel should be low as possible and they should be easy to handle and transport. So what is calorific value? calorific value is defined as the total amount of heat liberated when a unit mass or volume of fuel is burned completely. So units of heat are Calorie, kilocalorie, British thermal unit and Centigrade heat unit. The units of calorific value in cgs system for solid and liquid fuels are calories pergram and for gaseous fuels it is calories per centimeter cube. While in MKS system, solid and liquid fuels, healthcare unit kilocalories per kilogram and for gaseous fuels it is kilocalories per meter cube. In SI system, solid and liquid fuels have units joules per kg, while for gaseous fuels it is joules per meter cube. So what do you mean by gross and net calorific value? Gross calorific value is also called a high calorific value, and it is the total amount of heat produced when a unit quantity of fuel is burned completely and the products of combustion are cooled to room temperature. Net calorific value is also called as low calorific value and it is the heat produced when unit quantity of fuel is burned completely and hot combustion products are allowed to escape. the relation between net calorific value and gross calorific value has been shown here. So the net calorific value is equal to gross calorific value minus H by 100 into 9 into latent heat of steam. Here, the H is the

percentage of hydrogen. So we will try to solve one problem. The gross calorific value of fuel containing 8% hydrogen was found to be 9225.9 kilocalories per kilo gram., find out its net calorific value. If the latent heat of steam, is 587 kilocalories per kilogram, by using the relation between net calorific value. And gross calorific value. We can substitute the values we get net calorific value to be 8803.26 kilocalories per kilogram. So how to determine the calorific value? For solid and non volatile liquid fuels, bomb calorimeter is used while for gaseous and volatile liquid fuels, Junkers gas colorimeter and boys gas calorimeter is used. Determination of calorific value by dulongs formula. According to Dulong, the calorific value of fuel is sum of calorific values of its constituents. The calorific value of carbon, hydrogen, and sulfur are found to be 8080, 34500, and 2240 kilocalories per kilogram. And oxygen is assumed to be present in the form of water. So dulong formula in MKS unit has been shown here. Here the C,H,O,N,S are the percentages of carbon, hydrogen, oxygen and sulfur in the fuel. We will try to solve one problem. Calculate the gross and net calorific values of coal having the following composition. Carbon 85% hydrogen 8% sulfur 1% nitrogen 2% ash 4% and latent heat of steam 587 calories per gram. So by using the dulong formula we can substitute the values given and we obtain the gross calorific value to be 9650.4 kilocalories per kilogram. By using the relation between net calorific value and gross calorific value, we can obtain the net calorific value which you got 9227.76 kilocalories per kilogram. These are some of the practice problems you can try. This is the reference you can use.

Thank you.