



For Supervisor's use only

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90315



NEW ZEALAND QUALIFICATIONS AUTHORITY  
MANA TOHU MĀTAURANGA O AOTEAROA



National Certificate of Educational Achievement  
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

## Level 2 Science, 2004

### 90315 Describe naturally occurring organic mixtures and the production of derived consumer products

Credits: Four

9.30 am Wednesday 17 November 2004

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

A Periodic Table is printed on page 2 of this booklet.

Show ALL working.

If you need more space for any answer, use the page provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–10 in the correct order and that none of these pages is blank.

**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.**

Achievement Criteria			For Assessor's use only		
Achievement		Achievement with Merit		Achievement with Excellence	
Describe organic compounds, and the composition and uses of naturally occurring organic mixtures.	<input type="checkbox"/>	Link the composition of naturally occurring organic mixtures and the derived consumer products to their uses.	<input type="checkbox"/>	Explain the usefulness of naturally occurring organic mixtures and the derived consumer products in terms of their properties.	<input type="checkbox"/>
Describe key steps in the production of consumer products from naturally occurring organic mixtures.	<input type="checkbox"/>	Link the key steps in the consumer production process to the properties of the naturally occurring organic mixtures involved.	<input type="checkbox"/>	Explain the purpose of individual steps in the consumer production process.	<input type="checkbox"/>
Overall Level of Performance (all criteria within a column are met)					<input type="checkbox"/>

PERIODIC TABLE OF THE ELEMENTS

18

1		2		Atomic Number										Atomic Mass										2	
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21							
Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca	Sc							
6.9	9.0	10.8	12.0	14.0	16.0	19.0	20.2	23.0	24.3	27.0	28.1	31.0	32.0	35.5	40.0	39.1	40.1	45.0							
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29							
Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu							
23.0	24.3	27.0	28.1	31.0	32.0	35.5	40.0	39.1	40.1	45.0	47.9	50.9	52.0	54.9	55.9	58.9	58.7	63.6							
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55							
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	Cs							
85.5	87.6	88.9	91.2	92.9	95.9	(98)	101.1	102.9	106.4	107.9	112.4	114.8	118.7	121.8	127.6	126.9	131.3	132.9							
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73							
Cs	Ba	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta							
132.9	137.3	175.0	140.9	140.9	140.9	140.9	150.4	151.9	157.3	158.9	162.5	164.9	167.3	168.9	171.3	173.0	175.0	178.5							
87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105							
Fr	Ra	Ac	Th	Pa	U	Np	Pu	A	Am	Cm	Bk	Cf	Es	Fm	M	Lr	Rf	Db							
(223)	226.0	227.0	232.0	231.0	238.0	237.0	244.0	247.0	252.0	258.1	262.1	267.1	271.1	274.1	277.1	283.0	287.1	292.0							

You are advised to spend 45 minutes answering the questions in this booklet.

### QUESTION ONE: ORGANIC COMPOUNDS

(a) Complete the following table with the name or structure of each compound.

Name	Structure
Ethanol	(i)
(ii)	$  \begin{array}{cccccccc}  & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \\  &   &   &   &   &   &   &   \\  \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{C} - \text{H} \\  &   &   &   &   &   &   &   \\  & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H}  \end{array}  $
Pentene	(iii)
(iv)	$  \begin{array}{ccccccc}  & \text{H} & \text{H} & \text{H} & \text{H} & & \\  &   &   &   &   & & \\  \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{OH} \\  &   &   &   &   & & \\  & \text{H} & \text{H} & \text{H} & \text{H} & &   \end{array}  $
Butanoic acid	(v)

(b) Give the name and structure of the straight-chained alkane with 7 carbon atoms.

Name	Structure

(a) Describe how crude oil differs from refined oil.

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**QUESTION THREE: BIOGAS AS NATURAL GAS**Assessor's  
use only

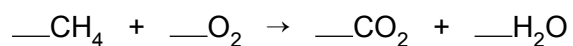
The breakdown of sewage wastes releases large amounts of methane.

- (a) Why is methane the simplest hydrocarbon?

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- (b) Balance the equation for the burning of methane in excess oxygen.



- (c) Explain the **process** by which methane is produced from raw sewage.

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**QUESTION FOUR: PLANTS AND ALCOHOL**Assessor's  
use only

Alcohol can be produced by the fermentation of plant material.

- (a) Complete the following word equation for fermentation.

Plant sugars + \_\_\_\_\_ → \_\_\_\_\_ + \_\_\_\_\_

- (b) Describe one chemical use of alcohol.

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- (c) Explain the process that produces alcohol from plants.

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- Discuss how the differences in the fermentation process account for the different levels of alcohol in beer and wine.

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# QUESTION FIVE: THE REFINING OF CRUDE OIL

Assessor's  
use only

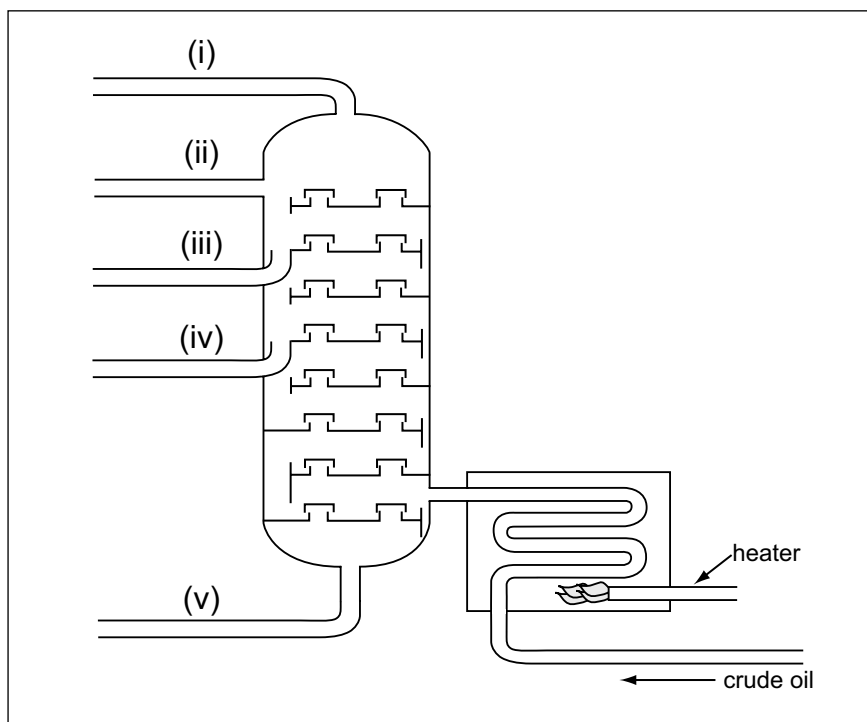


Diagram of a fractional distillation column.

- (a) During fractional distillation, the heater heats the crude oil. Why is the crude oil heated to  $450^{\circ}\text{C}$ ?

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- (b) List, in order, from the shortest carbon chain to the longest carbon chain, the products produced from the above refinery.

Products are petrol, oil, av-gas, methane, tar.

Shortest carbon chain length

- (i) \_\_\_\_\_
- (ii) \_\_\_\_\_
- (iii) \_\_\_\_\_
- (iv) \_\_\_\_\_
- (v) \_\_\_\_\_

Longest carbon chain length



To increase the amount of petrol obtained from crude oil, the process of 'cracking' is carried out.

Assessor's  
use only

- (c) Explain what 'cracking' does to the crude oil to get more petrol.

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- (d) Give the name and formula of the main **waste** product from cracking.

Name	Formula

- (e) This waste product is used to make a **key polymer**. Name the key polymer and draw its structure.

Name	Structure

- (f) Discuss the conditions necessary for 'cracking' to occur.

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