

Oral Gas Exam



**What is the essential
function and weight of air?**



Answer: to support life and combustion and the specific gravity of air is 1.00.



What gases are in the normal air that we breathe and in what percentages?



Oxygen (O₂) **20.93%**

Nitrogen (N₂) **78.10%**

Carbon Dioxide (CO₂) **0.03%**

**Argon and other
rare gases** **0.94%**



**What is meant by the
specific gravity of a gas?**



Answer: the weight of the gas compared to the same volume of air.



**What is considered as
intake air in a mine?**



Answer: Intake air in the mine is air which:

(1) has not passed through the last working place of a split or by the unsealed entrances to abandoned workings

(2) by analysis contains not less than 19.5% oxygen nor more than 0.5% carbon dioxide

(3) does not contain any dangerous quantities of flammable gas or any harmful amounts of poisonous gas or dust



What is considered an unsafe mine atmosphere?



Answer: one which contains a harmful amount of poisonous gas or a dangerous amount of flammable gas, or one which contains less than 19.5% oxygen and more than 0.5% carbon dioxide.



Where are dangerous or injurious atmospheres most likely to be found in mines?



Answer: Dangerous or injurious atmospheres are most likely to be found in unventilated , abandoned areas or idle working places.



What precaution should be observed before a worker is sent into an abandoned or idle place?



Answer: Before a worker is sent into an abandoned or idle place, a certified foreman must check the place for ventilation, roof conditions, and other dangers as required by a pre-shift examination.



What effect does temperature have upon the amount of moisture which can be absorbed by air?



Answer: When the temperature of air increases, the capacity to absorb moisture increases. Therefore, the changes in weather conditions outside the mine do effect conditions in the mine.



What effect does a low outside temperature (below 60° F) have upon the dampness of a mine?



When the temperature of the air outside the mine is cooler than the air inside the mine, (mine air is normally 60 degrees) it will travel in the mine and as it rises in temperature, it will absorb the moisture and dry out the mine.



What effect does a high outside temperature (above 60° F) have upon the dampness of a mine?



Answer: When the temperature of the air outside the mine is warmer than the air inside the mine, (mine air is normally 60 degrees) it will decrease in temperature as it travels in the mine and it will deposit moisture in the mine.



What is meant by the diffusion of gases?



Diffusion of gases means mixing or blending with each other when they come in contact.



**How does the diffusion rate
of gases vary?**



Light gases diffuse (mix or blend) more rapidly with heavy gases than with other light gases.



**Will diffused gases
separate from a mixture
because of their difference
in weight?**



Answer: Gases will not separate or stratify once they have been diffused or mixed.



**Which is easier to remove,
a body of methane or a
body of carbon dioxide?**



A body of methane is easier to remove than a body of carbon dioxide because methane is lighter than carbon dioxide and diffuses more readily.



What element in air is essential for life?



Oxygen



How does the body receive oxygen?



The hemoglobin of the blood carries oxygen to all parts of the body.



What is blackdamp?



An atmosphere in which the oxygen content is less than 16% is called “blackdamp”.



**What is the specific gravity
of oxygen?**



Answer: 1.105



What is the minimum percentage of oxygen that can be present in mine air in active workings?



Answer: 19.5%



Why does the percentage of oxygen decrease while passing through a coal mine?



The percentage of oxygen decreases while passing through a coal mine because it is absorbed by coal, breathed by men, and consumed by oxidation with other materials.



What changes occur to oxygen in an atmosphere confined in the presence of coal?



When oxygen is confined in the presence of coal in an underground mine, part of the oxygen combines with carbon to form carbon dioxide, but the greater part is absorbed by the coal.



How may oxygen be detected?



Oxygen can be detected by use of oxygen detectors and by chemical analysis.



When abandoned mines or abandoned parts of active mines are penetrated, what action shall be taken?



When abandoned mines or abandoned parts of active mines are penetrated, the machinery shall be stopped and tests for oxygen deficiency and explosive gases shall be made by a person qualified to use the approved instruments.



What instrument can be used to detect for low oxygen deficiency?



Oxygen can be detected by use of oxygen detectors and by chemical analysis.



What is methane (CH₄)?



Methane (CH₄) is a potentially explosive gas that is naturally formed from the decay of matter and it is frequently encountered in coal mining operations.



What is the composition of methane (CH₄)?



**Methane is made up
of carbon and
hydrogen (CH₄)**



**What is the specific gravity
of methane (CH₄)?**



Answer: .555



What is the source of methane (CH_4) in coal mines?



Methane is liberated from coal and adjoining roof and floor strata.



**In what areas of
underground mines is
methane usually found?**



Methane is usually found along the roof, in high places, in the vicinity of working faces, in dead ends above falls, in sealed areas, and abandoned workings.



**Why is methane not
explosive by itself?**



Methane is not explosive by itself because it does not contain oxygen which is required to support combustion.



What is the explosive range of methane?



The explosive range of methane is between 5% and 15%. However, the explosive range of methane may be lower than 5% when coal dust is in suspension.



Why can there be no explosion when the percentage of methane is greater than 15?



There can be no explosion when the percentage of methane is greater than 15%, because the amount of oxygen present is insufficient for rapid combustion to occur.



What is the percentage of methane required for maximum explosive force?



Answer: 10%



**What is the approximate
ignition temperature of
methane?**



Answer: 1200°F.



What is fire damp?



“Fire damp” is an explosive mixture of methane and air.



What is the percentage of oxygen below which no explosion of a methane-air mixture can occur?



Answer: 12%



What effect does the presence of methane have upon the explosibility of coal dust?



Coal dust is more easily ignited in the presence of methane and the force of the explosion is greater.



What effect does coal dust in the air have upon the range of explosibility of methane?



Coal dust in suspension lowers the explosive limit of methane. In other words, it is possible to have an explosion with less than 5% methane if coal dust is present in the air.



How can methane be detected?



Methane can be detected by use of methane detectors and testers, a flame safety lamp, or by chemical analysis.



What dangerous gas is most likely to be encountered above a pillar fall?



Answer: Methane



What is the maximum allowable concentration of methane at a surface mine area?



Answer: 1.0%



**What is carbon dioxide
(CO₂)?**



Carbon dioxide (CO₂) is a colorless, odorless gas formed by the chemical combination of carbon and oxygen.



**What is the specific gravity
of carbon dioxide (CO₂)?**



Answer: 1.529



**Is carbon dioxide (CO₂)
explosive?**



Answer: No



**What is carbon monoxide
(CO)?**



Carbon monoxide (CO) is a colorless, odorless, tasteless, combustible, and poisonous gas.



What effect does carbon monoxide (CO) have on life?



Carbon monoxide is an extremely poisonous gas.



What is the source of carbon monoxide (CO)?



Carbon monoxide is the product of incomplete combustion (combustion with an insufficiency of oxygen).



**How can carbon
monoxide be detected?**



Carbon monoxide can be detected by carbon monoxide detectors and by chemical analysis.



**When can carbon
monoxide most likely to
be found in underground
mines?**



Carbon monoxide will most likely be found in coal mines when there is a mine fire or after an explosion, or when it is produced in smaller quantities by diesel emissions.



**What else can produce
carbon monoxide?**



Internal combustion engines



**What is the principal
poisonous gas produced
by explosives?**



Carbon monoxide



**How does carbon
monoxide cause injury to
life?**



Carbon monoxide causes injury to life by combining with the hemoglobin of the blood and excluding oxygen.



**How are persons affected
by breathing CO?**



When breathed, carbon monoxide reduces the capacity of the blood to carry sufficient oxygen. Symptoms include drowsiness, headache, imbalance, mental confusion, and burning eyes.



What is the maximum amount of CO that can be present in the mine atmosphere of “active workings”?



Answer: .005% (50 ppm)



**Why is carbon monoxide
poisonous?**



**Carbon monoxide is
poisonous because the blood
absorbs carbon monoxide
300 times more readily than
it does oxygen.**



**Why are small quantities
of carbon monoxide
injurious?**



Small quantities of carbon monoxide are injurious because it accumulates in the blood.



What is the specific gravity of carbon monoxide ?



Answer: 0.967



What percentage of saturation of the blood from carbon monoxide is necessary to cause death?



Answer: 60% -70%



**Is carbon monoxide
explosive?**



**Yes, carbon monoxide is
explosive over a wide
range.**



**What is the range of
explosibility of carbon
monoxide?**



Answer: 12.5% -74%



What is the most dangerous feature of carbon monoxide?



Its poisonous character.



What is hydrogen sulfide?



Hydrogen sulfide is a poisonous, combustible, colorless gas having a sweetish taste and an odor like rotten eggs.



What is the specific gravity of hydrogen sulfide?



Answer: 1.191



What mine gas can be detected by its odor?



Answer: Hydrogen Sulfide



**Is hydrogen sulfide
poisonous?**



**Answer: Yes, it is
extremely poisonous even
in small amounts.**



**What is nitrogen dioxide
(NO₂)?**



Nitrogen dioxide (NO_2) is an extremely poisonous gas frequently formed by the burning of high explosives and in small amounts by diesel equipment.



What amount of nitrogen dioxide (NO_2) will be fatal?



**Extremely low concentrations,
approximately 0.01% (100ppm)
will be fatal.**



**What are the first effects
of nitrogen dioxide (NO₂)
on a person?**



Nitrogen dioxide is extremely irritating to the nostrils and eyes and relatively small quantities may cause death even after apparent recovery.



**What is sulfur dioxide
(SO₂)?**



Sulfur dioxide (SO₂) is a colorless, suffocating, irritating, and poisonous gas.



What is the specific gravity of sulfur dioxide (SO₂)?



Answer: 2.263



**Is sulfur dioxide (SO_2)
combustible?**



**Answer: No, it will not
burn or explode.**



What is hydrogen (H₂)?



Hydrogen (H₂) is a colorless, odorless, tasteless gas that is formed by mine fires , explosions, and by charging batteries.



**How is hydrogen (H_2)
formed in a mine?**



Hydrogen (H₂) is formed by mine fires, explosions, and by charging batteries.



**Is hydrogen (H_2)
explosive?**



Hydrogen is explosive over a wide range which is 4.1% to 74%.



What is the most important condition affecting the humidity of air?



The most important condition affecting the humidity of air is temperature.



What is humidity?



Humidity is the degree to which the air is saturated with moisture.



Which will hold the most moisture, hot or cold air?



Answer: Hot air



Under what provisions can diesel equipment be used underground in the Commonwealth of Kentucky?



Before diesel-powered machinery can be taken into an underground coal mine in the Commonwealth of Kentucky written approval must be obtained from the OMSL.



Where can diesel equipment be used in underground coal mines?



Diesel powered equipment used in an underground coal mine shall be restricted to haulageways and working places where positive (controlled flow) ventilation is maintained.



What quantity of ventilating air must be present where diesel equipment is used in underground coal mines?



In addition to the amount of air required by the Kentucky Mining Law, at least 6,000 cfm of air shall be provided for each diesel unit used in a working section of a mine.



What substance shall not be present in diesel exhaust?



Black smoke



How are gases detected in underground coal mines?



**All gases in coal mines
can be detected by an
appropriate gas detector
or by analysis.**



How is methane gas detected in underground coal mines?



Coal companies use different makes and brands of detectors. Some will detect only one gas and some are multi – detectors. Follow the manufacturer’s recommendation and instruction for use, charging, and calibration of the detector being used at your mine.



**Are flame safety lamps still used
for gas detection?**



Flame safety lamps can be used to detect for the presence of methane and oxygen deficiency, as a “back-up” means only.



If the total volume of an air split in a mine is 60,000 cfm, and the percentage of methane in the split is .75%, how many cubic feet of methane are in the split?



Answer : multiply the total volume of air by the percentage of methane in the split (60,000 times .75% or .0075 = 450cfm)



A mine liberates 500 cfm of methane in a split and has a volume of air equal to 40,000 cfm, what is the percentage of methane being liberated?



Answer : divide the cubic feet of methane by the volume of air (500 / 40,000 = 0.0125 or 1.25%)



A mine liberates 400 cfm of methane, how many cubic feet of air will be required per minute to keep the methane content to 0.50%?



Answer : divide the volume of methane by the percentage of methane (400 cfm / .50% = 400 / .0050 = 80,000 cfm)



End of Unit 3