

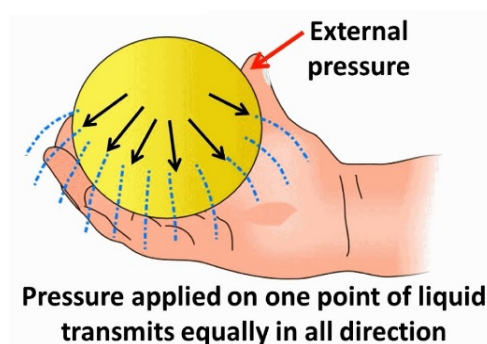
**Science 8**  
**Unit 2: FLUIDS**  
**Topic 8: Pascal's Law and Fluid Systems**



Student Name: \_\_\_\_\_

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**Pascal's Law:** states that pressure applied to an enclosed fluid is transmitted with equal force throughout the entire container.



**Fluid system** is something that makes use of a gas or a liquid to perform tasks. There are two types of fluid systems:

**1) Hydraulics**(high-DRAW-lik): refers to devices that transmit applied force through a liquid to move something else by means of pressure

**Hydraulic systems** refers to devices that transmit applied force through a liquid to move something else.

In many hydraulic systems, pumps and pipes are used to give the force that pushes the liquid. Pumps put the liquid under pressure.

Examples of hydraulic systems are

- dentist's or a hairdresser's chair,
- the Jaws of Life that are used by fire departments,
- dump trucks

**The circulatory system a natural hydraulic system?**

The circulatory system transports blood through the body. The circulatory system is made up of the heart, blood vessels, and blood. The constant beating of the heart (a pump) keeps blood moving through blood vessels (tubes or pipes).

Blood must be kept under pressure so it can reach all parts of the body. Blood pressure increases and decreases between heartbeats. Just after the heart contracts, blood leaves the heart under high pressure. Before the next heart beat, the pressure falls. Then the pressure increases again as soon as the heart contracts again. **Sphygmomanometer** (sfig-mom-an-AW-meet-er) is used to measure blood pressure.

**2) Pneumatic(new-MAT-ik):** is the study of pressure in gases

**Pneumatic systems:** a gas transmits a force exerted on the gas in an enclosed space

Examples of Pneumatic systems:

- jackhammers,
- precision drills used by dentists.
- Air Brakes on large trucks and buses

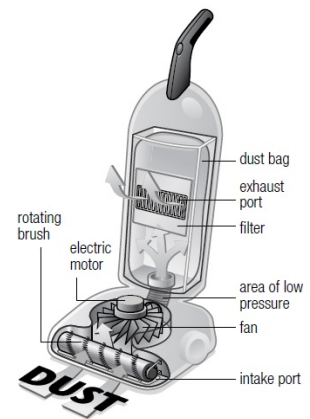
**How is the respiratory system like a pneumatic system?**

The respiratory system is the body system that brings air into the body and removes carbon dioxide from the body. Breathing involves changes in air pressure inside and outside your body.

When you inhale, your chest expands because muscles between your ribs push the ribs apart to make a bigger space. Also, a sheet of muscle in the lower chest, called the diaphragm, moves downward to make a bigger space. The bigger space in your chest makes the air pressure inside your lungs lower. The air outside your body is higher in pressure. So the air rushes into your body and into your lungs. When you exhale, the air pressure inside your lungs gets higher. Air is pushed out of your lungs and out of your body.

**What are some problems with hydraulic and pneumatic systems?**

Hydraulic and pneumatic systems cannot work if they lose pressure. A crack or hole in a closed fluid-filled container (such as a pipe) will let fluid leak out and reduce pressure. Hydraulic and pneumatic systems cannot work if they become blocked. For example, if a vacuum cleaner filter becomes clogged with dust the vacuum will not work well.



**PART A: MULTIPLE CHOICE.**

Instruction: Circle the correct answer below each question. Also, transfer your answers to the bubble sheet provided.

1. A climbing team congratulates you for all of your hard work and scientific knowledge. You let them know that you cannot take all of the credit. You also want them to think the French scientist \_\_\_\_\_ for his pioneering work with pressure.  
  - (A) Pascal Correct
  - (B) Archimedes Incorrect
  - (C) Pasteur
  - (D) Curie
  
2. Blaise Pascal observed that when pressure is applied at one point to a fluid in an enclosed system, that the pressure  
  - (A) Is greater at the point of pressure application.
  - (B) Is lower at the point of pressure application.
  - (C) Is transmitted equally through the entire system.
  - (D) Cannot be changed in the system.

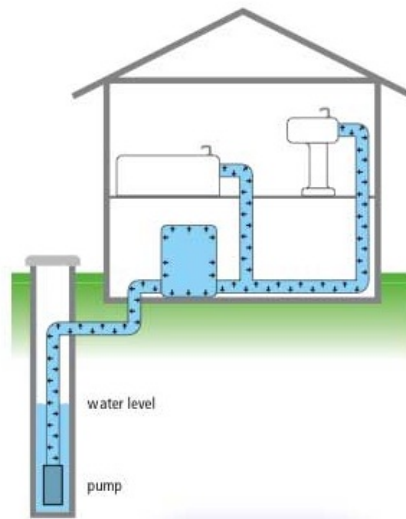
3. Which of the following describes what happens when pressure is applied at one point to a fluid in an enclosed system?
- (A) That pressure is increased at the other end of the system
  - (B) That pressure is decreased at the other end of the system
  - (C) The pressure at the other end of the system does not change
  - (D) You cannot apply pressure to a fluid in an enclosed system

4. Which of the following is true?

	<b>Pneumatic</b>	<b>Hydraulic</b>
(A)	study of pressure in gases	study of pressure in Liquids
(B)	study of pressure in liquids	study of pressure in gases
(C)	study of pressure in gases	study of pressure in solids
(D)	study of pressure in liquids	study of pressure in solids

5. You go on to talk about how water is forced through pipes and hoses to fight a fire. You mention that \_\_\_\_\_ is the study of pressure in liquids.
- (A) Compression
  - (B) Hydraulics
  - (C) Pneumatics
  - (D) Sublimation
6. Which of the following is created when an enclosed fluid is squeezed?
- (A) Buoyancy
  - (B) Convection
  - (C) Pressure
  - (D) Gravity
7. Which of the following refers to systems use pressurized air instead of water.
- (A) Barometric
  - (B) Hydraulic
  - (C) Pneumatic
  - (D) Viscose
8. Why is it bad to have air present in a hydraulic system such as car brakes?
- (A) Air is very effective at transmitting force, so when the brakes are applied, the brakes will operate too quickly.
  - (B) Air is not compressible, so when force is applied, nothing will happen.
  - (C) Air is compressible, so instead of transmitting force to operate the brakes, the force will go into compressing the gas.
  - (D) Air is will cause the hydraulic system to overheat
9. The primary function of a pump is that it is a device used for ...
- (A) Moving fluids
  - (B) Filtering fluids
  - (C) Analyzing fluids
  - (D) Measuring fluids

10. A home plumbing system that relies on well water requires a pump for the system to operate.



Why is the pump necessary?

- (A) The pump cleans the well water so that it is suitable for consumption.  
(B) The pump assists gravity in moving water to all parts of the home.  
(C) The pump moves water against gravity and creates pressure in the system.  
(D) The pump moves water against gravity and reduces pressure in the system.
11. Which of the following are usually important parts of hydraulic systems?
- I Pipes  
II Pumps  
III Compressor
- (A) II only  
(B) III only  
(C) I and II only  
(D) I, II, and III
12. What allows a pump to raise fluids in pipes?
- (A) Area  
(B) Force  
(C) Gravity  
(D) Pressure
13. Which of the following could cause a loss of pressure in a hydraulics system?
- I a crack in a pipe  
II a hole in pipe  
III a blockage in a pipe
- (A) I and II only  
(B) II and III only  
(C) I and III only  
(D) I, II, and III
14. Which of the following has a similar purpose to a pump in a hydraulic system?
- (A) The heart  
(B) The lungs  
(C) The blood  
(D) The diaphragm

**PART B: MATCHING**

Match the Term on the left with the best Descriptor on the right. Each Descriptor may be used only once.

Term	Descriptor
15. _____ hydraulics	
16. _____ pneumatics	A. a system in which an enclosed gas transmits a force, causing motion
17. _____ hydraulic system	B. the study of pressure in liquids
18. _____ pneumatic system	C. a device that transmits an applied force using a liquid under pressure
19. _____ circulatory system	D. the study of pressure in gases
	E. Carries blood under high pressure away from the heart

**PART C: WRITTEN RESPONSE**

1. Define Pascal's law.

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2. Provide an example of a hydraulic system and a pneumatic system.

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3. Why are pumps and valves necessary in hydraulic systems? Explain

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