Name: _____ Index Number:_____ Class: _____

TEMASEK SECONDARY SCHOOL
Preliminary Examination 2024
Secondary 4 Express

CHEMISTRY **6092/02**

Paper 2 (Section B) Total duration for Sections A and B: 1 hour 45 minutes

Candidates answer on the Question Paper.
No additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **one question** from this section.

Write your answers in the spaces provided on the question paper.

At the end of the examination, submit **Section A and B separately**.

The number of marks is given in brackets [ ] at the end of each question or part question.

A copy of the Periodic Table is printed on page **7** in Section B.

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

FOR EXAMINER'S USE	
Section B	/10

Section B
Answer only one question from this section.
Write your answers in the spaces provided.

B11 Hydrogen peroxide is a colourless liquid. An aqueous solution of hydrogen peroxide reacts with the iodide ions in acidified potassium iodide to form water and iodine.

…… $H_2O_2(aq)$ + ……. $H^+(aq)$ + ... $I^-(aq)$ → …… $H_2O(l)$ + …… $I_2(aq)$

(a) Balance the above ionic equation. [1]

(b) Identify the reducing agent in this reaction. Explain your answer using electrons transfer.

Reducing agent : ……..……

Explanation:

……

…… [2]

(c) Describe the observation seen during the reaction.

…… [1]

(d) Table 11.1 shows how the speed of this reaction changes when different concentrations of potassium iodide and sulfuric acid are used. The hydrogen peroxide used in the reaction is always in excess and the temperature is kept constant.

Table 11.1

experiment	concentration of potassium iodide in mol/dm^3	concentration of sulfuric acid in mol/dm^3	speed of reaction in mol/dm^3 per second
1	0.1	0.1	0.00017
2	0.2	0.2	0.00034
3	0.1	0.2	0.00017
4	0.3	0.1	0.00051
5	0.1	0.3	0.00017

Using the information in Table 11.1, describe how increasing the concentration of the following reagents affect the speed of reaction.

(i) potassium iodide

……...

……...

……...

……... [2]

(ii) sulfuric acid

……...

……...

……...

……... [2]

(e) Explain, in terms of Collision Theory, the effect of increasing the temperature on the speed of reaction between hydrogen peroxide and acidified potassium iodide.

…….....

…….....

…….....

…….....

…….....

……..... [2]

[Total: 10]

B12 Zinc nitrate is a white crystalline solid which is soluble in water and alcohol. It is used in the synthesis of nanowires and can be used as a component in dyeing.

(a) Zinc nitrate decomposes when heated to form zinc oxide, oxygen and nitrogen dioxide. Zinc nitrate can be prepared by the reaction of zinc oxide with dilute nitric acid.

(i) Write a balanced chemical equation for the decomposition of zinc nitrate.

……. [1]

(ii) State the colour change of the solid as zinc nitrate is heated until it has fully decomposed.

……. [1]

(iii) Describe how pure and dry solid zinc nitrate is prepared and obtained from the starting reagents mentioned above.

……

……

……

……

……

……

……

……. [3]

(b) Table 12.1 shows a series of tests that were carried out on solution X which is a solution of zinc nitrate.

Table 12.1

test number	tests	observations
1	An equal portion of aqueous sodium carbonate is added to solution X.	
2	Aqueous ammonia is added to solution X.	A white ppt is seen.
3	Aqueous sodium hydroxide and aluminium foil are added to solution X and the mixture is warmed.	

(i) Write the ionic equation for the formation of the white precipitate in test number 2.

……. [1]

(ii) Describe the observation expected if excess aqueous ammonia was added to the precipitate in Test 2.

…….

……. [1]

(iii) Complete the observations expected for Tests 1 and 3 in the empty spaces provided in Table 12.1. Include any test for gas and identify the gas if necessary. [3]

[Total: 10]

End of Section B

The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9		**Key** proton (atomic) number atomic symbol name relative atomic mass									5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24	3	4	5	6	7	8	9	10	11	12	13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

The Avogadro constant, $L = 6.02 \times 10^{23}\ mol^{-1}$