

RIVER VALLEY HIGH SCHOOL YEAR 6 PRELIMINARY EXAMINATION (II)

CANDIDATE NAME				
CLASS	6			
CENTRE NUMBER	S		INDEX NUMBER	
H2 CHE	MIST	RY		9647/01
Paper 1 Mul	tiple Choic	ce		25 September 2015 1 hour
Additional Ma	aterials:	Multiple Choice Ans Data Booklet	swer Sheet	

READ THESE INSTRUCTIONS FIRST

Do not use staples, paper clips, highlighters, glue or correction fluid.

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

There are **forty** 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 **15** printed pages and **1** blank page.

Section A

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

1 At 35 °C and 1 atm, ozone (O_3) reacts with water to give hydrogen and oxygen gas.

$$O_3(g) + H_2O(I) \rightarrow H_2(g) + 2O_2(g)$$

Given that gases expand by 14.3 % when heated from standard temperature to 35 °C, calculate the volume of gas collected when 0.15 g of water is required to fully react with a sample of ozone at 35 °C?

A 560 cm³ **B** 600 cm³ **C** 640 cm³ **D** 800 cm³

2 Radioactive decay is the process where an unstable atom loses energy by emitting radiation. ¹⁴C is an isotope of carbon that has a tendency to lose energy by undergoing β -decay, where a neutron changes into a proton and an electron.

What is the product after ¹⁴C undergoes β -decay?

	Α	¹³ C	B ¹⁴ C	C ¹³ N	D ¹⁴ N
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3 Which of the following is true when SO_2 is changed to SO_3^{2-} ?

	Total number of electrons around S	Bond angle
Α	Increases from 10 to 12	Increases from 107° to 120°
В	Increases from 10 to 14	Decreases from 180° to 120°
С	Remains the same	Decreases from 120° to 107°
D	Remains the same	Decreases from 180° to 120°

4 When one mole of water is formed from the reaction between solid $Ba(OH)_2$ and HNO_3 , 58.4 kJ of heat is released.

Calculate the final temperature of the solution when 2.56 g of solid $Ba(OH)_2$ is added to 200 cm³ of 0.500 mol dm⁻³ HNO₃ at room temperature?

A 22.6 °C **B** 24.0 °C **C** 26.4 °C **D** 27.1 °C

5 Enthalpy changes for the following reactions were determined experimentally:

$$\begin{split} H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(I) & \Delta H = -282 \text{ kJ mol}^{-1} \\ CH_3CH_3(g) + \frac{7}{2}O_2(g) \rightarrow 2CO_2(g) + 3H_2O(I) & \Delta H = -1560 \text{ kJ mol}^{-1} \\ H-C\%C-H(g) + 2H_2(g) \rightarrow CH_3CH_3(g) & \Delta H = -302 \text{ kJ mol}^{-1} \\ \end{split}$$

What is the enthalpy change of combustion of ethyne, H-C%C-H?

A _1298 kJ mol⁻¹

B –1580 kJ mol⁻¹

C –2144 kJ mol⁻¹

- **D** –2426 kJ mol⁻¹
- 6 If the behaviour of an ideal gas is described by the equation pV = nRT, which of the following statements must be true of the gas?
 - A The volume of a given mass of gas is doubled if temperature increases from 25 °C to 50 °C at constant pressure.
 - **B** The pressure is doubled when the volume is doubled for a given mass of gas at constant temperature.
 - **C** The relative molecular mass of the gas is doubled when the pressure of the gas is doubled.
 - **D** The density of the gas is inversely proportional to the temperature at constant pressure.
- 7 Two electrode potentials are given:

$$V^{2+} + 2e^{-} \rightleftharpoons V$$
 E = −1.20 V
Zn²⁺ + 2e⁻ \rightleftharpoons Zn E = −0.76 V

Which species is the strongest reducing agent?

A Zn^{2+} **B** V^{2+} **C** V **D** Zn

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8 Steel objects are sometimes electroplated with chromium to increase its ability to resist corrosion and to give the object an attractive shine.

An object to be chromium plated is immersed in a solution of chromium(III) chloride. After 15 min, the mass of chromium deposited is measured to be 0.47 g. What is the average current used for the electroplating process?

A 0.32 A **B** 0.97 A **C** 2.9 A **D** 6.3 A

9 The reaction between an alkyl bromide, **P**, and sodium hydroxide was studied and the following results were obtained:

$[\mathbf{P}]$ / mol dm $^{-3}$	$[OH^-]$ / mol dm $^{-3}$	Initial rate/ mol dm ⁻³ s ⁻¹
0.1	0.1	1.2×10^{-4}
0.1	0.2	2.4×10^{-4}
0.2	0.3	7.2×10^{-4}

What conclusion can be drawn about the reaction?

- **A** The reaction is overall 1st order.
- **B** The units for rate constant mol dm⁻³ s⁻¹.
- **C** The value of the rate constant is 0.024.
- **D** The reaction proceeds via the $S_N 2$ mechanism.
- **10** ¹⁴C (half-life of 5500 years) is used in the carbon dating of some archaeological artefacts. A wooden artefact is analysed and its ¹⁴C content is measured to be 8 % of the typical initial amount of ¹⁴C in trees. What is the age of this wooden artefact?

Α	16500 years	В	17900 years
С	20000 vears	D	22000 vears

At a total pressure of 1 atm and 20 °C, \mathbf{x} % of dinitrogen tetraoxide is dissociated according to the following equation:

$$N_2O_4 \rightleftharpoons 2NO$$

If the value of K_{ρ} is $\frac{1}{24}$ atm, what is the value of **x**?

Α	10	В	20	С	30	D	40
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- **12** Glycine, or aminoethanoic acid, is dissolved in a buffer solution of pH 9.0. Which one of the following shows the structures of the two main forms of glycine at this pH?
 - **A** $^{+}NH_{3}CH_{2}COOH$ and $NH_{2}CH_{2}COOH$
 - **B** ⁺NH₃CH₂COOH and NH₂CH₂COO⁻
 - **C** $^{+}NH_{3}CH_{2}COO^{-}$ and $NH_{2}CH_{2}COO^{-}$
 - **D** NH₂CH₂COOH and NH₂CH₂COO⁻
- **13** In which of the following series does the value of pK_a decrease?
 - $\mathbf{A} \quad CH_3CO_2H \quad > CCl_3CO_2H \quad > C_2H_5OH \quad > C_6H_5OH$
 - $\mathbf{B} \quad \mathbf{C}\mathbf{C}l_3\mathbf{C}\mathbf{O}_2\mathbf{H} > \mathbf{C}\mathbf{H}_3\mathbf{C}\mathbf{O}_2\mathbf{H} > \mathbf{C}_6\mathbf{H}_5\mathbf{O}\mathbf{H} > \mathbf{C}_2\mathbf{H}_5\mathbf{O}\mathbf{H}$
 - $\textbf{C} \quad C_6H_5OH \quad > C_2H_5OH \quad > CH_3CO_2H \ > \ CCl_3CO_2H$
 - $\textbf{D} \quad C_2H_5OH \quad > C_6H_5OH \quad > CH_3CO_2H \ > \ CCl_3CO_2H$
- **14** Calcium phosphate is a sparingly soluble salt. Given that the solubility product of calcium phosphate is **s**, what is the concentration of calcium ions?

Α	$\left(\frac{9s}{4}\right)^{\frac{1}{5}}$	$\mathbf{B} \left(\frac{s}{108}\right)^{\frac{1}{5}}$	$\mathbf{C} \qquad \left(\frac{8s}{27}\right)^{\frac{1}{5}}$	$\mathbf{D} = \left(\frac{s}{4}\right)^{\frac{1}{5}}$
		(100)	(=/)	

- 15 Which of the following is true for the Group II element, strontium, or its compounds?
 - **A** Strontium does not react with steam.
 - **B** Strontium oxide reacts with both acids and bases.
 - **C** Strontium chloride dissolves in water to give a weakly acidic solution.
 - **D** Strontium carbonate decomposes at a higher temperature than calcium carbonate.

16 The following graph shows the second ionisation energy of eight consecutive elements.



Atomic number

Element **J** belongs to Period 3 of the Periodic Table. It has a high electrical conductivity and its chloride has a simple molecular structure.

With reference to the graph above, which of the options **A**, **B**, **C** or **D**, corresponds to the second ionisation energy of element J?

17 Chlorine gas was bubbled into a beaker of cold potassium hydroxide solution. Three portions of the resultant mixture were pipetted into 2 conical flasks labelled **P** and **Q**.

The conical flask **P** and **Q** were left in an ice bath and a hot water bath respectively for 10 minutes before excess silver nitrate solution was added. The precipitate formed from each resultant mixture was isolated, dried and weighed.

Which of the following statements is incorrect regarding the above experiment?

- A The mass of precipitate obtained from resultant mixture in **Q** is five times of that from **P**.
- **B** Potassium chloride and potassium chlorate(V) are present in **Q** after 10 minutes.
- **C** When **Q** is left in the hot water bath, the oxidation number of chlorine changes from +1 to -1 and from +1 to +5.
- **D** Disproportionation occurred in conical flask **Q** when it was left in the hot water bath.

18 X_2 and Y_2 are either Br_2 or I_2 .

The table below shows the results of four experiments involving the addition of these halogens to separate aqueous solutions containing iron(II) or iron(III) in a test tube. The resultant mixtures were shaken with 2 cm³ of tetrachloromethane, allowed to settle into two layers.

Experiment	Reactants	Colour of CCl ₄ layer
1	$X_2(aq) + Fe^{2+}(aq)$	Colourless
2	$Y_2(aq) + Fe^{2+}(aq)$?
3	$X_2(aq) + Fe^{3+}(aq)$?

The following table shows part of the observations.

Which of the following set of observations is correct?

		Colour of aqueous layer	Colour of CCl ₄ layer
Α	Experiment 2	Colourless	Purple
В	Experiment 2	Pale green	Reddish brown
С	Experiment 3	Yellow	Purple
D	Experiment 3	Pale green	Reddish brown

19 A reaction scheme starting from aqueous copper(II) sulfate solution is shown below.Both J and K are copper-containing species.

$$CuSO_{4}(aq) \xrightarrow{NH_{3}(aq)} J \xrightarrow{excess NH_{3}(aq)} K \xrightarrow{K_{4}EDTA(aq)} [Cu(EDTA)]^{2}(aq)$$

Which of the following statements is correct?

- **A** NH_3 is a ligand in reaction **I**.
- **B** Reaction **II** is a redox reaction.
- **C K** is a deep blue solution containing $[Cu(NH_3)_4(H_2O)_2]SO_4$.
- **D** The entropy of the system decreases when reaction **III** occurs.

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20 Covalent bonds are formed by orbital overlap. The shape of unsaturated hydrocarbon molecules can be explained by hybridisation of orbitals.

Which bond is **not** present in (CH₃)₂C=CHC=CH?

- **A** A π bond formed by 2p-2p overlap
- **B** A σ bond formed by 1s-2sp overlap
- **C** A σ bond formed by $2sp^2-2sp^3$ overlap
- **D** A σ bond formed by 2sp-2sp³ overlap
- **21** Which of the following is the least likely product formed in the termination step of the reaction of CH_3CH_3 with Cl_2 in the presence of UV light?
 - **A** HCl **B** CH_3CHCl_2
 - **C** CH_2ClCH_2Cl **D** $CH_3CH_2CH_2CH_3$
- **22** During the nitration of benzene, a nitro group is substituted at a carbon atom. Which of the following gives the arrangement of bonds at this carbon atom during the reaction?

	At the start of reaction	In the intermediate	At the end of reaction
Α	Tetrahedral	Trigonal planar	Tetrahedral
В	Trigonal planar	Tetrahedral	Trigonal planar
С	Tetrahedral	Tetrahedral	Trigonal planar
D	Trigonal planar	Trigonal planar	Tetrahedral

- 23 Which of the following shows compounds arranged in increasing ease of hydrolysis?
 - A chloroethane, chlorobenzene, ethanoyl chloride
 - B ethanoyl chloride, chloroethane, chlorobenzene
 - C chlorobenzene, ethanoyl chloride, chloroethane
 - D chlorobenzene, chloroethane, ethanoyl chloride

24 Benzocaine and menthol are local anesthetics used in sunburn ointments and skin lotions.



Which of the following reagents and conditions can be used to distinguish between the two compounds?

- A Neutral FeCl₃
- **B** Aqueous Br₂
- **C** 2,4-dinitrophenylhydrazine
- **D** Acidified potassium manganate(VII)
- **25** A sample of ethene was added to a solution of $Br_2(aq)$ and NaCl(aq). Which of the following products is **not** likely to be found in the reaction mixture?
 - **A** $CH_2(OH)CH_2Cl$ **B** CH_2BrCH_2Cl
 - **C** $CH_2(OH)CH_2Br$ **D** CH_2BrCH_2Br

26 Compound **X**, C_4H_9Br , undergoes the following reactions:

 $\begin{array}{ccc} C_4H_9Br & \xrightarrow{\text{NaOH (aq)}} & C_4H_{10}O & \xrightarrow{\text{Cr}_2O_7^{2^-}, \text{ H}^+(aq)} & C_4H_8O \text{ only} \\ \textbf{X} & & & \\ \end{array}$

What is **X** likely to be?

- A 1-bromobutane B 2-bromobutane
- C 1-bromo-2-methylpropane D 2-bromo-2-methylpropane
- 27 In the catalytic hydrogenation of CH2=CHCH2CN using platinum, the volume of hydrogen in dm3 (measured at s.t.p.) that reacts with 1 mole of the compound could be

28 In the presence of a dilute alkali, some aldehydes and ketones undergo the "aldo reaction" where they dimerise to form a hydroxycarbonyl compound (an aldo).

For example, ethanal dimerises in this way to form 3-hydroxybutanal.



Which of the following carbonyl compounds will undergo the aldo reaction to produce the aldol shown below?



- A CH_3COCH_3 B $(CH_3)_2CHCHO$ C CH_3CH_2CHO D $CH_3CH_2COCH_3$
- **29** How many alkenes (both structural isomers and stereoisomers) can be obtained from the molecular formula C_5H_{10} ?
 - **A** 4 **B** 5 **C** 6 **D** 7
- 30 The drug cortisone has the structure as shown below:



What is the total number of stereoisomers present in a cortisone molecule?

A 16 **B** 32 **C** 64 **D** 128

10

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.

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

A	В	С	D
1, 2 and 3 are	1 and 2 only are	2 and 3 only are	1 only is
correct	correct	correct	correct

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

- **31** Which of the following contains one mole of the stated particles?
 - 1 H^+ ions in 1 dm³ of 0.5 mol dm^{#3} H₂SO₄.
 - **2** Carbon atoms in 11.2 dm³ of ethane gas at s.t.p.
 - **3** Aqueous chloride ions in a solution containing 0.50 mol of the compound $[Pt(NH_3)_4Cl_2]Cl_2$.
- **32** The following graph was obtained for N_2 and gas **G**.



Which of following can apply to gas G?

- 1 CO₂ at 500 K
- 2 N₂ at 250 K
- 3 NH₃ at 500 K

Α	В	С	D
1, 2 and 3 are	1 and 2 only are	2 and 3 only are	1 only is
correct	correct	correct	correct

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

- 33 Which of the following statement(s) is/are true for a galvanic cell set up represented by: Fe|Fe²⁺||Cu²⁺|Cu?
 - 1 The E_{cell} of this set up is equal to +0.78 V.
 - **2** Addition of NaOH(aq) to the Cu^{2+} half-cell will result in less positive E_{cell} value.
 - **3** Addition of excess $NH_3(aq)$ to the Cu^{2+} half-cell will result in less positive E_{cell} value.
- 34 When NO(g), NO₂(g) and O₂(g) is mixed at high pressure, N₂O₅(g) is produced. This reaction is known to be first order with respect to NO(g) and first order with respect to NO₂(g).

Which of the following suggested reaction mechanism is consistent with the observation made?

1	$NO + NO_2 \rightarrow N_2O_3$	(Slow)
	$N_2O_3 + O_2 \rightarrow N_2O_5$	(Fast)
2	$NO + \frac{1}{2}O_2 \rightarrow NO_3$	(Fast)
	$NO_3 \textbf{+} NO_2 \rightarrow N_2O_5$	(Slow)

 $\begin{array}{lll} \textbf{3} & 2\text{NO} + \text{O}_2 \rightarrow \text{N}_2\text{O}_4 & (\text{Fast}) \\ & & \text{N}_2\text{O}_4 + \text{NO}_2 \rightarrow \text{N}_2\text{O}_5 + \text{NO} & (\text{Slow}) \end{array}$

Α	В	С	D
1, 2 and 3 are	1 and 2 only are	2 and 3 only are	1 only is
correct	correct	correct	correct

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

35 The following table shows the pH of different solutions:

	рН
0.001 mol dm ⁻³ nitric acid	3.00
1.0 mol dm ^{-3} ethanoic acid	2.37
0.02 mol dm ⁻³ sulfuric acid	x

Which of the following statement(s) is/are true?

- 1 The value of **x** is around 1.40.
- **2** The numerical value of K_a of ethanoic acid is $1.8 \times 10^{\#5}$.
- **3** Ethanoic acid is a stronger acid than nitric acid since the pH value is lower.
- **36** The electronic configuration of a transition element **T** is shown.

 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

Which of the following species of T is likely to be formed?

- 1 TO
- **2 T**₂O₃
- **3** $T_2O_7^{2-}$

Α	В	С	D
1, 2 and 3 are	1 and 2 only are	2 and 3 only are	1 only is
correct	correct	correct	correct

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

37 Warfarin is an anticoagulant medication that helps to prevent blood from clotting.



Which of the following statement(s) about Warfarin is/are false?

- 1 It has 4 stereoisomers.
- 2 It is resistant to hydrolysis in acidic medium.
- 3 It gives a pale yellow precipitate when warmed with aqueous alkaline iodine.
- **38** Aureomycin is a powerful antibiotic.



Which of the following will react completely with 1 mole of Aureomycin?

- **1** 3 moles of Br₂(aq)
- 2 3 moles of HCl
- 3 5 moles of PCl₅

A	В	С	D
1, 2 and 3 are	1 and 2 only are	2 and 3 only are	1 only is
correct	correct	correct	correct

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

- **39** Which of the following liberates a gas that gives a white precipitate with aqueous calcium hydroxide when heated with acidified potassium manganate(VII)?
 - 1 Propene
 - 2 Methanoic acid
 - 3 Ethylbenzene
- **40** Which of the following is/are non-polar?



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