N5 Chemistry
Unit 3: Chemistry in Society
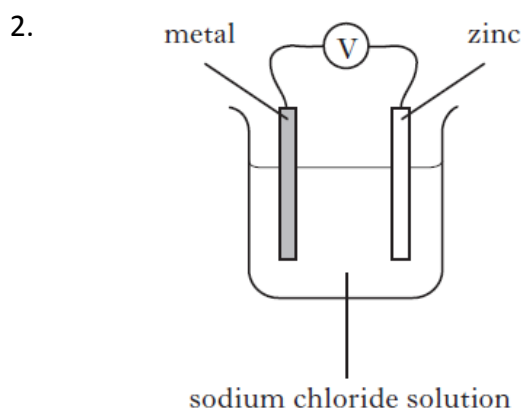## Homework 3.10

Name _____   Teacher _____

1. The half-life of the isotope ^{210}Pb is 21 years. What fraction of the original ^{210}Pb atoms will be present after 63 years?

   A   0·5
   B   0·25
   C   0·125
   D   0·0625

   Answer _____

2.

metal   V   zinc

sodium chloride solution

   Which of the following metals, when linked to zinc, would give the highest cell voltage? (You may wish to refer to the data booklet.)

   A   Copper
   B   Iron
   C   Magnesium
   D   Tin

   Answer _____

3. When nickel(II) chloride solution is added to sodium carbonate solution an insoluble solid is formed.

   A sample of the solid can be separated from the mixture by

   A   condensation

   B   distillation
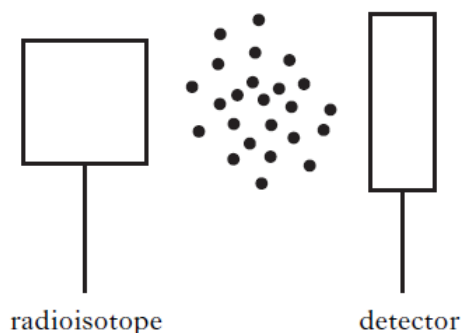
   C   evaporation

   D   filtration.

   Answer _____

4. Which particle will be formed when an atom of $^{212}_{83}$ Bi emits an α-particle?

   A $^{207}_{82}$ Pb

   B $^{208}_{81}$ Tl

   C $^{209}_{80}$ Hg

   D $^{210}_{79}$ Au

   Answer _____

5. Some smoke detectors make use of radiation which is very easily stopped by tiny smoke particles moving between the radioactive source and the detector.

   radioisotope   detector

   The most suitable type of radioisotope for a smoke detector would be

   A   an alpha-emitter with a long half-life

   B   a gamma-emitter with a short half-life

   C   an alpha-emitter with a short half-life

   D   a gamma-emitter with a long half-life.

   Answer _____

6. When a metal reacts to form a compound the metal is

   A   displaced
   B   oxidised
   C   precipitated
   D   reduced.

   Answer _____   6

7. Technetium-99m is used in medicine to detect damage to heart tissue. It is a gamma-emitting radioisotope and is injected into the body. The half-life of technetium-99m is 6 hours.

   a) i) What is meant by the term half-life?
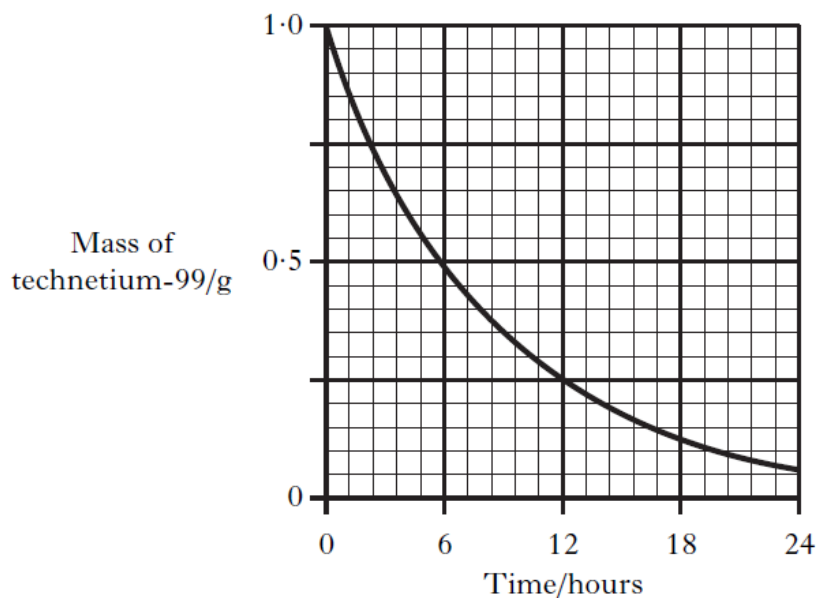
   _____

   _____ 1

   ii) How much of a 2 g sample of technetium-99m would be left after 12 hours?
   Space for working and answer.

   _____ g 2

   b) The graph below shows the decay curve for a 1·0 g sample of technetium-99.

   Draw a 2nd curve on the graph to show the variation of the mass with time for a 0·5 g sample of technetium-99. 1
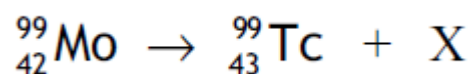
   c) Suggest one reason why technetium-99m can be used safely in this way.

   _____

   _____ 1

   d) Technetium-99m is formed when molybdenum-pp decays.

   The decay equation is:

   $$^{99}_{42}Mo \rightarrow ^{99}_{43}Tc + X$$

   Identify **X**.

   _____ 1

8.   The table shows information about two of the gases found in air.

Gas	Boiling point/°C
oxygen	−183
nitrogen	−196

a)   At very low temperatures air is a mixture of liquids.

Name the process which can be used to separate this mixture.

_____   1

b)   In a sample of oxygen there are two different types of oxygen atom: $^{18}_{8}O$ and $^{16}_{8}O$

   i)   What term is used to describe these different types of oxygen atom?

   _____   1

   ii)   Complete the table for each type of oxygen atom.

Type of atom	Number of protons	Number of neutrons
$^{18}_{8}O$		
$^{16}_{8}O$		

    1

9.   The table below contains information about some substances.

Substance	Melting point/°C	Boiling point/°C	Conducts as a solid	Conducts as a liquid
A	−7	59	no	no
B	1492	2897	yes	yes
C	1407	2357	no	no
D	606	1305	no	yes
E	−39	357	yes	yes
F	−78	−33	no	no

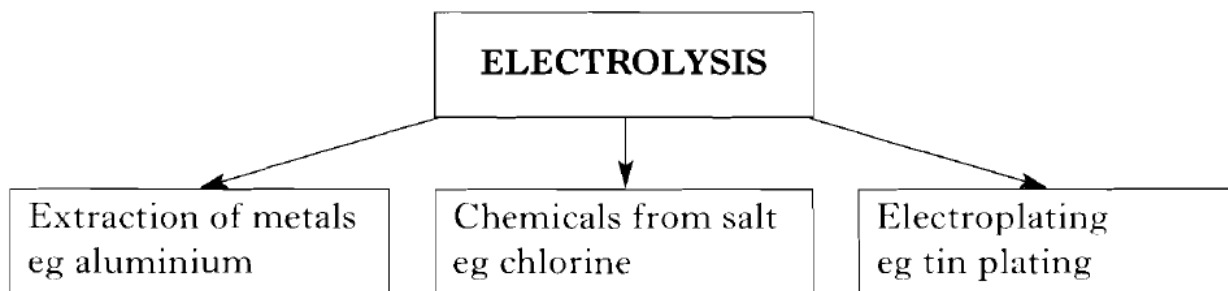a)   Identify the substance which is a gas at 0°C   Answer _____   1

b)   Identify the **two** substances which exist as molecules.   Answer _____ & _____   1

c)   Identify the substance which exists as a covalent network.Answer _____   1

10. Electrolysis is a common industrial process. Some uses of electrolysis are shown in the diagram.

ELECTROLYSIS

| Extraction of metals eg aluminium | Chemicals from salt eg chlorine | Electroplating eg tin plating |

a) Explain what is meant by electrolysis.

_____

_____ 1

b) Aluminium is extracted by electrolysis of its molten oxide since aluminium oxide does not react when heated with carbon.

Why does aluminium oxide not react with hot carbon?

_____

_____ 1

c) Chlorine is produced by the electrolysis of sodium chloride solution.

i) Write the ion-electron equation for the formation of chlorine.
(You may wish to use the data booklet to help you.)

_____ 1

ii) What type of chemical reaction occurs when chlorine is formed by electrolysis?

_____ 1

11. The grid shows information about some particles.

A	B	C
$^{23}_{11}Na$	$^{18}_{8}O$	$^{40}_{19}K^+$
D	**E**	**F**
$^{24}_{12}Mg^{2+}$	$^{35}_{17}Cl^-$	$^{16}_{8}O$

a) Identify the two particles with the same number of neutrons.   Answer _____ & _____ 1

b) Identify the particle which has the same electron arrangement as neon.   Answer _____ 1

12. Phosphourus-32 and strontium-89 are two radioisotopes used to study how far mosquitoes travel.

a) Strontium-89 decays by emission of a beta particle.
Complete the nuclear equation for the decay of strontium-89.

$$^{89}\text{Sr} \rightarrow$$
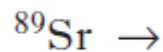
1

b) In an experiment, 10 g of strontium-89 was added to a sugar solution used to feed mosquitoes. Strontium-89 has a half-life of 50 days.
Calculate the mass, in grams, of strontium-89 present in the sugar solution if the solution was stored for 200 days.
Space for working and answer.

3

c) A mosquito fed on a solution containing phosphorus-32 is released. Phosphours-32 has a half-life of 14 days. When the mosquito is captured 28 days later, what fraction of the phosphours-32 will remain?
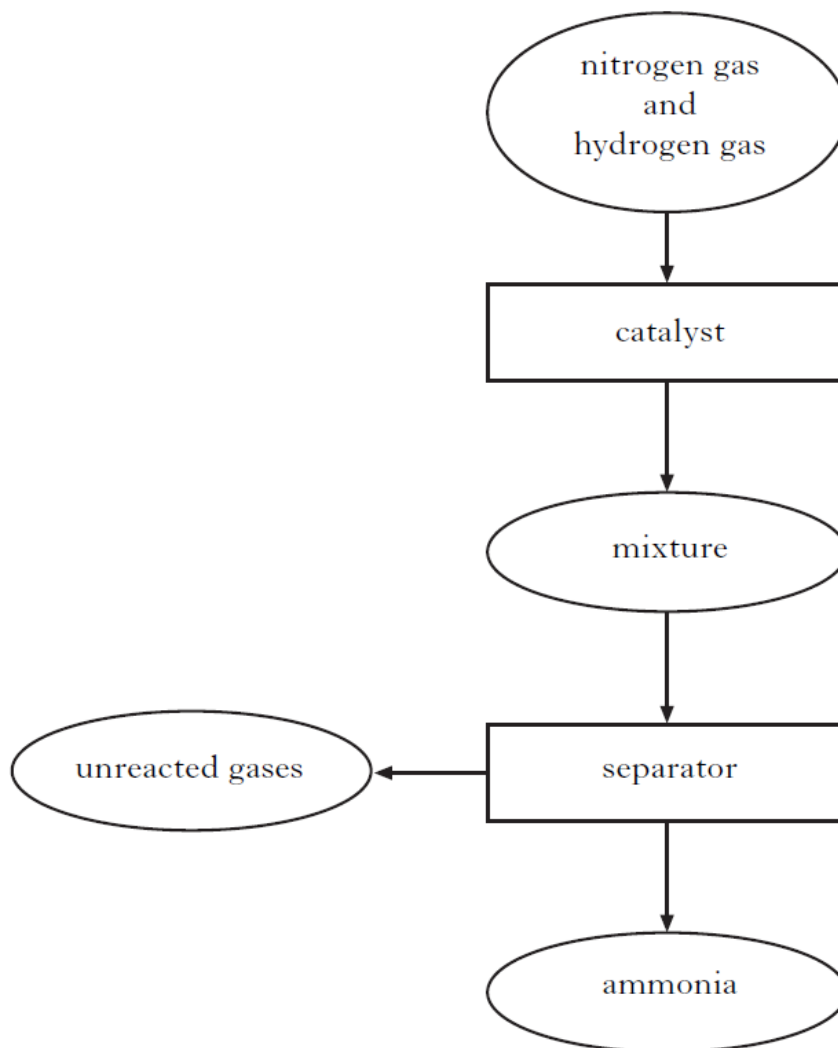*Space for working and answer.*

2

13. Balance the following chemical equations.

a) C_2H_5OH + O_2 ⟶ CO_2 + H_2O

b) N_2 + H_2 ⟶ NH_3

c) $Pb(NO_3)_2$ + NaI ⟶ PbI_2 + $NaNO_3$
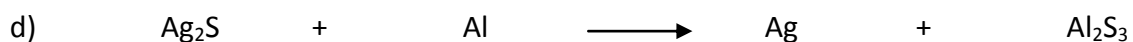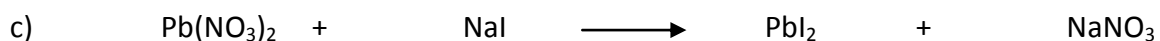
d) Ag_2S + Al ⟶ Ag + Al_2S_3 4

14. Catalysts can be used in different processes.

a) The flow diagram shows the steps involved in the Haber process.

i) One the flow diagram above draw an arrow to show how the process is made more economical. 1

ii) The nitrogen for use in the Haber process is obtained from the air.

Where is the hydrogen for use in the Haber process obtained from?

_____ 1

iii) Name the catalyst used in the Haber process.

_____ 1

b) The ammonia can then be used to produce nitric acid.

Name the process which produces nitric acid.

_____ 1

c) Ammonia will react with nitric acid to produce ammonium nitrate.
State a use for ammonia nitrate.

_____ 1

Total Marks 39