Rewarding Learning

Centre Number

Candidate Number

ADVANCED
General Certificate of Education
2017

Chemistry

Assessment Unit A2 3

assessing

Module 3: Practical Examination

Practical Booklet A

[AC233]

AC233

WEDNESDAY 10 MAY, MORNING

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **both** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 20.
Question 1 is a practical exercise worth 8 marks.
Question 2 is a practical exercise worth 12 marks.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
A Periodic Table of Elements (including some data) is provided.
You may not have access to notes, textbooks and other material to assist you.
Safety glasses must be worn at all times and care should be taken during the practical examination.

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1 Titration

You are required to titrate standard edta solution against a solution of calcium ions.

You are provided with:

a solution of calcium ions

pH 10 buffer solution

edta solution of concentration 0.01 mol dm^{-3}

Eriochrome Black T indicator

a reference sample solution showing the colour at the end point

Carry out the titration by:

- Rinsing and filling the burette with the edta solution.
- Rinsing the pipette with the solution of calcium ions and then transferring 25.0 cm^3 of the solution of calcium ions into a conical flask.
- Using a measuring cylinder add 10 cm^3 of pH 10 buffer solution to the solution in the conical flask.
- Adding **four drops** of Eriochrome Black T indicator solution to the conical flask and swirling the mixture.
- Titrating 0.01 mol dm^{-3} edta solution against the contents of the conical flask until the colour matches the reference sample provided.

Present your results in a suitable table and calculate the average titre.

[8]

[Turn over

2 Observation

(a) You are provided with a solid salt, labelled **A**. Transfer **A** into a small beaker and dissolve in 50 cm^3 of deionised water. Carry out the following tests on the solution of **A** and record your observations in the spaces below.

	Test	Observations
1	Add 5 drops of sodium hydroxide solution to a test tube one quarter filled with the solution of **A**. Add a further 3 cm^3 of sodium hydroxide solution to the test tube.	[1] [1]
2	Add 5 drops of barium chloride solution to a test tube one quarter filled with the solution of **A**.	[1]
3	**(a)** Add 4 cm^3 of potassium manganate(VII) solution and 1 cm^3 of sulfuric acid to a test tube. Add 6 cm^3 of the solution of **A** and shake the mixture gently. Pour approximately half of this solution into another test tube. **(b)** Add 5 drops of potassium thiocyanate solution to one of the test tubes. **(c)** Add 5 drops of sodium hydroxide solution to the other test tube. Do not shake the test tube.	[2] [2] [1]

(b) You are provided with a solution of an organic liquid, labelled **B**. Carry out the following tests and record your observations in the table below.

Test	Observations
1 Fill a test tube one quarter full with **B**. Record the initial temperature. Add 2 cm of magnesium ribbon to **B**. Record the final temperature.	[2]
2 Fill a test tube one quarter full with **B**. Record the initial temperature. Add a spatula measure of ammonium carbonate to **B**. Record the final temperature.	[2]

THIS IS THE END OF THE QUESTION PAPER

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Question Number	Marks	
	Examiner Mark	Remark
1		
2		
Total Marks		

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APPARATUS AND MATERIALS LIST

Advice for centres

- All chemicals used should be at least laboratory reagent specification and labelled with appropriate safety symbols, e.g. irritant.

- **Ensure all chemicals are in date otherwise expected observations may not be seen.**

It is the responsibility of the centre to be cognisant of all health and safety issues and to carry out a thorough risk assessment. Up to date information can be obtained at www.cleapss.org.uk

Each candidate must be supplied with safety goggles or glasses.

Question No. 1

Each candidate must be supplied with:

- one 50 cm^3 burette of at least class B quality;
- a funnel for filling the burette;
- a retort stand and clamp;
- two beakers of 100 cm^3 capacity;
- one 25 cm^3 pipette of at least class B quality;
- a safety pipette filler;
- three conical flasks of 250 cm^3 capacity;
- a white tile or white paper;
- a wash bottle containing deionised water;
- one 10 cm^3 measuring cylinder;
- Eriochrome Black T indicator solution labelled **Eriochrome Black T**, labelled **handle with caution**. This is made by adding 0.2 g of solid Eriochrome Black T to 15 cm^3 of concentrated ammonia solution and 5 cm^3 of ethanol. This should be made up the day before the examination and should stay in the fume cupboard with droppers available;
- 150 cm^3 of 0.01 mol dm^{-3} edta solution labelled **edta solution 0.01 mol dm^{-3}**, made by diluting an existing 0.1 M solution or by dissolving 18.6 g of the solid hydrated disodium salt of EDTA to 5 dm^3 with deionised water. The formula of this salt is $C_{10}H_{14}N_2Na_2O_8 \cdot 2H_2O$ and it has M_r = 372;
- 150 cm^3 of approximately 0.01 mol dm^{-3} solution of Ca^{2+} labelled **Ca^{2+}(aq)**, made by dissolving 10.0 g of $CaCl_2.6H_2O$ in 5 dm^3 of deionised water;
- 50 cm^3 of pH 10 buffer solution labelled **pH 10 buffer solution**;
- A conical flask containing 30 cm^3 0.01 mol dm^{-3} edta, 30 cm^3 deionised water, 4 drops of Eriochrome Black T indicator, labelled **end point colour reference** (made up on the morning of the practical examination).

  Appropriate amounts should be prepared for the total number of candidates taking the examination.

Question No. 2

Each candidate must be supplied with:

- small beaker (100 cm^3);
- six test tubes;
- a test tube rack;
- a spatula;
- a stirring rod;
- several plastic droppers;
- access to a digital balance;
- a wash bottle;
- a thermometer (0–100 °C) with 1 °C intervals **not** 0.1°C
- 0.6 g of hydrated iron(II) sulfate ($FeSO_4.7H_2O$), labelled **A**, in a sealed sample bottle;
- about 10 cm^3 of sodium hydroxide solution in a reagent bottle/beaker labelled **sodium hydroxide solution** and **corrosive**. This solution should be approximately 2 mol dm^{-3};
- about 10 cm^3 of barium chloride solution in a reagent bottle labelled **barium chloride**. This solution should be approximately 0.1 mol dm^{-3} (20.8 g dm^{-3} for $BaCl_2$ or 24.4 g dm^{-3} for $BaCl_2.2H_2O$);
- about 10 cm^3 of 0.02 mol dm^{-3} potassium manganate(VII) solution in a reagent bottle labelled **potassium manganate(VII) solution**;
- about 3 cm^3 of dilute sulfuric acid (2 mol dm^{-3}) in a reagent bottle labelled **dilute sulfuric acid** and **corrosive**;
- about 1 cm^3 of 0.5 mol dm^{-3} potassium thiocyanate solution in a reagent bottle labelled **potassium thiocyanate solution** and **handle with caution**;
- about 2 cm of magnesium ribbon;
- about 1 g of ammonium carbonate, $(NH_4)_2CO_3$, in a sealed reagent bottle/tub labelled **ammonium carbonate** and **handle with caution**;
- about 30 cm^3 of ethanoic acid solution in a stoppered container labelled **B**. This solution should be approximately 1 mol dm^{-3}.

  Appropriate amounts should be prepared for the total number of candidates taking the examination.

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Periodic Table of the Elements

For the use of candidates taking

Advanced Subsidiary and Advanced Level
Chemistry Examinations

Copies must be free from notes or additions of any kind. No other type of data booklet or information sheet is authorised for use in the examinations.

gce A/AS examinations

chemistry (advanced)

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THE PERIODIC TABLE OF ELEMENTS

I	II										III	IV	V	VI	VII	0
						Group										
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	99 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	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
223 Fr Francium 87	226 Ra Radium 88	227 Ac† Actinium 89														

One mole of any gas at 20 °C and a pressure of 1 atmosphere (10^5 Pa) occupies a volume of 24 dm^3.

Planck Constant = 6.63×10^{-34} Js

Gas Constant = 8.31 J mol^{-1} K^{-1}

Avogadro Constant = 6.02×10^{23} mol^{-1}

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 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	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	242 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	245 Bk Berkelium 97	251 Cf Californium 98	254 Es Einsteinium 99	253 Fm Fermium 100	256 Md Mendelevium 101	254 No Nobelium 102	257 Lr Lawrencium 103

* 58–71 Lanthanum series

† 90–103 Actinium series

a / b x

a = relative atomic mass (approx.)

x = atomic symbol

b = atomic number