ANGLO-CHINESE JUNIOR COLLEGE
DEPARTMENT OF CHEMISTRY
Preliminary Examination

CHEMISTRY **8872/01**
Higher 1

Paper 1 Multiple Choice

12 September 2012

50 minutes

Additional Materials: Multiple Choice Answer Sheet
Data Booklet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluids.
Write your name, index number and tutorial class on the Answer Sheet in the spaces provided unless this has been done for you.

There are **thirty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

This document consists of **11** printed pages.

Section A

For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider to be correct.

1 Which of the following contains 1.60×10^{22} of atoms?

A 7.98 g of ethane

B 1.86 g of chlorine free radicals (•C*l*)

C 638 cm^3 of neon at 298 K and 1 atm

D 5.95 dm^3 of hydrogen gas at 273 K and 1 atm

2 In an experiment, 20 cm^3 of a gaseous hydrocarbon C_xH_y, was completely burnt in 150 cm^3 of excess oxygen. The gaseous volume after the reaction was 120 cm^3 and treatment with aqueous potassium hydroxide decreased the volume to 80 cm^3. All volumes were measured under room temperature and pressure. What is the molecular formula of the hydrocarbon?

A C_2H_4 **C** C_4H_8

B C_2H_6 **D** C_4H_{10}

3 Iron poisoning in children is usually caused by excessive intake of iron supplement pills. The amount of iron which will cause poisoning depends on the size of the child. It was found that as little as 590 mg of Fe^{2+} can be fatal to a 12 kg child.

How many 325 mg $FeSO_4$ pills would it take to cause a fatal effect on a 12 kg child?

A 3 **C** 5

B 4 **D** 6

4 In which of the following compounds does vananium have the lowest oxidation state?

A VO_3^- **C** VO_2^+

B VO^{2+} **D** V_2O_5

5 In an experiment, 16.0 cm^3 of 0.3 mol dm^{-3} of acidified dichromate(VI) ions was used to oxidise 28.8 cm^3 of 0.5 mol dm^{-3} of $\mathbf{G^{n+}}$. What is the change in oxidation number for element **G**?

A -3 **C** +2

B -1 **D** +4

6 In 1996, Professor Hoffman and a group of scientists discovered a new element known as Ununbium, Uub. An atom of Uub can be formed by fusion of a lead nucleus with the nucleus of an isotope of element **H** as follows:

$^{208}_{82}Pb + \mathbf{H} \rightarrow {}^{277}_{112}Uub + 1$ neutron

What is element **H**?

A Cu **C** Ge

B Ga **D** Zn

7 Why is the first ionisation energy of oxygen lower than that of nitrogen?

A Oxygen is more electronegative than nitrogen.

B Oxygen forms anions more readily.

C The electron to be lost is paired with another electron.

D The oxygen atom is larger than the nitrogen atom.

8 In which of the following sets does the first compound have a larger bond angle than the second compound?

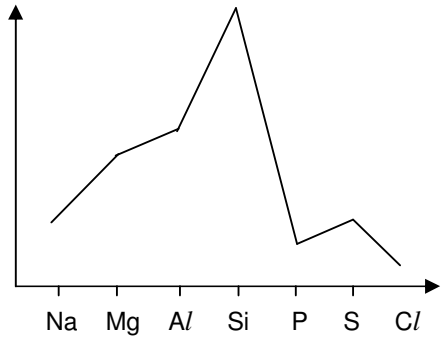
A H_2S and H_2O **C** PCl_3 and NCl_3

B ClO_3^- and BrO_3^- **D** BCl_3 and $BeCl_2$

9 Which set of properties could apply to a non-ionic compound which has a giant lattice?

	Physical state at room temperature	*Electrical conductivity of the molten compound*	*Melting point / ^oC*
A	Liquid	Does not conduct	-114
B	Liquid	Does not conduct	Melts over a temperature range
C	Solid	Does not conduct	110
D	Solid	Does not conduct	1610

10 The following graph shows how a property of the elements Na to C*l* varies with proton number.



What is the property?

A Electronegativity

B First ionisation energy

C Ionic radius

D Melting point

11 Which of the following reacts most vigorously with cold water?

A Sodium

B Potassium

C Magnesium

D Calcium

12 The oxide and chloride of an element **L** are separately added to water. The two resulting solutions have the same effect on litmus paper.

Which element could **L** be?

A Sodium

B Magnesium

C Silicon

D Phosphorus

13 The lattice energies of magnesium fluoride and calcium chloride are –2955 kJ mol^{-1} and –2255 kJ mol^{-1}, respectively. Which of the following values is likely to be the lattice energy of calcium fluoride?

A -2030 kJ mol^{-1}

B -2640 kJ mol^{-1}

C -3160 kJ mol^{-1}

D -4080 kJ mol^{-1}

14 The use of the *Data Booklet* is relevant to this question.

Calculate the enthalpy change of reaction for

$CH_2{=}CHCH_3\,(g) + Cl_2\,(g) \rightarrow CH_2ClCHClCH_3\,(g)$

A -86 kJ mol^{-1}

B -176 kJ mol^{-1}

C +174 kJ mol^{-1}

D -316 kJ mol^{-1}

15 Radioactive decay of Particle **A** to Particle **B** follows first order kinetics. After 3 half–lives have elapsed, the mole ratio of Particle **A** : Particle **B** would be

A 1 : 2

B 1 : 3

C 1 : 7

D 1 : 8

16 When the following equilibrium is established.

$Cu\,(s) + 2\,Ag^+\,(aq) \rightleftharpoons Cu^{2+}\,(aq) + 2Ag\,(s)$

Which of the following is the correct expression for equilibrium constant K_c?

A $\dfrac{[Cu^{2+}]}{[Ag^+]}$

B $\dfrac{[Cu^{2+}]}{[Ag^+]^2}$

C $\dfrac{[Cu^{2+}][Ag]}{[Cu][Ag^+]}$

D $\dfrac{[Cu^{2+}][Ag]^2}{[Cu][Ag^+]^2}$

17 Given that the K_c value for equilibrium **I** is 2.6, what is the K_c value for equilibrium **II** under the same condition?

Equilibrium **I**: $4X\ (g) + Y_2\ (g) \rightleftharpoons 2X_2Y\ (g)$

Equilibrium **II**: $X_2Y(g) \rightleftharpoons \frac{1}{2} Y_2\ (g) + 2X\ (g)$

A $\frac{1}{1.3}$ **C** $\frac{1}{\sqrt{1.3}}$

B $\frac{1}{2.6}$ **D** $\frac{1}{\sqrt{2.6}}$

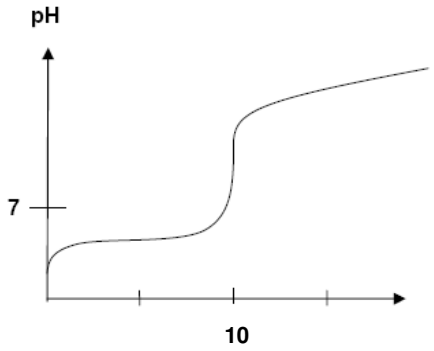
18 Consider the equilibrium, $HSO_4^-(aq) + HPO_4^{2-}(aq) \rightleftharpoons SO_4^{2-}(aq) + H_2PO_4^-(aq)$.

Which of the following is a conjugate acid-base pair?

	Base	*Conjugate acid*
A	HPO_4^{2-}	HSO_4^-
B	HPO_4^{2-}	$H_2PO_4^-$
C	HSO_4^-	SO_4^{2-}
D	HSO_4^-	HPO_4^{2-}

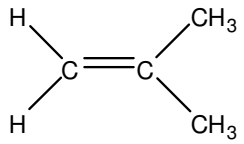
19 The following graph shows the changes in pH of 20.0 cm^3 of 1.0 mol dm^{-3} acid solution when excess 1.0 mol dm^{-3} alkali solution is added gradually.

Which one of the following pairs of solution with a suitable indicator could have resulted in the graph below?



	acid	**alkali**	**indicator**
A	CH_3COOH	NaOH	Methyl orange
B	CH_3COOH	NaOH	Phenolphthalein
C	CH_3COOH	$Ba(OH)_2$	Methyl orange
D	CH_3COOH	$Ba(OH)_2$	Phenolphthalein

20 What is the total number of sigma bonds in a molecule of 2-methylpropene as shown below?



A 5

B 6

C 11

D 12

21 Which of the following represents the molecular formula of a compound that can exhibit geometric isomerism?

A $C_2H_6O_2$

B C_2H_3Cl

C $C_2H_2Cl_2$

D $C_2H_2O_4$

22 Which of the following isomers of $C_5H_{12}O$ gives, on complete dehydration, the greatest number of different alkenes?

A $CH_3CH_2CH(CH_3)CH_2OH$

B $CH_3CH_2CH_2CH(OH)CH_3$

C $CH_3CH(CH_3)CH_2CH_2OH$

D $C(CH_3)_3CH_2OH$

23 Which of the following compounds, when dissolved in water, will give a solution of the lowest pH? (Assuming the solutions have the same concentration.)

A Chloroethanoic acid

B Propan-1-ol

C Ethanoic acid

D 2-Chloropropan-1-ol

24 Ethene (M_r = 28.0) reacts with a reagent **R** in the dark to form a compound **Q** (M_r = 187.8).

Which of the following statements is **false** about the reaction?

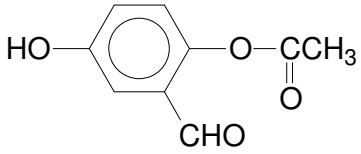
A The reaction mechanism is electrophilic addition.

B **Q** could be dibromoethane

C The reagent **R** is HBr

D The reaction can occur in the presence of light

25 Compound **S** is used in dusting powder to relieve the pain of open wounds.



Compound **S**

Which of the following reagents does **not** react with compound **S**?

A Aqueous bromine

B Fehling's solution

C 2,4-dinitrophenylhydrazine

D Hot, acidified potassium dichromate(VI) solution

Section B

For each of the questions in this section, one or more of the three numbered statements **1** to **3** may be correct.

Decide whether each of the statements is or is not correct (you may find it useful to put a tick against the statements that you consider to be correct).

The responses **A** to **D** should be selected on the basis of

A	B	C	D
1, **2** and **3** are correct	**1** and **2** only are correct	**2** and **3** only are correct	**1** only is correct

No other combination of statements is used as a correct response.

26 **E** and **F** are elements found in the same group.

Gaseous particle **E** has a proton (atomic) number n. Gaseous particle **F** has a proton (atomic) number (n+8).

Which of the following statements correctly describe **E** and **F**?

1 **E** has a larger radius than **F**.

2 **E** has a larger first ionisation energy than **F**.

3 **E** releases more energy than **F** when an electron is added to each particle.

27 Which of the following properties **decrease** when NaC*l* is compared to P$C\!l_3$?

1 Electrical conductivity of the chloride in liquid state.

2 pH of the resultant solution when mixed with water.

3 Covalent character.

28 Two colourless liquids were mixed together in a beaker and left to stand. The mixture separated into two distinct layers after standing for 30 minutes.

Assuming that the liquids did not undergo reaction with each other, which of the following pairs are immiscible liquids?

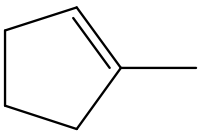
1 Cyclohexanol and water.

2 Ethanol and water.

3 Ethanal and water.

29 Which of the following compounds react with hot, acidified potassium manganate (VII) to form products that give a positive result for 2,4–dinitrophenylhydrazine test and tri-iodomethane test?

1



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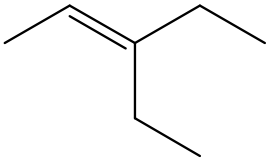

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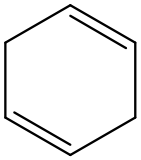
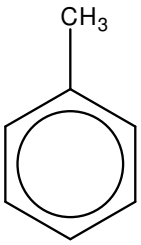
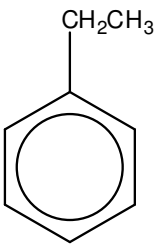


30 Which of the following pairs of compounds produce the **same** organic product when added to a hot solution of acidified potassium manganate (VII)?

1 $CH_3CH_2CH_2OH$ CH_3CH_2CHO

2





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