Mechanical Interview Questions With Answers (Technical)

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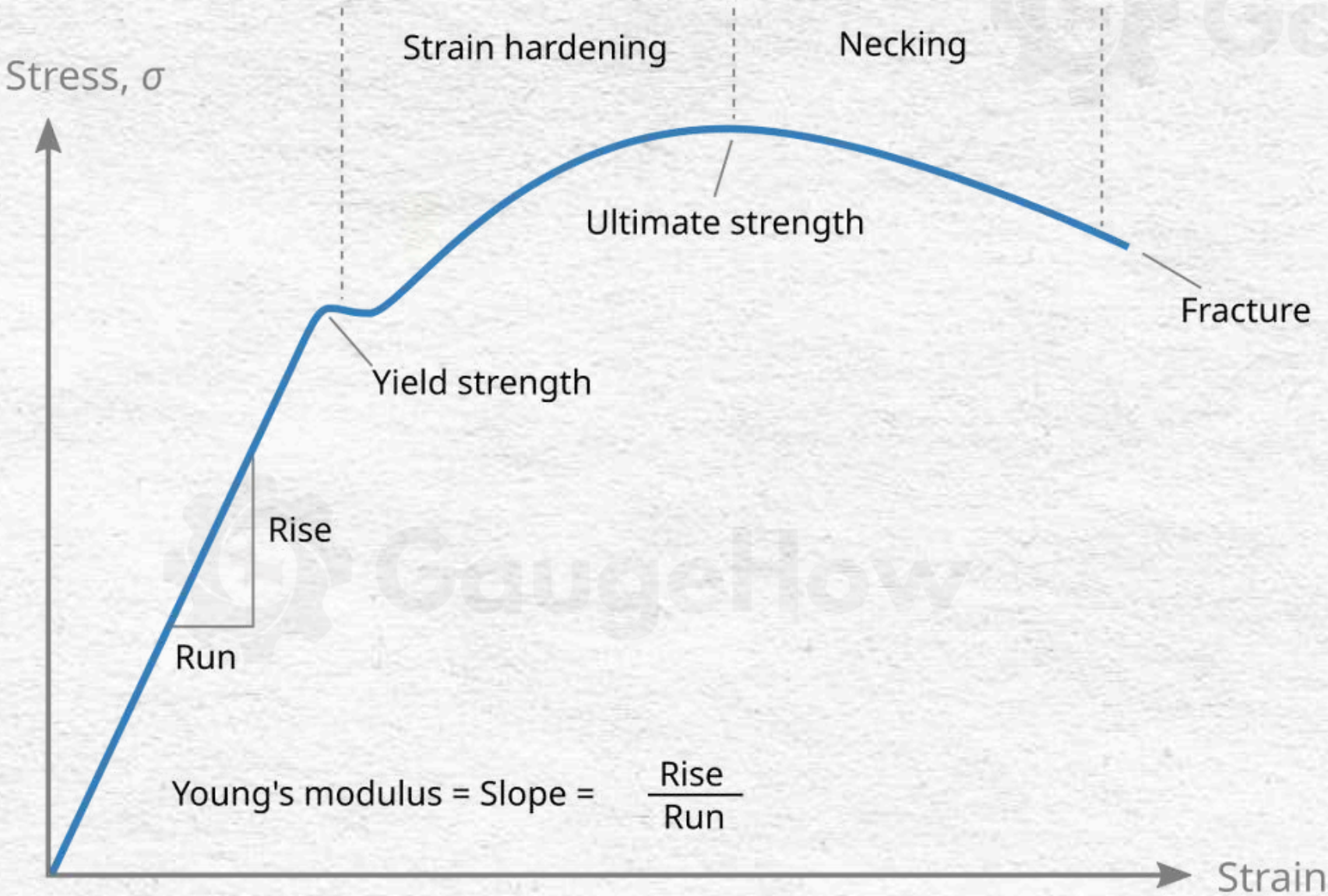
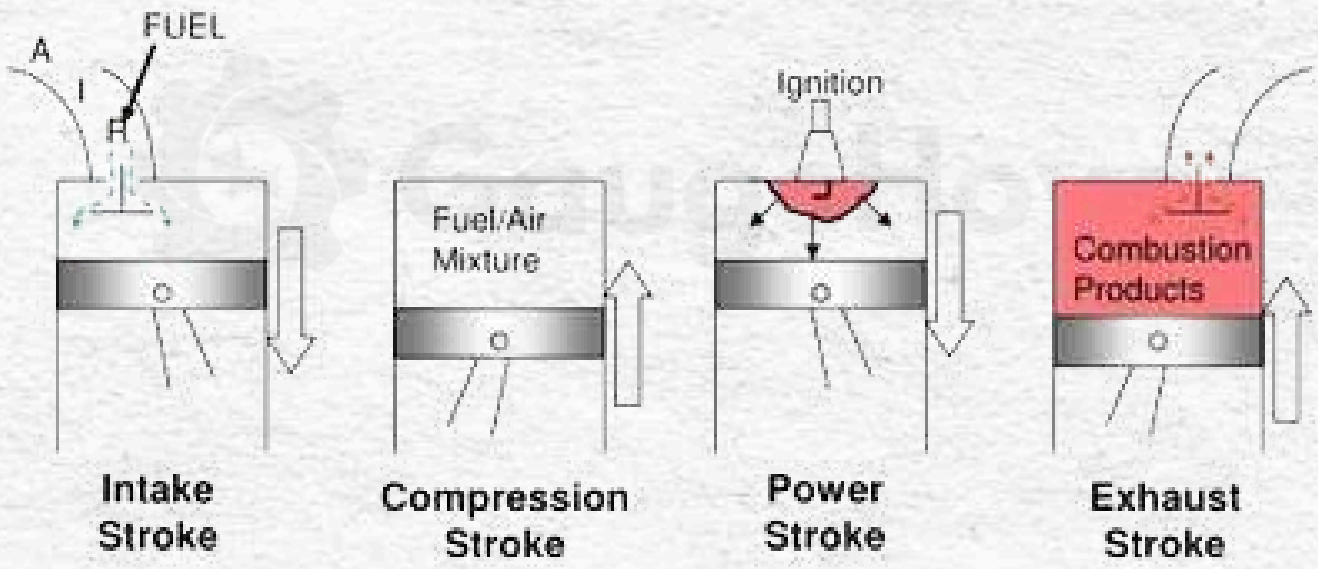


What is the difference between stress and strain?

Stress is the force applied per unit area, while strain is the deformation or change in shape that occurs in a material due to stress. Stress is measured in Pascals (Pa), and strain is dimensionless.

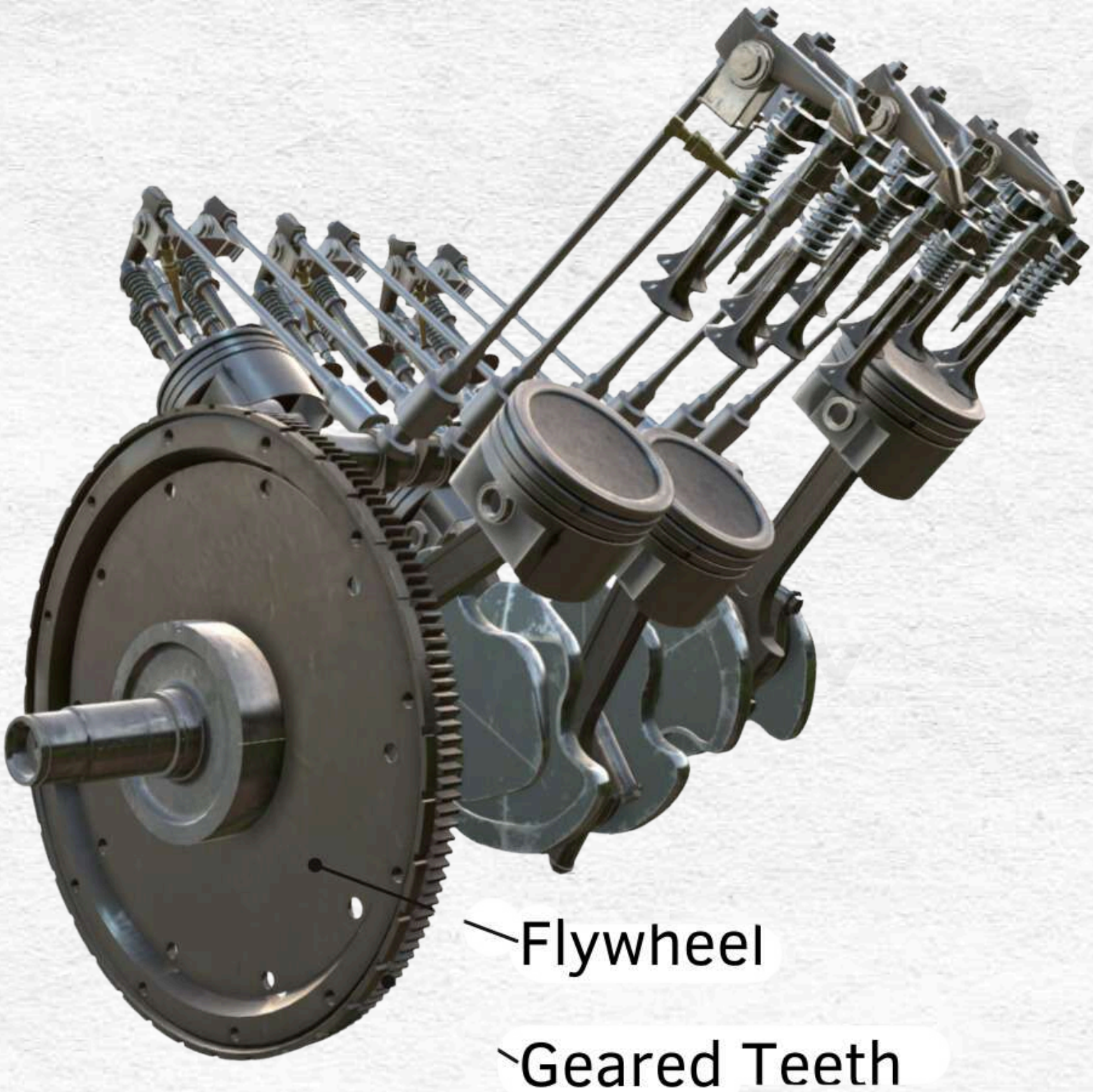
Four Stroke SI Engine

Stroke 1: Fuel-air mixture introduced into cylinder through intake valve
Stroke 2: Fuel-air mixture compressed
Stroke 3: Combustion (~constant volume) occurs and product gases expand doing work
Stroke 4: Product gases pushed out of the cylinder through the exhaust valve



Explain the working principle of a four-stroke engine?

A four-stroke engine goes through four phases: intake, compression, power, and exhaust. During the intake stroke, the fuel-air mixture enters the cylinder; in the compression stroke, the mixture is compressed; the power stroke is when the mixture is ignited, producing power; and the exhaust stroke expels the burnt gases.



What is the purpose of a flywheel in an engine?

A flywheel is used to store and release rotational energy, helping to maintain a steady and consistent speed of the engine by smoothing out variations in power output.

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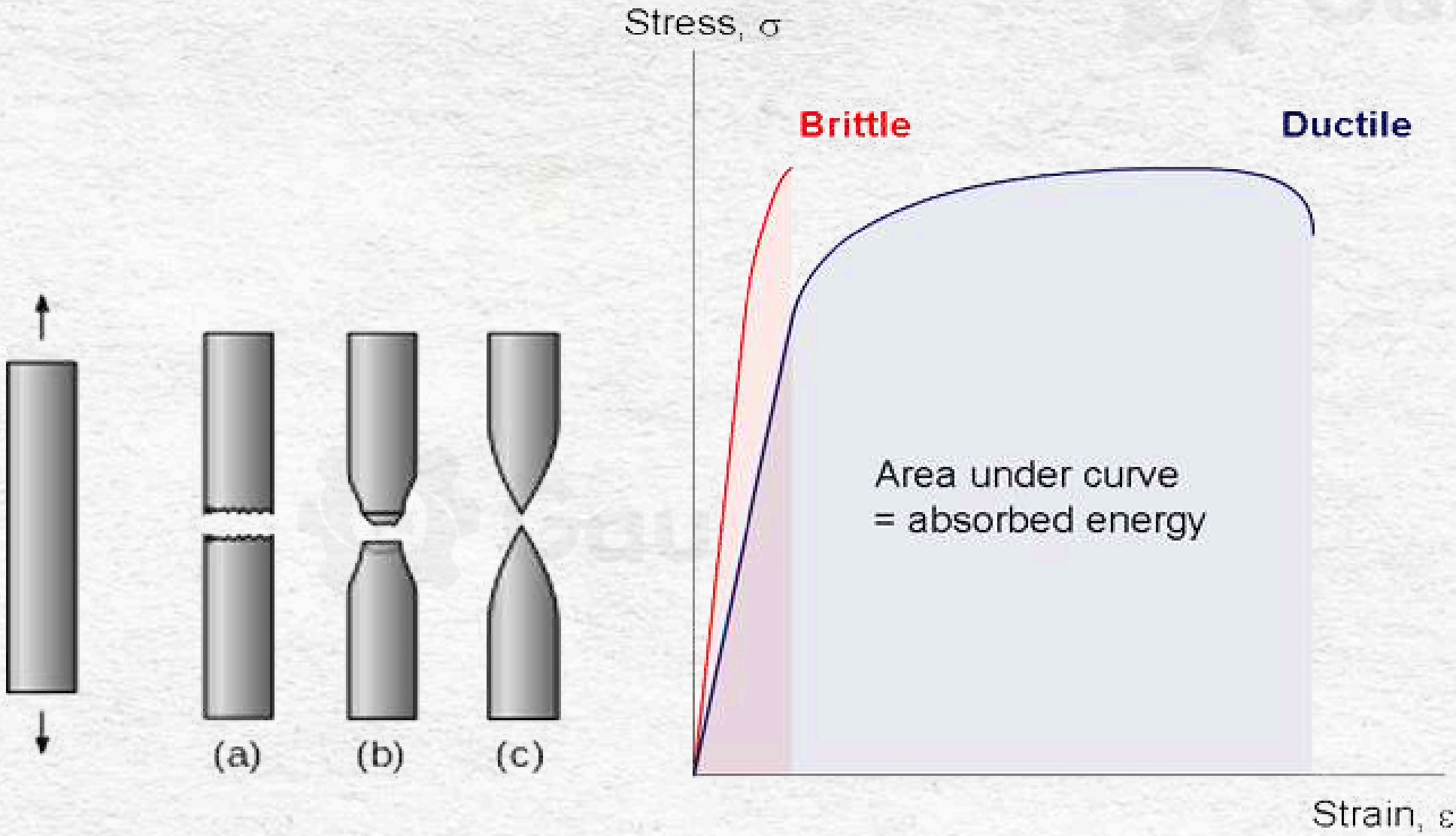

Differentiate between ductile and brittle materials.

Ductile materials can undergo significant deformation before rupture, whereas brittle materials tend to fracture without undergoing much deformation.

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Explain the concept of thermal expansion.

Thermal expansion is the tendency of a material to change in size (expand or contract) in response to a change in temperature. Most materials expand when heated and contract when cooled.

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What is the purpose of a gearbox in a vehicle?

A gearbox is used to provide variable speed and torque ratios between the engine and wheels, allowing the vehicle to operate efficiently at different speeds.

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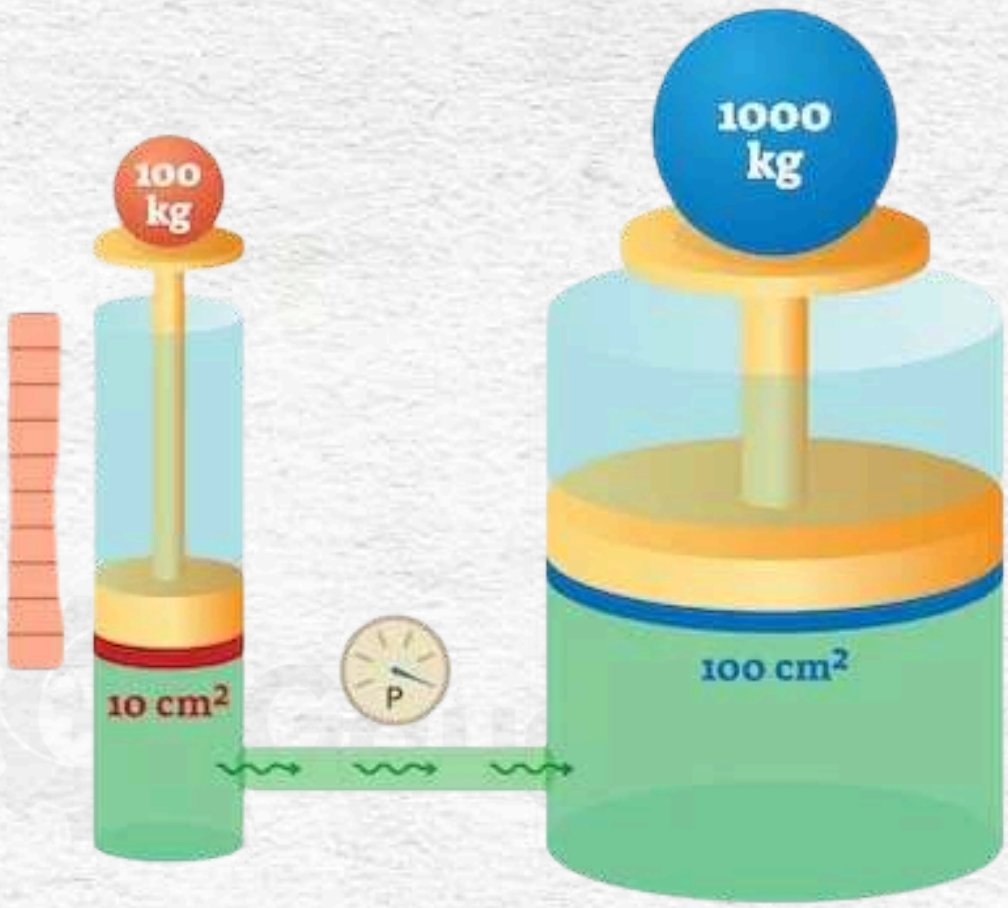

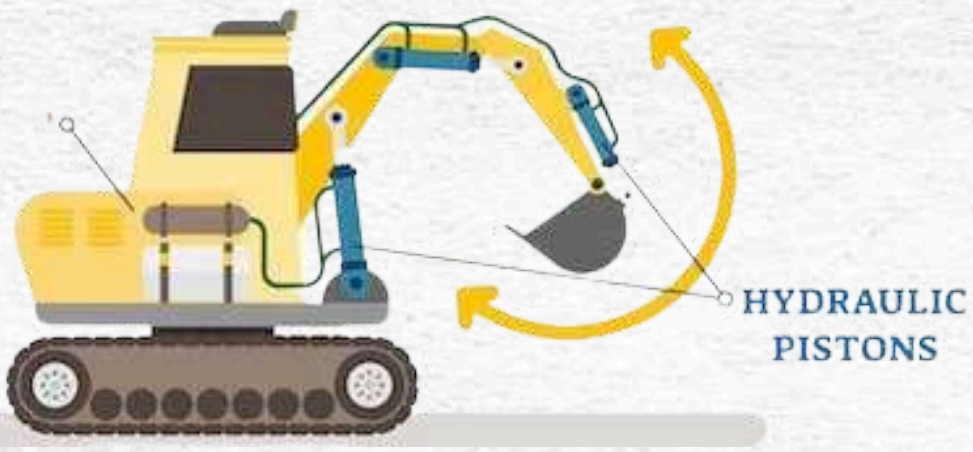

Describe the working principle of a hydraulic system.

A hydraulic system uses fluid to transmit power. When force is applied to a small piston, it creates pressure in the fluid, which is then transmitted to a larger piston, producing a larger force.

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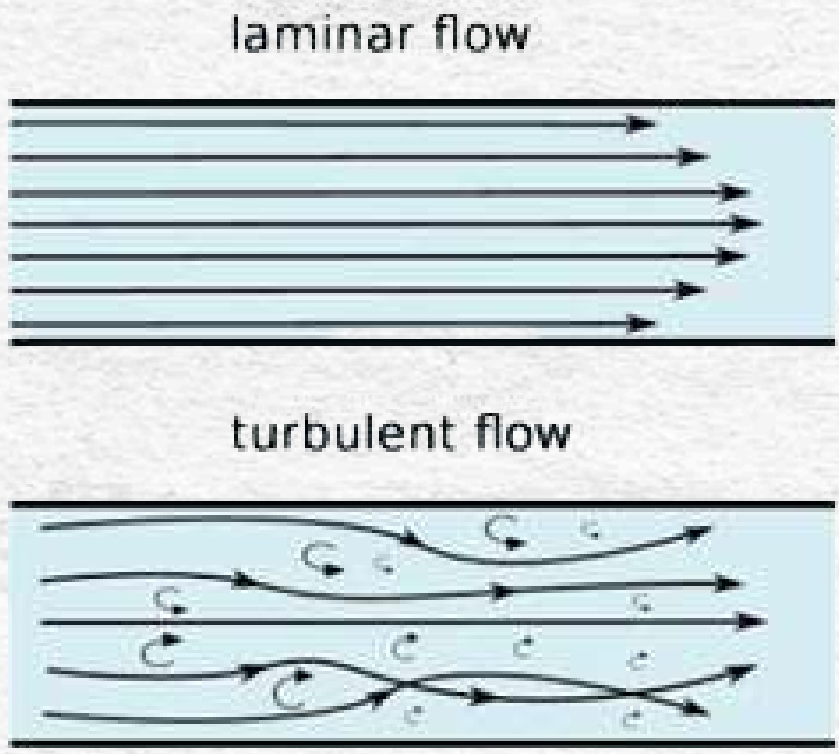
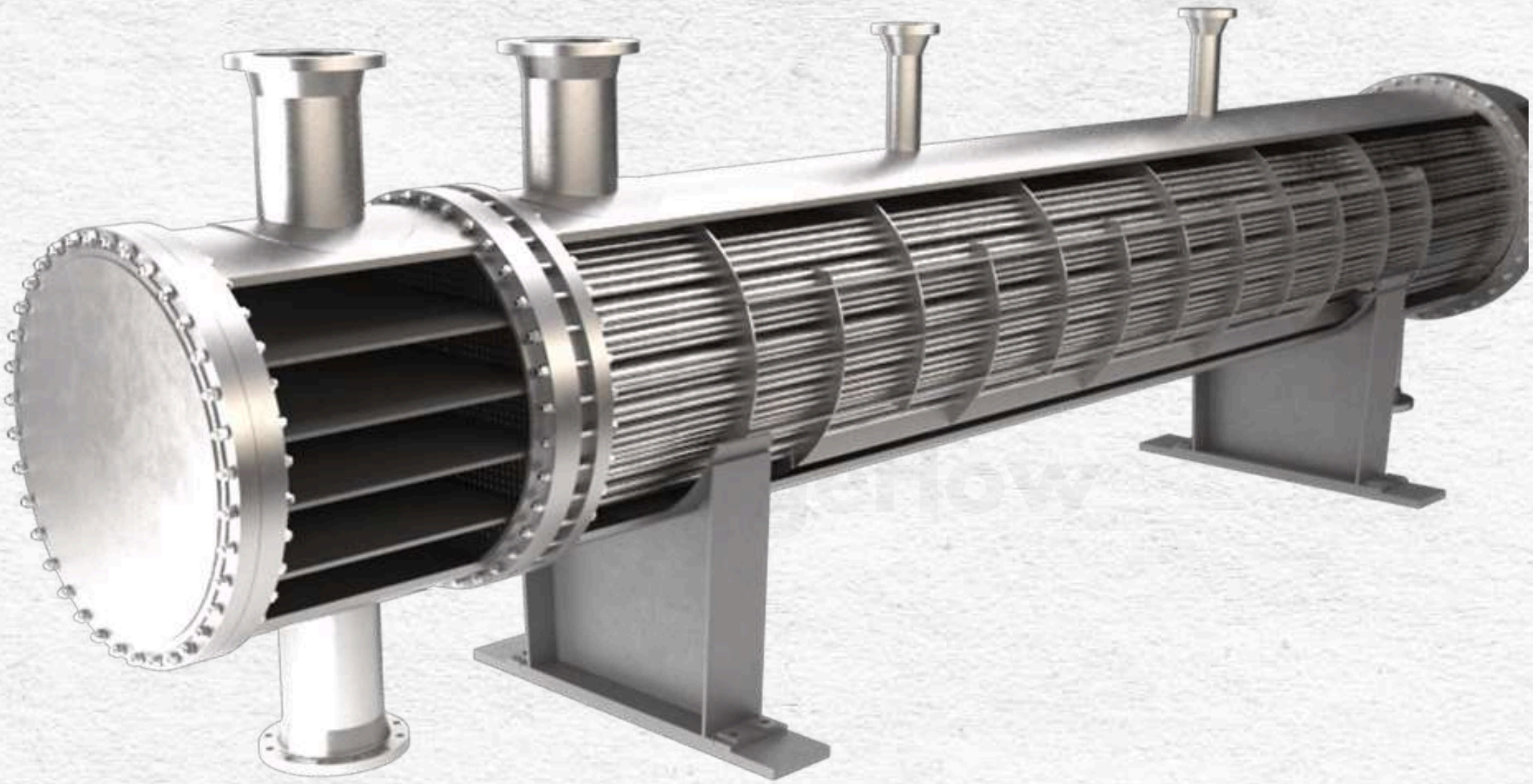
$$Re = \frac{\text{inertia forces}}{\text{viscous forces}} = \frac{\rho \cdot V \cdot D}{\mu}$$



What is the significance of the Reynolds number in fluid mechanics?

The Reynolds number is a dimensionless quantity that characterizes the flow of a fluid. It helps predict the flow patterns, turbulence, and the transition between laminar and turbulent flow in pipes and channels.



Explain the purpose of a heat exchanger.

A heat exchanger transfers heat between two fluids, ensuring that they do not mix. It is commonly used in HVAC systems, refrigeration, and industrial processes to increase or decrease the temperature of a fluid.

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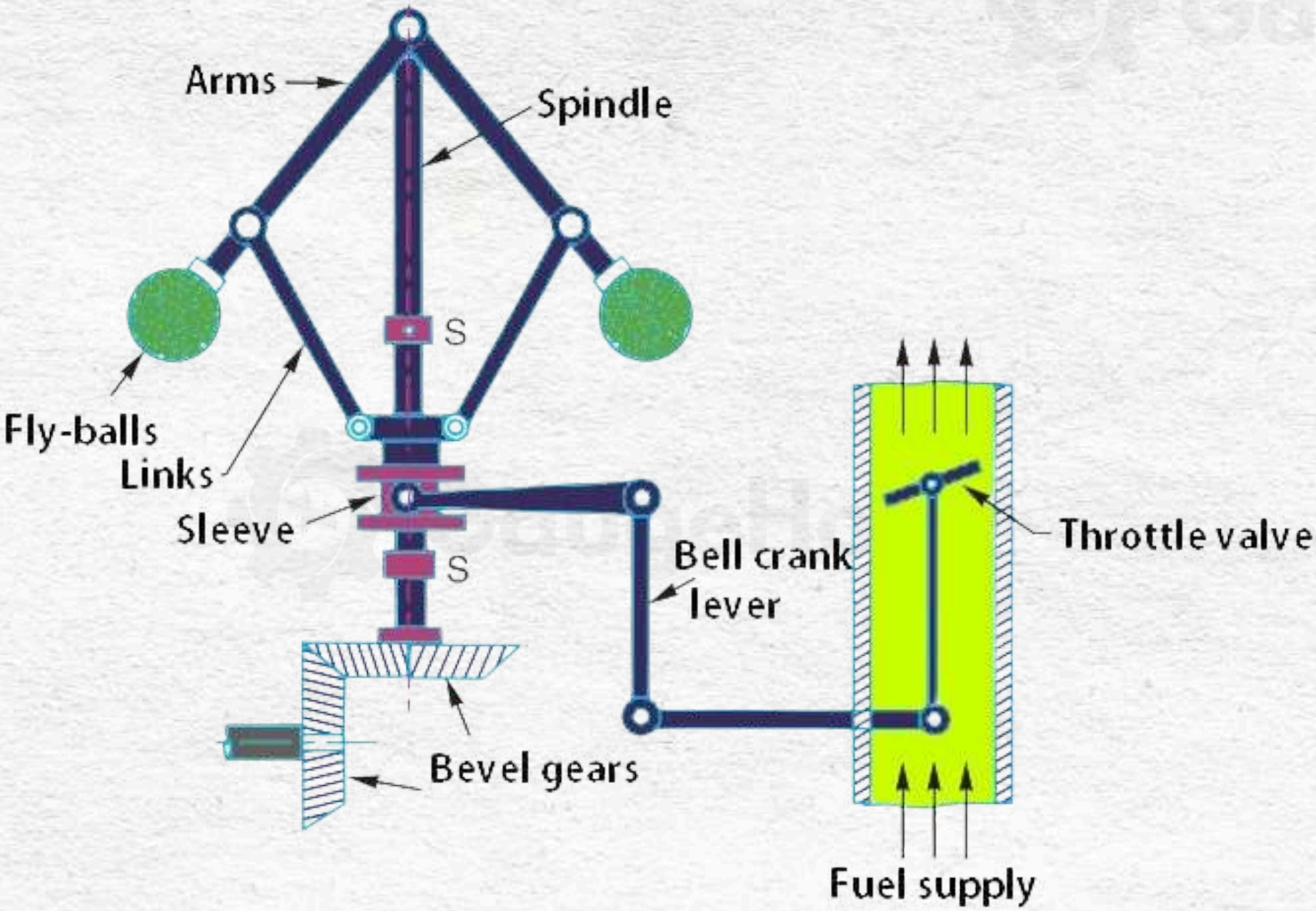
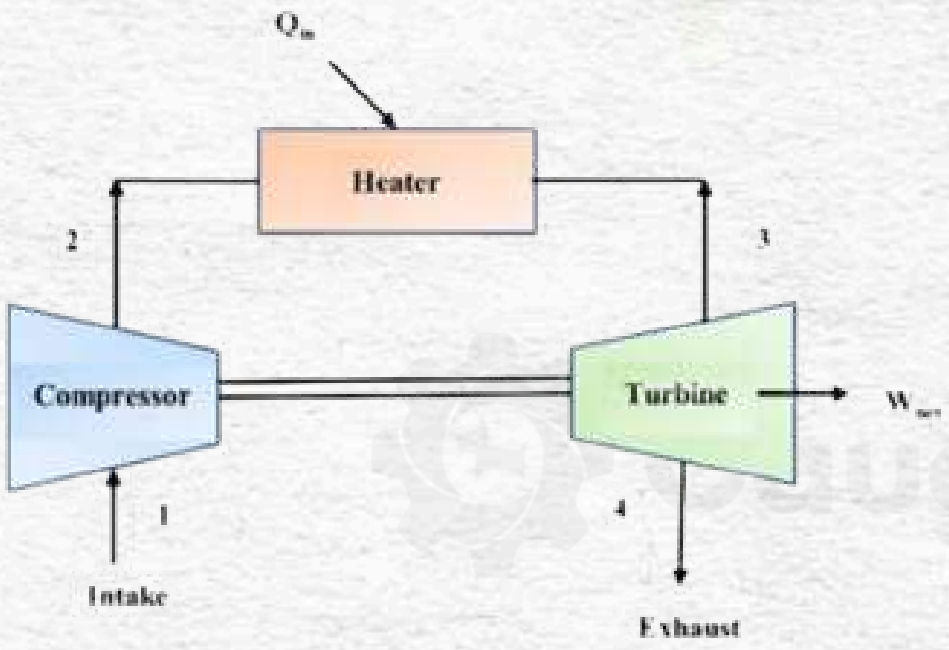
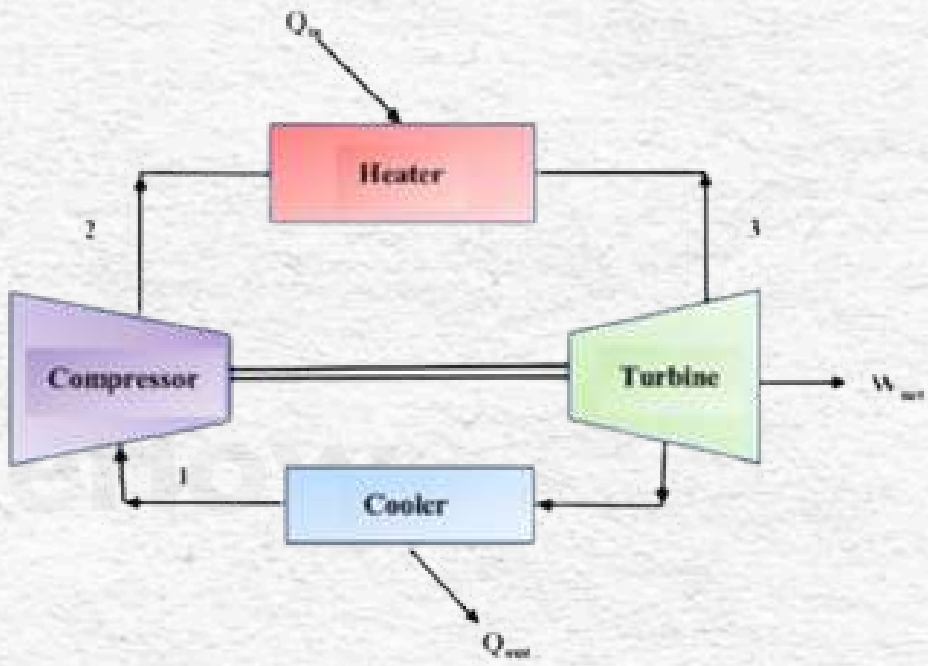


What is the role of a governor in an engine?

A governor regulates the speed of an engine by controlling the fuel or power input based on the variations in load.



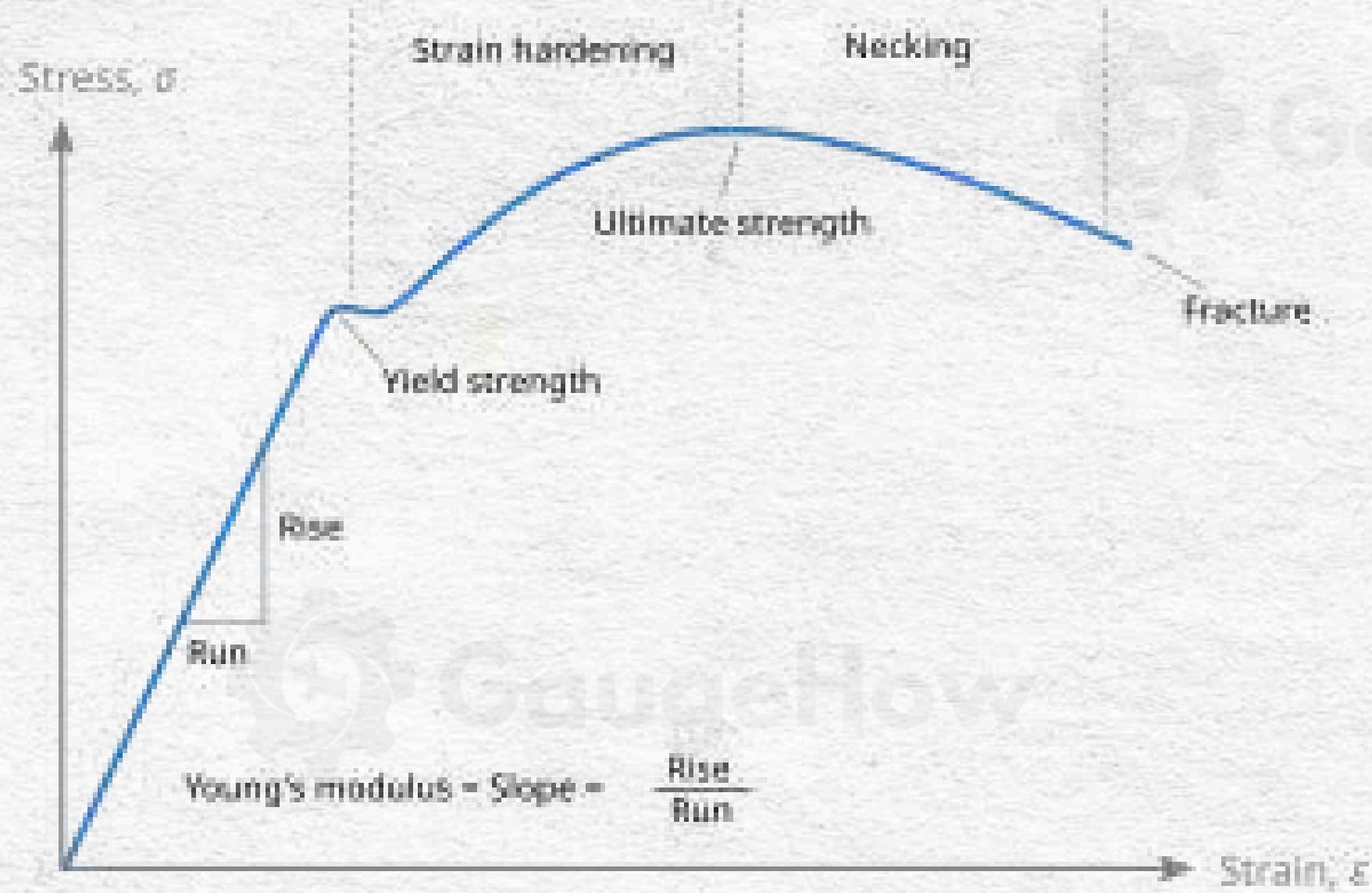
(a) Open Cycle



(b) Closed Cycle

Differentiate between a closed cycle and an open cycle gas turbine.

In a closed-cycle gas turbine, the working fluid remains within the system, while in an open-cycle gas turbine, the working fluid is continuously taken in, expanded, and expelled.



Explain the concept of Young's Modulus.

Young's Modulus is a measure of the stiffness of a material. It describes the ratio of stress to strain in a material under elastic deformation.

What is the purpose of a camshaft in an engine?

The camshaft is responsible for controlling the opening and closing of the engine's valves. It has lobes that push against the valves, allowing the intake and exhaust processes to occur.

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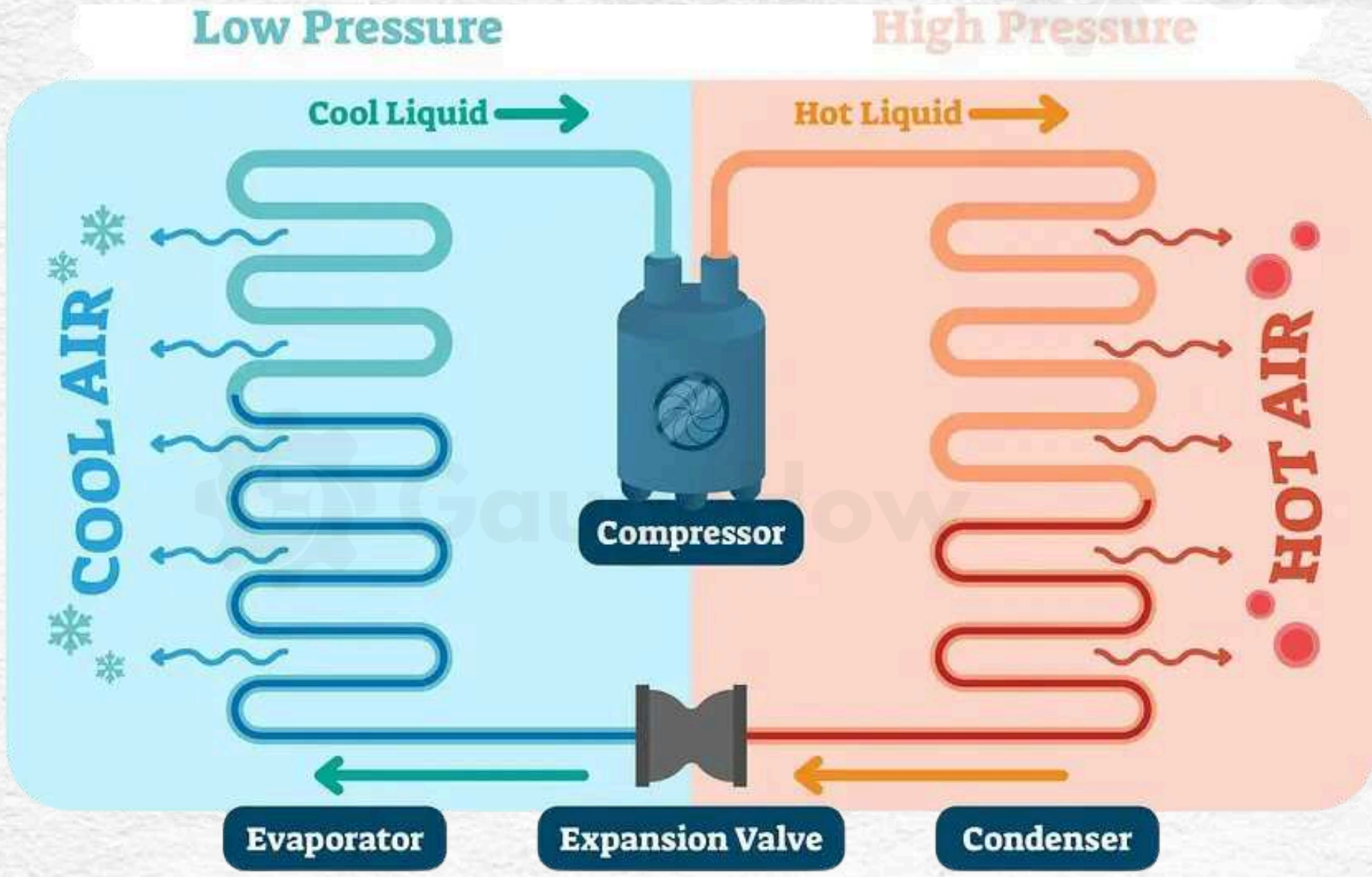

What is the function of a condenser in a refrigeration system?

A condenser in a refrigeration system is responsible for rejecting heat from the refrigerant to the surrounding environment, causing the refrigerant to change from a vapor to a liquid.

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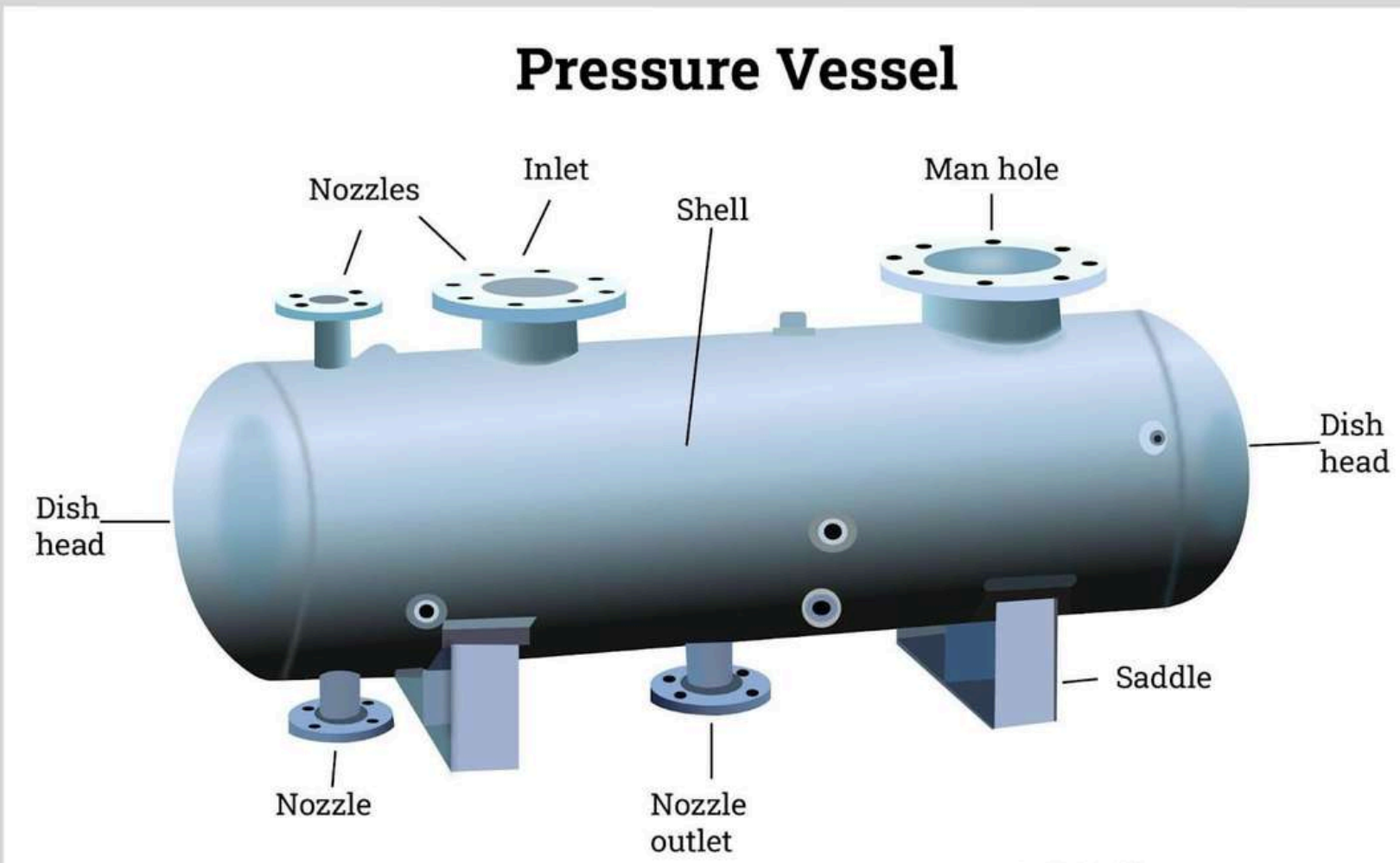
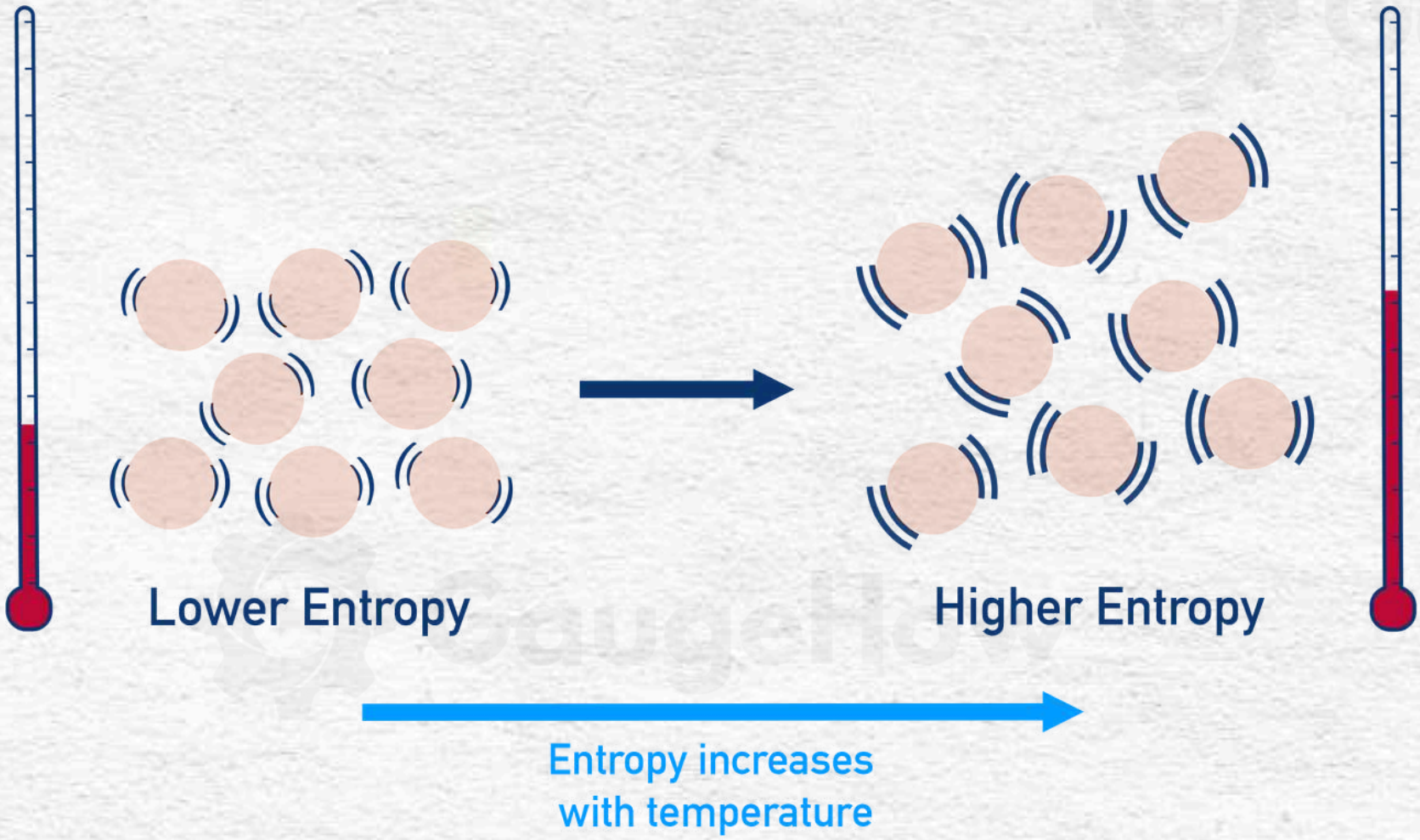


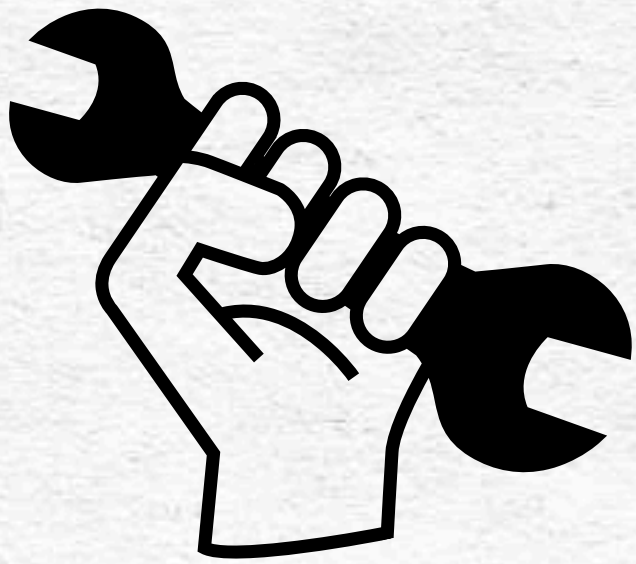
Describe the purpose of a pressure vessel.

Pressure vessels are designed to hold gases or liquids at a pressure substantially different from the ambient pressure. They are used in various industries for storing and transporting compressed gases and liquids.



Discuss the concept of entropy in thermodynamics.

Entropy is a measure of the disorder or randomness in a system. In thermodynamics, it is associated with the amount of energy in a system that is no longer available to do work. Systems tend to evolve towards higher entropy states.



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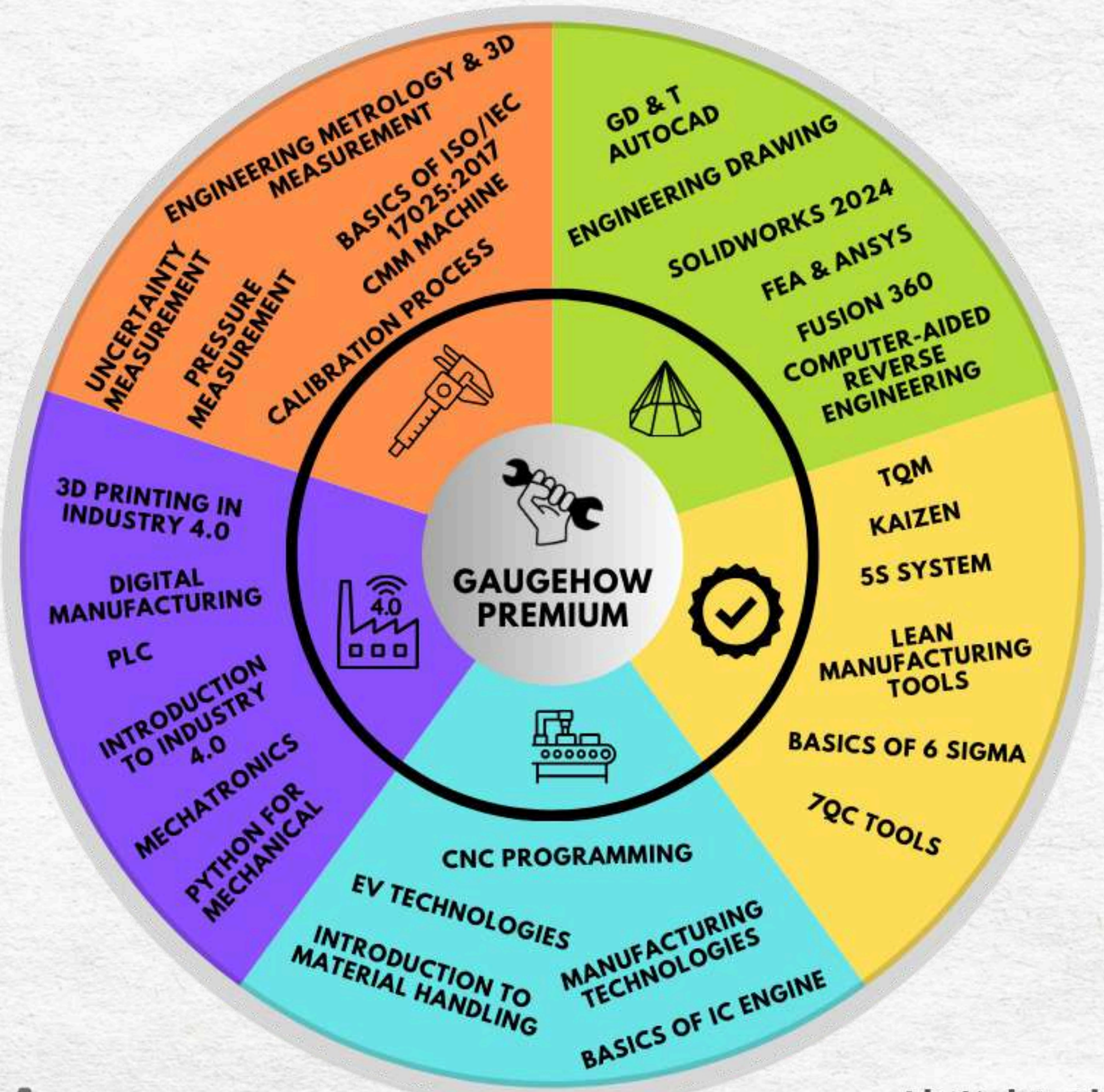

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