



Master Lesson Plan

For

Coal and Petroleum

Board	Standard	Subject	Chapter	Language	Reference Link	Creation
CBSE	STD VIII	Science	Coal and Petroleum	English	Coal and Petroleum	2020-08

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Coal and Petroleum

1. MS_Objectives_Coal and Petroleum

Notes to the teacher: This asset lays down the proposed plan for transacting this chapter. It states the asset objectives of the MLP. This asset is for teacher's reference and need not be taught to the students:

Students will be able to...

- know the importance of conservation of resources
- classify natural resources
- relish the history of coal
- describe coal and its formation
- enumerate the products of coal
- identify the various types of coal and its properties
- recognize how coal is responsible for climate change
- examine how electricity is produced using coal
- experiment destructive distillation of wood
- explain about the sources and refinement of petroleum
- discover the history of petroleum
- evaluate the causes of global warming
- relate to the uses of natural sources of energy in our daily lives
- make a solar cooker
- explore more on natural gas
- appreciate the power of wind energy
- revise the topic 'Coal and petroleum'

Time to teach	Asset Type	Theme	SubTheme
2 Minutes	Main Script	Coal and Petroleum	Uses of coal, Properties of coal (coke, coal tar, coal gas refinement of petroleum),Petrol and their uses, Coal, Uses o of coal, Products of coal (coal gas), Petroleum refinement Petroleum products

2. VC_Reserve to Conserve

Just as trees are to be conserved other natural resources like water should also be conserved. The teacher should show the video to the children, following which a role play can be performed.

Scene 1

Narrator - In a classroom.

Teacher- Tomorrow please bring a new notebook to do your rough calculations.

Students - Yes teacher.

Narrator- Priya, one of the students has a worried look on her face. She returns home, just as she enters her house she hears her mother telling her younger brother Sanjay.

Mother- Don't ask for any more books or pencils, I can buy them only next month. I have already taken an advance from my employer.

Narrator-Priya did not have a father, her mother worked as a housekeeper in the bungalow and they stayed in the servant quarters. Priya knew she could not ask her mother for a new notebook now. She wondered what she could do. Suddenly, her eyes fell upon her brother's discarded slate. Ever since he moved to a higher class, it was lying neglected. Priya got an idea. She picked it up and put it in her school bag. She prayed that her teacher should not scold her the next day.

Scene 2

Narrator- Next day in the classroom

Teacher – Good morning children. Remember, I told you to bring a notebook for rough calculations. Please take out your notebooks.

Narrator – All the students took out their notebooks, but Priya pulled out her slate and chalk.

Narrator – There was a lot of whispering and giggling among students. They began to laugh at Priya.

Teacher – Stop laughing! What a brilliant idea! We are always talking about conservation but this is a practical demonstration. Do you know children, it takes twelve trees to make one ton of non-recycled paper? Every time we use a substitute for paper we are actually saving a tree. So I feel we can all follow Priya's example.

Sudha (one of the students) - Yes teacher, we must use paper carefully, and not waste it. So, using a slate for rough work is a good idea, Priya. In my cousin's school in Delhi they have done rain water harvesting from terraces.

Gita- What! How can you harvest rain, is it a crop?

Sudha- Don't you know that gallons of water go down the drain during monsoon. The terraces are used as catchment areas and the water is made to flow through pipes after filtration to storage tanks. This stored water can be used during summer.

Teacher- Excellent Sudha! That is another project we can take up later.

Farida- Yes, my mother tells me to close the tap, while I brush my teeth or apply soap to wash my hands.

Teacher- Yes children, small acts of conservation go a long way. Who do you think has given us these gifts of land, forests, air, water, minerals??? Yes you are right! These are gifts of Mother Nature given to us by God. So we must use them gratefully, and never ever misuse them. We have to conserve and preserve our natural heritage for all. As Gandhiji said, "Earth provides enough to satisfy every man's need but not enough for any man's greed". We must remember the 3 R's i.e. Reduce, Reuse and Recycle. We can make little contributions towards this goal as we have seen today. So children, from tomorrow please bring a slate for your rough calculations: Now let us applaud Priya for her eco friendly idea.

Time to teach	Value Type	Value Sub Type	Value Attribute
10 Minutes	Right Action		Group Activities

3. MS_Classification of Natural Resources

Classification of Natural Resources

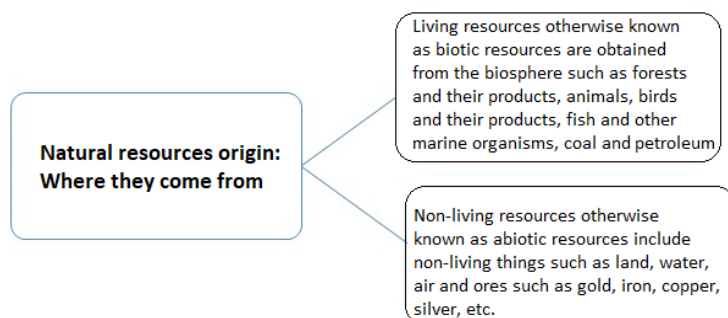
Air, water, soil, forest and minerals are known as natural resources. Man has been using them for a long time. Increasing population forced him to overuse the resources. Some such resources are regenerated with time.

Resources like electricity are manmade. So they are known as manmade resources

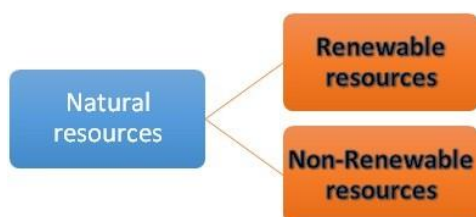
Natural resources are classified on the basis of

1. Origin
2. Renewability and
3. Availability.

1. Origin: Where they come from?



2. Renewability: Are they renewable or non-renewable?

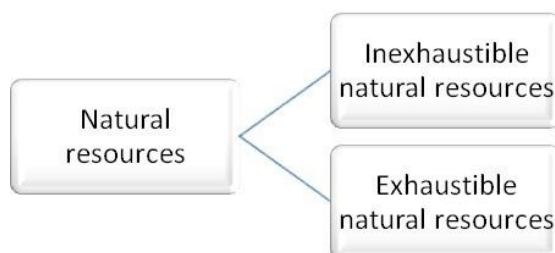


A. Renewable resources: Renewable resources are the ones that can be replenished or reproduced easily, eg. sunlight, air, and wind, are continuously available and not affected by human consumption.

Many renewable resources can be depleted, but may also be replenished, like agricultural crops take a short time for renewal; others, like water, take a comparatively longer time, while still others, like forests, take even longer. These may be more accurately described as potentially renewable, because in many places they are not being actively renewed.

B. Non-renewable resources: Non-renewable resources are formed over very long geological periods. These resources take extensive geological time to form, and are therefore essentially finite. Oil and natural gas are fossil fuels, which constitute an essential energy source of developed countries.

3. Availability: How available or abundant is the natural resource?



- a. Inexhaustible natural resources** – Those resources which are present in unlimited quantities in nature and are not likely to be exhausted easily by human activity.
Example- wind, water, sunlight, etc.

b. Exhaustible natural resources-

The resources which are present in limited quantities in nature and are likely to get exhausted over a certain period of time are called exhaustible natural resources.

Example - petroleum, coal, natural gas, forests, minerals, etc.

Coal, petroleum and their products are the most commonly used concentrated sources of energy. They take millions of years to form and therefore these are commonly known as fossil fuels.

Time to teach	Asset Type	Theme	SubTheme
8 Minutes	Main Script	Coal and Petroleum	Natural resources (exhaustible and inexhaustible), Natural resources (exhaustible, inexhaustible)

4. IA_History of Coal



- Coal is the most abundant and has the most interesting history.
- Coal is used for heating from ancient times. People living in caves also used coal for heating. Archaeologists also say that the Romans who lived in England used coal in the second and third centuries (100 – 200 AD).
- In the 1700s, the English made many experiments on coal and found that coal produces a cleaner and hotter fuel than wood charcoal.
- The Native tribe of Indians in North America, used coal for cooking, heating and baking pottery in the 1300s.
- By the invention of the steam engine by James Watt, machines, vehicles used to run using coal.



- During the first half of the 1800s, the industrial revolution spread to the United States. Steamships and steam – powered railroads were main forms of transportation, and they used coal to fuel their boilers.



- In the second half of the 1800s, more uses for coal were found. During the civil war, factories manufacturing weapons were beginning to use coal. By 1875, coke replaced charcoal as the primary fuel for iron blast furnaces to make steel.
- The burning of coal to generate electricity is a relative newcomer in the long history of this fossil fuel. It was in the 1880s when coal was first used to generate electricity for homes and factories. By 1961, coal had become the major fuel used to generate electricity in the United States.
- Long after homes were being lit by electricity produced by coal, many of them continued to have furnaces for heating and some had stoves for cooking that were fuelled by coal.

Image Source

<https://www.pikrepo.com/fpssr/coal-on-fire>

<https://pixnio.com/transportation-vehicles/trains-and-buses/steam-locomotive-coal-steam-engine-locomotive-train-vehicle-iron>

<https://commons.wikimedia.org/w/index.php?curid=2990792>

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Interesting Asides	Coal and Petroleum	Coal, Coal

5. MS_Coal and its formation

Coal is a hard, black, shiny, stone-like substance made up of mainly carbon along with some other materials. It is one of the most important minerals and earliest-used fossil fuels. It is found at varying depths under the upper crust of the earth. Coal beds generally contain large amounts of methane.

Formation of Coal

Coal was formed from the dead remains of trees, ferns and other plants that lived 300 to 400 million years ago. In some areas, such as the eastern United States, coal was formed from swamp covered by sea water.

The sea water contained large amounts of sulphur, and after seas dried up, sulphur was left behind in the coal. One primary concern of scientists these days is the removal of sulphur from coal because when coal burns, sulphur goes into the atmosphere and pollutes the air.

Millions of years ago the dense forest cover in the low lying areas got buried under the earth due to natural calamities like floods, earthquakes, etc. Over a period of time the forests got buried under the earth. The upper layers increased the pressure and temperature, due to which the dead vegetation slowly got converted into coal.

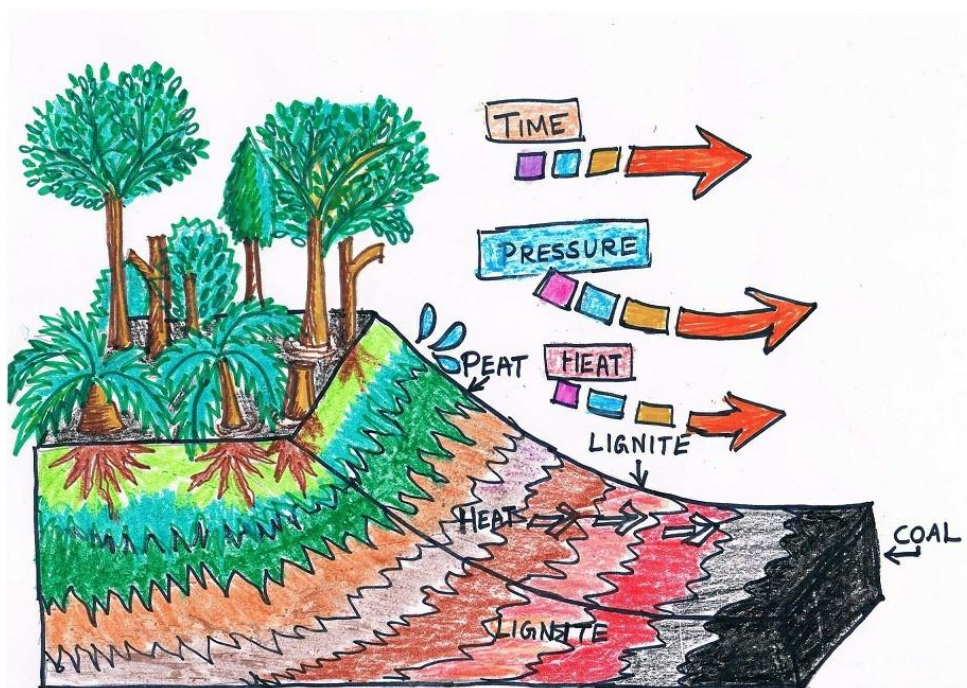


Swamps with giant plants hundreds of millions of years ago covered with Earth.

Water and dirt covered the plant remains 100 million years ago.

Rocks, dirt and sediment created pressure and heat to form coal deep in the ground.

Coal was formed by the anaerobic thermal degradation of the cellulosic material of big plants/trees which got buried inside the earth millions of years ago.



Note to the teacher: Please play the video
<https://www.youtube.com/watch?v=EYeSBNBCjx4>
 The video is 2 mins 56 seconds. It is attached.

Video Source
 Category: [Education](#)

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Image Source
 Source: Art by Smt. Srividhya Sridhar . SSSVV. Team
 Original contribution - rushmish@gmail.com

Time to teach	Asset Type	Theme	SubTheme
6 Minutes	Main Script	Coal and Petroleum	Coal, Coal

6. DD_Uses of Coal Products

Coke



The greyish-black residue left after the destructive distillation of coal is called coke.

Uses of Coke

1. Coke is used as a domestic fuel.
2. Coke is used as a reducing agent in the metallurgical processes. It is used in the manufacture of steel and extraction of some metals.
3. Coke is used for producing fuel gases, such as water-gas ($\text{CO} + \text{H}_2$) and producer gas ($\text{CO} + \text{N}_2$).
4. Coke is used for producing carbides, such as calcium carbide (CaC_2), silicon carbide (SiC) and aluminium carbide (Al_4C_3). Calcium and aluminium carbides are very useful as cheap raw materials for the petrochemical industry. Silicon carbide is very hard and used as an abrasive.

Coal Tar



The black tarry material obtained during the destructive distillation of coal is called coal tar.

Uses of Coal Tar

- Coal tar is a valuable source of raw material for manufacturing various substances like synthetic dyes, drugs, explosives, perfumes and many other useful organic compounds.
- It is used in the manufacture of, drugs, paints, varnishes, plastics, naphthalene balls, roofing materials, dyes, etc.

Coal Gas

The gaseous product obtained by the destructive distillation of coal is called coal gas.

Uses of Coal Gas

Coal gas is an excellent gaseous fuel. In earlier days, coal gas was used for various purposes.

1. As domestic and industrial fuel for heating purposes.
2. As an illuminant for domestic/ street lighting.
3. Coal gas is used for providing an inert reducing atmosphere in reaction vessel and in certain metal extraction processes.

Since better fuels for domestic use and plenty of electricity for lighting purposes are now available, coal gas is not used as domestic fuel or as an illuminant nowadays. Coal gas is used as a fuel only for industrial heating and for maintaining an inert (and/or) reducing atmosphere in reaction vessel.

Image source

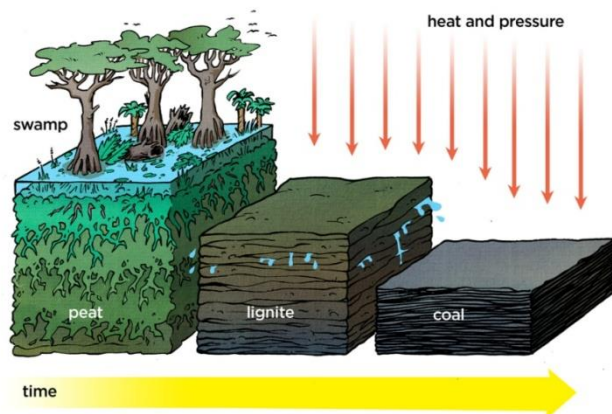
https://www.youtube.com/watch?v=6vJ_AfSMXgA (Attribution - कोयला और पेट्रोलियम (Coal and Petroleum) - कक्षा 8 विज्ञान (Class 8 Science) – Hindi by OLI - NSS, IITB)

<https://www.flickr.com/photos/usoceangov/4639736124> – CC BY 2.0 - [NOAA's National Ocean Service](#)

Time to teach	Asset Type	Theme	SubTheme
8 Minutes	Day to Day Relevance	Coal and Petroleum	Products of coal (coke,coal Coal, Products of coal (cok gas), Coal

7. MS_Coal and its varieties

Wood, under the effect of high temperature and pressure, and in the absence of air, gets converted into coal through a number of steps, each step leading to increased carbon content.



The sequence of change is

Wood Peat --- Lignite --- Bituminous coal ----- Anthracite

• Common variety of Coal

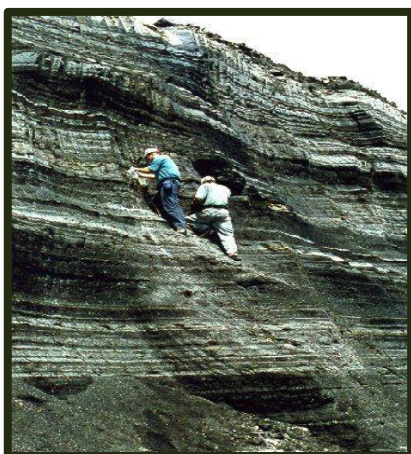
The common varieties of coal are:

1. Peat (Least carbon content)



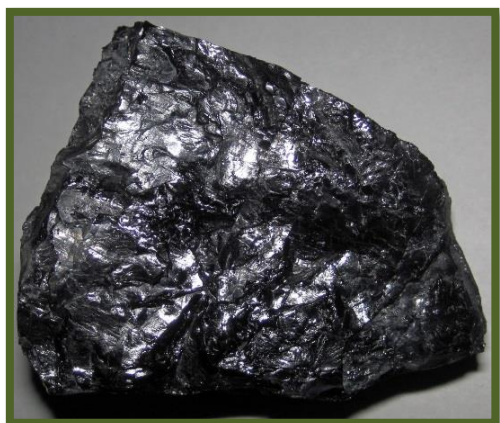
This is a spongy organic matter. It is considered as the earliest stage in the formation of coal and the top most layer in the coal – forming environment. This type of coal contains approximately 27% of carbon. (Least carbon content)

2. Lignite (soft coal)



This is the young stage of coal formation. It is soft coal. It is about 60-70% carbon. It also has a lot of organic matter and has high moisture content. It has low energy content and hence, its value as a fuel is low.

3. Bituminous coal (household coal)



This coal yields more energy when burned. It is the household coal. It is dull black in colour and burns with a bright smoky flame.

4. Anthracite (hard coal) (maximum carbon content)



This is the best form of coal. It is hard coal with maximum carbon content (92-98%). It has a sub-metallic lustre.

Image source:

<https://www.flickr.com/photos/121935927@N06/13598459184> (Attribution - Siyavula Education)

<https://www.flickr.com/photos/isigeology/16207616053> (Attribution: By [James St. John](#))

<https://pixabay.com/en/peat-bales-dried-nature-moor-260014/>

https://commons.wikimedia.org/wiki/File%3ALignite_mine_in_Ptolemaida.jpg

<https://www.flickr.com/photos/47445767@N05/46356761785> (Attribution - [James St. John](#))

<https://pixabay.com/en/oven-coal-stove-fireplace-heat-1960784/>

<https://pixabay.com/en/coal-cabbage-burned-fuel-black-842468/>

<https://www.flickr.com/photos/isigeology/16319380394> (Attribution: By [James St. John](#))

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Main Script	Coal and Petroleum	Products of coal (coke, coal gas) Coal, Products of coal (coke, Coal gas)

8. IA_Coal and Climate change

- Carbon dioxide(CO_2) is a colourless, odourless gas that is produced naturally when humans and animals breathe.
- The main source of man – made CO_2 emissions, however is the burning of fossil fuels (oil, natural gas and coal) for energy production.
- Carbon dioxide is important for plants and animals, but if too much of it is produced, it can build up in the air and trap heat near the earth's surface. This is called the *greenhouse effect*.
- To clean CO_2 from power plants, scientists have been studying how to capture the CO_2 coming from power plants, smokestack before it gets into the air. The CO_2 can then be gathered, transported, and eventually stored deep underground or in the ocean, where it's supposed to sit for a long, long time.
- Scientists are even studying ways to recycle the CO_2 into new materials. The technical name for this process is *carbon capture and storage or carbon sequestration*.
- It is expected that coal and other fossil fuels will remain a major energy source for years to come. Many environmentalists believe that capturing and storing CO_2 from power plants, combined with other efforts, could help fight climate change.
- Scientists continue to research and develop carbon sequestration technologies.
- It is important to make sure these new processes are environmentally acceptable and safe. For example, scientists must determine that CO_2 will not escape from under the ground or contaminate drinking water supplies. Carbon capture and storage is an exciting area of research and development for today's scientists.

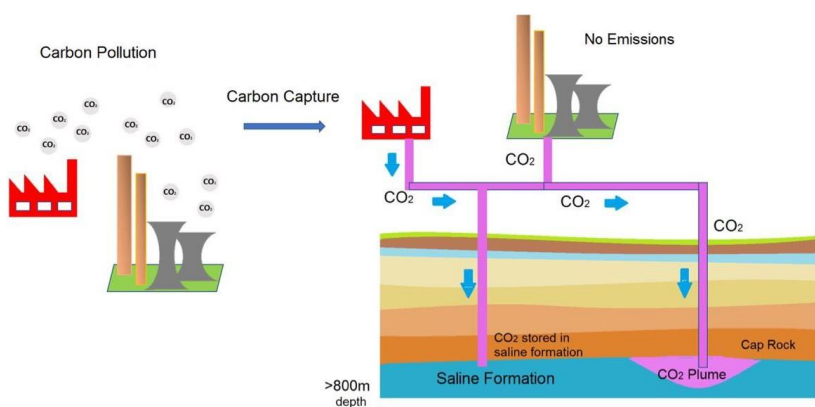


Image Source

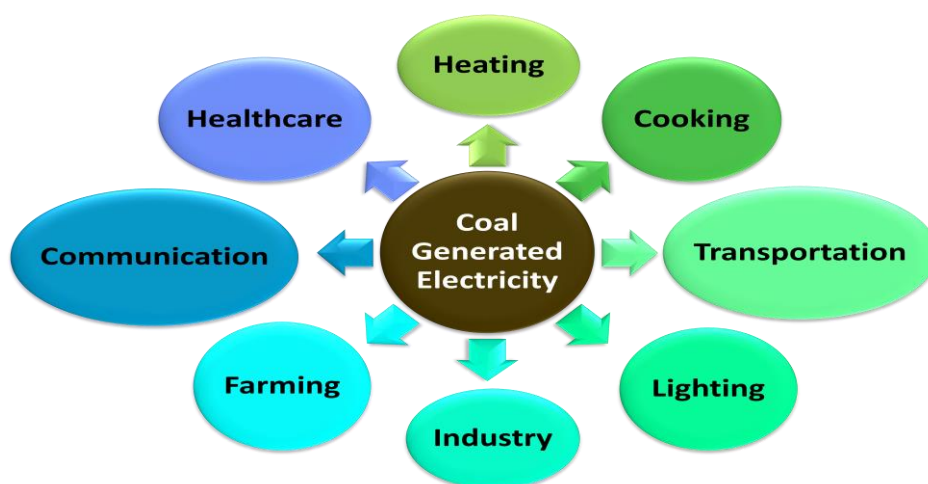
SSVV Gallery: Swarup

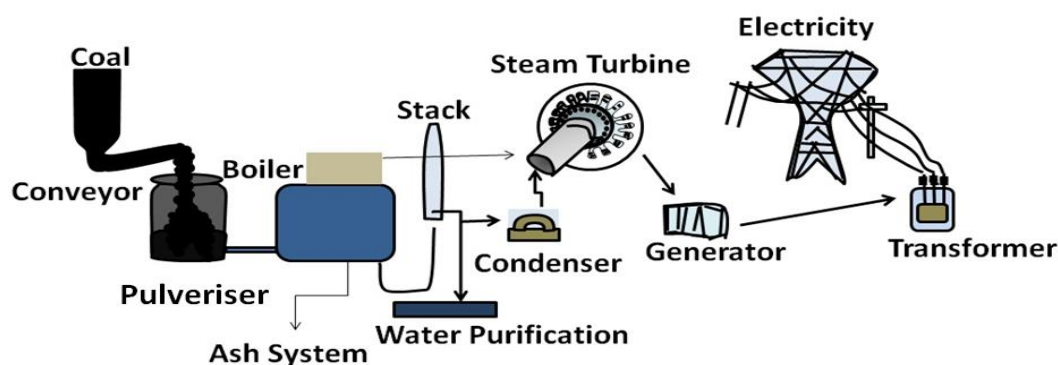
Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Interesting Aside	Coal and Petroleum	Coal, Affects of over use of petroleum, Coal, Affects of o and petroleum

9. MS_Coal turned into electricity

India has long depended on coal-fired power plants to meet most of its energy requirements. More than 62% of India's electricity demand is met through the country's vast coal mines.

Electricity from coal is the electric power made from the energy stored in coal. Carbon, made from ancient plant material, gives coal most of its energy. This energy is released when coal is burned.





- The process of converting coal into electricity has multiple steps and is similar to the process used to convert oil and natural gas into electricity:
- A machine called a pulveriser grinds the coal into a fine powder.
- The coal powder mixes with hot air, which helps the coal burn more efficiently, and the mixture moves to the furnace.
- The burning coal heats water in a boiler, creating steam.
- Steam released from the boiler powers an engine called a turbine, transforming heat energy from burning coal, into mechanical energy that spins the turbine engine.
- The spinning turbine is used to power a generator, a machine that turns mechanical energy into electric energy. This happens when magnets inside a copper coil in the generator spin.
- A condenser cools the steam moving through the turbine. As the steam is condensed, it turns back into water.
- The water returns to the boiler, and the cycle begins again.
- The steps for converting coal into electricity are shown here and described above. An actual photo of a turbine is shown in the circle. Turbines have fan – like blades attached to a shaft that spin to generate power. Practically every form of electric power is generated by a turbine. Even the space shuttle uses again turbine!

Image Source:

Coal mines - <https://pixabay.com/en/dumper-coal-mining-coal-2129354/>

Coal burning - <https://pixabay.com/photos/ash-burn-campfire-charcoal-coal-2591/>

Original contribution - rushmish@gmail.com

Time to teach	Asset Type	Theme	SubTheme
8 Minutes	Main Script	Coal and Petroleum	Uses of coal, Coal, Uses of

10. SA_Destructive distillation in the laboratory

Aim: To perform destructive distillation of wood in the laboratory.

Resources required:

1. A Bunsen burner
2. Two boiling test tubes with stands
3. Two one holed rubber corks
4. Two delivery tubes

5. A match box

6. Small wood pieces

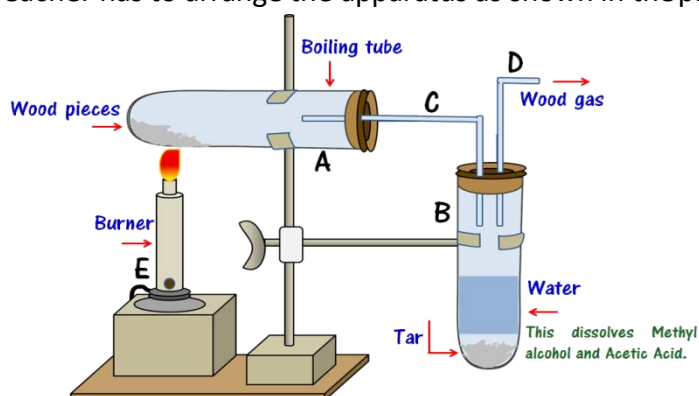
7. Glass of water

Setting for the Activity: [Indoor]

Type of Activity: [Demonstration]

Procedure:

- Teacher has to arrange the apparatus as shown in the picture.



Experimental setup for the destructive distillation of wood to prepare charcoal.

- Put the wood pieces in the test tube.
- Light the burner and allow the wooden pieces to become hot.

Observation: It is observed that the bubbles come out through the bent tube which leads to the other test tube. A black thick mass settles down in the second test tube. If a burning splinter is introduced near the mouth of the second test tube, the gas which comes out starts burning.

Conclusion: On heating the wooden pieces, they got separated into the constituents. The leftover mass in the first test tube is wood charcoal, the black mass which is collected at the bottom of the other tube with water is actually the wood tar and the gas which comes out is wood gas. This activity helps the students to understand the process of destructive distillation of coal in detail.

Discussion Questions-

Question 1. - **What is destructive distillation?**

Answer - It is the process of heating a substance in absence of air.

Question 2. **What is the end product formed during the destructive distillation of coal?**

Coke is the residue left behind on the completion of the destructive distillation of coal.

Question 3. **Can destructive distillation of coal be carried out in school laboratories?**

Answer: Destructive distillation of coal requires heating coal to 1000 °C in the absence of air. Hence this experiment cannot be carried out in school laboratories.

Question 4. **What did we substitute with coal in the destructive distillation conducted in the laboratory?**

Answer: Small wood pieces

Question 5- **What are the end products obtained in the destructive distillation of wood pieces?**

Answer- Wood charcoal, wood tar and wood gas.

Instructions to Teacher:

1. All the resources required for the demonstration of the activity have to be arranged a day prior to the activity.

Precautions:

- The experiment should be performed by teachers only.
- The rubber corks must be air tight and should hold the tubes firmly.
- Allow the bubbles to come out of the test tube initially as they may be simple air bubbles.
- Utmost care should be taken when the burning splinter is introduced.

Image resource

Original Contribution – rushmish@gmail.com

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Suggested Activity	Coal and Petroleum	Products of coal (coke, coal Products of coal (coke, coal

11. MS_Petroleum and its sources

Petroleum is a thick, viscous, dark-coloured fluorescent oily liquid which occurs deep inside the earth. It has an unpleasant odour. Petroleum is lighter than water.

Petroleum as it occurs cannot be used for any useful purposes. That is why it is called crude oil. More usable form can be obtained by refining it.



Composition of Petroleum

The composition of petroleum depends upon the place where it is found. But, it contains a large number of hydrocarbons and certain organic compounds containing nitrogen, oxygen and Sulphur also. Petroleum is a complex mixture of a large number of organic compounds of different types mixed with sea water and fine dust particles.

Formation of Petroleum

Petroleum or crude oil was formed due to decomposition of the organisms living in the sea under high temperature, high pressure and without air. The remains of the dead organisms went to the sea bottom. They were gradually covered by sand and clay. Over a period of millions of years, the remains of these dead organisms got converted into petroleum under high temperature, high pressure and bacteria in the absence of air. The petroleum thus formed passes through porous rocks and gets trapped between some non porous rocks. The more explosive component of the petroleum forms a gaseous layer over petroleum. Such a gaseous mixture covering the petroleum is known as natural gas.

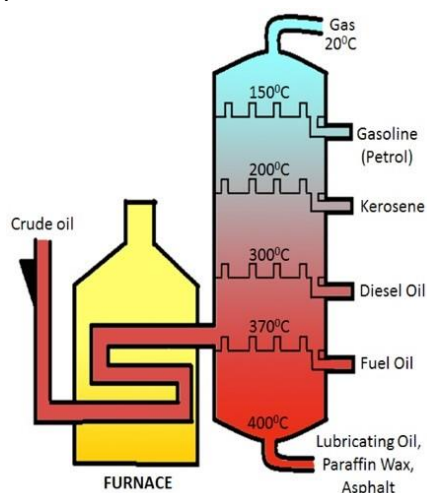
Mining of Petroleum

Petroleum is found at different depths ranging from a few hundred metres to 2-3 kilometres.

Holes are drilled into the earth's crust and pipes are inserted until the pipes reach the petroleum deposit. Crude oil gushes out of the pipes due to high internal pressure of natural gas. Later, petroleum is pumped out with the help of pumps.

Refining of Petroleum

Petroleum consists of a large number of saturated hydrocarbons mixed with sea water and fine clay(silt). It cannot be used as such. However petroleum can be separated into several useful products by fractional distillation. The process of separating petroleum into usable fractions by fractional distillation is known as refining of petroleum. It is also known as fractional distillation of petroleum. It is carried out in a petroleum refinery.



Petroleum is refined in a tall steel fractional tower fitted with holed shelves. Crude oil is heated to about 400°C in a

furnace and the vapour is allowed to move into the tower.

As the vapour moves up the (high boiling) component gets condensed and returns to the lower part of the tower. The components having low boiling points move upwards and condense in the upper part of the column. The uncondensed fraction goes out as the gas through an outlet at the top. The gas which goes out of the column is known as petroleum gas.

The least volatile fraction of the petroleum is collected from an outlet at the bottom of the column. Various fractions, each having a different boiling range, are removed from the outlets at different heights of Tower.

FRACTIONAL DISTILLATION

Fraction	Boiling range
Kerosene	150 - 240
Diesel	220 -275
Petrol	40-175
Bitumen	>350
Fuel gas	Below 40
Lubricating oil	250-350

Uses of Fractional Distillation

Fuel gas	Burned in the refinery to fuel the distillation process, sold as LPG, purified and sold as bottled camping gas
Petrol/ gasoline	Fuels for cars and motorbikes, also used to make certain chemicals
Naphthalene	To make chemicals
Paraffin/ kerosene	Fuel for greenhouse heaters and jet engines, manufacture of chemicals
Diesel	Fuel for lorries and trains
Lubricating oil	Fuel for ships, lubricating oil, heating large buildings
Bitumen	Roofing and road surfaces

Note to the teacher: Please play the video

<https://www.youtube.com/watch?v=JZdvsQzOKuk>

It is attached. The video is 4 minutes 6 seconds

Education: License

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Attributions : Crude Oil Fractions & Their Uses | Organic Chemistry | Chemistry | FuseSchool

Image Source

CCO: Petroleum: <https://www.publicdomainpictures.net/en/view-image.php?image=246456&picture=oil-drill-rig-petroleum-fuel>

Fractional distillation: OC:saisanjay@saibrains.com

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Main Script	Coal and Petroleum	Petroleum (refinement of petrol) Petroleum (refinement of petrol)

12. QA_A king of liquid

[Notes to the teacher - Teacher may enable the students to think and come out with as many answers as possible before giving out the right answer/ answers]

1. Where did the word petroleum come from?

Suggested Answer: The word 'petroleum', is coined from two Latin words 'Petra' which means rock and 'oleum' which means oil. Petroleum is one of the world's most important substances, for it is a rich source of valuable chemicals. The rock in which petroleum is found lies deep underground.

2. How can we extract petroleum?

Suggested Answer: The 'Crude', as people in the oil industry call petroleum, is reached by drilling beneath the Earth's surface.

3. Petroleum is called as black gold. But why?

Suggested Answer: Petroleum is called by names such as 'black gold' and 'liquid sunlight'. It is called black gold because crude oil is usually black in colour and at the same time, it is valuable like gold and is difficult to find. Sometimes it is also called 'liquid sunshine'.

4. What were the uses of petroleum in ancient times?

Suggested Answer: People have known about petroleum from ancient times. They collected it when it bubbled to the surface in the form of pitch or tar, or seeped into wells. Petroleum was used by different civilisations in many ways. It is believed that Noah used ~~oil~~ tar pitch to make his ark seaworthy when the great flood threatened to destroy mankind. The Egyptians coated mummies, and sealed their mighty pyramids with coal tar pitch. The Babylonians, Assyrians, and Persians used it to pave their streets, and hold their walls and building together. Boats along the Euphrates were constructed with woven reeds and sealed with pitch. The Chinese used petroleum for heating.

5. How do we know that American Indians used petroleum?

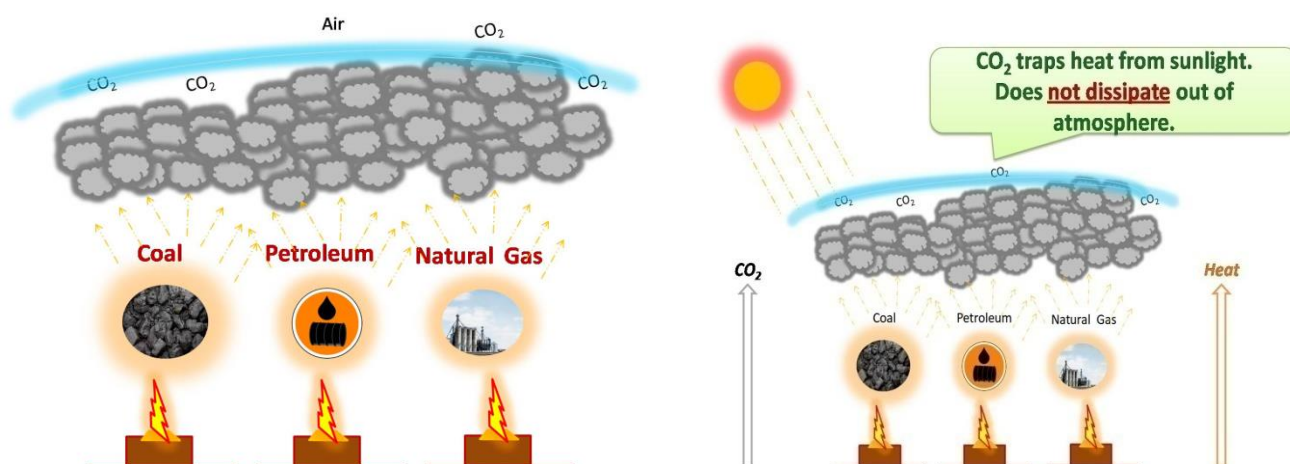
Suggested Answer: American Indians employed the black liquid that oozed from beneath rocks and accumulated on the surface of creeks and springs, as medicine for themselves, and their animals. They believed that this oil toned up their muscles, and made them active and quick word of this amazing stuff spread to the early explorers who arrived in America. The colonists who settled in the eastern part of the continent also began to use the oil to a certain extent. It was supposed to be a wonderful cure all, and was rubbed on the body externally to cure rheumatism, and also taken internally as a medicine.

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Question to assess	Coal and Petroleum	Petroleum (refinement of petrol) Petroleum (refinement of petrol)

13. DD_Fossil Fuels and Global Warming

Coal, petroleum and natural gas are the three different forms of fossil fuels that are widely used. Statistics show that almost three-fourth of the demands of the energy in the world is fulfilled by fossil fuels.

Burning fossil fuels releases a large amount of carbon dioxide into the air. The presence of high levels of carbon dioxide results in increased heat in the atmosphere. This is because carbon dioxide traps heat obtained from sunlight and does not let it disappear out of the atmosphere.



When there is a significant rise in the percentage of carbon dioxide in the air, the amount of heat captured by the carbon dioxide gas also increases. This in turn leads to overall rise in the surface temperature of the earth which is also known as global warming.

As temperatures rise, it is expected that glaciers and polar caps will continue to melt, making the sea level rise. Low-lying Pacific nations may be entirely flooded under the ocean. Coastal cities and coastlines would not be suitable for living because of the sea level. Polar caps play an important role in regulating the temperature by reflecting the sunlight. If our polar caps keep melting, it would add more heat to our oceans and land instead of helping regulate it. Due to the rising temperature of our oceans, plants and animals which aren't heat tolerant would die.



Image source:

<https://pixabay.com/en/coal-cabbage-burned-fuel-black-842468/>

<https://pixabay.com/en/oil-environmental-spills-issues-310841/>

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Time to teach	Asset Type	Theme	SubTheme
3 Minutes	Day-to-day Relevance	Natural resources	Green house effect, Green house effect

14. DD_Coal and petroleum in our lives

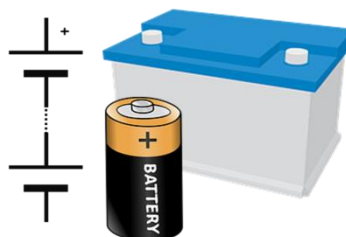
- Coal is primarily used as a solid fuel to produce electricity and heat through combustion.



- Coke is a solid carbon residue taken from low-ash bituminous coal. Coke is used as a fuel and as a reducing agent in extracting iron ore.



- Graphite, another form of carbon is used in manufacturing of carbon electrodes needed in dry cell batteries



- Graphite crucibles are used for melting aluminium, brass, gold and other non-ferrous metals.
- In an atomic reactor, bricks of graphite are used to reduce the speed of fast moving neutrons.
- Graphite is used in the manufacturing of lead used in pencils.



- Though all the non-metals are insulators, graphite is the only non-metal which can conduct electricity and so used extensively as electrodes.
- A simple carbon atom can be changed into diamond which has a crystalline lattice structure with high light dispersion and refraction properties. Diamonds are therefore used in jewellery as gemstones.



- Diamonds are used as abrasives.
- Petroleum fractions viz. natural gas, petrol, diesel, etc., are used as fuel.
- Kerosene is used in generating energy for household purposes.



- Paraffin wax, lubricating oil are used in greasing.
- White petroleum jelly is widely used in skin care products.



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Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Day-to-day Relevance	Coal and Petroleum	Judicious ways of using coal Judicious ways of using coal

15. SA_Solar Cooker

Aim:- To make a solar cooker.

Materials required:

Empty cardboard box	4	235 mm x 235 mm x 140mm	
Aluminium foil	4		
Thermocol sheet	8	i) one should be 230 mm x 230 mm x 30 mm 1 inch thick ii) Other with dimensions mentioned below	
Plastic sheet or glass	4	230mm x 230 mm x 4 mm	
Glue and tape	4		
Black paper	4	230 mm x 230 mm x 30 mm	

Setting for the Activity: - Outdoor / Indoor

Type of Experiment: - Group activity/ 4 groups

Procedure:-

1. Take an empty carton box.
2. Glue the black paper to one of the thermocol sheets (230 mm x 230 mm x 30 mm 1 inch). This is going to be the base of the cooker.
3. Apply glue on the base of the box and put the thermocol with black paper into it.
4. Cut the other thermocol sheet into 4 pieces. Two of 200mm x 110mm and other two of 225 mm x 110 mm each with 1 cm thickness.
5. Apply glue on the thermocol pieces and stick aluminium foil, fold the other side and stick it with a tape, the glazy

part should be outside.

6. Glue all the 4 thermocol pieces with aluminium foil on all 4 sides of the box.

7. Cut the top flaps (covers) keeping one about 2 cm long.

8. Place the glass sheet or the plastic sheet on the top of the box and tape it carefully so as to cover the whole top portion of the box.

9. Now we have to make a reflector. So take another cardboard sheet 470 mm x 235 mm. Glue it with the aluminium foil. Then fold two sides of this reflector.

10. Stick the reflector on top of the box with tape.

11. Now the cooker is ready for use.

12. Keep the cooker in the sun for about 30 minutes and try to cook something in it.

Observation:- It is observed that the food gets cooked when kept in this cooker.

Conclusion:- This experiment shows the working of the solar cooker and we can conclude that solar energy can be used as an alternate source of energy for cooking.

Discussion Questions-

1. Why is black paper stuck on the base of the solar cooker?

Answer: Black paper absorbs direct and reflected heat keeping the cooker warm.

2. Why is Aluminium foil used to make solar cooker?

Answer: Metals reflect light and so Aluminium foil is used.

3. Why is the box wrapped in a plastic sheet?

Answer: Plastic sheet acts as an insulator and does not allow heat to escape.

4. What is a reflector in a solar cooker?

Answer: Reflector is a concave mirror which reflects heat at a single focal point thus increasing the thermal energy.

Instructions to Teacher: (If any – Optional)

1. This is a group activity.

2. Teacher has to divide the class into 4 groups.

3. All the materials required for the activity have to be distributed among each group.

Troubleshooting: (If any – Optional)

1.If the dimensions mentioned in the procedure are not available, then the teacher could use carton boxes of any sizes.

Image source:

SA: <http://www.publicdomainpictures.net/view-image.php?image=56626&picture=cardboard-box-white-background>

SA : <http://www.arvindguptatoys.com/toys/Aluminumfoildoll.html>

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Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Suggested Activity	Sources of Energy	Non-conventional sources of energy, tidal, wave, ocean the thermal, nuclear energy, Non sources of energy (solar energy, tidal, wave, ocean the thermal, nuclear energy

16. IQ_Natural Gas

[Notes to the teacher - Teacher may enable the students to think and come out with as many answers as possible before giving out the right answer/ answers]

1. We see green autos everyday in cities like Delhi etc. But have you ever wondered why they are green and what does CNG mean?



Suggested Answer: They are green in colour because they run on friendly fuel. All these autos use CNG. CNG means Compressed Natural Gas.

2. What makes these CNG powered vehicles different from other vehicles?

Suggested Answer:

- They are less polluting vehicles. CNG has lower carbon content and hence burns cleaner than other vehicles.
- It is safer because the CNG fuel storage tanks are sealed and stronger so a chance of leakage is less.
- Maintenance cost is less.
- It is affordable and cheap.

3. Where else do we see the use of natural gas in our daily lives?

Suggested Answer:

- i. In power generation-Natural gas is used to generate electricity which is then used to light our homes.
- ii. For domestic use-Natural gas is used in cooking and heating.
- iii. Fertilisers-Natural gas is used for the production of ammonia.
- iv. It is used as an industrial fuel - Natural gas is a part of petrochemical, iron and steel and aluminium industries.
- v. It is also exported to other countries to generate foreign currency.
- vi. It is used for manufacturing carbon black. Carbon black is used in the rubber industry as a reinforcing agent (strengthening agent). For example, carbon black is used in tyres and tubes of automobiles as a raw material for manufacturing petrochemicals and fertilisers.

4. What are the advantages of natural gases?

Suggested Answer:

Advantages

- i) Cleanest fossil fuel
- ii) Cheap
- iii) Low levels of harmful emission
- iv) Non -toxic
- v) Easy to transport
- vi) Safer and easier to store

Image Source

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Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Inquisitive Questions	Coal and Petroleum	Natural gas and its uses, Na uses

17. IA_Windmills

- Windmills are generally located near the sea shore because abundant wind and breeze flow from the sea to the land. They are called wind farms.
- Windmills make clean sources of energy and reduce fossil fuel consumption.
- Large blades of windmills are rotated by the blowing wind. They in turn make the turbines work and generate electricity.
- Transformers within the turbines convert electricity into voltages suitable for distribution for commercial uses.
- In India, Tamil Nadu is also the largest producer of wind energy, next to Sweden and Denmark.

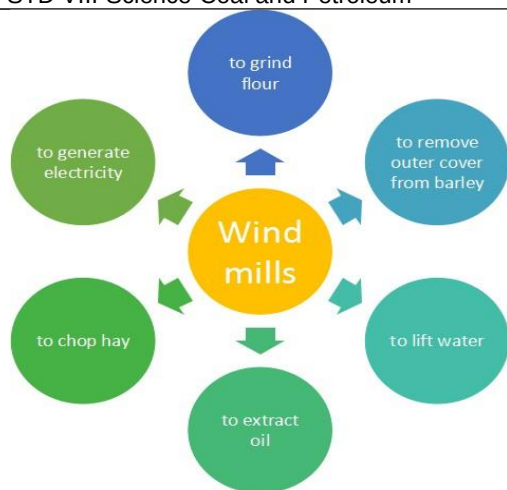


Image Source

Original Contribution: Wind mills: puttyrevankar@gmail.com

<https://www.srisathyaivaividyaahini.org/index.php/component/joomgallery/default/windmills-of-netherlands-5901.html>

<https://www.srisathyaivaividyaahini.org/index.php/component/joomgallery/default/windmills-of-netherlands-5903.html>

https://commons.wikimedia.org/wiki/File:Oxyfuel_CCS_fossil_fuel_power_plant_operation.png – Public domain

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Interesting Asides	Sources of Energy	Improvements in technology sources of energy (biomass, Improvements in technology sources of energy (biomass,

18. QA_Coal and Petroleum - A Recap

I. Multiple choice questions:

I. Choose the correct answer :-

1. Coal that has a high content of carbon _____.
a) lignite b) peat c) bituminous coal d) anthracite coal

Suggested Answer: Anthracite Coal

2. Coal that is used in the household _____.
a) lignite b) peat c) bituminous coal d) anthracite coal

Suggested Answer: bituminous coal

3. Naphthalene ball is obtained from
a) coal gas b) coke c) coal tar d) liquor ammonia

Suggested Answer: coal tar

4. Fuel that is used in jet aircraft
a) petrol b) petroleum gas c) kerosene d) diesel

Suggested Answer: kerosene

5. Which of these is a fossil fuel?
a) wood b) paper c) petroleum d) phosphorus

Suggested Answer: petroleum

6. What happens in carbonization?
a) Carbon is released b) Oxygen is released c) Dead vegetation is converted into coal d) Nature forms carbon

Suggested Answer: Dead vegetation is converted into coal

7. The process of separation of petroleum into its constituents is called _____.
a) sublimation b) filtration c) carbonation d) refining

Suggested Answer: refining

8. A pure form of carbon is used for extracting metals and manufacturing steel.
a) petrol b) coal gas c) coke d) diesel

Suggested Answer: coke

9. The dead aquatic organisms that were buried under the sand and clay of the sea bed get converted into petroleum because of _____.

- a) high pressure b) absence of air c) high temperature d) All of the above

Suggested Answer: All of the above

10. Petroleum product used to make ointments is _____.

- a) diesel b) bitumen c) paraffin wax d) kerosene

Suggested Answer: paraffin wax

11. A fuel that causes less pollution _____.

- a) petrol b) diesel c) CNG d) kerosene

Suggested Answer: CNG

13. The characteristic of coal is _____.

- a) tough b) black in colour c) porous d) all of the above

Suggested Answer: all of the above

14. Petroleum is an _____ natural resource.

- a) inexhaustible b) exhaustible c) both (a) & (b) d) none of these

Suggested Answer: exhaustible

15. Fossils are the _____.

- a) dead remains of living organisms b) coal mines c) kind of natural resource d) living beings

Suggested Answer: Dead remains of living organisms

16. Coal can be formed from _____.

- a) sunlight b) steam c) fossils d) plants

Suggested Answer: Fossils

17. _____ is not a fossil fuel.

- a) natural gas b) petrol c) coal d) uranium

Suggested Answer: uranium

18. Petroleum is a mixture of _____.

- a) petrol b) diesel c) petroleum gas d) all of these

Suggested Answer: all of these

19. Burning of fossil fuel causes _____.

- a) air pollution b) global warming c) both (a) & (b) d) none of these

Suggested Answer: both (a) & (b)

20. _____ are non-renewable resources.
a) wind b) water c) vegetation d) coal and minerals

Suggested Answer: coal and minerals

II. Fill in the blanks with an appropriate answer:

1. The main element that is present in coal is _____.
2. The process of separating individual liquids from the mixture of liquids in petroleum which differ in their boiling point is called _____.
3. Full form of LPG is _____.
4. Petroleum is a mixture of _____.

Suggested Answer:

1. Carbon
2. Fractional distillation
3. Liquefied petroleum gas
4. Hydrocarbons

III. Tick True/False against the following statements:

- (a) Fossil fuels cannot be made in the laboratory.
- (b) Petrol is a more polluting fuel than CNG.
- (c) Coke is not the pure form of carbon.
- (d) Coal tar is made up of petroleum.
- (e) Kerosene is a fossil fuel.

Suggested Answers: (a) True (b) True (c) False (d) False (e) True

IV. Match the following:

Column A	Column B
1. Petroleum	anthracite
2. Coal	fossil fuel
3. Peat	98% carbon
4. Solar energy	roads
5. Coke	27% carbon
6. petrol	less polluting fuel
7. CNG	cars and motor bikes
8. Bitumen	alternative source of energy

Suggested Answers:

Column A	Column B
1. Petroleum	fossil fuel
2. Coal	anthracite
3. Peat	27% carbon
4. Solar energy	alternative source of energy
5. Coke	98% carbon
6. Petrol	cars and motor bikes
7. CNG	less polluting fuel
8. Bitumen	roads

V. Answer the following questions:**1. Where is coal found? Explain in brief about its formation?**

Suggested Answer: Coal is found deep in the earth's crust in coal mines.

Coal is formed by the slow decomposition of dead organic matter such as plants, trees and other vegetable matter which is buried deep under the earth's crust with high pressure and temperature.

2. What do you mean by the term destructive distillation?

Suggested Answer: Destructive distillation is a process of heating coal in the absence of air, to get coke, coal tar and coal gas.

3. List two characteristics of coke and coal tar.

Suggested Answer:

Coke	Coal tar
1. Coke is a porous black substance that contains 98% carbon. 2. It is the purest form of coal.	1. It is a thick black coloured viscous liquid. 2. It has an unpleasant odour.

4. List the uses of any 4 petroleum products.

Suggested Answer: The different uses of petroleum products are:

- (a) Petrol is used in cars and motorbikes as fuel. Kerosene is used as fuel for stoves, lamps and jet air crafts.
- (b) Diesel is used as fuel for heavy motor vehicles, electric generators, etc.
- (c) Paraffin wax is used as ointment, candles.

5. Why is petroleum known as Black Gold?

Suggested Answer: Petroleum when extracted from land, is black in colour. It is called as Black Gold because of its scarcity on earth and also for its value.

6. Write the names of the products obtained by processing of coal.

Suggested Answer: Coke, coal gas, coal tar

7. Give two examples of exhaustible and inexhaustible natural resources.

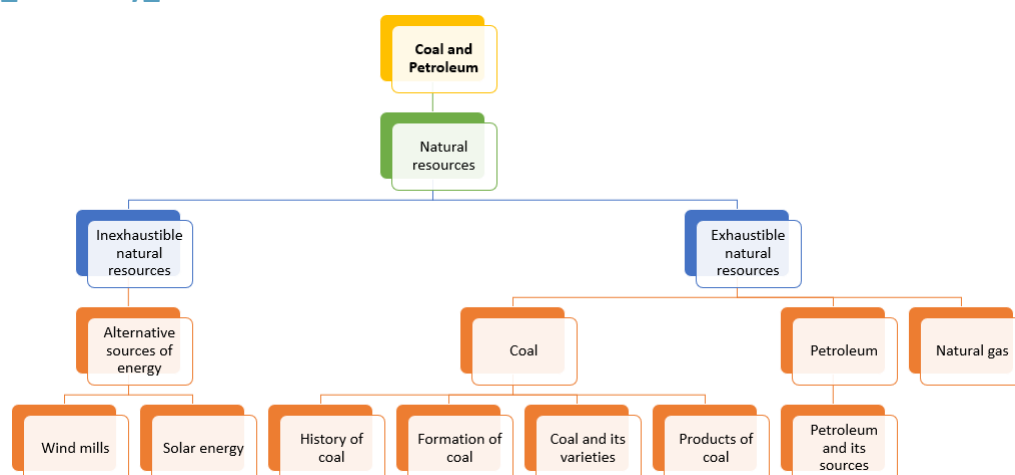
Suggested Answer: Exhaustible:

Coal, petroleum

Inexhaustible: Solar energy, water

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Assessments	Coal and Petroleum	Natural resources (exhaustible, inexhaustible), Natural resources (exhaustible, inexhaustible)

19_MS_Summary_Coal and Petroleum



Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Main Script	Coal and Petroleum	Uses of coal, Properties of coal (coke, coal tar, coal gas), refinement of petroleum), Petrol and their uses, Natural resources (exhaustible, inexhaustible) its uses, Uses of coal, Products of coal (coke, coal gas), Petroleum (refinement of Petroleum products and the resources (exhaustible, inexhaustible) Natural gas and its uses

