E

GAN ENG SENG SCHOOL
Mid-Year Examination 2016

GESS

CANDIDATE NAME			
CLASS		**INDEX NUMBER**	

SCIENCE
Paper 1 Multiple Choice

10 May 2016
Papers 1 & 2: 2 hours

Sec 1 Express

Additional Materials: OTAS

Calculators are allowed in the examination

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and index number on the OTAS.

There are **thirty** questions in Section A. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the answer you consider correct and record your choice in soft pencil on the separate OTAS.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Read the instructions on the OTAS very carefully.
A copy of the periodic table is inserted on page 11.

You may proceed to answer Paper 2 as soon as you have completed Paper 1.

Any rough working should be done in this booklet.

Total marks
30

Answer **all** the questions with the most suitable option **A**, **B**, **C** or **D**.

1. Thomas Edison was a famous inventor who invented the light bulb. Before he successfully invented the light bulb, he experienced hundreds of failures.
Which of the following qualities did he demonstrate?

   A Curiosity
   B Perseverance
   C Responsibility
   D Open-mindedness

2. Pouring unused chemicals back into their containers is discouraged. Why?

   A Doing so causes an explosion.
   B Doing so contaminates the chemicals.
   C Doing so dilutes the chemicals.
   D Doing so increases the concentration of the chemicals

3. The following statement is written by a student who is carrying out the scientific method.

   "More sugar is dissolved in a fixed volume of water when the water is heated with a Bunsen flame."

   At which stage is the student carrying out the scientific method?

   A The student is asking a question.
   B The student is constructing a hypothesis.
   C The student is making an observation.
   D The student is recording experimental results.

4. What should a student have done when he first noticed the small crack at the side of the test-tube at the start of his experiment?

   A Exchange the test-tube for another one at the teacher's bench quietly.
   B Inform his teacher about the crack and dispose the cracked test-tube in a dustbin for sharps.
   C Inform his teacher about the crack and dispose the cracked test-tube in a general dustbin.
   D Place the cracked test-tube back into the test-tube rack without informing his teacher.

5. Which of the following laboratory apparatus is correctly matched to its function?

	Apparatus	Function
I	round bottom flask	used to hold a solid for heating
II	tripod stand	used to support apparatus during heating
III	evaporating dish	used to contain a solution to be heated
IV	measuring cylinder	used to measure an approximate volume of liquid

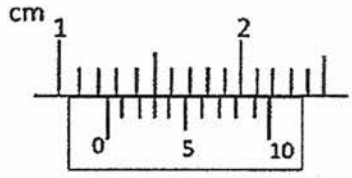
A I and II
B I and III
C II and III
D III and IV

6. Various objects are used to scratch against each other and the observations are recorded in the table below.
   - Object **A** was used to rub against object **B** to cause scratches. Scratch marks were seen on object **A**.
   - Object **B** was used to rub against object **C** to cause scratches. Scratch marks were seen on object **C**.
   - Object **A** was used to rub against object **C** to cause scratches. Scratch marks were seen on object **A**.

   Which of the following statement best explain the observations above?

A Object **A** is stronger than object **C** and object **C** is stronger than object **B**.
B Object **B** is stronger than object **C** and object **C** is stronger than object **A**.
C Object **A** is harder than object **C** and object **C** is harder than object **B**.
D Object **B** is harder than object **C** and object **C** is harder than object **A**.

7. What is the reading on the Vernier calipers?

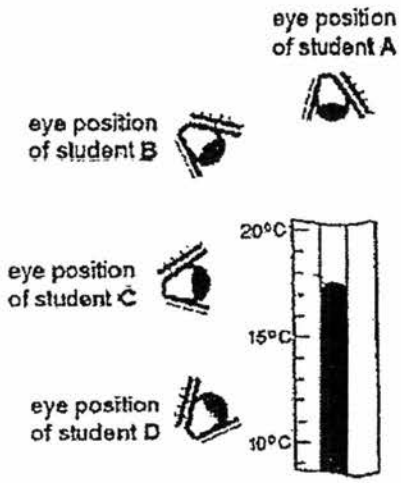


A 1.03 cm
B 1.23 cm
C 1.50 cm
D 1.53 cm

8. A material can bend without breaking and return to its original size and shape after bending. What is the physical property that is being described?

A flexibility
B hardness
C durability
D strength

9. What is the correct temperature reading?



A 16.0 °C
B 16.5 °C
C 17.5 °C
D 18.5 °C

10. Luke took a ball of clay weighing 200 g and flattened it.
Which of the following statements about the clay is true?

A Its mass and density have increased.
B Its mass and density have decreased.
C Its mass and density remain the same.
D Its mass remains the same but the density is changed.

11. Most metals such as copper and iron have high melting points. Which of the following is an advantage of this property?

A It allows metal parts to be reshaped more easily.
B It enables people to use pots and pans made of metal to cook food.
C It keeps cars from becoming too hot on sunny days.
D It prevents machine parts made of metal from rusting.

12. Hillary wanted to find out how much space an irregular piece of rock occupies. What should she measure, and what instrument should she use?

	Measurement	Instrument
A	Mass	Beam balance
B	Mass	Displacement can
C	Volume	Beam balance
D	Volume	Displacement can

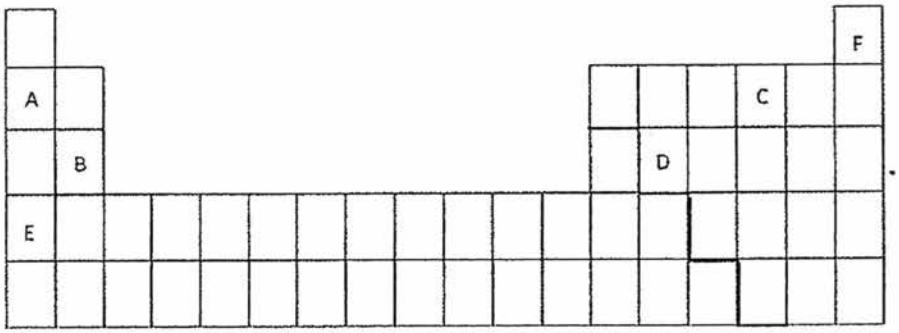
13. Paint dissolves completely in turpentine, but not in water.
Which statement is **not** true?

A Turpentine is the solvent that can dissolve paint.
B Stirring the paint in turpentine decreases the time taken for the paint to dissolve.
C No residue is seen after filtration when the paint is placed in turpentine.
D It shows that the type of solvent affects solubility of paint.

14. Which of the following statements **incorrectly** describes an element?

A An element can be combined chemically to form a compound.
B An element can be differentiated from another element by its physical and chemical properties.
C An element is the simplest form of matter found naturally.
D An element is made up of many different simpler substances.

Use the Periodic Table to answer questions **15, 16** and **17.**



15. Which two elements have similar chemical properties?

A A and C
B A and E
C B and D
D C and F

16. Which two elements belong in the same period?

A A and C
B B and E
C C and D
D C and F

17. Which two elements display the change of metallic properties to non- metallic properties?

A A to E
B E to A
C A to C
D B to D

18. The substances **X** and **Y** are combined to produce **Z**, which has different chemical and physical properties as compared to **X** and **Y**.

What is **Z** known as?

A Compound
B Element
C Solution
D Suspension

19. Liquid **X** has a boiling point of 75 °C while liquid **Y** has a boiling point of 120 °C. Liquid **X** can be separated from liquid **Y** via fractional distillation. What will be the most suitable temperature for the fractional distillation to be conducted at?

A 65 °C
B 90 °C
C 120 °C
D 130 °C

20. Which of the following methods is most suitable to separate a liquid from a mixture of a liquid and a solid?

A chromatography
B distillation
C evaporation
D filtration

21. A distillation set-up involves the use of a condenser. The purpose of this piece of apparatus is to .....

A change liquid into vapour.
B change vapour into a liquid.
C change vapour into a gas.
D change vapour into a solid

22. Which of the following does not make use of filtration?

I. Making a cup of tea using a teabag
II. Separating dirt from air in a vacuum cleaner
III. Using a sieve to remove pulp from fruit juice
IV. Removing salt from a mixture of salt and water

A II only
B IV only
C I and III only
D II and IV only

23. Which of the following separation techniques replies on the solubility of the particles?

A distillation
B filtration
C magnetic attraction
D paper chromatography

24. Which of the following statements is true about a solution and a suspension?

A Both solution and suspension can be separated into their components by filtration.
B The liquid in both solution and suspension can be separated and obtained by distillation.
C A solution has different chemical properties from its components but a suspension has the same chemical properties as its components.
D The solids of both solution and suspension will eventually settle to the bottom of the container if left to stand long enough.

25. The table gives some information about three indicators.

indicator	colour at pH = 1	pH at which colour changes	colour at pH = 12
naphthyl red	red	4	yellow
bromocresol purple	yellow	6	purple
thymolphthalein	colourless	9	blue

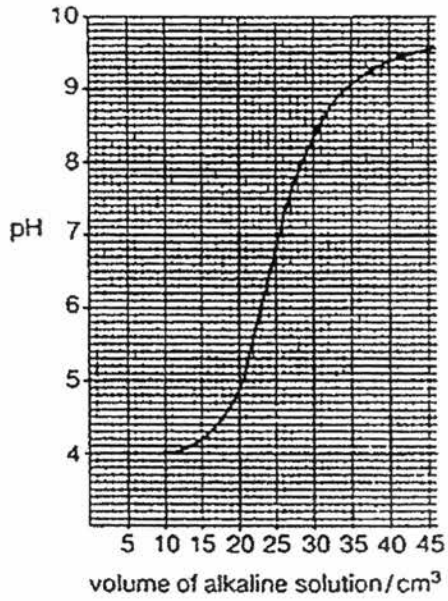
Which colours would be seen when each indicator is added separately into pure water?

	naphthyl red	**bromocresol purple**	**thymolphthalein**
A	red	yellow	blue
B	red	yellow	colourless
C	yellow	purple	blue
D	yellow	purple	colourless

26. A piece of moist blue litmus paper remains blue when placed in liquid **X**. A piece of moist red litmus paper turns blue when placed in liquid **X**. What is the most appropriate identity of liquid **X**?

A bleach
B distilled water
C hydrochloric acid
D lime juice

27. The graph shows how the pH changed when an alkaline solution was added to an acid.



Which volume of alkaline solution had been added when the mixture became neutral?

A 5 cm^3
B 15 cm^3
C 25 cm^3
D 35 cm^3

28. Which of the following is a property of an alkali?

A Feels soapy.
B Reacts with a metal to produce hydrogen gas and a salt.
C Removes rusts from metals.
D Tastes sour.

29. A large pool of acid is being spilled on the floor of the laboratory. What can be added to the acid as a mean to safely remove the acid?

A calcium carbonate
B magnesium
C sodium hydroxide
D water

30. Which of the following are the products formed from a reaction of acid with metal?

A Salt and carbon dioxide
B Salt and hydrogen gas
C Salt, hydrogen gas and water
D Salt and water

END OF PAPER 1

The Periodic Table of the Elements

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	226 Ra Radium 88	227 Ac actinium 89 †															

*58-71 Lanthanoid series

†90-103 Actinoid 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
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

Key: a / X / b

a = relative atomic mass

X = atomic symbol

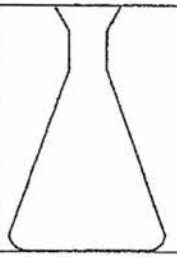
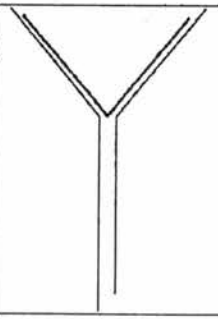
b = proton (atomic) number

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

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

Paper 2 Section A [30 marks]				
Q		**Answers**	**Mark**	**Remarks**
1.	a)	A: flammable B: corrosive C: irritant [all 3 correct = 1 mark]	1	**Reject:** harmful (irritant substances are not the only 'harmful' substance)
	b)	A: keep away from flame / fire [1] B: avoid direct contact to skin and eyes [1]	2	**Accept:** B: wearing of goggles and gloves. (although the wearing of gloves is not practiced in sec sch labs) **Reject:** A: do not put near Bunsen burner some students misinterpreted 'precaution' as danger.
2.	a)	A: non luminous B: luminous	2	
	b)	Soot/ carbon	1	**Reject:** burnt glass, burnt marks, smoke, marks caused by flame, marks caused by overheating,

6.	a)	(Fractional) **Distillation**	1	well done
	b)	i thermometer; ii tripod stand; iii condenser; iv beaker 2 correct answers = 1 mark	2	well done
	c)	To ensure that the **boiling process is smooth.**	1	well done
	d)	To ensure **maximum condensation** of vapour to liquid droplets before it enters the beaker.	1	**Accept:** • to ensure the water that is cooling the condenser is the coolest at the bottom portion of the condenser to ensure the vapour is condensed to liquid state. • To ensure the cooling chamber of condenser is fully filled with cool water. **Reject:** allow all water vapour to condense (distillation can be done with other liquids, not just water) , faster condensation,
	e)	To **measure the temperature** of the **vapour** so as to ensure that only one liquid is boiling at one time.	1	distillation can be done with other liquids, not just water; do not use 'sense, detect, see, show' (they are not scientific terms)
7.		Dip a piece of **red litmus paper** and a piece of **blue litmus paper** into the two solutions separately. [1, method] If the red litmus paper **remains red** and the blue litmus paper **turns red** in colour, the solution is an **acid.** If the blue litmus paper **remains blue** and the red litmus paper **turns blue** in colour, the solution is an **alkali.** [1, result]	2	**Reject:** litmus paper turn red/ blue (need to state the <u>original colour</u> of the litmus paper) **Accept:** If student only state only the use of red/ blue litmus paper with correct results [2 marks] (this is applicable now as Q only require a test to identify an acid from an alkali. This is not applicable is Q is asking "State how you can identify an acidic solution?")
8.	a)	X: acid, Y: metal carbonate, Z: alkali (1 correct: 1m, 3 correct: 2m)	2	
	b)	1. **Bubbles** produced. [1] 2. A metal reacts with an acid to produce **hydrogen gas** and a **salt.** [1]	2	**Reject:** no marks for point 2 if there products are wrong.

10.	ai)	She did not wear safety goggles. [1] She used her bare hands to hold onto the test tube while heating. [1]	2	**Accept:** tilting opening of the test tube towards herself. **Reject:** did not tie up her hair (hair band is enough for shoulder length hair) ;
	aii)	Beaker, wire gauze and tripod stand (all 3 to be correct for 1 mark)	1	Reject: • round bottom flask, wire gauze and tripod stand (the flask cannot balance itself on the tripod stand and wire gauze, unless a retort stand is used as well); • flat bottom flask, wire gauze and tripod stand (the flask will crack upon strong heating); • wire mesh? • retort stand & boiling tube(boiling tube will crack upon heating due to the pressure exerted by the arm of retort stand) • Bunsen burner is not an apparatus (
	bi)		1	Graduated markings are only applicable for measuring cylinder and burette as these apparatus can measure volume. Conical flask markings are only for approximate estimation only. They cannot be used for measurement.
	bii)		1	

11.	ai)	paper chromatography	1	
	aii)	E	1	Many students chose D. D is insoluble. It could be a mixture of substances that is insoluble in the solvent used in the chromatography.
	aiii)	C & E	1	
	aiv)	D is insoluble in the solvent (reject: water, as the Q did not specify water)	1	
	av)	Solute with a **higher solubility** in the solvent will move **faster with the solvent** up the paper.	1	**Reject:** The higher the solubility of the solute, the higher its position / greater the distance from the start line. (this does not explain the principle but just stating the obvious observation)
	b)	1. Use a **magnet** to attract the iron filings from the mixture [1] 2. Add **water** to the remaining mixture and **stir to dissolve** salt X **completely** [1] 3. Pass the mixture through a **filter paper**. [1] 4. The **residue** is salt Y. [1] 5. **Heat the filtrate to dryness** to obtain salt X. [1]	5	well done, many missed point 2 some just stated 'filter / filtration' .

13.	a)	P metals Q glass R ceramics S plastics 2 correct answers = 1 mark	2	many gave a name of metal (eg. copper, iron).
	b)	• Plastics are **non-biodegradable / cannot be broken down (decomposed) by organisms.**[1] • They cause **land pollution** (build-up of waste) OR **water pollution** (killing of marine animals) [1] • When plastic is **burnt**, they releases **poisonous gases.** [1]	2	Non-renewable is a term used for sources of energy.
	c)	• Material **S** / **Plastic** [1] • Material S is a **poor conductor of heat** and thus young children **would not be hurt by the heat** from the hot food in the bowl. **OR** • Material S is **not brittle** and thus **would not break easily** when a young children drop the bowl. [1]	2	
	di)	• Plastic / wood / ceramic • **poor conductor of heat, prevent burns**	2	**Reject:** plastic is a poor conductor of electricity and the person using the iron will not be electrocuted. (there is no electrical current flowing in the metallic part of the iron).
	dii)	• metal • **good conductor of heat**, allow **heat to reach the clothes readily.** (accept: allow the heat to reach the clothes fast / transfer heat to clothes fast)	2	**Reject:** iron clothes more easily (not specific enough)

3.	a)	It acts as a sinker.	1	well done
	b)	volume of cork = volume with stone and cork – volume with stone = $50cm^3 - 47cm^3$ [1] = $3cm^3$ [1, no marks if unit is wrong]	2	well done some used $41cm^3 - 40\ cm^3 = 1cm^3$ (note that the cork is not fully submerged)
	c)	Density = mass / volume = 0.54g / $3cm^3$ [1] = $0.18g/cm^3$ [1, no marks if unit is wrong]	2	well done allow ECF
	d)	It is **less dense** than water.	1	well done
4.		a) E b) C or D c) B	3	many take A as a mixture an element and a compound.
5.	a)	The **elements** that made up the compound urea are **chemically combined.** [1] The elements that made up the urea molecule is in a **fixed proportion by mass.** [1]	2	**Reject:** connected ; **Accept:** chemically bonded need to address the concept why this molecule can represent <u>every</u> urea molecule
	b)	4	1	well done

Paper 2 Section B [40 marks]				
9.	a)	mixture [1] The 2 tablets contains a **different proportion of ingredients**.[1] For example, brand A tablet contains 450 mg of paracetamol while brand A tablet contains 440 mg of paracetamol when each tablet has a total weight of 500 mg. [1] (accept any other relevant data quoted)	3	many students did not quote data. (Q keyword: with reference to the table above) **Reject:** components are not chemically combined together (you cannot tell this from the data given)
	b)	compound [1] It is **made up of different elements**, which are carbon, hydrogen, oxygen and nitrogen. [1] It has **different physical properties from the elements** which it is made up of. [1]	3	**Accept:** have the **ratio** of carbon: hydrogen: nitrogen: oxygen is **fixed at 8:9:1:2** (must quote the ratio)
	c)	Both paracetamol and caffeine are made up of **elements carbon, hydrogen, oxygen and nitrogen.** [1] The **ratio (proportion) of carbon: hydrogen: nitrogen: oxygen** in paracetamol is 8:9:1:2 and in caffeine is 8:10:4:2. [1]	2	**Reject:** • Made up of same substances / components • N & O are chemically combined in paracetamol but not in caffeine **Accept:** • Different number of atoms
	d)			**Removed from paper. Total is 98 marks, to be converted to 98%.**

10.	ci)	Water boils faster in a ceramic pot than in a metal pot **OR** Water boils faster in a metal pot than in a ceramic pot. (reject if answer provides explanation)	1	**Reject:** • water in ceramic pot boils first • metal pot is a good conductor of heat • the material of the pot affects the time taken for water to boil • the conductivity of the material affects the time taken for the water to boil.
	cii)	The controlled variable is the **volume of water** added into the pot [1, variable], as **different volume** will **change** the time taken for it to boil [1, reason]. Other possible controlled variables: size of fire, initial temperature of water, size of pot	2	**Reject:** • Type of water, type of fire (a stove only uses non-luminous flame), type of stove Students misunderstood the term 'controlled variable' as the variable that is changed. Controlled variable means a factor that must remain constant. Most students are not able to provide a good reason.
	ciii)	The amount of water added into the pots is not measured [1]. A possible improvement for the experiment will be to measure the amount of water added into the two pots [1]. **OR** The initial temperature of the water is not measured [1] and might be different. A possible improvement will be to ensure that the initial temperature is the same, or measure the difference in temperature. [1] **OR** The size of fire is different [1]. A possible improvement will be to ensure that the size of fire is kept constant.[1] Award 1m for reason and 1m for improvement. **Variable should not be the same as that in part (cii). If the variable is already had been controlled in (cii), it should not be a concern in (ciii).**	2	**Reject:** • The experiment is only done once. Repeat experiment to improve accuracy of results. (unfair is not inaccurate) • Water may boil at different temperatures. • Ceramic pot is thicker than metal pot (there is no way to improve this aspect of the experiment) •

12.	ai)	Q. [1] Aluminium is a metal. Since Q has high electrical conductivity and thermal conductivity and high melting point, it is a metal.[1]	2	Many students mistakenly regard aluminium as a metalloid or aluminium has low melting point and low thermal conductivity.
	aii)	Element T is oxygen. [1] Since sulfur has **similar chemical properties**, T must be in the **same group**.[1]	2	Many students failed to state 'same group'. Some named elements other than oxygen from group VI as they missed the key word 'gas' in the question.
	bi	5 g	1	
	bii	Gas Y	1	
	biii	**Solubility** of all three gases **decreases** as **temperature increases**.	1	Some students stated that the gases are left as residue (but the concept of residue only apply to solid solutes). Some students compared the boiling point of water and the gases (the gas are gaseous in the first place, even in cold water).
	ci	Beaker A	1	
	cii	Small crystals **increase surface area to volume ratio** for water molecules to act on. [1] **Stirring speeds up the rate of dissolving** of the small crystals [1]	2	Many students missed out the 'larger surface are to volume ratio'. Many students still state that a smaller surface area increases the rate of dissolving. Stirring does not increase solubility but the rate of dissolving.