



Delegate Booklet

Course Title:

Welcome to Pearson: IAL Chemistry

About this event

Course Title: Welcome to Pearson: IAL Chemistry

Course Code: YCH11-23IF2

Aims and objectives of the event

- ❖ To gain an understanding about how the qualification is devised
- ❖ To understand the content of the qualification
- ❖ To understand the assessment of the qualification and how to cover the content
- ❖ To explore how to plan the course
- ❖ To network and share ideas with other teachers



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Agenda

Time	Item
10.00 – 10.10	Welcome and introductions
10.10 – 11.15	Session 1 – Understanding the qualification and assessment
11.15 – 11.30	MORNING BREAK
11.30 – 12.45	Session 2 (Part 1) – Assessment objectives and exemplars
12.45 – 13.45	LUNCH
13.45 – 14.45	Session 2 (Part 2) – Assessment objectives and exemplars (cont)
14.45 – 15.00	AFTERNOON BREAK
15.00 – 16.00	Session 3 – Support



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PERSONAL LEARNING

Things to do:

-
-
-
-
-

Things to avoid:

-
-
-
-
-

Your ideas:



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ACTIVITY 1

Which specification point is the following question assessing?

- (ii) Explain how the electrical conductivity, high melting temperature and malleability of metals depend on their structure and bonding.

(3)

Electrical conductivity

.....

.....

High melting temperature

.....

.....

Malleability

.....

.....



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ACTIVITY 2

Devise a multiple-choice question to assess the specification statement 9.10



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ACTIVITY 3

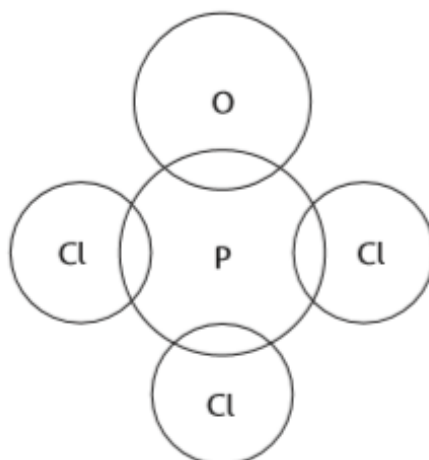
What are the essential points to include when answering the following two questions?

(c) The compound POCl_3 has a simple molecular structure.

(i) Complete the dot-and-cross diagram for the POCl_3 molecule.

Use crosses (x) for the phosphorus electrons, dots (•) for the chlorine electrons and circles (o) for the oxygen electrons.

(2)



(ii) Explain the shape of this molecule using the electron-pair repulsion theory.

(3)



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ACTIVITY 4

What is the answer to the following question?

- (ii) Explain why iodine is very soluble in cyclohexane but only slightly soluble in water.**
(2)



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ACTIVITY 5

Assigning AOs to questions

Assign an AO to each of the following questions/part questions

1 Which statement is **not** true for sodium chloride?

- ☐ A sodium chloride conducts electricity in aqueous solution
- ☐ B sodium chloride conducts electricity when molten
- ☐ C sodium chloride has a molecular structure
- ☐ D sodium chloride has a giant structure

AO:

12 In an experiment, 50.0 cm^3 of 1.0 mol dm^{-3} HCl(aq) reacts with 50.0 cm^3 of 1.0 mol dm^{-3} NaOH(aq) .

The energy released = 2500 J .

The specific heat capacity of the mixture is $4.18\text{ J g}^{-1}\text{ }^{\circ}\text{C}^{-1}$

What temperature change occurs in the reaction?

- ☐ A an increase of 6.0°C
- ☐ B a decrease of 6.0°C
- ☐ C an increase of 12.0°C
- ☐ D a decrease of 12.0°C

AO:



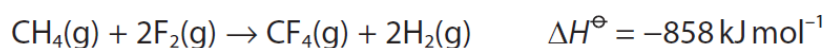
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8 Which of these sulfates is the **least** soluble in water?

- ☐ A CaSO_4
- ☐ B BaSO_4
- ☐ C K_2SO_4
- ☐ D Rb_2SO_4

AO:

9 Use the data shown.



What is the standard enthalpy change of formation of methane (CH_4) in kJ mol^{-1} ?

- ☐ A -1791
- ☐ B -75
- ☐ C $+75$
- ☐ D $+1791$

AO:



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22 This question is about fuels and polymers.

Used coffee grounds have been suggested as a carbon-neutral fuel to replace some fossil fuels.

(a) (i) Explain why coffee grounds might be considered a carbon-neutral fuel. (2)

(ii) Explain how the use of fossil fuels causes climate change. (2)

AO:

22 (d) Alkenes, such as ethene, can be used to make polymers.

(i) Write a balanced equation for the polymerisation of ethene using displayed formulae. (1)

(ii) Bananas produce ethene as they ripen.

Suggest one advantage and one disadvantage of using ripening bananas as a source of ethene for polymer production. (2)

AO:



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(d) A sample of ammonium carbonate was dissolved in distilled water and the solution tested.

Complete the table to give the expected observations and the identity of the observed products.

	Test	Observation	Observed product	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	(2)
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	(2)

AO:



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ACTIVITY 6:

Command words

The following table lists the command words used in the external assessments.

Command word	Definition
Add/Label	Requires the addition or labelling of a stimulus material given in the question, for example labelling a diagram or adding units to a table.
Calculate	Obtain a numerical answer, showing relevant working.
Comment on	Requires the synthesis of a number of variables from data/information to form a judgement.
Complete	Requires the completion of a table/diagram.
Deduce	Draw/reach conclusion(s) from the information provided.
Describe	To give an account of something. Statements in the response need to be developed, as they are often linked but do not need to include a justification or reason.
Determine	The answer must have an element that is quantitative from the stimulus provided, or must show how the answer can be reached quantitatively. To gain maximum marks, there must be a quantitative element to the answer.
Design	Plan or invent a procedure from existing principles/ideas.
Discuss	<ul style="list-style-type: none">Identify the issue/situation/problem/argument that is being assessed within the question.Explore all aspects of an issue/situation/problem/argument.Investigate the issue/situation etc. by reasoning or argument.
Draw	Produce a diagram either using a ruler or freehand.
Estimate	Find an approximate value, number or quantity from a diagram/given data or through a calculation.
Evaluate	Review information (e.g. data, methods) then bring it together to form a conclusion, drawing on evidence including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject's quality and relate it to its context.
Explain	An explanation requires a justification/exemplification of a point. The answer must contain some element of reasoning/justification – this can include mathematical explanations.
Give/State/Name	All of these command words are really synonyms. They generally all require recall of one or more pieces of information.
Give a reason/reasons	When a statement has been made and the requirement is only to give the reason(s) why.
Identify	Usually requires some key information to be selected from a given stimulus/resource.



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Command word	Definition
Justify	Give evidence to support (either the statement given in the question or an earlier answer).
Plot	Produce a graph by marking points accurately on a grid from data that is provided and then draw a line of best fit through these points. A suitable scale and appropriately labelled axes must be included if these are not provided in the question.
Predict	Give an expected result.
Show that	Verify the statement given in the question.
Sketch	Produce a freehand drawing. For a graph, this would need a line and labelled axes with important features indicated. The axes are not scaled.
State what is meant by	When the meaning of a term is expected but there are different ways for how these can be described.
Suggest	Use your knowledge to propose a solution to a problem in a novel context.
Verb preceding a command word	
Analyse the data/graph to explain	Examine the data/graph in detail to provide an explanation.
Multiple choice questions	
What, Why	Direct command words used for multiple-choice questions.



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ACTIVITY 7a

AO2a in Exams

UNIT 1, Q24(a)

In some airbags, solid sodium azide (NaN_3) decomposes forming nitrogen gas and sodium as the only products.

(a) Write an equation for the decomposition of sodium azide.
State symbols are not required.

(1)

Question Number	Answer	Additional guidance	Mark
24(a)	<ul style="list-style-type: none">correct equation	$2\text{NaN}_3 \rightarrow 2\text{Na} + 3\text{N}_2$ Accept $\text{NaN}_3 \rightarrow \text{Na} + 1.5\text{N}_2$ Accept $\text{NaN}_3 \rightarrow \text{Na} + 3/2 \text{N}_2$ Allow multiples Ignore state symbols even if incorrect Do not award Na_2	(1)

UNIT 2, Q20(b)

20 (b) (iii) Explain the trend in thermal stability of Group 2 carbonates. (4)

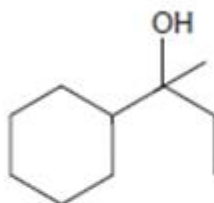
Question Number	Answer	Additional guidance	Mark
20(b)(iii)	<p>An explanation that makes reference to the following points</p> <ul style="list-style-type: none">Group 2 carbonates increase in (thermal) stability as you go down the group (1)size of the (metal) ion increases / charge density (of ion) decreases (1)so metal ion is less polarising <p>or</p> <p>(electron cloud of) anion less distorted (1)</p> <ul style="list-style-type: none">so weakens (covalent) bonds in carbonate ion less / more energy needed to break (covalent) bonds in carbonate (1)	<p>Accept reverse argument</p> <p>Each marking point is independent</p> <p>Ignore 'atomic radius'</p> <p>Allow C-O or C=O as alternative for 'bonds in carbonate'</p>	(4)



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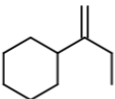
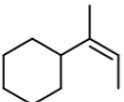
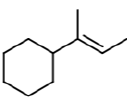
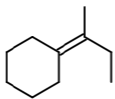
UNIT 2, Q22(b)(i)

22 An alcohol **Y** has the structure shown.



(b) **Y** reacts with concentrated phosphoric(V) acid, H_3PO_4 , to form four isomers with the molecular formula $\text{C}_{10}\text{H}_{18}$.

(i) Draw the skeletal formulae of the **four** isomers formed in this reaction. (4)

Question Number	Answer	Additional guidance	Mark
22 (b)(i)	<div> (1)</div> <div> (1)</div> <div> (1)</div> <div> (1)</div>	Allow any unambiguous type of structure	(4)



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ACTIVITY 7b

AO2a in Exams – Student Answers

UNIT 1, Q24(a)

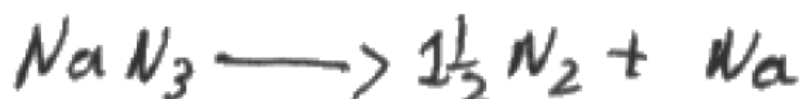
Student 1



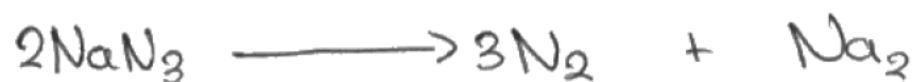
Student 2



Student 3



Student 4





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UNIT 2, Q20(b)

Student 1

Thermal stability of group 2 carbonates decreases down the group. Because the size of the cation increases as the inner shielding increases with the same no. of ~~extra~~ valency electron. The atomic radius increases down the group. The size of the cation ~~is~~ remain the same. The charge density ~~increases~~ decreases. \therefore the distortion of electron cloud by group 2 carbonates decreases down the group and \therefore thermal stability decreases down the group.

Student 2

Down the group, the number of shells increase, therefore size increases. Charge ~~increases~~ as the number of protons increases. Charge density remains the same. ~~Be~~ Polarisation decreases, i.e. the distortion of CO_3^{2-} decreases. Thus down ~~the~~ group \therefore the thermal stability of group 2 carbonates increases.



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Student 3

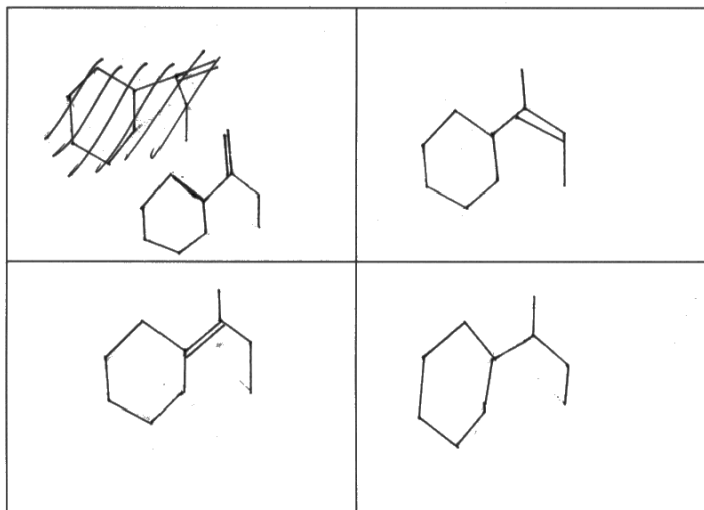
- Going down the group 2, thermal stability of carbonates increases.
- This is because going down the group, the ionic radius of cations increase, and the charge stays +2, so the charge density of the cations decrease.
- This causes the anion (CO_3^{2-}) to be less distorted, so the C-O bond is less weakened and decomposition ability decrease.



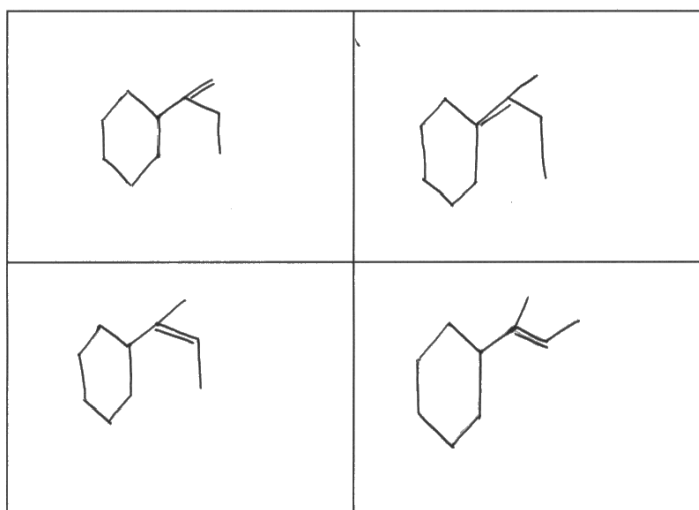
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UNIT 2, Q22(b)(i)

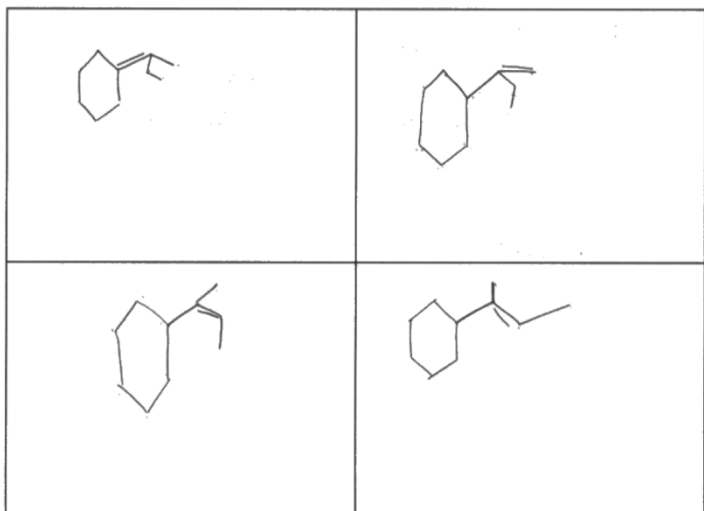
Student 1



Student 2



Student 3





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ACTIVITY 8a

AO2b in Exams

UNIT 1, Q22(e)(ii)

(e) Burning poly(chloroethene) in an incinerator results in the formation of hydrogen chloride.

(ii) Suggest how the hydrogen chloride could be removed from the waste gases produced in an incinerator. (1)

Question Number	Answer	Additional guidance	Mark
22 (e)(ii)	<ul style="list-style-type: none">use of basic/alkaline (scrubbers) / form a <u>ppt/salt/solid</u>orinjection of powdered activated carbon (to the flue)orpass through water / <u>dissolve</u> the HCl in water	<p>Allow named examples of basic/alkaline chemicals e.g. NH_3, NaOH, CaCO_3 etc</p> <p>Scrubbers alone is insufficient</p> <p>Accept adsorption in granular activated carbon or coke beds</p> <p>Allow dissolve in steam</p> <p>Ignore fractional distillation of gases</p> <p>Do not award general descriptions of recycling</p>	(1)

UNIT 2, Q23(c)

23 Propanoic acid, $\text{CH}_3\text{CH}_2\text{COOH}$, is a colourless liquid used as a preservative in animal feed. Propanoic acid can be formed by oxidising the alcohol propan-1-ol.

Propan-1-ol is heated with a concentrated solution of acidified potassium dichromate(VI).

(c) A student suggested using universal indicator to check for the presence of propanoic acid formed in the reaction mixture.

Give a reason why the result of this test is **not** likely to be conclusive. (1)

Question Number	Answer	Additional guidance	Mark
23(c)	<ul style="list-style-type: none">colour of the potassium dichromate(VI) / chromium(III) will mask the colour of the indicatororthe reaction mixture will contain hydrogen ions / acid (present from the oxidising agent)	<p>Ignore references to 'not a sharp colour change'</p> <p>Allow any named mineral acid</p>	(1)



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ACTIVITY 8b

AO2b in Exams – Student Answers

UNIT 1, Q22(e)(ii)

Student 1

React Add Ammonia to produce
 NH_4Cl

Student 2

The gases can be passed into a fractionating
column and the hydrogen chloride can be
condensed off by sorting.

Student 3

It can be removed using a gas scrubber.

Student 4

Pass the waste gases through a base
like NaOH . HCl reacts with NaOH
to produce harmless NaCl and H_2O .



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UNIT 2, Q23(c)

Student 1

Because ~~so~~ sulfuric acid could be an impurity
(and the indicator would show positive)

Student 2

Because It has a range of colours which makes it hard
to find the pH of the mixture

Student 3

Universal indicator will show the same results
for any acid be it propanoic or hydrochloric
Even propan-1-ol has an acidic feature so universal
indicator will still show acidity present in the mixture

Student 4

The reaction mixture turns green when
oxidised so no colour of the indicator ~~will~~
will ~~show~~ ~~show~~



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ACTIVITY 9a

AO3 in Exams

UNIT 3, Q1

- 1 The use of ammonium carbonate in smelling salts is due to the formation of ammonia which counters the effects that cause fainting.

When ammonium carbonate is heated gently, it decomposes to form ammonia, water and carbon dioxide.

- (a) Write the equation for the decomposition of ammonium carbonate.
State symbols are not required.

(1)

- (b) Complete the table, giving a **chemical** test, not involving indicators, and its result for each of the products of the decomposition of ammonium carbonate.

(6)

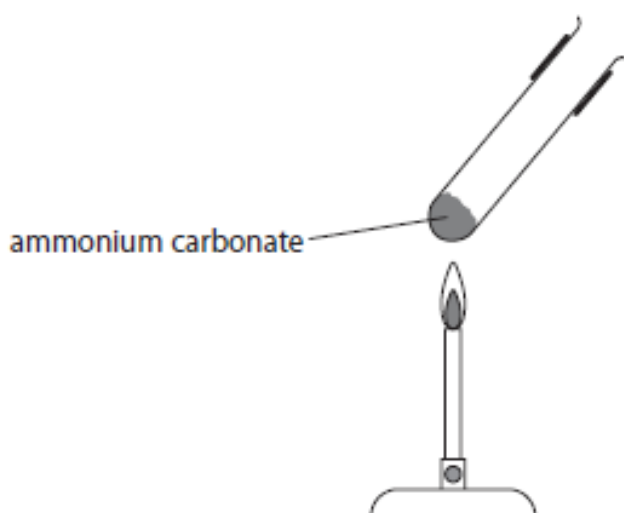
Product	Chemical test	Result of test
ammonia		
water		
carbon dioxide		



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- (c) Complete the diagram to show how you would collect the carbon dioxide obtained by heating ammonium carbonate, using another test tube as the **only** additional apparatus.

(1)



- (d) A sample of ammonium carbonate was dissolved in distilled water and the solution tested.

Complete the table to give the expected observations and the identity of the observed products.

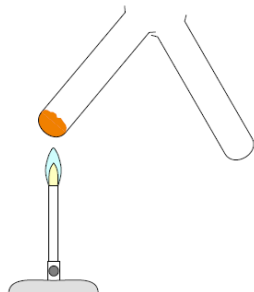
	Test	Observation	Observed product	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	 	 	(2)
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	 	 	(2)



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Question number	Answer	Additional guidance	Mark
1(a)	<ul style="list-style-type: none"> correct balanced equation 	Example of correct equation: $(\text{NH}_4)_2\text{CO}_3 \rightarrow 2\text{NH}_3 + \text{H}_2\text{O} + \text{CO}_2$ Allow multiples H_2CO_3 for $\text{H}_2\text{O} + \text{CO}_2$ Ignore state symbols even if incorrect	(1)

Question Number	Answer	Additional guidance	Mark
1(b)	<p>For ammonia</p> <ul style="list-style-type: none"> test: reaction with hydrogen chloride / HCl(g) (1) result: white smoke (1) <p>For water</p> <ul style="list-style-type: none"> test: add (anhydrous) copper(II) sulfate or cobalt(II) chloride (1) result: white to blue or blue to pink (1) <p>For carbon dioxide</p> <ul style="list-style-type: none"> test: (add / add to) lime water or (saturated) solution of calcium hydroxide (1) result: any indication that a white suspension is formed (1) 	For all the tests ignore indicators If name and formula given both must be correct Observation marks are dependent on test Allow (add / introduce / place next to) HCl If HCl(aq) / conc HCl is used a suitable method is needed e.g. dipping a glass rod into HCl(aq) or opening a bottle of HCl(aq) close to the ammonia. Do not award 'add hydrochloric acid' / HCl(aq) / other hydrogen halides but allow the result mark Allow white fumes / white solid Do not award steamy / misty fumes / precipitate / cloud Accept CuSO_4 / CoCl_2 If start & finish colours are given both must be correct Allow just CuSO_4 turns blue or CoCl_2 turns pink Allow observation mark if CuSO_4 / CoCl_2 solutions are used Do not award CoCl_2 turns red Ignore boiling temperature measurement Accept $\text{Ca(OH)}_2(\text{aq})$ turns cloudy / turns milky / white precipitate forms	(6)

Question number	Answer	Additional guidance	Mark
1(c)	Diagram showing collecting test tube angled down with mouth of the tube close to and below that of the heated test tube	Example of diagram:  ALLOW angles to the vertical 0—75° Ignore lime water in collecting tube Do not award if additional apparatus used e.g. delivery tube. Do not award if horizontal distance between test tube lips > 1cm	(1)



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Question number	Answer	Additional guidance	Mark
1(d)(i)	An answer that makes reference to the following points: <ul style="list-style-type: none">white and precipitate (forms) (1)identifies the precipitate as barium carbonate (1)	Ignore subsequent tests in (i) and (ii) Allow white solid / crystals Accept formula BaCO_3 If name and formula are given, both must be correct Ignore ammonium chloride (and water) if the precipitate is clearly identified	(2)

Question number	Answer	Additional guidance	Mark
1(d)(ii)	An answer that makes reference to the following points: <ul style="list-style-type: none">effervescence (precipitate dissolves) (1)carbon dioxide (is evolved) (1)	Accept bubbling / bubbles / fizzing Ignore gas evolves Accept formula CO_2 Ignore barium chloride / BaCl_2 (product) ammonium chloride / NH_4Cl water / H_2O	(2)



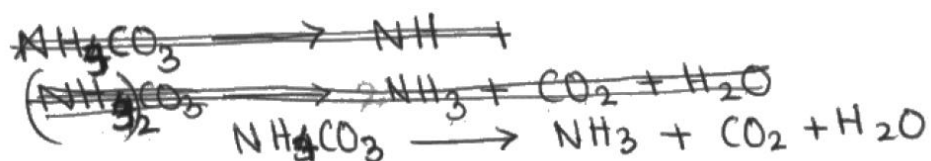
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ACTIVITY 9b

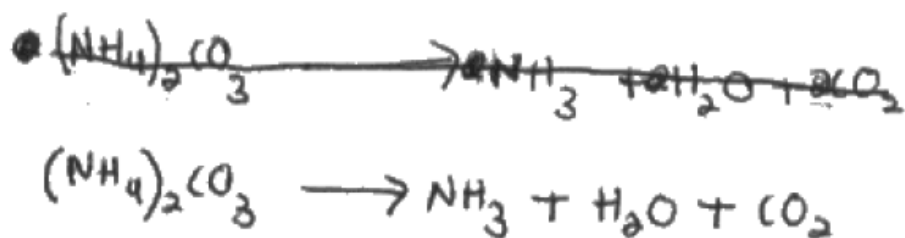
AO3 in Exams – Student Answers

UNIT 3, Q1(a)

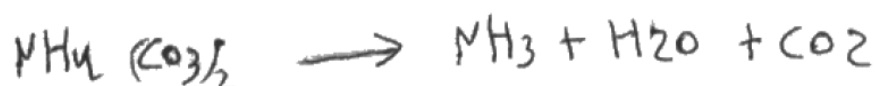
Student 1



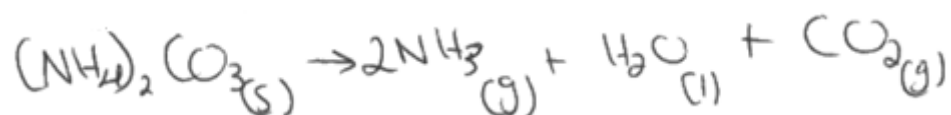
Student 2



Student 3



Student 4





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UNIT 3, Q1(b)

Student 1

Product	Chemical test	Result of test
ammonia	place tube of ammonia close to an open bottle of conc. HCl	white fumes are produced (NH_4Cl)
water	Add to calcium chloride	turns from white to Blue
carbon dioxide	PASS through lime water ($\text{Ca}(\text{OH})_2$)	Turns milky (white ppt - CaCO_3)

Student 2

Product	Chemical test	Result of test
ammonia	Damp litmus paper	turns red litmus paper blue
water	limewater put thermometer and boil it	turns it cloudy or milky boils at 100°C
carbon dioxide	limewater put CO_2 into limewater	turns it cloudy or milky



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Student 3

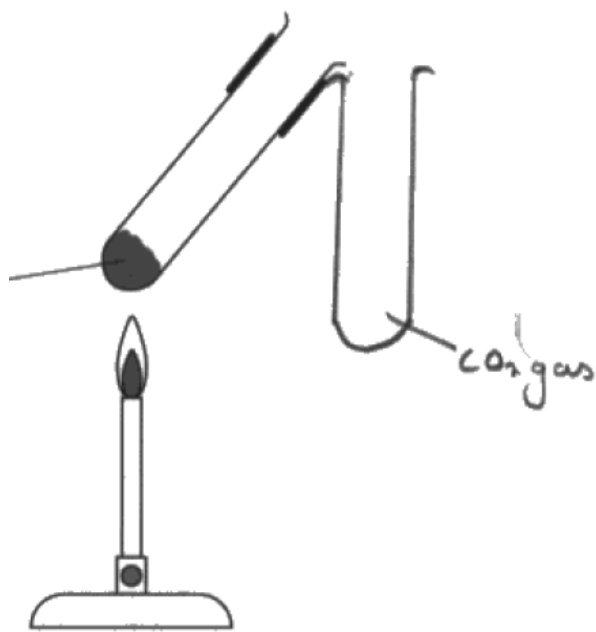
Product	Chemical test	Result of test
ammonia	add excess sodium hydroxide HCl	white precipitate forms
water	add anhydrous copper(II) sulphate	colour changes from white to blue
carbon dioxide	add lime water	turns milky



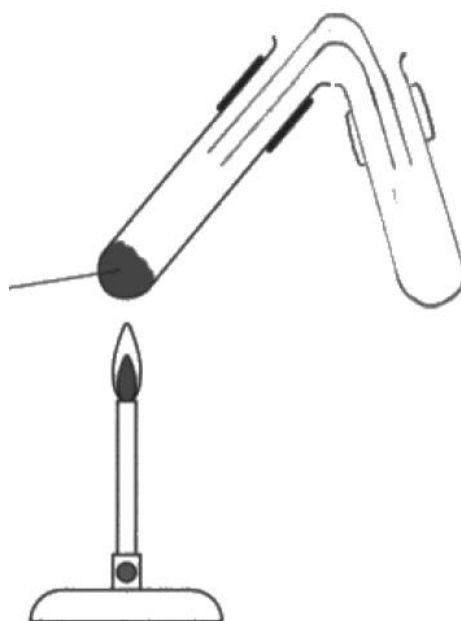
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UNIT 3, Q1(c)

Student 1



Student 2





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UNIT 3, Q1(d)(i) & (ii)

Student 1

	Test	Observation	Observed product	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	Insoluble	BaCO ₃	(2)
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	Fizzing	CO ₂	(2)

Student 2

	Test	Observation	Observed product	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	A white precipitate ppt forms	Barium carbonate Ammonium chloride	(2)
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	precipitate dissolves	formation of Barium chloride	(2)



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Student 3

	Test	Observation	Observed product	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	vigorous effervescence and white precipitate.	Barium carbonate Hydrochloric acid	(2)
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	effervescence is produced.	a gas that turns lime water cloudy, effervescence (CO ₂)	(2)

Student 4

	Test	Observation	Observed product	
(i)	About 1 cm ³ of barium chloride solution was added to 5 cm ³ of the ammonium carbonate solution	A white precipitate forms	Barium carbonate, BaCO ₃	(2)
(ii)	About 5 cm ³ of hydrochloric acid was added to the mixture from (i)	The precipitate dissolves, effervescence	BaCl ₂ and CO ₂ forms. H₂O forms.	(2)