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Index Number	Class	Name

CHIJ ST JOSEPH'S CONVENT
SEMESTRAL ASSESSMENT 1

O **O**

SCIENCE (CHEMISTRY)

Secondary 2 Express

Friday, 6 May 2016
50 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your index number, class and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
There are **ten** questions. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C**, and **D**.
Choose the **one** you consider correct and shade your choice in the Multiple Choice Answer Sheet with a 2B pencil.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Section B
Answer **all** questions in the spaces provided.

The number of marks is given in brackets [ ] at the end of each question or part question.
Show all your working on the same page as the rest of the answer.
Omission of essential working will result in loss of marks.
Electronic calculator may be used in this paper.
The total of the marks for this paper is 40.

A copy of the Periodic Table is printed on page **11**.

FOR EXAMINER'S USE	
A	
B	
Total	40

This document consists of **11** printed pages.

Setter(s) : Mr Zulkiffli and Mrs Lee-Tan YJ

Section A (10 marks)

Answer **all** questions.

1 The table below shows the electronic structures of four elements.

element	electronic structure
W	2.6
X	2.8.7
Y	2.8.2
Z	2.8.6

Which of the following combination forms a covalent substance?

A an atom of **W** and an atom of **Y**
B two atoms of **X** and an atom of **Z**
C an atom of **Y** and two atom of **X**
D two atoms of **Y** and two atoms of **Z**

2 Which substance will only conduct electricity in the solid state?

A magnesium chloride
B magnesium oxide
C magnesium ribbon
D magnesium sulfate

3 Which of the following **cannot** be deduced from the number of valence electrons in an atom?

A the identity of the element of the atom
B the chemical reactivity of the atom
C the number and type of charges when the atom forms an ion
D the group number of the atom in the Periodic Table

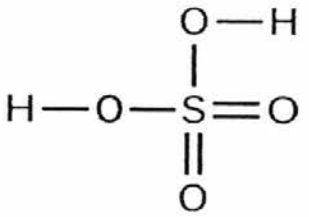
4 Three elements, **W**, **X** and **Y** are in the same period of the Periodic Table. They form ions with the following charge

element	charge on ion
W	-3
X	+2
Y	-1

What is the arrangement of these elements in the increasing order of atomic number?

A X, W, Y
B X, Y, W
C Y, X, W
D Y, W, X

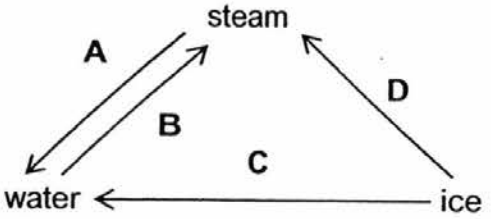
5 The diagram shows the bonding in sulfuric acid.



How many electrons are shared between sulfur and oxygen atoms?

A 6
B 8
C 12
D 16

6 Which of the following changes of state of water is exothermic?



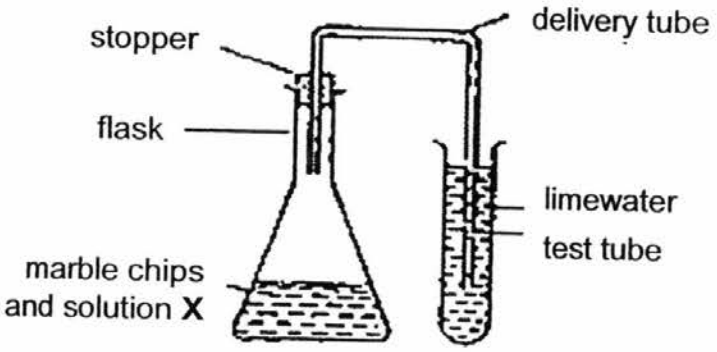
7 Photosynthesis can be represented by the following:

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2 \qquad \Delta H = +2802\ kJ$$

Which of the following deduction is **correct**?

A Heat energy is released to the surrounding.
B The temperature of the surrounding will stay constant.
C The temperature of the surrounding will increase.
D Light energy is absorbed from the surrounding.

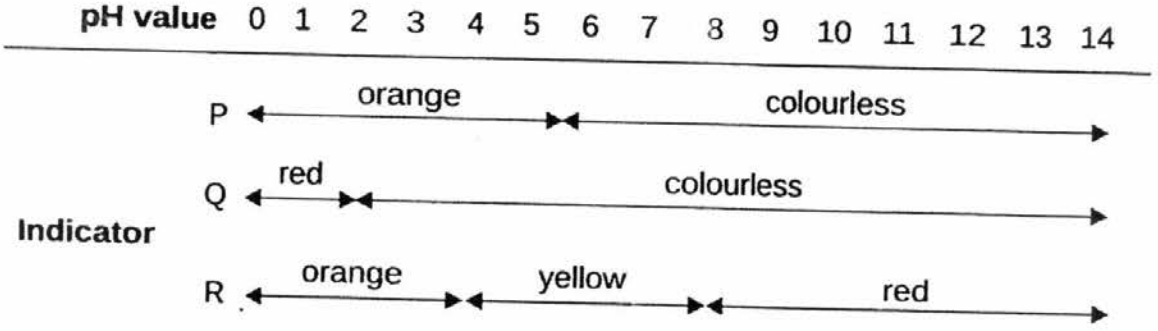
8 A gas which forms white precipitate with limewater is produced when marble chips (calcium carbonate) is reacted with solution **X**.



Which of the following is a possible identity of solution **X**?

A aqueous ammonia
B bleach
C table salt
D vinegar

9 The information below gives the colours of three different indicators, **P**, **Q** and **R**, at different pH values.



What colour will be observed if all three indicators were added to water?

A blue
B colourless
C red
D yellow

10 Which statement best explains why a shaken can of carbonated drink explode when opened?

A Pressure is released therefore gas particles in the drink expanded.
B Pressure is released therefore spacing between the gas particles increases.
C Pressure builds up as gas particles absorb heat and move further apart.
D Pressure builds up as covalent bonds within the gas particles are broken to form atoms.

Section B (30 marks)

Answer **all** questions in the spaces provided.

For Examiner's Use

1 Hydrogen can form ions with different charges, H^+ and H^-.

(a) Fill in the table below to show the number of sub-atomic particles in H atom and H^- ion.

	proton	**neutron**	**electron**
H atom	1		1
H^- ion		0	

[1]

(b) Describe the formation of H^- ion from hydrogen.

.....

.....

..... [1]

(c) In the space below, draw a diagram to show the 'dot and cross' diagram of sodium hydride, NaH. Only the valence electrons need to be shown.

[2]

For Examiner's Use

2 The table gives the composition of three particles.

particle	number of protons	number of electrons	number of neutrons
X	7	7	8
Y	7	7	7
Z	11	11	12

(a) With reference to the table above, explain why

(i) particles **X** and **Y** are isotopes of the same element,

.....

..... [1]

(ii) particle **Z** reacts readily.

.....

..... [1]

(b) **(i)** State the group number of particle **X** and **Z**.

X.....**Z**..... [1]

(ii) Particle **X** reacts with particle **Z** to form compound **1**.
Write the chemical formula of compound **1**.

..... [1]

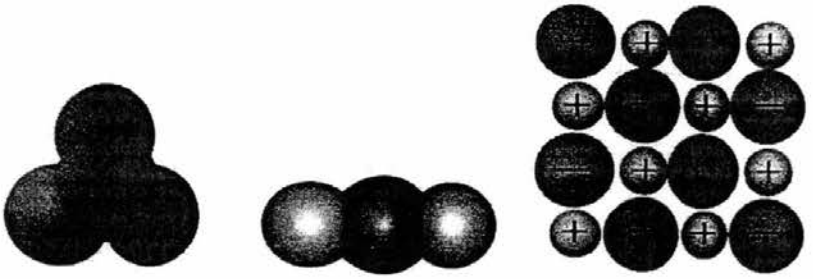
(iii) Can compound **1** conduct electricity? Explain your answer.

.....

..... [1]

For Examiner's Use

3 The diagrams show the names and models of three substances.



phosphorus trichloride carbon dioxide sodium chloride

(a) In the space below, draw a 'dot and cross' diagram to represent phosphorus trichloride.

[2]

(b) Explain why carbon dioxide exists as a gas but sodium chloride is a solid at room temperature and pressure.

.....

.....

.....

.....

..... [3]

For Examiner's Use

4 When zinc reacts with sulfuric acid, the temperature of the solution increases rapidly.

(a) **(i)** Write a word equation to represent the reaction.

..... [1]

(ii) State the chemical formula of all the products from the reaction.

..... [2]

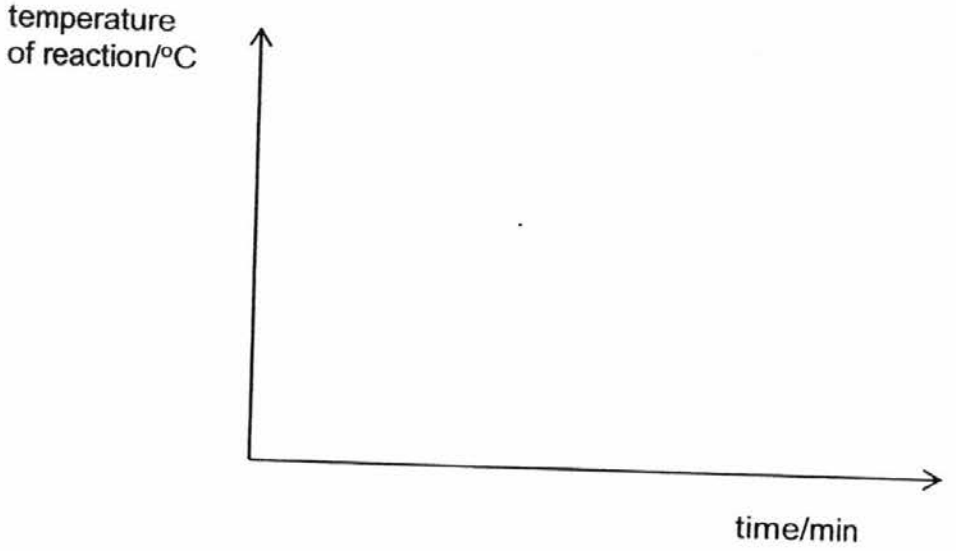
(b) What type of energy change can we classify the above reaction?

Explain your answer.

.....

..... [2]

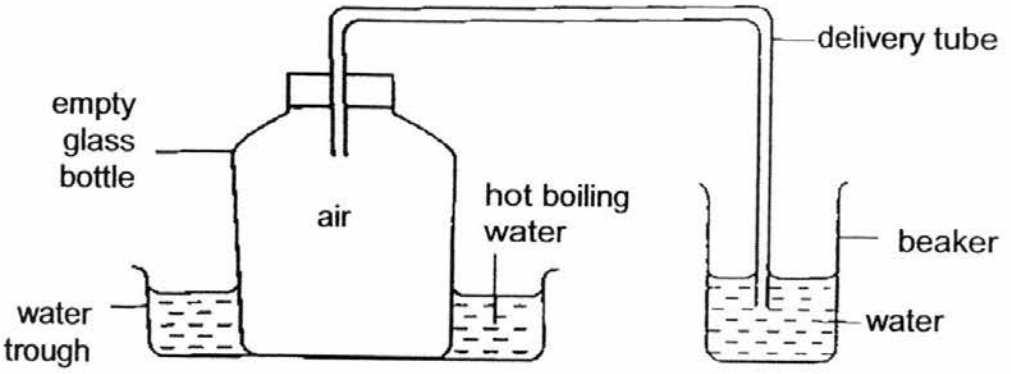
(c) Sketch a graph to represent how the temperature of the reaction will change against time.



[1]

For Examiner's Use

5 Study the experimental set-up below.



(a) Predict what is observed in the beaker of water.

.....

..... [1]

(b) Using ideas of kinetic particle theory, explain your answer in **(a)**.

.....

.....

.....

..... [3]

For Examiner's Use

6 (a) An experiment was carried out to compare the acidity of some fruit juices. An alkali, sodium hydroxide solution was used to neutralise 25.0 cm^3 of each fruit juice.

fruit juice	volume of sodium hydroxide solution needed for neutralisation /cm^3
apple	10
lemon	16
pineapple	6
grapefruit	14
lime	12

(i) Using the information from the table, identify which fruit juice has the lowest pH. Explain your answer.

.....

.....

..... [2]

(ii) Name the gas that will be produced when sodium carbonate is added to the fruit juices.

..... [1]

(iii) State the difference in observation when equal mass of sodium carbonate is added to lemon juice and pineapple juice separately.

.....

..... [1]

(b) Sodium hydroxide also reacts with ammonium nitrate to give out a pungent gas. Describe how the gas can be tested.

.....

.....

..... [2]

End of paper

The Periodic Table of the Elements

Key

relative atomic mass
atomic symbol
name
atomic number

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57 *	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

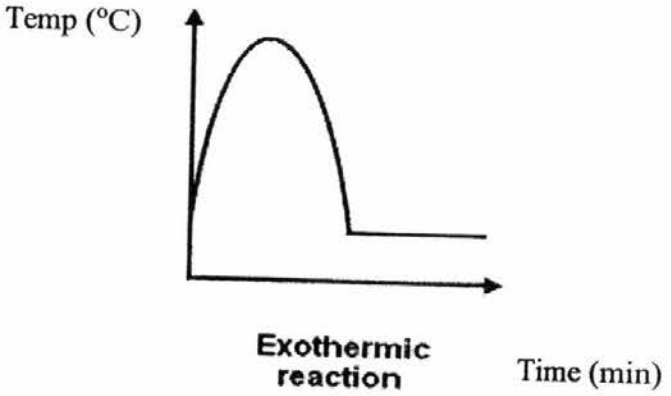
*58-71 Lanthanoid series	140 Ce cerium 58	141 Pr Praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
†90-103 Actinoid series	232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

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

Sec 2 Exp SA1 2016 Science Chemistry

Question	1	2	3	4	5
Answer	B	C	A	A	C
Question	6	7	8	9	10
Answer	A	D	D	D	B

1a	H atom: 0n H- ion: 1p, 2e	1
b	hydrogen atoms gain 1 electron	1
c	Na+ (8 e) 1m H- (2e; 1 dot, 1 cross) 1m	
2ai	They have 7/ same number protons hence they are of the same element but X has 1 less neutrons from Z (or quote the number: X has 8 neutrons but Y has 7 neutrons)/different number of neutrons	1
ii	They need to lose 1 e to obtain a fully filled valence shell/ stable noble gas configuration[this is with BOD]	1 1
b	X: V, Z: I Students who wrote both roman numerals and number form are not awarded the mark. They showed lack of precision in their answers. Z_3X	1 1
ii	Yes, There's <u>free moving ions</u> in <u>aqueous and molten state</u>	1
3a	PCl_3 one P and 3Cl with sharing of a pair of electron between each P and Cl → 1m correct number of valence e for Cl and P→ 1m	
b	Carbon dioxide has a low boiling point but sodium chloride has a high melting point. Carbon dioxide (occurs as simple molecular structure) is held by weak intermolecular forces of attraction, little energy is needed to overcome the attractive force. Sodium chloride (occurs as giant ionic lattice structure) is held by strong electrostatic forces of attraction between oppositely charged ions, large amount of energy is needed to overcome the attractive force	1 1 1

4	(a) zinc + sulfuric acid → zinc sulfate + hydrogen (ii) $ZnSO_4$ and H_2 (allow ECF from (i)) (b) Exothermic reaction . Heat energy Is given to the surroundings/ temperature has increased (c)  	1 2 1 1
5a	Bubbles will be seen Effervescence [marked with BOD]	1
b	Air particles in the glass bottle gain kinetic energy/energy/ heat energy Air particles will move faster "vibrate" is unacceptable Air particles will move further apart hence spacing between air particles will increase If students simply wrote spacing between air particles will increase, they are not awarded the mark as this is not account for. Volume of air will increase hence pushing gas out of the delivery tube	1 1 1 1 Max 3
6ai	lemon juice it needs the greatest volume of sodium hydroxide to remove the acidicity/ remove the excess Hydrogen ions	1 1
ii	carbon dioxide gas	1
iiii	more vigorous bubbling in lemon juice than pineapple juice	1
b	use a damp red litmus paper which will turn blue	1 1