RIVER VALLEY HIGH SCHOOL
YEAR 6 PRELIMINARY EXAMINATION

CANDIDATE NAME									
CLASS	6								
CENTRE NUMBER	S					INDEX NUMBER				

H2 CHEMISTRY 9729/01

Paper 1 Multiple Choice

20 September 2018
1 hour

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 fluid.

Write your name, class and index number on the Optical Answer Sheet in the spaces provided.

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 Optical 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.

The use of an approved scientific calculator is expected, where appropriate.

This document consists of **12** printed pages.

For each question there are four possible answers, **A, B, C** and **D**.

Choose the **one** you consider to be correct.

1 A mixture of argon and another gas is commonly used during welding. At s.t.p, the density of the gaseous mixture is 1.82 g dm^{-3}.

What is the identity of the other gas in the mixture?

[Density of argon = 1.78 g dm^{-3} at s.t.p.]

A neon

B nitrogen

C oxygen

D carbon dioxide

2 Sodium thiosulfate ($Na_2S_2O_3$) is used in the textile industry to remove an excess of chlorine from bleaching processes by reducing it to chloride ions.

If 10 cm^3 of 0.20 mol dm^{-3} of sodium thiosulfate requires 192 cm^3 of chlorine for complete reaction at r.t.p., which of the following is a possible formula of the sulfur-containing product?

A S **B** SO_2 **C** HSO_4^- **D** H_2S

3 Which of the following ions would undergo the smallest deflection in an electric field?

A $^{16}O_2^+$ **B** $^{16}O^{18}O^+$ **C** $^{16}O^{18}O^{2+}$ **D** $^{18}O^{2+}$

4 The table below shows the fourth ionisation energies of five consecutive elements in the Periodic Table.

Element	V	W	X	Y	Z
Fourth ionisation energy / kJ mol^{-1}	10450	11710	4350	5030	4580

What is the formula of the bromide of V?

A VBr **B** VBr_2 **C** VBr_3 **D** VBr_5

5 Two identical bulbs at the same temperature contain ideal gases **P** and **Q** separately. The density of gas **P** is half that of gas **Q** while the molecular mass of gas **P** is twice that of gas **Q**.

What is the ratio of the pressure of gas **P** to that of gas **Q**?

A 1 : 1 **B** 1 : 2 **C** 1 : 4 **D** 2 : 1

6 The auto-ionisation of bromine trifluoride is represented by the equation:

$$2BrF_3 \rightleftharpoons BrF_2^+ + BrF_4^-$$

Which of the following statements is correct?

A BrF_3 is planar while BrF_4^- is non-planar.

B BrF_2^+ is linear while BrF_4^- is tetrahedral in shape.

C The F–Br–F bond angle in BrF_3 is smaller than that in BrF_2^+.

D There are more lone pairs of electrons around the Br atom in BrF_3 than that in BrF_2^+.

7 Dimerisation is described as a process in which two identical molecules combine to give a single product. Some examples include Al_2Cl_6, N_2O_4 and $(CH_3CO_2H)_2$.

Which of the following statements about the above dimers are correct?

1 Hydrogen bonds hold the CH_3CO_2H molecules together in the dimer.

2 All the nitrogen-oxygen bonds in N_2O_4 are of equal length.

3 The bond angle around each aluminium atom in Al_2Cl_6 is 109.5°.

A 1 only **B** 1 and 2 only **C** 2 and 3 only **D** 1, 2 and 3

8 Vaporisation is the process when a liquid is converted to a gas.

Given that the enthalpy change of vaporisation of water is +40.8 kJ mol^{-1}, what is the entropy change when 36.0 g of water boil to form water vapour?

A +109 J K^{-1}

B −109 J K^{-1}

C +219 J K^{-1}

D −219 J K^{-1}

9 At T °C and a total pressure of 6.00 atm, N_2O_4 is 60.0% dissociated into NO_2.

What is the K_p value at T °C?

A 3.0 **B** 5.4 **C** 13.5 **D** 21.6

10 H_2A is a weak acid which undergoes partial dissociation.

$$H_2A(aq) \rightleftharpoons 2H^+(aq) + A^{2-}(aq)$$

Given that the pH of 1.00 mol dm^{-3} $H_2A(aq)$ solution is 2.3, what is the degree of dissociation of H_2A?

A 2.50×10^{-3} **B** 5.01×10^{-3} **C** 1.26×10^{-5} **D** 1.26×10^{-7}

11 The auto-ionisation of water is an endothermic process.

$$H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq) \qquad \Delta H = +6.5 \text{ kJ mol}^{-1}$$

Which of the following statements are correct?

1 K_w increases as temperature increases.

2 pH of solution decreases as temperature increases.

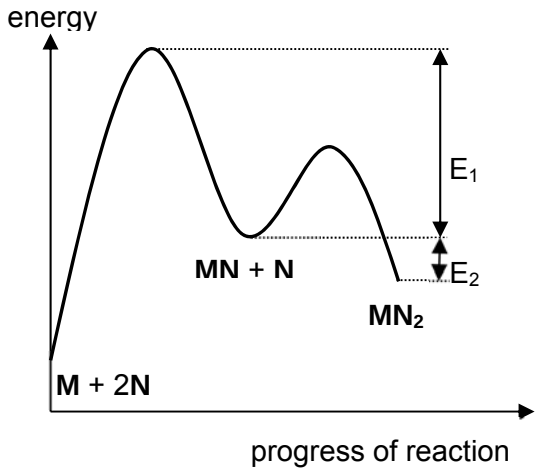
3 Acidity of water increases as temperature increases.

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

12 What is the pH of a saturated solution of aluminium hydroxide, $Al(OH)_3$, if its solubility product is 2.53×10^{-18} mol^4 dm^{-12}?

A 4.28 **B** 5.44 **C** 9.60 **D** 9.72

13 The energy profile diagram of the reversible reaction between **M** and **N** is shown below.



Which of the following statements are correct?

1 The activation energy of the reverse reaction is $E_1 + E_2$.

2 Rate equation of the reaction is rate = k[**M**][**N**]^2.

3 The equilibrium [**MN_2**] increases as temperature increases.

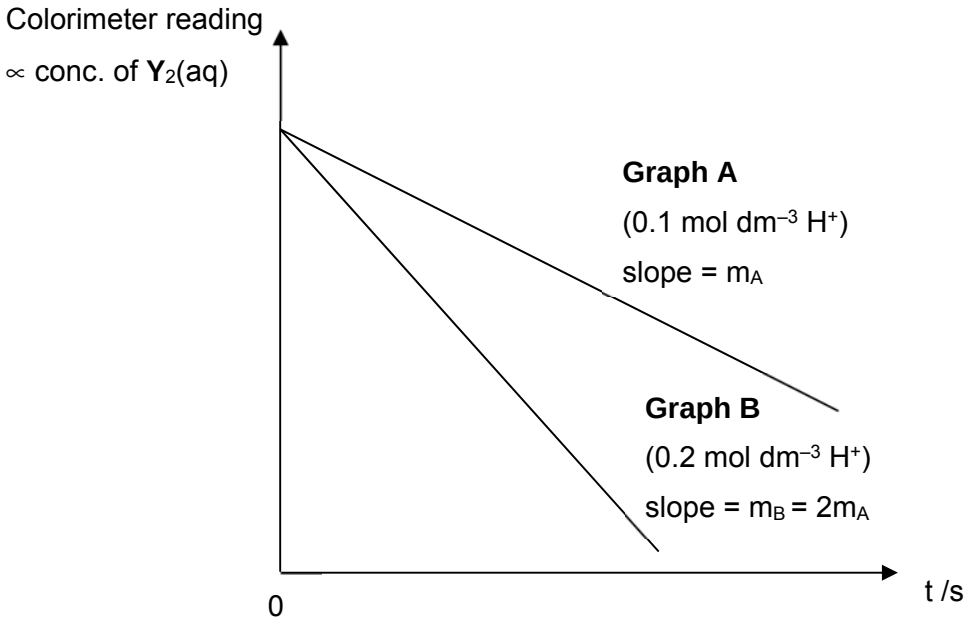
A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

14 The acid-catalysed reaction between **X** and $\mathbf{Y}_2$ in aqueous solution has been investigated.

$$\mathbf{X} + \mathbf{Y}_2(aq) \xrightarrow{H^+} \mathbf{XY}(aq) + H\mathbf{Y}(aq)$$

It has been found that rate equation is rate = $k[\mathbf{X}][\mathbf{Y}_2]^m[H^+]^n$.

The change in concentration of $\mathbf{Y}_2$ remaining for this reaction is measured by using a photoelectric colorimeter. **Graph A** is obtained when the concentration of hydrogen ions used is 0.1 mol dm^{-3}.



What is the overall order of reaction?

A 0 **B** 1 **C** 2 **D** 3

15 **W** and **X** are 2 different elements in Period 3. The following are some of their properties:

- The oxide of **W** is insoluble in water, but is soluble in both NaOH(aq) and HC*l*(aq).
- The chloride of **X** dissolves completely in water to give a colourless solution of pH = 2.

Which of the following is the likely identity of element **W** and **X**?

	W	**X**
A	A*l*	P
B	A*l*	Si
C	Mg	P
D	Mg	Si

16 **Y** and **Z** are two different elements from the same Group. The chlorides of both **Y** and **Z** have giant ionic lattice structure.

Which of the following statements is inconsistent with the other options?

A The first ionisation energy of **Y** is less endothermic compared to **Z**.

B The oxide of **Y** is less soluble in water compared to the oxide of **Z**.

C The magnitude of the lattice energy of chloride of **Y** is higher compared to the chloride of **Z**.

D The carbonate of **Y** decomposes at a lower temperature compared to the carbonate of **Z**.

17 Purification of copper involves placing the impure copper at the anode of an electrolytic cell of $CuSO_4$(aq) and running a current though the setup. Over time, pure copper will be deposited on the cathode.

In a particular setup, a copper sample with zinc and silver impurities was placed at the anode and a current of 6.00 A was passed through the circuit for 11 min. The cathode was then found to have an increase of mass of 1.12 g.

Which of the following statement is likely to be incorrect?

A Less time is needed if [$CuSO_4$] is increased.

B Anodic sludge containing silver would be formed.

C The maximum mass of copper that can be purified is 1.30 g.

D There would be Zn^{2+} ions found in the solution after the purification process.

18 *Use of the Data Booklet is relevant to this question.*

Patterns or designs can be etched on copper objects as a way to improve its aesthetics. Etching of copper objects are can be done chemically, where a solution of etching chemical is poured over copper surface to dissolve part of the copper.

Which of the following solution cannot be used as an etching chemical?

A Fe^{2+}(aq)

B Fe^{3+}(aq)

C Mn^{3+}(aq)

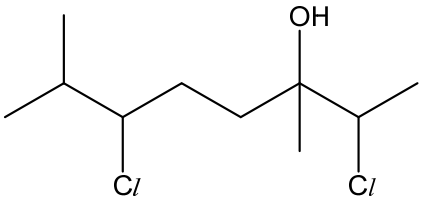
D acidified $Cr_2O_7^{2-}$(aq)

19 Which of the following galvanic cell information is incorrect?

You may assume that all ions stated are at 1.00 mol dm^{-3} and all measurements are made at standard conditions.

	Half-cell 1		Half-cell 2		$E^{\ominus}_{cell}$ / V
	Electrolyte	Electrode (Anode)	Electrolyte	Electrode (Cathode)	
A	H^+ Mn^{2+} MnO_4^-	Pt	Fe^{2+} Fe^{3+}	Pt	+0.75
B	Mn^{2+}	Mn	Fe^{2+} Fe^{3+}	Pt	+1.95
C	Mn^{2+}	Mn	Fe^{2+}	Fe	+0.74
D	Fe^{2+}	Fe	Mn^{2+} Mn^{3+}	Pt	+1.98

20 The following molecule is a derivative of linalool.



How many isomers may be formed when the molecule is heated under reflux with excess ethanolic potassium hydroxide?

A 2 **B** 4 **C** 6 **D** 8

21 Ethane reacts with chlorine gas in the presence of ultraviolet light to form a mixture via free radical substitution.

Which statement about this reaction is true?

A Homolytic fission occurs only in the initiation step.

B Bond formation occurs only in the termination step.

C Chloroethane is formed only in the propagation step.

D Small quantities of butane is formed only in the termination step.

22 Which of the following compounds are formed in the reaction between ethene and aqueous bromine in the present of sodium ethoxide ($CH_3CH_2O^-Na^+$)?

1 $BrCH_2CH_2OH$

2 $BrCH_2CH_2OCH_2CH_3$

3 $CH_3CH_2OCH_2CH_2OCH_2CH_3$

A 1 and 2 only **B** 2 and 3 only **C** 1 and 3 only **D** 1 only

23 Which of the following sequence of steps is expected to give the best yield for the synthesis of 3-bromo-4-methylphenylamine from benzene?

A alkylation, nitration, bromination, reduction

B alkylation, nitration, reduction, bromination

C bromination, alkylation, nitration, reduction

D nitration, alkylation, reduction, bromination

24 In which of the following pairs of compounds is the compound on the left more volatile than that on the right?

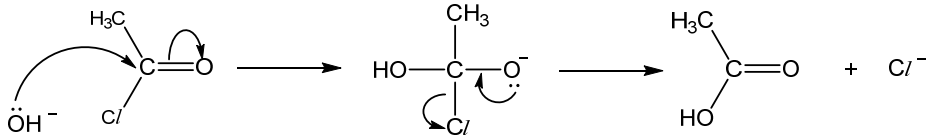
1 propylamine and propan-1-ol

2 pentan-2-one and pentan-2-ol

3 cyclohexylamine and aminoethanoic acid

A 1 only **B** 1 and 2 only **C** 2 and 3 only **D** 1, 2 and 3

25 The two-stage reaction given below shows a possible mechanism for the reaction between hydroxide ions and ethanoyl chloride.



Which of the following best describes the overall reaction mechanism?

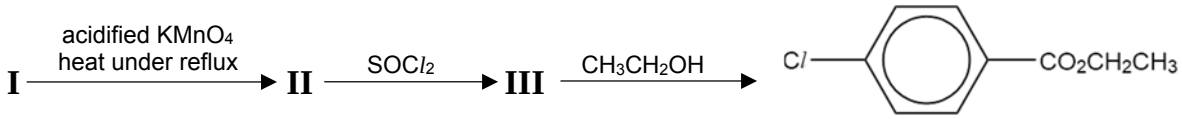
A electrophilic substitution

B electrophilic addition

C nucleophilic substitution

D nucleophilic addition

26 Consider the reaction scheme below:



Which of the following molecules is a possible identity of **I**?

A

B

C

D

27 A compound **X**, with molecular formula $C_9H_{10}O_2$, is heated under reflux with NaOH(aq) and the resulting mixture then cooled and acidified with H_2SO_4(aq). The final products include a compound that turns blue litmus solution red, and another which gives a violet colouration when tested with neutral $FeCl_3$(aq).

What is a possible identity of **X**?

A $C_6H_5OCOCH_2CH_3$

B $C_6H_5CH_2OCOCH_3$

C $C_6H_5COOCH_2CH_3$

D $C_6H_5CH_2COOCH_3$

28 Ascorbic acid, commonly known as vitamin C, is a water-soluble molecule that traps radicals formed in the aqueous environments of the cell and in the blood plasma.

Which of the following statements is correct?

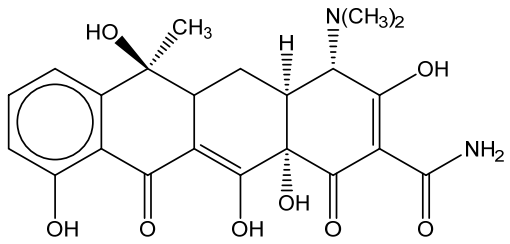
A Ascorbic acid molecule is planar.

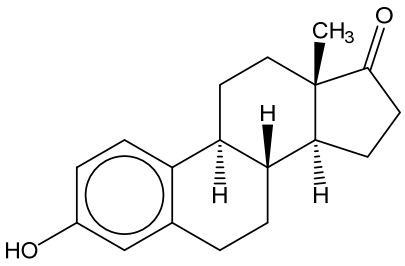
B Ascorbic acid can exhibit cis-trans isomerism.

C Ascorbic acid can react with hot hydrochloric acid.

D Ascorbic acid can react with 2,4-dinitrophenylhydrazine.

29 Which of the following procedures can be used to distinguish between the two molecules below?





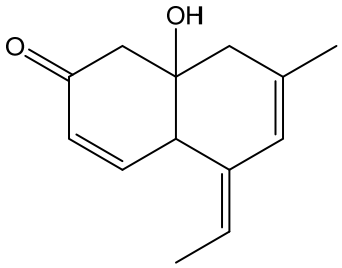
A Add 2,4-dinitrophenylhydrazine at room temperature.

B Add aqueous bromine at room temperature.

C Add silver(I) diammine solution and warm.

D Add dilute sodium hydroxide and warm.

30 Which of the following statements are true about molecule **Y** below?



1 1 mol of **Y** reacts with excess HBr(g) to yield a major product with 7 chiral centres.

2 1 mol of **Y** reacts with hot acidified $KMnO_4$(aq) to give a tribasic carboxylic acid as one of the products.

3 When heated, 1 mol of **Y** reacts with 4 mol of H_2(g) in the presence of Ni catalyst to yield a saturated compound.

A 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 3 only

- End of Paper -