**Intermolekulêre Kragte Memo**
**November 2018**

1.3 D ✓✓ (2)

**QUESTION 3/*VRAAG 3***

3.1
- $NH_3$ has hydrogen bonds between the molecules ✓
- $N_2$ has London forces/induced dipole forces ✓
- $NH_3$ has stronger intermolecular forces than $N_2$ and therefore a higher boiling point than $N_2$ ✓
  (Accept: more energy requires to overcome stronger forces of $NH_3$)

OR

- $N_2$ has weaker intermolecular forces than $NH_3$ and therefore a lower boiling point than $NH_3$
  (Accept: less energy requires to overcome weaker forces of $H_2$)

- *$NH_3$ het waterstofbindings tussen die molekules*
- *$N_2$ het Londonkragte/geïnduseerde dipoolkragte*
- *$NH_3$ het sterker intermolekulêre kragte as $N_2$ en daarom 'n hoër kookpunt as $N_2$*

*OF*

- *$N_2$ het swakker intermolekulêre kragte as $NH_3$ en daarom 'n laer kookpunt as $NH_3$*
  *(Aanvaar: $NH_3$ vereis meer energie om sterker kragte te oorkom)* (3)

3.2 $H_2$ ✓ (1)

3.3

- $H_2$ and $N_2$ both have weak London forces/induced dipole forces ✓
- $N_2$ is a larger molecule/has a greater molecular mass/has a larger surface area than $H_2$ ✓
- and therefore $N_2$ has stronger intermolecular forces. ✓

**OR**

- $H_2$ is a smaller molecule/has a smaller molecular mass/has a smaller surface area than $N_2$ ✓
- and therefore $H_2$ has weaker intermolecular forces. ✓

- *$H_2$ en $N_2$ het beide swak Londonkragte/geïnduseerde dipoolkragte*
- *$N_2$ is 'n groter molekule/groter molekulêre massa/groter oppervlakarea as $H_2$*
- *en daarom het $N_2$ sterker intermolekulêre kragte.*

***OF***

- *$H_2$ is 'n kleiner molekule/het kleiner molekulêre massa/kleiner oppervlakarea as $N_2$*
- *en daarom swakker intermolekulêre kragte.*

(3)

3.4

$H_2$ ✓
It has the weakest intermolecular forces/London forces ✓
It has the lowest boiling point ✓
OR
It has the weakest intermolecular forces/London forces ✓
Boiling point is inversely proportional to vapour pressure ✓
*Dit het die swakste intermolekulêre kragte*
*Dit het die laagste kookpunt*
OF
*Dit het die swakste intermolekulêre kragte/Londonkragte*
*Kookpunt is omgekeerd eweredig aan die dampdruk* (3)

**[10]**

**Intermolekulêre Kragte Memo**
**November 2017/1**

1.2 A ✓✓ (2)

**QUESTION/*VRAAG 3***

3.1
- Both water and ethanol have hydrogen bonds ✓
- which are the same in relative strength. ✓
- Substances with comparable (same) relative strength in intermolecular forces will dissolve. ✓

- *Beide water en etanol het waterstofbindings*
- *wat dieselfde relatiewe sterkte is.*

*Stowwe wat vergelykbare (dieselfde) relatiewe sterkte in intermolekulêre kragte het, sal in mekaar oplos* (3)

**Intermolekulêre Kragte Memo**
**November 2017/2**

3.2
- The intermolecular forces between the molecules of iodine and bromine are both London forces (Van der Waals forces/Induced dipole forces). ✓
- Iodine molecules have a bigger molecular mass than the molecules of bromine **OR** iodine molecules have a larger surface area than molecules of bromine **OR** iodine molecules have more electrons than that of bromine and thus have a larger polarity (any option) ✓
- The bigger the molecules/larger the surface are of the molecules, the stronger the intermolecular forces. ✓

- *Die intermolekulêre kragte tussen molekules van jodium en broom is beide London kragte (van der Waalskragte/Geïnduseerde kragte).*
- *Jodiummolekules het 'n groter molekulêre massa as die molekules van broom **OF** jodiummolekules het 'n groter oppervlak as broommolekules **OF** jodiummolekules het meer elektrone as die van broom en het daarom 'n groter polariteit (enige opsie)*
- *Hoe groter die molekule/oppervlakte van die molekule, hoe sterker is die intermolekulêre kragte.* (3)

3.3
- The intermolecular forces between phosphine molecules are dipole-dipole forces/Van der Waals forces. ✓
- The intermolecular forces between ammonia molecules are hydrogen bonds. ✓
- The dipole-dipole forces are weaker than the hydrogen bonds. ✓
- Weaker forces will cause the molecules to evaporate faster/stronger forces will evaporate slower ✓

- *Die intermolekulêre kragte tussen fosfien se molekules is dipool-dipoolkragte/Van der Waalskragte*
- *Die intermolekulêre kragte tussen die molekules van ammoniak is waterstofbindings*
- *Die dipool-dipoolkragte is swakker as die waterstofbindings*
- *Swakker kragte sal veroorsaak dat molekules vinniger verdamp/sterker kragte sal veroorsaak dat molekules stadiger verdamp* (4)

3.4 Bromine ✓/*Broom* ✓ (1)

3.5 **NEGATIVE MARKING FROM 3.4/*NEGATIEWE NASIEN VANAF 3.4***
- The boiling point of bromine is lower than the other two liquids therefore it has weaker intermolecular forces. ✓
- If intermolecular forces are weaker, the vapour pressure will be higher. ✓

- *Die kookpunt van broom is laer as die ander twee vloeistowwe en het daarom swakker intermolekulêre kragte.*
- *Indien die intermolekulêre kragte swakker is, sal die dampdruk van die vloeistof hoër wees.*

**OR/*OF***
- The boiling point of water and ethanol are higher than bromine, therefore it has stronger intermolecular forces.
- If the intermolecular forces are stronger, the vapour pressure will be lower.

*Die kookpunt van water en etanol is hoër as broom en het daarom sterker intermolekulêre kragte.*
*Indien die intermolekulêre kragte sterker is, sal die dampdruk laer wees.* (2)

**[13]**

**Intermolekulêre Kragte**
**November 2016/1**

1.2 D ✓✓

**QUESTION/*VRAAG* 3**

3.1.1 Hydrogen bonds ✓/*Waterstofbinding* (1)

3.1.2 Density of ice is less than that of water ✓
Ice floats on top of water providing an insulating layer ✓ between the water and atmosphere.
*Digtheid van ys is laer as dié van water.*
*Ys dryf bo-op water en bied 'n isolerende laag tussen water en die atmosfeer.*

*OR* Water freezes from top down ✓ and capturing heat.✓ (2)
*OF Water vries van bo na onder ✓en vang hitte vas.* ✓

3.1.3 The mass of 1 $dm^3$ of water is 1 000 g./
*Die massa van 1 $dm^3$ water is 1 000 g.*

n = m/M ✓ = 1000/18 ✓ = 55,56 mol.

Number/*Aantal* = n x $N_A$ = (55,56)(6,02 x $10^{23}$) ✓
= 3,34 x $10^{25}$ ✓molecules/*molekules* water (4)

3.1.4 Water has high heat of vaporisation ✓ due to hydrogen bonds. ✓
OR
Water needs a lot of energy to evaporate due to hydrogen bonds.
OR
The sea acts as a reservoir of heat due to large amounts of energy needed to overcome hydrogen bonds.

*Water het hoë verdampingshitte as gevolg van waterstofbindings.*
*OF*
*Water benodig baie energie om te verdamp as gevolg van waterstofbindings.*
*OF*
*Die see tree op as 'n opgaartenk vir hitte as gevolg van groot hoeveelheid energie benodig om waterstofbindings te oorkom.* (2)

3.2.1 INCREASES from **A** to **C**. ✓✓
*NEEM TOE vanaf **A** na **C*** (2)

3.2.2 Molecular mass increases from **A to C**.✓
Strength of the London forces ✓/Dispersion forces/Induced dipole forces increases. ✓
*Molekulêre massa neem toe van **A** na **C**.*
*Sterkte van die intermolekulêre kragte Londonkragte/ Dispersiekragte/Geïnduseerde dipoolkragte neem toe.*

**OF/*OR***

Molecular mass decreases from **C** to **A**. ✓
Strength of the intermolecular forces London forces✓/Dispersion forces/ Induced dipole forces decreases. ✓
*Molekulêre massa neem af vanaf **C** na **A***
*Sterkte van die intermolekulêre kragte Londonkragte/ Dispersiekragte/Geïnduseerde dipoolkragte neem af.* (3)

3.2.3 C ✓ (1)

3.3 Hydrogen bonds ✓ between $NH_3$ molecules is stronger ✓ than the London forces ✓/Dispersion forces/Induced-dipole forces or Dipole-dipole forces between $PH_3$ molecules.
*Waterstofbindings tussen $NH_3$ molekules is sterker as die Londonkragte/Dispersiekragte/Geïnduseerde dipoolkragte of Dipool dipoolkragte tussen $PH_3$ molekules.* (3)

**[18]**

**Intermolekulêre Kragte**
**November 2015**

1.1 D √√

**QUESTION 3 / *VRAAG 3***

3.1 3.1.1 Induced-dipole induced dipole √ / London / dispersion forces
*Geïnduseerde-dipool geïnduseerde dipool / London dispersiekragte* (1)

3.1.2 hydrogen bonds √ / *waterstofbindings* (1)

3.1.3 ion-dipole forces √ / *ion-dipool kragte* (1)

3.2 3.2.1
- Strong H-bonds between molecules √
- Large amount of energy absorbed for small change in temperature √
- *Sterk H-binding tussen molekule*
- *Groot hoeveelheid energie word vir 'n klein toename in temperatuur geabsorbeer.*

3.2.2
- Moderate climate close to large bodies of water √ / organisms can maintain steady body temperatures.
- *Gematigde klimaat naby groot wateroppervlaktes / organismes kan 'n konstante liggaamstemperatuur onderhou.*

3.2.3
- Each molecule of water surrounded by 4 others √ / 3D-tetrahedral shape
- Structure with large open spaces. √
- *Elke molekuul omring deur 4 ander watermolekules/ 3-D tetrahedrale vorm*
- *Struktuur met groot oop spasies.*

3.2.4
- Water freezes from top down – capturing heat √ / aquatic organisms stay alive below ice.
- *Water vries van bo na onder – vang hitte vas / akwatiese organismes bly lewend onder die water.*

3.2.5
- Strong adhesive forces √√
- *Sterk adhesiekragte*

3.2.6
- Water moves upward/and sideways √ to top branches and leaves / photosynthesis / transpiration.
- Water beweeg op- en sywaarts na boonste take en blare/ fotosintese / transpirasie.

(9)
**[12]**

1.3 B ✓✓ (2)

## QUESTION 3/*VRAAG 3*

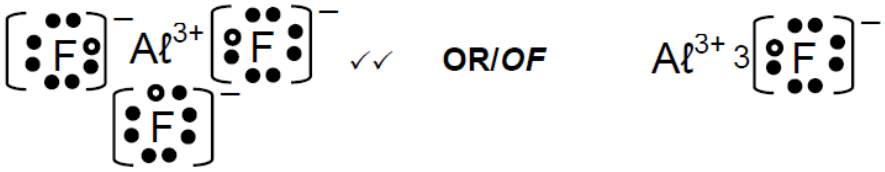
3.1 A covalent bond is a sharing of electrons between two atoms ✓
whilst an ionic bond forms when electrons are transferred from one atom to another and oppositely charged ions attract each other. ✓
*'n Kovalente binding is die deling van elektrone tussen twee atome terwyl 'n ioniese binding vorm wanneer elektrone oorgedra word van een atoom na 'n ander en teenoorgesteld gelaaide ione mekaar aantrek.* (2)

3.2

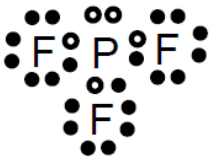
3.2.1 Ionic bond ✓
*Ioniese binding* (1)

3.2.2 Covalent bond ✓
*Kovalente binding* (1)

3.3

3.3.1  ✓✓ **OR/*OF*** 

**Marking criteria/*Nasienriglyne:***
- Symbol of one $A\ell^{3+}$ ion shown – no electrons around it. ✓
  *Simbool van een $A\ell^{3+}$-ioon getoon – geen elektrone rondom dit.*
- Symbol of $F^-$ ion shown with 8 electrons around it. ✓
  *Simbool van $F^-$-ioon getoon met 8 elektrone rondom dit.*
- Three $F^-$ ions included in structure.
  *Drie $F^-$-ione ingesluit in die struktuur.* (3)

3.3.2  ✓✓

**Marking criteria/*Nasienriglyne:***
- Symbols of one P atom and three F atoms shown with two electrons shown as dots/crosses between them. ✓
  *Simbole van een P-atoom en drie F-atome getoon met twee elektrone aangedui as kolle/kruise tussen hulle.*
- Three lone pairs placed around each F atom and one lone pair placed around P atom. ✓
  *Drie alleenpare geplaas rondom elke F-atoom en een alleenpaar geplaas rondom P-atoom.* (2)

3.4 Pyramidal ✓
*Piramidaal* (1)

3.5 The ionic bonds between particles in $AlF_3$ ✓ are stronger than ✓
the intermolecular forces/Van der Waals forces/dipole-dipole forces between molecules in $PF_3$. ✓
*Die ioniese bindings tussen deeltjies in $AlF_3$ is sterker as die intermoleklêre kragte/Van der Waalskragte/dipool-dipoolkragte tussen molekule in $PF_3$.*
More energy needed to overcome ionic bonds in $AlF_3$ than the intermolecular forces/Van der Waals forces/dipole-dipole forces in $PF_3$. ✓
*Meer energie nodig om die ioniese bindings in $AlF_3$ te oorkom as die intermolekulêre kragte/Van der Waalskragte/dipool-dipoolkragte tussen molekule in $PF_3$.* (4)
**[14]**

## QUESTION 4/*VRAAG 4*

4.1 The temperature ✓
at which the vapour pressure of a liquid equals external (atmospheric) pressure. ✓
*Die temperatuur waarby die dampdruk van 'n vloeistof gelyk is aan die eksterne (atmosferiese) druk.* (2)

4.2

4.2.1
- Between molecules of P are weak London forces/dispersion forces/ induced dipole forces. ✓
  *Tussen molekule van P is swak London-kragte/dispersiekragte/ geïnduseerde dipoolkragte.*
- Between molecules of Q are strong hydrogen bonds. ✓
  *Tussen molekule van Q is sterk waterstofbindings.*
- Hydrogen bonds are stronger than London forces/dispersion forces/ induced dipole forces. ✓
  *Waterstofbindings is sterker as London-kragte/dispersiekragte/ geïnduseerde dipoolkragte.*
  OR/*OF*
  London forces/dispersion forces/induced dipole forces are weaker than hydrogen bonds.
  *London-kragte/dispersiekragte/geïnduseerde dipoolkragte is swakker as waterstofbinding.*
- More energy needed to overcome intermolecular forces in Q than in P. ✓
  *Meer energie nodig om intermolekulêre kragte in Q as in P te oorkom.*
  OR/*OF*
  Less energy needed to overcome intermolecular forces in P than in Q.
  *Minder energie nodig om intermolekulêre kragte in P as in Q te oorkom.* (4)

4.2.2
- Molecules of S are larger than those of P./Molecules of P smaller than those of S. ✓
  *Molekule van S is groter as die van P./Molekule van P kleiner as die van S.*
- London forces increase with increase in molecular size/mass. ✓
  *London-kragte neem toe met toename in molekulêre grootte/massa.*
- More energy needed to overcome intermolecular forces in S than in P. ✓
  *Meer energie nodig om die intermolekulêre kragte in S as in P te oorkom.*
  OR/*OF*
- Less energy needed to overcome intermolecular forces in P than in S.
  *Minder energie nodig om die intermolekulêre kragte in P as in S te oorkom.* (3)

**Intermolekulêre Kragte**
**November 2014/3**

4.3 Electronegtivity of oxygen is higher than that of nitrogen. ✓
*Elektronegatiwiteit van suurstof is hoër as die van stikstof.*
The water molecule is more polar than the ammonia molecule. ✓
*Die watermolekuul is meer polêr as die ammoniakmolekuul.* (2)

4.4

4.4.1 Q/R ✓ (1)

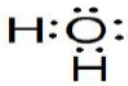
4.4.2 P/S ✓ (1)

**[12]**

## VRAAG 4

4.1 Waterstofbindings ✓ (1)

4.2 Die aantal hitte benodig vir verdamping om plaas te vind. ✓ (1)

4.3  ✓✓ **OF**  ✓ (2)

4.4 Hoekig/gebuigd ✓ (1)

4.5 Polêr. ✓
- Die O-atoom is meer elektronegatief as die H-atoom. ✓
- Beide dipoolmomente werk in dieselfde rigting om 'n netto dipoolmoment in die rigting van die O-atoom te gee. ✓
- Die suurstof gedeelte van die molekuul word effens meer negatief as die waterstof gedeelte ✓ en 'n polêre molekuul word gevorm. (4)

4.6 KCℓ ✓
- Die KCℓ is 'n ioniese stof met Coulombkragte ✓ wat vergelykbaar in grootte is met die waterstofbindings wat in water gevind word. ✓ (3)

4.7 Kapillariteit ✓ Adhesiekragte tussen die watermolekule en die glasmolekule veroorsaak dat water by die kante van die glas op beweeg. ✓✓ (3)

**[15]**