



Unit 8 • Pressure: Pascal's law and hydraulic machines

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 35

1 Key words

[4]

Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

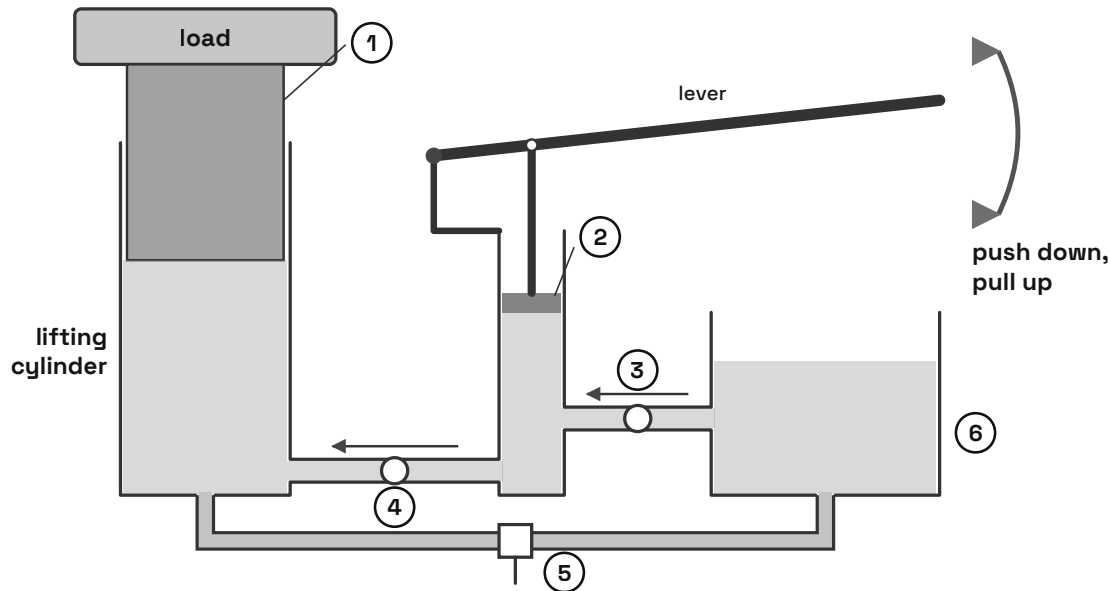
depth fluids incompressible multiplier newton pascal pressure thrust
transmitted upthrust

A force that acts at right angles to a surface is called _____. The thrust acting on each unit of area is the _____, and its SI unit is the _____. Liquids and gases can flow, so together they are called _____. The pressure in a liquid increases with _____. A liquid can't be squeezed into a smaller volume: it is _____. So a pressure made at one point of a liquid in a closed vessel is _____ equally in all directions. A hydraulic machine uses this as a force _____.

2 Label the diagram

[3]

The diagram shows a hydraulic jack. Name the parts numbered 1 to 6. Each carries 0.5 mark.



1. _____

2. _____

3. _____

4. _____

5. _____

6. _____



3 Multiple choice

[5]

Choose the correct option for each of the following questions.

- i. Two girls of the same weight stand on soft mud. One wears flat sandals; the other wears shoes with narrow high heels. Who sinks deeper, and why? [1]
- a. the one in sandals, because she presses on a larger area
 - b. the one in high heels, because her weight is spread over a smaller area
 - c. both the same, because their weights are equal
 - d. neither; mud is a liquid
- ii. Why does toothpaste come out of the nozzle when you squeeze the bottom of the tube? [1]
- a. the paste is pulled out by the air outside
 - b. the pressure made by your fingers is transmitted through the paste to the nozzle
 - c. squeezing makes the paste lighter
 - d. the tube shrinks only near the nozzle
- iii. In a hydraulic machine, the cross-sectional area of the larger piston is twice that of the smaller piston. Which weights on the smaller piston (W_1) and the larger piston (W_2) keep the machine balanced? [1]
- a. $W_1 = 4 \text{ N}$, $W_2 = 2 \text{ N}$
 - b. $W_1 = 5 \text{ N}$, $W_2 = 10 \text{ N}$
 - c. $W_1 = 2 \text{ N}$, $W_2 = 1 \text{ N}$
 - d. $W_1 = 3 \text{ N}$, $W_2 = 1.5 \text{ N}$
- iv. In a hydraulic press, the large piston has 30 times the area of the small one. You push the small piston with 50 N. What force does the large piston exert? [1]
- a. 50 N
 - b. 80 N
 - c. 1,500 N
 - d. 1.67 N
- v. Why is the liquid in a hydraulic machine not replaced by air? [1]
- a. air is too heavy
 - b. air would leak less than oil
 - c. air can be compressed, so the push would squeeze the air instead of moving the large piston
 - d. Pascal's law is only true for air

4 Very short answers

[3]

Write very short answers to the following questions.

- a. What is thrust? [1]
-
-
- b. State Pascal's law. [1]
-
-
- c. Write any two applications of Pascal's law in daily life. [1]
-
-



[6]

Write short answers to the following questions.

- a. Give a reason: a porter's namlo (head strap) is made wide, not thin.

[2]

- b.** Give a reason: the wall of a dam is made thicker at the bottom than at the top.

[2]

- c. Give a reason: a special type of oil is used in hydraulic brakes.

[2]

6 Long answer

[4]

Write a long answer to the following question.

A person is trying to lift a stone of 500 N by putting it on the smaller piston of a hydraulic machine and pushing on the larger piston. What would you suggest so that the load can be lifted easily? Explain, with a figure, how a hydraulic machine increases a force.

7 Numerical problems

[8]

Solve the following problems. Show your working. ($g = 9.8 \text{ m/s}^2$, density of water = 1000 kg/m^3)

- a. Find the pressure of the water at the bottom of a tank 2 m deep.

[2]

[illegible]

Answer:



[2]

Answer: _____

[4]

Answer: _____

[2]

Think, then answer.

Pascal fixed a thin tube about 10 m tall into the lid of a barrel full of water and poured water into it. Only a few cups of water filled the tube, yet the barrel burst. Why?

(not marked)

Join the nozzles of a thin and a thick syringe with a saline pipe, and fill them with water without air bubbles. Put a small weight on the small piston and find the weight on the large piston that balances it. Fill in the table.

Weight on the smaller piston, F_1	Weight on the larger piston, F_2	F_2 is how many times F_1 ?

Push the small piston in by 1 cm. How far does the large piston move?

