N5 Chemistry
Unit 3: Chemistry in Society
Homework 3.11

Name _____ **Teacher** _____

1. Metallic bonding is a force of attraction between

   A negative ions and positive ions

   B a shared pair of electrons and two nuclei

   C positive ions and delocalised electrons

   D negative ions and delocalised electrons.

   Answer _____

2. Which compound would **not** neutralise hydrochloric acid?

   A Sodium carbonate

   B Sodium chloride

   C Sodium hydroxide

   D Sodium oxide

   Answer _____

3. 0·2 mol of a gas has a mass of 12·8 g.

   Which of the following could be the molecular formula for the gas?

   A SO_2

   B CO

   C CO_2

   D NH_3

   Answer _____

4. Solid ionic compounds do **not** conduct electricity because

   A the ions are not free to move

   B the electrons are not free to move

   C solid substances never conduct electricity

   D there are no charged particles in ionic compounds.

   Answer _____

5. Which of the following statements correctly describes the concentrations of $H^+(aq)$ and $OH^-(aq)$ ions in pure water?

   A The concentrations of H^+ (aq) and OH^- (aq) ions are equal.

   B The concentrations of H^+ (aq) and OH^- (aq) ions are zero.

   C The concentration of $H^+(aq)$ ions is greater than the concentration of $OH^-(aq)$ ions.

   D The concentration of $H^+(aq)$ ions is less than the concentration of $OH^-(aq)$ ions.

   Answer _____

6. What is the charge on the chromium ion in $CrCl_3$?

   A 1+

   B 1–

   C 3+

   D 3–

   Answer _____

7. Americium-241, a radioisotope used in smoke detectors, has a half-life of 432 years.

(a) The equation for the decay of americium-241 is

$$^{241}_{95}Am \longrightarrow {}^{4}_{2}He + X$$

Name element X.

(b) Name the **type** of radiation emitted by the americium-241 radioisotope.

_____ 1

(c) Another radioisotope of americium exists which has an atomic mass of 242.

Americium-242 has a half-life of 16 hours.

(i) A sample of americium-242 has a mass of 8 g.

Calculate the mass, in grams, of americium-242 that would be left after 48 hours.

Show your working clearly. 3

(ii) Suggest why americium-241, and not americium-242, is the radioisotope used in smoke detectors. 1

_____

_____

_____

8. 0·2 mol of a gas has a mass of 12·8 g.

Which of the following could be the molecular formula for the gas?

A SO_2

B CO

C CO_2

D NH_3

Answer _____ 1

9. A researcher investigated the conditions for producing ammonia.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

(a) Name the catalyst used in the production of ammonia.

_____ 1

(b) In her first experiment she measured how the percentage yield of ammonia varied with pressure at a constant temperature of 500 °C.

Pressure (atmospheres)	100	200	300	400	500
Percentage yield (%)	10	18	26	32	40

Predict the percentage yield of ammonia at 700 atmospheres.

_____ 1

(c) In a second experiment the researcher kept the pressure constant, at 200 atmospheres, and changed the temperature as shown.

Temperature (°C)	200	300	400	500
Percentage yield (%)	89	67	39	18

Describe how the percentage yield varies with temperature.

_____

_____

_____ 1

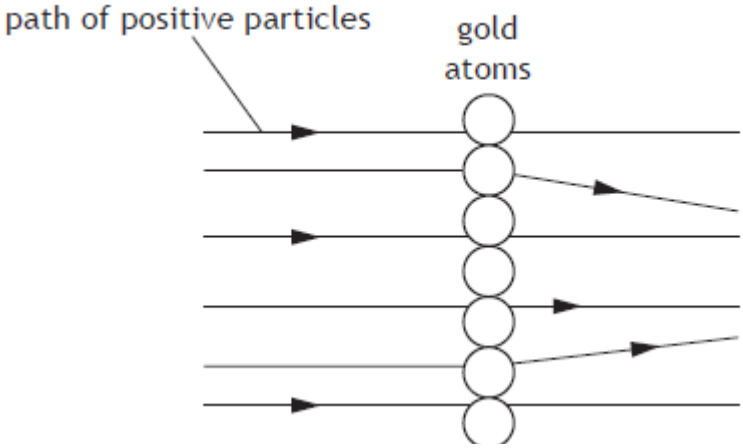
(d) **Using the information in both tables**, suggest the combination of temperature and pressure that would produce the highest percentage yield of ammonia.

_____

_____

_____ 1

10. In 1911, Ernest Rutherford carried out an experiment to confirm the structure of the atom. In this experiment, he fired positive particles at a very thin layer of gold foil. Most of the particles passed straight through but a small number of the positively charged particles were deflected.



(a) What caused some of the positive particles to be deflected in this experiment?

_____ 1

(b) Gold is the heaviest element to have only one naturally occurring isotope.

The isotope has a mass number of 197.

(i) Complete the table to show the number of each type of particle in this gold atom.
You may wish to use the data booklet to help you.

Particle	*Number*
Proton	
Electron	
Neutron	

1

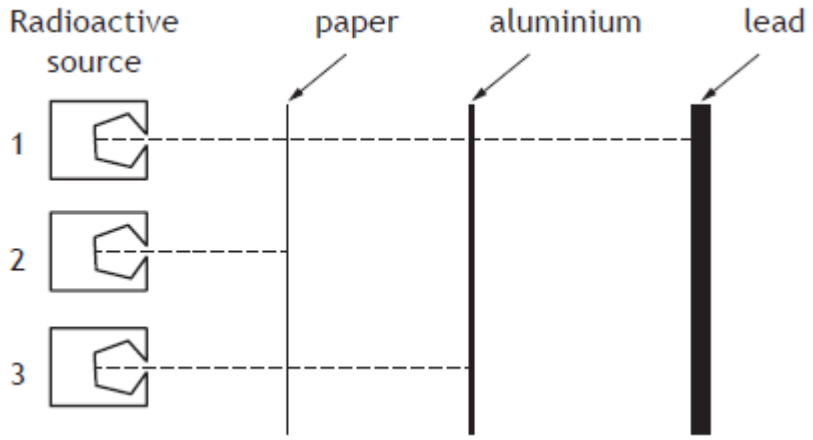
(ii) Most elements have more than one isotope.

State what is meant by the term isotope.

_____

_____ 1

11. Different types of radiation have different penetrating properties.
An investigation was carried out using three radioactive sources.



(a) Name the type of radiation emitted by source **2**.

_____ 1

(b) The half-life of source **3** is 8 days.
Calculate the fraction of source **3** that would remain after 16 days.
Show your working clearly.

3

(c) Radioisotopes can be made by scientists.
The nuclear equation shows how a radioisotope of element **X** can be made from aluminium.

$$^{27}_{13}Al + {}^{1}_{0}n \longrightarrow X + {}^{4}_{2}He$$

Name element **X**.

_____ 1

11. A group of students were given strips of aluminium, iron, tin and zinc.

Using your knowledge of chemistry, suggest how the students could identify each of the four metals.

3

12. The ion-electron equations for the oxidation and reduction steps in the reaction between **sulfite ions** and **iron(III) ions** are given below.

oxidation $H_2O(\ell) + SO_3^{2-}(aq) \longrightarrow SO_4^{2-}(aq) + 2H^+(aq) + 2e^-$

reduction $Fe^{3+}(aq) + e^- \longrightarrow Fe^{2+}(aq)$

The redox equation for the overall reaction is

A $H_2O(\ell) + SO_3^{2-}(aq) + Fe^{3+}(aq) \longrightarrow SO_4^{2-}(aq) + 2H^+(aq) + Fe^{2+}(aq) + e^-$

B $H_2O(\ell) + SO_3^{2-}(aq) + 2Fe^{3+}(aq) \longrightarrow SO_4^{2-}(aq) + 2H^+(aq) + 2Fe^{2+}(aq)$

C $SO_4^{2-}(aq) + 2H^+(aq) + Fe^{2+}(aq) + e^- \longrightarrow H_2O(\ell) + SO_3^{2-}(aq) + Fe^{3+}(aq)$

D $SO_4^{2-}(aq) + 2H^+(aq) + 2Fe^{2+}(aq) \longrightarrow H_2O(\ell) + SO_3^{2-}(aq) + 2Fe^{3+}(aq)$.

Answer _____ 1

Total Marks 29