

A level Chemistry B
H433/02 Scientific literacy in chemistry

Question Set 7

1 Propene gas, C₃H₆, is obtained industrially from a variety of sources.
Propene is mainly used as a starting material for making polymers.

(a) (i) The mass spectrum of propene has several peaks including those at *m/z* 27 and 43.

Give the species responsible for these

peaks 27

43

[2]

(ii) Propene has an isomer, cyclopropane.

Explain why high-resolution mass spectrometry would **not** distinguish between propene and cyclopropane.

[2]

(iii) Suggest, with reasons, **two** spectroscopic methods (apart from mass spectroscopy) that would distinguish between cyclopropane and propene.

Method 1

.....

Reason:

.....

.....

.....

Method 2

.....

Reason:

.....

.....

.....

[4]

(b) (i) How many σ and π bonds are there in a propene molecule?

)

Number of σ bonds Number of π bonds

[1]

(ii) Propene has a H–C–H bond where the C atom forms a double bond.

What is the bond angle of this H–C–H bond?

[1]

(c) (i) Propene, C_3H_6 , can be made by cracking longer-chain hydrocarbons.

Write the equation for the cracking of nonane to give two molecules of propene and one other molecule.

[1]

(ii) What mass of propene (in kg) would be obtained from 15 kg of nonane in the reaction in (i) if the percentage yield was 85%?

mass of propene =kg. [2]

(d) Most of the propene that is manufactured is used to make the polymer poly(propene).

)

Draw the **full** structural formula of the repeating unit of poly(propene).

[1]

(e) (i) Cyclohexene is another industrially important alkene.

Explain how the enthalpy change of hydrogenation of cyclohexene is used to give evidence for the bonding in the benzene molecule.

[3]

(ii)* Cyclohexene and benzene both react with bromine but in different ways.

Compare the two reactions and explain why they are different.

[6]

Total Marks for Question Set 7: 23

Resource Materials

Question Set No: 7

The Periodic Table of the Elements

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(0)
1	2	13	14	15	16	17	18
1	2	5	6	7	8	9	10
H hydrogen 1.0	He helium 4.0	B boron 10.8	C carbon 12.0	N nitrogen 14.0	O oxygen 16.0	F fluorine 19.0	Ne neon 20.2
3	4	13	14	15	16	17	18
Li lithium 6.9	Be beryllium 9.0	Al aluminum 27.0	Si silicon 28.1	P phosphorus 31.0	S sulfur 32.1	Cl chlorine 35.5	Ar argon 39.9
11	12	13	14	15	16	17	18
Na sodium 23.0	Mg magnesium 24.3	Al aluminum 27.0	Si silicon 28.1	P phosphorus 31.0	S sulfur 32.1	Cl chlorine 35.5	Ar argon 39.9
19	20	31	32	33	34	35	36
K potassium 39.1	Ca calcium 40.1	Ga gallium 69.7	Ge germanium 72.6	As arsenic 74.9	Se selenium 79.0	Br bromine 79.9	Kr krypton 83.8
37	38	49	50	51	52	53	54
Rb rubidium 85.5	Sr strontium 87.6	In indium 114.8	Sn tin 118.7	Sb antimony 121.8	Te tellurium 127.6	I iodine 126.9	Xe xenon 131.3
55	56	81	82	83	84	85	86
Cs cesium 132.9	Ba barium 137.3	Tl thallium 204.4	Pb lead 207.2	Bi bismuth 209.0	Po polonium	At astatine	Rn radon
87	88	113	114	115	116		
Fr francium	Ra radium		Fl flerovium		Lv livermorium		

Key
atomic number
Symbol
name
relative atomic mass

57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
La lanthanum 138.9	Ce cerium 140.1	Pr praseodymium 140.9	Nd neodymium 144.2	Pm promethium 144.9	Sm samarium 150.4	Eu europium 152.0	Gd gadolinium 157.2	Tb terbium 158.9	Dy dysprosium 162.5	Ho holmium 164.9	Er erbium 167.3	Tm thulium 168.9	Yb ytterbium 173.0	Lu lutetium 175.0
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
Ac actinium 227.0	Th thorium 232.0	Pa protactinium 231.0	U uranium 238.1	Np neptunium	Pu plutonium	Am americium	Cm curium	Bk berkelium	Cf californium	Es einsteinium	Fm fermium	Md mendelevium	No nobelium	Lr lawrencium

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