



DULWICH COLLEGE
FOUNDED 1619

Upper School Entrance Examination

Specimen Paper

Chemistry

Surname	
First Name	
Date of Birth	
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:



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.

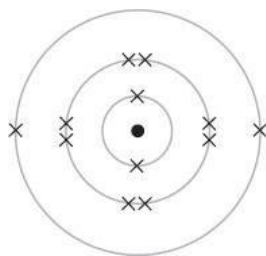
Give your answer to **two** decimal places.

(3)

(Total for Question 1 = 7 marks)

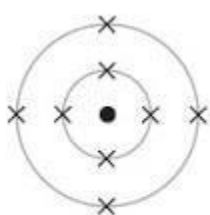
2. Distress flares are used to attract attention in an emergency. The flares contain magnesium, which burns with a bright, white flame to form magnesium oxide.

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

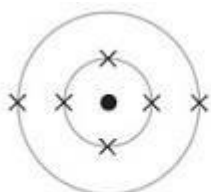


Put a cross in a box to indicate the diagram that shows the electronic configuration of an oxygen atom.

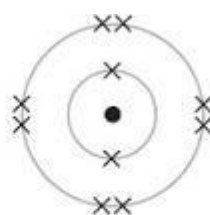
(1)



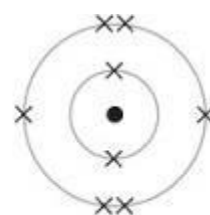
A ☐



B ☐



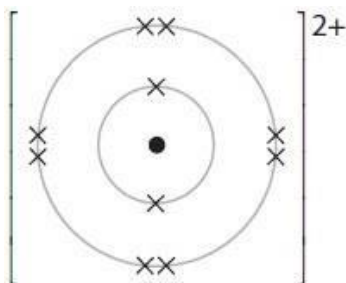
C ☐



D ☐

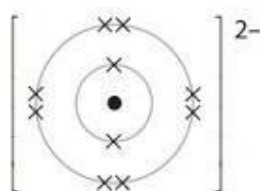
(b) Magnesium ions and oxide ions are formed when magnesium reacts with oxygen.

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

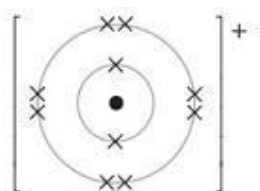


Put a cross in a box to indicate the diagram that shows the electronic configuration and charge of an oxide ion.

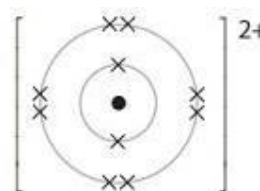
(1)



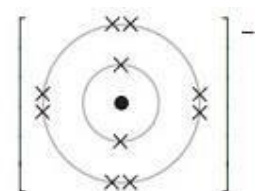
A ☐



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.

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(3)

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

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(1)

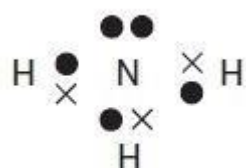
- (e) Write a balanced symbol equation for the reaction of magnesium oxide and nitric acid.

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(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)

6. 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.

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.

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(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.

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(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.

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(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 (X) 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 (X) 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.



(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)

Group	3	4	5	6	7	0
1						
2						

Hydrogen

4	He	Helium	2
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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	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								
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	106	Pd Palladium 46	108	Ag Silver 47	112	Cd Cadmium 48	115	In Indium 49	119	Sn Tin 50	122	Sb Antimony 51	127	Te Tellurium 52	127	I Iodine 53	131	Xe Xenon 54										
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	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											81	Th Thorium 90	91	Pa Protactinium 91	92	U Uranium 92	93	Np Neptunium 93	94	Pu Plutonium 94	95	Am Americium 95	96	Cm Curium 96	97	Bk Berkelium 97	98	Cf Californium 98	99	Es Einsteinium 99	100	Fm Fermium 100	101	Mn Mendelevium 101	102	No Nobelium 102	103	Lr Lawrencium 103

Relative atomic mass	Symbol	Name	Atomic number
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