

# SCI 10 Review Booklet

Name: KEY

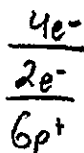
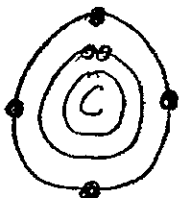
## Review of Atomic Structure

Draw the energy level diagrams and Bohr models for each of the following elements and answer the two questions at the bottom of the page.

1. hydrogen atom



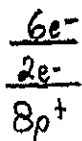
2. carbon atom



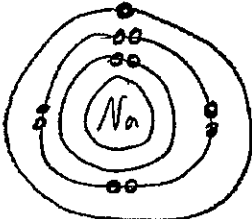
3. helium atom



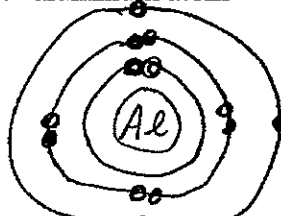
4. oxygen atom



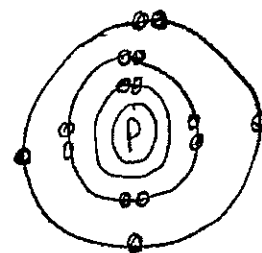
5. sodium atom



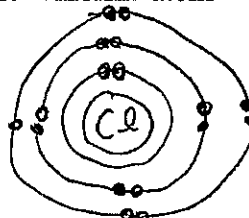
6. aluminum atom



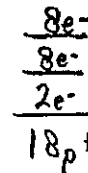
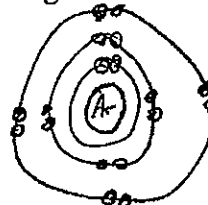
7. phosphorus atom



8. chlorine atom



9. argon atom



10. calcium atom

11. What is the relationship between group number and number of valence (outermost) electrons?

12. What is the relationship between period number and the number of energy levels occupied by electrons?

## Review of Ionic Structure

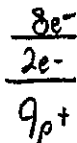
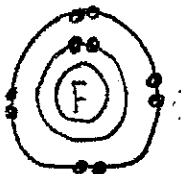
Draw the energy level diagrams and Bohr models for each of the following ions and answer the two questions at the bottom of the page.

1. lithium ion

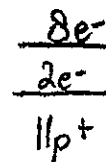


6. nitride ion

2. fluoride ion



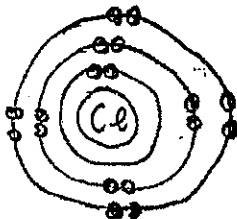
7. sodium ion



3. aluminum ion

8. sulphide ion

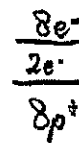
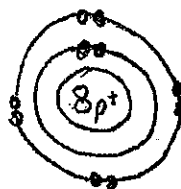
4. chloride ion



9. calcium ion

5. magnesium ion

10. oxide ion



11. What is the relationship between the electron configuration of an ion of one of the representative elements and the electron configuration of the nearest noble gas?

12. What problem arises when trying to predict the charge on an ion in Group 14?

## Review of Atoms vs. Ions

Complete the following chart:

Name	Symbol	# of Protons	# of Electrons	Net Charge
eg. calcium ion	$\text{Ca}^{2+}$	20	18	2+
1. oxygen atom	O	8	8	0
2. fluoride ion	$\text{F}^{-1}$	9	10	-1
3. carbon atom	C	6	6	0
4. chloride ion	$\text{Cl}^{-}$	17	18	-1
5. magnesium ion	$\text{Mg}^{2+}$	12	10	2+
6. sulphide ion	$\text{S}^{-2}$	16	18	2-
7. potassium ion	$\text{K}^{+}$	19	18	1+
8. neon atom	Ne	10	10	0
9. barium ion	$\text{Ba}^{2+}$	56	54	+2
10. helium atom	He	2	2	0
11. hydrogen ion	$\text{H}^{+}$	1	0	+1
12. nitride ion	$\text{N}^{-3}$	7	10	-3
13. iron (III) ion	$\text{Fe}^{3+}$	26	23	+3
14. tin (IV) ion	$\text{Sn}^{4+}$	50	46	+4
15. sodium ion	$\text{Na}^{+1}$	11	10	+1
16. aluminum ion	$\text{Al}^{3+}$	13	10	+3
17. copper (II) ion	$\text{Cu}^{2+}$	29	27	2+
18. iodide ion	$\text{I}^{-1}$	53	54	1-
19. gold atom	Au	79	79	0
20. cesium ion	$\text{Cs}^{+1}$	55	54	1+

## Review of Elements and Ionic Nomenclature

	Formula	IUPAC Name
1.	$\text{CdO}_{(s)}$	cadmium oxide
2.	$\text{NaF}$	sodium fluoride
3.	$\text{Cl}_2$	chlorine gas
4.	$\text{AlP}$	aluminium phosphide
5.	$\text{CuO}$	copper (II) oxide
6.	$\text{Mg(OH)}_{2(s)}$	magnesium hydroxide
7.	$\text{Na}_2\text{CO}_3$	sodium carbonate
8.	$\text{MgSO}_4$	magnesium sulphate
9.	$\text{N}_{2(g)}$	nitrogen gas
10.	$\text{LiCl}$	lithium chloride
11.	$\text{NaClO}_3$	sodium chlorate
12.	$\text{K}_3\text{PO}_{4(s)}$	potassium phosphate
13.	$\text{Ca}$	calcium metal
14.	$\text{NiBr}_3$	nickel (III) bromide
15.	$\text{MnO}_{2(s)}$	manganese (IV) oxide
16.	$(\text{NH}_4)_2\text{SO}_3$	ammonium sulphite
17.	$\text{ZnS}$	zinc sulphide
18.	$\text{NaHSO}_{3(s)}$	sodium hydrogen sulphite
19.	$(\text{NH}_4)_2\text{SO}_4$	ammonium sulphate
20.	$\text{Au}_{(s)}$	gold metal
21.	$\text{CuCl}_2$	copper (II) chloride
22.	$\text{SnF}_{2(s)}$	tin (II) fluoride
23.	$\text{P}_4$	phosphorus
24.	$\text{NaOCl}$	sodium hypochlorite
25.	$\text{KMnO}_{4(s)}$	potassium permanganate

## Review of Ionic Nomenclature

	Formula	IUPAC Name
26.	$\text{SrF}_2(\text{s})$	strontium fluoride
27.	$\text{RbCl}(\text{s})$	rubidium chloride
28.	$\text{Li}_2\text{O}(\text{s})$	lithium oxide
29.	$\text{Fe}_2\text{S}_3$	iron (III) sulphide
30.	$\text{ZnCl}_2$	zinc chloride
31.	$\text{Al}_2\text{S}_3$	aluminum sulphide
32.	$\text{CoCl}_2(\text{s})$	cobalt (II) chloride
33.	$\text{Au}(\text{NO}_3)_3(\text{s})$	gold (III) nitrate
34.	$\text{Cu}_2\text{O}(\text{s})$	copper (I) oxide
35.	$\text{Pb}(\text{CH}_3\text{COO})_4$	lead (IV) acetate
36.	$\text{CrO}$	chromium (II) oxide
37.	$\text{MgI}_2$	magnesium iodide
38.	$\text{KC}_6\text{H}_5\text{COO}(\text{s})$	potassium benzoate
39.	$\text{Na}_2\text{S}_2\text{O}_3(\text{s})$	sodium thiosulphate
40.	$\text{NH}_4\text{HCO}_3(\text{s})$	ammonium hydrogen carbonate
41.	$(\text{NH}_4)_2\text{S}$	ammonium sulphide
42.	$\text{BaSO}_3$	barium sulphite
43.	$\text{Mg}(\text{OH})_2$	magnesium hydroxide
44.	$\text{FeSO}_4$	iron (II) sulphate
45.	$\text{LiCl}$	lithium chloride
46.	$\text{Na}_3\text{PO}_4$	sodium phosphate
47.	$\text{TiO}_2(\text{s})$	titanium (IV) oxide
48.	$\text{Bi}_2(\text{SO}_4)_3$	bismuth (V) sulphate
49.	$\text{SnS}_2$	tin (IV) sulphide
50.	$\text{NaOH}(\text{s})$	sodium hydroxide

## Review of Molecular Nomenclature and Acids

	Formula	IUPAC Name
1.	$\text{NO}_3(\text{g})$	nitrogen trioxide
2.	$\text{NH}_3(\text{g})$	ammonia
3.	$\text{H}_2\text{S}(\text{g})$	hydrogen sulphide
4.	$\text{OF}_2$	oxygen difluoride
5.	$\text{CH}_4(\text{g})$	methane
6.	$\text{CH}_3\text{OH}(\text{l})$	methanol
7.	$\text{HBr}(\text{aq})$	hydrobromic acid
8.	$\text{H}_2\text{SO}_3(\text{aq})$	sulphurous acid
9.	$\text{CS}_2(\text{l})$	carbon disulphide
10.	$\text{H}_2\text{S}(\text{aq})$	hydrosulphuric acid
11.	$\text{SO}_2(\text{g})$	sulphur dioxide
12.	$\text{N}_2\text{O}_4$	dinitrogen tetraoxide
13.	$\text{HNO}_2(\text{aq})$	nitrous acid
14.	$\text{CO}(\text{g})$	carbon monoxide
15.	$\text{C}_{12}\text{H}_{22}\text{O}_{11}(\text{s})$	sucrose
16.	$\text{HOCl}(\text{aq})$	hypochlorous acid
17.	$\text{As}_2\text{O}_3$	diarsenic trioxide
18.	$\text{C}_2\text{H}_5\text{OH}$	ethanol
19.	$\text{H}_2\text{CO}_3(\text{aq})$	carbonic acid
20.	$\text{HClO}_4$	perchloric acid
21.	$\text{P}_4\text{O}_{10}(\text{s})$	tetraphosphorous decaoxide
22.	$\text{SO}_3$	sulphur trioxide
23.	$\text{CF}_4(\text{l})$	carbon tetrafluoride
24.	$\text{SiO}_2$	silicon dioxide
25.	$\text{CH}_3\text{COOH}(\text{aq})$	acetic acid

## Review of Nomenclature

	Class	Formula	IUPAC Name
1.	A	$H_3PO_{4(aq)}$	phosphoric acid
2.	A	$HClO_2$	chlorous acid
3.	metal	$Mg$	magnesium
4.	I	$Al_2(SO_4)_3(s)$	aluminium sulphate
5.	I	$MgCl_2$	magnesium chloride
6.	I	$NH_4NO_2(s)$	ammonium nitrite
7.	M	$PH_3$	phosphorus trihydride
8.	I	$KNO_3(s)$	potassium nitrate
9.	I	$NaNO_3$	sodium nitrate
10.	A	$HNO_2(aq)$	nitrous acid
11.	I	$Al(OH)_3(s)$	aluminium hydroxide
12.	I	$Na_2SO_4$	sodium sulphate
13.	I	$(NH_4)_2SO_4(s)$	ammonium sulphate
14.	I	$PbF_4(s)$	lead (IV) fluoride
15.	M	$H_2O_2$	hydrogen peroxide
16.	I	$PbO(s)$	lead (II) oxide
17.	A	$HF(aq)$	hydrofluoric acid
18.	I	$KClO(s)$	potassium hypochlorite
19.	non-metal	$Br_2$	bromine
20.	M	$N_2O_3(g)$	dinitrogen trioxide
21.	I	$K_2CO_3$	potassium carbonate
22.	A	$HNO_3$	nitric acid
23.	M	$HF(g)$	hydrogen fluoride
24.	I	$NaOH$	sodium hydroxide
25.	I	$NaHSO_3(s)$	sodium hydrogen sulphite

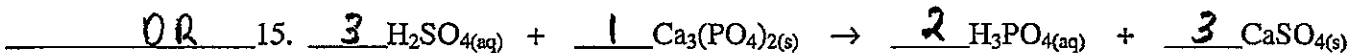
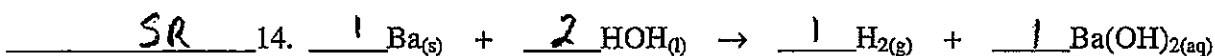
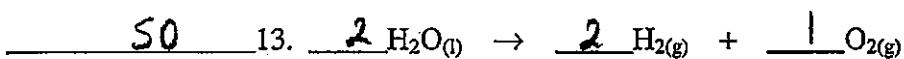
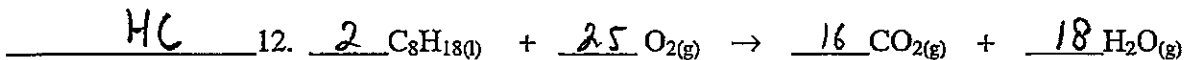
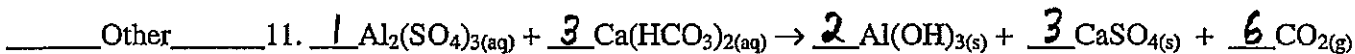
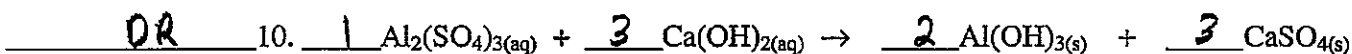
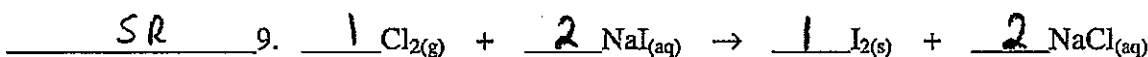
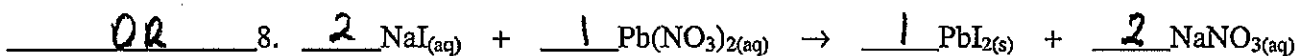
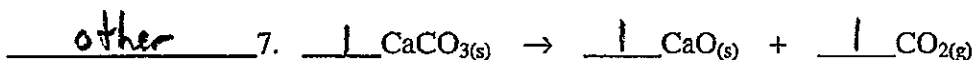
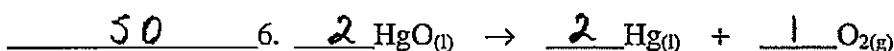
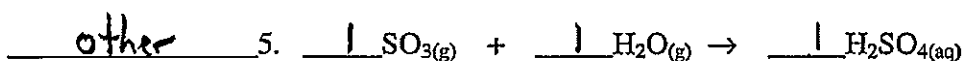
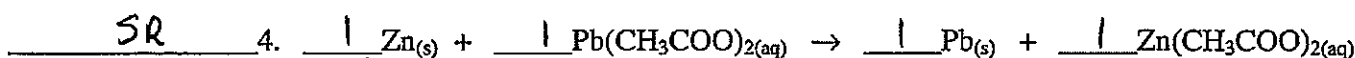
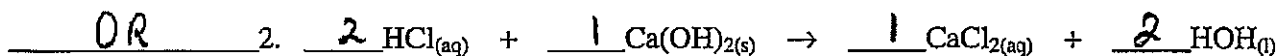
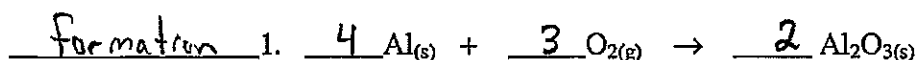
## Review of Nomenclature

	Class	Formula	IUPAC Name
26.	I	$MgSO_4(s)$	magnesium sulphate
27.	I	$Ca(OH)_2(s)$	calcium hydroxide
28.	I	$AuCl(s)$	gold (I) chloride
29.	I	$CaO(s)$	calcium oxide
30.	I	$CuSO_4(s)$	copper (II) sulphate
31.	M	$S_8(s)$	sulphur
32.	I	$Ca(HCO_3)_2(s)$	calcium hydrogen carbonate
33.	I	$KBr(s)$	potassium bromide
34.	I	$TiO_2(s)$	titanium (IV) oxide
35.	M	$PCl_5(g)$	phosphorous pentachloride
36.	I	$NaClO_4(s)$	sodium chlorate
37.	M	$N_2H_4(l)$	dinitrogen tetrahydride
38.	M	$HCl(g)$	hydrogen chloride
39.	A	$HClO_3(aq)$	chloric acid
40.	I	$Li_2S_2O_3(s)$	lithium thiosulphate
41.	M	$B_2H_6(g)$	diboron hexahydride
42.	M	$PCl_3$	nitrogen trichloride
43.	I	$NaHSO_3(s)$	sodium hydrogen sulphite
44.	metal	$Al(s)$	aluminum
45.	A	$HBr(aq)$	hydrobromic acid
46.	non-metal	$Si(s)$	silicon
47.	I	$(NH_4)_3PO_4$	ammonium phosphate
48.	non-metal	$Xe$	xenon
49.	M	$SF_2(s)$	sulphur difluoride
50.	I	$Na_2SiO_3(s)$	sodium silicate



## Review of Chemical Reactions

For each of the following reactions, identify the reaction type and balance the reaction.



## Review of Chemical Reactions

For each of the following word equations, write out the balanced chemical reaction including all states and identify the reaction type.

\_\_\_\_\_ 1. water  $\rightarrow$  hydrogen + oxygen

\_\_\_\_\_ 2. nitrogen + hydrogen  $\rightarrow$  ammonia gas

\_\_\_\_\_ 3. sulphuric acid + sodium hydroxide  $\rightarrow$  water + sodium sulphate

\_\_\_\_\_ 4. aluminum + copper (II) nitrate  $\rightarrow$  copper + aluminum nitrate

\_\_\_\_\_ 5. chlorine + potassium bromide  $\rightarrow$  bromine + potassium chloride

\_\_\_\_\_ 6. sodium hydroxide + aluminum sulphate  $\rightarrow$  aluminum hydroxide + sodium sulphate

\_\_\_\_\_ 7. phosphorus + oxygen  $\rightarrow$  solid tetraphosphorus decaoxide

\_\_\_\_\_ 8. lead (II) nitrate + sodium iodide  $\rightarrow$  lead (II) iodide + sodium nitrate

\_\_\_\_\_ 9. methanol + oxygen  $\rightarrow$  carbon dioxide + water vapour

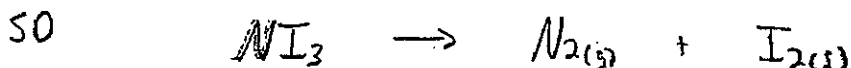
Other \_\_\_\_\_ 10. nitrogen dioxide gas + water  $\rightarrow$  nitric acid + nitrogen monoxide gas

## Review of Predicting Chemical Reactions

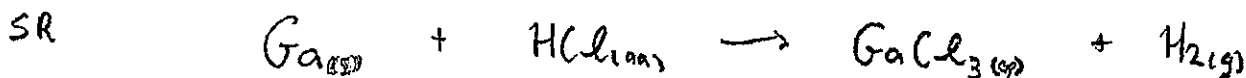
For each of the following reactions:

1. Write the correct equation including states for each element and compound.
2. Balance the equation.
3. State the reaction type.

1. Nitrogen triiodide decomposes explosively into its elements.



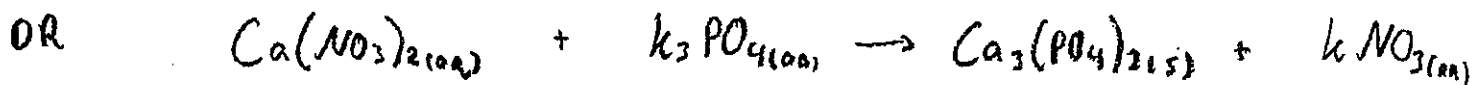
2. Gallium metal reacts with hydrochloric acid.



3. In a charcoal barbeque, some of the carbon undergoes incomplete combustion to produce deadly carbon monoxide gas.



4. Solutions of calcium nitrate and potassium phosphate are mixed.



5. Chlorine gas is bubbled through an aluminum iodide solution.



6. Iron reacts with silver nitrate. The iron (III) compound is formed.



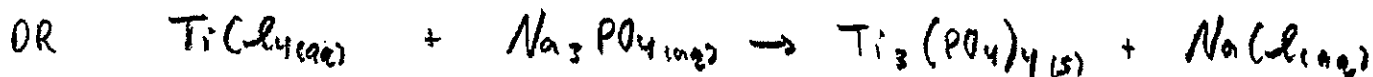
7. Acetylene ( $C_2H_2(g)$ ) burns in a welding torch.



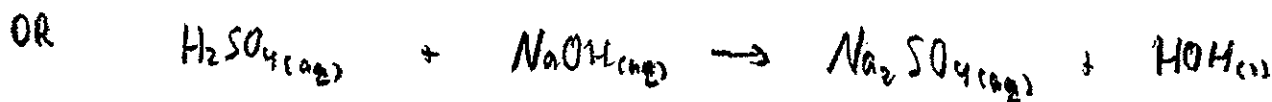
8. Copper ore (copper (II) oxide) is decomposed to produce copper metal.



9. Titanium (IV) chloride solution reacts with a sodium phosphate solution.



10. Sulphuric acid is neutralized by sodium hydroxide.



## Review of Significant Digits, Scientific Notation and SI Units

State the number of significant digits in each of the following measured values:

- |                         |          |                            |          |
|-------------------------|----------|----------------------------|----------|
| 1. 18.56 g              | <u>4</u> | 4. 1.00 W                  | <u>3</u> |
| 2. 1500°C               | <u>4</u> | 5. 0.05730 mol             | <u>4</u> |
| 3. 0.0062 L             | <u>2</u> | 6. $8.0 \times 10^{-2}$ mL | <u>2</u> |
| 7. 14.08 cm             | <u>4</u> | 9. 0.100 km                | <u>3</u> |
| 8. $1.58 \times 10^8$ m | <u>3</u> | 10. 62 km/h                | <u>2</u> |

Convert the following numbers into scientific notation. The number in brackets indicates the number of significant digits the answer is to be rounded to.

- |           |  |     |               |   |     |
|-----------|--|-----|---------------|---|-----|
| 1. 1000   | <u><math>1 \times 10^3</math></u>      | (1) | 4. 0.00001098 | <u><math>1.10 \times 10^{-5}</math></u> | (3) |
| 2. 492.32 | <u><math>4.92 \times 10^2</math></u>   | (3) | 5. 6 995 000  | <u><math>7.00 \times 10^6</math></u>    | (3) |
| 3. 0.0573 | <u><math>5.7 \times 10^{-2}</math></u> | (2) | 6. 62.49      | <u><math>6.2 \times 10^1</math></u>     | (2) |

Using the SI Prefixes table on your data sheet, perform the following conversions. Maintain the same number of significant digits in each conversion.

- |  |  |
|--|--|
| 1. 0.520 km = <u>520</u> m   | 6. 200 mL = <u><math>2.00 \times 10^8</math></u> L                           |
| 2. 100 mL = <u>0.100</u> L   | 7. 45 g = <u><math>4.5 \times 10^{-2}</math></u> kg <small>0.045</small>     |
| 3. 152.5 cm = <u>1.525</u> m   | 8. 10.8 mol = <u><math>1.08 \times 10^4</math></u> mmol <small>10800</small> |
| 4. 3300 mg = <u>3.300</u> g  | 9. 0.450 L = <u>450</u> mL   |
| 5. 650 kg = <u><del>650000</del></u> g<br><u><math>6.50 \times 10^5</math></u> | 10. 1500 m = <u>1.500</u> km   |

Perform the following calculations. Round your answer to the correct number of significant digits, using scientific notation where necessary. Include units.

- 16.56 mL - 6.3 mL = 10.3 mL
- 21.4 g ÷ 0.825 mol = 25.9 g/mol
- 480 km + 24.07 km = 504 km
- 0.550 mol × 40.00 g/mol = 22.0 g
- 18.4 g/mL × 5.5 mL =  $1.0 \times 10^2$  g
- 22.99 g/mol + 35.45 g/mol = 58.44 g/mol
- 18.5°C - 4.5°C = 14.0°C
- 6.0 g ÷ 24.30 g/mol = 0.25 mol
- 19.55 mL - 17.55 mL = 2.00 mL
- 15 600 g ÷ 2000 mol = 7.800 g/mol

### Review of Molar Mass and Mole Calculations

Complete the following chart, showing all calculations, formulas, substitutions, units and significant digits.

Name and Formula	Molar Mass	Mass	Moles
1. NaCl <sub>(s)</sub>	58.44 g/mol	12 g	0.20 mol
2. sodium hydroxide	40.00 g/mol	5.48 g	0.137 mol
3. (NH <sub>4</sub> ) <sub>3</sub> PO <sub>4(s)</sub>	149.12 g/mol	89.5 g	0.600 mol
4. sodium carbonate octahydrate	105.99 g/mol	50 g	0.47 mol

Name and Formula	Molar Mass	Mass	Moles
5. $\text{Ca}(\text{NO}_3)_2(\text{s})$	164.10 g/mol	8.45 g	0.0515 mol
6. potassium dichromate	294.20 g/mol	5.65 g	0.0192 mol
7. $\text{Na}_2\text{CO}_3(\text{s})$	105.99 g/mol	90.1 g	0.850 mol
8. sulphur trioxide	80.07 g/mol	116 g	1.45 mol

## Science 10 Review

1. Define the following terms:

- |                     |                                  |
|---------------------|----------------------------------|
| a) proton           | i) multivalent                   |
| b) neutron          | j) endothermic                   |
| c) electron         | k) exothermic                    |
| d) atom             | l) law of conservation of matter |
| e) ion              | m) mole                          |
| f) valence electron | n) molar mass                    |
| g) octet rule       |                                  |
| h) monovalent       |                                  |

2. Draw the energy level diagrams for the following:

- |                  |                  |
|------------------|------------------|
| a) fluorine atom | d) nitride ion   |
| b) carbon atom   | e) argon atom    |
| c) lithium ion   | f) magnesium ion |

3. Where on the periodic table would you find nonmetals? What kind of charge do all nonmetals have?

4. Where on the periodic table would you find metals? What kind of charge do all metals have?

5. Perform the following unit conversions:

- |   |  |
|---|--|
| a) $500 \text{ kg} = \frac{5.00 \times 10^5}{1000} \text{ g}$               | e) $600 \text{ mg} = \frac{0.600}{1000} \text{ g}$                     |
| b) $25.5 \text{ mL} = \frac{0.0255}{1000} \text{ L}$                        | f) $9.85 \text{ GL} = \frac{9.85 \times 10^9}{1000} \text{ L}$         |
| c) $102.6 \text{ mmol} = \frac{0.1026}{1000} \text{ mol}$                   | g) $6.85 \text{ cm} = \frac{0.0685}{100} \text{ m}$                    |
| d) $58.2 \text{ MJ} = \frac{5.82 \times 10^7 \text{ J}}{1000000} \text{ J}$ | h) $680 \text{ nm} = \frac{6.80 \times 10^{-7}}{1000000000} \text{ m}$ |

6. Calculate the number of moles in 6.55 g of  $\text{NaHCO}_3(\text{s})$ .

$$0.0780 \text{ mol}$$

7. Calculate the mass of 8.98 mol of  $\text{AgNO}_3(\text{s})$ .

$$1.53 \times 10^3 \text{ g} \text{ or } 1.53 \text{ kg}$$

8. What is the mass of 0.155 mol of potassium phosphate?  $\text{K}_3\text{PO}_4$

$$32.9 \text{ g}$$

9. How many moles are in 0.558 kg of dinitrogen dioxide?  $\text{N}_2\text{O}_2$

$$558 \text{ g}$$
$$9.30 \text{ mol}$$

10. Complete the following chart:

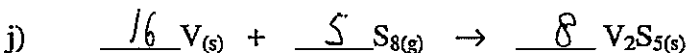
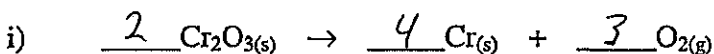
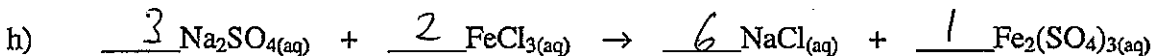
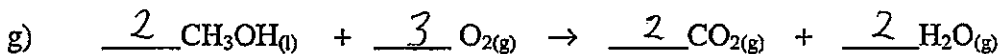
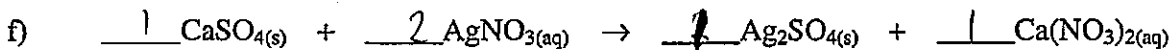
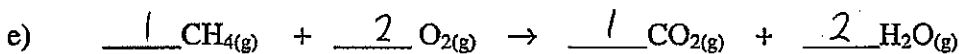
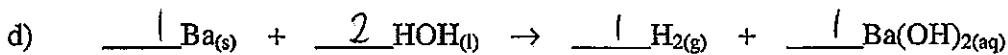
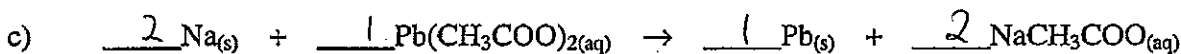
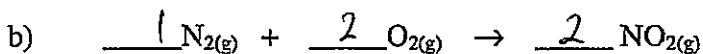
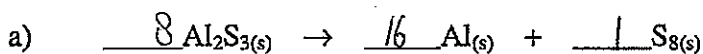
	Class	Formula	IUPAC Name
1.		$\text{SrCl}_2$	strontium chloride
2.		$\text{H}_2\text{S}_{(\text{aq})}$	hydrosulfuric acid
3.		$\text{Na}_2\text{O}$	sodium oxide
4.		$\text{H}_2\text{O}$	water
5.		$\text{CaS}_2\text{O}_3 \cdot n\text{H}_2\text{O}$	calcium thiosulphate
6.		$\text{Fe}(\text{IO}_3)_3$	iron (III) iodate
7.		$\text{P}_2\text{O}_4$	diphosphorous tetraoxide
8.		$\text{S}_{8(\text{s})}$	sulphur
9.		$\text{Ni}(\text{OH})_2$	nickel (II) hydroxide
10.		$\text{H}_3\text{PO}_4_{(\text{aq})}$	phosphoric acid
11.		$\text{NaCl}$	sodium chloride
12.		$\text{N}_{2(\text{g})}$	nitrogen
13.		$\text{Sb}_2(\text{SO}_3)_5$	antimony (V) sulfite
14.		$\text{Ca}_{(\text{s})}$	calcium
15.		$\text{NaCl}$	sodium chloride
16.		$\text{CuSO}_4$	copper (II) sulphate pentahydrate
17.		$(\text{NH}_4)_2\text{S}$	ammonium sulphide
18.		$\text{Bi}_2(\text{SO}_4)_3$	bismuth (III) sulphate
19.		$\text{Na}_2\text{SO}_4$	sodium sulphate decahydrate
20.		$\text{H}_2\text{O}$	water
21.		$\text{Cu}_2\text{O}$	copper (I) oxide
22.		$\text{Ca}$	calcium
23.		$\text{HI}_{(\text{aq})}$	hydroiodic acid
24.		$\text{Ra}_{(\text{g})}$	radon gas
25.		$\text{C}_2\text{H}_5\text{OH}$	ethanol
26.		$\text{C}_{12}\text{H}_{22}\text{O}_{11}$	sucrose
27.		$\text{N}_2$	nitrogen gas
28.		$\text{H}_2\text{CO}_3$	carbonic acid
29.		$\text{N}_2\text{O}$	dinitrogen monoxide
30.		$\text{HNO}_2$	nitrous acid



11. After the chemical formula for each compound, state the solubility with either (aq) for soluble or (s) for low solubility in water.

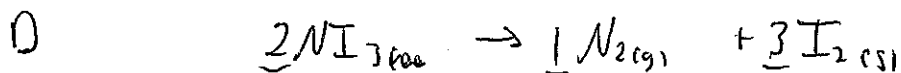
- |                        |                        |
|------------------------|------------------------|
| 1. $K_2S$ ( )          | 11. $Zn_3(PO_4)_2$ ( ) |
| 2. $NH_4CH_3COO$ ( )   | 12. $PbI_2$ ( )        |
| 3. $Fe(OH)_3$ ( )      | 13. $ZnSO_4$ ( )       |
| 4. $HgBr$ ( )          | 14. $Cu(NO_3)_2$ ( )   |
| 5. $BaSO_4$ ( )        | 15. $AgCl$ ( )         |
| 6. $CaCl_2$ ( )        | 16. $CdSO_4$ ( )       |
| 7. $CuI_2$ ( )         | 17. $NH_4Cl$ ( )       |
| 8. $Ca(CH_3COO)_2$ ( ) | 18. $CuS$ ( )          |
| 9. $FeSO_4$ ( )        | 19. $PbCl_2$ ( )       |
| 10. $Co(NO_3)_2$ ( )   | 20. $Na_3PO_4$ ( )     |

12. Balance the following reactions and give the reaction type:

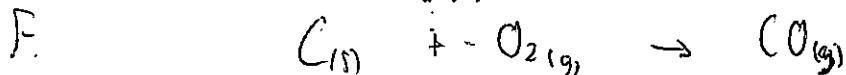


13. For each of the following word problems, give the reaction type and write out a balanced chemical reaction including all states of matter.

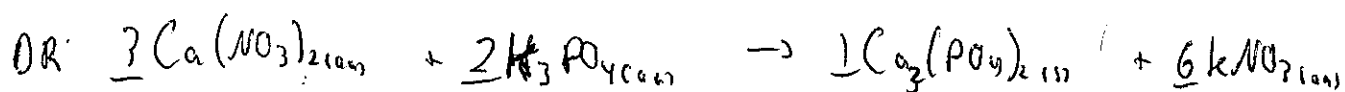
a) Nitrogen triiodide decomposes explosively into its elements.



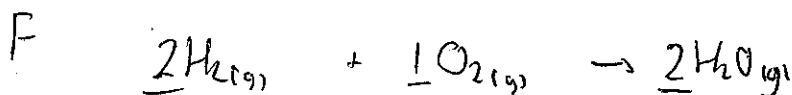
b) In a charcoal barbeque, some of the carbon undergoes incomplete combustion to produce deadly carbon monoxide gas.



c) Solutions of calcium nitrate and potassium phosphate are mixed.



d) The main fuel used to propel rockets into outer space is liquid hydrogen combining with liquid oxygen to produce water vapour.



e) Chlorine gas is bubbled through an aluminum iodide solution.

