N5 Chemistry
Unit 3: Chemistry in Society
Homework 3.2

Name _____ **Teacher** _____

1. Which of the following metals can be extracted from its oxide by heat alone?

   A Aluminium
   B Silver
   C Iron
   D Zinc

   Answer _____

2. Which of the following metals does not react with dilute acid?

   A Magnesium
   B Calcium
   C Copper
   D Zinc

   Answer _____

3. Which salt could be produced by a precipitation reaction?
   You may wish to refer to the data booklet.

   A Sodium chloride
   B Sodium sulfate
   C Barium chloride
   D Barium sulfate

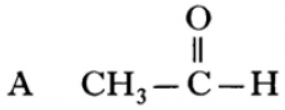
   Answer _____

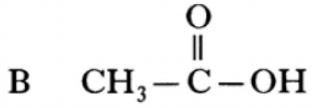
4. How many moles of sodium nitrate are needed to make 500 cm^3 of 2 mol l^{-1} solution?

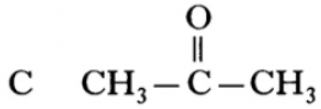
   A 0·1
   B 0·5
   C 1·0
   D 2·0

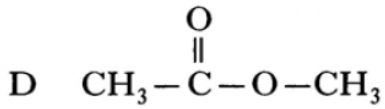
   Answer _____

5. Which of the following is a carboxylic acid?

   A 

   B 

   C 

   D 

   Answer _____

6. A group of S4 boys were studying the reactions of an unknown metal **X**. Three observations were recorded.

   1 Metal **X** was oxidised when placed in a solution of copper ions.
   2 Magnesium reacted more vigorously with dilute acid than metal **X**.
   3 The oxide of metal **X** is less stable to heat than the oxide of iron.

   Which is the correct order of reactivity (most reactive first)?

   A **X** Mg Fe Cu
   B Mg **X** Fe Cu
   C Mg Fe **X** Cu
   D Mg Fe Cu **X**

   Answer _____

7. Read the passage below and answer the questions that follow.

Potassium Permanganate ($KMnO_4$)—The Purple Solution

Potassium permanganate's strong oxidising properties make it an effective disinfectant. Complaints such as athlete's foot and some fungal infections are treated by bathing the affected area in $KMnO_4$ solution.

In warm climates vegetables are washed in $KMnO_4$ to kill bacteria such as E. coli and S. aureus. Chemists use $KMnO_4$ in the manufacture of saccharin, ascorbic acid (vitamin C) and benzoic acid.

Baeyer's reagent is an alkaline solution of $KMnO_4$ and is used to detect unsaturated organic compounds. The reaction of $KMnO_4$ with alkenes is also used to extend the shelf life of fruit. Ripening fruit releases ethene gas which causes other fruit to ripen. Shipping containers are fitted with gas scrubbers that use alumina or zeolite impregnated with $KMnO_4$ to stop the fruit ripening too quickly.

$$C_2H_4 + 4KMnO_4 \rightarrow 4MnO_2 + 4KOH + 2CO_2$$

The scrubbers indicate when they need to be replaced because the purple colour changes to brown as the $KMnO_4$ is used up.

The passage on potassium permanganate was taken from an article by Simon Cotton on "Soundbite molecules" in "Education in Chemistry" November 2009.

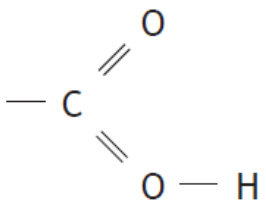
a) Suggest a pH for Baeyer's reagent.

_____ 1

b) Name the gas removed by the scrubbers.

_____ 1

c) Name a chemical mentioned in the passage which contains the following functional group.



_____ 1

d) Potassium permanganate can also react with oxalic acid in a redox reaction. The ion-electron equation for the reaction of the permanganate ion is:

$$MnO_4^-(aq) + 8H^+(aq) + 5e^- \longrightarrow Mn^{2+}(aq) + 4H_2O(\ell)$$

What type of reaction is shown by this ion-electron equation?

_____ 1

8. The group 7 element bromine was discovered by Balard in 1826. Bromine gets it name from the Greek "bromos" meaning stench. Bromine consists of a mixture of two isotopes, $^{79}_{35}Br$ and $^{81}_{35}Br$.

a) What is meant by the term isotope?

_____

_____ 1

b) Complete the table for $^{79}_{35}Br$.

Isotope	*Number of protons*	*Number of neutrons*
$^{79}_{35}Br$		

1

c) The relative atomic mass of an element can be calculated using the formula:

$$\frac{(\text{mass of isotope A} \times \% \text{ of isotope A}) + (\text{mass of isotope B} \times \% \text{ of isotope B})}{100}$$

A sample of bromine contains 55% of the isotope with mass 79 and 45% of the isotope with mass 81. Calculate the relative atomic mass of the bromine in this sample.

Show your working clearly.

2

d) In 1825 bromine had been isolated from sea water by Liebig who mistakenly thought it was a compound of iodine and chlorine. Using your knowledge of chemistry, comment on why Liebig might have made this mistake.

_____

_____

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_____ 3

9. The results of experiments with three metals, **A**, **B** and **C** and their oxides are summarised in the table below.

Metal	Column 1 Reaction of metal with cold water	Column 2 Action of heat on metal oxide
A	no reaction	no reaction
B	very slow reaction	no reaction
C	no reaction	metal formed

a) State what information about the order of reactivity of the metals can be obtained from **Column 1 alone**.

_____

_____ 1

b) Place the metals in order of reactivity, **starting with the most reactive.**

_____ 1

10. When sulfuric acid is neutralised by excess magnesium carbonate, a salt, carbon dioxide and water are formed.

a) What happens to the pH of the sulfuric acid as it is neutralised?

_____ 1

b) Give the **ionic** formula for magnesium carbonate.

_____ 1

c) Name the salt produced in the reaction.

_____ 1

d) Which two ions react together to form the carbon dioxide and water?

_____ 1

e) What would have to be done to obtained a pure salt solution from the reaction mixture?

_____

_____ 1

f) How would a dry sample of the salt be obtained?

_____

_____ 1

11. Some metals are found in the Earth's crust but others have to be extracted from their ores.

a) What is meant by the term ore?

_____ 1

b Name a metal found uncombined.

_____ 1

c) Name the method used to obtain aluminium from its oxide, Al_2O_3.

_____ 1

d) Give the ion-electron equation for the extraction of aluminium from its ore to form aluminium atoms. You may wish to refer to the data booklet (page 10).

_____ 1

e) Calculate the percentage by mass of aluminium in aluminium oxide, Al_2O_3.
Space for working and answer

3

12. Magnesium reacts with dilute hydrochloric acid to produce a gas.

a) i) Name the gas produced.

_____ 1

ii) In the reaction, the magnesium atoms lose electrons to form magnesium ions

$Mg(s) \longrightarrow Mg^{2+}(aq) + 2e^-$

Name this type of reaction.

_____ 1

b) Give the ion-electron equation for the reduction of hydrogen ions when magnesium reacts with dilute acid. You may wish to refer to the data booklet, page 10.

_____ 1

c) Name a metal which will **not** react with dilute acid.

_____ 1

Total Marks 36