GCSE Science – Investigative Skills Assignment – Marking Guidelines
Chemistry 1.2 – Viscosity of Oils
For submission in May 2007 or May 2008

Please mark in red ink, and use one tick for one mark.

Subtotals for each part of each question should be written in the right hand margin.

Please add annotations where necessary to explain why marks have or have not been awarded.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

The teacher must sign and date the front cover of the ISA.

The papers must be kept in a secure place and must **not** be returned to candidates.

SECTION 1

1	One mark for independent variable eg (How the viscosity of an oil) changes / varies with temperature		1 mark
2(a)	Any **one** from: (depending on the method used) • cup viscometer – size of cup / size of cup hole / volume of oil • falling ball-bearing – size of ball-bearing / distance the ball bearing falls • trapped air bubble – size/diameter of tube / size of bubble / distance the bubble rises • angled tile – angle of tile/slide / number of drops / tile surface etc • correct answer based on the method used		1 mark
(b)	Affects the timing measurement		1 mark
	Explanation of how it affects the timing measurement eg the larger the hole the shorter the time it takes to empty the cup		1 mark
3	Suggestion		1 mark

	Explanation
	
	eg Uses pipette / burette / syringe (to measure volume)
	
	    Measures out / delivers volume of oil more precisely
	
	    or
	
	    Smaller holes / smaller ball bearings / bigger tile etc
	
	    Changes to the apparatus result in longer times
	
	    or
	
	    Details of a more precise timing method
	    Suitable explanation
			1 mark

4	A continuous variable ticked for changing temperature **or** A categoric variable if different oils have been tested		1 mark

5	Amplified correct statement eg the viscosity of an oil decreases with increasing temperature (or converse)	2 marks
	Simple correct statement eg the viscosity of an oil changes with for **1** mark only temperature (owtte)	
	or	
	correct statement about their own investigation	
6	Error correctly identified	1 mark
	Measurement errors eg difficult to measure volume of oil exactly	
	Method errors eg timing difficulties / temperature of the oil may change over the timing / hard to judge exactly when the oil stops running out **not** just 'human error'	
7	Allows recognition of anomalies / odd results	1 mark
	or	
	Allows recognition of spread / scatter	
	Explanation of how the spread / scatter indicates reliability	1 mark
8	**Table:**	1 mark
	Suitable table of results with all relevant data included	
	Columns and rows correctly labelled with quantities and units	1 mark
	Graph/chart:	
	X axis: suitable scales chosen and labelled with quantity and units (no mark if bars are not the same width)	1 mark
	Y axis: suitable scales chosen and labelled with quantity and units	1 mark
	Points or bars plotted correctly to within ± 1mm Allow **one** plotting error	1 mark
	Suitable line drawn on graph or bars correctly labelled on bar chart (allow error carried forward from incorrect plots)	1 mark
		Max 18 marks

SECTION 2

9	20°C to 60°C	1 mark
10	15.5	2 marks
	17.7 for **1** mark only	
11	Line graph ticked	1 mark
12	**Result:** Temperature 20°C, Test 3	1 mark
	or	
	Temperature 30°C, Test 2	
	Explanation: the values are much greater than the other two results / are anomalous / are very different (and should be checked)	1 mark
13	The measurement would have been more precise	1 mark

14	The longer it takes for the oil to drain then the higher the viscosity (or converse)	1 mark
15	Use a larger viscometer cup / cup with a smaller hole / larger volume of oil if the cup was not completely filled	1 mark
16(a)	No mark for Yes or No Mark is for an appropriate explanation An awareness that 10 bottles of oil out of 100 000 is too low a number to test	1 mark
(b)	No mark for Yes or No Mark is for appropriate explanation An awareness that bottles of oil should be sampled more than once a week	1 mark
17	Bottles should be chosen randomly **or** at a pre-set time on a given day	1 mark
18	Any **two** from: • the company has not tested the oil below 20°C and does not know how the viscosity would change at low temperatures in cold climates • the company has not tested the oil above 60°C and does not know how the viscosity would change at high temperatures greater than 60°C when the engine is hot • the company has not tested oil in use and does not know how long the oil would maintain its lubrication properties when it is no longer new / there are impurities in the oil	2 marks
	Quality of written communication The mark is to be awarded for the correct use of technical terms. Candidates should use at least **two** of the following in the correct context: • viscosity • lubrication • temperature • impurities The marker should circle these terms. Annotate below candidate's answer with *Q✔ for mark given or QX for mark not given.*	1 mark
19	Any suggestion about mistrust of the findings: eg suggestion that the consumer group might believe that there could be some pressure on the company testers to produce results that the company would like to see, rather than the accurate results eg an independent testing company would not be subject to pressure to report favourable results for the oil company	1 mark
		Max 16 marks

ISA Total 34 Marks