eduresourceza.com

Downloaded from eduresourceza.com

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

* 9 4 4 9 0 3 1 3 2 4 *

CHEMISTRY **0620/32**

Paper 3 (Extended) **May/June 2015**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

MODIFIED LANGUAGE

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
A copy of the Periodic Table is printed on page 12.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

© UCLES 2015

CAMBRIDGE International Examinations

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

1 Complete the following table which gives the number of protons, electrons and neutrons in each of the five particles.

particle	number of protons	number of electrons	number of neutrons
.....	19	19	20
$^{56}_{26}Fe$	.....	.....	.....
.....	3	2	4
$^{70}_{31}Ga^{3+}$	.....	.....	.....
.....	34	36	45

[Total: 8]

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

2 The table shows the melting points, boiling points and electrical properties of five substances, **A** to **E**.

substance	melting point / °C	boiling point / °C	electrical conductivity of solid	electrical conductivity of liquid
A	–7	59	poor	poor
B	1083	2567	good	good
C	755	1387	poor	good
D	43	181	poor	poor
E	1607	2227	poor	poor

Choose a substance from the table above to match each of the following descriptions. A substance may be used once, more than once or not at all. Justify each choice with evidence from the table.

One has been completed as an example.

This substance is covalent and is a solid at room temperature (25 °C). .....**D**.....

evidence *Its melting point is above room temperature. It has a low melting point and it does not conduct as a liquid, so it is covalent.*

(a) This substance has a giant covalent structure. .....

evidence .....

..... [3]

(b) This substance is a metal. .....

evidence .....

..... [2]

(c) This substance is a liquid at room temperature (25 °C). .....

evidence .....

..... [3]

(d) This substance is an ionic solid. .....

evidence .....

..... [3]

[Total: 11]

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

3 Calcium reacts with nitrogen to form the ionic compound calcium nitride, Ca_3N_2.

(a) Draw a diagram, based on the correct formula, which shows the charges on the ions and the arrangement of the electrons around the negative ion.

Use o to represent an electron from a calcium atom.
Use x to represent an electron from a nitrogen atom.

[3]

(b) In the lattice of calcium nitride, the ratio of calcium ions to nitride ions is 3 : 2.

(i) What is meant by the term *lattice*?

.....

..... [2]

(ii) In terms of ionic charges, explain why the ratio of ions is 3 : 2.

.....

..... [2]

(c) The reaction between calcium and nitrogen to form calcium nitride is a redox reaction.

In terms of electron transfer, explain why calcium is the reducing agent.

.....

.....

.....

..... [3]

[Total: 10]

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

4 Ammonia is made by the Haber process.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

The forward reaction is exothermic.

Typical reaction conditions are:

- finely divided iron catalyst,
- temperature 450 °C,
- pressure 200 atmospheres.

(a) Explain why the catalyst is used as a very fine powder and larger pieces of iron are not used.

.....

.....

..... [2]

(b) Using the above conditions, the equilibrium mixture contains about 15% ammonia.

State two changes to the reaction conditions which would increase the percentage of ammonia at equilibrium.

.....

.....

..... [2]

(c) Suggest why the changes you have described in **(b)** are **not** used in practice.

.....

.....

..... [2]

[Total: 6]

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

5 Three common methods of preparing salts are shown below.

method **A** adding an excess of an insoluble base or carbonate or metal to a dilute acid and removing excess by filtration

method **B** using a burette and indicator

method **C** mixing two solutions to obtain the salt by precipitation

For each of the following salt preparations, choose a method, **A**, **B** or **C**. Name any additional reagent which is needed and complete the equation.

(a) the soluble salt, nickel chloride, from the insoluble compound nickel carbonate

method .....

reagent .....

word equation .....

[3]

(b) the insoluble salt, lead(II) bromide, from aqueous lead(II) nitrate

method .....

reagent .....

ionic equation ..... + ... → $PbBr_2$

[3]

(c) the soluble salt, lithium sulfate, from the soluble base lithium hydroxide

method .....

reagent .....

equation .....

[4]

[Total: 10]

Downloaded from eduresourceza.com
© UCLES 2015

Downloaded from eduresourceza.com

6 The Atacama desert in Chile has deposits of the salt sodium nitrate. Very large amounts of this salt were exported to Europe for use as a fertiliser. After the introduction of the Haber process in 1913, this trade rapidly diminished.

(a) **(i)** Explain why the introduction of the Haber process reduced the demand for sodium nitrate.

.....

..... [2]

(ii) Suggest why surface deposits of sodium nitrate only occur in areas with very low rainfall such as desert areas.

..... [1]

(iii) The desert has smaller surface deposits of potassium nitrate.

Suggest why potassium nitrate is a better fertiliser than the sodium salt.

..... [1]

(b) All nitrates decompose when heated. The extent to which a nitrate decomposes is determined by the metal in the salt.

(i) Sodium nitrate decomposes to form sodium nitrite, $NaNO_2$.

Write the equation for decomposition of sodium nitrate.

..... [2]

(ii) Sodium nitrite is a reducing agent.

What would be observed if an excess of sodium nitrite solution was added to a solution of acidified potassium manganate(VII)?

..... [2]

(iii) Copper(II) nitrate decomposes to form copper(II) oxide, nitrogen dioxide and oxygen.

What is the relationship between the extent of decomposition and the reactivity of the metal in the nitrate?

.....

..... [1]

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

(c) The equation for the decomposition of copper(II) nitrate is given below.

$$2Cu(NO_3)_2 \rightarrow 2CuO + 4NO_2 + O_2$$

(i) Predict what you would observe when copper(II) nitrate is heated.

.....

.....

..... [3]

(ii) Copper(II) nitrate forms a series of hydrates with the formula $Cu(NO_3)_2.xH_2O$.
All these hydrates decompose to form copper(II) oxide.
1 mole of $Cu(NO_3)_2.xH_2O$ forms 1 mole of CuO.

What is meant by 1 mole of a substance?

.....

..... [2]

(iii) 7.26 g of a hydrate, $Cu(NO_3)_2.xH_2O$, formed 2.4 g copper(II) oxide.

number of moles of CuO formed = ...

number of moles of $Cu(NO_3)_2.xH_2O$ in 7.26 g = ...

mass of 1 mole of $Cu(NO_3)_2.xH_2O$ = ... g

mass of 1 mole of $Cu(NO_3)_2$ is 188 g

the value of *x* in this hydrate = ...

[4]

[Total: 18]

Downloaded from eduresourceza.com
© UCLES 2015

Downloaded from eduresourceza.com

7 Alcohols can be made by fermentation or from petroleum.

(a) Ethanol can be made by the fermentation of glucose.

$$C_6H_{12}O_6(aq) \xrightarrow{\text{yeast}} 2C_2H_5OH(aq) + 2CO_2(g) \text{ exothermic reaction}$$

Yeast are living single-cell fungi which ferment glucose by anaerobic respiration. This reaction is catalysed by enzymes from the yeast.

(i) What is meant by the term *respiration*?

.....

.....

..... [3]

(ii) *Anaerobic* means in the absence of oxygen.

Name the products formed from respiration in the **presence** of oxygen.

..... [1]

(iii) What are enzymes?

..... [1]

(iv) Suggest a method of measuring the rate of this reaction.

.....

..... [1]

(b) The following observations were noted.

- When a small amount of yeast was added to the aqueous glucose the reaction started and the solution went slightly cloudy.
- The reaction rate increased and the solution became cloudier and warmer.
- After a while, the reaction rate decreased and eventually stopped, leaving a 14% solution of ethanol in water.

(i) Why did the reaction rate increase?

..... [1]

(ii) Suggest an explanation for the increase in cloudiness of the solution.

..... [1]

(iii) Give **two** reasons why the fermentation stopped.

.....

..... [2]

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

(c) One use of ethanol is in alcoholic drinks.

Give **two** other uses of ethanol.

..... [2]

(d) Alcohols can be made from petroleum by the following sequence of reactions.

alkanes from petroleum $\rightarrow$ alkene $\rightarrow$ alcohol

Describe the manufacture of ethanol from hexane, C_6H_{14}. Include in your description an equation and type of reaction for each step.

.....

.....

.....

..... [5]

[Total: 17]

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

BLANK PAGE

Downloaded from eduresourceza.com

Downloaded from eduresourceza.com

DATA SHEET
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 †															

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

*58-71 Lanthanoid series
†90-103 Actinoid series

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.).

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

© UCLES 2015

Downloaded from eduresourceza.com