

AMERICAN LANGUAGE COURSE

UNIT 2404

OUTLINE AND STUDY OBJECTIVES

READING: THE AIR AROUND US

QUESTIONS ON THE READING

PROVERBS AND WISE SAYINGS

TAPE 2404A

TAPE 2404B

UNIT 2404

READING

THE AIR AROUND US

The instructor will read or rephrase the following paragraphs. Books closed. The student may take notes or simply listen to the instructor as he reads or speaks. The student should be prepared to answer questions on the material. The instructor may use questions other than those appearing in the exercise.

Knowledge of the behavior of the ocean was necessary for safe traveling on its surface. Man had to learn the effects of ocean currents. He needed to know the behavior of the ocean during periods of storm and calm. We have gone forward from traveling on an ocean of water to flying through an ocean of air. This ocean of air is called the atmosphere.

QUESTIONS ON THE READING

1. What did man have to learn for safe traveling on the ocean?
2. Who had to learn the effects of ocean currents?
3. Why did he have to learn this?
4. If we travel on an "ocean of water," what do we fly through?
5. What is another name for this ocean of air?

The atmosphere is actually part of the earth. It rotates with the earth in space and can be considered a gaseous outer cover of the earth. The size relationship between the earth and the earth's atmosphere is comparable to a baseball and its cover. In addition to rotating with the earth, the atmosphere is in continuous motion, separate from its motion of rotation with the earth. This continuous motion of the atmosphere is caused by temperature variations; hot over the equator, cold over the poles.

1. What is part of the earth?
2. What rotates with the earth?
3. Is the atmosphere a gaseous outer cover of the earth?
4. What is the atmosphere compared to?
5. The earth and its atmosphere is comparable to a baseball and its cover. Can you think of other objects that could be used for a comparison?
6. The atmosphere rotates with the earth. Does it have another motion?

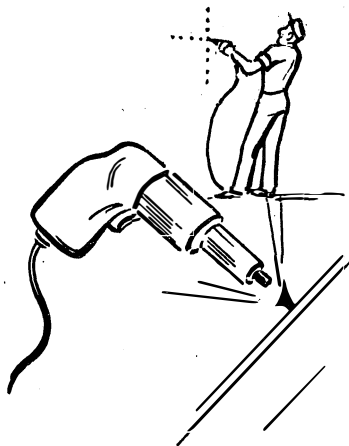
7. What causes this motion?
8. Discuss temperature regions on the earth.

Air, an invisible gas, can be changed to a liquid. It becomes a liquid when it is sufficiently compressed, squeezed together, and cooled. In liquid form, you can pour it from one container (a glass, for example) into another.

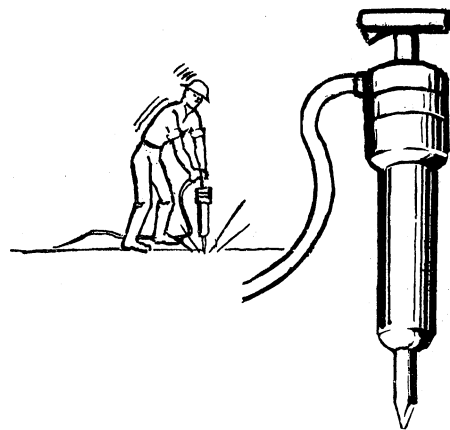
1. Is the air a gas or a liquid?
2. What can air be changed to?
3. How can we change air from a gas to a liquid?
4. What are the two forms of air?

Air under pressure is used in automobile and truck tires to absorb shock. It can be used in devices to drive rivets, tighten and loosen nuts, and break holes in concrete. *Moving air* (air in motion) drives windmills and boats on lakes and oceans. On the quietest days, air is strong enough to support an airplane in flight. Moving as a *tornado* (a whirling wind), it can wreck buildings.

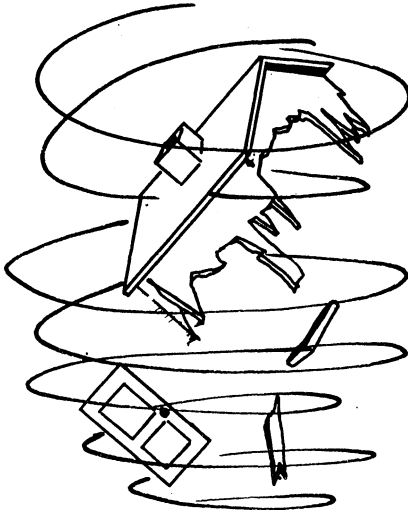
1. Why do we put air in automobile and truck tires?
2. What do we use air under pressure for?
3. What are some other uses of compressed air?
4. Can a tire pump be used to compress air?
5. Name some devices that use the energy of air in motion to do work.



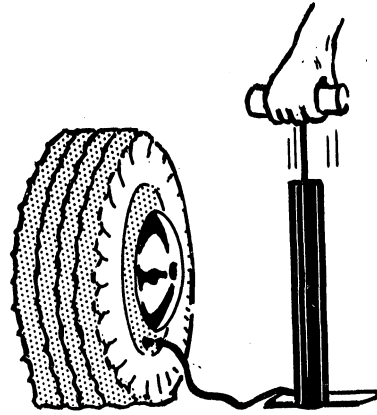
RIVET HAMMER



PNEUMATIC HAMMER



WHIRLWIND



TIRE PUMP

Like other gases, air flows and takes the shape of its container just as liquids do. Air is a mixture of about 80% nitrogen and 20% oxygen. Oxygen, you will remember, is an element man must have in order to live. Small amounts of other gases are present in the air. Water vapor and dust particles are also present and are found as high as 30,000 and 40,000 feet.

1. What is the shape of the air in a square box?
2. What shape does coffee take in a coffee cup?
3. What does air mainly consist of?
4. Does air consist of oxygen and nitrogen only?
5. Is water vapor in the air a gas or a liquid?
6. What element in the air must man have in order to survive?
7. Are dust particles found only in the lower atmosphere?
8. Do you change the shape of the air inside a toy balloon if you squeeze or bend the balloon?

The atmosphere extends upward about 500 miles. Particles of air at sea level are close together. In other words, the air is *dense* (has weight). The higher we go, the farther apart the particles are and the air is lighter. Normally you have no difficulty breathing and you do not feel the effects of atmospheric pressure. On a high mountain, you would have difficulty breathing. In a high altitude aircraft, air has such little density that you need a pressurized cabin or a pressure suit in order to survive.

1. How far does the atmosphere extend upward?
2. Does air have the same density throughout the atmosphere?

3. Where would you experience difficulty breathing?
4. Where would your body feel the effects of low air pressure?
5. Where is air least dense?
6. Where is air more dense?
7. What would you need in order to survive at a very high altitude?

A fish under water is under pressure of the weight of water and air above. In a similar manner, man is under pressure of the air layers above him. The air pressure at the surface of earth is 14.7 pounds *per square inch* (psi).

1. Does pressure increase or decrease when you go deeper into the water?
2. What does psi stand for?
3. Can we compare a man and a fish as far as pressure is concerned?

Here are some summary statements about the composition and behavior of the atmosphere.

Air is composed primarily of oxygen and nitrogen.

It flows and changes shape under pressure.

Under pressure, air is used to do work.

Pressure exerted by air is the same in all directions.

The closer air is to the earth, the greater its density.

When you speak of air as the entire air layer, you call it the atmosphere.

VACUUM

The air in the atmosphere occupies space. Although its 14.7 psi cannot consciously be felt, we do feel a force when the wind is blowing. Deprive a man of his atmosphere and he dies like a fish lifted from the water. For all practical purposes, we can say that there is nothing but empty space above the atmosphere. An empty space without air is called a vacuum. A man above the atmosphere would die violently from his own internal pressures. Man cannot exist in a vacuum.

You can create a partial vacuum by doing many simple experiments. Boys sometimes put a glass over their mouths, making it an airtight container. They then inhale, emptying part of the air out of the glass. If you have ever done this, you have undoubtedly felt the extreme lack of air pressure around your lips. Can you imagine what the effect must be on an unprotected body 50 miles above the surface of the earth?

In a straw that you use for drinking and in the pump, you create a partial vacuum.

1. Does atmosphere occupy space?
2. Does the atmosphere exert pressure on our bodies?
3. When do we feel air pressure?
4. What is above the atmosphere?
5. Is there anything in a vacuum?
6. Can man exist in a vacuum?
7. How can you create a partial vacuum?



VACUUM CLEANER

Many machines use a partial vacuum for operational purposes. A mechanic may talk about a pressure differential. He means that one part of a system has less pressure than another part. In essence, the part that has less pressure has a partial vacuum in relation to the part with pressure. If a pressure differential exists in two connected chambers, the air will try to move to the chamber that has the partial vacuum. The carburetor of a car works on this principle. Because of the pressure differential, air is sucked into the chamber where it mixes with the fuel.

1. How does air react when a pressure differential occurs?
2. What happens in a carburetor?
3. Can you think of other machines that use a partial vacuum or suction for their operation?

PROVERBS AND WISE SAYINGS

Students read and discuss literal and/or figurative meanings of the following.

1. Constant dripping wears away stone.
2. All that glitters is not gold.
3. Experience is the best teacher.
4. Practice makes perfect.

TAPE 2404A

Listen.

Air is an invisible gas. It can be changed to a liquid. When it is sufficiently compressed and cooled, air changes to a liquid. In liquid form, you can pour air from one container into another. Liquid air has about the same density as water.

Listen and repeat.

invisible gas	*	invisible gas	*
Air is an invisible gas.			*
to a liquid	*	to a liquid	*
It can be changed to a liquid.			*
when it is sufficiently compressed and cooled			*
when it is sufficiently compressed and cooled			*
Air changes to a liquid when it is sufficiently compressed and cooled.			*
about the same density as water			*
about the same density as water			*
Liquid air has about the same density as water.			*

Listen.

You will hear some statements followed by questions. Do not repeat the sentences after the speaker, but answer the questions when you hear **. Give short and complete answers.

Air is an invisible gas. It can be changed to a liquid.	
What is air?	**
an invisible gas	*
Air is an invisible gas.	*
What can it be changed to?	**
to a liquid	*
It can be changed to a liquid.	*
Air changes to a liquid when it is sufficiently compressed and cooled.	
Liquid air has about the same density as water.	
When does air change to a liquid?	**
when it is sufficiently compressed and cooled	*
Air changes to a liquid when it is sufficiently compressed and cooled.	*
What is the density of liquid air?	**
about the same as water	*
The density of liquid air is about the same as water.	*

 Listen.

Air under pressure is powerful enough to cushion truck tires. It is, in other words, used to form a cushion for truck tires because it is capable of supporting several thousand pounds. Air under pressure is also used in devices to drive rivets, tighten and loosen nuts, and drill holes in concrete. A device that is used to compress air is called an air compressor.

Listen and repeat when you hear *. Answer the questions when you hear **. Do not repeat the questions but answer them.

to compress air	*	to compress air	*
an air compressor	*	an air compressor	*
An air compressor is used to compress air.			*

What is an air compressor used for?		**
to compress air		*
An air compressor is used to compress air.		*

What is used to compress air?		**
an air compressor		*

to drive rivets	*	to drive rivets	*
air under pressure	*	air under pressure	*
Air under pressure can drive rivets.			*

What is air under pressure used for?		**
to drive rivets		*
Air under pressure is used to drive rivets.		*

to tighten and loosen nuts	*	to tighten and loosen nuts	*
it is also used	*	it is also used	*
It is also used to tighten and loosen nuts.			

What else is air under pressure used for?		**
to tighten and loosen nuts		*
It is also used to tighten and loosen nuts.		*

What is capable of tightening and loosening nuts?		**
air under pressure		*
Air under pressure is capable of tightening and loosening nuts.		*

for truck tires	*	for truck tires	*
air forms a cushion	*	air forms a cushion	*
Air forms a cushion for truck tires.			*

What does air form?		**
a cushion		*
Air forms a cushion for truck tires.		*

Under pressure, air can support several thousand pounds. *

In liquid form, you can pour it from one container into another. *

Moving as a tornado, air can wreck buildings. *

It is strong enough to support an airplane in flight. *

We put air in our tires to form a cushion. *

We ride on a soft flexible cushion of air. *

We cannot see air. *

In other words, it is invisible. *

Air can be compressed. *

That is, it can be squeezed together. *

Liquid air is dense. *

This means the parts are crowded together. *

A cushion is made of soft elastic materials. *

It is used to absorb shock. *

A rivet is a pin or bolt of metal. *

It is used to unite pieces of metal. *

To rivet means to fasten or unite with rivets. *

Listen.

Let's practice the pronunciation of some key words and phrases.

Listen and repeat.

sufficient	*	sufficient	*
sufficiently	*	sufficiently	*
sufficiently compressed	*	sufficiently compressed	*
container	*	container	*
a metal container	*	a metal container	*
a glass container	*	a glass container	*
visible	*	visible	*
invisible	*	invisible	*
visibility	*	visibility	*
pressure	*	pressure	*
air under pressure	*	air under pressure	*

TAPE 2404B

Let's learn some expressions relating to the earth's atmosphere.

1. the highest layer * the highest layer *
 the highest layer of air * the highest layer of air *
 The highest layer of air above the earth's surface is the ionosphere. *
 Is the ionosphere the highest or the lowest layer of air above the earth's surface? **
 the highest layer *
 The ionosphere is the highest layer of air above the earth's surface. *

2. nearest the surface * nearest the surface *
 nearest the surface of the earth *
 The troposphere is the layer of the atmosphere that rests nearest the surface of the earth. *
 Is the troposphere the layer of the atmosphere that rests the nearest or the farthest from
 the surface of the earth? **
 the nearest *
 The troposphere is the layer of the atmosphere that rests nearest the surface of the earth. *

3. thicker than * thicker than *
 thicker above the equator * thicker above the equator *
 The troposphere is thicker above the equator than it is above the north or south poles. *
 Is the troposphere thicker or thinner above the equator than it is above the north or
 south poles? **
 The troposphere is thicker above the equator than it is above the north or south poles. *

4. greater in the summer * greater in the summer *
 less in the winter * less in the winter *
 The height of the troposphere is greater in the summer and less in the winter in the
 temperate zones. *
 Is the height of the troposphere greater or less in the summer in the temperate zones? **
 greater in the summer *
 The height of the troposphere is greater in the summer in the temperate zones. *

5. the upper stratosphere * the upper stratosphere *
 The upper stratosphere is characterized by an increase in temperature with altitude. *
 Is the upper or lower stratosphere characterized by an increase in temperature with
 altitude? **
 the upper stratosphere *
 The upper stratosphere is characterized by an increase in temperature with altitude. *

6. coldest * coldest *
 coldest temperatures * coldest temperatures *
 The coldest temperatures in the troposphere occur in polar regions. *
 Do the coldest or hottest temperatures in the troposphere occur in polar regions? **
 the coldest temperatures *
 The coldest temperatures in the troposphere occur in polar regions. *

7. faster than * faster than *
 higher than * higher than *
 Jets fly faster and higher than conventional aircraft. *
 Do jets fly slower and lower or faster and higher than conventional aircraft? **
 faster and higher *
 Jets fly faster and higher than conventional aircraft. *
8. slower than * *
 lower than * *
 Helicopters fly slower and lower than conventional aircraft. *
 Do helicopters fly slower and lower or faster and higher than conventional aircraft? **
 slower and lower *
 Helicopters fly slower and lower than conventional aircraft. *
9. more interesting * more interesting *
 Flying jets is more interesting than flying conventional aircraft. *
 Is flying jets less interesting than or more interesting than flying conventional aircraft? **
 more interesting *
 Flying jets is more interesting than flying conventional aircraft. *
10. the least * the least *
 the least experienced * the least experienced *
 the most * the most *
 the most experienced * the most experienced *
 Capt. Pryor is the least experienced officer, and Col. Bodine is the most experienced officer. *
 Is Capt Pryor the least or the most experienced officer? **
 the least experienced *
 Capt. Pryor is the least experienced officer. *
 Is Col. Bodine the most or the least experienced officer? **
 the most experienced *
 Col. Bodine is the most experienced officer. *
11. bigger and bigger * bigger and bigger *
 closer and closer * closer and closer *
 As the boat comes closer and closer to the shore, the waves become bigger and bigger. *
 What happens as the boat comes closer and closer to the shore? **
 The waves become bigger and bigger. *
 As the boat comes closer and closer to the shore, the waves become bigger and bigger. *
12. same as * same as *
 the same density as * the same density as *
 The density of liquid air is about the same as the density of water. *
 Is the density of liquid air different from or the same as water? **
 the same as *
 The density of liquid air is about the same as the density of water. *
13. up and down * up and down *
 back and forth * back and forth *
 Insects were moving up and down and back and forth on the window. *
 How were the insects moving on the window? **
 up and down and back and forth *
 Insects were moving up and down and back and forth on the window. *

14. strong * strong *
- strong enough * strong enough *
- Air is strong enough to support an airplane in flight. *
- Is the air strong enough to support an airplane? **
- Yes, it is. *
- Air is strong enough to support an airplane in flight. *
15. upward * upward *
- extends upward * extends upward *
- The atmosphere extends upward about 500 miles. *
- How high does the atmosphere extend? **
- The atmosphere extends upward about 500 miles. *
16. higher * higher *
- the higher we go * the higher we go *
- farther * farther *
- the farther apart * the farther apart *
- The higher we go in the atmosphere, the farther apart the particles are from each other. *
- Are the particles farther apart or closer together as we go higher and higher? **
- farther apart *
- The particles are farther apart from each other the higher we go in the atmosphere. *
17. closer * closer *
- the closer air is * the closer air is *
- greater * greater *
- The closer air is to the earth, the greater is its density. *
- Is density greater or less when air is closer to the earth? **
- greater *
- Density is greater the closer air is to the earth. *
18. rapidly * rapidly *
- more rapidly * more rapidly *
- more rapidly than * more rapidly than *
- much more rapidly than * much more rapidly than *
- Liquid air will cause a fire to burn much more rapidly than normal. *
- Will liquid air cause fire to burn a little less rapidly or much more rapidly than normal? **
- more rapidly * more rapidly *
- much more rapidly * much more rapidly *
- much more rapidly than * much more rapidly than *
- Liquid air will cause a fire to burn much more rapidly than normal. *
19. more dense * more dense *
- less dense * less dense *
- near * near *
- near the surface * near the surface *
- higher * higher *
- Air is more dense near the surface of the earth, and is less dense the higher we go. *
- Is air less or more dense near the surface of the earth? **
- Air is more dense near the surface of the earth. *
- Is air more or less dense the higher we go? **
- less dense *
- Air is less dense the higher we go. *