Alkenes (MCQ)

1. What is the best description for the bonding between the carbon atoms in an ethene molecule?

A One σ-bond and one π-bond
B One π-bond
C Two σ-bonds
D Two π-bonds

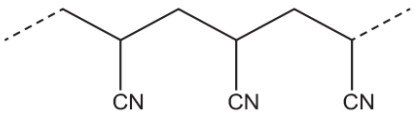
Your answer ☐ **[1]**

2. Which statement about an electrophile is correct?

A It is an electron pair acceptor.
B It is a proton donor.
C It is a negative ion.
D It is a species with an unpaired electron.

Your answer ☐ **[1]**

3. A section of a polymer is shown below.



Which monomer could form this polymer?

A $CH_3CH(OH)CN$
B $HOCH_2CH_2CN$
C $H_2C=CHCN$
D NCCH=CHCN

Your answer ☐ **[1]**

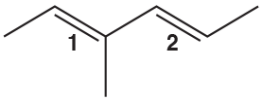
4. A student reacts pent-2-ene with bromine in the laboratory.

Which compound is formed?

A 1,1-dibromopentane
B 1,2-dibromopentane
C 2,2-dibromopentane
D 2,3-dibromopentane

Your answer ☐ **[1]**

5. The molecule below has two double bonds, labelled **1** and **2**.



The arrangement around each double bond can be identified as *E* or *Z*.

Which row in the table is correct for double bond **1** and double bond **2**?

	Double bond 1	**Double bond 2**
A	*E*	*Z*
B	*Z*	*E*
C	*E*	*E*
D	*Z*	*Z*

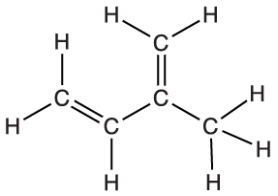
Your answer ☐ **[1]**

6. Which alcohol reacts with an acid catalyst to form *E* and *Z* stereoisomers?

A pentan-3-ol
B pentan-1-ol
C 2-methylbutan-2-ol
D 2,2-dimethylpropan-1-ol

Your answer ☐ **[1]**

7. The displayed formula for a hydrocarbon is shown below.



How many σ and π bonds are present in a molecule of this hydrocarbon?

	σ bonds	**π bonds**
A	2	4
B	10	2
C	10	4
D	12	2

Your answer ☐

[1]

8. A reaction sequence is shown below:

Step 1 $CH_3CH{=}CHCH_3 + HBr \rightarrow CH_3CH_2CHBrCH_3$

Step 2 $CH_3CH_2CHBrCH_3 + NaOH \rightarrow CH_3CH_2CH(OH)CH_3 + NaBr$

Which type of reaction mechanism is involved in each step?

	Step 1	**Step 2**
A	electrophilic addition	electrophilic substitution
B	electrophilic addition	nucleophilic substitution
C	nucleophilic addition	electrophilic substitution
D	nucleophilic addition	nucleophilic substitution

Your answer ☐

[1]

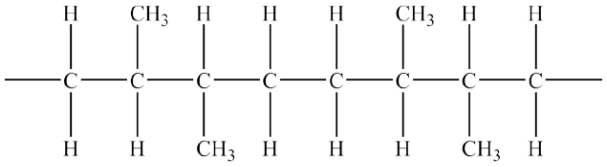
9. Which compound has non-polar molecules?

A *E*-1,2-dichlorobut-2-ene
B *E*-2,3-dichlorobut-2-ene
C *Z*-2,3-dichlorobut-2-ene
D *Z*-1,4-dichlorobut-2-ene

Your answer ☐

[1]

10. A section of a polymer chain is shown below.



Identify the monomer that would give rise to this section of addition polymer.

A. *E*-But-2-ene
B. *Z*-But-2-ene
C. Methylpropene
D. Propene

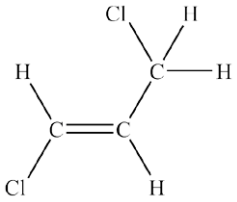
Your answer ☐

[1]

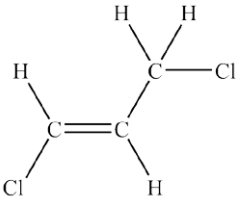
11. Three of the following displayed formulae represent the same isomer of $C_3H_4Cl_2$ but one structure represents a different isomer, **X**.

Which displayed formula represents **X**?

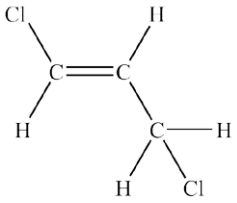
A



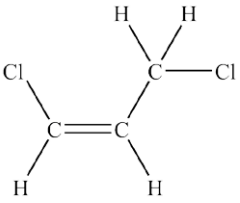
B



C



D



Your answer ☐

[1]

END OF QUESTION PAPER

Mark scheme – Alkenes (MCQ)

Question			Answer/Indicative content	Marks	Guidance
1			**A**	1 (AO1.1)	**Examiner's Comments** Candidates answered this question well with over two-thirds choosing the correct option A. Option D was the most common incorrect response suggesting that candidates are uncertain about the nature of a C=C double bond.
			Total	**1**	
2			**A**	1 (AO1.1)	
			Total	**1**	
3			**C**	1 (AO1.2)	**Examiner's Comments** This part discriminated well. Although most candidates did select C as the correct structure, many were diverted into selecting option D, the other alternative containing a double C=C bond. In identifying a monomer for an addition polymer, candidates are advised to identify the repeat unit and then to replace the single C–C bond with a double bond to give the monomer.
			Total	**1**	
4			**D**	**1**	**Examiner's Comments** Most candidates chose the correct option of D but a sizeable number chose B and C, the other options containing a '2' in their names. The best strategy here is to draw out the carbon skeleton of pent-2-ene from which it is clear that bromine atoms must be added at carbon positions 2 and 3.
			Total	**1**	
5			**C**	**1**	**Examiner's Comments** This was a difficult question but higher ability candidates selected the correct option of C. The main discriminator was B, which identifies the 1 double bond as *Z*. CIP analysis is required to show that the double bond is *E*. This is a good 'hard' example for illustrating *E*/*Z* isomerism.

			Total	**1**	
6			A	**1**	**Examiner's Comments** Candidates found this question challenging, with only the more able candidates obtaining the correct alcohol. Answer option C was a common incorrect answer.
			Total	**1**	
7			D	1	**Examiner's Comments** B was a common incorrect answer with the sigma bond not counted as part of a double bond.
			Total	**1**	
8			B	1	**Examiner's Comments** Generally scored well.
			Total	**1**	
9			B	1	**Examiner's Comments** Candidates struggled with this very different polarity question. The majority of candidates are clearly used to applying symmetry to much simpler molecules.
			Total	**1**	
10			D	1	
			Total	**1**	
11			D	1	
			Total	**1**	