

### Instructions

- ✓ Put a dash where necessary eg dipole-dipole, non-metal, induced-dipole
  - ✓ If a term is two words, only leave one space between the words
  - ✓ Round values off to 2 decimal places
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### Question 1

1.1 Intramolecular forces: Are forces inside between molecules  
Intermolecular forces: Are forces inside between molecules

1.2 The types of Intramolecular forces are

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1.3 covalent bonds occur between atoms of a \_\_\_\_\_ and a \_\_\_\_\_

1.4 The types of Van der Waals forces are

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1.4 The other types of intermolecular forces are

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

1.5 The strongest IMF out of the above 6 is \_\_\_\_\_

1.6 The weakest IMF out of the above 6 is \_\_\_\_\_

1.7 State whether the following molecules contain lone pair/s on their terminal atom (central atom)

a)	CO <sub>2</sub>	Yes	No
b)	H <sub>2</sub> O	Yes	No
c)	NH <sub>3</sub>	Yes	No
d)	BF <sub>3</sub>	Yes	No
e)	PCl <sub>3</sub>	Yes	No

1.8 Within compounds the greatest repulsion force always exists between:

Bonding pair – bonding pair

Lone pair – lone pair

Lone pair – bonding pair

1.9 State the shape of the following molecules

a) HF

b) H<sub>2</sub>S

c) BCl<sub>3</sub>

d) CCl<sub>4</sub>

e) PF<sub>5</sub>

**Extension question:**

For elements to have a full valence shell they need to obey the 'octet rule'.

Which states that each element must have 8 valence electrons to have a full shell.

There are obvious exceptions – like Hydrogen which only needs 2 electrons in its 1s level to have a full valence shell.

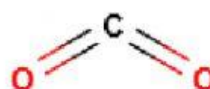
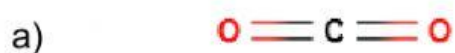
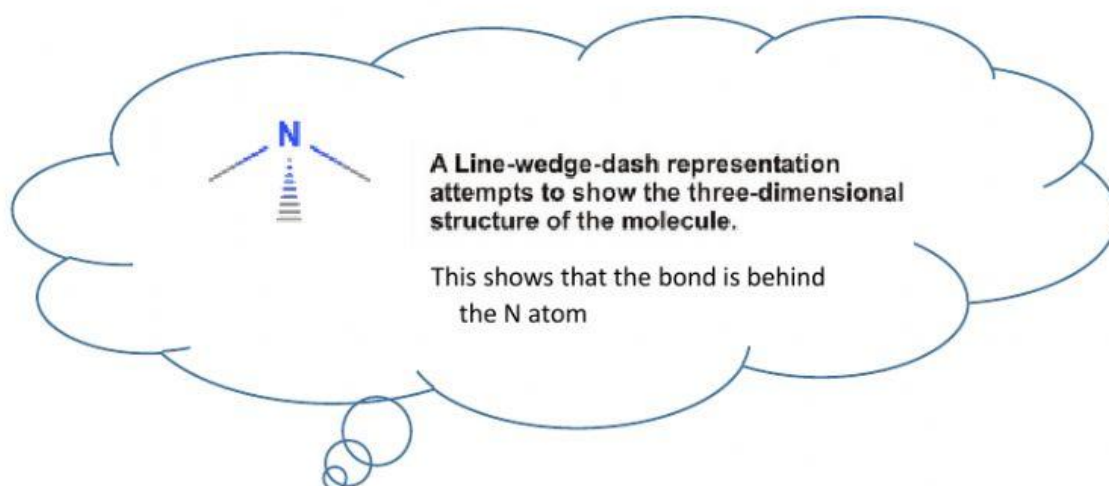
However- notice Phosphorus in PF<sub>5</sub>. It will end up with 10 electrons!

This is as a result of (2 words) \_\_\_\_\_

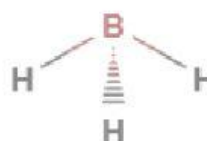
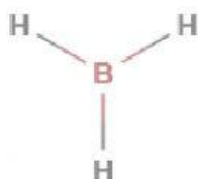
1.10 State whether the following molecules are polar or non-polar

- |    |                  |       |           |
|----|------------------|-------|-----------|
| a) | CO <sub>2</sub>  | polar | non-polar |
| b) | H <sub>2</sub> O | polar | non-polar |
| c) | CCl <sub>4</sub> | polar | non-polar |
| d) | HBr              | polar | non-polar |
| e) | NH <sub>3</sub>  | polar | non-polar |
| f) | BF <sub>3</sub>  | polar | non-polar |

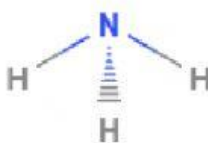
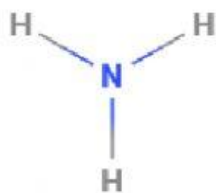
1.10 Choose the correct Couper structure for the given molecules:



b)



c)



## Question 2

Consider the molecules He, Ne and Ar

2.1 Which of these would have the largest atomic radius and the largest molecular mass?

2.2 Which of these would thus have the:

2.2.1 highest melting point

2.2.2 highest viscosity:

2.2.3 highest vapour pressure

### Question 3

Consider the following table of bond length

Bond	Bond length (pm)
C = C	134
C - C	154
Cl - Cl	199
I - I	266

- 3.1 As the bond length increases the bond energy will increase decrease
- 3.2 As the bond order increases the bond energy will increase decrease
- 3.3 Consider the  $\text{C}\equiv\text{C}$  bond  
How will the bond energy of  $\text{C}\equiv\text{C}$  compare to that of  $\text{C}=\text{C}$ ?  
Greater than      Less than      Equal to

### Question 4

State whether the following substance will be soluble or insoluble when mixed with each other.

- |     |                                       |         |           |
|-----|---------------------------------------|---------|-----------|
| 4.1 | CH <sub>4</sub> in HCl                | soluble | insoluble |
| 4.2 | HF in H <sub>2</sub> O                | soluble | insoluble |
| 4.3 | CH <sub>3</sub> F in PCl <sub>5</sub> | soluble | insoluble |

## Gas laws

### Question 1

An investigation is carried out to determine the relationship between the pressure and temperature of an enclosed gas. The following results were obtained from the investigation.

Pressure (kPa)	Temperature (°C)
100	-151
200	-29
300	93
400	X

1.1 Name the gas law being investigated

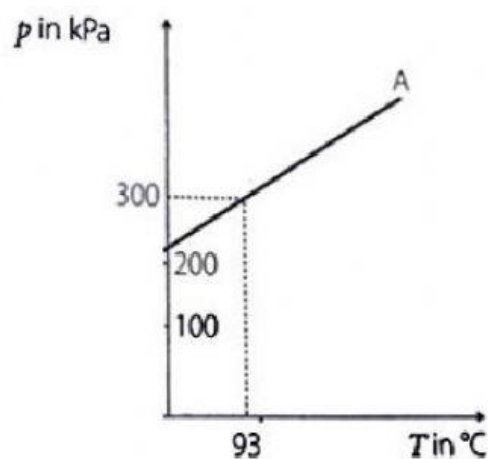
1.2 Name two variables that need to be controlled in this investigation (write answer in singular, not plural form)

\_\_\_\_\_ of gas

\_\_\_\_\_ of gas

1.3 The graph is drawn of pressure vs temperature and the graph is then extrapolated back to where it meets the x-axis.

What is the value of the kelvin temperature of the gas when the pressure is zero





1.4 Calculate the value of x in the table, in Kelvin and in °C.

=                      K  
=                      °C

Pressure (kPa)	Temperature (°C)
100	-151
200	-29
300	93
400	X



1.5 How will the gradient of the graph be affected if a greater mass of gas is used.

INCREASE      DECREASE      REMAIN THE SAME

## Question 2

A gas occupies a volume of 200 dm<sup>3</sup> at a pressure of 3kPa.

If the pressure is increased to 3,6 kPa, calculate the volume the gas will occupy

=                      dm<sup>3</sup> (2 decimal places)

## Question 3

0.44g of a certain gas was used to determine the relationship between the volume and the temperature of the gas.

Volume (cm <sup>3</sup> )	Temperature (°C)	Temperature (K)
35	-73	A
70	127	B
105	327	C
140	527	D
250	X	

3.1 Name the law that is being investigated here.



3.2 Convert the first four temperatures given in the table to Kelvin temperatures.

A = K

B = K

C = K

D = K

3.3 Calculate the value of X in °C

= °C (2 decimal places)

#### Question 4

50g of a gas occupies a volume of 30 000dm<sup>3</sup> at a pressure of 202,9 Pa and at a temperature of 20°C. Identify what the gas is, by using suitable calculations.

**(This is a two-step calculation. Write the answer to the first step in the first block and final answer in the last blocks.)**

**Leave no spaces between the values and the unit**

= (1 decimal place)

= (0 decimal places)

Thus the element symbol is =