Surname		Other Names	
Centre Number		Candidate Number	
Title of your own investigation if different			
Are the results and tables presented with this work your own?		YES / NO	
Candidate Signature		Date	
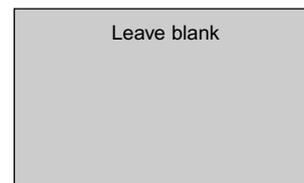
General Certificate of Secondary Education
June 2007 / June 2008

SCIENCE / CHEMISTRY   SCYC/CHYC/C1.2
ISA C1.2   Viscosity of Oils

AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

To be conducted between 1 September 2006 and 4 May 2008
For submission in May 2007 or May 2008

For this paper you must have:
- results tables and charts or graphs from your own investigation.

You may use a calculator.

Time allowed: 45 minutes

For Teacher's Use

Section	Mark
1	
2	
Total (max 34)	

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in **Section 1** and **Section 2**.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The maximum mark for this paper is 34.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

Signature of teacher marking this ISA .... Date ....

SCYC/CHYC/C1.2

SECTION 1

These questions are about the investigation that you carried out on the viscosity of oils.

Answer **all** questions in the spaces provided.

1 What were you trying to find out in your investigation?

....

....

(1 mark)

2 In your investigation:

(a) state **one** variable that it was important to keep the same;

....

....

(1 mark)

(b) it was important to keep this variable the same to make it a fair test.

Explain why.

....

....

....

....

(2 marks)

3 Suggest **one** change in the apparatus that you used which would improve the **precision** of your measurements.

....

Explain your answer.

....

....

....

....

(2 marks)

4 The **independent** variable (the one that you deliberately changed) that you used can best be described as which type of variable?
Draw a ring around your answer.

        categoric   **continuous**   **discrete**   **ordered**

(1 mark)

5 What did you find out in your investigation?

....

....

(2 marks)

6 Explain **one** possible cause of error in your investigation.

....

....

(1 mark)

7 Repeating the measurements may make the calculated mean more **reliable**.
Explain why.

....

....

....

(2 marks)

8 Make sure that **your** results tables, and charts or graphs are handed in with this paper. You will be awarded up to 6 marks for these.

(6 marks)

18

Turn over ▶

SECTION 2

These questions are about an investigation that may be similar to the one you carried out.

Answer **all** questions in the spaces provided.

An oil company wanted to measure the viscosity of its motor oil over a range of temperatures. The company selected bottles of oil from its production line and tested the oils at different temperatures using a cup viscometer.

A cup viscometer is a small container with a hole in the bottom. A known volume of oil is put into the cup. The time it takes for the cup to empty is measured.
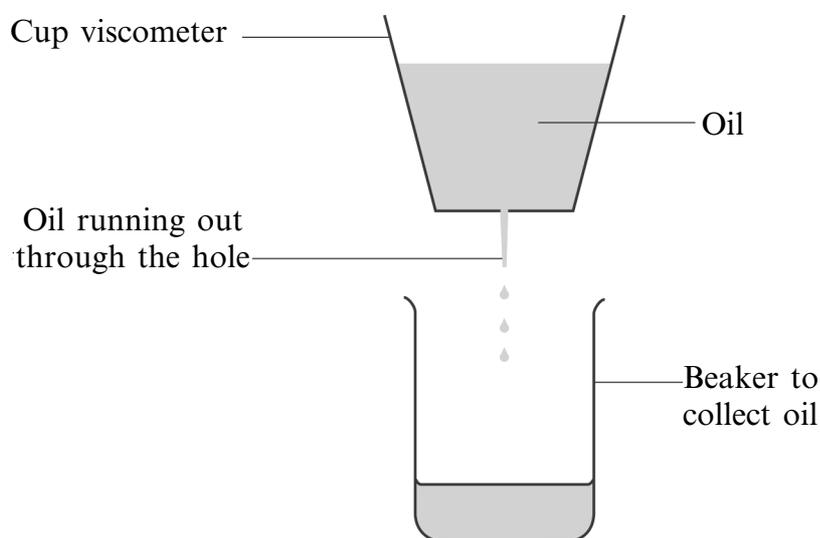
The table shows the results for one motor oil.

Look at the results and then answer the questions that follow.

Temperature of oil ºC	Time to empty the cup viscometer in seconds			
	Test 1	Test 2	Test 3	Mean
20	22.3	23.7	29.0	23.0
30	15.2	22.1	15.8	
40	12.5	12.7	12.9	12.7
50	10.2	10.2	10.5	10.3
60	9.1	9.6	9.2	9.3

9 What was the range of temperatures for the oil being tested?

The range was from .... °C   to .... °C

(1 mark)

10 Use the results in the table to calculate the mean time for the cup to empty at 30 °C.

Take account of any anomalous results.

Show clearly how you work out your answer.

....

....

....

Write your answer into the table.

(2 marks)

11 Which of the following would be the best way to present the results in the table? Put a tick (✓) in the box next to your choice.

Bar chart   ☐

Histogram   ☐

Line graph   ☐

Pie chart   ☐

(1 mark)

12 Choose **one** result in the table that should have been checked.

Temperature .... °C   Test ....

(1 mark)

Explain why.

....

....

(1 mark)

     Turn over ▶

13 The smallest scale division on the thermometer used to measure temperature was 0.1 °C.

Another thermometer has scale divisions of 0.05 °C.

What effect would using this other thermometer have on the measurements?
Put a tick (✓) in the box next to your choice.

The measurements would have been more accurate ☐

The measurements would have been more precise ☐

The measurements would have been more reliable ☐

The measurements would have been more valid ☐

(1 mark)

14 What is the relationship between the viscosity of the oil and the time it takes for the oil to flow out of the cup viscometer?

....

....

(1 mark)

15 The company decided that these test times were too short and wanted to increase the time that each test took.

Explain **one** way in which this could be done.

....

....

(1 mark)

16 Once a week the company tests a sample of 10 bottles of oil from its production line. Each week the company produces 100 000 bottles of oil.

(a) Is 10 bottles of oil a suitable **number** of bottles to test?

Draw a ring around your answer.　　　　**Yes / No**

Explain your answer.

....

....
(1 mark)

(b) Is once a week a suitable **frequency** of test samples?

Draw a ring around your answer.　　　　**Yes / No**

Explain your answer.

....

....
(1 mark)

17 Suggest how the company should choose the sample of 10 bottles of oil from its production line to use for its tests.

....

....
(1 mark)

Turn over for the next question

　　　　　　　　　　　　　　　　　Turn over ▶

18 The oil keeps its lubricating properties if the flow times are above 5 seconds and below 40 seconds. The company claimed the results in the table proved that the oil would last a long time and could be used in all climates.

Was the company justified in its claims? Explain your answer.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

....

....

....

....

....

....

(3 marks)

19 A consumer group suggested that the company that manufactures the oils should not carry out the testing. Why would the consumer group suggest that an independent company should do the testing?

....

....

(1 mark)

16

END OF QUESTIONS