***O LEVEL CHEMISTRY 5070* CHEMICAL ENERGETICS**

***WORKSHEET 1***

A gas barbecue uses butane (C4H10) as a fuel. The butane is stored as a liquid in a container. When the burner is turned on, the liquid turns to a gas and is lit by pushing a button to create a small spark

1. Suggest one advantage and one disadvantage of using butane compared to charcoal as a source of heat

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….[1]

1. Describe the arrangement and movement of molecules in butane when it is:
2. A liquid:

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….

1. A gas:

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………[2]

1. What term is used to describe the change of state from liquid to gas?

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………[1]

1. Draw a diagram to show the structural arrangement of the atoms in a molecule of butane.

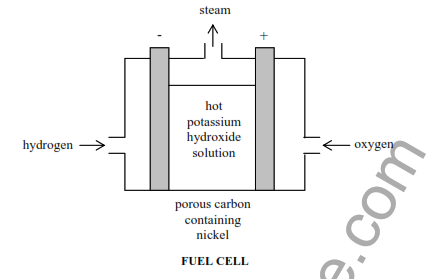
[2]

1. How does the structure of butane explain why it has a low boiling point?

………………………………………………………………………………………………………………………………………………………………………………………… [1]

***WORKSHEET # 2***

Fuel cells are often taken into space to supply energy. They turn the energy of a fuel directly into electricity.



1. Why are porous electrodes needed in a fuel cell?

……………………………………………………………………………………………………………………………………………………………………………………[1]

1. Why is nickel included in the electrodes?

………………………………………………………………………………………………………………………………………………………………………………………….[1]

1. What is the main way in which fuel cells differ from other electrochemical cells?

………………………………………………………………………………………………………………………………………………………………………………………[1]

1. Write an equation for the overall reaction taking place in a fuel cell.

……………………………………………………………………………………………………………………………………………………………………………………..[1]

1. Give two reasons why fuel cells are more suitable than dry cells for use in spacecrafts.

…………………………………………………………………………………………………………………………………………………………………………………………[1]

1. What other type of cell could be used in a spacecraft?

…………………………………………………………………………………………………………………………………………………………………………………………[1]

***WORKSHEET # 3***

Cold packs are used to treat sports injuries. A pack contains water and ammonium nitrate crystals. When mixed, rapid cooling takes place.

1. Draw an energy level diagram to show the process occurring in the cold pack.

Explain your answer

Explanation: ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….[4]

1. Explain in terms of bonding why this process takes in heat.

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..[2]

1. A company has recently invented ‘cook-in-the-box’ meals. To start the cooking process a tab is pulled which lights a match. The match starts a reaction which continues without further heating.

A reaction which could be used is that between aluminium and iron(III) oxide, to produce aluminium oxide and iron.

1. Write a symbol equation for the reaction between aluminium and iron(III) oxide.

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..[2]

1. Explain why the match is needed to start the reaction, but once started it continues without further heating

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..[1]

***WORKSHEET # 4***

When hydrogen reacts with iodine, we can show the reaction as follows:

H–H + I–I 2 (H – I)

1. Given the following bond energies, calculate the heat of reaction

(H – H = 436 kJ, I – I = 151 kJ, H – I = 298kJ)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….[4]

1. Is the reaction exothermic or endothermic?

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….[2]

1. Draw an energy level diagram for the reaction

[4]