

# Alkenes

## Mark Scheme 1

<b>Level</b>	IGCSE(9-1)
<b>Subject</b>	Chemistry
<b>Exam Board</b>	Edexcel IGCSE
<b>Module</b>	Double Award (Paper 1C)
<b>Topic</b>	Organic Chemistry
<b>Sub-Topic</b>	Alkenes
<b>Booklet</b>	Mark Scheme 1

**Time Allowed:** 54 minutes

**Score:** /45

**Percentage:** /100

**Grade Boundaries:**

9	8	7	6	5	4	3	2	1
>90%	80%	70%	60%	50%	40%	30%	20%	10%

Question number	Answer	Notes	Marks
1 (a)	C	Accept formula of C	1
1 (b) i	(compound/molecule/substance containing) carbon and hydrogen (atoms/elements)	Reject atom/element in place of compound/molecule Reject compound/molecule in place of atoms/elements Reject mixture	1
	Only	M2 dependent on mention of carbon and hydrogen even if M1 not awarded Accept other terms with same meaning, e.g. solely / exclusively / just	1
	A	M3 independent Accept name/formula of A	1
	ii contains a (C=C) double bond	Accept multiple bond Ignore references to type of compound, eg hydrocarbon Reject double bond between C and H Do not penalise incorrect terms such as atom or element Ignore not all bonds are single Accept can undergo addition reactions Accept does not contain the maximum number of hydrogens/hydrogen atoms	1
	B	M2 independent Accept name/formula of B	1

	Answer	Notes	Marks
1 b iii	(compounds / molecules / substances with) same molecular formula / same number of each type of atom	Ignore same (chemical) formula /same compound No penalty for reference to hydrocarbons Reject same empirical/general formula If atoms or elements instead of compounds or molecules, only 1 of M1 and M2 can be awarded	1
	different structures /different structural/displayed formulae OR atoms arranged differently	Ignore different molecular arrangement	1
	C and F	Accept in either order Accept formulae of C and F	1

Question number	Answer	Notes	Marks
1 c i	<p>same/similar chemical properties/reactions/behaviour/characteristics</p> <p>gradation / gradual change / trend / increase / decrease of physical properties</p> <p>same functional group</p> <p>same general formula</p>	<p>Ignore specific examples such as react with oxygen</p> <p>Ignore similar (type of) reactivity</p> <p>Do not penalise reference to trends</p> <p>Accept reference to specific property, eg boiling point</p> <p>Reject same / similar physical properties</p> <p>Ignore variable physical properties</p> <p>Ignore reference to specific group</p> <p>Accept alkanes have the (general) formula <math>C_nH_{2n+2}</math></p> <p>Reject same empirical/molecular formula</p> <p>Any two for 1 each</p> <p>Accept two answers on one answer line</p> <p>Ignore any reference to properties not specified as physical or chemical</p>	2
ii	D AND E	<p>Reject any other combinations</p> <p>Accept correct formulae</p>	1

Question number	Answer	Notes	Marks
1 d i	$\begin{array}{cc} \text{H} & \text{H} \\   &   \\ \text{H}-\text{C} & - & \text{C}-\text{H} \\   &   \\ \text{Br} & \text{Br} \end{array}$	Ignore bond angles and positioning of Br (as long as one on each C)	1
ii	$\begin{array}{c} \text{H} \\   \\ \text{H}-\text{C}-\text{H} \\   \\ \text{H} \end{array}$		<b>Total</b>

Question number	Answer	Notes	Marks
2 (a) (i)	Q R S P <b>M1</b> Q and P correct <b>M2</b> R and S correct		2
(ii)	<b>M1</b> magnesium chloride <b>M2</b> hydrogen <b>M1</b> and <b>M2</b> can be in either order	ACCEPT correct formulae IGNORE incorrect formulae	2
(b)	<b>M1</b> (add) (aqueous) silver nitrate / $\text{AgNO}_3$  <b>M2</b> white precipitate (forms)	IGNORE refs to nitric acid  do not award <b>M1</b> if hydrochloric acid also <b>added</b>  <b>M2</b> dep on mention of silver nitrate in <b>M1</b>	2

Question number	Answer	Notes	Marks
3 a	<p>M1 (they/all) contain hydrogen and carbon (atoms)</p> <p>M2 only</p>	<p>Accept H and C            Accept particles/elements in place of atoms            Reject ions/molecules/compounds in place of atoms            Reject element instead of they/all            Reject H<sub>2</sub>            Reject mixture</p> <p>Accept words with other meaning (eg solely/exclusively)            M2 DEP on reference to hydrogen and carbon even if M1 not awarded</p>	2
b	double bond	<p>Accept multiple in place of double            Accept contain C=C            Ignore references to single bonds</p>	1
c	A		1
d	B and E and F	<p>All three correct scores 2 marks            Two correct scores 1 mark</p> <p>If more than three answers given lose one mark for each error eg BCEF scores 1 mark</p>	2
e	because it has no double bond(s) / has only single bonds / is saturated	<p>Accept because only unsaturated compounds decolourise bromine water            Accept because only alkenes decolourise bromine water            Accept because it's not an alkene            Accept because it's not unsaturated            Accept because it's a (cyclo)alkane</p>	1

Question number	Answer	Notes			Marks
3 f i	<p>M1 for setting out calculation</p> <p>If division upside down or division by one or more atomic numbers, then 0/3</p> <p>M2 for obtaining ratio Accept any number of sig figs except one Allow 0.92</p> <p>M3 for whole number ratio M3 DEP on M2</p> <p>allow alternative method:</p> <p>M1 calculation of <math>M_r C_2H_4Br = 108</math></p> <p>M2 expression for % of <u>each</u> element eg C: <math>24/108 \times 100</math></p> <p>M3 evaluation to show these equal 22.2%, 3.7%, 74.1%</p>	<p>C</p> <p><math>\frac{22.2}{12}</math></p> <p>1.85</p> <p>2</p>	<p>H</p> <p><math>\frac{3.7}{1}</math></p> <p>3.7</p> <p>:</p> <p>4</p>	<p>Br</p> <p><math>\frac{74.1}{80}</math></p> <p>0.93</p> <p>:</p> <p>1</p>	3
ii	<p>M1 <math>((2 \times 12) + (4 \times 1) + (1 \times 80) =) 108</math></p> <p>M2 <math>(216 \div 108 = 2)</math> (so molecular formula is) <math>C_4H_8Br_2</math></p>	correct answer with no working scores 2			2





iii	M1	over/greater supply of long-chain hydrocarbons/molecules/ heavy/heavier fractions / OWTTE	Accept long chain hydrocarbons/molecules heavy/heavier fractions are of less use (as fuels)	3
	M2	high demand/more use for short-chain/small hydrocarbons/ light/lighter fractions / OWTTE	Accept answers in terms of petrol / fuel (for cars)  Short chain hydrocarbon molecules are more useful/in greater demand than long chain hydrocarbons/molecules scores M1 and M2	
	M3	Alkenes used to make polymers	Accept specific alkene and product eg ethene to make poly(ethene)/ethanol/alcohol	
c	M1	forms sulfur dioxide (when burned)		2
	M2	which causes specified problem for environment OR specified problem for humans	eg acid rain / damages trees / kills fish  eg toxic / respiratory irritant / triggers asthma attacks Ignore harmful gas	

Question number	Answer	Notes	Marks
4 d	$  \begin{array}{cccc}  \text{H} & \text{H} & \text{H} & \text{H} \\    &   &   &   \\  \text{---C} & \text{---C} & \text{---C} & \text{---C} \text{---} \\    &   &   &   \\  \text{H} & \text{CH}_3 & \text{H} & \text{CH}_3  \end{array}  $	<p>M1 for only <u>two</u> (of the four) carbon atoms both with two H  eg -CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>- scores 0</p> <p>M2 for (the other) <u>two</u> carbon atoms each with one H and one CH<sub>3</sub>  No M2 if methyl groups on 1st + 2nd, or on 3rd + 4th carbons in chain</p> <p>Do not penalise bonds to H of CH<sub>3</sub></p> <p>Max 1 if chain extended correctly</p> <p>Ignore brackets and n</p> <p>each carbon must have four bonds  eg -CH<sub>2</sub>-CH-CH-CH<sub>2</sub>- scores 0</p> <p>if terminal Hs added max 1</p> <p>0/2 if any double bonds shown</p>	2