N5 Chemistry
Unit 3: Chemistry in Society
Homework 3.9

Name _____ **Teacher** _____

1. Which of the following **must** be unsaturated?

   A C_2H_4
   B C_3H_6
   C C_4H_8
   D C_5H_{12}

   Answer _____

2. Which of the following is an electrical conductor when molten?

   A Neon
   B Silicon dioxide
   C Calcium chloride
   D Carbon dioxide

   Answer _____

3. In which of the following reactions is oxygen used up?

   A Combustion
   B Neutralisation
   C Addition
   D Polymerisation

   Answer _____

4. A solid metal oxide dissolves in water to give a solution with

   A more $H^+(aq)$ ions than $OH^-(aq)$ ions
   B equal numbers of $H^+(aq)$ ions than $OH^-(aq)$
   C more $OH^-(aq)$ ions than $H^+(aq)$ ions
   D $OH^-(aq)$ ions but no $H^+(aq)$ ions.

   Answer _____

5. A fertiliser solution prepared by dissolving 400 g of ammonium nitrate, NH_4NO_3, in water was made up to 10 litres. The concentration of the solution is

   A 0·4
   B 0·5
   C 2·0
   D 5·0

   Answer _____

6. Which of the following would be suitable for use as a fertiliser?

   A Sodium chloride
   B Magnesium phosphate
   C Potassium nitrate
   D Lithium bromide

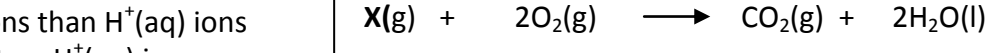
   Answer _____

7. All metal oxides, metal hydroxides and metal carbonate are examples of

   A acids
   B alkalis
   C bases
   D salts.

   Answer _____

8. The balanced equation for the complete combustion of a hydrocarbon X is shown below.



   Which of following is the correct formula of hydrocarbon X?

   A CH_4
   B C_2H_6
   C C_3H_8
   D C_4H_{10}

   Answer _____

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

Self Distilling Vodka

Scientists were investigating the permeability of a material called graphene oxide. This is graphene that has been reacted with a strong oxidising agent, making it more soluble and easier to deal with. They created membranes made up of small pieces of graphene oxide which pile up like bricks to form an interlocked structure, and then tested how gas-proof they were by using the film as a lid for a container full of various gases.

They found that despite being 500 times thinner than a human hair, it completely stopped the gases hydrogen, nitrogen and argon from escaping.

It even stopped helium which, being a tiny single atom will escape from party balloons very quickly, and can even diffuse out through a millimeter of glass. They then tried various liquids, and found similar behaviour for ethanol, hexane, acetone, decane and propanol vapour, but when they tried normal water it behaved as if the membrane wasn't there, escaping at least a hundred thousand times faster than any of the other materials. They think the water is forming a layer one molecule thick between the layers of graphene, blocking the route for everything else, but if it dries out, this gap shrinks and seals up. To make use of this behaviour they put some vodka in the container, and left it for a few days. Normally ethanol evaporates faster than water so vodka gets weaker over time, but with their membrane, which blocked the ethanol, the vodka got stronger and stronger.

Taken from the article "Self Distilling Vodka" by Dave Ansell, published on the nakedscientists.com January 2012.

a) Name one gas prevented from escaping by the graphene oxide?

_____ 1

b) Why is helium found as a single atom?

_____

_____ 1

c) How much faster was water able to escape compared to other liquids tested?

_____

_____ 1

d) "Propanol vapour was also able to escape through the graphene oxide".
Give the correct systematic name of the two isomers of propanol that may have been used.

_____ 2

10. The octane number of petrol is a measure of how efficiently it burns as a fuel. The higher the octane number, the more efficient the fuel.

a) The octane numbers for some hydrocarbons are shown.

Hydrocarbon	*Number of carbon atoms*	*Octane number*
butane	4	90
pentane	5	62
hexane	6	
heptane	7	0
octane	8	−19
2-methylpentane	6	71
2-methylhexane	7	44
2-methylheptane	8	23

i) What is meant by the term hydrocarbon?

_____ 1

ii) Predict the octane number for hexane. _____ 1

iii) State the relationship between the structure of the hydrocarbon and their efficiency.

_____

_____

_____ 1

b) A student investigated the amount of energy released when hexane was burned. The student recorded the following data.

Mass of hexane burned	5 g
Volume of water	1 litre
Initial temperature of water	20 °C
Final temperature of water	78 °C
Specific heat capacity of water	4.18 kJ kg $^{-1}$ °C^{-1}

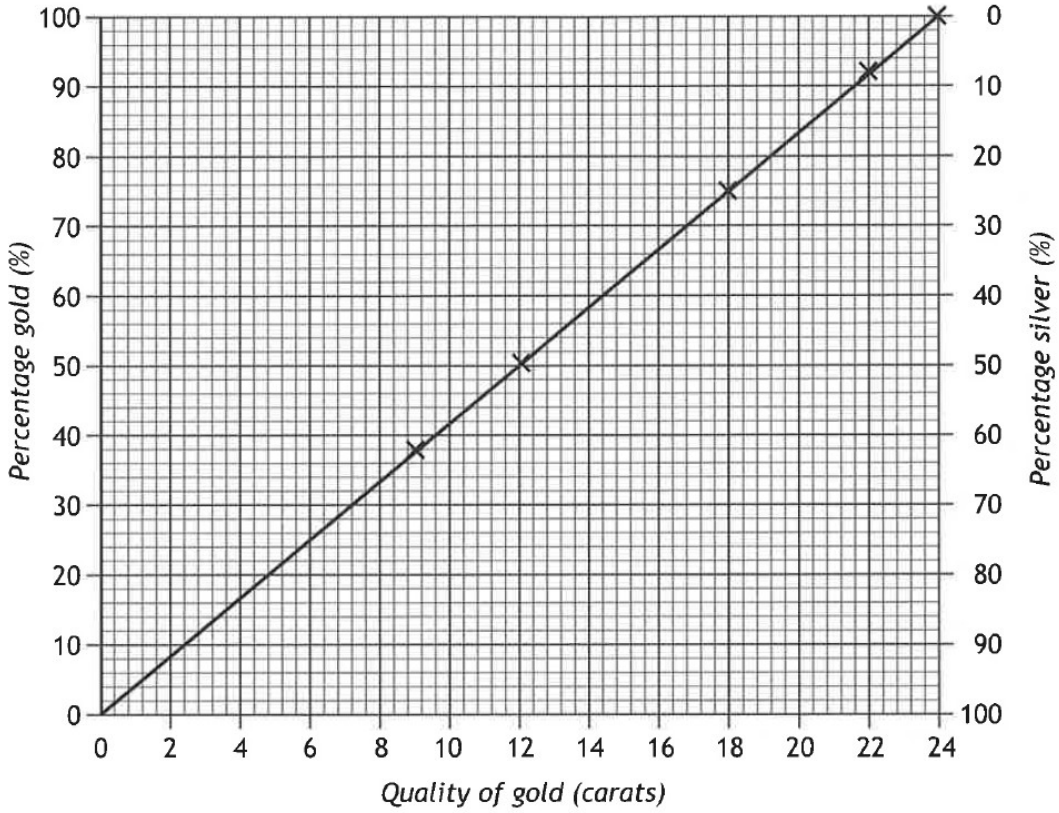
Calculate the energy released, in kJ.

Space for working and answer.

_____ kJ 3

11. Gold is a very soft metal. In order to make it harder, goldsmiths mix it with silver. The quantity of the gold is measured in carats.

a) The graph shows information about the quality of gold.



i) What percentage of silver in an 18 carat gold ring?

_____ 1

ii) Calculate the mass of silver in an 18 carat ring weighing 6 g.

_____ g 1

b) Silver tarnishes in the presence of hydrogen sulfide forming black silver sulfide, Ag_2S.

The equation for the reaction is:

$$4Ag + 2H_2S + O_2 \longrightarrow 2Ag_2S + 2H_2O$$

What mass of silver sulfide would be formed from 1·08 g of silver?

_____ g 3

12. In the 2012 London Olympics, alkanes were used as fuels for the Olympic flame.

a) The torches that carried the Olympic flame across Britain burned a mixture of propane and butane.

i) Propane and butane are members of the same homologous series.
What is meant by the term homologous series?

_____ 1

ii) Butane has a higher boiling point than propane. Explain clearly why the boiling point of butane is greater than the boiling point of propane.

_____

_____ 1

b) Natural gas, which is mainly methane, was used to fuel the flame in the Olympic cauldron.

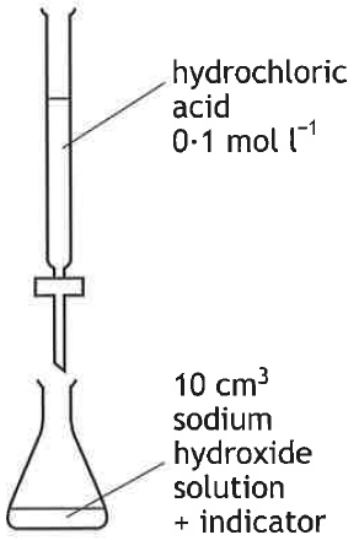
i) Draw a diagram to show how all the outer electrons are arranged in a molecule of methane, CH_4.

1

ii) Draw a diagram to show the **shape** of a methane molecule.

1

13. A student carried out a titration using the chemicals and apparatus shown.



	Rough titre	*1st titre*	*2nd titre*
Initial burette reading/cm^3	0·3	0·2	0·5
Final burette reading/cm^3	26·6	25·3	25·4
Volume used/cm^3	26·3	25·1	24·9

a) Using the results in the table, calculate the **average** volume, in cm^3, of hydrochloric acid required to neutralise the sodium hydroxide solution.

1

b) The equation for the reaction is:

$$HCl + NaOH \longrightarrow NaCl + H_2O$$

Using the answer from part a), calculate the concentration, in mol l^1 of the sodium hydroxide solution.

Show your working clearly.

3

Total Marks 32