FUKIEN SECONDARY SCHOOL
S5 First Term Uniform Test (2020-2021)
Chemistry
(1 hour)

Date: 20th October 2020 Name:____________________
Time: 10:00a.m. - 11:00a.m. Class: ________ No.:_______

Instructions to students:

1. Write your name, class and class number on both the question paper and the answer sheets.
2. Answer ALL questions.
3. Write down all the answers on the answer sheets.
4. Hand in the question paper and the answer sheets at the end of the examination.
5. The total mark of the paper is 60.

I. Multiple Choice Questions (20 marks)

1. Which of the following statements about natural gas is INCORRECT?
   A. It is often found together with petroleum.
   B. It is manufactured from petroleum.
   C. It was formed from dead remains of marine animals and plants.
   D. It is a cleaner fuel than coal.

2. Which of the following substances is NOT derived from petroleum?
   A. Diesel oil
   B. Polythene
   C. Soaps
   D. Town gas

3. Which of the following elements might be found in petroleum?
   (1) Carbon
   (2) Oxygen
   (3) Sulphur

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

4. Which of the following underlined atoms of molecules has 6 outermost shell electrons?

A. $\underline{S}F_6$
B. $\underline{B}Cl_3$
C. $\underline{N}H_3$
D. $\underline{P}Cl_5$

5. In which of the following molecules does the underlined atom having an non-octet structure?

A. $\underline{C}F_2$
B. $\underline{O}F_2$
C. $\underline{C}O_2$
D. $\underline{P}H_3$

6. Which of the following chemical species does NOT exist?

A. OF_2
B. PCl_3
C. OF_4
D. PCl_5

7. Which of the following statements about carbon disulphide are correct?

(1) Its molecule conforms to the octet rule.
(2) Its molecule contains dative covalent bonds.
(3) It is a liquid at room temperature and pressure.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

8. Which of the following is a linear molecule?

A. H_2O
B. HCN
C. SO_2
D. Cl_2O

9. In which pair do the molecules have the same shape as each other?

A. H_2O and CO_2
B. H_2O and SF_2
C. PH_3 and BF_3
D. OF_2 and $BeCl_2$

10. Which of the following bonds is the MOST polar?

A. C–F

B. C–N

C. C–Cl

D. C–O

11. When a positively charged rod is placed near a jet of liquid running out from a burette, the jet of liquid shows NO deflection. Which of the following may the liquid be?

A. Water (H_2O)

B. Cyclohexane (C_6H_{12})

C. Propanone (CH_3COCH_3)

D. Trichloromethane ($CHCl_3$)

12. Which of the following liquids is miscible with water?

A Bromine

B Carbon disulphide

C Cyclohexane

D Ethanol

13. Which of the following statements can be explained by hydrogen bonds between molecules?

A. Propane (C_3H_8) has a higher boiling point than ethane (C_2H_6).

B. Hydrogen chloride forms an acidic solution when dissolved in water.

C. Silane (SiH_4) has a higher boiling point than methane (CH_4).

D. Ammonia (NH_3) has a higher water solubility than phosphine (PH_3).

14. Which of the following compounds has the HIGHEST boiling point?

A. CH_3F

B. CH_3Cl

C. CH_3Br

D. CH_3I

15. Which of the following lists of compounds is in order of INCREASING boiling point?

A. $CH_4 < SiH_4 < NH_3 < H_2O$

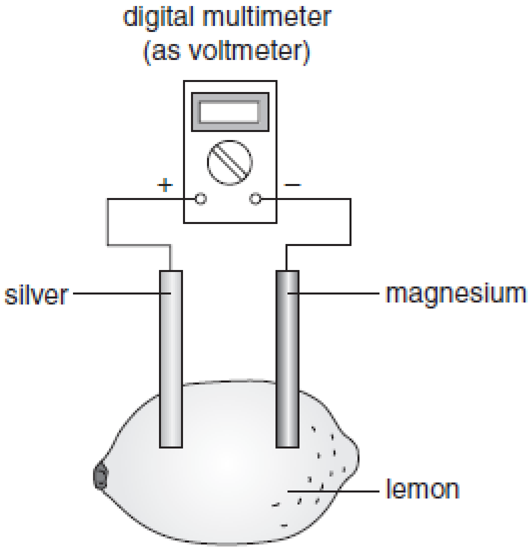
B. $CH_4 < H_2O < NH_3 < SiH_4$

C. $SiH_4 < CH_4 < H_2O < NH_3$

D. $H_2O < NH_3 < CH_4 < SiH_4$

16. Which of the following statements about a lithium ion secondary cell is INCORRECT?
    - A. It has a high energy density.
    - B. It offers relatively low discharge currents.
    - C. It has a high self-discharge rate.
    - D. During discharge, a current flows from the cathode to the anode in the external circuit.

17. Consider the set-up shown below:



Which of the following statements about the set-up is INCORRECT?
    - A. The lemon can be replaced by a potato.
    - B. The voltmeter gives a positive voltage reading.
    - C. Silver ions are reduced to silver in the lemon cell.
    - D. The voltage of the cell is related to the positions of silver and magnesium in the electrochemical series.

18. 8.50 g of anhydrous sodium carbonate react with 25.0 cm^3 of 1.00 mol dm^{-3} hydrochloric acid. What is the mass of carbon dioxide liberated at room temperature and pressure?
(Relative atomic masses: C = 12.0, O = 16.0, Na = 23.0)
    - A. 0.550 g
    - B. 1.48 g
    - C. 3.55 g
    - D. 4.85 g

Directions: Questions 19 and 20 refer to the following sample of hydrochloric acid.

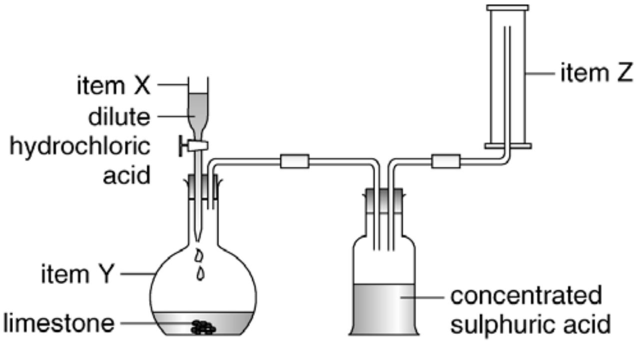
50.0 m^3 of hydrochloric acid contains 55 000 kg of the acid. The percentage by mass of HCl in the acid is 34.8%.

19. What is the concentration of the acid in g dm^{-3}?
    - A. 275 g dm^{-3}
    - B. 316 g dm^{-3}
    - C. 383 g dm^{-3}
    - D. 1 100 g dm^{-3}

20. What is the molarity of the acid?
    (Relative atomic masses: H = 1.0, Cl = 35.5)
    - A. 7.53 mol dm^{-3}
    - B. 6.86 mol dm^{-3}
    - C. 10.5 mol dm^{-3}
    - D. 30.1 mol dm^{-3}

II. Structured Questions (40 marks)

1. A student prepared dry carbon dioxide gas by adding dilute hydrochloric acid to limestone using the setup shown below.



(a) Name items X and Z. (2 marks)

(b) State TWO mistakes in the above set-up and explain why they are wrong. (4 marks)

(c) State a hazard warning symbol that should be displayed on a bottle of concentrated sulphuric acid. (1 mark)

(d) Besides concentrated sulphuric acid, suggest ONE common drying agent. (1 mark)

2. The table below shows the chemical formulae and melting points of the oxides of some elements.

Formula of oxide	MgO	Al_2O_3	SiO_2	P_4O_6	SO_2	Cl_2O
Melting point (K)	3 173	2 313	1 883	297	198	253

(a) (i) Draw the three-dimensional structure of silicon dioxide. (2 marks)

(ii) Draw an electron diagram to show the electronic structure of a molecule of an oxide of chlorine, Cl_2O, showing electrons in the outermost shells only. (2 marks)

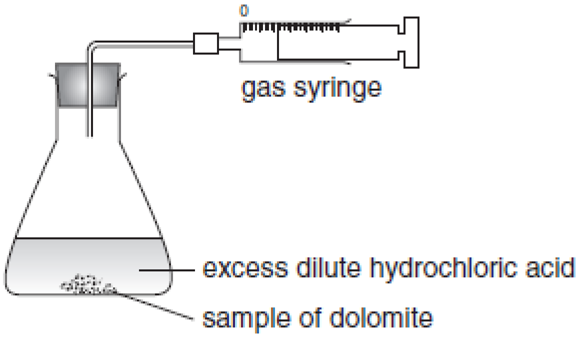
(iii) Explain why quartz has a higher melting point than the oxide of chlorine. (5 marks)

(b) Magnesium is manufactured by the electrolysis of molten magnesium chloride.

(i) Explain why molten magnesium chloride can conduct electricity. (1 mark)

(ii) Use the table at the beginning of the question to suggest why molten magnesium chloride is used as the electrolyte, rather than molten magnesium oxide. (2 marks)

3. The mineral dolomite is a double carbonate of magnesium and calcium, with the chemical formula $CaMg(CO_3)_2$. An experiment was carried out to determine the percentage by mass of carbonate in a sample of dolomite using the set-up shown below.



The chemical equation for the reaction involved is:

$$CaMg(CO_3)_2(s) + 4HCl(aq) \longrightarrow CaCl_2(aq) + MgCl_2(aq) + 2CO_2(g) + 2H_2O(l)$$

(a) The mass of the sample used was 1.20 g. At the end of the experiment, 0.450 g of carbon dioxide was collected. Calculate

(i) the number of moles of carbon dioxide collected; and (1 mark)

(ii) the percentage purity of the dolomite sample. (4 marks)

(Relative atomic masses: C = 12.0, O = 16.0, Mg = 24.3, Ca = 40.1)

(b) Assuming that there was no leakage of gas in the set-up, suggest ONE source of error in the experiment. (1 mark)

4. An oven cleanser contains sodium hydroxide solution. 25.0 cm^3 of the oven cleanser were diluted 10 times. 25.0 cm^3 portions of the diluted cleanser were titrated with 0.107 mol dm^{-3} sulphuric acid.

(a) Name a piece of apparatus for measuring 25.0 cm^3 of the oven cleanser. (1 mark)

(b) A student did the titration four times. The table below shows the results.

Burette reading (cm^3)	**Titration**			
	1st	**2nd**	**3rd**	**4th**
Final reading	13.10	26.15	39.00	13.10
Initial reading	0.00	13.20	26.15	0.20

(i) Calculate a reasonable average for the volume of sulphuric acid required to neutralize 25.0 cm^3 of the diluted cleanser. (1 mark)

(ii) Calculate the concentration of sodium hydroxide in the oven cleanser. (4 marks)

5. Water molecules form hydrogen bonds with each other but hydrogen bonding does not occur between H_2S molecules.

(a) Define the term ‘electronegativity’. (2 marks)

(b) Explain, in terms of electronegativity, why hydrogen bonds form between H_2O molecules but not between H_2S molecules. (4 marks)

(c) Draw a diagram to show how two molecules of water are attracted to each other by hydrogen bonding. You should include partial charges and all lone pairs of electrons in your diagram.

(2 marks)

End of paper

PERIODIC TABLE 週期表

GROUP 族

1
H
1.0

atomic number 原子序

relative atomic mass 相對原子質量

I	II											III	IV	V	VI	VII	0
																	2 **He** 4.0
3 **Li** 6.9	4 **Be** 9.0											5 **B** 10.8	6 **C** 12.0	7 **N** 14.0	8 **O** 16.0	9 **F** 19.0	10 **Ne** 20.2
11 **Na** 23.0	12 **Mg** 24.3											13 **Al** 27.0	14 **Si** 28.1	15 **P** 31.0	16 **S** 32.1	17 **Cl** 35.5	18 **Ar** 40.0
19 **K** 39.1	20 **Ca** 40.1	21 **Sc** 45.0	22 **Ti** 47.9	23 **V** 50.9	24 **Cr** 52.0	25 **Mn** 54.9	26 **Fe** 55.8	27 **Co** 58.9	28 **Ni** 58.7	29 **Cu** 63.5	30 **Zn** 65.4	31 **Ga** 69.7	32 **Ge** 72.6	33 **As** 74.9	34 **Se** 79.0	35 **Br** 79.9	36 **Kr** 83.8
37 **Rb** 85.5	38 **Sr** 87.6	39 **Y** 88.9	40 **Zr** 91.2	41 **Nb** 92.9	42 **Mo** 95.9	43 **Tc** (98)	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 * **La** 138.9	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.9	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** (226)	89 ** **Ac** (227)	104 **Rf** (261)	105 **Db** (262)													

*	58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (145)	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.3	65 **Tb** 158.9	66 **Dy** 162.5	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0
**	90 **Th** 232.0	91 **Pa** (231)	92 **U** 238.0	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (260)

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Chemistry
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Answer Sheets

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I. Multiple Choice Questions (20 marks)

Please put a tick in the appropriate box below.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A																				
B																				
C																				
D																				

II. Structured Questions (40 marks)

End of Answer Sheets