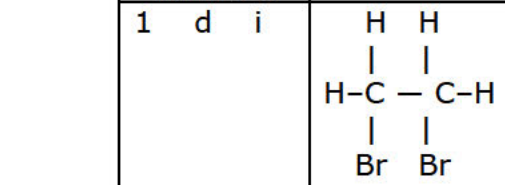
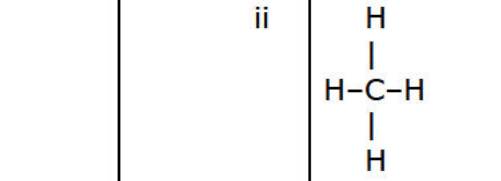
Question number	Answer	Notes	Marks
1 (a)	C	Accept formula of C	1
1 (b) i	(compound/molecule/substance containing) carbon and hydrogen (atoms/elements)	Reject atom/element in place of compound/molecule Reject compound/molecule in place of atoms/elements Reject mixture	1
	Only	M2 dependent on mention of 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	same/similar chemical properties/reactions/behaviour/characteristics	Ignore specific examples such as react with oxygen Ignore similar (type of) reactivity Do not penalise reference to trends	2
	gradation / gradual change / trend / increase / decrease of physical properties	Accept reference to specific property, eg boiling point Reject same / similar physical properties Ignore variable physical properties	
	same functional group	Ignore reference to specific group	
	same general formula	Accept alkanes have the (general) formula C_nH_{2n+2} Reject same empirical/molecular formula	
		Any two for 1 each Accept two answers on one answer line Ignore any reference to properties not specified as physical or chemical	
ii	D AND E	Reject any other combinations Accept correct formulae	1

Question number	Answer	Notes	Marks
1 d i		Ignore bond angles and positioning of Br (as long as one on each C)	1
ii			1
		Total	**14**

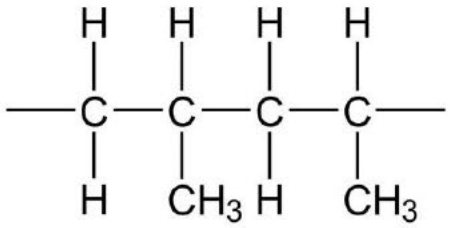
Question number	Answer	Notes	Marks
2 (a) (i)	Q R S P **M1** Q and P correct **M2** R and S correct		2
(ii)	**M1** magnesium chloride **M2** hydrogen **M1** and **M2** can be in either order	ACCEPT correct formulae IGNORE incorrect formulae	2
(b)	**M1** (add) (aqueous) silver nitrate / $AgNO_3$ **M2** white precipitate (forms)	IGNORE refs to nitric acid do not award **M1** if hydrochloric acid also **added** **M2** dep on mention of silver nitrate in **M1**	2

Question number	Answer	Notes	Marks
3 a	M1 (they/all) contain hydrogen and carbon (atoms) M2 only	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_2 Reject mixture Accept words with other meaning (eg solely/ exclusively) M2 DEP on reference to hydrogen and carbon even if M1 not awarded	2
b	double bond	Accept multiple in place of double Accept contain C=C Ignore references to single bonds	1
c	A		1
d	B and E and F	All three correct scores 2 marks Two correct scores 1 mark If more than three answers given lose one mark for each error eg BCEF scores 1 mark	2
e	because it has no double bond(s) / has only single bonds / is saturated	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	1

Question number	Answer	Notes	Marks
3 f i	M1 for setting out calculation If division upside down or division by one or more atomic numbers, then 0/3	C H Br 22.2 3.7 74.1 12 1 80	
	M2 for obtaining ratio Accept any number of sig figs except one Allow 0.92	1.85 3.7 0.93	
	M3 for whole number ratio M3 DEP on M2	2 : 4 : 1	
	allow alternative method:		3
	M1 calculation of M_r C_2H_4Br = 108		
	M2 expression for % of <u>each</u> element eg C: 24/108 x100		
	M3 evaluation to show these equal 22.2%, 3.7%, 74.1%		
ii	M1 ((2×12) + (4×1) + (1×80) =) 108		
	M2 (216 ÷ 108 = 2) (so molecular formula is) $C_4H_8Br_2$	correct answer with no working scores 2	2

Question number	Answer	Notes	Marks
4 a i	fuel oil		1
ii	fuel oil		1
iii	gasoline		1
b i	alumina / silica	Accept aluminosilicates/zeolites Accept aluminium oxide/silicon dioxide/silicon oxide/silicon (IV) oxide Accept correct formulae	1
ii	M1 for correct formula - C_4H_8 M2 for correct coefficient - 2	Accept $C_4H_8 + C_4H_8$ for 2 marks Award 1 mark for $4C_2H_4$ Award 1 mark for C_8H_{16} Award 1 mark for two alkenes which have a total of 8C and 16H eg $C_3H_6 + C_5H_{10}$	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		M1 for only <u>two</u> (of the four) carbon atoms both with two H eg $-CH_2-CH_2-CH_2-CH_2-$ scores 0 M2 for (the other) <u>two</u> carbon atoms each with one H and one CH_3 No M2 if methyl groups on 1st + 2nd, or on 3rd + 4th carbons in chain Do not penalise bonds to H of CH_3 Max 1 if chain extended correctly Ignore brackets and n each carbon must have four bonds eg $-CH_2-CH-CH-CH_2-$ scores 0 if terminal Hs added max 1 0/2 if any double bonds shown	2