1 Which substance exists as a macromolecule?

A Cu ⬭

B SiO_2 ⬭

C P_4O_{10} ⬭

D MgO ⬭

(Total 1 mark)

2 Which molecule has the largest dipole?

A ClF_3 ⬭

B BF_3 ⬭

C SF_6 ⬭

D CF_4 ⬭

(Total 1 mark)

3 Which of these species has a trigonal planar structure?

A PH_3 ⬭

B BCl_3 ⬭

C H_3O^+ ⬭

D CH_3^- ⬭

(Total 1 mark)

4 Use your understanding of intermolecular forces to predict which of these compounds has the highest boiling point.

A HF ⬭

B HCl ⬭

C HBr ⬭

D HI ⬭

(Total 1 mark)

5 Which type of bond is formed between N and B when a molecule of NH_3 reacts with a molecule of BF_3?

A Ionic. ⬭

B Covalent. ⬭

C Co-ordinate. ⬭

D Van der Waals. ⬭

(Total 1 mark)

6 Which of these atoms has the highest electronegativity?

A Na ⬭

B Mg ⬭

C Cl ⬭

D Ar ⬭

(Total 1 mark)

7 Which of these substances does **not** show hydrogen bonding?

A HF ⬭

B NH_3 ⬭

C CH_3COOH ⬭

D CHF_3 ⬭

(Total 1 mark)

8 What is the formula of calcium nitrate(V)?

A $CaNO_3$ ⬭

B $Ca(NO_3)_2$ ⬭

C Ca_2NO_2 ⬭

D $Ca(NO_2)_2$ ⬭

(Total 1 mark)

9 Which of these substances has permanent dipole-dipole attractions between molecules?

A CCl_4 ⬭

B C_2F_4 ⬭

C $(CH_3)_2CO$ ⬭

D CO_2 ⬭

(Total 1 mark)

10 Which compound has the highest boiling point?

A C_2H_4 ⬭

B C_2H_6 ⬭

C CH_3NH_2 ⬭

D CH_3F ⬭

(Total 1 mark)

11 In which one of the following species is the shape influenced by the presence of one or more lone pairs of electrons?

A NH_2^-

B NH_4^+

C $[CH_3NH_3]^+$

D $[Co(NH_3)_6]^{2+}$

(Total 1 mark)

12 Which one of the following molecules is **not** planar?

A BF_3

B NCl_3

C C_2H_4

D HCHO

(Total 1 mark)

13 The ester methyl ethanoate is hydrolysed as shown in the following equation.

$$CH_3COOCH_3(l) + H_2O(l) \rightleftharpoons CH_3COOH(l) + CH_3OH(l) \quad \Delta H^{\ominus} = +3 \text{ kJ mol}^{-1}$$

Which one of the following compounds from the reaction mixture has no hydrogen bonding between its molecules when pure?

A $CH_3COOCH_3(l)$

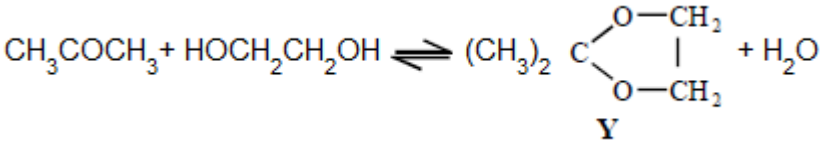
B $H_2O(l)$

C $CH_3COOH(l)$

D $CH_3OH(l)$

(Total 1 mark)

14 This question is about the reaction between propanone and an excess of ethane-1,2-diol, the equation for which is given below.



Y

In a typical procedure, a mixture of 1.00 g of propanone, 5.00 g of ethane-1,2-diol and 0.100 g of benzenesulphonic acid, $C_6H_5SO_3H$, is heated under reflux in an inert solvent. Benzenesulphonic acid is a strong acid.

Which one of the following statements is **not** true?

A Ethane-1,2-diol and water can form hydrogen bonds.

B Ethane-1,2-diol is soluble in water.

C Propane has a higher boiling point than ethane-1,2-diol.

D **Y** and water are polar molecules.

(Total 1 mark)

15 Which one of the following ions has three lone pairs of electrons around the central atom?

A BF_2^-

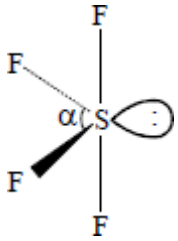
B NH_2^-

C ClF_2^-

D PF_6^-

(Total 1 mark)

16 Which one of the following is the most likely value for the bond angle α shown in the diagram of SF_4 below?



A 118°

B 101°

C 90°

D 88°

(Total 1 mark)

17 Predict which one of the following has the highest boiling temperature.

A $CH_3COOCH_2CH_3$

B $CH_3CH_2CH_2CH_2OH$

C $CH_3CH_2CH_2CH_2CH_3$

D $CH_3CH_2CH_2CHO$

(Total 1 mark)

18 Which one of the following molecules or ions is pyramidal in shape?

A BF_3

B CH_3^+

C CH_3^-

D SF_3^-

(Total 1 mark)

19 Which one of the following has a shape which is **not** influenced by a lone pair of electrons?

A CH_3OH

B H_2F^+

C BF_3

D NF_3

(Total 1 mark)

20 Which one of the following bond polarities is **not** correct?

A $\overset{\delta+}{C}-\overset{\delta-}{H}$ in ethane

B $\overset{\delta+}{C}-\overset{\delta-}{Br}$ in bromoethane

C $\overset{\delta+}{C}-\overset{\delta-}{O}$ in ethanol

D $\overset{\delta+}{C}=\overset{\delta-}{O}$ in ethanal

(Total 1 mark)

Mark schemes

1	B	[1]
2	A	[1]
3	B	[1]
4	A	[1]
5	C	[1]
6	C	[1]
7	D	[1]
8	B	[1]
9	C	[1]
10	C	[1]
11	A	[1]
12	B	[1]
13	A	[1]
14	C	[1]
15	C	[1]
16	A	[1]
17	B	[1]
18	C	[1]

19 C [1]

20 A [1]