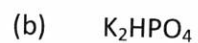
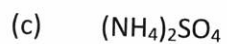


1. Name the following compounds.





















2. Write formulae for the following compounds.

- (a) ammonium chloride _____
- (b) aluminium sulfate _____
- (c) ammonia _____
- (d) phosphorous triiodide _____
- (e) sodium permanganate _____
- (f) copper (II) oxide _____
- (g) hydrogen peroxide _____
- (h) iron (III) phosphate _____
- (i) carbon tetrafluoride _____
- (j) potassium chromate _____

3. Balance the following equations.

- (a) $\text{Zn} + \text{NaOH} + \text{H}_2\text{O} \rightarrow \text{H}_2 + \text{Na}_2[\text{Zn}(\text{OH})_4]$
- (b) $\text{Al}(\text{OH})_3 + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2\text{O}$
- (c) $\text{Ba}(\text{OH})_2 + \text{HNO}_3 \rightarrow \text{Ba}(\text{NO}_3)_2 + \text{H}_2\text{O}$
- (d) $\text{Na}_2\text{O}_2 + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{O}_2$
- (e) $\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$

4. Draw Lewis diagrams (e^- dot diagrams) for each of the following:



5. Complete the following table:

Symbol (including charges where appropriate)	Number of Protons in the Nucleus	Number of Neutrons in the Nucleus	Number of Electrons	Net Charge
	17	21		-1
$^{79}_{34}\text{Y}$				
	56	81		+2

6. Distinguish between the following terms.

(i) Molecule versus ion.

(ii) Covalent bonding versus ionic bonding.

7. (a) Write the electron configuration for these 3 species (principle energy levels only).

Na⁺ _____ P³⁻ _____ Ne _____

(b) For each of the following atomic numbers, use the periodic table to write the formula (including the charge) for the *simple ion* that the element is most likely to form in ionic compounds.

(i) 56

(ii) 87

(iii) 35

8. Name or give symbols for all the elements that match the following criteria:

(a) The elements that have similar properties to sodium. _____

(b) The halogen from the fourth period. _____

(c) The fifth period element with similar chemical properties to calcium. _____

(d) The element in the same group as oxygen whose most stable ion contains 54 electrons. _____

9. (a) Calculate the molar mass of the artificial sweetener aspartame which has the formula C₁₄H₁₈N₂O₅.

(b) How many atoms are present in 1 mole of this compound?

10. A solution of K_2CO_3 was prepared by dissolving 3.25g of K_2CO_3 in 150.0 mL of water. Calculate the concentration of this solution in

(a) mol L^{-1}

(b) g L^{-1}

11. Write equations for any reactions that occur in the following situations. If no reaction occurs write "**no reaction**". In each case describe **in full** what you would observe, including any colours, odours, precipitates (give the colour), or gases evolved (give the colour or describe as colourless).

- (a) Copper II sulphate solution is mixed with a potassium carbonate solution.

Equation _____

Observation _____

- (b) Sulfuric acid is added to a sodium carbonate solution.

Equation _____

Observation _____

- (c) Hydrochloric acid is added to solid calcium metal.

Equation _____

Observation _____

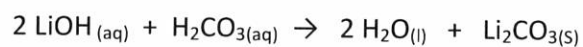
- (d) Hydrochloric acid is added to solid aluminium hydroxide.

Equation _____

Observation _____

12. Calculate the volume of 0.155 mol L^{-1} NaOH needed to neutralise 150.0 mL of 0.255 mol L^{-1} H_3PO_4 .

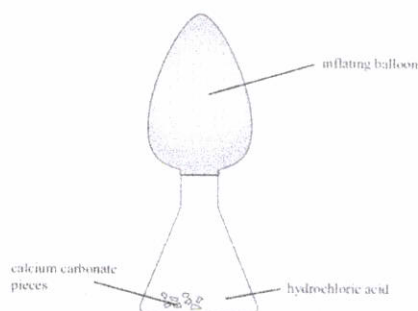
13. A 0.175 g sample of solid lithium hydroxide solution was mixed with a 60.0 mL sample of a $0.0370 \text{ mol L}^{-1}$ carbonic acid solution and the following reaction occurred:



Find:

- (a) the number of moles of lithium hydroxide and carbonic acid present.
- (b) the limiting reagent
- (c) the mass of any precipitate formed

14. Calcium carbonate pieces are placed in a flask and hydrochloric acid is added. Immediately a balloon is placed over the top of the flask. The balloon then starts to inflate.

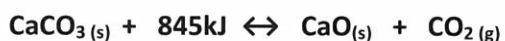


- (a) Explain why the balloon inflates.

- (b) In a second experiment, the same mass of calcium carbonate in a powdered form is used. Explain why the balloon inflates faster when powdered calcium carbonate is used.

- (c) Discuss another **two** methods that could be used to make the balloon inflate faster. In your answer you should refer to rates of reaction and particle collisions.

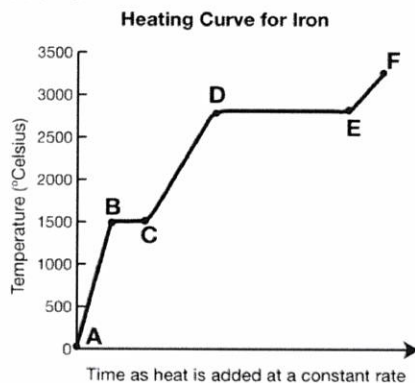
15. Calcium carbonate will decompose when heated strongly as shown in the equation below.



- (a) Write an equilibrium constant expression for this reaction.
- (b) The value for K_{eq} is 2.5×10^{-3} at 800°C . From this information state which species in the reaction will be present in the greatest amount at equilibrium.
- (c) Use Le Chatelier's principle to predict the effect of the following changes on the equilibrium yield of carbon dioxide from the thermal decomposition of calcium carbonate.

Change made to the system	Effect on equilibrium concentration of CO_2 . (Increases, decreases or no change)
Grinding the calcium carbonate into a fine powder	
Increasing the pressure in the system by adding some helium gas	
The addition of extra calcium oxide to the system	
Heating the system	
Increasing the volume of the system	
Removing the lid on the reaction vessel for a moment to stir the contents. During this time some of the CO_2 escaped	

16. The heating curve below shows the change in temperature in a sample of iron as heat is added at a constant rate. Use this information to answer the following questions.



- (a) Describe the phase change that occurred between points D and E on the graph.

- (b) Explain why the temperature remained constant between points D and E.

- (c) What is the melting point of iron? _____

- (d) What is the boiling point of iron? _____

- (e) Compare the boiling point of iron and water (water boils at 100°C). Which substance has stronger intermolecular forces? How do you know?
