Delegate Booklet

Course Title

Pearson Edexcel International A Level Chemistry:

Welcome to Pearson (Module 2)

YCH11-24IO2

ACTIVITY 4a – 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. (1)
State symbols are not required.

Question Number	Answer	Additional guidance	Mark
24(a)	• correct equation	$2NaN_3 \rightarrow 2Na + 3N_2$ Accept $NaN_3 \rightarrow Na + 1.5N_2$ Accept $NaN_3 \rightarrow Na + 3/2\ N_2$ 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)	An explanation that makes reference to the following points • 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 or (electron cloud of) anion less distorted **(1)** • so weakens (covalent) bonds in carbonate ion less / more energy needed to break (covalent) bonds in carbonate **(1)**	Accept reverse argument Each marking point is independent Ignore 'atomic radius" Allow C-O or C=O as alternative for 'bonds in carbonate'	**(4)**

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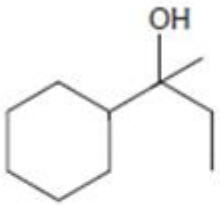
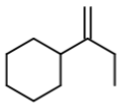
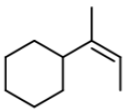
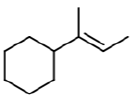
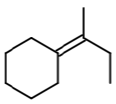
UNIT 2, Q22(b)(i)

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 $C_{10}H_{18}$.

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

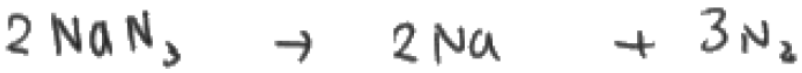
Question Number	Answer	Additional guidance	Mark
22 (b)(i)	 **(1)**  **(1)**  **(1)**  **(1)**	Allow any unambiguous type of structure	**(4)**

ACTIVITY 4b – AO2a in Exams – Student Answers

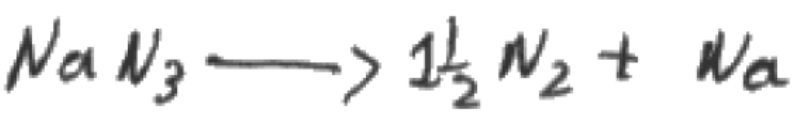
UNIT 1, Q24(a)

Student 1

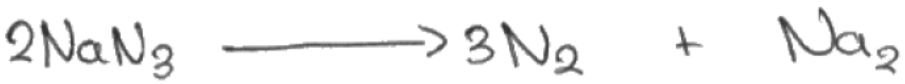
Student 2



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 ~~of~~ valency electron. The atomic radius increases down the group. The size of the cation ~~d~~ remain the same. The charge density ~~increases~~ decreases. ∴ the distortion of electron cloud by group 2 carbonates decreases down the group and ∴ 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.

~~Re~~ Polarisation decreases, i.e. the distortion of CO_3^{2-} decreases.

Thus down the group ∝ the thermal stability of group 2 carbonates increases

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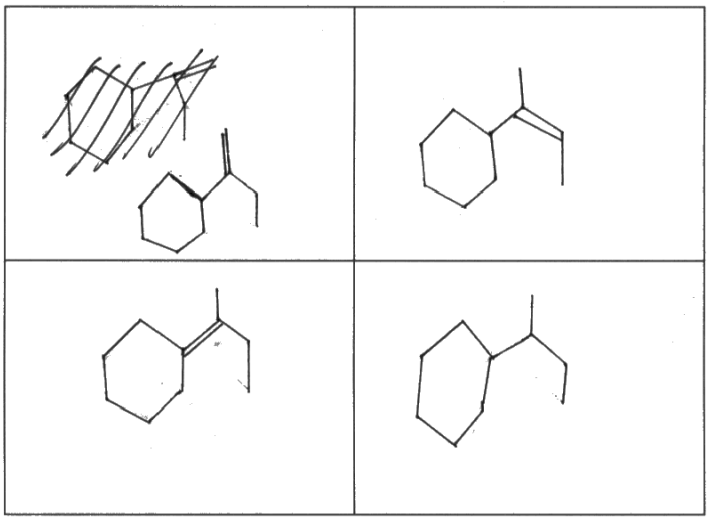
Student 3

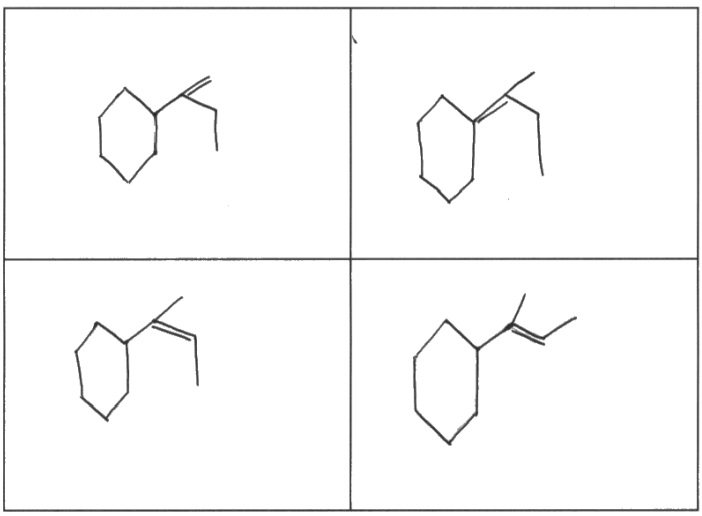
- Going down the group 2 thermal stability of carbonates increases.
- This is because going down the group, the ionic radius of cations increase, and the charge stays +2, so the charge density of the cations decrease.
- This causes the anion (CO_3^{2-}) to be less distorted, so the C–O bond is less weakend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

UNIT 2, Q22(b)(i)

Student 1



Student 2



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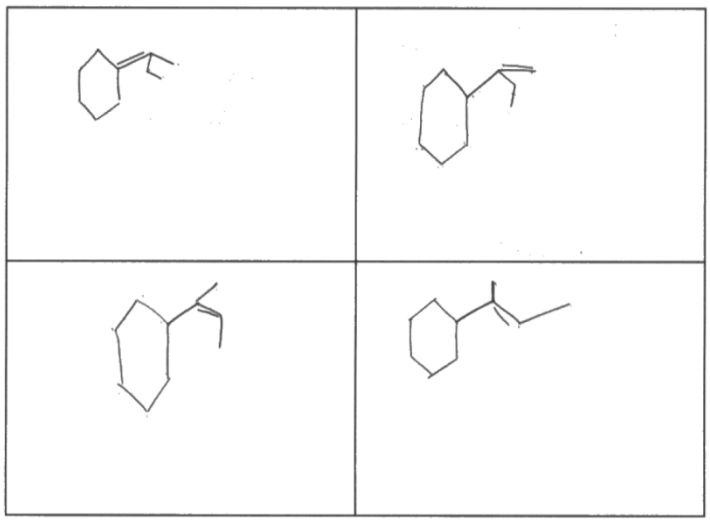
Student 3



ACTIVITY 5a – 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)	• use of basic/alkaline (scrubbers) / form a ppt/salt/solid or injection of powdered activated carbon (to the flue) or pass through water / dissolve the HCl in water	Allow named examples of basic/alkaline chemicals e.g. NH_3, NaOH, $CaCO_3$ etc Scrubbers alone is insufficient Accept adsorption in granular activated carbon or coke beds Allow dissolve in steam Ignore fractional distillation of gases Do not award general descriptions of recycling	(1)

UNIT 2, Q23(c)

23 Propanoic acid, CH_3CH_2COOH, 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)	• colour of the potassium dichromate(VI) / chromium(III) will mask the colour of the indicator or the reaction mixture will contain hydrogen ions / acid (present from the oxidising agent)	Ignore references to 'not a sharp colour change' Allow any named mineral acid	**(1)**

ACTIVITY 5b – 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

can be removed using a gas scrubber

Student 4

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

UNIT 2, Q23(c)

Student 1

Because ~~sotp~~ 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

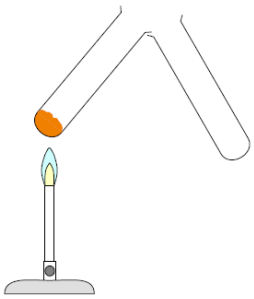
The reaction mixture turns green when oxidised so no colour of the indicater will show.

ACTIVITY 6a – AO3 in Exams

UNIT 3, Q1

Question number	Answer	Additional guidance	Mark
1(a)	• correct balanced equation	Example of correct equation: $(NH_4)_2CO_3 \rightarrow 2NH_3 + H_2O + CO_2$ Allow multiples H_2CO_3 for $H_2O + CO_2$ Ignore state symbols even if incorrect	(1)

Question Number	Answer	Additional guidance	Mark
1(b)		For all the tests ignore indicators If name and formula given both must be correct Observation marks are dependent on test	(6)
	For ammonia	Allow (add /introduce / place next to) HCl	
	• test: reaction with hydrogen chloride / HCl(g) **(1)**	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	
	• result: white smoke **(1)**	Allow white fumes / white solid Do not award steamy / misty fumes / precipitate /cloud	
	For water		
	• test: add (anhydrous) copper((II)) sulfate or cobalt((II)) chloride **(1)**	Accept $CuSO_4$ / $CoCl_2$	
	• result: white to blue or blue to pink **(1)**	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	
	For carbon dioxide	Ignore boiling temperature measurement Accept $Ca(OH)_2$((aq))	
	• test: (add / add to) lime water or (saturated) solution of calcium hydroxide **(1)**	turns cloudy / turns milky / white precipitate forms	
	• result: any indication that a white suspension is formed **(1)**		

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)

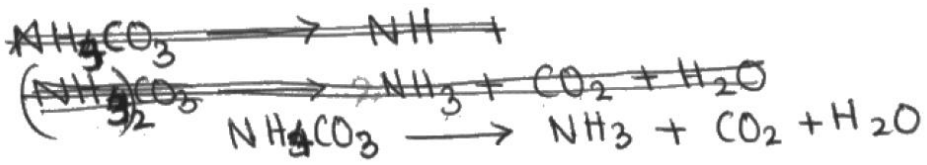
Question number	Answer	Additional guidance	Mark
1(d)(i)	An answer that makes reference to the following points: • white **and** precipitate (forms) **(1)** • identifies the precipitate as barium carbonate **(1)**	Ignore subsequent tests in (i) and (ii) Allow white solid / crystals Accept formula $BaCO_3$ 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: • 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)**

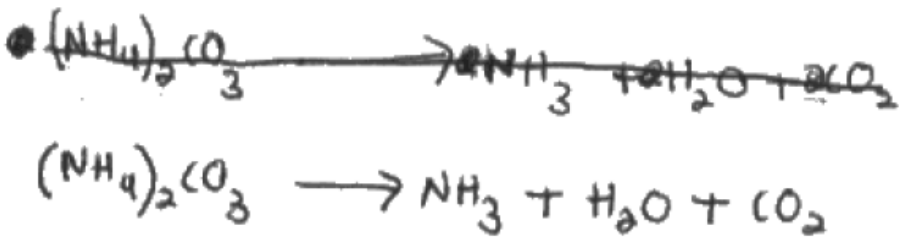
ACTIVITY 6b – AO3 in Exams – Student Answers

UNIT 3, Q1(a)

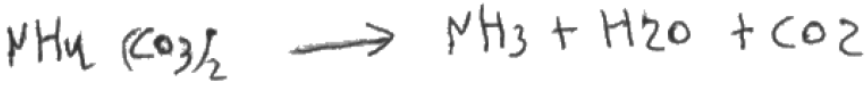
Student 1



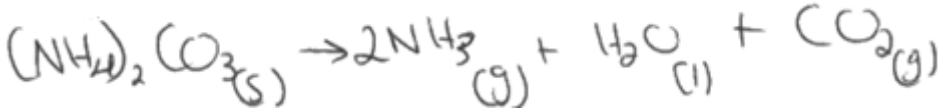
Student 2



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 ($Ca(OH)_2$)	Turns milky (white ppt - $CaCO_3$)

Student 2

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

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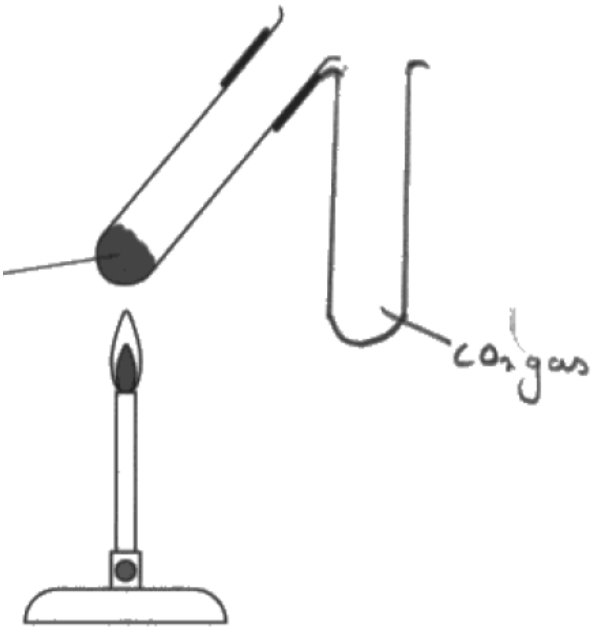
Student 3

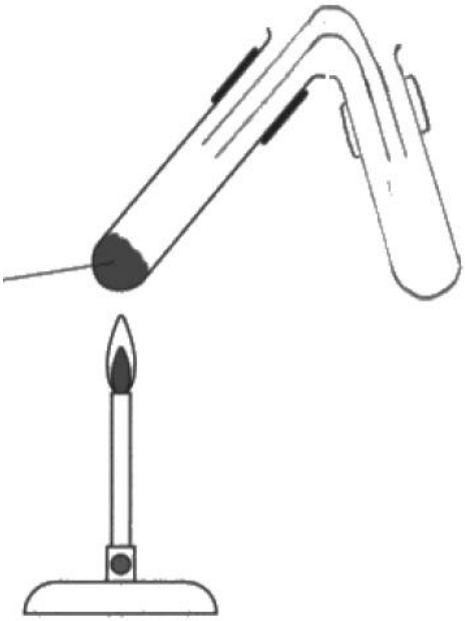
Product	Chemical test	Result of test
ammonia	add ~~[illegible]~~ HCl	white precipitate forms
water	add anhydrous copper(II) sulphate	colour changes from white to blue
carbon dioxide	add lime water	turns milky

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 Attract. 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)

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 limewater cloudy, effervescence (CO_2)	(2)

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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 ~~forms~~ CO_2 ~~and H_2O forms~~.	(2)