

Community in the Classroom Presentation Plan

Lesson Name _____ How Can You Tell One Clear Gas From Another? _____

Presenter(s) _____ Michael Grass _____

Grade Level 5th Standards Connection(s) _____

Abstract:

Many gases are clear and have no smell. How, then, can we tell one gas from another? In this lesson we will explore the properties of 4 different gases and use our observations to determine the element in each gas.

Vocabulary/Definitions:

Element

Chemical Reaction

Periodic Table

Materials:

I will bring:

- 1) 40 observation/inference worksheets
- 2) 40 balloons
- 3) 40 lab goggles
- 4) 20 test tubes
- 5) 20 rubber bands
- 6) Lab coat
- 7) Gloves
- 8) Chemicals
 - a. Concentrated hydrogen peroxide
 - b. Potassium permanganate
 - c. Zinc
 - d. Hydrochloric acid
 - e. Baking soda
 - f. Vinegar

Students will need:

Pencils

Classroom Set-up:

Students should be in groups of 2-3.

Classroom Visit

1. Personal Introduction: _____ 5 _____ Minutes

I am a graduate student in Chemistry at the University of California in Berkeley. I study small metal particles. Has anyone heard of nanoparticles? Does anyone know what that means? I study how these nanoparticles interact with gases.

When I am not in lab at Berkeley, I am usually playing ultimate Frisbee or tennis, cooking, or going camping.

2. Topic Introduction: _____ 10 _____ Minutes

Put vocab on the board: element, chemical reaction

Ask questions to see if students know about:

Elements, reaction, periodic table, gas, states of matter

Talk about gases as a state of matter. Air one we are surrounded by every day:

What is a gas?

What are some types of gas? Air, oxygen, nitrogen, hydrogen, helium, carbon dioxide, carbon monoxide



What are some properties of gases?
Can you name properties of each of the gases we listed?

3. Learning Experience(s): 40 Minutes

Write down the following gases and (hopefully) get students to provide a property of each

Air: we breath it, some oxygen and mostly nitrogen

Oxygen: our bodies need it, needed for flames to burn

Hydrogen: burns

Carbon dioxide: global warming, used in fire extinguishers

Lets also find the elements that make up each of these gases on the periodic table. Oxygen is 2 oxygen atoms, so we write O₂, hydrogen is 2 hydrogen atoms, so we write H₂, and nitrogen is 2 nitrogen atoms, so we write N₂. Can anyone guess what carbon dioxide is? CO₂.

Now we are going to make balloons full of each balloon. How will we do this?

Air? We can just blow into it.

Oxygen, hydrogen, and carbon dioxide? We will react chemicals together to form each – but I won't tell you which reaction makes which gas yet.

After we have made each gas, we investigate which balloon contains which type of gas through experiments. All of them are clear and have no odor, so we'll have to try something different

Demonstrate how to fill up the balloon with baking soda and vinegar for the carbon dioxide. Also, demonstrate how to fill up the air balloon with the SAME amount.

Have each group fill a balloon with the CO₂ and another with air. When this is finished, I will fill up one balloon with hydrogen and another with oxygen.

With all four balloons at the front, we will fill out the worksheet. First, students guess which gas is in which balloon and give a reason. Then we perform 2 experiments for each: (1) mass of the balloon) and (2) how the gas reacts with a splint that has a red ember on the end (we do this by introducing some gas into a test tube, then lowering the splint into the test tube).

4. Wrap-up: Sharing Experiences and Building Connections 10 Minutes

Have students share their results and their conclusions. Ask if their hypotheses matched their conclusions. Come to a consensus on what was in each balloon and how we know that. Discuss the chemical reaction that formed each gas.

5. Close: 5 Minutes

Science is all about observing, experimenting, and thinking. The best scientists are the most curious ones. So if you are curious about how things work or why things are the way they are, science is for you. Thanks for letting me come into the classroom...

TOTAL 50 – 60 Minutes

Follow-up – After Presentation

Worksheet and Periodic Table are attached to this lesson plan.

Notes:

Be careful with hydrogen peroxide – it is concentrated and bleaches your skin and clothes.

Be careful with hydrochloric acid – it is also concentrated and will burn you skin and clothes.

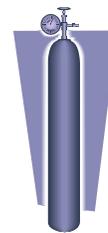
Practice all of these activities and demos beforehand.



Name: _____



How Can You Tell One Clear Gas From Another?



1) Listing what we already know

Name of Gas	Chemical Formula	Properties

2) Initial Observations and Hypotheses (Guesses)

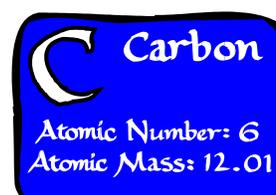
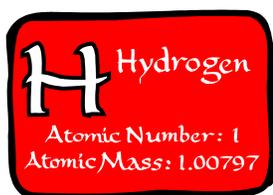
Color of Balloon	Observations while filling it up	Hypothesis (Guess)
		I think this balloon was filled with _____ because _____ _____
		I think this balloon was filled with _____ because _____ _____
		I think this balloon was filled with _____ because _____ _____
		I think this balloon was filled with _____ because _____ _____



3) Experiment Results and Conclusions

Color of Balloon	Results of Experiments	Hypothesis (Guess)
		This balloon was filled with _____ because _____ _____
		This balloon was filled with _____ because _____ _____
		This balloon was filled with _____ because _____ _____
		This balloon was filled with _____ because _____ _____

4) What did you learn today?



The Periodic Table of the Elements

1 H Hydrogen 1.00794																	2 He Helium 4.003										
3 Li Lithium 6.941	4 Be Beryllium 9.012182															9 F Fluorine 18.9984032	10 Ne Neon 20.1797										
11 Na Sodium 22.989770	12 Mg Magnesium 24.3050															17 Cl Chlorine 35.4527	18 Ar Argon 39.948										
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.955910	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938049	26 Fe Iron 55.845	27 Co Cobalt 58.933200	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.92160	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80										
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.90550	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.60	53 I Iodine 126.90447	54 Xe Xenon 131.29										
55 Cs Cesium 132.90545	56 Ba Barium 137.327	57 La Lanthanum 138.9055	72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.078	79 Au Gold 196.96655	80 Hg Mercury 200.59	81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.98038	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)										
87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (262)	108 Hs Hassium (265)	109 Mt Meitnerium (266)	110 Ds Darmstadtium (269)	111 Cn Copernicium (272)	112 Cu Copper (277)	113 Nh Nihonium (278)	114 Fl Flerovium (285)														
58 Ce Cerium 140.116	59 Pr Praseodymium 140.90765	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92534	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93032	68 Er Erbium 167.26	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967	90 Th Thorium 232.0381	91 Pa Protactinium 231.03588	92 U Uranium 238.0289	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)

