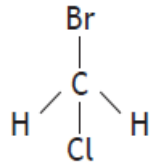
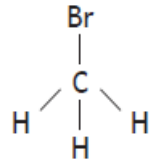
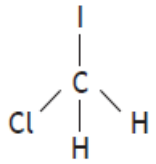
N5 Chemistry
Unit 2: Nature's Chemistry
Homework 2.8

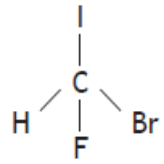
1. Molecules in which four different atoms are attached to a carbon atom are said to be chiral.

   Which of the following molecules is chiral?

A 

B 

C 

D 

Answer _____

2. A reaction is endothermic if

   A energy is required to start the reaction

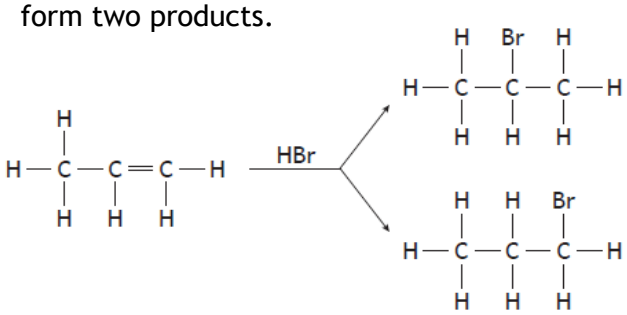
   B heat is released during the reaction

   C the temperature drops during the reaction

   D the temperature rises during the reaction.

Answer _____

3. Propene reacts with hydrogen bromide to form two products.



Which of the following alkenes does **not** form two products on reaction with hydrogen bromide?

A But-1-ene

B But-2-ene

C Pent-1-ene

D Pent-2-ene

Answer _____

4. Petrol is a mixture of hydrocarbons.

   The tendency of a hydrocarbon to ignite spontaneously is measured by its octane number.

	Hydrocarbon	*Octane number*
1	3-methylpentane	74·5
2	butane	93·6
3	pentane	61·7
4	2-methylpentane	73·4
5	hexane	24·8
6	methylcyclopentane	91·3

A student made the hypothesis that as the chain length of a hydrocarbon increases, the octane number decreases.

Which set of three hydrocarbons should have their octane numbers compared in order to test this hypothesis?

A 1, 4, 6
B 1, 2, 4
C 2, 3, 5
D 3, 4, 5

Answer _____

5. The lowest temperature at which a hydrocarbon ignites is called its flash point.

Hydrocarbon	*Flash point (°C)*
hexane	−23
heptane	−4
octane	13
nonane	31

a) i) Using the information in the table, make a general statement linking the flash point to the number of carbon atoms.

_____ 1

ii) Predict the flash point, in °C, of decane, $C_{10}H_{22}$.

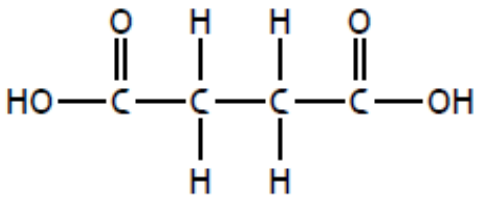
_____ 1

b) Nonane burns to produce carbon dioxide and water.

$$C_9H_{20} + 14O_2 \longrightarrow 9CO_2 + 10H_2O$$

Calculate the mass, in grams, of carbon dioxide produced when 25 g of nonane is burned.
Show your working clearly. 3

6. Succinic acid is a natural antibiotic. The structure of succinic acid is shown.



Name the functional group present in succinic acid. 1

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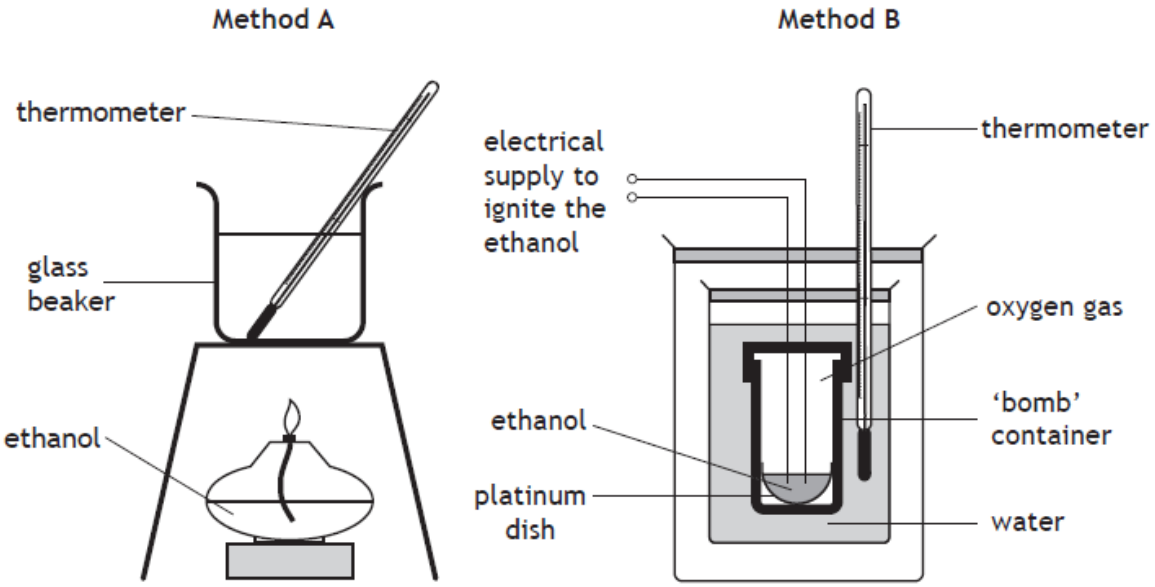
7. A student calculated the energy absorbed by water when ethanol is burned using two different methods.



The student recorded the following data.

	Method	
	A	**B**
Mass of ethanol burned (g)	0·5	0·5
Mass of water heated (g)	100	100
Initial temperature of water (°C)	24	24
Final temperature of water (°C)	32	58

a) The final temperature of water in method **B** is higher than in method **A**.

Suggest why there is a difference in the energy absorbed by the water.

_____ 1

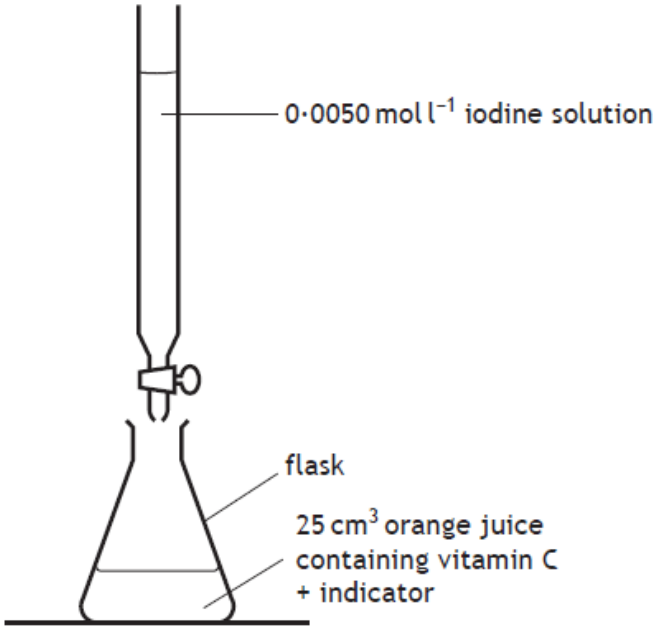
b) Calculate the energy, in kJ, absorbed by the water in method **B**.

You may wish to use the data booklet to help you.

Show your working clearly. 3

8. Vitamin C is found in fruits and vegetables.

Using iodine solution, a student carried out titrations to determine the concentration of vitamin C in orange juice.



The results of the titration are given in the table.

Titration	*Initial burette reading* (cm^3)	*Final burette reading* (cm^3)	*Titre* (cm^3)
1	1·2	18·0	16·8
2	18·0	33·9	15·9
3	0·5	16·6	16·1

a) Calculate the average volume, in cm^3, that should be used in calculating the concentration of vitamin C.

_____ 1

b) The equation for the reaction is

$C_6H_8O_6(aq) + I_2(aq) \longrightarrow C_6H_6O_6(aq) + 2HI(aq)$

vitamin C

Calculate the concentration, in mol l^{-1}, of vitamin C in the orange juice.

Show your working clearly. 3

Total Marks 18