Chemistry **A.AravinthanBsc(Hons)Spl.Chem,PGDE**

Chemical Bonding & Lattice question

1.which of the the following compounds has the highest ionic character?
1. LiCl 2. HF 3. LiBr 4. RbCl 5.HI

2.In the ionic compound Rb_2S, which atom gains electrons & which loses electrons.
1. Rb loses S gains 2. S loses Rb gains
3.Rb_2S being a covalent compound neither of two losses electrons
4.All are correct explanations 5. All are wrong explanations

3. which one of the following contains both ionic & covalent bonds?
1.CCl_4 2. $CaCl_2$ 3. NH_4Cl 4. H_2O 5.NH_3

4. Which one of the following compound is covalent?
1. H_2 2.CaO 3.KCl 4.Na_2S 5. AgCl

5. The types of bonds present in $CuSO_4.5H_2O$ are
1. Ionic,Covalent 2. Ionic, Dative 3. Covalent, Dative
4.Ionic ,Covalent, Dative 5. Only covalent

6. NH_3 ,& BF_3 form an adduct readily because they form .
1.A coordinate bond 2. A covalent bond 3. An ionic bond
4. A H-Bond 5.none of the above

7. Which one of the following contains coordinate covalent bond are present?
1.N_2H_5+ 2. $BaCl_2$ 3. HCl 4. H_2O 5. NH_3

8. In which one of the following ionic,covalent&Co-ordinate bonds are present?
1.H_2O 2.NH_3 3. NaCNS 4. KBr 5.NaBr

9. which of the the following compounds has the highest ionic character?
1. LiCl 2. CsF 3. CsI 4. LiF 5.LiBr

10.Which of the following compound is essentially ionic &which is essentially covalent?
a. IBr b. $SiCl_4$ c. RaO d. KOH
1.all are covalent 2.all are ionic 3. C is ionic while the rest are covalent
4. A is ionic while others are covalent 5. A&b are covalent,c&d are ionic.

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11.combination of atoms take place because

1. They acquires the higher energy state
2. They tend to ability acquires by lowering of energy
3. Atoms change their position
4. None of these 5. All of these

12. which of the following statements would represent the formation of covalent bonds?

1. A nonmetal taking electrons from a metal
2. A non metal taking electrons from another nonmetal
3. A metal giving pair of electrons to a nonmetal
4. A nonmetal giving pair of electrons to a metal
5. A metal & nonmetal sharing electrons.

13.An electropositive atom forms an ion by?

1. Gaining electrons readily 2. Loosing electron readily
3. Sharing the electron readily 4.Accepting the proton
5. None of the above.

13.Which one the following is an electron deficient compound?

1. ICl 2. NH_3 3. BCl_3 4. PCl_3 5. PBr_3

14. Fused ionic compounds or aqueous solution of ionic compounds are?

a. Good conductors of electricity b. Semi conducters
c.Bad conducters of electricity d. Good electrolyte

15.which is likely to have the highest melting point?

1. He 2. CsF 3. CsCl 4. $CHCl_3$ 5. H_2O

16.Co-ordinate linkage is formed ?

a. Between NH_3 & BF_3 b. Between F^- & F_2
c.Between F& H_2O d. Between F^- & BH_3

17.Which of the following is not the property of metal?

1.High electrical conducting ability
2. High thermal conducting ability
3. Formation of positive ions
4. Could be flattend
5. Formation of covalent bond between metallic particles

18.Which of the following statements is /are true about metals

a.They conduct electricity
b. The density of metals is higher than that of water
c. The reacts with dilute acids always liberating H_2 gas
d. Majority of the elements are metals

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19. which molecule has the highest ionic property

1. AlF_3 2.$BeCl_2$ 3.HF 4.NCl_3 5.SiF_4

20. BF_3 forms coordination bonds with

a.$CH_3CH_2CH_2NH_2$ b.$(CH_3)_4Si$ c.HF d.CH_3COCH_3

21. In the valance shell of the Si atom in the SiF_6^{2-} an ion there are

1. $2e^n$ 2. $4e^n$ 3. $6e^n$ 4. $10e^n$ 5.$12e^n$

22.The molecules $(CH_3)_3P$ & $AlCl_3$ form coordinates compound in the mole ratio of 1:1In this compound the bond between the P atom and the Al atom

1.can be shownas P = Al 2.can be shown as P+ = Al-

3. can be shown as P- = Al+ 4. can be shown as P← Al

5. can be shown as P→Al

23.which one of the statements concerning the process of the formation of the bond between BF_3 & $N(CH_3)_3$are /is true?

a.It could be assumed that initially an electron is temperately transferred from the N atom to the B atom.

b.It could be assumed that initially an electron is temperately transferred from the B atom to the N atom.

c.The B atom supplies a pair of electrons for the formation of the bond

d. The N atom supplies a pair of electrons for the formation of the bond

24.The elements most likely to form a diatomic molecule in the gaseous state is

1. Ne 2. Zn 3. Na 4. Ca 5. Ar

25.The electronic configuration of the valence shell of the element that has the least tendency to form a diatomic molecule is,

1,s^1p^0 2. S^2p^0 3. S^2p^3 4. S^2p^4 5.s^2p^5

26.The element Z has the electronic configuration of the ns2np3 The electronic configuration of the element that form the most covalent bonds?

1. ns^2np^1 2. ns^2np^2 3. ns^2np^3 4. ns^2np^4 5. ns^2np^5

	1st statement	2nd statement
27	NaCl(s) exhibits high melting & boiling point	NaCl(s) is giant Ionic lattice
29	CsCl(s) doesnot conduct electricity but an aqueous solution of CsCl does	Cs & Cl atoms in CsCl lattice form Cs+ & Cl- ions When dissolved inn water
30	Boiling point of H_2O is higher than that of HF	Strength of H-bonding is greater in water than in HF
31	PCl_5 exists but NCl_5 does not	The phosphorous atom is larger than the N-atom

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32	The properties of one N-H bond in the NH_4+ ion are different from those of the other three N-H bonds	One N-H bond in the NH_4+ ion can be identified as a co-ordinate bond
33.	NaCl dissolves in water through hydration	In hydration of ions , there are ion-dipole interactions available
34.	Solid ionic lattices can not conduct electricity	Mobile electrons or ions available in ionic lattices
35.	Boiling point of He is remarkably low	There exists vanderwaals forces between the He atoms
36.	Boiling point of HBr is lower than that of Cl_2	There exists vanderwaals forces between the HBr atoms
37.	Liquid HF conducts electricity very well	The electronegativity difference between H & F is high
38.	The specific heat capacity of liquid water is anomalously high	In liquid water strong interaction occur between H_2Omolecules
39	Both sucrose & KI readily dissolve inn water	H2O form strong hydrogen bonds with sucrose & KI
40	Glucose soluble in water while cholesterol is insoluble in water	Cholesterol can not form hydrogens bonds with water
41.	The solubility of a non-polar substance in a polar solvent zero	Inter molecular forces a non polar molecule & a polar molecule are weaker compared to dipole –dipole interaction
42	I_2, is more soluble aqueous KI than in pure water	KI reduces the polarity of water making non-polar I_2 more soluble
43.	The melting point of diamond is very high	The bonds in diamond are covalent
44.	The boiling point of Graphite is very high	Graphite contain covalent bonds
45	The hardness of diamond is very much higher than the hardness of solid carbon dioxide	The C-C bod strength is very much higher than the C=O bond strength.
46.	Silica (SiO2) has a very high melting points	Si-O bonds are strong covalent bond
47	Melting point of diamond is very high	Bonds in diamond are covalent

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48	Melting point of silica is very high	It is a giant hetero atomic lattice made up strong bonds between Si&O
49	Shapes of CO2 & SiO2 are similar	Both C & Si belongs to the same group in the periodic table
50	HF is more polar than HCl	F is more electro negativity than Cl
51.	Diamond is an allotrope of carbon which does not conduct electricity	Diamond has a giant structure where each carbon atom ,is covalently bonded as four other carbon atoms
52.	The boiling point of CO2 is higher than the boiling point of formaldehyde	Intermolecular attractive forces between CO2 molecules are stronger than intermolecular attractive forces between formaldehyde molecules.

53. which of the following compound is most soluble in water ?

1. NaCl 2. CCl_4 3. NH_3 4. C_2H_5OH 5. PH_3

54.Strongest H-Bonds

a. Exist in $CH_3OH(l)$ b. Exist in $CH_3COOH(l)$

c.Exist in $NH_3(l)$ d. Exist in HF(g)

55.Which one of thefollowing exhibits the strongest inter–molecular attractions?

1. NH_3 2.HI 3. H_2S 4. CH_4 5. PH_3

56.Which one of thefollowing exhibits the weakest inter–molecular attractions?

1.NH_3 2.HI 3.CH_3Cl 4.CH_4 5. H_2S

57.Which of the following statements /statement concerning hydrogen bonds are/is true?

a. Hydrogen bonds may be formed by NH_3

b. Hydrogen bonds may be formed by SiH_2

c.-CH_3 groups form strong H-Bonds

d.Strong hydrogen bonds exist is liquid HF

58.which one of the followings statements is true

1.Hydrogen bonds are weaker than London forces

2. Dipole-Dipole interactions are stronger than H-Bond

3. Dipole-Dipole interactions are stronger than London forces

4.London forces are the weakest among inter-molecular forces

5. All above are falls

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59. The incorrect statement is ?

1. There exist London forces among layers of Graphite
2. Strength of London forces increases with the distance between the molecules
3. Strength of London forces increases with increasing molecular weight
4. Strength of London forces decreases with decreasing surface area of the molecule
5. There are London forces among hydro-carbon molecules

36. The species does not contain London forces is?

1. CO_2 2. Kr 3. Cl_2 4. O_2 5. NO

60. Which one of the following does not occur in H2O due to H-bonding

1. Exist as a liquid at room temperature 2. High boiling point
3. Low heat conductivity 4. High latent heat of vaporization
5. Extremly large melting point

61. Which of the following molecule consist of H-Bonds.?

1. HF 2. HBr 3. H_2Se 4. AsH_3 5. PH_3

62. H-Bonds exists in?

1. Proteins 2. Water 3. Nucleic acid 4. Lipids 5. All above

63. Weakest intermolecular forcesexist in,

1. NH_3 2. HI 3. CH_3Cl 4. CH_4 5. H_2S

64. Which of the following statements /statement concerning hydrogen bonds are /is true?

a. Hydrogen bonds occur in $CH_3CH_3NH_2$
b. Hydrogen bonds occur in $CH_3SiH_2OCH_3$
c. Hydrogen bonds occur in $CH_3CH_2OSiCH_3$
d. Hydrogen bonds occur in liquid NH_3

65. Consider the following

a. liquid methane b. a mixture of water & methanol
c. an aqueous solution of LiCl d. a solution of I_2 in methanol

The correct sequence that gives the increasing strength of inter molecular forces in the above is

1. a<d<b<c 2. a<d<c<b 3. a<c<b<d 4. A<b<d<c
5. a<b<c<d

66. The correct increasing order boiling points to given compound is ?

1. $CH_3CH_2CH_2CH_3$<CH_3CH_2COOH<$CH_3CH_2COCH_3$<$CH_3CH_2CH_2CH_2OH$
2. $CH_3CH_2COCH_3$< CH_3CH_2COOH< $CH_3CH_2CH_2CH_3$< $CH_3CH_2CH_2CH_2OH$
3. $CH_3CH_2CH_2CH_3$<$CH_3CH_2COCH_3$< CH_3CH_2COOH< <$CH_3CH_2CH_2CH_2OH$
4. $CH_3CH_2COCH_3$< CH_3CH_2COOH < $CH_3CH_2CH_2CH_2OH$< $CH_3CH_2CH_2CH_3$
5. $CH_3CH_2CH_2CH_3$<$CH_3CH_2COCH_3$< $CH_3CH_2CH_2CH_2OH$ <CH_3CH_2COOH

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67. OF the following which one has highest boiling point??

1. H_2 2. He 3.Ne 4. Xe 5.CH_4

68.The increasing order of CO_2,SO_2,N_2,He,& Ne is

1.He<Ne<N_2<CO_2<SO_2 2.He<Ne<CO_2<N_2<SO_2 3.He<Ne<N_2<SO_2<CO_2

4. Ne<He<N_2<CO_2<SO_2 5. Ne<He<CO_2<SO_2<N_2

69. The correct increasing order boiling points to given compound is ?

1.C_2H_5OH< C_2H_6<C_2H_5F< H_2O 2. C_2H_6<C_2H_5F< H_2O <C_2H_5OH

3. C_2H_5F<C_2H_6< C_2H_5OH< H_20 4.C_2H_6<C_2H_5F<C_2H_5OH<H_2O

5. C_2H_6<C_2H_5OH<C_2H_5F<H_2O

70. Boiling point is highest in?

1. H_2O 2.NH_3 3.SbH_3 4.AsH_3 5.PH_3

71. Melting point of given compounds varies as?

1.NH_3<PH_3<AsH_3<SbH_3 4.PH_3<AsH_3<SbH_3<NH_3

2.SbH_3<AsH_3<PH_3<NH_3 5.NH_3<SbH_3<AsH_3<PH_3

3.PH_3<AsH_3<PH_3<SbH_3

72.The correct boiling point variation is?

1.HF<NH_3<H_2O 2.H_2O<HF<NH_3 3.H_2O<HF<NH_3

4.HF<H_2O<NH_3 **5.NH_3<HF<H_2O**

73.Boiling points of group IVA hydrides varies as,

1.SiH_4<GeH_4<SnH_4<CH_4 2.CH_4<SnH_4<GeH_4<SiH_4

3.CH_4<GeH_4<SnH_4<SiH_4 4.CH_4<SiH_4<GeH_4<SnH_4

5.SnH_4<GeH_4<SiH_4<CH_4

74. Boiling points of group VIIA hydrides varies as?

1.HF>HI>HBr>HCl 2.HCl>HBr>HI>HF 3.HF>HCl>HBr>HI

4.HI>HBr>HCl>HF 5.HI>HF>HCl>HBr

75. Boiling point is highest in?

1.Ne 2.Ar 3.He 4.Kr 5.Xe

76. The property of diamond which does not depend on it's giant lattice structure is?

1.Structural hardness 2. Low density 3. High interence

4. High melting point 5.Extreme refractive index

77.Which of the following is false regarding graphite

1. Its composed of two dimensional sheets of carbon atoms

2. It's layers are held by week London forces

3. Each carbon atom in graphite is SP3 hybridized

4.It can be used as a lubricant 5.it is used battery electrodes

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78.which one of the followings gives a homoatomic lattice & hetero atomic lattice respectively

1. Sillica,graphite 2.Diamond,graphite 3.boron nitride,silica
4.Diamond,silica 5.Silica,diamond

79.NaCl is a?

1.Cubic type ionic lattice 2. Body centered lattice 3. Molecular lattice
4.Metallic lattice 5. None of the above

80.Which one of the following is a polar molecular lattice

1.NaCl 2.CsCl 3.CaO 4.Ice 5.Silica

81. Which one of the following is a non-polar molecular lattice

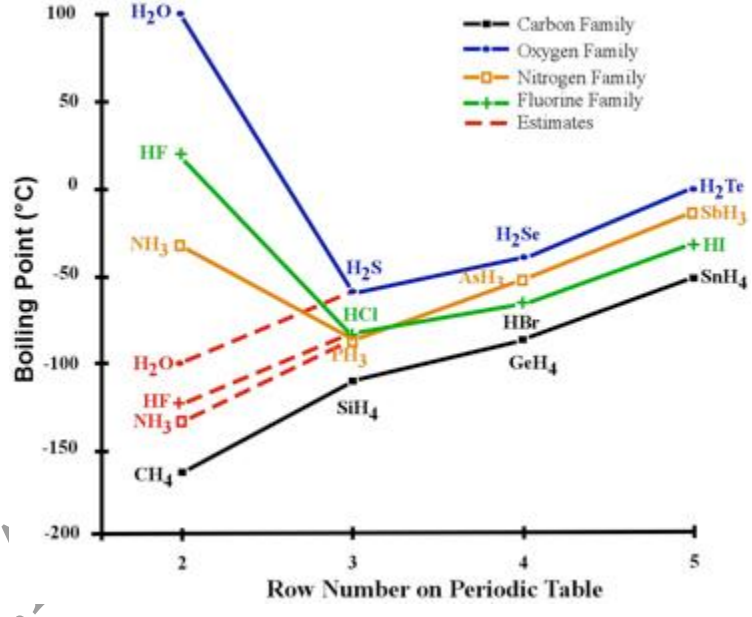
1.Ice 2.Iodine 3.Silica 4.Graphite 5.Diamond

82.Which one of the following is not an example for giant molecule?

1.Quarts 2.NaCl 3.HCl 4.DNA 5.CaO

83. which one of the followings gives a homo atomic lattices is?

1. SiO_2 2. BN 3.Ice 4.Diamond 5.None of the above



The diagram above shows the boiling points of the hydrides of the elements in groups 4, 5, 6 and 7.

Notice how the data for the group 4 hydrides (CH_4, SiH_4 etc) follow a smoothly increasing trend. All the group 4 hydrides have a regular tetrahedral shape and are

non-polar. The only intermolecular forces between such molecules are weak van der Waals' forces. These generally increase with increasing relative molecular mass.

Notice how the data for the hydrides of groups 5, 6 and 7 do not follow a smooth trend. In each case the first member of the set has a significantly higher boiling point than would be expected from the boiling points of the other members of the set. All these molecules are polar and the intermolecular forces between them are a mixture of van der Waals' forces and hydrogen bonding.

Hydrogen bonding is most effective when the difference in electronegativity between the elements present in the compound is large. This is the case for hydrogen fluoride, water, and ammonia (involving the highly electronegative elements fluorine, oxygen and nitrogen and the less electronegative element hydrogen).

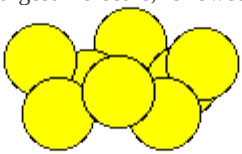
The other group 5, 6 and 7 hydrides have a lower electronegativity difference between the hydrogen(s) and the central atom and correspondingly the hydrogen bonding between them is weaker or even negligible. For these compounds the pattern of the boiling points is largely determined by the strength of the van der Waals' forces which depends approximately on the relative molecular mass.

Q)1)The melting point of Sulfur is higher than Phosphorous, and the melting point of Phosphorous is higher than Chlorine. Suggest a reason for this, related to the size of each molecule?

Sulfur, phosphorus, and chlorine vary in the size of their respective molecules; out of these three, phosphorus has the largest molecule, followed by sulfur and chlorine.



a P_4 molecule



an S_8 molecule



a Cl_2 molecule

These molecules only exhibit weak **van der Waals interactions,** or **London dispersion forces** (**LDF**), the strength of which depending on the size and shape of the molecules.
LDFs are very weak because they depend on the random distribution of electrons around a molecule at a given moment. When electron clouds get distorded by this random variation in the distribution of electrons, temporary dipoles appear.
When one such dipole appears in a molecule, that molecule is able to polarize the electron cloud of a neighbouring molecule → attraction takes place.
So, the bigger the molecule, the bigger and denser its electron cloud will be, which means that the temporary dipoles that appear will be a little stronger.
So, in order to melt phosphorus, sulfur, and chlorine all you have to do is break these very weak van der Waals interactions, which explains why sulfur, the *bigger molecule* of

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the three, will have the *highest* melting point, and chlorine, the *smallest* of the bunch, will have the *lowest*.

1.Mention the bond type where ever a bond exists and the intermolecular force if any in each of the following substances.

The symbol that should be used for indicating bond type and intermolecular force are given below.

Symbol		**bond type**
I	-	Ionic bond
P.C	-	Polar Covalent bond
N.P.C	-	Non-Polar Covalent bond
D-D	-	Dipole-Dipole Interaction
H	-	Hydrogen bond
M	-	Metallic

Substances	Bond Type	Intermolecular force
$CHF_{3(l)}$		
$Cl_{2(g)}$ /Br2(g)		
$HBr_{(l)}$		
$KBr_{(S)}$		
$H_{2(g)}$		
$HF_{(S)}$/H2O(s)/H2O(l)		
Na(s)/K(S)/Mg(S)		
Ar(g)/Ne(g)		
CH3Cl(l)		
HCl(l),BCl3(l)		
NH4Cl(s)		
MgS/Hg(l)/H2O(g)		
SiO2(s)/CH4(g)/CCl4(l)		
Napthalene/		
CS2(l)/COS/SiCl4/		
CH3OH(l)/Formaldehyde		

3. What is lattice

4.Give the type oflattice

5.Give three lattice which conduct current in solid stage

6.Give 3solid which does not exist lattice

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7. Fill the blanks in the following table selecting the most appropriate words/ parades from only those given below the table under categories X,Y & Z for the respective columns.

Material	X- Type Of Material	X-Particles Occupying Lattice Positions	Z-Interaction Between the Particles(Primary&Secondary)
$SiO_{2(S)}$	Hetero atomic	atoms	covalent/vander
ICE	Polarmolecula	molecules	Covalent/H-Bond
CsBr	Ionic	+/- ions	Ionic/--------
$I_{2(S)}$			
Ag	Metalic	+,- ions	Ionicbond/------
Diamond			
Dry Ice			
P4(s)	homoatomic	atoms	Covalent/vander
Naphthalene			
Cr/Pt			
KCl(s)			
SiC			
AlN			
BN			
graphite			

X----Homoatomic lattice, Heteroatomic lattice, nonpolar molecular lattice, Polar molecular lattice, Ionic lattice, Metallic lattice, Giant molecule lattice & amorphous material.

ns.

9.1 Physical properties of amine

- Boiling point of increasing in homologous series

onds.

Amine	CH_3NH_2	$C_2H_5NH_2$	$C_3H_7NH_2$	$C_4H_9NH_2$	$C_5H_{11}NH_2$
Boiling point °C	4	17	52	83	106
Boiling point trend	Boiling point increase →				

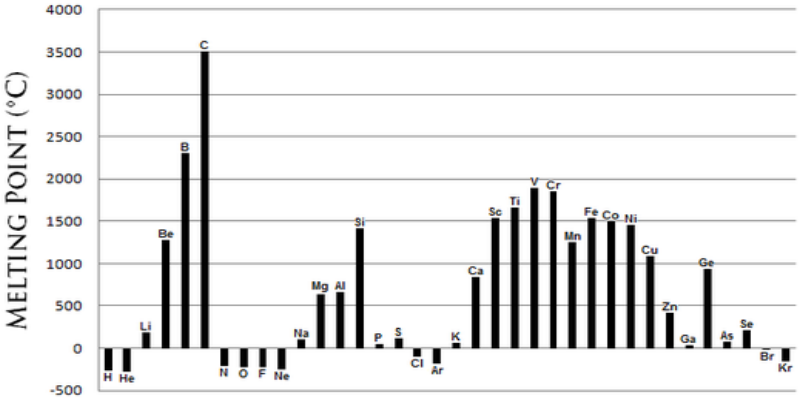
Explanation : When going down to homologous series, the boiling point increase. This is due to the increase in relative molecular mass, which increase the weak Van Der Waals forces causing boiling point increase.

Classification of amine	Primary amine	Secondary amine	Tertiary amine
Example (same RMM)	$CH_3CH_2CH_2NH_2$	$CH_3CH_2NHCH_3$	$(CH_3)_3N$
Boiling point (°C)	52	34	2

Explanation : Amine can form hydrogen bond between molecules. Straight chain molecule has a larger total surface area compare to a branched chain molecule. Hence, greater the total surface area exposed, greater the Van Der Waals forces, higher the boiling point. However, tertiary amine cannot form hydrogen bond, so their boiling point decrease significantly.

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In a given series, boiling point increases with molecular weight. Why?

ALKANES				
Boiling point	–42 °C	0 °C	36 °C	69 °C
ALCOHOLS	HO	HO	HO	HO
Boiling point	97 °C	117 °C	138 °C	158 °C
CARBOXYLIC ACIDS	HO, O	HO, O	HO, O	HO, O
Boiling point	141 °C	164 °C	186 °C	202 °C
ETHERS	O	O	O	
Boiling point	–24 °C	35 °C	89 °C	

Increasing surface area gives rise to increased Van Der Waals interactions

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