

Question



State the meaning of the term structural isomers.

2 marks

Answer



Compounds with the same molecular formula but different structural formula.



Introduction to Organic





l mark

Answer



 C_4H_{10} as it has stronger van der Waals' forces as it has a longer chain.



Question



Give the IUPAC name of the position isomer of but-l-ene. I mark

Answer



But-2-ene (the functional group is in a different position on the carbon skeleton)



Explain why the complete combustion of butane might contribute to environmental problems.

I mark

Answer



H₂O and CO_2 are produced which are both greenhouse gases (and contribute global to warming).



Question



Give the IUPAC name of the chain isomer of butl-ene.

I mark

Answer



(2)-methyl-prop-(1)-ene (the carbon skeleton is changed; you are usually looking for branched isomers)

CHEMISTRY **Introduction to Organic**

Question



Identify a compound that is used to react with SO_2 and give a reason for using this compound.

2 marks

Answer



oxide/calcium Calcium carbonate. Both are bases and neutralise the SO_2 .



Introduction to Organic



Explain why the boiling 2.2point of dimethylpropane is lower than that of pentane.

2 marks



There are weaker van der Waals forces in 2,2dimethylpropane as there is less surface contact between the molecules.



Introduction to Organic

Question CHCl₃ State what is meant by the term molecular formula.

l mark

Answer



The molecular formula is the actual number of atoms of each element in a molecule.





State the type of cracking that produces a high % of ethene and propene. Give the 2 conditions needed.



Answer

Thermal cracking. High temperature and high pressure. (condition mark depends on correct type of cracking).



Answer



Fractional distillation molecules (separating based on differences in their boiling points due to differences in chain length).

I mark







CHEMISTRY **Introduction to Organic** Give the type of reactive intermediate formed during catalytic cracking. l mark Carbocation CHEMISTRY **Introduction to Organic** Give one reason why the oxide NO is a pollutant l mark is toxic./forms the acidic gas NO₂/triggers asthma attacks/causes photochemical smog/forms acid rain/is a



Question



Identify a catalyst used in catalytic cracking.

🕨 I mark

Answer



Zeolite/Aluminium oxide



Introduction to Organic

Question



Identify a catalyst used in the catalytic converter.

I mark

Answer



Platinum or Palladium or Rhodium





Give the type of reactive intermediate formed during thermal cracking and state how it is formed.

Answer



Free radical. Homolytic fission of a C-C or C-H bond.



Introduction to Organic



Explain what is meant by the term fraction (in fractional distillation).

I mark

Answer



Molecules with similar boiling points/similar carbon chain length





What type of isomerism do chain and position isomers belong to?



Answer



Structural isomerism.



Introduction to Organic

Question



Describe the temperature gradient in the fractionating column.

l mark

Answer



It is hotter at the base/ is colder at the top (must be a comparative statement).





Explain how NO is produced in the engine of the motor vehicle.

2 marks

Answer



Nitrogen and oxygen react at high temperature (created by the spark).



Introduction to Organic

Question



Suggest how you could demonstrate that a boiler is faulty and combustion is incomplete.

Answer



Detect CO in the exhaust gases.





Give the name of a solid pollutant which forms when pentane burns incompletely.

I mark





Carbon/Soot



Question



What is a fuel?

I mark

Answer



A substance that releases heat energy when burned.





Question



Give the two main types of product formed during catalytic cracking.

2 marks

Answer



Aromatic hydrocarbons, branched alkanes, cycloalkanes.

A S CHEMISTRY

Introduction to Organic





Answer



The fuel solidifies/freezes/goes viscous at polar temperatures.



Introduction to Organic



What effect does increasing the intensity of UV light on the rate of reaction between CH_4 and Cl_2 . Why?

Answer



The rate increases as there are more CI radicals produced.



Question



State the strongest intermolecular force in alcohols.

Answer



Hydrogen bonding.



Introduction to Organic



Suggest one reason, other than cost, why a catalyst is coated on a ceramic honeycomb.

l mark

Answer



The surface area is increased which increases the rate of reaction and removes more pollutant gases.





Explain why propane (boiling point -42°C) is supplied as a liquid for use in camping stoves.

l mark

Answer



As a liquid it occupies a much smaller volume than as a gas.



Atomic Structure

Question



Explain why the first ionisation energy of every element is endothermic.

🕨 l mark

Answer



Energy is required to overcome the attraction between the negative electron and the positive protons.



Atomic Structure

Question



Suggest why the first ionisation energy decreases down a group.

I mark





The atoms become bigger due to the addition of an extra shell. Shielding and distance between the nucleus and the outer shell increase so attraction decreases.



Atomic Structure



Explain why isotopes of the same element react in the same way.

l mark

Answer



The isotopes have the same electron configuration.



Atomic Structure



Explain how gaseous atoms are ionised in a mass spectrometer.

2 marks

Answer



An electron gun knocks out electrons.

A S C Atomic St	HEMISTRY ructure
Question "ass number - i stomic - jumber - 3	Define mass number of an isotope.
Answer	Total number of protons and neutrons.
A S C Atomic Str	HEMISTRY
Question	Explain how the abundance of an isotope is determined by a mass spectrometer.
Answer	A current is produced at the detector. The size of the current is proportional to

abundance.



Atomic Structure



State why more than the minimum energy is not used to ionise samples inside the mass spectrometer. l mark

Answer



То prevent further ionisation/to knock out only one electron.



Atomic Structure

Question



Answer



The number of protons inside the nucleus.

l mark



Atomic Structure



Give two reasons why samples must be ionised inside the mass spectrometer.

2 marks

Answer



To accelerate, to deflect and to detect the sample ions.



Atomic Structure

Question



Define isotope.

I mark

Answer



Atoms with the same number of protons and different number of neutrons.



Question



State one change in the operation of the mass spectrometer that will change the path of an ion. 2 marks

Answer



The electromagnetic field is increased in strength to deflect ions with a high m/z ratio.



Question



State the relative mass and charge of electrons, protons and neutrons.

3 marks

Answer



Relative charges: electron I-; proton I+, neutron 0 Relative masses: electron $1/1800 \rightarrow 0/$ neglible; proton I; neutron I



but the shielding remains

the same.



ions in the lattice.

A S CHEMISTRY Bonding		
Question CI H	Define electronegativity.	
Answer Polar Covalent Bond	The power of an aton to attract an electron pair in a covalent bond.	
A S C Bonding	HEMISTRY	
Question	Explain why the bondin in nitrogen oxide covalent and not ionic.	
Answer Non-Polar Covalent Bond	The electronegativit difference between N and O is very small.	



Bonding

Question



Explain why metals have a high melting point.

2 marks



There is a strong attraction between the positive metal ions and the delocalised electrons in the giant metallic lattice.



Bonding

Question



Explain why iodine has a higher melting point than fluorine.

2 marks

Answer



lodine atoms are larger than fluorine atoms so have more electrons and therefore stronger van der Waals forces between the molecules.



Bonding

Question



Explain why metals can be hammered into different shapes.

l mark

Answer



Because the layers can slide past each other.



Solitaing

Question



Explain why ice is less dense than water.

I mark

Answer



Water molecules in ice are held further apart than in liquid water.

A S	HEMISTRY
Bonding	
Question	
*****	Explain why the boiling point of fluorine is low.
	2 marks
Answer	There are only weak van
	der Waals forces between the fluorine molecules.
A S C	HEMISTRY
Bonding	
Question	Explain why the melting point of silicon is high.
	3 marks
Answer	Silicon forms a giant covalent lattice. Many strong covalent bonds have to be broken for which a large amount of
	energy is required.



Bonding





Explain the melting point of sodium iodide is lower than that of sodium bromide.

I mark



The iodide ion is larger than the bromide ion; there is less attraction between the iodide and sodium ion as a result.



Bonding

Question



Explain why the melting point of sulfur is higher than that of phosphorus.

2 marks

Answer



 S_8 is larger than P_4 , so there are more van der Waals forces to be overcome in S_8 .



Bonding



Answer



Shared pair of electrons.

l mark

2nd

of

I mark

CHEMISTRY **Bonding**

Explain

ionisation

Question Ne_(q) → Ne⁺_(q)+ e⁻ Ne⁺_(a) → Ne²⁺_(a)+ e⁻

Answer



In sodium, the second electron is lost from a 2p orbital, in magnesium it is lost from a 3s orbital. The 2p orbital is closer to the nucleus so the electron is less shielded.

why

sodium is greater than

that of magnesium.

the

energy



Bonding

Question



Explain why the melting point of Al is higher than that of Na.

2 marks

Answer



Al³⁺ has a bigger charge than Na^+ & the Al^{3+} is a smaller ion than Na⁺; there are more delocalised electrons in Al so the metallic bond is stronger in Al.

A S	CHEMISTRY
Bonding	
Question	State the type of structure shown by crystals of sulfur and phosphorus.
Answer	Simple molecular.



	A S CHEMISTRY Bonding
type d F ₂ , d HF. marks	Question Explain how hydrogen bonding between HF molecules arises. 3marks
es pole 3.	AnswerLarge difference in electronegativity between H and F results in a permanent dipole $^{\delta+}H-F^{\delta-}$ and an attraction between a lone pair of electrons on F and $^{\delta+}H.$
	A S CHEMISTRY Bonding
llar. ^{mark}	Question Define polarised (as in polarised bond). 2 marks
with	$ \begin{array}{c} \textbf{Answer} \\ \delta^+ & \delta^- \\ \textbf{C} & \textbf{F} \end{array} \begin{array}{c} \text{Electron cloud/electron} \\ \text{distribution is} \\ \text{distorted/unequally} \\ \text{distributed.} \end{array} $

3marks

dipole-dipole

l mark





A S Bonding	CHEMISTRY
Question	Describe the bonding in a crystal of iodine.
Answer	Covalent between iodine atoms; van der Waals forces between iodine molecules.
A S Bonding	CHEMISTRY
Question	Explain why heat is required to melt and iodine crystal.
Answer	The van der Waals forces must be overcome.



Atomic Structure

Question

State the meaning of the first ionisation term energy of an atom.

2 marks

Answer



Energy change required when an electron is removed from a gaseous atom to form a 1 + ion.



Atomic Structure



State and explain the general trend in first ionisation energies going from Na to Ar.

3 marks





ionisation energies st increase from Na to Ar as the nuclear charge but the increases shielding remains the same.



Atomic Structure



Give 2 reasons why the Ist ionisation energy of Ne is lower than the 3rd ionisation energy of Mg.

Answer



3p

A Mg²⁺ ion is smaller than an Ne atom. Mg²⁺ has more protons than Ne/ it is harder to remove an electron from a positively charged ion.



repulsion between the electrons in this electron pair results in a lower first ionisation energy.





Bonding





Explain why the melting point of magnesium is higher than that of sodium.

3 marks



Mg atoms have a greater nuclear charge, are smaller and have more delocalised electrons so there is a stronger electrostatic attraction between the ions and delocalised electrons.



Bonding

Question



Explain how Na₂S is formed from its atoms. Make reference to electrons in your answer.

2 marks

Answer



I electron from each Na atom is transferred to the S atom.



Bonding



Explain how metals conduct electricity.

2 marks





Delocalised electrons move in a given direction when a pd is applied.



Question



Define relative atomic mass.

2 marks

Answer



Average mass of an atom / isotope (compared to C-12) on a scale in which an atom of C-12 has a mass of 12





Periodicity



Answer



Carbon; it has the smallest number of protons and similar shielding which results in the outer electrons to be least attracted to the positive nuclear charge.



Periodicity

Question



Explain why the van der Waals forces in liquid argon are very weak.

2 marks





Argon is made of single atoms with electrons close to the nucleus. This means argon atoms cannot be easily polarised.



Periodicity



Explain why the second ionisation energy of carbon is greater than the first ionisation energy.





An electron has to be removed from a positive ion which requires more energy as the electrons are now closer to the nucleus.



QuestionExplain why the first
ionisation energy of Al is
lower than that of Mg.Image: state s



Less energy is needed to remove an electron from the 3p sub-level than the 3s sub-level as the 3p sub- level is further from the nucleus and more shielded.

2 marks



Answer



Patterns in the change in the properties of a row of elements are repeated in the next row.