Edexcel Chemistry A-level - Organic Chemistry I MCQ

Questions

Q1.

This question is about hydrocarbons.

How many σ bonds and π bonds are there in one molecule of cyclohexene?

(1)

		σ bonds	π bonds
☒	**A**	5	2
☒	**B**	6	1
☒	**C**	15	2
☒	**D**	16	1

(Total for question = 1 mark)

Q2.

This question is about 2-methylpropan-2-ol.

Which observation would be expected when 2-methylpropan-2-ol is heated with potassium dichromate(VI) and dilute sulfuric acid?

(1)

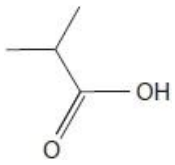
☒ **A** orange to green
☒ **B** green to orange
☒ **C** purple to colourless
☒ **D** no change

(Total for question = 1 mark)

Q3.

Some alcohols can be oxidised by acidified sodium dichromate(VI), $Na_2Cr_2O_7$.

The carboxylic acid shown can be produced by oxidation of an alcohol under reflux.



Which alcohol would be oxidised under reflux to produce this carboxylic acid?

(1)

- ☒ **A** 1,1-dimethylethanol
- ☒ **B** 2-methylpropan-1-ol
- ☒ **C** 2-methylbutan-1-ol
- ☒ **D** propan-2-ol

(Total for question = 1 mark)

Q4.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

This question is about alcohols and their reactions.

2-methylpropan-2-ol may be formed by the reaction between
2-bromo-2-methylpropane and aqueous potassium hydroxide.

What is the role of the hydroxide ions in this reaction?

(1)

- ☒ **A** alkali
- ☒ **B** catalyst
- ☒ **C** electrophile
- ☒ **D** nucleophile

(Total for question = 1 mark)

Q5.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Which of the following changes to the proportions of organic molecules within a fraction results from the reforming process?

(1)

	Proportion of branched chain alkanes	Proportion of cyclic hydrocarbons
☒ **A**	decrease	decrease
☒ **B**	decrease	increase
☒ **C**	increase	decrease
☒ **D**	increase	increase

(Total for question = 1 mark)

Q6.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

This question is about alkenes.

Which of these has the molecular formula C_6H_{10}?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

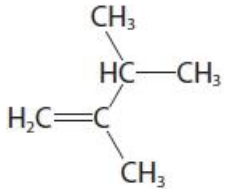
(Total for question = 1 mark)

Q7.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

This question is about alkenes.

What is the systematic name of this alkene?



(1)

- ☐ **A** 2-methylpent-1-ene
- ☐ **B** 3-methylpent-1-ene
- ☐ **C** 2,3-dimethylbut-1-ene
- ☐ **D** 2,3-dimethylbut-3-ene

(Total for question = 1 mark)

Q8.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

This question is about alkenes with the molecular formula C_5H_{10}.

Which of these compounds would form pent-2-ene **only**, when reacted with concentrated phosphoric acid, H_3PO_4?

(1)

- ☐ **A** $CH_3CH(OH)CH(CH_3)_2$
- ☐ **B** $CH_2(OH)CH_2CH_2CH_2CH_3$
- ☐ **C** $CH_3CH_2CH_2CH(OH)CH_3$
- ☐ **D** $CH_3CH_2CH(OH)CH_2CH_3$

(Total for question = 1 mark)

Q9.

This question is about alkanes.

The black smoke produced from the incomplete combustion of alkane fuels is

(1)

- ☒ **A** carbon particulates
- ☒ **B** oxides of nitrogen
- ☒ **C** oxides of sulfur
- ☒ **D** unburnt hydrocarbons

(Total for question = 1 mark)

Q10.

The number of structural isomers with the molecular formula C_5H_{12} is

(1)

- ☒ **A** 3
- ☒ **B** 4
- ☒ **C** 5
- ☒ **D** 6

(Total for question = 1 mark)

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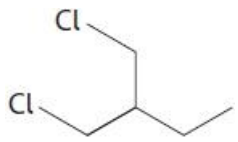
Q11.

This is a question about dihalogenoalkanes.

What is the classification of the dihalogenoalkane shown?



(1)

- ☒ **A** primary
- ☒ **B** secondary
- ☒ **C** tertiary
- ☒ **D** primary and secondary

(Total for question = 1 mark)

Q12.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

The structures of two isomers are shown.

What kind of isomerism is shown by these molecules?

- ☒ **A** carbon chain
- ☒ **B** positional
- ☒ **C** *E*/*Z*
- ☒ **D** *cis*/*trans*

(Total for question = 1 mark)

Q13.

Ethene reacts with bromine in the dark.

(i) What is the classification of the mechanism for the reaction between ethene and bromine?

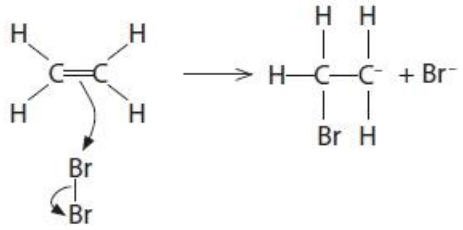
(1)

- ☒ **A** electrophilic addition
- ☒ **B** electrophilic substitution
- ☒ **C** nucleophilic addition
- ☒ **D** nucleophilic substitution

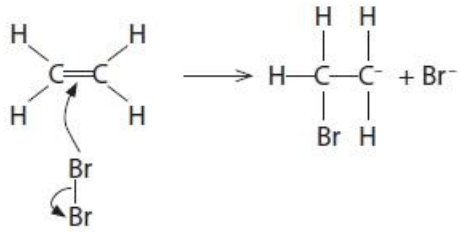
(ii) Which of the following shows the formation of the intermediate in the mechanism for the reaction between ethene and bromine?

(1)

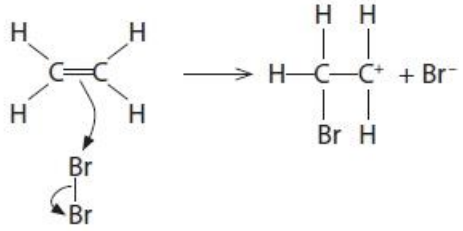
☒ **A**



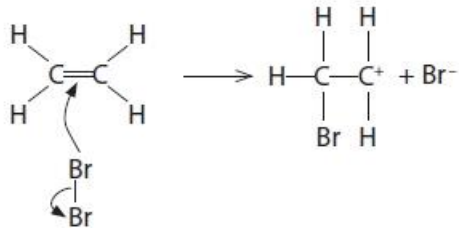
☒ **B**



☒ **C**



☒ **D**



(Total for question = 2 marks)

Q14.

This question is about compounds of Group 5 elements.

Which of these compounds produces hydrogen chloride when it reacts with PCl_5?

(1)

- ☒ **A** propanal
- ☒ **B** propan-1-ol
- ☒ **C** propanone
- ☒ **D** propyl propanoate

(Total for question = 1 mark)

Q15.

This is a question about hydrocarbons.

The **heterolytic** bond fission of a sigma (σ) bond in an alkane would produce

(1)

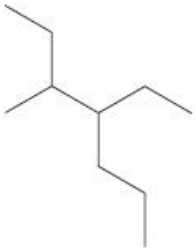
- ☒ **A** only carbocations
- ☒ **B** only free radicals
- ☒ **C** free radicals and ions
- ☒ **D** ions

(Total for question = 1 mark)

Q16.

This is a question about alkanes.

What is the name of this alkane?



(1)

- ☒ **A** 2-ethyl-3-propylpentane
- ☒ **B** 4-ethyl-3-methylheptane
- ☒ **C** 3-methyl-4-propylhexane
- ☒ **D** 4-methyl-3-propylhexane

(Total for question = 1 mark)

Q17.

This is a question about alkanes.

What is the reaction mechanism when ethane and chlorine react in UV light?

(1)

- ☒ **A** electrophilic addition
- ☒ **B** electrophilic substitution
- ☒ **C** free radical addition
- ☒ **D** free radical substitution

(Total for question = 1 mark)

Q18.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

This question is about hydrocarbons.

Which of these molecular formulae represents a non-cyclic, saturated hydrocarbon?

(1)

- ☐ **A** C_6H_6
- ☐ **B** C_6H_{10}
- ☐ **C** C_6H_{12}
- ☐ **D** C_6H_{14}

(Total for question = 1 mark)

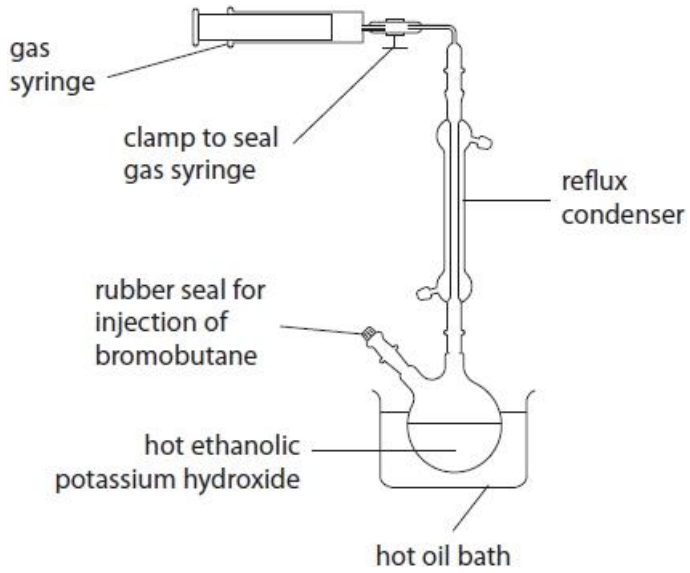
Q19.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Bromobutanes react with hot ethanolic potassium hydroxide solution to produce gaseous butenes.

$$C_4H_9Br + OH^- \rightarrow C_4H_8 + Br^- + H_2O$$

Apparatus



Procedure

- 0.0080 mol of liquid 1-bromobutane was injected into a round bottom flask containing hot ethanolic potassium hydroxide.
- After the reaction, the syringe was sealed using a clamp.
- The syringe was then removed from the apparatus and allowed to cool to room temperature (298 K).

Result

The final volume of but-1-ene collected was 22.0 cm^3.

Alkene molecules are formed by elimination from 2-bromobutane.

How many isomeric alkene products will be formed in this reaction?

(1)

☒ **A** 1
☒ **B** 2
☒ **C** 3
☒ **D** 4

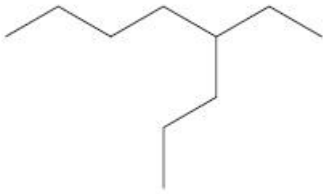
(Total for question = 1 mark)

Q20.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

This question is about alkanes and their reactions.

What is the IUPAC name for this alkane?



(1)

- ☐ **A** 4-ethyloctane
- ☐ **B** 5-ethyloctane
- ☐ **C** 3-propylheptane
- ☐ **D** 5-propylheptane

(Total for question = 1 mark)

Q21.

This is a question about polymers.

Which approach used by chemists would not contribute to a more sustainable use of materials over the life cycle of a polymer?

(1)

- ☐ **A** make more efficient use of energy
- ☐ **B** make more efficient use of resources
- ☐ **C** use catalysts for a faster reaction rate
- ☐ **D** use a higher temperature for a faster reaction rate

(Total for question = 1 mark)

Q22.

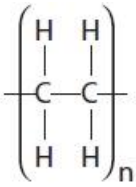
Plastic products often have a symbol on them. Two of the symbols are shown.

LDPE stands for low density poly(ethene).

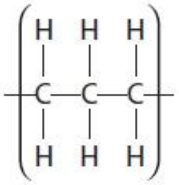
Which of the diagrams shows exactly three repeat units of poly(ethene)?

(1)

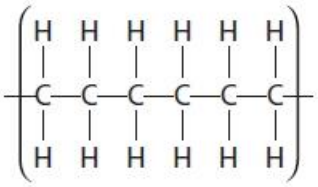
☒ **A**



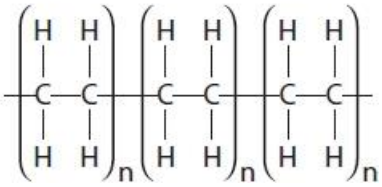
☒ **B**



☒ **C**



☒ **D**



(Total for question = 1 mark)

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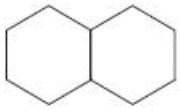
Q23.

This question is about alkanes.

The skeletal formula of decalin is



The molecular formula of decalin is

(1)

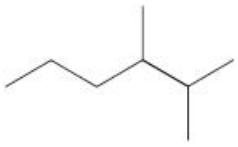
- ☒ **A** $C_{10}H_{22}$
- ☒ **B** $C_{10}H_{20}$
- ☒ **C** $C_{10}H_{18}$
- ☒ **D** $C_{10}H_{16}$

(Total for question = 1 mark)

Q24.

Alkanes are a homologous series of hydrocarbons.

What is the name of this compound?



(1)

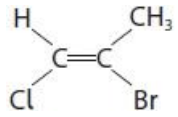
- ☒ **A** 1,1,2-trimethylpentane
- ☒ **B** 2,3-dimethylhexane
- ☒ **C** 4,5-dimethylhexane
- ☒ **D** 4,5,5-trimethylpentane

(Total for question = 1 mark)

Q25.

Compounds with a carbon−carbon double bond are unsaturated.

What is the name of the compound shown?



(1)

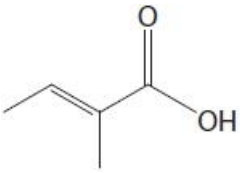
- ☒ **A** *cis*-2-bromo-1-chloroprop-1-ene
- ☒ **B** *E*-2-bromo-1-chloroprop-1-ene
- ☒ **C** *trans*-2-bromo-1-chloroprop-1-ene
- ☒ **D** *Z*-2-bromo-1-chloroprop-1-ene

(Total for question = 1 mark)

Q26.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

What is the systematic name for tiglic acid?



tiglic acid

- ☒ **A** *E*-2-methylbut-2-enoic acid
- ☒ **B** *Z*-2-methylbut-2-enoic acid
- ☒ **C** *E*-3-methylbut-2-enoic acid
- ☒ **D** *Z*-3-methylbut-2-enoic acid

(Total for question = 1 mark)

Q27.

Which of the following does **not** act as a nucleophile?

(1)

- ☒ **A** HBr
- ☒ **B** H_2O
- ☒ **C** NH_3
- ☒ **D** CN^-

(Total for question = 1 mark)

Q28.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

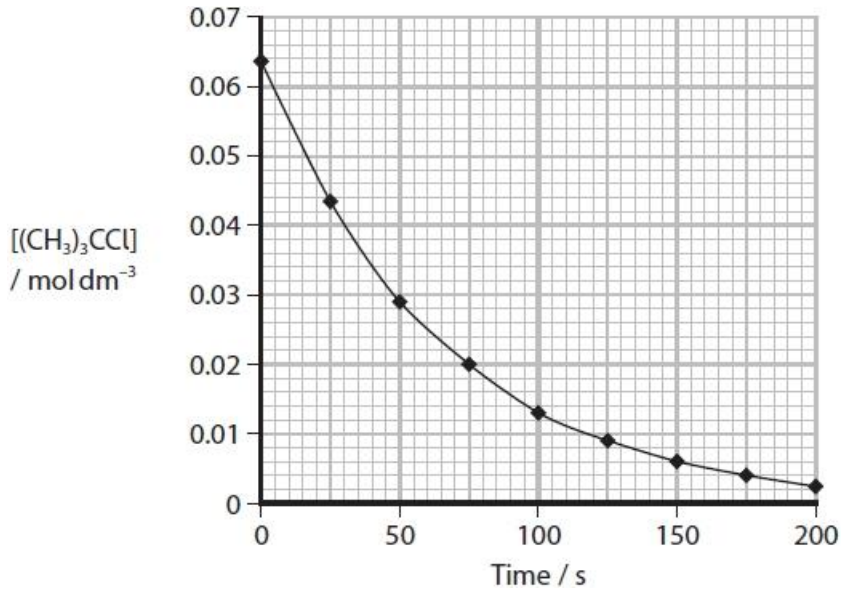
This question is about halogenoalkanes.

2-chloro-2-methylpropane can be hydrolysed by water.

The equation for this reaction is

$$(CH_3)_3CCl + H_2O \rightarrow (CH_3)_3COH + H^+ + Cl^-$$

The graph shows how the concentration of 2-chloro-2-methylpropane changes with time during an investigation of this reaction.



What is the classification of the mechanism for the hydrolysis of 2-chloro-2-methylpropane by water?

(1)

☒ **A** addition

☒ **B** elimination

☒ **C** free radical substitution

☒ **D** nucleophilic substitution

(Total for question = 1 mark)

Q29.

This question is about the chemistry of propane-1,3-diol and propanedioic acid.

Propane-1,3-diol can be oxidised to propanedioic acid in the same way as other primary alcohols.

(i) Suitable reagents and conditions are

(1)

	Reagents	Conditions
☐ **A**	sodium dichromate(VI) + sulfuric acid	heating under reflux
☐ **B**	sodium dichromate(VI) + hydrochloric acid	heating under reflux
☐ **C**	potassium dichromate(VI) + sulfuric acid	room temperature
☐ **D**	potassium dichromate(VI) + hydrochloric acid	room temperature

(ii) The colour change in this reaction is

(1)

☒ **A** green to orange

☒ **B** orange to green

☒ **C** orange to colourless

☒ **D** colourless to orange

(Total for question = 2 marks)

Q30.

This is a question about polymers.

Which is **not** a use of waste poly(alkenes)?

(1)

- ☒ **A** feedstock for cracking
- ☒ **B** generation of biodegradable materials
- ☒ **C** incineration to release energy
- ☒ **D** make new materials by recycling

(Total for question = 1 mark)

Q31.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

This question is about some reactions of alcohols.

Which reagent is used with iodine to prepare iodoalkanes from alcohols?

(1)

- ☒ **A** red phosphorus
- ☒ **B** concentrated phosphoric acid
- ☒ **C** sulfur
- ☒ **D** concentrated sulfuric acid

(Total for question = 1 mark)

Q32.

This question is about alkanes and their reactions.

What is the name of the process that could be used to produce propane, C_3H_8, from decane, $C_{10}H_{22}$?

(1)

- ☒ **A** substitution
- ☒ **B** reforming
- ☒ **C** fractional distillation
- ☒ **D** cracking

(Total for question = 1 mark)

Q33.

This question is about alkanes.

The reaction of ethane and chlorine in UV radiation produces chloroethane.

$$C_2H_6 + Cl_2 \rightarrow C_2H_5Cl + HCl$$

This reaction is classified as

(1)

- ☒ **A** addition
- ☒ **B** elimination
- ☒ **C** initiation
- ☒ **D** substitution

(Total for question = 1 mark)

Q34.

This question is about alkanes.

A reaction of hexane is shown below.

This is **best** described as

(1)

- ☒ **A** elimination
- ☒ **B** hydrogenation
- ☒ **C** isomerisation
- ☒ **D** reforming

(Total for question = 1 mark)

Q35.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

This question is about some reactions of alcohols.

(i) Which alcohol **cannot** be oxidised by acidified potassium dichromate(VI)?

(1)

- ☐ **A** hexan-2-ol
- ☐ **B** 2-methylpentan-2-ol
- ☐ **C** hexan-3-ol
- ☐ **D** 2-methylpentan-3-ol

(ii) Which alcohol reacts with iodine in the presence of alkali to form a yellow solid?

(1)

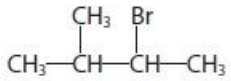
- ☐ **A** hexan-2-ol
- ☐ **B** 2-methylpentan-2-ol
- ☐ **C** hexan-3-ol
- ☐ **D** 2-methylpentan-3-ol

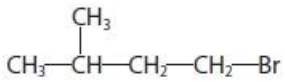
(Total for question = 2 marks)

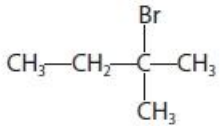
Q36.

This question concerns halogenoalkanes.

The bromoalkanes, X, Y and Z, were each added to a mixture of aqueous silver nitrate and ethanol at 50 °C. The rate of hydrolysis was compared by measuring the time for a precipitate to appear.

X 

Y 

Z 

The relative rates of hydrolysis are in the order (fastest first)

(1)

- ☒ **A** X, Y, Z
- ☒ **B** Z, X, Y
- ☒ **C** Z, Y, X
- ☒ **D** X, Z, Y

(Total for question = 1 mark)

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Q37.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

This question is about hydrocarbons.

How many **structural** isomers are there with the molecular formula C_5H_{12}?

(1)

- ☐ **A** 2
- ☐ **B** 3
- ☐ **C** 4
- ☐ **D** 5

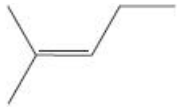
(Total for question = 1 mark)

Q38.

This is a question about polymers.

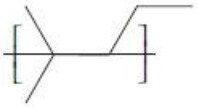
An addition polymer is formed from 2-methylpent-2-ene.

What is the repeat unit for poly(2-methylpent-2-ene)?

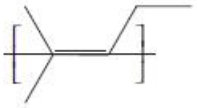


(1)

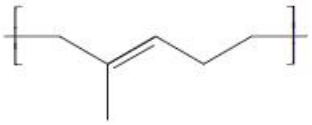
☐ **A**



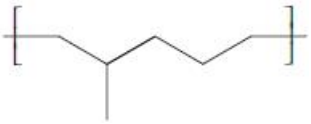
☐ **B**



☐ **C**



☐ **D**



(Total for question = 1 mark)

Mark Scheme

Q1.

Question number	Answer	Mark
	The only correct answer is D (16σ bonds and 1π bond) ***A*** *is incorrect because there are 10 σ C-H bonds, 6 C-C σ bonds and 1 C-C π bond* ***B*** *is incorrect because there are 10 σ C-H bonds, 6 C-C σ bonds and 1 C-C π bond* ***C*** *is incorrect because there are 10 σ C-H bonds, 6 C-C σ bonds and 1 C-C π bond*	**(1)**

Q2.

Question Number	Acceptable Answer	Mark
	The only correct answer is D ***A*** *is not correct because tertiary alcohol is not oxidised* ***B*** *is not correct because this is incorrect colour change for acidified dichromate* ***C*** *is not correct because this is incorrect colour change for these reagents*	**(1)**

Q3.

Question Number	Acceptable Answer	Mark
	The only correct answer is **B** ***A*** *is incorrect because not a systematic name* ***C*** *is incorrect because it has five carbons* ***D*** *is incorrect because it has only three carbons*	**(1)**

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Q4.

Question Number	Answer	Mark
	The only correct answer is **D** (nucleophile) ***A*** *is not correct because OH^- does not neutralise an acid in this reaction* ***B*** *is not correct because the OH^- ions are used up in this reaction* ***C*** *is not correct because OH^- is looking to react with an electron deficient area not an electron rich one*	**(1)**

Q5.

Question Number	Answer	Mark
	The only correct answer is D (increase / increase) **A** *is not correct because both proportions increase* **B** *is not correct because the proportion of branched chain alkanes increases* **C** *is not correct because the proportion of cyclic hydrocarbons increases*	**(1)**

Q6.

Question number	Answer	Mark
	The only correct answer is C  ***A*** *is incorrect because this has molecular formula C_6H_{12}* ***B*** *is incorrect because this has molecular formula C_6H_8* ***D*** *is incorrect because this has molecular formula C_6H_8*	**(1)**

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Q7.

Question number	Answer	Mark
	The only correct answer is C (2,3-dimethylbut-1-ene) ***A*** *is incorrect because the longest chain has 4 carbon atoms* ***B*** *is incorrect because the longest chain has 4 carbon atoms* ***D*** *is incorrect because the C=C should have the lowest number*	**(1)**

Q8.

Question Number	Answer	Mark
	The only correct answer is D $CH_3CH_2CH(OH)CH_2CH_3$ only **A** *is not correct because it will not form pent-2-ene* **B** *is not correct because it will only form pent-1-ene* **C** *is not correct because* $CH_3CH(OH)CH_2CH_2CH_3$ *will also form pent-1-ene*	**(1)**

Q9.

Question Number	Acceptable Answer	Mark
	The only correct answer is **A** ***B*** *is incorrect because oxides of nitrogen are not black solids* ***C*** *is incorrect because oxides of sulfur are not black* ***D*** *is incorrect because unburnt hydrocarbons are not black solids*	**(1)**

Q10.

Question Number	Answer	Mark
	A (3)	**(1)**

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Q11.

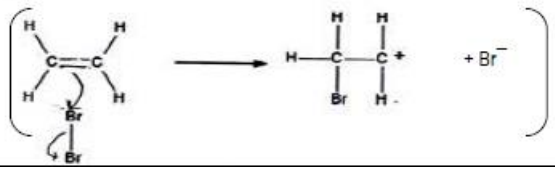
Question Number	Answer	Mark
	The only correct answer is A (primary) ***B*** *is not correct because there is no chlorine atom bonded to a carbon atom which is bonded to two other carbon atoms* ***C*** *is not correct because there is no chlorine atom bonded to a carbon atom which is bonded to three other carbon atoms* ***D*** *is not correct because both chlorine atoms are bonded to carbon atoms which are bonded to only one carbon atom*	**(1)**

Q12.

Question Number	Answer	Mark
	The only correct answer is C (*E/Z*) **A** *is not correct because there are no differences in the carbon chain* **B** *is not correct because the functional group (C=C) is in the same position in both molecules* **D** *is not correct because cis/trans isomerism does not assign groups in order of priority*	**(1)**

Q13.

Question Number	Answer	Mark
(i)	**A** (electrophilic addition)	**(1)**

Question Number	Answer	Mark
(ii)	**C** 	**(1)**

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Q14.

Question Number	Answer	Mark
	The only correct answer is B (propan-1-ol) **A** *is not correct because it does not give hydrogen chloride when PCl_5 is added* **C** *is not correct because it does not give hydrogen chloride when PCl_5 is added* **D** *is not correct because it does not give hydrogen chloride when PCl_5 is added*	**(1)**

Q15.

Question Number	Answer	Mark
	The only correct answer is D (ions) ***A*** *is not correct because both anions and cations are produced* ***B*** *is not correct because homolytic fission produces free radicals* ***C*** *is not correct because homolytic fission produces free radicals and heterolytic fission also produces anions*	**(1)**

Q16.

Question Number	Answer	Mark
	The only correct answer is B (4-ethyl-3-methylheptane) ***A*** *is not correct because the longest consecutive carbon chain involves the seven carbon atoms from the top left of the molecular drawing down to the bottom right which means that the stem of the name is not pentane but heptane, with the consequential effect on the numbering and length of side chains* ***C*** *is not correct because the longest consecutive carbon chain involves the seven carbon atoms from the top left of the molecular drawing down to the bottom right which means that the stem of the name is not hexane but heptane, with the consequential effect on the numbering and length of side chains* ***D*** *is not correct because the longest consecutive carbon chain involves the seven carbon atoms from the top left of the molecular drawing down to the bottom right which means that the stem of the name is not hexane but heptane, with the consequential effect on the numbering and length of side chains*	**(1)**

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Q17.

Question Number	Answer	Mark
	The only correct answer is D (free radical substitution) ***A*** *is not correct because electrophilic addition would be the reaction mechanism between alkenes, such as ethene, and chlorine but the substance in the question is the alkane, ethane* ***B*** *is not correct because electrophilic substitution involves the reactions of aromatic systems but this question refers to the reaction of the alkane, ethane* ***C*** *is not correct because the mechanism of reaction between an alkane such as ethane and chlorine involves substitution and not addition*	**(1)**

Q18.

Question number	Answer	Mark
	The only correct answer is D (C_6H_{14}) ***A*** *is incorrect because this has general formula C_nH_n and non-cyclic, saturated hydrocarbons have the general formula C_nH_{2n+2}* ***B*** *is incorrect because this has general formula C_nH_{2n-2} and non-cyclic, saturated hydrocarbons have the general formula C_nH_{2n+2}* ***C*** *is incorrect because this has general formula C_nH_{2n} and non-cyclic, saturated hydrocarbons have the general formula C_nH_{2n+2}*	**(1)**

Q19.

Question Number	Answer	Mark
	The only correct answer is C (3) **A** *is not correct because the reaction forms but-1-ene and cis- and trans-but-2-ene* **B** *is not correct because the reaction forms but-1-ene and cis- and trans-but-2-ene* **D** *is not correct because the reaction forms but-1-ene and cis- and trans-but-2-ene*	**(1)**

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Q20.

Question Number	Answer	Mark
	The only correct answer is A (4-ethyloctane) *B is incorrect because the position of the ethyl group should be shown by counting in the direction that gives the lowest possible number* *C is incorrect because the longest carbon chain has 8 carbons* *D is incorrect because the longest carbon chain has 8 carbons and because the position of the alkyl group should be shown by counting in the direction that gives the lowest possible number*	**(1)**

Q21.

Question Number	Answer	Mark
	The only correct answer is D (use a higher temperature for a faster reaction rate) ***A** is not correct because efficient use of energy does contribute to sustainability* ***B** is not correct because efficient use of resources does contribute to sustainability* ***C** is not correct because use of catalysts do contribute to sustainability*	**(1)**

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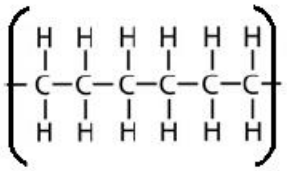
Q22.

Question Number	Answer	Mark
	The only correct answer is **C**  ***A*** *is not correct because this is the structure of the polymer and does not show three repeat units* ***B*** *is not correct because it is one and a half repeat units* ***D*** *is not correct because this is three polymer molecules joined together due to the n after the brackets*	**(1)**

Q23.

Question Number	Acceptable Answer	Mark
	The only correct answer is **C** ***A*** *is incorrect because* there are not 22 hydrogen atoms ***B*** *is incorrect because* there are not 20 hydrogen atoms ***D*** *is incorrect because* there are not 16 hydrogen atoms	**(1)**

Q24.

Question Number	Answer	Mark
	B (2,3-dimethylhexane)	**(1)**

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Q25.

Question Number	Answer	Mark
	D (*Z*-2-bromo-1-chloroprop-1-ene)	**(1)**

Q26.

Question Number	Answer	Mark
	The only correct answer is A (*E*-2-methylbut-2-enoic acid) ***B*** *is incorrect because the two high priority groups are on opposite sides* ***C*** *is incorrect because the methyl group is on carbon 2* ***D*** *is incorrect because the two high priority groups are on opposite sides and the methyl group is on carbon 2*	**(1)**

Q27.

Question Number	Acceptable Answer	Mark
	The only correct answer is A ***B*** *is incorrect because* H_2O *is a nucleophile – via lone pairs* ***C*** *is incorrect because* NH_3 *is a nucleophile – via lone pair* ***D*** *is incorrect because* CN^- *is a nucleophile – via lone pairs*	**(1)**

Q28.

Question Number	Answer	Mark
	The only correct answer is D (nucleophilic substitution) **A** *is not correct because there is more than one product* **B** *is not correct because substitution occurs, not elimination* **C** *is not correct because free radicals are not involved in this reaction*	(1)

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Q29.

Question Number	Acceptable Answer	Mark
(i)	**The only correct answer is A** ***B*** *is not correct because hydrogen chloride would be lost during heating* ***C*** *is not correct because reflux is required to ensure complete oxidation* ***D*** *is not correct because reflux is required to ensure complete oxidation*	**(1)**

Question Number	Acceptable Answer	Mark
(ii)	**The only correct answer is B** ***A*** *is not correct because the correct colour change is reversed* ***C*** *is not correct because the orange dichromate(VI) ions are reduced to* ***green*** *chromium(III) ions* ***D*** *is not correct because the* ***orange*** *dichromate (VI) ions are reduced to* ***green*** *chromium(III) ions*	**(1)**

Q30.

Question Number	Answer	Mark
	The only correct answer is B (generation of biodegradable materials) ***A*** *is not correct because some poly(alkenes) may be used as a feedstock for cracking* ***C*** *is not correct because some poly(alkenes) may be used for energy from incineration* ***D*** *is not correct because some poly(alkenes) may be used for recycling to make new materials*	**(1)**

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Q31.

Question Number	Answer	Mark
	The only correct answer is A (red phosphorus) **B** *is not correct because it will not form iodoalkanes with iodine and alcohols* **C** *is not correct because it will not form iodoalkanes with iodine and alcohols* **D** *is not correct because it will not form iodoalkanes with iodine and alcohols*	**(1)**

Q32.

Question Number	Answer	Mark
	The only correct answer is D (cracking) *A is incorrect because substitution would exchange atoms/groups in the reactant for other atoms/groups* *B is incorrect because reforming would produce branched/cyclic alkanes* *C is incorrect because fractional distillation would separate a mixture of alkanes*	**(1)**

Q33.

Question Number	Acceptable Answer	Mark
	The only correct answer is **D** ***A*** *is incorrect because it is not an addition reaction* ***B*** *is incorrect because no multiple bond is formed* ***C*** *is incorrect because initiation is only the first stage in the mechanism of the reaction*	**(1)**

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Q34.

Question Number	Acceptable Answer	Mark
	The only correct answer is **D** ***A*** *is incorrect because no alkenes are produced* ***B*** *is incorrect because hydrogen is formed* ***C*** *is incorrect because the molecular formulae of the organic compounds are not the same*	**(1)**

Q35.

Question Number	Answer	Mark
(i)	**The only correct answer is B** (2-methylpentan-2-ol) **A** *is not correct because it is a secondary alcohol* **C** *is not correct because it is a secondary alcohol* **D** *is not correct because it is a secondary alcohol*	**(1)**

Question Number	Answer	Mark
(ii)	**The only correct answer is A** (hexan-2-ol) **B** *is not correct because it is a tertiary alcohol* **C** *is not correct because it does not contain a* CH_3CHOH *group* **D** *is not correct because it does not contain a* CH_3CHOH *group*	**(1)**

Q36.

Question Number	Acceptable Answer	Mark
	The only correct answer is B ***A*** *is not correct because Z (3rd) is tertiary (fastest)* ***C*** *is not correct because Y (2nd) is primary (slower than X, secondary)* ***D*** *is not correct because X (1st) is secondary (slower than Z, tertiary)*	**(1)**

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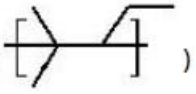
Q37.

Question number	Answer	Mark
	The only correct answer is B (3) **A** *is incorrect because the structural isomers of C_5H_{12} are pentane, 2-methylbutane and 2,2-dimethylpropane* **C** *is incorrect because the structural isomers of C_5H_{12} are pentane, 2-methylbutane and 2,2-dimethylpropane* **D** *is incorrect because the structural isomers of C_5H_{12} are pentane, 2-methylbutane and 2,2-dimethylpropane*	(1)

Q38.

Question Number	Answer	Mark
	The only correct answer is A () **B** *is not correct because there is no C=C in the repeat unit* **C** *is not correct because the extension bonds are not from the correct carbon atoms of the chain and there should not be a C=C in the repeat unit* **D** *is not correct because the extension bonds are not from the correct carbon atoms of the chain*	(1)