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)

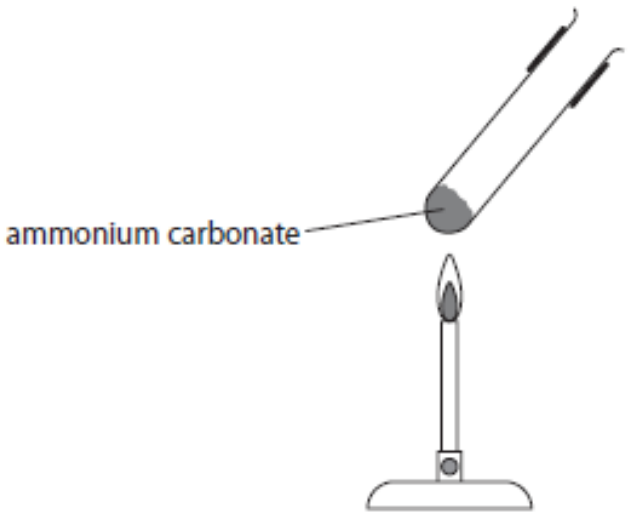
(b) Complete the table, giving a **chemical** test, not involving indicators, and its result for each of the products of the decomposition of ammonium carbonate.

(6)

Product	Chemical test	Result of test
ammonia		
water		
carbon dioxide		

(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.

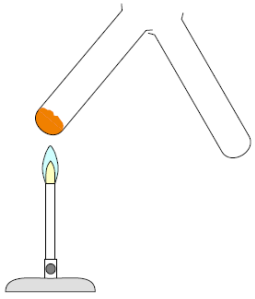
	Test	Observation	Observed product
(i)	About 1 cm^3 of barium chloride solution was added to 5 cm^3 of the ammonium carbonate solution	.....	.....
		.....	.....
		.....	.....
(ii)	About 5 cm^3 of hydrochloric acid was added to the mixture from (i)	.....	.....
		.....	.....
		.....	.....

(2)

(2)

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 ammonia** • test: reaction with hydrogen chloride / HCl(g) **(1)** • result: white smoke **(1)** **For water** • test: add (anhydrous) copper((II)) sulfate or cobalt((II)) chloride **(1)** • result: white to blue or blue to pink **(1)** **For carbon dioxide** • 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 $Ca(OH)_2(aq)$ 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)

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)**