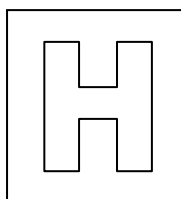


Candidate Name: _____

Class Adm No

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2017 Preliminary Examination II

Pre-University 2

H1 CHEMISTRY

8872/01

Paper 1 Multiple Choice

19th Sep 2017

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, glue or correction fluid.

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 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 Multiple Choice Answer Sheet provided.

Read the instructions on the Multiple Choice 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 question paper.

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

FOR EXAMINER'S USE	
TOTAL (30 marks)	

Section A

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

- 1 A sample of a rare ore containing iron and molybdenum was investigated. The composition of the sample is given in the table below.

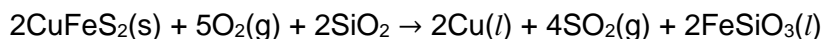
mass number	55	56	95	96
% abundance	5	54	36	5

What is the A_r of Fe in this sample of Elinvar?

- A** 55.8 **B** 55.9 **C** 72.0 **D** 75.5
- 2 Perfluoroacetic acid is a structural analogue of ethanoic acid and is a stronger acid than ethanoic acid. The percentage composition by mass of perfluoroacetic acid is given as: C, 21.1%; H, 0.90%; O, 28.1%; F, 49.9%.

What is the empirical formula of perfluoroacetic acid?

- A** CHOF_2
B $\text{C}_2\text{H}_2\text{OF}$
C $\text{C}_2\text{HO}_2\text{F}_2$
D $\text{C}_2\text{HO}_2\text{F}_3$
- 3 Chalcopyrite is a common copper ore with the chemical formula CuFeS_2 . Copper can be extracted from chalcopyrite through the roasting of the ore and undergoes the following reaction.



What is the mass of chalcopyrite needed to produce 10 g of Cu?

- A** 28.9
B 51.6
C 57.8
D 103

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

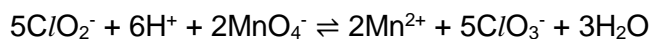
Chloride ions can be oxidised to hypochlorous acid as shown below.



If 2 moles of acidified MnO_4^- were reacted with 1 mole of Cl^- ions, how many moles of hypochlorous acid would be obtained?

- A 1
- B 2
- C 5
- D 10

- 5 What is the change in oxidation number of chlorine and manganese in the following reaction?



	Chlorine	manganese
A	0	+3
B	+1	-5
C	+2	-5
D	+2	+3

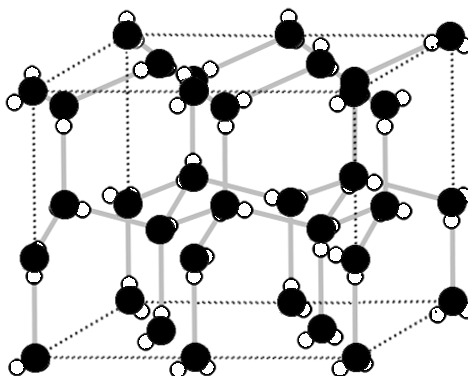
- 6 The first six ionisation energies of an element, **A**, in kJ mol^{-1} are given below.

947 1798 2735 4837 6043 12310

A forms an oxide. What is the empirical formula of the oxide?

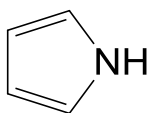
- A AO
- B A_2O
- C AO_2
- D A_2O_3

- 7 The diagram below shows the structure of ice.



Which of the following statements about ice is correct?

- A The bond angle about oxygen atom is 109.5° .
 - B There are strong covalent bonds between water molecules.
 - C A sample of ice occupies a smaller volume than a sample of water with the same mass.
 - D Ice has a giant covalent lattice.
- 8 Recycling metals are important to many countries. Which of the following statements does **not** explain why recycling is important?
- A It is energy intensive to extract metals from its ore.
 - B Natural resources are used up during the extraction of metals.
 - C It is expensive to dispose of waste produced in the extraction process.
 - D Recycling increases the consumption of non-renewable resources.
- 9 What is the number of sigma (σ) and pi (π) bonds in this molecule?



pyrrole

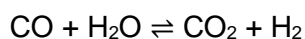
- | | σ | π |
|---|----------|-------|
| A | 9 | 2 |
| B | 9 | 3 |
| C | 10 | 2 |
| D | 10 | 3 |

10 Which of the following compounds has the least exothermic lattice energy?

- A barium oxide
- B barium sulfide
- C magnesium oxide
- D magnesium sulfide

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

The water-gas shift reaction is used industrially to obtain hydrogen and is shown below.

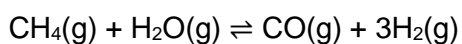


The $\text{C}\equiv\text{O}$ bond enthalpy is 1076 kJ mol^{-1} .

What is the enthalpy change for the reaction?

- A $+80 \text{ kJ mol}^{-1}$
- B -80 kJ mol^{-1}
- C $+360 \text{ kJ mol}^{-1}$
- D -360 kJ mol^{-1}

12 Methane and steam undergo a reaction as shown below.



A mixture containing 4 moles of gas with methane and steam in 1:1 ratio is injected into a 5 dm^3 vessel. After some time, 1 mole of water is left.

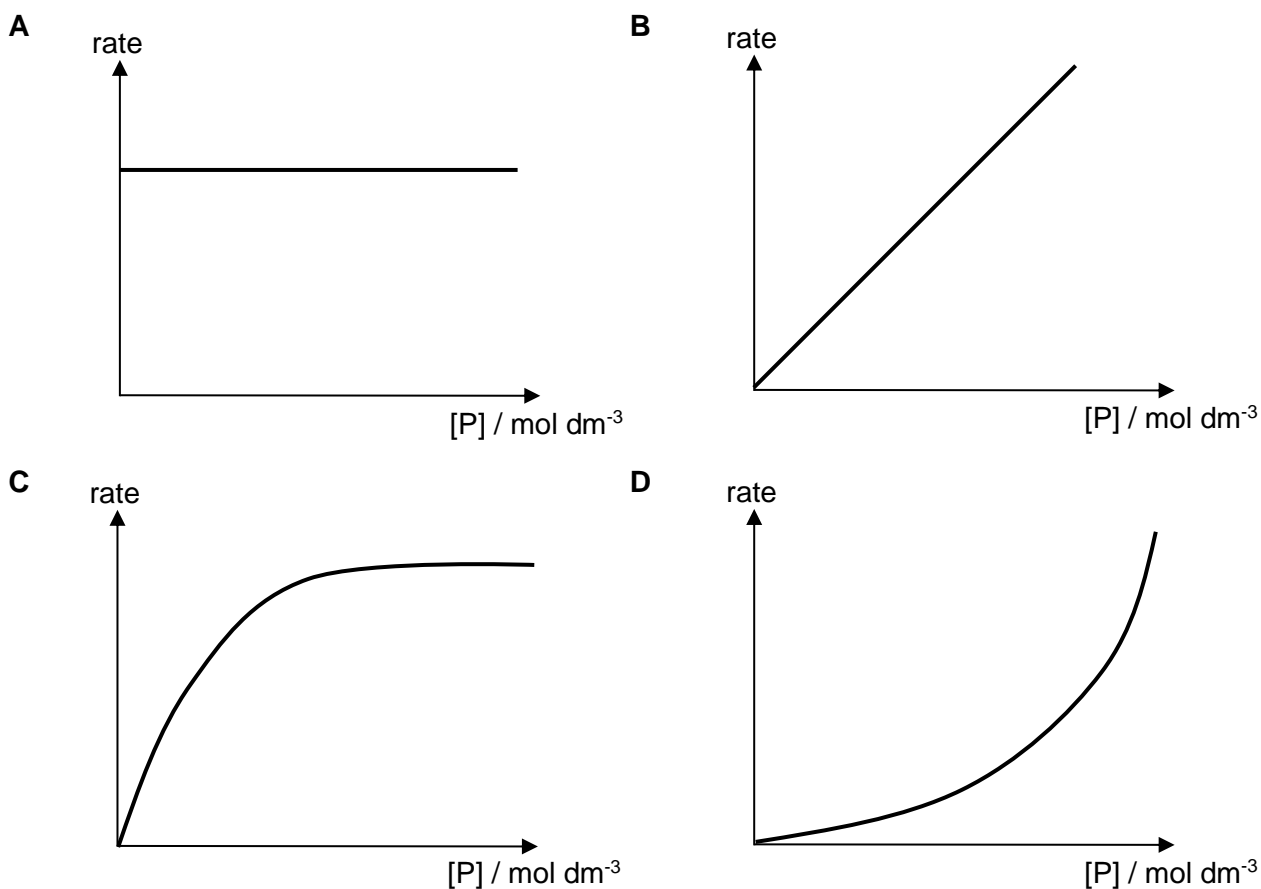
What is the numerical value of the equilibrium constant, K_c , for the reaction?

- A 27
- B 9
- C 1.08
- D 0.04

- 13 A reaction between **P** and **Q** is investigated and the following experimental results were obtained.

experiment	initial concentration of P / mol dm ⁻³	initial concentration of Q / mol dm ⁻³	initial rate / mol dm ⁻³ s ⁻¹
1	0.5	1.0	0.005
2	0.5	4.0	0.020
3	1.0	4.0	0.020

Which of the following correctly depicts the rate-concentration graph for the reaction?



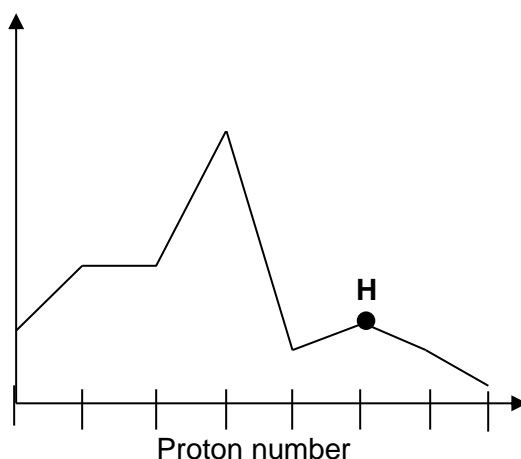
- 14 The decomposition of azomethane with time has the following rate equation. It takes 2000 s for 10 mol of azomethane to decay to 0.625 mol.

$$\text{rate} = k[\text{azomethane}]$$

What is the half-life for the decomposition of azomethane?

- A** 250 s **B** 500 s **C** 1000 s **D** 2000 s

- 15 The graph below shows a trend in the variation of a physical property of Period 3 elements.



Which of the following best describes the oxide of the element labelled **H**?

- A It is amphoteric.
 - B It is an ionic compound with covalent character.
 - C It exists as discrete molecules.
 - D It turns universal indicator blue when dissolved in water.
- 16 The ionic radii of Period 3 metals decreases across the period.

Which of the following best explains this observation?

- A More electrons are lost from the parent atom.
 - B There is less electronic shielding across the period.
 - C They are isoelectronic.
 - D The effective nuclear charge increases.
- 17 Element **J** is in Period 3 of the Periodic Table. It has a melting point of 660 °C and conducts electricity in the liquid state. The chloride of **J** is able to react with ammonia in a 1:1 ratio.

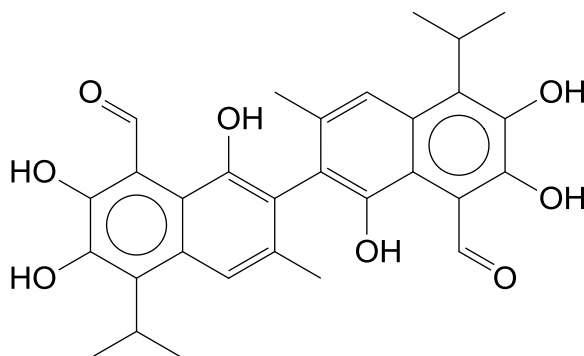
Which of the following correctly describes the structure of the chloride of **J**?

- A Metallic
- B Simple covalent
- C Giant covalent
- D Ionic

18 Which one of the following pairs of compounds does **not** have the same empirical formula?

- A $\text{C}_6\text{H}_{12}\text{O}_6$, CH_3COOH
- B C_6H_{12} , C_3H_6
- C CHCl_3 , $\text{Cl}_3\text{CHCHCl}_3$
- D $\text{CH}_3\text{COOCH}_3$, $\text{C}_3\text{H}_5\text{OH}$

19 Gossypol is a pigment found in cotton plants and has the following structure.



Which statement about this compound is **not** true?

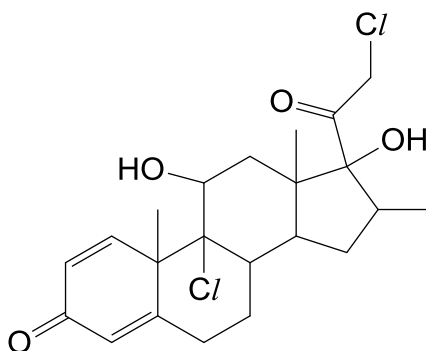
- A 1 mole of Gossypol will react with 2 moles of 2,4-dinitrophenylhydrazine.
- B 1 mole of Gossypol will react with 2 moles of Fehling's solution.
- C Gossypol will react with sodium metal.
- D Gossypol will react with aqueous bromine.

20 R-124, C_2HClF_4 , is a chlorofluorocarbon used as a refrigerant.

Which of the following statements is **not** true about R-124?

- A Hydrogen bonds are formed between its molecules.
- B It can deplete the ozone layer.
- C It does not have π bonds within the molecule.
- D The C–F bond requires a large amount of energy to break.

- 21 Mometasone is a corticosteroid that has functions similar to progesterone, an important hormone in the body.



Mometasone

Which of the following statements is **not** true about mometasone?

- A The molecular formula is $C_{22}H_{28}ClO_4$
 - B After treatment with $NaOH(aq)$, it reacts with $AgNO_3(aq)$ readily.
 - C It can undergo reduction when reacted with $LiAlH_4$.
 - D It can be oxidised by acidified $K_2Cr_2O_7(aq)$.
- 22 A sample of 2-chlorobutane is first treated with hot $NaOH(aq)$ and then with acidified $KMnO_4(aq)$.

What is the final organic product?

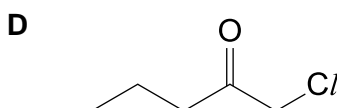
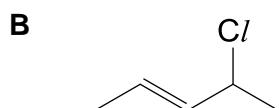
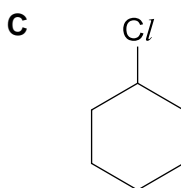
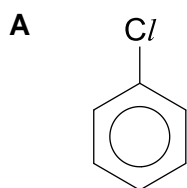
- A CH_3COOH
- B $CH_3CHCHCH_3$
- C $CH_3COCH_2CH_3$
- D $CH_3CH(COOH)CH_2CH_3$

- 23** Nitecapone is a drug that can be used to treat Parkinson's disease and has two carbonyl groups. It has the molecular formula of $C_{12}H_{11}NO_6$. When nitecapone reacts with HCN and trace amount of NaCN, a product is formed.

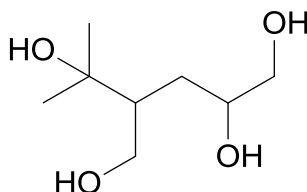
Which of the following is the molecular formula of the product?

- A** $C_{12}H_{11}N_2O_8$
B $C_{13}H_{11}N_2O_6$
C $C_{14}H_{12}N_2O_6$
D $C_{14}H_{13}N_3O_6$
- 24** Compound **X** is subjected to NaOH(aq) followed by aqueous silver nitrate at room temperature but white precipitate does not form.

What is the structure of **X**?



- 25** The compound below is heated with acidified potassium dichromate(VI) and forms an organic compound.



How many moles of sodium carbonate will react with 1 mole of the oxidised product?

- A** 0 **B** 1 **C** 1.5 **D** 2

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 Which of the following correctly define the relative molecular mass of a substance?

- 1** the mass of 1 mole of the substance compared to the mass of 1 mole of ^{12}C
- 2** the average mass of 1 mole of the substance compared to $\frac{1}{12}$ of the mass of 1 mole of ^{12}C atoms
- 3** the average mass of 1 molecule of the substance compared to $\frac{1}{12}$ of the mass of 1 atom of ^{12}C

27 Which of the following statements describe catalysts correctly?

- 1** Catalysts increase the number of molecules with energy more than activation energy.
- 2** Catalysts affect the rate constant.
- 3** At 40 °C, catalysts can increase the yield of a reaction.

28 Which of the following has a pH of 1?

- 1** 0.05 mol dm⁻³ of sulfuric acid
- 2** 0.10 mol dm⁻³ of nitric acid
- 3** 0.05 mol dm⁻³ of hydrochloric acid

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

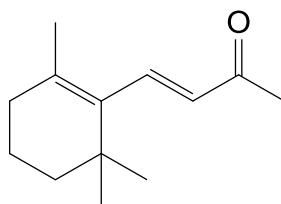
No other combination of statements is used as a correct response.

- 29** Element **G** is a Period 3 element and is a solid at room temperature and pressure. The oxide of **G** is soluble in water and forms a solution that turns blue litmus paper red.

Which of the following describes the chloride of **G** correctly?

- 1** It is a gas at room temperature.
- 2** It has a formula of **GCl₅**.
- 3** It hydrolyses in water to form an acidic solution.

- 30** β -ionone is a compound that is known to have the aroma of roses.



β -ionone

Which reagents will react with β -ionone?

- 1** alkaline aqueous iodide
- 2** 2,4-dinitrophenylhydrazine
- 3** potassium dichromate(VI)

END OF PAPER 1

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