Name _____ Date _____

Slowing the Cylinder Worksheet Answers

In the tables below, record the length of time each setup took to rebound from compression of **2mL** to full extension.

Spring #1

Water

Trial	Time
1	3.8
2	3.7
3	3.2
Average	3.57

Oil

Trial	Time(Sec)
1	1.1
2	.9
3	2.1
Average	1.4

Soda

Trial	Time(Sec)
1	.6
2	.7
3	1
Average	.77

Orifice

Trial	Time(Sec)
1	8.4
2	8.5
3	8.7
Average	8.5

example data

Spring #2

Water

Trial	Time(Sec)
1	.6
2	1
3	.8
Average	.8

Oil

Trial	Time(Sec)
1	1.1
2	.7
3	1.2
Average	1

Soda

Trial	Time(Sec)
1	.8
2	.4
3	.8
Average	.67

Orifice

Trial	Time(Sec)
1	3.5
2	5.2
3	4.6
Average	4.4

Reflection

1. Did the spring stiffness have an effect on the time it took the plunger to reach full extension? Explain your answer using data.

   (Possible answer: Yes! The stiffer spring caused the plunger to rebound in .8 seconds, while the other spring caused the plunger the rebound in 3.8 seconds.)

2. Did the size of the orifice have an effect on the time it took the plunger to reach full extension? Explain your answer using data.

   (Possible answer: Yes! For both springs, the smaller orifice size caused the plunger to rebound much more slowly. For example, using the thick spring and regular orifice size, it took .8 seconds for the plunger to rebound. However, using the thick spring and smaller orifice size, it took 4.4 seconds for the plunger to rebound.)

3. Did the liquid used in the syringe have an effect on the time it took the plunger to reach full extension? Explain your answer using data.

   (Possible answer: Yes! For both springs, oil caused the slowest rebound of all tests, with a time of 1 second for the stiffer spring and 1.4 seconds for the other spring.)

4. From the perspective of an engineer designing a shock absorber, which is best: for the plunger to rebound quickly or slowly? Why?

   (Possible answer: From the perspective of an engineer, it would be most desirable to slow the time it takes for the plunger to rebound to full extension. This slowing process indicates that the shock absorber is doing its job by preventing the spring from jerking back to full extension, thereby making a car ride feel much smoother.)

5. Of the three variables, springs, orifice size, and liquid variations, which combination would engineers most likely use (based on your data!) to improve shock absorption? Why?

   (Possible answer: Based on the data from our experiment, engineers would most likely use a small orifice size, less-stiff spring, and oil to successfully create shock absorbers using this model. Each of those variables slowed down the plunger extension, making them most useful to engineers looking to create shock absorbers.