

SNC2DI Chemistry : Review

2. Complete the chart for the following atoms and ions:

Name of Element	Symbol for Element	Atomic Number	Number of Protons	Number of Electrons	Number of Neutrons	Mass Number	Overall Charge
Phosphorus	P	15	15	18	23	38	3 -
Manganese	Mn	25	25	23	31	56	2+
Magnesium	Mg	12	12	12	14	26	0
Fluorine	F	9	9	10	10	19	1-
Argon	Ar	18	18	18	21	39	0
Magnesium	Mg	12	12	10	13	25	2 +
Scandium	Sc	21	21	18	23	44	3+
Manganese	Mn	25	25	21	31	56	4 +
Selenium	Se	34	34	36	45	79	2-
Chlorine	Cl	17	17	18	19	36	1 -

3. What relationship is there between the atoms of manganese shown in question 3? **Both have different charges - multivalent**

4. What relationship is there between the atoms of magnesium shown in question 3? **One is an atom and the other is an ion**

5. Krypton (atomic number 36) has a stable octet arrangement of electrons in the outer shell. List four ions with 36 electrons (include their charge): **Br⁻; Se²⁻; As³⁻; Rb⁺; Sr²⁺; Y³⁺**

6. Compare the properties of metals and non-metals with four different characteristics. **Metals are generally solids, lustrous, High MP and BP and conduct electricity. Non-metals are solids, liquids or gases, low MP and BP, dull and non-conductors of electricity**

7. Complete the following chart:

	calcium	selenium	cesium	lead	carbon	argon	fluorine
Period (row)	4	4	6	6	2	3	2
Group Number (column #)	2	16 (VI)	1	14 (IV)	14 (IV)	18 (VIII)	17 (VII)

8. Complete the following chart for the Groups (families) of elements on the Periodic Table:

Group Number	# of Valence Electrons	Metal or Non-metal?	Lose or Gain Electrons?	Charge on Ion that Forms
1	1	M	Lose	1+
2	2	M	Lose	2+
16 (VI)	6	NM	Gain	2-
17 (VII)	7	NM	Gain	1-
18 (VIII)	8	-	-	-

9. Would two metal atoms ever combine to form a compound? Explain why or why not. **Two metals do not combine as metals can only lose electrons and two metals giving away electrons will not work as there has to be one element to accept the electrons.**

10. What kinds of elements combine to make ionic compounds? What holds the compound together? **Metals and non-metals and the strong attraction between the + and - ions hold them together.**

11. What kinds of elements combine to form covalent compounds? What holds the compound together? **Two non-metals share electrons to form a covalent bond.**

12. What is the charge on the platinum ion in PtS_2 ? **4+** The zirconium ion in $\text{Zr}(\text{NO}_3)_4$? **4+**

13. Compare the properties of covalent and ionic compounds with regard to: melting points, presence of odours, solubility in water, and the ability of the pure substance and solution to conduct electricity. **Ionic – high MP, no odours, soluble, pure substance does not conduct while melted or solutions will conduct electricity. Covalent – low MP, have odour, not soluble in water, and do not conduct electricity**

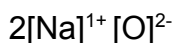
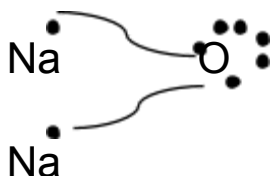
14. Use Lewis dot diagrams to show the formation of the **ionic** compounds between the following atoms below. Show all three steps:

Step 1: draw the neutral atoms and indicate the direction that the electrons will tend to move

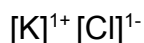
Step 2: draw the ions that form and show their charges

Step 3: write the chemical formula for the final compound and name the compound

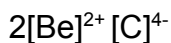
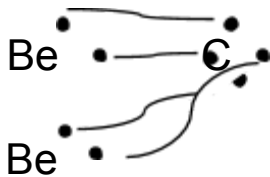
a) sodium and oxygen



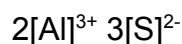
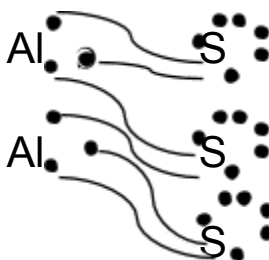
c) potassium and chloride



b) beryllium and carbon



d) aluminum and sulfur



15. Complete the following chart, assuming that hydrogen is a non-metal. Use the chemical formula to find the number of atoms or ions of each element that are present in each compound.

Chemical Formula	Ionic or Covalent Compound?	Number of Each Type of Atom in this Compound
$\text{C}_2\text{H}_2\text{F}_4$	Covalent	C=2; H=2; F=4
Na_2O	Ionic	Na=2; O=1
$\text{Ba}(\text{NO}_3)_2$	Ionic	Ba=1; N=2; O=6
NOCH_3	Covalent	N=1, O=1; C=1; H=3
$\text{Ca}(\text{HCO}_3)_2$	Ionic	Ca=1; H=2; C=2; O=6
$\text{Sn}_3(\text{PO}_4)_4$	Ionic	Sn =3, P=4; O=16

16. Name the following **ionic compounds** (remember to use Roman Numerals where necessary):

- | | | | |
|------------------------|-------------------------------|--|-----------------------------|
| a) CaO | Calcium oxide | f) Na ₂ (CO ₃) | sodium carbonate |
| b) PbCl ₄ | lead(IV)chloride | g) Fe ₂ O ₃ | iron (III) oxide |
| c) BaS | Barium sulfide | h) Mg(NO ₃) ₂ | Magnesium nitrate |
| d) CrCl ₃ | Chromium(III) chloride | i) Co ₂ (SO ₄) ₃ | Cobalt (III) sulfate |
| e) Al(OH) ₃ | Aluminum hydroxide | j) NH ₄ (HCO ₃) | ammonium bicarbonate |

17. Write the chemical formulas for the following ionic compounds:

- | | | | |
|---------------------------|---------------------------------------|------------------------------|---|
| a) silver carbonate | Ag₂CO₃ | f) manganese (II) bromide | MnBr₂ |
| b) nickel (III) hydroxide | Ni(OH)₃ | g) ammonium phosphate | (NH₄)₃PO₄ |
| c) iron (II) sulfide | FeS | h) zinc carbide | Zn₂C |
| c) cobalt (III) nitrate | Co(NO₃)₃ | i) tin (IV) hydrogen sulfate | Sn(HSO₄)₄ |
| d) molybdenum (V) oxide | Mo₂O₅ | j) gold (I) phosphide | Au₃P |

18. Write the chemical formulas of the following **covalent compounds**:

- | | | | |
|---------------------------|-----------------------------------|--------------------------|-----------------------------------|
| a) carbon tetrachloride | CCl₄ | e) tricarbon octahydride | C₃H₈ |
| b) diphosphorus tetroxide | P₂O₄ | f) nitrogen triiodide | NI₃ |
| c) bromine pentafluoride | BrF₅ | g) silicon dioxide | SiO₂ |
| d) selenium monoxide | SeO | h) iodine heptachloride | ICl₇ |

19. Write the names of the following covalent compounds using the prefix system:

- | | | | |
|-----------------------------------|----------------------------------|----------------------------------|--------------------------------|
| a) SF ₆ | sulfur hexafluoride | e) CH ₄ | carbon tetrahydride |
| b) P ₄ O ₁₀ | tetraphosphorous decoxide | f) N ₂ S ₅ | dinitrogen pentasulfide |
| c) Cl ₂ O ₇ | dichlorine heptoxide | g) OF ₂ | oxygen difluoride |
| d) SeF ₂ | selenium difluoride | h) NH ₃ | nitrogen trihydride |

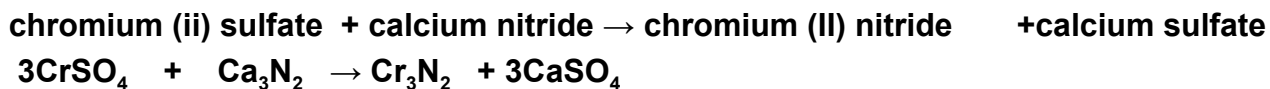
20. Balance the following chemical reactions. Classify each reaction.

Type of Reaction

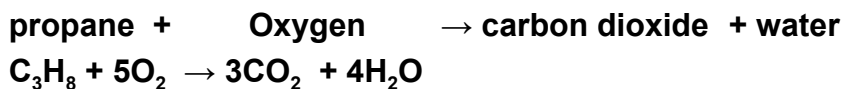
- | | | | | | | | | |
|----|------------------------------------|---|-------------------|---|------------------------------------|---|---------------------|-----------|
| a) | 4 Cu | + | O ₂ | → | 2Cu ₂ O | | S | |
| b) | XeF ₆ | + | 3H ₂ O | → | XeO ₃ | + | 6 HF | DD |
| c) | 2 Al | + | 6 HCl | → | 3 H ₂ | + | 2 AlCl ₃ | SD |
| d) | 2PCl ₃ | + | 3H ₂ S | → | P ₂ S ₃ | + | 6HCl | DD |
| e) | 2PH ₃ | → | 3H ₂ | + | 2 P | | D | |
| f) | 16 Cu | + | S ₈ | → | 8Cu ₂ S | | S | |
| g) | 2SnO | → | 2Sn | + | O ₂ | | D | |
| h) | 3Cu(NO ₃) ₂ | + | 2Fe | → | 2Fe(NO ₃) ₃ | + | 3Cu | SD |

21. Write word equations and balanced chemical equations for the following reactions:

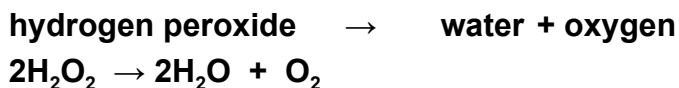
a) chromium (II) sulfate reacts with calcium nitride to form chromium (II) nitride and calcium sulfate



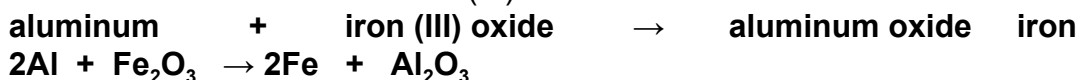
b) propane (C_3H_8) burns in air to produce carbon dioxide and water



c) hydrogen peroxide (H_2O_2) breaks down to form water and oxygen gas



d) aluminum metal reacts with iron (III) oxide to form iron metal and aluminum oxide



22. What are the four signs that a chemical change has taken place?

A change in colour, A precipitate is formed, bubbles are formed; energy is given out or taken in.

23. What causes a substance to be acidic, basic or neutral?

When a substance is dissolved in water and it releases a H^{1+} ion then it is an acid and when dissolved in water it releases a OH^{1-} ion it is a base. If it does not release either of the ions or releases both then those substances are neutral.

24. Identify the following as acids, bases or neutral substances from their chemical formulas:

HClO_3 Acid - chloric acid;	H_3PO_4 Acid – phosphoric acid
H_2O Neutral - water	NaCl Neutral
NH_4OH Base – ammonium hydroxide	$\text{Cd}(\text{OH})_2$ Base – cadmium hydroxide
$\text{Mg}(\text{OH})_2$ Base – magnesium hydroxide	HBr Acid – hydrobromic acid

25. A student tested the pH of several household items. She found the pH values shown in the chart to the right. Write acid or base in the space beside each substance.

_____ Toothpaste	(pH 8.1) Base
_____ Window cleaner	(pH 11.6) Base
_____ Mouthwash	(pH 7.2) Base
_____ Vinegar	(pH 2.5) Acid
_____ Grape juice	(pH 3.5) Acid
_____ Hair remover	(pH 11.7) Base
_____ Oven cleaner	(pH 13.7) Base
_____ Coke	(pH 3.1) Acid

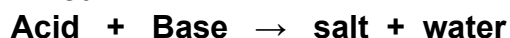
26. Referring to the pH values in question 34:

- How many times stronger is vinegar than grape juice? **10X**
- Which is stronger: hair remover or oven cleaner? **Oven cleaner** By how many times? **100X**
- Which substance is the strongest acid? **Vinegar**
- Which substance is the strongest base? **Oven cleaner**

27. What are three chemical indicators that can be used to identify acids and bases? What colour does each indicator turn in an

	acidic solution and	in a basic solution?
Universal indicator	red	blue green
Phenolphthalein	colourless	pink
Litmus blue	turns red	
Litmus red		turns blue
Red Cabbage juice	red	blue

28. Write the general word equation for the reaction that occurs when an acid and a base are mixed.



29. What happens to the **properties** of acids and bases when they are mixed together?

They lose their individual properties and get new properties.