FUKIEN SECONDARY SCHOOL
S5 Final Examination (2020-2021)
Chemistry Paper 2
(1 hour)

Date: 17th June 2021 Name:_____
Time: 11:30a.m. - 12:30p.m. Class: _____ No.:_____

Instructions to students:

1. Write your name, class and class number on both the question paper and the answer book.

2. Answer ALL questions.

3. Write your answers in the answer book provided. Start each question (not part of a question) on a new page.

4. A Periodic Table is printed on the last page of this question paper. Atomic numbers and relative atomic masses of elements can be obtained from the Periodic Table.

5. Hand in the question paper and the answer book at the end of the examination.

6. The total mark of the paper is 40.

Answer **ALL** parts of the questions.

1. When 3.5 g of sodium hydrogencarbonate was added to 25.0 cm^3 of 3.0 M sulphuric acid, sodium hydrogencarbonate reacted and disappeared in 180 seconds.

(a) Write a chemical equation for the reaction between sodium hydrogencarbonate and sulphuric acid. (1 mark)

(b) Which reactant is in excess? Explain your answer by calculation.
(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0, Na = 23.0) (2 marks)

(c) Calculate the rate of consumption of sodium hydrogencarbonate. (1 mark)

(d) Sketch a graph to show the change in concentration of sulphuric acid with time. (2 marks)

2. Consider the following reaction:

$$2MnO_4^-(aq) + 5C_2O_4^{2-}(aq) + 16H^+(aq) \rightarrow 2Mn^{2+}(aq) + 10CO_2(g) + 8H_2O(l)$$

Colorimetric analysis is used to monitor the reaction progress.

(a) State the colour change of the reaction mixture. (1 mark)

(b) A student stated that the colour change is mainly due to the formation of water which diluted the solution. Comment on his statement. (2 marks)

(c) Sketch a graph to show the change in MnO_4^- concentration with time. (2 marks)

(d) Besides colorimetric analysis, suggest another method to follow the progress of the reaction. (1 mark)

3. Besides sodium oxide, sodium forms sodium peroxide when heated with oxygen.

(a) State the oxidation number of oxygen in sodium peroxide. (1 mark)

(b) Write an equation for the reaction involved when sodium is heated in oxygen. (1 mark)

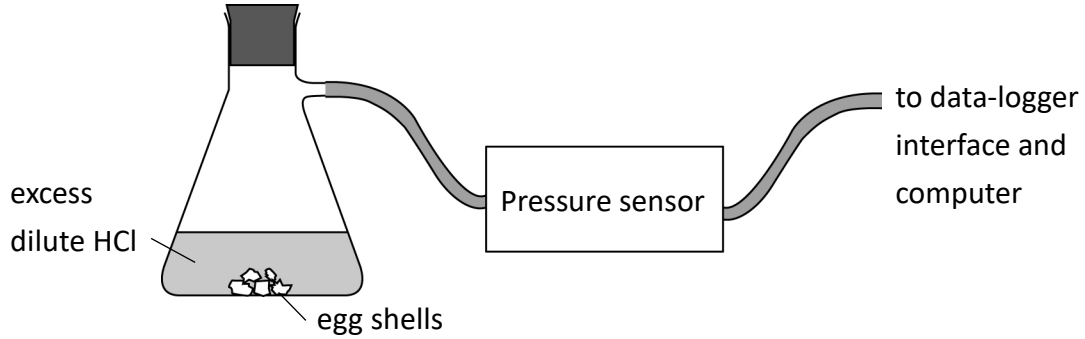
(c) Sodium peroxide reacts with water to give sodium hydroxide and compound *X*.

(i) Write an equation for the reaction of sodium peroxide with water. (1 mark)

(ii) Draw the electron diagram for *X*, showing electrons in the outermost shells only. (1 mark)

(iii) State whether sodium peroxide is acidic, basic or amphoteric. (1 mark)

4. Calcium carbonate is the main component of egg shells. An experiment was carried out to determine the change of pressure of the reaction system during the reaction between egg shells and dilute hydrochloric acid.

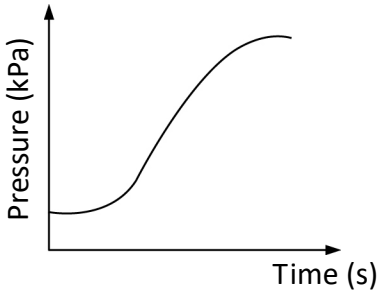


(a) State ONE observable change in the reaction mixture. (1 mark)

(b) Write an ionic equation for the reaction involved. (1 mark)

(c) State ONE advantage of using a data-logger in experiments. (1 mark)

(d) The graph below shows the change in pressure of the reaction system with time.



(i) Explain why the pressure inside the suction flask was NOT equal to zero initially. (1 mark)

(ii) Describe and explain the change in the shape of the curve. (5 marks)

5. Nitrogen and oxygen are two major components in air.

(a) (i) Predict, with explanation, the difference in boiling points between nitrogen and oxygen. (3 marks)

(ii) Hence, state how nitrogen and oxygen are separated from air. (1 mark)

(b) Phosphorus has the same structure as nitrogen and oxygen.

(i) Draw the structure of a phosphorus molecule. (1 mark)

(ii) A student claimed that phosphorus should have a boiling point close to nitrogen and oxygen. Comment on the statement. (2 marks)

6. Boron and aluminium belong to the same group in the Periodic Table but they have different electrical conductivities at different temperatures.

(a) State the types of structure of boron and aluminium respectively. (2 marks)

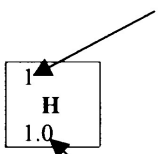
(b) Compare the electrical conductivities of boron and aluminium at room temperature. Explain your answer. (3 marks)

(c) At higher temperatures, the electrical conductivity of boron increases while that of aluminium decreases. Suggest why. (2 marks)

END OF PAPER

PERIODIC TABLE　週期表

GROUP 族



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)