

## Systems and Controls

System: A set of things working together as part of a mechanism.

Control: Allows for the manipulation of an input or a process.

Force: A push or a pull, which changes how fast an object moves. A force will change the velocity of an object. This means it will start moving if it is still, stop it moving, speed it up, slow it down or changes its direction.

Pressure: The force on an object divided by the area over which the force is spread. Force over a large area would give a low pressure. The same force over a small area would give a high pressure.

### Types of Motion

- Linear: Moving in one direction at a time either in an irregular or straight line.
- Reciprocating: Back and forth/ Up and down repeatedly.
- Oscillating: Back and forth/ Up and down repeatedly in a semi-circular pattern.
- Rotary: Movement in a circular pattern.

Types of systems in this section:

1. Hydraulic
2. Pneumatic
3. Mechanical
4. Electrical/Electronic

### Pneumatic Systems

A Pneumatic system uses compressed air or gas (these are compressible) to produce an output. Pneumatics is often used for different kinds of hand tools and

for machines doing repetitive motion. A jackhammer is a good example of a pneumatic system.

Other examples:

A pneumatic dentist drill.

A pneumatic wrench.

Provide two further examples of pneumatic systems.

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## Hydraulic Systems

Hydraulic systems work on the same principle as pneumatics, but instead of air it uses liquids (liquids are incompressible) such as water or oil to produce an output. Hydraulics deals with the study and use of liquids related to the mechanical aspects of physics. Hydraulics work on the principle of pressurized (not compressed) fluid forcing mechanical action.

Pascals principle states: Pressure exerted on one part of a hydraulic system will be transferred equally, without any loss, in all directions to the other parts of the system. When there is an increase in pressure at any point in a confined liquid, there is an equal increase at every other point in the system.

### Principles of hydraulics:

1. Liquids have no shape of their own.
2. Liquids do not compress.
3. Liquids transmit applied pressure in all directions.
4. Liquids provide great increase in work force.

Common calculations for hydraulic systems:

Force = pressure x area

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

Examples of hydraulic systems:

Hydraulic Jack.

Car braking system.

Provide two further examples of hydraulic systems.

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Parts of a Pneumatic/Hydraulic system

Cylinders: Tubes to suck in the air or liquid.

Pistons: Inside the tube to compress air or to push the liquid through.

One way valve: Stops the air/liquid from flowing out.