DULWICH COLLEGE
FOUNDED 1619

Possible Topics Examined on the Chemistry Upper School Entrance Examination

With reference to the Edexcel IGCSE Chemistry specification at:

https://qualifications.pearson.com/en/qualifications/edexcel-international-gcses-and-edexcel-certificates/international-gcse-chemistry-2017.html

The following topics may be examined:

- **Any** specification point in Section 1: Principles of Chemistry, *except for points 1.5C–1.7C inclusive, 1.34C–1.35C inclusive and 1.55C–1.60C inclusive.*
- **Any** specification point in Section 2: Inorganic Chemistry, *except for points 2.9–2.14 inclusive, 2.22C–2.27C inclusive, 2.33C and 2.45–2.50 inclusive.*
- **Any** specification point in Section 3: Physical Chemistry, *except for points 3.3–3.4 inclusive, 3.7C, and 3.17–3.22C inclusive.*

No specification points in Section 4: Organic Chemistry will be examined.
A pen, pencil, and calculator is required for the examination.

JCAF

Upper School Entrance Examinations
SPECIMEN PAPER
Chemistry

First Name	
Age	
Current School	

Time Allowed: 45 minutes

Total Marks: 50

1. This question is about isotopes.

(a) (i) The symbol for an atom of one isotope of hydrogen is:

$$^{3}_{1}H$$

State the number of protons, neutrons and electrons present in one atom of this isotope.

Number of protons .....

Number of neutrons .....

Number of electrons .....

(2)

(ii) What is meant by the term **isotopes**?

.....

.....

.....

(2)

(b) Bromine has two naturally-occurring isotopes with mass numbers 79 and 81.

A sample of bromine contained the two isotopes in the following proportions:

bromine-79 = 50.7% and bromine-81 = 49.3%

Use this information to calculate the relative atomic mass of bromine.

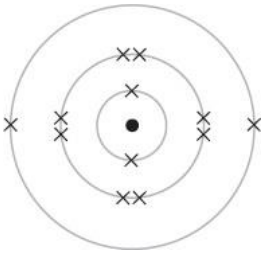
Give your answer to **two** decimal places.

(3)

(Total for Question 1 = 7 marks)

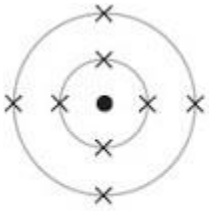
2. Distress flares are used to attract attention in an emergency. The flares contain magnesium, which burns with a bright, white flame to form magnesium oxide.

(a) The diagram shows the electronic configuration of a magnesium atom.

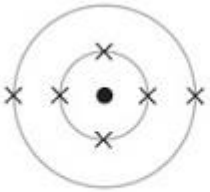


Put a cross in a box to indicate the diagram that shows the electronic configuration of an oxygen atom.

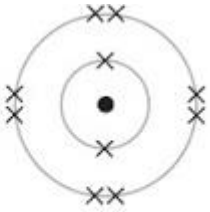
(1)



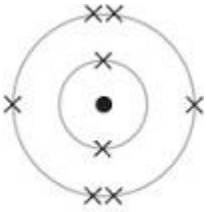
A ☐



B ☐



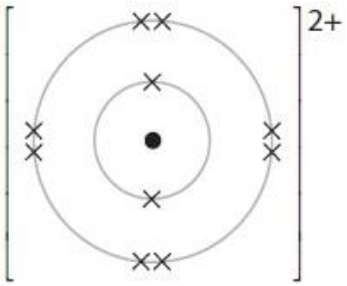
C ☐



D ☐

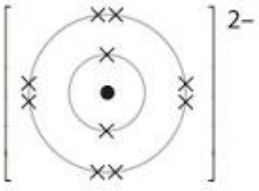
(b) Magnesium ions and oxide ions are formed when magnesium reacts with oxygen.

The diagram shows the electronic configuration and charge of a magnesium ion.

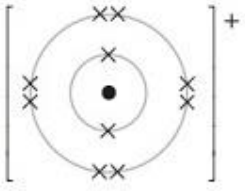


Put a cross in a box to indicate the diagram that shows the electronic configuration and charge of an oxide ion.

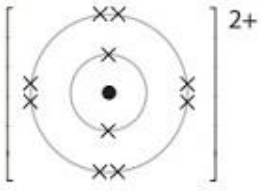
(1)



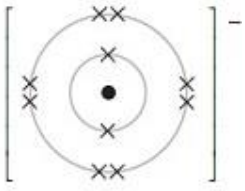
A ☐



B ☐



C ☐



D ☐

(c) A major use of magnesium oxide is as a refractory material, which is a material that can withstand very high temperatures.

Explain, in terms of its structure and bonding, why magnesium oxide has a very high melting point.

.....

.....

.....

.....

.....

.....

.....

(3)

(d) Write a word equation for the reaction of magnesium and hydrochloric acid.

.....

(1)

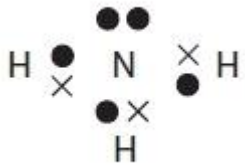
(e) Write a balanced symbol equation for the reaction of magnesium oxide and nitric acid.

.....

(2)

(Total for Question 2 = 9 marks)

3. The diagram represents a particle of ammonia.



(a) This particle of ammonia is

☒ **A** an atom.

☒ **B** an ion.

☒ **C** a lattice.

☒ **D** a molecule.

(1)

(b) Which type of bonding is present in this particle of ammonia?

☒ **A** covalent

☒ **B** hydrogen

☒ **C** ionic

☒ **D** metallic

(1)

(c) What is the formula of ammonia?

.....

(1)

(Total for Question 3 = 3 marks)

4. Bromine, chlorine and iodine are elements in Group 7 of the Periodic Table.

(a) Identify which of these elements has

the palest colour .....

(1)

the highest melting point .....

(1)

(b) Give the name of another Group 7 element that is a **solid** at room temperature.

.....

(1)

(Total for Question 4 = 3 marks)

5. The table shows some properties of four substances **A**, **B**, **C** and **D**.

Substance	Melting point in °C	Boiling point in °C	Conducts electricity when solid?	Conducts electricity when molten?
A	−101	−35	no	no
B	1063	2970	yes	yes
C	801	1413	no	yes
D	3550	4830	no	no

(a) Use the information in the table to identify the substance that

(i) is a metal

☐ **A** ☐ **B** ☐ **C** ☐ **D**

(1)

(ii) could be diamond

☐ **A** ☐ **B** ☐ **C** ☐ **D**

(1)

(iii) is a gas at 20 °C

☐ **A** ☐ **B** ☐ **C** ☐ **D**

(1)

(iv) contains oppositely charged ions

☐ **A** ☐ **B** ☐ **C** ☐ **D**

(1)

(b) Some of the substances in the table are compounds.

What is meant by the term **compound**?

.....

.....

.....

.....

(2)

(c) (i) The electronic configurations of atoms of sodium and chlorine are

Na 2.8.1

Cl 2.8.7

Describe the changes in the electronic configurations of sodium and chlorine when these atoms form sodium chloride.

.....

.....

.....

.....

.....

.....

(3)

(ii) Calculate the relative formula mass of sodium chloride (NaCl).

Use the Periodic Table to help you.

Relative formula mass = ...

(2)

(iii) Describe how you could extract sodium chloride from seawater using distillation. Your answer should refer to the changes of state water undergoes during this process.

.....

.....

.....

.....

.....

(3)

(Total for Question 5 = 14 marks)

6. Iron is a useful metal. One problem with using iron is that it can rust.

(a) (i) Name the iron compound present in rust.

.....

(1)

(ii) Name the **two** substances that iron reacts with when it rusts.

1. .....

2. .....

(2)

(b) What type of reaction occurs in the rusting of iron?

Place a cross (☒) in **one** box.

☒ **A** combustion

☒ **B** decomposition

☒ **C** displacement

☒ **D** oxidation

(1)

(c) Galvanising can prevent iron from rusting. In this process, the iron is coated with another metal.

(i) Identify the other metal.

.....

(1)

(ii) Identify one object suitable for galvanising.

Place a cross (☒) in **one** box.

☒ **A** bicycle chain

☒ **B** bucket

☒ **C** car engine

☒ **D** drink can

(1)

(d) State **two** other methods used to prevent iron from rusting.

1. .....

2. .....

(2)

(e) Calculate the maximum mass of iron (Fe) that can be extracted from 8 g of Fe_2O_3 in a reaction with carbon.

$$\mathbf{2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2}$$

(3)

(Total for Question 6 = 11 marks)

7. A sample of a chlorofluorocarbon (CFC) contains 0.24 g of carbon, 0.38 g of fluorine and 1.42 g of chlorine.

(a) (i) Show, by calculation, that the **empirical** formula of the CFC is $CFCl_2$.

(3)

(ii) The relative formula mass of the CFC is 204.

Deduce the **molecular** formula of the CFC.

Molecular formula = ...

(2)

(Total for Question 7 = 5 marks)

THE PERIODIC TABLE

Period	1	2											3	4	5	6	7	0
	Group																	
1	1 H Hydrogen 1																	4 He Helium 2
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
3	23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
4	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	63.5 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
5	86 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
6	133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	179 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
7	223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89															

Key

Relative atomic mass
Symbol
Name
Atomic number