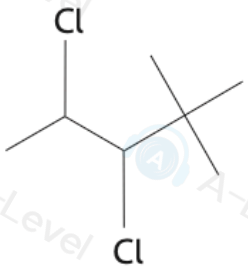
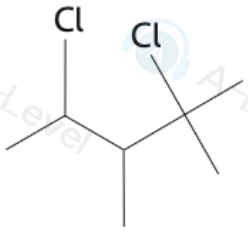
16 Which is the skeletal structure for 3,4-dichloro-2,2-dimethylpentane?

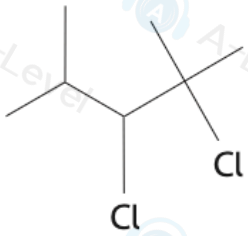
☒ **A**



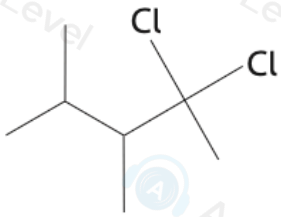
☒ **B**



☒ **C**



☒ **D**



(Total for Question 16 = 1 mark)

15: One molecule of a hydrocarbon is cracked to form two molecules of ethene, two molecules of propene and one molecule of propane. What is the molecular formula of the hydrocarbon?

☒ **A** C_8H_{18}

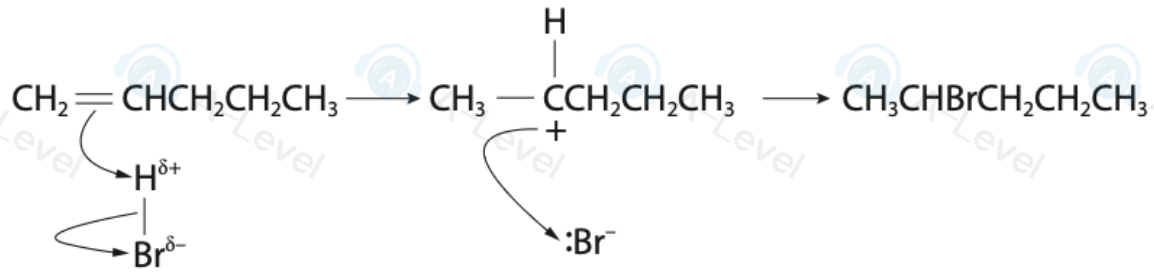
☒ **B** $C_{10}H_{22}$

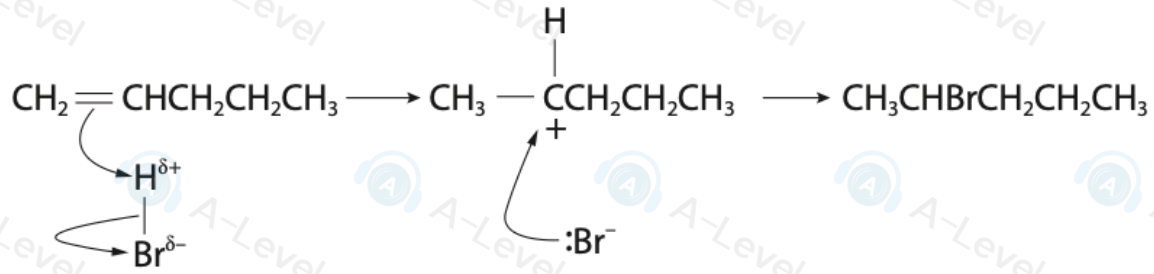
☒ **C** $C_{11}H_{24}$

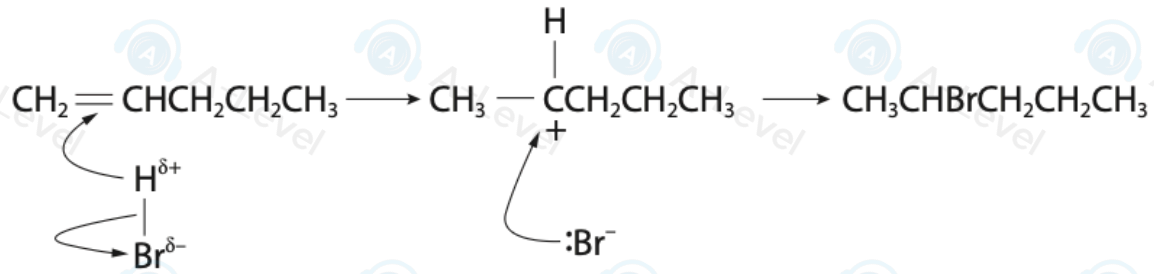
☒ **D** $C_{13}H_{28}$

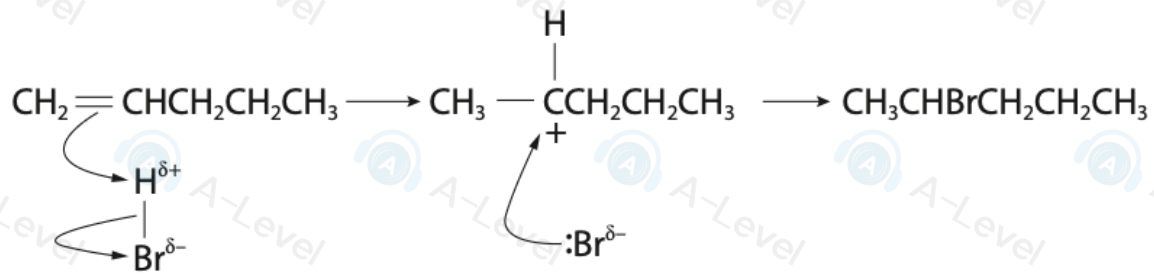
(Total for Question 15 = 1 mark)

19: Which is the correct mechanism for the electrophilic addition reaction between HBr and pent-1-ene to give the major product?

☒ **A** 

☒ **B** 

☒ **C** 

☒ **D** 

(Total for Question 19 = 1 mark)

13 What is observed when iron(II) carbonate reacts with ethanoic acid?

☒ **A** colourless solution

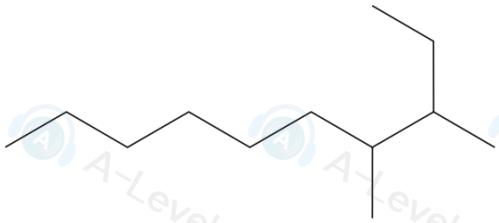
☒ **B** colourless solution and effervescence

☒ **C** green solution and effervescence

☒ **D** green solution

(Total for Question 13 = 1 mark)

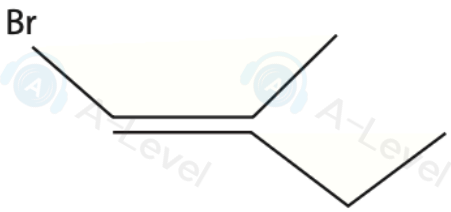
15 What is the IUPAC name for the hydrocarbon shown?



- ☒ **A** 2-ethyl-3-methylnonane
- ☒ **B** 3,4-dimethyldecane
- ☒ **C** 8-ethyl-7-methylnonane
- ☒ **D** 7,8-dimethyldecane

(Total for Question 15 = 1 mark)

17 What is the IUPAC name for the compound shown?



- ☒ **A** *E*-1-bromo-2-methylbut-1-ene
- ☒ **B** *Z*-1-bromo-2-methylbut-1-ene
- ☒ **C** *E*-1-bromo-2-ethyl-2-methylethene
- ☒ **D** *Z*-1-bromo-2-ethylpropene

(Total for Question 17 = 1 mark)

---

4 What is the best definition of a hydrocarbon?

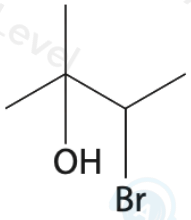
- ☒ **A** a compound containing carbon, hydrogen and oxygen
- ☒ **B** a compound containing carbon and hydrogen only
- ☒ **C** a compound that contains single carbon to carbon bonds
- ☒ **D** a mixture containing carbon and hydrogen only

(Total for Question 4 = 1 mark)

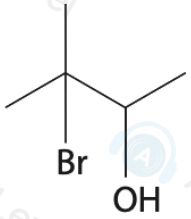
17 Bromine and bromine water can be used to test for a carbon-carbon double bond. When **bromine water** reacts with 2-methylbut-2-ene, there is one major organic product.

Which is the skeletal formula of the **major** product?

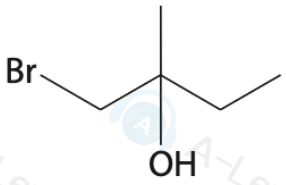
☒ **A**



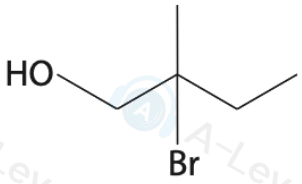
☒ **B**



☒ **C**



☒ **D**



(Total for Question 17 = 1 mark)

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16 Which mixture could be formed when a **single** molecule of $C_{12}H_{26}$ is cracked?

☒ **A** butene, pentane and propene

☒ **B** hexane, butene and ethane

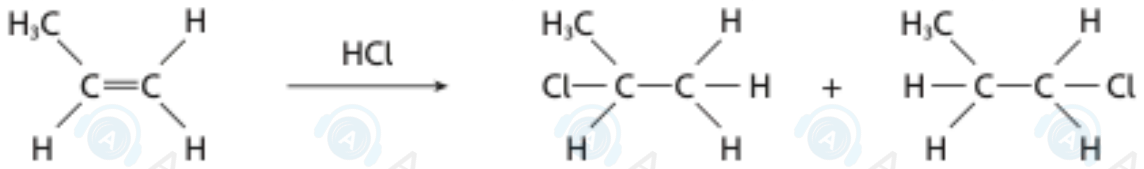
☒ **C** nonane and ethene

☒ **D** propene and decane

(Total for Question 16 = 1 mark)

19 This question is about two reactions of propene.

Reaction **1**

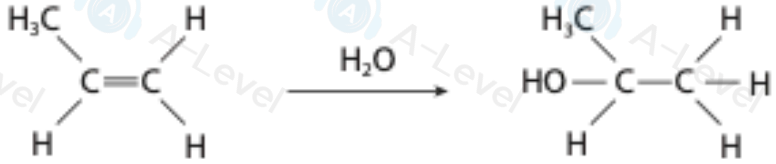


propene

2-chloropropane
(major product)

1-chloropropane
(minor product)

Reaction **2**



(a) (i) Name the mechanism and type of reaction for Reaction **1**.

(1)

(ii) Explain why the structures of the intermediates in Reaction **1** mean that 2-chloropropane is formed in greater yield than 1-chloropropane.

(3)

18 Compounds **A**, **B**, **C** and **D** all have the molecular formula C_4H_8.
A, **B** and **C** each contain one double bond, but **D** does not.
A and **B** are geometric isomers of each other.

(a) Deduce a possible structure and name for each compound.

(4)

Possible structure of **A**

Name

.....

Possible structure of **B**

Name

.....

Possible structure of **C**

Name

.....

Possible structure of **D**

Name

.....

(b) The carbon–carbon double bond consists of a σ bond and a π bond.

Describe the difference between the σ bond and the π bond.
Include a labelled diagram in your answer.

(4)

(c) Give **two** reasons why compounds **A** and **B** exist as geometric isomers.

(2)

(Total for Question 18 = 10 marks)

19 Both butter and margarine are fats used in cooking.

(a) Margarines are sold as unsaturated fats.

State the meaning of the term unsaturated.

(1)

.....

.....

(b) (i) The degree of unsaturation can be determined by the reaction with bromine water.

Name the type of reaction.

(1)

.....

Data using 0.5 g of some unsaturated fat in this bromination is given in the table.

Average number of C═C bonds per molecule	Volume of 0.0625 mol dm^{-3} bromine water / cm^3
1	28.3
2	57.3
3	86.9
4	115

(ii) Plot a graph of the data. Include a line of best fit.

(3)

(iii) Data for the bromination of 0.5 g samples of a margarine are shown.

Trial	Volume of 0.0625 mol dm^{-3} bromine water / cm^3
1	36.9
2	34.1
3	39.3
4	32.5

Calculate the mean volume of bromine water using all results in the table.

(1)

(iv) Determine the average number of C═C bonds per molecule of the unknown sample to 2 significant figures, using your graph.

(1)

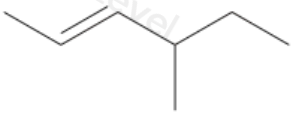
.....

(c) (i) Using the simplest alkene as an example, draw the mechanism to show the reaction with liquid bromine.

(4)

(ii) Name this compound by applying IUPAC rules.

(1)

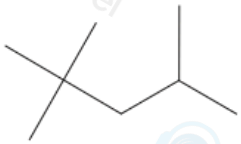


.....

(d) Explain the meaning of "trans" in "trans" fats, using a **skeletal** formula showing four carbon atoms in your answer.

(2)

21 The structure of a compound **X** is shown. **X** is present in petrol.



(a) (i) Give the molecular formula and IUPAC name for **X**.

(2)

.....

.....

(ii) Name the industrial process used to produce **X** from the straight-chain isomer.

(1)

.....

(b) Heptane is also present in petrol.

(i) Write an equation for the **complete** combustion of heptane.
Include state symbols.

(2)

(ii) Identify, by name or formula, a pollutant that may result from the **incomplete** combustion of heptane.

(1)

(c) Recently, sales of electric cars have increased.

Give **two** environmental benefits of using electric cars.
Justify your answers.

(2)

(Total for Question 21 = 8 marks)