

Chemistry induction tasks 2: Organic Chemistry.

Although organic chemistry would be intensively practical in the laboratory situation, at home there is a lot of learning to do and before you can do this the rules for naming and describing compounds must be familiar. It is touched upon at GCSE, but only for a very narrow range of compounds and isomerism is hardly mentioned.

This induction exercise reviews, reinforces and introduces new content to naming organic compounds (and later summer work enables you to start looking at reactions in a new way)

Tasks part 1:

Aim to do about 2 hours work and then submit an image (or images) of what you accomplished in the time.

IMPORTANT: All work should be self-assessed according to the following rules:

- **Underline correct parts of work/responses in green; do NOT just tick somewhere on the page;**
- **Add essential words and phrases, also in green, to show development;**
- **Circle / cross out incorrect responses in red. Try to be specific about what was wrong and why.**

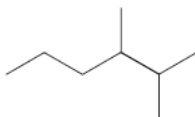
Work to complete:

- 1) Chemistry factsheet 15 – required for induction:
 - a. Review work on pp1 (which is barely more than GCSE). No need to write anything unless it is new to you.
 - b. Now from pp2-4 see if you can make some notes about the rules for naming organic compounds, especially alkanes and alkenes, as well as the various formula types used to describe them. Use the subheadings from the factsheet and watch these videos to help you:
 - i. <https://www.youtube.com/watch?v=bFn-OjeWNAw>
 - ii. <https://www.youtube.com/watch?v=RPPvqCnNgCM>
 - iii. <https://www.youtube.com/watch?v=frtnEDTSzi8>
 - c. Next, try the relevant factsheet questions and self-assess them (using the guidance given above) as evidence of improvement.
 - d. Now, lets try some 'real' exam questions – on the following page.
 - e. Submit your IMPROVED, assessed answers to these questions (one page) as part of your evidence bundle.

Questions

Q1. Alkanes are a homologous series of hydrocarbons.

What is the name of this compound?

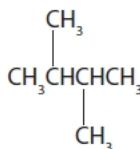


- A** 1,1,2-trimethylpentane
- B** 2,3-dimethylhexane
- C** 4,5-dimethylhexane
- D** 4,5,5-trimethylpentane

(1)

(Total for question = 1 mark)

Q2. What is the systematic name for the hydrocarbon shown below?



- A** 1,4-dimethylbutane
- B** 2,3-dimethylbutane
- C** 2,3-dimethylhexane
- D** 1,1,2,2-tetramethylethane

(Total for question = 1 mark)

Q3. This question is about some cyclic alkanes.

A student wrote these statements about cyclobutane (C_4H_8):

The -ane ending of the name means that cyclobutane is an alkane, so its general formula is C_nH_{2n+2}

The molecular formula means that its general formula is C_nH_{2n} , so it is an alkene

Criticise each statement.

(2)

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(b) Cyclobutane can be formed by an addition reaction, starting from cyclobutene.

Write the equation for this reaction.

State symbols are not required.

(1)

(c) An unusual type of hydrocarbon, known as a ladderane, can be described as consisting of cyclobutane rings joined together. The skeletal formula of one example of a ladderane is



What is the molecular formula of this ladderane?

(1)

Q4.

This question is about organic compounds.

Organic compounds can be grouped together in homologous series.

(i) Describe **two** characteristics of a homologous series.

(2)

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(ii) Name the homologous series to which propene belongs.

(1)

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(Total for question = 3 marks)

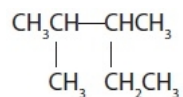
Q5. But-1-ene and but-2-ene are unsaturated hydrocarbons with the molecular formula C_4H_8 .

Each one reacts with a few drops of bromine in an addition reaction.

Draw the skeletal formula of *trans*-but-2-ene.

(1)

Q6. What is the systematic name for the compound with the following formula?



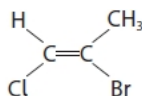
- A** 2-methyl-3-ethylbutane
- B** 1,2,3-trimethylbutane
- C** 2,3-dimethylpropane
- D** 2,3-dimethylpentane

(Total for Question = 1 mark)

Q7.

Compounds with a carbon-carbon double bond are unsaturated.

What is the name of the compound shown?



(1)

- A** *cis*-2-bromo-1-chloroprop-1-ene
- B** *E*-2-bromo-1-chloroprop-1-ene
- C** *trans*-2-bromo-1-chloroprop-1-ene
- D** *Z*-2-bromo-1-chloroprop-1-ene

(Total for question = 1 mark)

Mark Scheme

Q1.

Question Number	Answer	Mark
	B (2,3-dimethylhexane)	(1)

Q2.

Question Number	Correct Answer	Mark
	B	1

Q3.

Question number	Acceptable Answer	Additional Guidance	Mark
(a)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> -ane means molecule is saturated but a cycloalkane does not have the same general formula as an alkane (1) cyclobutane does have the general formula C_nH_{2n} but it is not an alkene (1) 	<p>Accept is an alkane for molecule is saturated</p> <p>Accept does not contain (C=C) double bonds</p> <p>Allow 1 mark for the two errors in the statements without discussion of the merits of the statements</p>	2

Question number	Acceptable Answer	Additional Guidance	Mark
(b)	<ul style="list-style-type: none"> $C_4H_6 + H_2 \rightarrow C_4H_8$ 	<p>Accept skeletal formulae</p> <p>Ignore state symbols</p>	1

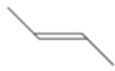
Question number	Acceptable Answer	Additional Guidance	Mark
(c)	<ul style="list-style-type: none"> $C_{10}H_{14}$ 		1

Q4.

Question Number	Acceptable Answer	Additional Guidance	Mark
(i)	<p>Award any two from the following:</p> <ul style="list-style-type: none"> they have the same general formula (1) they / neighbouring compounds differ from each other by a $-CH_2-$ group (1) they have the same functional group / display similar chemical properties (1) they show a gradual change / trend in physical properties (1) 	<p>Allow example of general formula, e.g alkanes are C_nH_{2n+2}</p> <p>Do not award 'the same formula / molecular formula / structural formula'</p> <p>Allow 'the same chemical properties'</p> <p>Ignore 'the same physical properties' or 'similar physical properties'.</p> <p>Trend must be stated or implied.</p> <p>Allow a stated property such as boiling temperature</p>	(2)

Question Number	Acceptable Answer	Additional Guidance	Mark
(ii)	• alkene(s)	Do not award alkanes	(1)

Q5.

Question Number	Answer	Additional Guidance	Mark
		Do not accept a structural or displayed formula.	1

Q6.

Question Number	Correct Answer	Reject	Mark
	D		1

Q7.

Question Number	Answer	Mark
	D (Z-2-bromo-1-chloroprop-1-ene)	(1)

Further work (not required for induction but a very good idea to smooth your transition over the summer)

Tasks:

- Use a similar structure to the task I set out earlier in the document.
- There is no need to submit any of this to me.
- Base your 'organic chemistry' work on the factsheets 16,17 (in that order)
- Beware of 'americanised' videos on YouTube, many of which use rules for naming or describing organic compounds which are a little inaccurate and could possibly confuse you.

Important:

- If you are finding 'jumping in at the deep end' difficult, don't be surprised!
- Organic chemistry has a heavy practical bias and organic reactions, in particular, usually need some visual accompaniment to make sense of – which you will get at A-level.
- However, to be clear, this IS the level you have to work at from term 3 in February (though with a LOT more teacher guidance, of course!)
- In summary, the induction again shows the initial level of challenge, but without the support. This means if you can do it without guidance (or even just a proportion of it) then you have the 'right stuff'!