# Question 3

## Candidate 1

- melting point of an element is used to predict its state, at room temperature. It is dependant on the number of London dispertion forces present in the molecule as the more forces there is the more energy that is required to break those bonds. These have no set pattern in the periodic table
- Ionisation energy decreases as you decsend the group, this is due to there being increased sheilding of the electrons, meaning they are less strongly attraceed to the nucles and therefore less energy is required to remove them.

  Ionisation energy increases as you go along a period due to the increase in the number of protons and in turn the nuclear charge, this means the electrons are more strongly bonded to the nucleus and therefore more energy is required to remove them.
- covalent radius increases as you go down a group due to the number of outer electron ~~rewels~~ levels increasing, meaning the molecules increase in size

  covalent radius decreases as you go along a period as the nuclear charge increases due to the increase in the number of protons so the electrons are held closer to the nucleus meaning the molecule ends up smaller in size
- electronegativity decreases as you go down the group due to the electron levels becoming fuller so they are less reactive molecules.

  electronegativity increases going along a period due to the increased number of protons

## Candidate 2

~~Electronegativity~~

- down a group electronegativity decreases
  - This is due to the increased effect of Shielding/Screening caused by the larger number of outer electron shell
- across a period electronegativity increases
  - This is due to the increasing number of outer electrons to form that bond.
- down a group ionisation energy decreases
  - This is due to the outer electron shells being further away from the nucleus so requiring less energy to break the electrostatic attraction.
- across a period ionisation energy increases
  - This is due to the increasing number of outer electrons being held tighter to the nucleus
- down a group covalent radius increases
  - This is due to the number of outer electron shells increasing.
- across a period covalent radius decreases
  - this is due to more outer electrons being held tighter to the nucleus.

Electronegativity can tell if a compound is covalent or ionic

0 - 0.4 → covalent non polar

0.4 - 1 ⇒ covalent polar

1 - 2 → covalent very polar

2≥ → ionic.

[Turn over

# Candidate 3

- Going across a period, the melting point increases. This is because there is an increased number of electrons in the outer energy level, resulting in stronger intermolecular forces and therefore higher melting points.
- Going across a period, the ionisation energy and electronegativity increases. This is because as you go across a period the number of protons increases, increasing the nuclear charge. This means the electrons are more strongly attracted to the nucleus, resulting in increased ionisation energy and electronegativity.
- Going across a period the covalent radius decreases. This is because as you go across a period the nuclear charge increases, pulling the electrons closer to the nucleus, therefore decreasing the size of the atom.
- Going down a group the ionisation energy and electronegativity decreases. This is because as you go down a group the number of outer energy levels increases, causing the outer electrons to be shielded from the nucleus, meaning they experience less attraction to the nucleus, resulting in decreased ionisation energy and electronegativity.
- Going down a group the covalent radius increases. This is because, as you go down a group the number of outer energy levels increases, increasing the size of the atom.

# Candidate 4

Covalent radius

- As you move along the period, the covalent radius decreases. This is because the ~~nucleus~~ elements have increased numbers of protons and electrons, while the number of electron shells remains the same which pulls the electrons closer together thus a smaller size physically.
- As you move down a group, the covalent radius increases. This is due to the chemical change where the inner shells begin to ~~scree~~ shield the outer electrons from the nuclear charge due to the increase in the number of electron shells. This reduces the attraction resulting in a larger atomic size physically.

Electronegativity

- ~~E~~ metals have ~~high~~ low electronegativities allowing them to be good reducing agents (found at the bottom of group 1) (strongest)
- non-metals have high electronegativities allowing them to become good oxidising agents (strongest found at the top of group 7)
- Electronegativity is the measure of attraction an atom has for a pair of electrons in a bond.

Melting points

- As you go down the group 7 / halogens, the atoms increase in size and have more electrons. This increases the strengths of London Dispersion forces meaning more energy is required to overcome, giving higher boiling / melting points.

[Turn over

# Candidate 5

Covalent radius is the distance from the atoms nucleus to the outer most electron.

Electronegativity is the attraction which a nucleus has for ~~a~~ the pair of electrons in a covalent bond.

Ionisation energy is when one mole of gas atoms is converted to one mole of gas positive ions.

When going across a period, there is more protons / increase in positive nuclear charge, so there is an increase in attraction by the nucleus.

When going down a group, there is an increase in energy levels leading to a decrease in attraction.

Melting points are higher for polar than non polar, for example, hydrogen bonding and PD-PDI will have high melting points as they are polar due to them being strong intermolecular forces. However, LDF, will have lower mp as it is non polar and the weakest intermolecular force.

When going down a group for ionisation energy, a shielding / screening effect is happening.

# Question 9

## Candidate 1

- soaps are a ~~salt~~ substance which contains an ionic head and a hydro~~phobic~~ phillic tail, the ionic head is soluble in oils so can help to remove the oils from clothes and the hydrophyllic tail helps these oils to dissolve in the water which prevents them reattaching elsewhere on the clothes.
- Detergent is a ~~[illegible]~~ substance which carries out the same function as soap to help remove grease and dirt from clothes except it can be used in hard water areas where a precipitate called scum is formed when soap is used due to the metal ions in the water, detergent doesn't cause this scum, as the scum may cause further stains on the clothes. Both of these are emolsifiers.

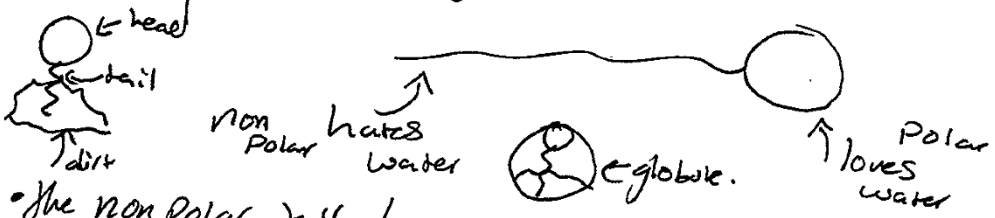
- enzymes are biological catalysts which can help to breakdown the molecules through catabolic reactions, this will help to breakdown the dirt and stains rather than just remove them. These are a form of proteins so if their temperature rises to high they may become denatured and the hydrogen bonds in the molecule will break and the active site will change shape so it no longer fits the substrate.

- bleaching agents ~~[illegible]~~ are a free radical meaning they contain an unpaired electron so are highly reactive. This can cause free radical chain reactions to occur on the stains which will oxidise them an they will breakdown to their individual molecules which may be soluble in water or with the help of the soaps and detergents can become water soluble.

# Candidate 2

Soaps and detergents

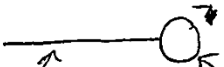
Soaps are made of a hydrophillic polar head and a hydrophobic non-polar tail




- the non polar tail buries into the grime, oil, dirt, grease. while the head stays in the water.
  this creates micelles. globules of ~~Polar~~ and non polar liquids held together.
  Emulsifiers work the same way.
- detergents are used in areas with hard water where soap reacts with the water to create scum. They are soapless so do not react the same.
- Bleaching agents. ~~Are~~ made of acids. Lots of hydrogen.
- ~~Enzymes~~ Enzymes. The enzymes in washing powder have an optimum temperature. So they will only work to act during the wash however if its a really hot wash the enzymes will denature meaning their amino acids will separate making it pretty much useless.

# Candidate 3

SOAP



- Non-polar tail
  - hydrophobic
  - Dissolves in grease/oil
- Ionic head
  - hydrophilic
  - dissolves in water

CLEANING ACTION OF SOAP


The non-polar hydrophobic tails dissolve in the grease and the ionic hydrophilic heads dissolve in the water,


Agitating the water causes the grease to break apart, forming ball-like structures called micelles. The negative charge on the ionic heads repels the negative charge of another ionic head on a different micelle away. This means that the micelles dont form a big blob of grease again.

When soaps are used in hard water (water with high concentrations of metal ions), scum is formed. To avoid the formation of scum, soapless detergents are used in place of soap.

# Candidate 4

Soaps are the ~~alkoxi~~ ionic salts formed by alkaline hydrolysis of fats or oils and glycerol.
Soaps have a hydrophobic tail, and a hydrophilic ionic head. When soap is agitated with grease* and water, the hydrophobic tail dissolves in the non-polar grease, whilst the hydrophilic heads dissolve in water. Micelles are formed, which are ball-like structures that suspend the grease in water. The negatively charged heads repel one another, ensuring the micelles do not bond together.

Detergents contain potassium or magnesium in the head, and unlike soaps they do not form scum when used in hard water, which contains metallic ions. Therefore detergents are more effective in cleaning action than soaps.
Bleaching agents, such as hydrogen peroxide, are also oxidising agents which are highly efficient in removing stains by undergoing reduction.
Enzymes catalyse reactions, and can be used to break down certain molecules, such as compounds producing stains.

# Candidate 5

Soaps are salts of fatty acids.

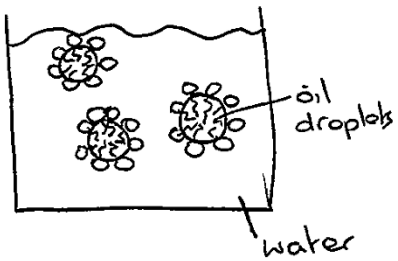
A detergent = in hard water areas, normal soap particles form to make a solid precipitate.

Hydrophillic = dissolves in water, ionic, polar

Hydrophobic = dissolves in oil, covalent bonding, non polar.

Agitation causes micelle ball to form.

Hydrophillic head dissolves in water, hydrophobic tail dissolves in oil.




Repulsion between causes dirt to be released.

Enzymes changes the shape