Energetics Questions 1

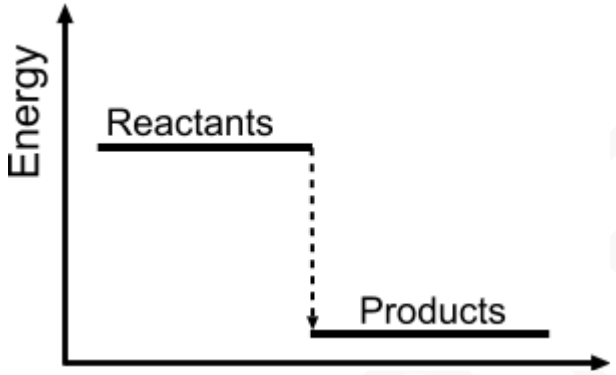
1 Chemical reactions can be classified as exothermic or endothermic. Complete the following sentences by inserting appropriate words. [4]

The combustion of ethanol is an …….. reaction because heat is ……

When barium hydroxide reacts with ammonium thiocyanate the temperature goes down. This

indicates that it is an …….. reaction and heat is ……

2 (a) Explain whether the following energy level diagram is for an exothermic or endothermic reaction [2]



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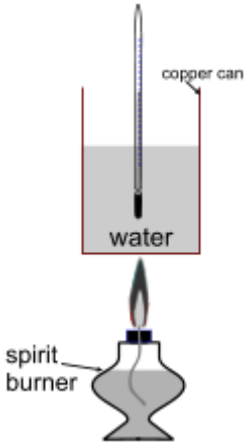
(b) For the reaction in (a) circle which answer could be the molar enthalpy change for the reaction. [1]

ΔH = -200 kJ/mol ΔH = +200 kJ/mol

3 A student carried out an experiment to investigate the combustion of hexane. They used the apparatus shown in the diagram



(a) The student measured out 200 g of water into the copper can. State 4 measurements that the student must make in order to calculate the molar enthalpy change for the combustion of hexane. [4]

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(b) Explain 1 improvement the student could make to ***the apparatus*** shown in the diagram to improve the accuracy of their results. [2]

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(c) Hexane is an alkane containing 6 carbon atoms. What is the molecular formula of hexane?

……. [1]

(d) Write an equation for the complete combustion of hexane. [3]

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(e) In the experiment the student carried out using the apparatus in (a) they burnt 0.45 g of hexane and the temperature of the water increased by 14 ^{o}C. They carried out the following calculation to work out the molar enthalpy change in kJ/mol.

Q = 0.45 x 4.18 x 14 = 26.3 J

0.45/86 = 0.00523 mol

ΔH = -26.3 x 0.00523 x 1000 = -138 kJ/mol

Explain 3 things that the student did incorrectly in this calculation. [3]

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(f) When the student does the calculation correctly they get the value -2200 kJ/mol. Their teacher say that the accepted value for the molar enthalpy change of combustion of hexane is -4200 kJ/mol. *Explain* the two main reasons why the value is less exothermic than expected. [4]

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(g) What is the maximum theoretical temperature change that could be obtained for heating 200 g of water by burning 0.45 g of hexane? *Show your working.* [2]

Temperature change ……. ^{o}C