OCR
RECOGNISING ACHIEVEMENT

Tuesday 4 June 2013 – Afternoon

AS GCE CHEMISTRY A

F322/01 Chains, Energy and Resources

Candidates answer on the Question Paper.

OCR supplied materials:
- *Data Sheet for Chemistry A* (inserted)

Other materials required:
- Scientific calculator

Duration: 1 hour 45 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- The Insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.

Where you see this icon you will be awarded marks for the quality of written communication in your answer.

This means for example you should:
- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
- organise information clearly and coherently, using specialist vocabulary when appropriate.

- You may use a scientific calculator.
- A copy of the *Data Sheet for Chemistry A* is provided as an insert with this question paper.
- You are advised to show all the steps in any calculations.
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Crude oil is a complex mixture of many hydrocarbons.

Crude oil is processed by the petroleum industry to make fuels and petrochemicals.

(a) The straight-chain alkane, **A**, is present in crude oil.
A has molecules with ten carbon atoms.

(i) What is the molecular formula of **A**?

..... **[1]**

(ii) **B** is a branched-chain isomer of **A**.

Draw the skeletal formula of a possible structure for **B**.

Name your structure.

name ..... **[2]**

(iii) The branched-chain isomer **B** has a lower boiling point than the straight chain alkane **A**.

Explain why.

.....

.....

.....

..... **[2]**

(b) A chemist heats a pure sample of $C_{15}H_{32}$ in the presence of a catalyst.

A reaction called cracking happens.

(i) Construct an equation to show the cracking of $C_{15}H_{32}$.

..... **[1]**

(ii) When cracking takes place, a large number of products are formed.

Suggest why a large number of products are formed.

.....

.....

..... **[1]**

(c) The petroleum industry processes straight-chain alkanes into cyclic hydrocarbons.

For example, octane can be processed into a cyclic hydrocarbon and hydrogen.

(i) Suggest the structure of this cyclic hydrocarbon.

[1]

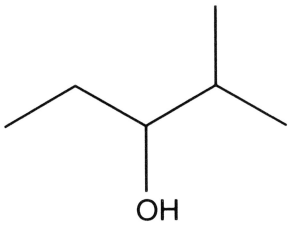
(ii) Why does the petroleum industry process straight-chain alkanes into cyclic hydrocarbons?

.....

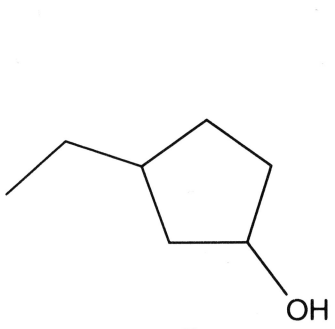
..... **[1]**

[Total: 9]

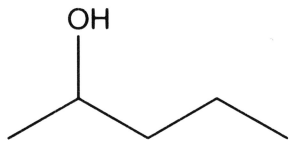
2 The skeletal formulae of six alcohols, **C**, **D**, **E**, **F**, **G** and **H**, are shown below.



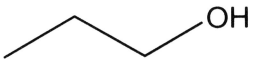
C



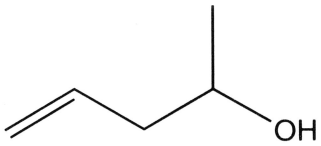
D



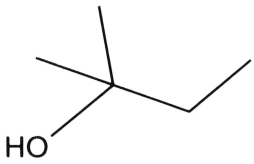
E



F



G



H

(a) (i) Which **two** alcohols are structural isomers of one another?

.....

[1]

(ii) Which alcohol is a tertiary alcohol?

.....

[1]

(iii) Which alcohol can be oxidised to a carboxylic acid using acidified $K_2Cr_2O_7$?

.....

[1]

(b) (i) What is the molecular formula of alcohol **G**?

..... **[1]**

(ii) What is the name of alcohol **C**?

..... **[1]**

(c) The alcohols are members of a homologous series.

Explain the term *homologous series*.

.....

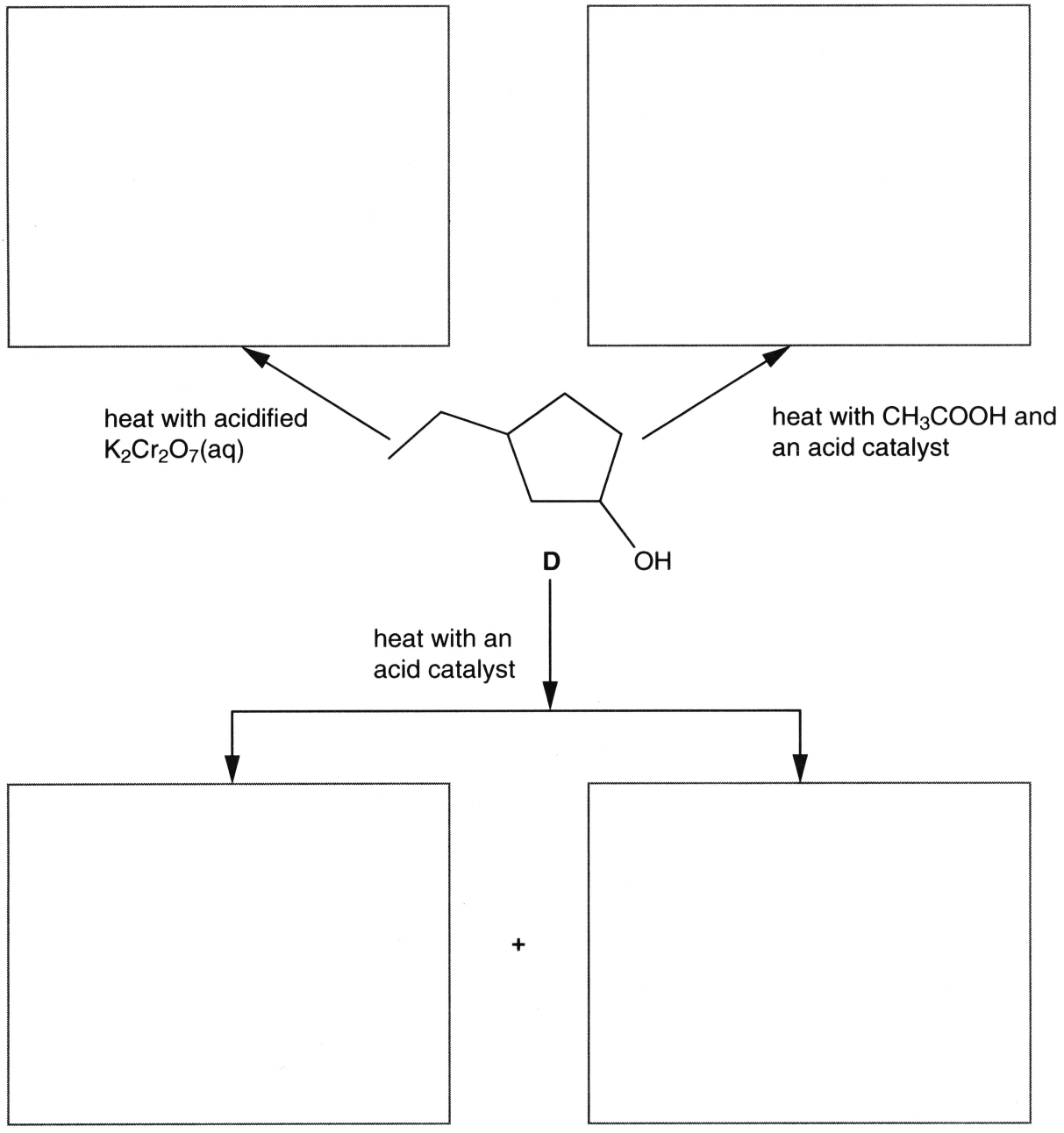
.....

.....

..... **[2]**

(d) Alcohol **D** is reacted with three different reagents.

Complete the flowchart below to show the organic product(s) formed in each of the reactions of alcohol **D**.



[4]

[Total: 11]