

Part A

1. Zinc is made entirely of _____ atoms and oxygen is made entirely of _____ atoms. Zinc oxide (ZnO) is made of _____

2. In the 1810s and 1820s, carbon was found to have a relative atomic weight of 12 and nitrogen a relative atomic weight of 14. What does “relative atomic weight” mean, and what do these figures tell you about carbon atoms and nitrogen atoms?

3. What happens to atoms in a chemical reaction?

Part B

4. Fill in the table with some of the properties of metals and non-metals. (A “property” of a substance is a characteristic that can be used to describe it.) You can use words like “usually” or “generally” if you want.

Properties of Metals	Properties of Non-metals

5. What is a metalloid? Give two examples.

Part C

6. The process of using electricity to drive chemical reactions is called _____.

7. Briefly describe how aluminium is produced in industry.

Part D 8. Elements within Groups usually chemically react in similar ways. Fill in the table below. (And balance the equations.)

Element	Group	Reaction with Oxygen	Reaction with Water
Lithium, Li	1	___Li + ___O ₂ → ___Li ₂ O	___Li + ___H ₂ O → ___LiOH + ___H ₂
Sodium, Na	1		
Potassium, K	1		
Rubidium, Rb	1		

Part E

9. Mendeleev predicted that ekaaluminium, Ea, and ekasilicon, Es, (the temporary names he gave to the undiscovered elements between zinc and arsenic) would react with oxygen to produce Ea₂O₃ and EsO₂ respectively. On what did he base these predictions?

10. Below is a small section of the (modern) Periodic Table. (The Group numbers were changed in 1990, so, for example Group 4 on Mendeleev's table is now Group 14 on the Modern Periodic Table.)

	Group 14 (Mendeleev's Group 4)	Group 15 (Mendeleev's Group 5)	Group 16 (Mendeleev's Group 6)	Group 17 (Mendeleev's Group 7)
Period 2	carbon 6 C 12	nitrogen 7 N 14	oxygen 8 O 16	fluorine 9 F 19
Period 3	silicon 14 Si 28	phosphorus 15 P 31	sulfur 16 S 32	chlorine 17 Cl 35.5
Period 4	germanium 32 Ge 72.6	arsenic 33 As 74.9	selenium 34 Se 79	bromine 35 Br 79.9

On reacting with hydrogen atoms, a single carbon atom will form CH₄, a single nitrogen atom will form NH₃, a single oxygen atom will form H₂O, and a single fluorine atom will form HF. (Note the 4:1, 3:1, 2:1 and 1:1 ratios)

oxygen 8 O 16	Element Name Atomic No. Element Symbol Atomic Weight
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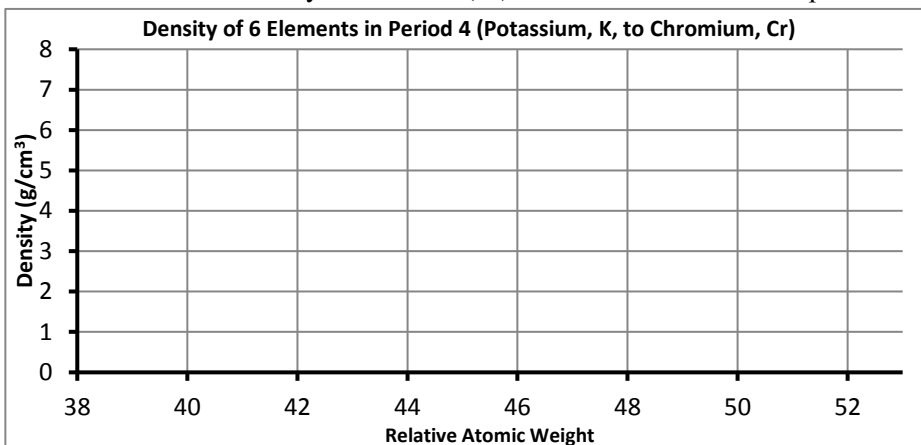
Fill in the table below. (The first row has been done for you, the answers to the second row are in the video, but you have to "do a Mendeleev" and "guess" the third row.)

Simplest Compounds Formed Between Each Element and Hydrogen	Group							
	14 (Mendeleev's Group 4)		15 (Mendeleev's Group 5)		16 (Mendeleev's Group 6)		17 (Mendeleev's Group 7)	
	C	CH ₄	N	NH ₃	O	H ₂ O	F	HF
	Si		P		S		Cl	
Ge		As		Se		Br		

11. Graph the data in the table and then estimate the density of titanium (Ti). Mark in titanium's data point.

Six Elements of Period 4	Atomic Weight	Density (g/cm ³)
Potassium, K	39.1	0.86
Calcium, Ca	40.1	1.55
Scandium, Sc	45.0	2.99
Titanium, Ti	47.9	
Vanadium, V	50.9	6.11
Chromium, Cr	52.0	7.19

This task involves you putting yourself in Mendeleev's shoes and making predictions! The trends actually work better if you use atomic number instead of atomic weight. The atomic number of an atom is the number of protons inside the atom's nucleus. More about this in Episode 5.



12. Trends in the Periodic Table are apparent both across each Period and down each Group. Using two lines (one for boiling point and one for melting point), graph the data in the table on the right onto the graph below. Use a colour code. Use the graph to estimate the melting point and boiling point of bromine. Mark in bromine's data points.

Elements of Group 17	Atomic Weight	Melting Point (°C)	Boiling Point (°C)
Fluorine, F	19	-220	-188
Chlorine, Cl	35.5	-101	-35
Bromine, Br	78		
Iodine, I	127	114	184

