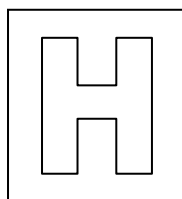


Candidate Name: _____

Class Adm No

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2014 Promotional Examination II Pre-University 2

H1 CHEMISTRY

8872 / 01

Paper 1 Multiple Choice

Tuesday, 23 Sept 2014

50 minutes

Additional Materials: Multiple Choice Answer Sheet
 Data Booklet

READ THESE INSTRUCTIONS FIRST

Do not turn over this question paper until you are told to do so.

Write in soft pencil.

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

Write your name, class and admission number in the spaces provided at the top of this page and on the Multiple Choice Answer Sheet provided.

There are **30** questions in 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 Multiple Choice Answer Sheet provided.

No extra time will be given for shading.

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.

FOR EXAMINER'S USE	
TOTAL (30 marks)	

This question paper consists of 11 printed pages and 1 blank page.

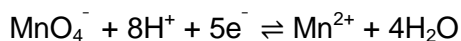
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Section A

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 have the same number of atoms as 16.0 g of oxygen gas?
- A** 2.0 g of hydrogen gas
- B** 10.1 g of neon
- C** 24.0 g of carbon
- D** 28.1 g of silicon
- 2 The metallic ion, M^{x+} , is oxidised to MO_3^- by acidified $KMnO_4$ solution. A sample of 25.0 cm³ of 0.200 mol dm⁻³ aqueous M^{x+} requires 20.00 cm³ of 0.100 mol dm⁻³ acidified $KMnO_4$ solution for complete reaction. What is the value of x in M^{x+} ?



- A** 1
- B** 2
- C** 3
- D** 4
- 3 How many 3d electrons are present in the ground state of iron as an atom and as a 3+ ion?

	${}_{26}Fe$	${}_{26}Fe^{3+}$
A	6	5
B	6	3
C	8	5
D	8	3

- 4 Under the same conditions, which of the following ions would be deflected in an electric field to the same extent as ${}^{12}C^+$?
- A** ${}^6Li^+$
- B** ${}^{13}C^+$
- C** ${}^{24}Mg^{2+}$
- D** ${}^{36}Cl^+$

- 5 Which of the following species contains only covalent and dative bonding within itself?
- A Al_2O_3
- B H_3O^+
- C H_2SO_4
- D $(NH_4)_2SO_4$

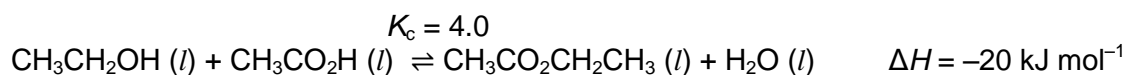
- 6 The enthalpy changes of vapourisation of ammonia and water are shown in the table below.

Compound	Enthalpy change of vapourisation /kJ mol ⁻¹
NH ₃	+21.7
H ₂ O	+43.9

Which statement explains the difference in enthalpy change of vapourisation between ammonia and water?

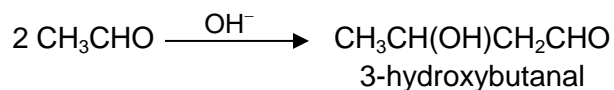
- A Covalent bond in water is stronger than that in ammonia.
- B Hydrogen bonding between water molecules is stronger than that in ammonia.
- C The temporary dipole-induced dipole forces of attraction in water are stronger than that in ammonia.
- D Water is a liquid whereas ammonia is a gas at room temperature.
- 7 Which of the following reactions shows standard enthalpy change of formation of sodium chloride?
- A $Na^+(aq) + Cl^-(aq) \rightarrow NaCl(aq)$
- B $Na^+(g) + Cl^-(g) \rightarrow NaCl(s)$
- C $Na(s) + \frac{1}{2}Cl_2(g) \rightarrow NaCl(s)$
- D $Na(s) + Cl(g) \rightarrow NaCl(s)$
- 8 In an experiment, 100 cm³ of water at 20°C was brought to boiling point by burning propane in excess of oxygen. Given that the enthalpy change of combustion of propane is -2220 kJ mol⁻¹, calculate the mass of propane needed if this process is only 80% efficient.
- Assume that the specific heat capacity of water is 4.2 J K⁻¹ cm⁻³.
- A 0.533 g
- B 0.666 g
- C 0.832 g
- D 1.20 g

- 9 Which of the following has an exothermic enthalpy change?
- A $\text{Ca(g)} \rightarrow \text{Ca}^{2+}(\text{g}) + 2\text{e}^{-}$
- B $\text{CaO(s)} \rightarrow \text{Ca}^{2+}(\text{g}) + \text{O}^{2-}(\text{g})$
- C $\text{O}^{-}(\text{g}) \rightarrow \text{O(g)} + \text{e}^{-}$
- D $2\text{O(g)} \rightarrow \text{O}_2(\text{g})$
- 10 What is the pH of a solution prepared by dissolving 2.0 g of H_2SO_4 in 500 cm^3 of water?
- A 1.1
- B 1.4
- C 1.7
- D 12.6
- 11 Ethyl ethanoate is a common ester formed during production of wines. It gives the aroma found in younger wines and contributes towards the “fruitiness” perception in wine. The formation of ester in wine can be illustrated by the following equation.



- Which of the following statements is correct about the above equilibrium?
- A As temperature of the wine increases, $[\text{CH}_3\text{CO}_2\text{CH}_2\text{CH}_3]$ decreases and K_c increases.
- B As temperature of the wine decreases, $[\text{CH}_3\text{CO}_2\text{CH}_2\text{CH}_3]$ and K_c both increases.
- C As water is removed from wine, $[\text{CH}_3\text{CO}_2\text{CH}_2\text{CH}_3]$ and K_c both increases.
- D As water is added to the wine, $[\text{CH}_3\text{CO}_2\text{CH}_2\text{CH}_3]$ increases.
- 12 Which of the following statements about the rate constant, k , of chemical reactions is true?
- A All rate constants have the same units.
- B The rate constant decreases when the temperature is increased.
- C The rate constant increases when a catalyst is added.
- D The rate constant increases when the concentrations of reactants are increased.

- 13** Under the influence of a dilute base or acid, two molecules of an aldehyde or a ketone may combine in a process known as Aldol reaction. An example of an Aldol reaction between ethanal molecules in dilute alkaline solution is shown below.



A chemist studied the kinetics of the above reaction at 298 K and obtained the following table of results.

Experiment number	initial $[\text{CH}_3\text{CHO}]$ / mol dm^{-3}	initial $[\text{OH}^-]$ / mol dm^{-3}	initial rate / $\text{mol dm}^{-3} \text{s}^{-1}$
1	0.10	0.10	0.0110
2	0.10	0.15	0.0165
3	0.30	0.10	0.0330
4	0.30	a	0.0990

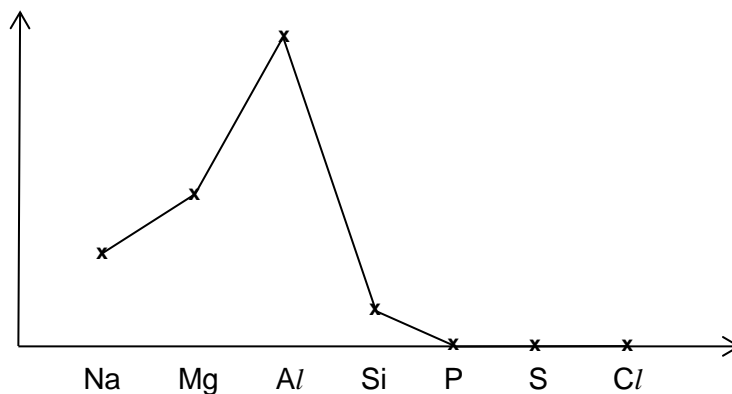
Which of the following statements regarding the above system is incorrect?

- A** Rate equation for the reaction is $\text{rate} = k[\text{CH}_3\text{CHO}][\text{OH}^-]$.
B The unit of the rate constant is s^{-1} .
C The overall order of the reaction is two.
D The value of **a** is 0.30.

- 14** Which sequence of ions is in order of increasing radius?

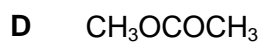
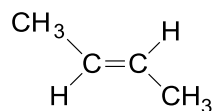
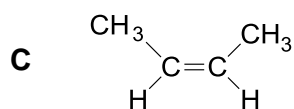
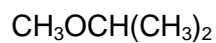
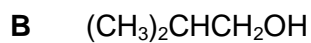
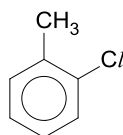
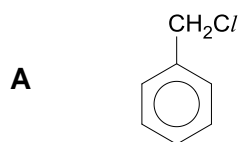
- A** $\text{Ca}^{2+} < \text{K}^+ < \text{Cl}^- < \text{S}^{2-} < \text{P}^{3-}$
B $\text{Ca}^{2+} < \text{K}^+ < \text{P}^{3-} < \text{S}^{2-} < \text{Cl}^-$
C $\text{K}^+ < \text{Ca}^{2+} < \text{Cl}^- < \text{S}^{2-} < \text{P}^{3-}$
D $\text{P}^{3-} < \text{S}^{2-} < \text{Cl}^- < \text{K}^+ < \text{Ca}^{2+}$

- 15 The graph shows how a property of the elements Na to Cl varies across the period.

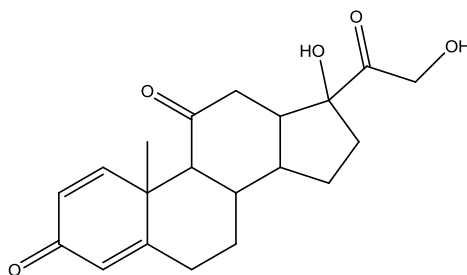


What is this property?

- A** Electrical conductivity
B Electronegativity
C Ionic radius
D Melting point
- 16 Which of the following pairs of molecules are **not** isomers?



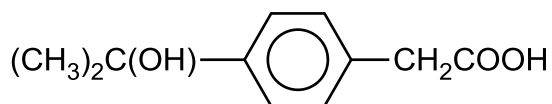
- 17 Prednisone is an immune suppressant used to prevent rejection after organ transplants. The structure of prednisone is shown below.



Prednisone

Which functional group is **not** found in the molecule?

- A Alkene
 - B Carboxylic acid
 - C Ketone
 - D Tertiary alcohol
- 18 One mole of the organic compound with the structure below is reacted with excess sodium metal.



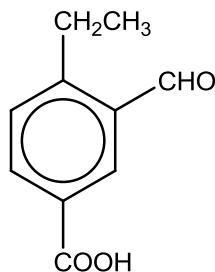
The products of the reaction are

- A $(\text{CH}_3)_2\text{C}(\text{OH})-\text{C}_6\text{H}_4-\text{CH}_2\text{COO}^-\text{Na}^+$ and $\frac{1}{2}$ mol of H_2 gas.
- B $(\text{CH}_3)_2\text{C}(\text{OH})-\text{C}_6\text{H}_4-\text{CH}_2\text{COO}^-\text{Na}^+$ and 1 mol of H_2 gas.
- C $(\text{CH}_3)_2\text{C}(\text{O}^-\text{Na}^+)-\text{C}_6\text{H}_4-\text{CH}_2\text{COO}^-\text{Na}^+$ and $\frac{1}{2}$ mol of H_2 gas.
- D $(\text{CH}_3)_2\text{C}(\text{O}^-\text{Na}^+)-\text{C}_6\text{H}_4-\text{CH}_2\text{COO}^-\text{Na}^+$ and 1 mol of H_2 gas.

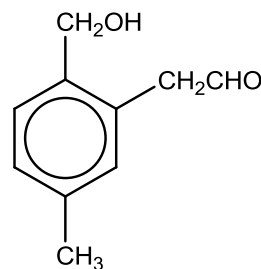
19 Which sequence shows the correct order of increasing ease of hydrolysis?

- A $\text{CH}_3\text{CH}_2\text{Cl} < \text{CH}_3\text{CH}_2\text{Br} < \text{C}_6\text{H}_5\text{I}$
 B $\text{C}_6\text{H}_5\text{I} < \text{C}_6\text{H}_5\text{Br} < \text{C}_6\text{H}_5\text{CH}_2\text{Cl}$
 C $\text{C}_6\text{H}_5\text{Br} < \text{C}_6\text{H}_5\text{I} < \text{C}_6\text{H}_5\text{CH}_2\text{Cl}$
 D $\text{C}_6\text{H}_5\text{Br} < \text{C}_6\text{H}_5\text{CH}_2\text{I} < \text{C}_6\text{H}_5\text{I}$

20 Which of the following reagents can be used to distinguish between compounds **P** and **Q** shown below?



Compound **P**



Compound **Q**

- A 2,4-dinitrophenylhydrazine
 B Hot acidified KMnO_4
 C Na_2CO_3
 D Tollens' reagent

21 Compound **S** gives the following observations when it reacts with the reagents stated.

- Forms a yellow precipitate with alkaline aqueous iodine
- Is oxidised by acidified KMnO_4 to a carboxylic acid
- Does not react with PCl_5

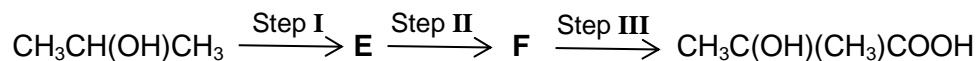
Compound **S** could be

- A $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$
 B $\text{CH}_3\text{CH}_2\text{CHO}$
 C CH_3COCH_3
 D $\text{C}_6\text{H}_5\text{CH}_2\text{COCH}_3$

22 What is the type of reaction undergone when bromoethane reacts with hot aqueous sodium hydroxide?

- A addition
 B elimination
 C oxidation
 D substitution

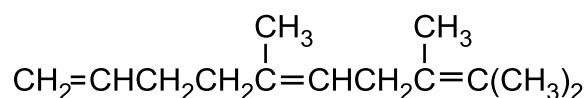
- 23 Propan-2-ol, $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$, was reacted in a three-step reaction as shown below.



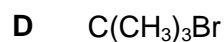
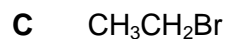
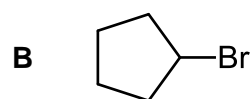
Which of the following sets gives correct reagents and conditions for Steps I, II and III?

	Step I	Step II	Step III
A	ethanolic KCN, heat	aqueous NaOH, heat	dilute H_2SO_4 , heat
B	ethanolic KCN, heat	dilute H_2SO_4 , heat	$\text{K}_2\text{Cr}_2\text{O}_7$, H_2SO_4 , heat
C	$\text{K}_2\text{Cr}_2\text{O}_7$, H_2SO_4 , heat	ethanolic KCN, heat	dilute H_2SO_4 , heat
D	$\text{K}_2\text{Cr}_2\text{O}_7$, H_2SO_4 , heat	HCN, NaCN, 10-20 °C	dilute H_2SO_4 , heat

- 24 How many cis-trans isomers would be possible for the following molecule?



- A 2
 B 4
 C 6
 D 8
- 25 Which of the following compounds would not undergo an elimination reaction when treated with hot ethanolic sodium hydroxide?



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 helpful 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.

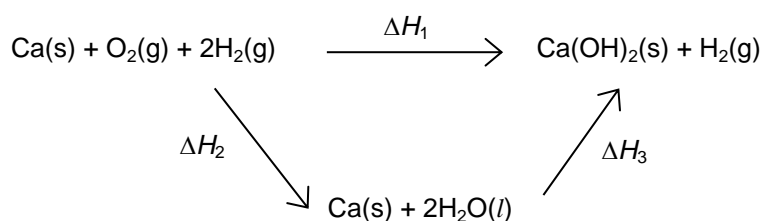
- 26** Complete combustion of a sample of a hydrocarbon, **Y**, gave 0.66 g of carbon dioxide and 0.36 g of water. Which of the following samples can **Y** be?

- 1** C_3H_8
- 2** C_3H_4
- 3** C_6H_8

- 27** Which of the following particles have the same shape?

- 1** BeF_2
- 2** BrF_2^-
- 3** SCl_2

- 28** The diagram below shows an energy cycle involving calcium.



Which of the following statements are true?

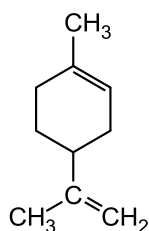
- 1** ΔH_1 is equal to the enthalpy change of formation of $\text{Ca(OH)}_2\text{(s)}$.
- 2** ΔH_2 is equal to two times the enthalpy change of combustion of $\text{H}_2\text{(g)}$.
- 3** $\Delta H_2 = \Delta H_1 + \Delta H_3$

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.

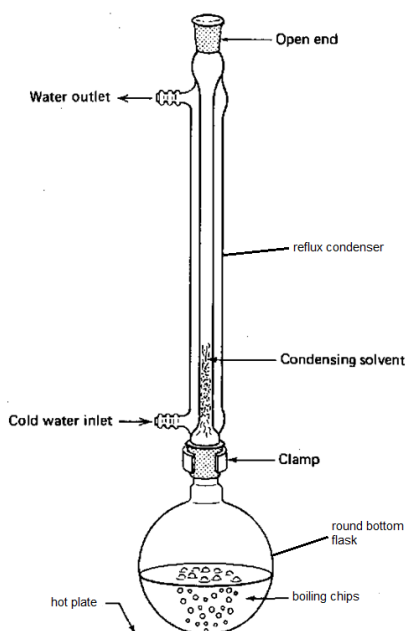
- 29** Limonene is an essential oil which gives an orange fragrance. Its structure is shown below.



Limonene

Which of the following are **not** true regarding limonene?

- 1** Limonene can be oxidised by acidified potassium dichromate(VI).
 - 2** Limonene exhibits geometrical isomerism.
 - 3** Limonene is soluble in water.
- 30** The diagram below shows a set of apparatus for the reaction between a compound **X** and an acidic solution of potassium dichromate(VI).



If the colour of the solution changes from orange to green, compound **X** could be

- 1** benzoic acid
- 2** phenyl methanol
- 3** propanal

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