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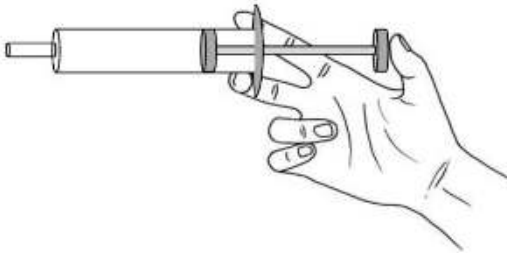
QUESTION 1**[15]****1.1 Do the following investigations about pneumatics and hydraulics. Answer the questions after each investigation.**

Investigate how we can use syringes to make things move. This will help you to design tools that can be used by rescue workers at accident scenes.

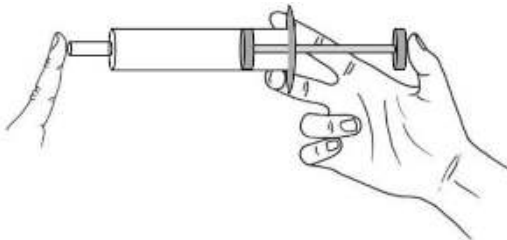
When you worked with levers, you learnt the following:

- A push can be made stronger or weaker by using a lever. In other words, a lever can give you mechanical advantage.
- A movement can be made smaller or bigger by using a lever.

The direction of movement can be changed by using a lever. You can also change and control movement by using syringes.



This is how you should grip a syringe so that you can push the plunger in with your thumb. Now you do it.



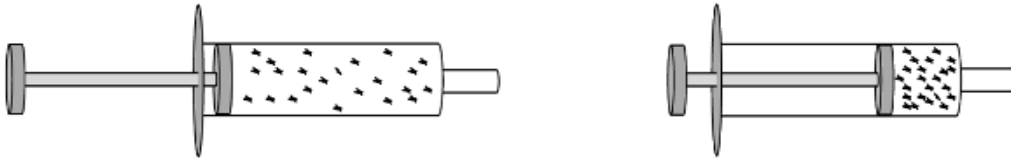
Close the outlet tube tightly with a finger, then try to push the plunger in.

1.1.1 Explain the feeling when you push the plunger in figure two (2)?

(2)**1.1.2 Name the substance you think is in the cylinder that you cannot see and prevents the plunger from going all the way in even when you push the plunger hard? Motivate your answer.**

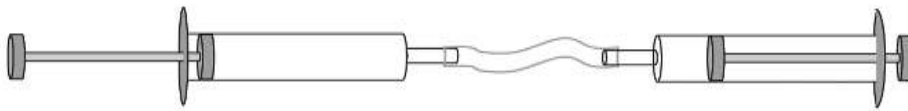
(2)

- 1.2 To compress means to make something smaller. When you pressed the plunger in while keeping the outlet closed, you compressed the air inside the syringe. This means that you forced the air molecules to move closer together.**

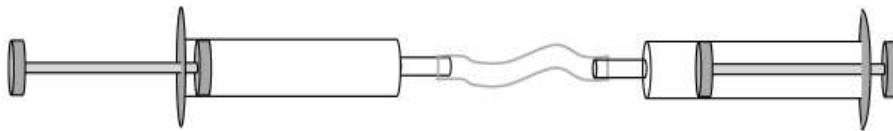


Do you think you can use a syringe to push something without touching it? Try to do it.

Connect two syringes with a plastic tube, as shown below.



Find out whether you can move small objects by pushing one plunger in. Press syringe A to move an object with syringe B.



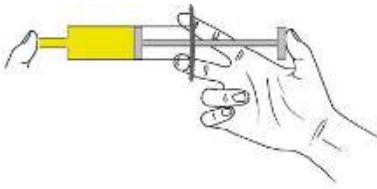
A pushing device made with syringes and pipe that is filled with air, is called a pneumatic mechanism. The word “pneumatic” is used to indicate that gas is used to push something.

- 1.2.1** Explain the feeling when you press the plunger in and try to move the pile of books with your pneumatic mechanism?

(1)

1.3 Fill a syringe with water to investigate this.

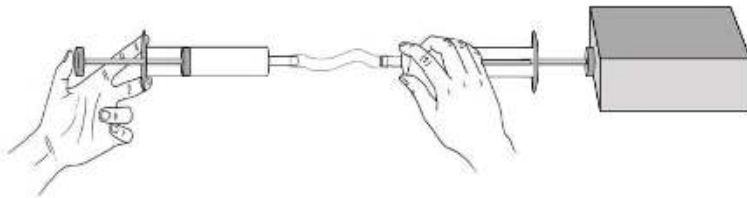
The word “hydraulic” is used to indicate that liquid is used to push something.



- 1.3.1 Do you think you can compress the water just like you compressed the air? Try it. Describe the difference you notice between using air in the syringe, and water in the syringe.

(2)

1.4 Investigate force transfer between two equal syringes.



- **Two equal syringes filled with air (pneumatic system).**

- 1.4.1 What happens when you use syringes of the same size?

(1)

- **Two equal syringes filled with water (hydraulic system).**

- 1.4.2 What happens when you use syringes of the same size?

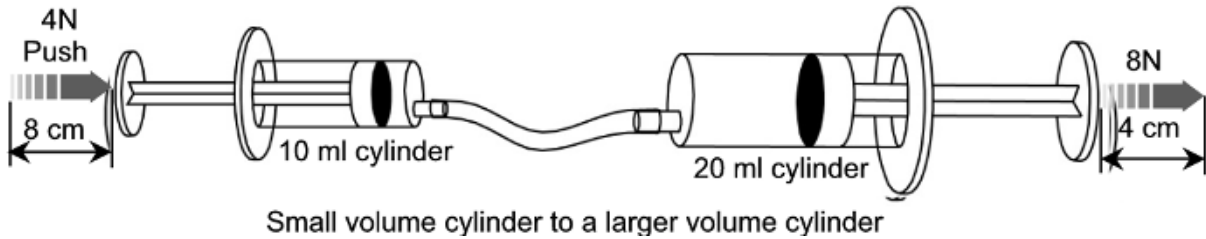
(1)

- 1.4.3 Add some pressure on syringe B by pushing in syringe A's plunger. Underline the correct word (s) in the result column to make the result fit best to the investigation.

Investigate	Result
Equal syringes	Force transfer from syringe A to Syringe B
Air: syringe A to syringe B	More/ less /remains the same
Water: syringe A to syringe B	More/ less /remains the same

(2)

- 1.5 Investigate force transfer between two unequal syringes.



- **Two unequal syringes filled with air.**

- 1.5.1 What happens when you use unequal syringes?

(2)

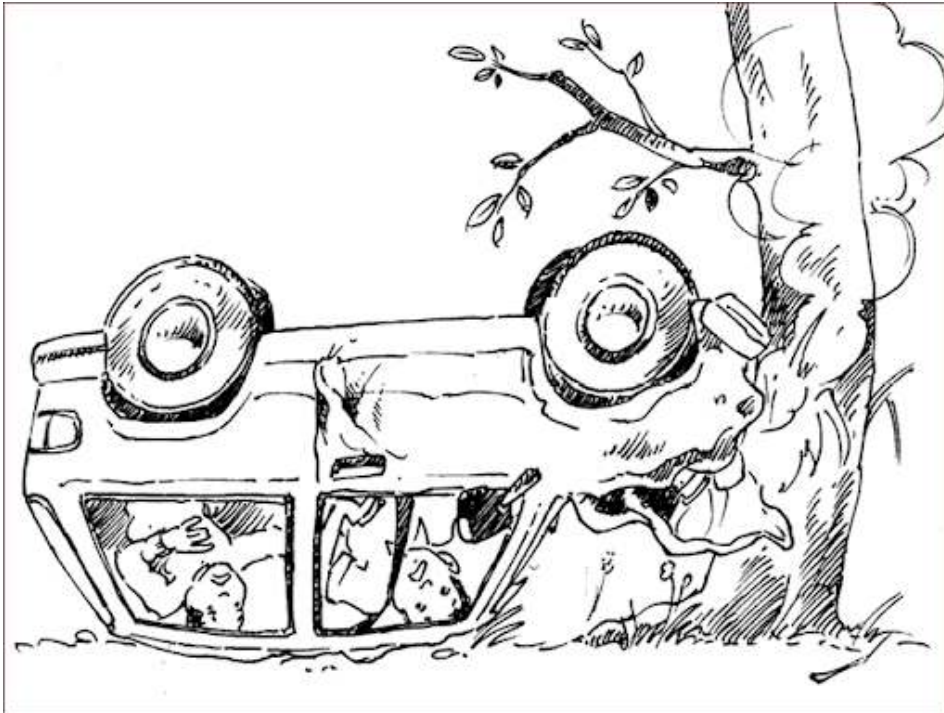
- **Two unequal syringes filled with water.**

- 1.5.2 What happens when you use unequal syringes?

(2)

QUESTION 2**[12]****2.1 Read the scenario and answer the questions that follow.****SCENARIO**

Last weekend, there was an accident just outside town. A car lost control, went off the road and toppled over. Two people were trapped inside the crashed car. They were badly injured, but still alive. Because the metal body of the car was bent, the doors could not open. An ambulance with “paramedics” arrived to help the trapped people, but the paramedics could not get them out of the crumpled car in time to give them medical treatment or to take them to the hospital. The two people inside the car died from their injuries. Incidents like these are very sad. Many peoples’ lives could be saved if it was possible to remove them from car wrecks in time to get medical help. If the paramedics had the Jaws of Life tools with them, they could have cut or bent the car doors open with these tools to remove the injured people. Then they could have given medical help to the injured people, and the story would have had a happier ending. Jaws of Life rescue tools can easily cut through the metal of a car body. They can also be used to bend or open the metal body of a car. Rescue workers have to work very carefully to ensure they don’t hurt the passengers inside. So the rescue tools should make small movements, compared to the large movements made by the rescue workers operating them.



2.1.1 Identify the need, problem and want from the scenario.

(2)

2.1.2 Write a design brief (a short statement explaining what you should design to solve the problem and the purpose it will serve).

(3)

2.1.3 Identify four (4) specifications (exact requirements of the solution).

(4)

2.1.4 Identify three (3) constraints (things/obstacles that limit your choices in solving the problem)

(3)

QUESTION 4**[35]****4.1 Learners make a simple working model of a Jaws of life**

Rubric

Outstanding	Meritorious	Adequate	Moderate	Not achieved
5	4	3	2	0-1
Outstanding correlation between the model and the design brief.	Admirable correlation between the model and the design brief.	Adequate correlation between the model and the design brief.	Moderate correlation between the model and the design brief.	No / little correlation between the model and the design brief.
Outstanding evidence of incorporating hydraulic, pneumatics.	Admirable evidence of incorporating hydraulic, pneumatics.	Adequate evidence of incorporating hydraulic, pneumatics.	Moderate evidence of incorporating hydraulic, pneumatics.	No / little evidence of incorporating hydraulic, pneumatics.
Outstanding evidence of incorporating linked levers.	Admirable evidence of incorporating linked levers.	Adequate evidence of incorporating linked levers.	Moderate evidence of incorporating linked levers.	No / little evidence of incorporating linked levers.
Demonstrated outstanding understanding of the making process and personal role.	Shows a very good understanding of the making process and personal role.	Shows a general understanding of the making process and personal role.	Shows some understanding of the making process and personal role.	Shows no / little understanding of the making process and personal role.
Takes outstanding care when working, using tools and materials safely and accurately.	Takes care when working, using tools and materials safely and accurately.	Takes reasonable care when working, using tools and materials safely and accurately.	Takes some care when working, using tools and materials safely and accurately.	No / little ability to use tools and materials safely or accurately.
Works outstandingly well with others, making a very good contribution.	Works confidently with others, making a very good contribution.	Works easily with others, making a good contribution.	Works with others, making a reasonable contribution.	Finds it difficult to work with others, making little or no contribution.
Produces an outstanding working model.	Produces an excellent working model.	Produces a good working model.	Produces a satisfactory working model.	Produces a poor working model / no model.
Total				/35

TOTAL: 70