JURONG JUNIOR COLLEGE
PRELIMINARY EXAMINATION 2008

H1 CHEMISTRY PAPER 1
8872 / 1

Friday 22 August 2008 50 minutes

INSTRUCTIONS TO CANDIDATES:

Do not open this question booklet until you are told to do so.

Write your name and class on the answer sheet in the spaces provided.

There are **30** 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.

INFORMATION FOR CANDIDATES:

Each correction answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A *Data Booklet* is provided.

This question booklet consists of 10 printed pages, including this page.

[Turn over]

SECTION A (25 MARKS)

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

1. How many atoms of carbon are present in 18 g of glucose $C_6H_{12}O_6$?

A 6.0×10^{22}

B 3.6×10^{23}

C 6.0×10^{23}

D 3.6×10^{24}

2. What is the minimum volume of **air** required for complete combustion of 10 cm^3 of a hydrocarbon, C_3H_4?

Assume that **air** contains one-fifth oxygen by volume and that both gases are measured at the same temperature and pressure.

A 40 cm^3

B 50 cm^3

C 200 cm^3

D 250 cm^3

3. Nitrogen dioxide reacts with iodide ions under acidic conditions according to the equation shown.

$$NO_2 + 2I^- + 2H^+ \rightarrow NO + I_2 + H_2O$$

How many moles of electrons are gained by one mole of nitrogen dioxide?

A 1

B 2

C 3

D 4

4. The electronic configurations of four elements are given.

Which of these elements has the lowest first ionisation energy?

A $1s^2\ 2s^2\ 2p^3$

B $1s^2\ 2s^2\ 2p^4$

C $1s^2\ 2s^2\ 2p^6\ 3s^2$

D $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$

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

The successive ionisation energies, in kJ mol^{-1}, of an element **X** are given below.

947 1798 2735 4837 6043 12310 13298

What could **X** be?

A $_{33}As$

B $_{40}Zr$

C $_{49}In$

D $_{52}Te$

6. Which of the following particles would, on losing an electron, have a half-filled set of p orbitals?

A C^- **B** N **C** N^- **D** O^+

7. Silicon carbide (carborundum) has a similar structure to diamond.

Silicon carbide can be used as

A a lubricant

B a tip for cutting tools

C an electrical conductor

D a substitute for pencil 'lead'

8. Which of the following molecules ***do not*** have all the atoms lying on the same plane?

A H_2O **B** PH_3 **C** $AlCl_3$ **D** ICl_3

9. Which of the following molecules will **not** form a hydrogen bond with another of its own molecules?

A CH_3CHO

B CH_3NH_2

C CH_3OH

D NH_3

10. Zinc is extracted from zinc sulphide by a process which begins with roasting of the sulphide ore in air.

$$2ZnS(s) + 3O_2(g) \rightarrow 2ZnO(s) + 2SO_2(g)$$

Given that ΔH_f^θ for ZnS(s) = –200 kJ mol^{-1}, ΔH_f^θ for ZnO(s) = –348 kJ mol^{-1}, and ΔH_f^θ for SO_2(g) = –297 kJ mol^{-1}, what is the ΔH^θ for this reaction?

A –445 kJ mol^{-1}

B –890 kJ mol^{-1}

C +890 kJ mol^{-1}

D –1690 kJ mol^{-1}

11. The enthalpy change for the neutralisation given below is –57 kJ mol^{-1}.

HC*l* (aq) + NaOH (aq) ⟶ NaC*l* (aq) + H_2O (*l*)

By using this information, predict a value for the enthalpy change given below.

CH_3COOH (aq) + NaOH (aq) ⟶ CH_3COONa (aq) + H_2O (*l*)

A – 55 kJ mol^{-1}

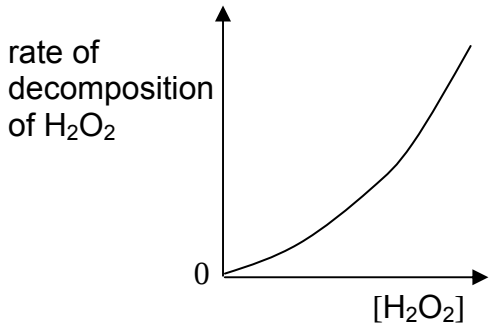
B – 57 kJ mol^{-1}

C – 114 kJ mol^{-1}

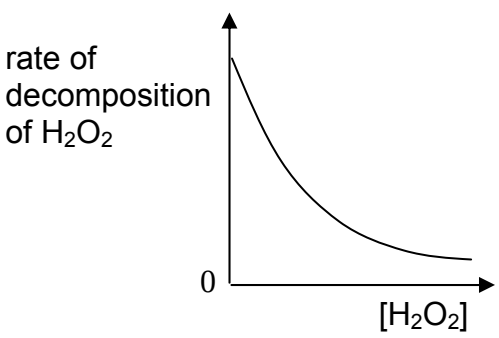
D – 120 kJ mol^{-1}

12. Which graph would confirm that the rate of decomposition of hydrogen peroxide is first order with respect to the concentration of hydrogen peroxide?

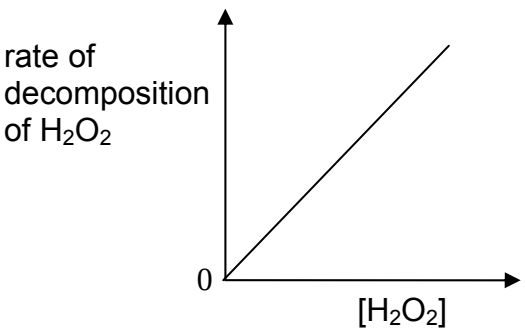
A



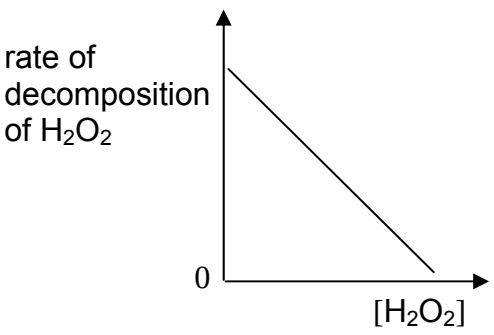
C



B



D



13. Which statement about the effect of a catalyst on a reversible reaction is correct?

A It increases the equilibrium constant for the forward reaction.

B It increases the yield of product in an equilibrium.

C It increases the rate constant for both the forward reaction and the reverse reaction.

D It increases the rate constant for the forward reaction but not that for the backward reaction.

14. An enzyme, found in stomach, operates at maximum efficiency when in an aqueous solution buffered at pH 5.

Which combination of substances when dissolved in 10 dm^3 of water, would give the necessary buffer solution?

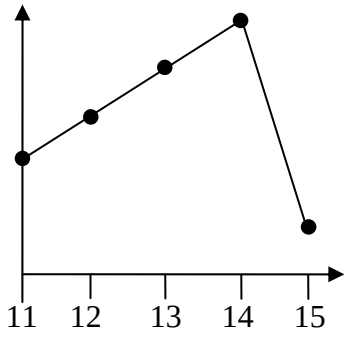
A 1 mol HC*l* and 1 mol of CH_3COOH

B 1 mol CH_3COOH and 1 mol of CH_3COONa

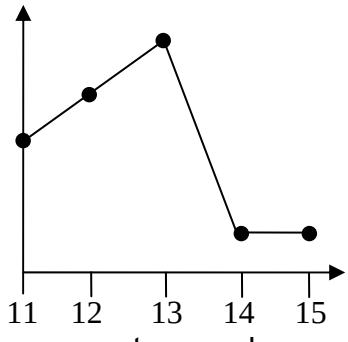
C 1 mol HC*l* and 1 mol of CH_3COONa

D 1 mol of CH_3COONH_4

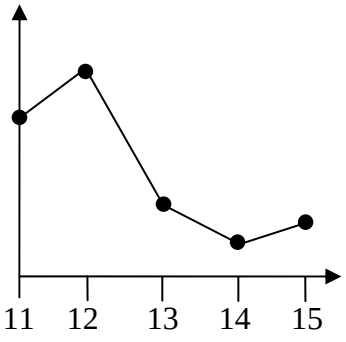
15. The following graphs show how three properties of the elements, Na to P, and their compounds, vary with proton number.



Graph 1



Graph 2



Graph 3

What properties are shown by the three graphs?

	Graph 1	Graph 2	Graph 3
A	Melting point of oxide	Melting point of chloride	Conductivity of element
B	Melting point of chloride	Melting point of element	Melting point of oxide
C	Melting point of oxide	Conductivity of element	Melting point of chloride
D	Melting point of element	Melting point of chloride	Conductivity of element

16. An element **V** forms an oxide of high melting point which is sparingly soluble in water. The chloride of **V** is a solid at room temperature, has high melting point and dissolves in water to from a weakly acidic solution of pH 6.5.

What is element **V**?

A Sodium

B Magnesium

C Silicon

D Phosphorus

17. What is the product when propene is oxidised with cold dilute potassium manganate(VII)

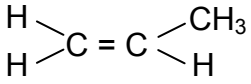
A $CH_3CH(OH)CH_2OH$

B $CH_3CH_2CH_2OH$

C CH_3CH_2CHO

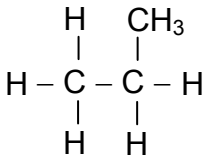
D CH_3COCH_3

18. Which compound **cannot** be obtained from propene in a **single** reaction?

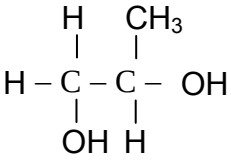


propene

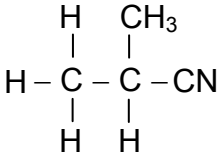
A



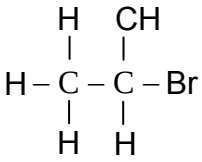
B



C



D



19. Which property of benzene may be directly attributed to the stability associated with its delocalised electrons?

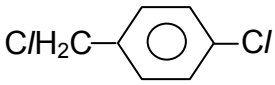
A It has a low boiling point

B It does not conduct electricity

C Its enthalpy change of formation is positive

D It tends to undergo substitution rather than addition reactions

20. A chlorine compound with the following structural formula is boiled with aqueous sodium hydroxide.



How many chlorine atoms in each molecule will be substituted upon hydrolysis?

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

21. The compound C_3H_7Br undergoes a sequence of reactions as follows. n

$$C_3H_7Br \xrightarrow{\text{aq } OH^-} \mathbf{X} \xrightarrow[K_2Cr_2O_7]{\text{acidified}} \mathbf{Y} \xrightarrow[\text{reagent}]{\text{Tollen's}} \mathbf{Z} + \text{silver mirror}$$

What could be the formulae for **X**, **Y** and **Z**?

	X	**Y**	**Z**
A	$CH_3CH_2CH_2OH$	CH_3CH_2COOH	CH_3CH_2CHO
B	$CH_3CH_2CH_2OH$	CH_3CH_2CHO	CH_3COOH
C	$CH_3CH_2CH_2OH$	CH_3CH_2CHO	CH_3CH_2COOH
D	$CH_3CH(OH)CH_3$	CH_3COCH_3	CH_3COOH

22. The volatile liquid, *Fluothane,* $CF_3CHBrCl$, is a widely used anaesthetic.

Which statement about *Fluothane* is incorrect?

A It is chemically inert.

B It may cause depletion of the ozone layer.

C It can form hydrogen bonds between its molecules.

D It may undergo nucleophilic substitution with ammonia.

23. Which of the following compounds reacts with its own oxidation product (an oxidation which involves no loss of carbon) to give a sweet smelling liquid?

A propanal

B propanoic acid

C propanone

D propan-1-ol

24. Which statement about ethanal and propanone is **incorrect**?

A Both may be prepared by the oxidation of an alcohol.

B Both change the colour of warm acidified potassium dichromate(VII) from orange to green.

C Both react with 2,4-dinitrophenylhydrazine reagent.

D Both give a positive tri-iodomethane(idoform) test.

25. A compound **Y** is boiled with aqueous sodium hydroxide and the resulting mixture cooled and acidified with dilute sulphuric acid. The final products include a compound $C_3H_6O_2$ and an alcohol. This alcohol gives a positive tri-iodomethane (iodoform) test.

Which formula could represent **Y**?

A $CH_3CH_2COOCH_3$

B $CH_3CH_2OCOCH_3$

C $CH_3CH_2COOCH_2CH_3$

D $HOCH_2CH_2COCH_2CH_3$

SECTION B (5 MARKS)

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	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. The conversion of $CrO_4^{2-}(aq)$ into $Cr_2O_7^{2-}(aq)$ is represented by the following equation.

$$2CrO_4^{2-}(aq) + 2H^+(aq) = Cr_2O_7^{2-}(aq) + H_2O(l)$$

yellow orange

Which of the following statements is true of this reaction?

1 $CrO_4^{2-}(aq)$ acts as a base.

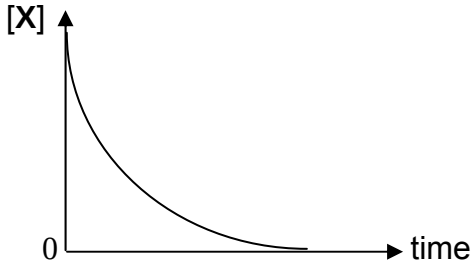
2 When $K_2Cr_2O_7$ is dissolved in aqueous potassium hydroxide, the colour of the solution is yellow.

3 $CrO_4^{2-}(aq)$ is oxidised to become $Cr_2O_7^{2-}(aq)$.

27. The following reaction was believed to be of first order.

X ⟶ products

In an experiment, [**X**], the concentration of **X**, varied with time as shown in the graph.



What can the graph be used for?

1 to determine the rate of reaction at any given instant

2 to check whether the reaction is first order

3 to determine the half-life of the reaction

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

28. The values of two lattice energies are given below:

NaF , $-915\ kJ\ mol^{-1}$

MgO, $-3933\ kJ\ mol^{-1}$

Which of the following correct statements help to explain the difference between these two values?

1 In each of these compounds, the ions are isoelectronic(have the same number of electrons).

2 The attraction between doubly charged ions is about four times that between singly charged ions.

3 The interionic distance in NaF is 0.102 nm and that in MgO is 0.074 nm.

29. In a beehive, the queen bee secretes the substance below to cause worker bees to begin constructing royal colony cells.

$$CH_3CO(CH_2)_5CH{=}CHCOOH$$

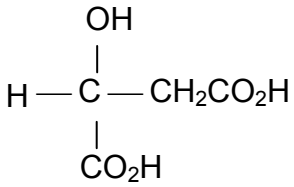
From the structure above, which of the following statements are true?

1 It give a positive test with Fehling's solution (alkaline Cu^{2+} solution)

2 It gives a positive tri-iodomethane (iodoform) test.

3 It could exist as *cis trans* isomers

30. Malic acid occurs in apples.



Which properties does malic acid have?

1 It can form esters both with ethanoic acid and with ethanol.

2 Its molecule contains a secondary alcohol group.

3 All three –OH groups can react with NaOH(aq)

ANSWERS TO 2008 H1 CHEMISTRY PRELIMINARY EXAMINATION PAPER 1

1.	B	11.	A	21.	C
2.	C	12.	B	22.	C
3.	B	13.	C	23.	D
4.	D	14.	B	24.	B
5.	A	15.	C	25.	C
6.	C	16.	B	26.	B
7.	B	17.	D	27.	A
8.	B	18.	C	28.	C
9.	A	19.	B	29.	C
10.	B	20.	B	30.	B