TALENT & OLYMPIAD

Coal and Petroleum

💎 Coal

Coal is a fossil fuel formed in ecosystems where plant remains were preserved by water and mud from oxidization and biodegradation, and by which its chemical and physical properties have been changed as a result of geological action over time, thus sequestering atmospheric carbon. Coal is a readily combustible black or brownish-black rock.



It is composed primarily of carbon and hydrogen along with small quantities of other elements, notably sulphur. Coal is extracted from the ground by coal mining, either underground mining or open pit mining (surface mining). It is a nonrenewable resource.

Coal Formation

Coal is a sedimentary rock formed from plants that flourished millions of years ago when tropical swamps covered large areas of the world. Lush vegetation, such as early club mosses, horsetails, and enormous ferns, thrived in these swamps. Generations of this vegetation died and settled to the swamp bottom, and over time the organic material lost oxygen and hydrogen, leaving the material with a high percentage of carbon. Layers of mud and sand accumulated over the decomposed plant matter, compressing and hardening the organic material as the sediments deepened. Over millions of years, deepening sediment layers, known as overburden, exerted tremendous heat and pressure on the underlying plant matter, which eventually became coal.

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Types of Coal

As geological processes apply pressure to dead biotic matter over time, under suitable conditions it is transformed successively into

Peat: It is considered to be a precursor of coal, has industrial importance as a fuel in some regions, for example, Ireland and Finland.

Lignite: It also referred to as brown coal, is the lowest rank of coal and used almost exclusively as fuel for electric power generation. Bituminous: It is dense mineral, black but sometimes dark brown, often with well-defined bands of bright and dull material, used primarily as fuel in steam-electric power generation, with substantial quantities also used for heat and power applications in manufacturing and to make coke. Anthracite: It is the highest rank of coal; a harder, glossy, black coal used primarily for residential and commercial space heating.

Coalmine Fires

Coalmine fires can be triggered during routine mining operations. For example, sparks generated by mining equipment can ignite explosive gases, coal dust, and even the coal bed itself. Because coal beds provide an almost inexhaustible fuel source, once a coal seam is ignited, it can be extremely difficult to extinguish. The

intense heat generated by burning coal can rupture the overlying rock strata, sometimes causing the roof to collapse. Uncontrollable fires in some coal deposits have continued burning for years, posing a danger to local communities.



Petroleum

Petroleum, or crude oil, naturally occurring oily, bituminous liquid composed of various organic chemicals. It is found in large quantities below the surface of Earth and is used as a fuel and as a raw material in the chemical industry. Modern industrial societies use it primarily to achieve a degree of mobility on land, at sea, and in the air—that was barely imaginable less than 100 years ago. In addition, petroleum and its derivatives are used in the manufacture of medicines and fertilizers, foodstuffs, plastics, building materials, paints, and cloth and to generate electricity.



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Composition

The hydrocarbons in crude oil are mostly alkanes, cycloalkanes and various aromatic hydrocarbons while the other organic compounds contain nitrogen, oxygen and sulphur, and trace amounts of metals such as iron, nickel, copper and vanadium. The exact molecular composition varies widely from formation to formation but the proportion of chemical elements vary over fairly narrow limits as follows:

Table: Composition of crude petroleum by weight

Element	Percent range
Carbon	83 to 87%
Hydrogen	10 to 14%
Nytrogen	0.1 to 2%
Oxygen	0.1 to 1.5%
Sulfur	0.5 to 6%
Metals	Less than 1000 ppm

Characteristics

The chemical composition of all petroleum is principally hydrocarbons, although a few sulphur-containing and oxygen-containing compounds are usually present; the sulphur content varies from about 0.1 to 5 percent. Petroleum contains gaseous, liquid, and solid elements. The consistency of petroleum varies from liquid as thin as gasoline to liquid so thick that it will barely pour. Small quantities of gaseous compounds are usually dissolved in the liquid; when larger quantities of these compounds are present, the petroleum deposit is associated with a deposit of natural gas.

Formation

Petroleum is formed under Earth's surface by the decomposition of marine organisms. The remains of tiny organisms that live in the sea—and, to a lesser extent, those of land organisms that are carried down to the sea in rivers and of plants that grow on the ocean bottoms—are enmeshed with the fine sands and silts that settle to the bottom in quiet sea basins. Such deposits, which are rich in organic materials, become the source rocks for the generation of crude oil. The process began many millions of years ago with the development of abundant life, and it continues to this day. The sediments grow thicker and sink into the seafloor under their own weight. As additional deposits pile up, the pressure on the ones below increases several thousand times, and the temperature rises by several hundred degrees. The mud and sand harden into shale and sandstone; carbonate precipitates and skeletal shells harden into limestone; and the remains of the dead organisms are transformed into crude oil and natural gas.

Environmental Effects of Using Petroleum

Adding to the urgency of finding alternatives to petroleum and other fossil fuels is the problem of global warming. Petroleum combustion releases carbon dioxide, a greenhouse gas, into the atmosphere, and most atmospheric scientists believe that rising levels of greenhouse gases are driving climate change.

These changes could cause numerous environmental problems, including disrupted weather patterns and polar ice cap melting. Disrupted weather patterns could lead to extensive drought and desertification. Polar ice cap melting could cause flooding and profound changes in ocean circulation.



Which one of the following types of coal is of higher quality than bituminous coal?

(a) Peat

(b) Lignite

(c) Anthracite(e) None of these

(d) All of these

Answer: (c)



Petroleum mainly consists of:

(a) Carbon

(c) Nitrogen

(e) None of these

(b) Hydrogen (d) Oxygen

Answer: (a)

SUMMARY



- Coal is a fossil fuel which consists mainly of carbon.
- Coal is formed under the surface of earth where temperature and pressure is very high.
- Anthracite is of highest rank of coal.
- Petroleum is a dark coloured, thick crude oil.
- Petroleum is formed under Earth's surface by the decomposition of marine organisms

Self Evaluation



1.	Coal mainly consists of:											
	(a) Carbon	(b) Hydrogen										
	(c) Oxygen	(d) Nitrogen										
	(e) None of these											
2.	When coal is burnt in the air, which one of the following gasses is produced?											
	(a) Carbon dioxide	(b) Hydrogen										
	(c) Oxygen	(d) Nitrogen										
	(e) None of these											
3.	Which one of the following is correct about the coal?											
	(a) Coal is a fossil fuel	(b) Coal was formed from the remains of plants										
	(c) Coal is used to generate electricity	(d) All of these										
	(e) None of these											
4.	Which one of the following material is obtained when coal is strongly heated in the absence of air?											
	(a) Coke	(b) Petroleum										
	(c) Coal tar	(d) Both (a) and (b)										
	(e) Both (a) and (c)											
5.	Coal gas is mainly a mixture of :											
	(a) Ethane and methane	(b) Methane and hydrogen										
	(c) Methane and carbon	(d) Carbon and butane										
	(e) None of these											
6.	Which one of the following is used as reducing agents in the extraction of metals?											
	(a) Coal gas	(b) Coal tar										
	(c) Coke	(d) All of these										
	(e) None of these											

7.	Which one of the following statements is correct? Statement 1: Petroleum is soluble in water										
	Statement 2: Petroleum is a complex mixture of compounds of hydrocarbons										
	(a) Statement 1	(b) Statement 2									
	(c) Both statements are correct	(d) Both statements are incorrect									
8.	Which one of the following is obtained by the refining of petroleum?										
	(a) Petrol	(b) Kerosine									
	(c) Diesel	(d) All of these									
	(e) None of these										
9.	Which one of the following fractions obtained by the refining of petroleum is used to make candle?										
	(a) Bitumen	(b) Lubricating oil									
	(c) Paraffin wax	(d) Both (b) and (c)									
	(e) None of these										
10.	Which one of the following is not correct about LPG?										
	(a) It burns easily										
	(b) It has high calorific value										
	(c) It produces carbon dioxide gas on burning										
	(d) All of these										
	(e) None of these										

Answers – Self Evaluation Test																		
1.	А	2.	А	3.	D	4.	Е	5.	В	6.	С	7.	В	8.	D	9.	С	10. C