**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Reactions of some hydrocarbons**

**Background**

Three classes of hydrocarbons are alkanes (saturated hydrocarbons containing only single C-C bonds), alkenes (unsaturated hydrocarbons containing C=C double bond) and aromatics (derivatives of benzene). The purpose of this experiment is to investigate the reactivities of these classes of hydrocarbons with potassium permanganate solution and bromine water. The representative compounds you will be using are cyclohexane (an alkane), cyclohexene (an alkene) and toluene (an aromatic).

**Equipment required**

4 test tubes

Dropper

Cyclohexane [C6H12] (3 mL)

Cyclohexene [C6H10] (3mL)

Toluene [CH3C6H5] (3 mL)

Potassium permanganate 0.01 molL-1 (4mL)

Sulphuric acid 2 molL-1 (2 mL)

Bromine water (5mL)

***Safety***

***The hydrocarbons we are using are poisonous, do not let these liquids come into contact with your skin and avoid breathing in their vapours.***

***Bromine water is poisonous and corrosive. Do not breathe in any of the vapours given off by the Bromine water. If the Bromine water comes into contact with the skin immediately wash the affected area with copious quantities of water.***

**Procedure**

**A Reaction of Hydrocarbons with Acidified Permanganate**

1. Place 1 mL of cyclohexane, cyclohexene and toluene into three separate test tubes.
2. In the fourth test tube mix 4mL of the potassium permanganate and 2 mL of sulphuric acid.
3. Add 1mL of the acidified potassium permanganate to each of the test tubes containing the hydrocarbons. Shake each test tube gently and record any change that takes place in the aqueous layer over about 5 minutes.

**B Reaction of Hydrocarbons with Bromine Water**

1. Place 1mL of cyclohexane, cyclohexene and toluene into three separate test tubes.
2. Add 1mL of bromine water to each of the test tubes containing the hydrocarbons. Shake each test tube gently and record any colour change in each case.

**Results**

**A Reactions of Hydrocarbons with Acidified Permanganate**

**B Reaction of Hydrocarbons with Bromine Water**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lab Validation quiz**

1. Explain why the experiments were conducted outside.

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[2]

1. Define the term “immiscible liquids”.

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[1]

1. How did you identify the aqueous layer mentioned in procedure ‘A’?

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[2]

1. Write the formulae for the following:
2. Potassium permanganate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Sulphuric acid \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Bromine water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[3]

1. Draw the structural formula and give the systematic (IUPAC) name for toluene.

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[2]

1. Assuming that the reactions of these hydrocarbons are typical of the classes of compounds to which they belong, describe the relative reactivities of the three classes.

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[3]

1. Explain your answer to question 5 in terms of the strength of the bonds in alkanes, alkenes and benzene.

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[3]

1. All of the reactions that you attempted will occur at different rates under different conditions and with different catalysts. Write equations for the reactions of bromine water with cyclohexane, cyclohexene and toluene. Indicate next to each equation:
2. whether the equation represents an addition or a substitution reaction
3. the names of the **organic** products of the reactions

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[9]