

Gas Laws Fun Sheet

COMPLETE ON YOUR OWN PAPER PLEASE.

Part 1: Boyle's Law:

1. Some people messin' with Shrek steal his birthday balloon that occupies 3.5 L at 0.82 atm of pressure in the mountains and take the balloon to sea level where the pressure is 1.00 atm. What is the new volume of the balloon in L?
2. A bubble in the top of Donkey's shampoo bottle occupies 23.2 mL in Florida at 760 mm Hg when Donkey is on vacation. When he returns to the mountains, the bubble occupies 28.0 mL. What is the pressure in the mountains in mm Hg?
3. If Shrek passes 13.0 L of gas each day at standard pressure, what volume in L would this be at 0.89 atm?



Part 2: Charles' Law:

4. If Princess Fiona receives a 5.5 L birthday balloon from Shrek in the afternoon at 25.0°C, what will its volume be in the evening when the temperature drops to 10.0°C?
5. The Three Blind Mice heat steam in a tea kettle beginning at 101°C to make some espresso. If the original volume of steam was 125 mL and the final volume of steam is 175 mL what is the final temperature of the espresso?
6. The Ginger Bread Man contains 13.0 mL of air at room temperature (25°C) just before he is dropped into hot oil at 180°C by Lord Farquaad. What is the final volume of the gas inside the Ginger Bread Man?



Part 3: Gay Lussac's Law:

7. The pressure inside The Fairy Godmother's pumpkin coach is 85.0 kPa at 25°C. If the pressure is determined later on to be 101.3 KPa, what is the new temperature?
8. Rumpelstiltskin has Captain Hook carry a 30.0 atm scuba tank from a temperature of 1.5°C in the ocean to the shore where the sun heats it to 45°C. What is the new pressure in the tank?
9. Prince Charming's hairspray can has a pressure of 25.6 atm at room temperature (25°C). When Prince Charming uses the hairspray to freeze his golden locks in place, the pressure of the gas drops to 0.98 atm. What is the new temperature of the gas?



Part 4: Mixed Gas Law Problems

10. A metal dive bell filled with air has an internal pressure of 1.20 atm and a fixed volume of 25.0 L at 22.0 C°. If I take the dive bell to the bottom of the Mariana Trench where the pressure is 992 atmospheres, what will the new temperature of the gas be? How many moles of gas does the dive bell hold?
11. Divers get "the bends" if they come up too fast because gas in their blood expands, forming bubbles in their blood. If a diver has 0.050 L of gas in his blood under a pressure of 2.50 atm, then rises instantaneously to a depth where his blood has a pressure of 1.00 atm, what will the volume of gas in his blood be? Do you think this will harm the diver?
12. The highest pressure ever produced in a laboratory setting was 2.0×10^6 atm. This pressure was created by increasing the temperature of a small sample of gas via the use of lasers. If a 1.2×10^{-5} L sample of this gas starts at 23.5 C° and 1.0 atm of pressure, what temperature would be required to reach 2.0×10^6 atm (assuming the volume does not change)?
13. Atmospheric pressure on the peak of Mt. Everest can be as low as 150 mm Hg, which is why climbers need to bring oxygen tanks for the last part of the climb. If the climbers carry 10.0 liter tanks with an internal gas pressure of 3.04×10^4 mm Hg, what will the volume of the gas be when it is released from the tanks on the top of Mt. Everest?



Part 5: Combined Gas Law:

14. Doris the ugly stepsister initially has a balloon at a pressure of 1.2 atm, a volume of 23 liters, and a temperature of 205 K, and then raises the pressure to 1.4 atm and increases the temperature to 325 K, what is the new volume of the gas? If the balloon will only hold 28.0 L before popping, will she cry?
15. Donkey fills a tire on the Royal Coach to a volume of 28.0 liters at a temperature of 25.5 °C, and a pressure of 2.0 atm. As Donkey, Shrek and Fiona travel to the Kingdom of Far Far Away, the volume of the tire is decreased to 27.0 liters and its temperature increased to 45.0°C. What is the new pressure of the gas in the tire? If the tire bursts at 21.15 atm, will they be walking the rest of the way?
16. Sitting in his hot mud pit, Shrek expels a gas that takes up a volume of 17 liters at a pressure of 81.0 kPa and a temperature of 21.2°C. If the temperature is raised to 80.0°C and the pressure is lowered to 64.0 kPa, what is the new volume of the noxious gas?



Part 6: More Gas Law Problems

17. I have an unknown volume of gas at a pressure of 0.50 atm and a temperature of 325 K. If I raise the pressure to 1.2 atm, decrease the temperature to 320 K, and measure the final volume to be 48 liters, what was the initial volume of the gas?
18. In a thermonuclear device, the pressure of 0.50 liters of gas within the bomb casing reaches 4.0×10^6 atm. When the bomb casing is destroyed by the explosion, the gas is released into the atmosphere where it reaches a pressure of 1.00 atm. What is the volume of the radioactive gas after the explosion?
19. A car has an internal volume of 2600 liters. If the sun heats a car from a temperature of 20.0° C to a temperature of 55.0° C (131 F), what will the pressure inside my car be if the pressure was 760.0 mm Hg at the start.
20. Some students believe that teachers are full of hot air. If I inhale 2.2 liters of gas at a temperature of 18.0° C and it heats to a temperature of 38.0° C in my lungs, what is the new volume of the gas?
21. You take your little brother's teddy bear and place it in a 9.50 L container at STP conditions. After throwing the box out for the refuse collectors to pick up, it is then crushed to a volume of 0.700 L at -15°C. How many atmospheres of pressure is the teddy bear under in the garbage truck's compressor?
22. Synthetic diamonds can be manufactured at pressures of 6.00×10^4 atm. If we took 2.00 liters of gas at 1.00 atm and compressed it to a pressure of 6.00×10^4 atm, what would the volume of that gas be?
23. The gaseous contents in an aerosol can are under a pressure of 3.00 atm at 25 C. If the can will rupture at pressures greater than 4.00 atm, what is the highest temperature that the can be stored at?
24. A soda bottle is flexible enough that the volume of the bottle can change even without opening it. If you have an empty soda bottle (volume of 2.0 L) at room temperature (25 °C), what will the new volume be if you put it in your freezer (-4.0 °C)?
25. On hot days, you may have noticed that potato chip bags seem to "inflate", even though they have not been opened. If I have a 250 mL bag at a temperature of 19.0 °C, and I leave it in my car which has a temperature of 60.0°C, what will the new volume of the bag be?

