

New
Specification

Rewarding Learning

General Certificate of Secondary Education
2017–2018

Centre Number

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Candidate Number

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Double Award Science: Chemistry

Unit C1

Higher Tier



[GDW22]

GDW22

THURSDAY 17 MAY 2018, MORNING

TIME

1 hour.

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 **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **4(b)**.

A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

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20GDW2201

1 Transition elements form ions with different charges.

- (a) Iron can form iron(II) oxide and iron(III) oxide.
Which one of the following statements would you expect to be correct?
Put a tick in the correct box.

Both these oxides of iron are white solids

Both these oxides of iron are coloured solids

One of the oxides is a white solid and the other is a coloured solid

[1]

- (b) (i) Describe how you would carry out a flame test to identify the copper(II) ions in copper(II) chloride powder.

[4]

- (ii) What is the flame colour for copper(II) ions?

[1]





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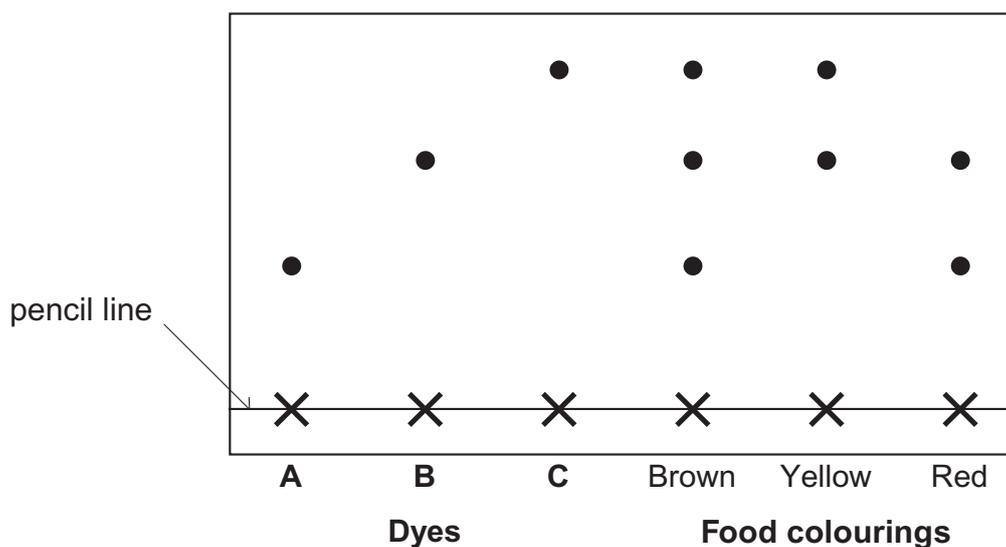
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20GDW2203

- 2 The following results were obtained in a paper chromatography experiment, using water as a solvent, to find out which dyes (A, B or C) were present in brown, yellow and red food colourings.



- (a) (i) What is the **stationary phase** in paper chromatography?

_____ [1]

- (ii) How can you tell that none of the food colourings are pure substances?

 _____ [1]

- (iii) Which dye (A, B or C) is the **least** soluble in the solvent used? Give a reason for your answer.

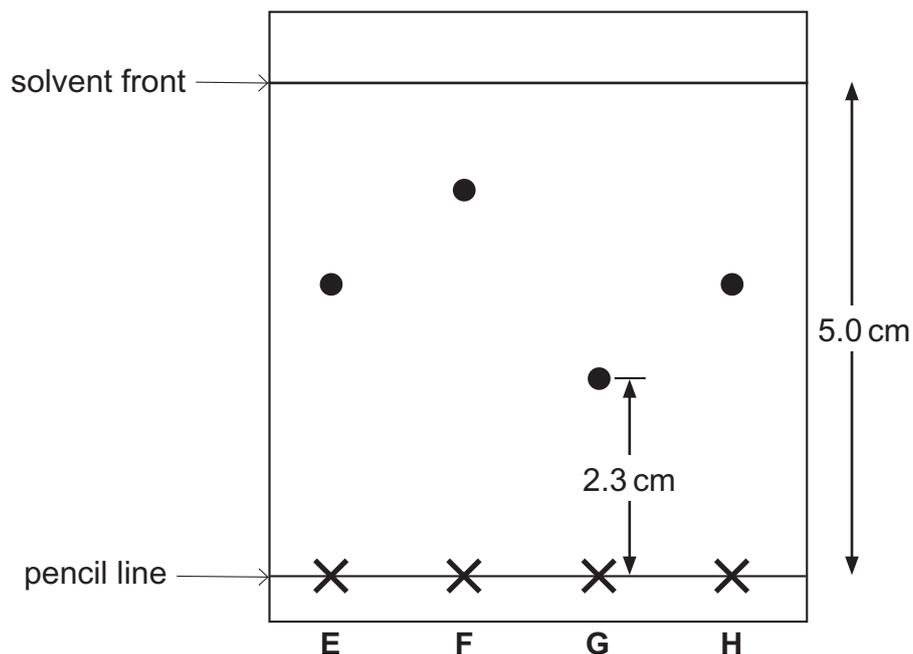
Dye: _____

Reason: _____

_____ [2]



- (b) Four green dyes (E, F, G and H) were investigated using chromatography. The chromatogram is shown below:



The dyes can be identified by calculating the R_f value for a particular solvent.

Calculate the R_f value for dye **G**.

Show your working out.

R_f value: _____ [2]

[Turn over



- 3 Read the article below which is about nanoparticles in sun creams and answer the questions that follow.

Today many sun creams use nanoparticles. These sun creams are very good at absorbing ultraviolet radiation which can be harmful to the skin. Due to their particle size, these sun creams spread more easily, and cover the skin better which also saves money because less is needed. They are also transparent, unlike the more traditional sun creams which are white.

Nanoparticles of titanium oxide are used in some sun creams. Normal sized particles of titanium oxide are also used.

It is thought that nanoparticles can pass through the skin and travel more easily around the body than normal sized particles. This could result in the possibility that they could be toxic to some types of cells such as skin, bone, brain and liver cells.

- (a) How many atoms are in a typical nanoparticle?

Circle the correct answer.

a few a few hundred a few million a few billion

[1]

- (b) Apart from cost, give three advantages of using sun creams which contain nanoparticles.

1. _____

2. _____

3. _____

[3]

- (c) Why might using sun creams which contain nanoparticles pose a risk to the body?

[2]





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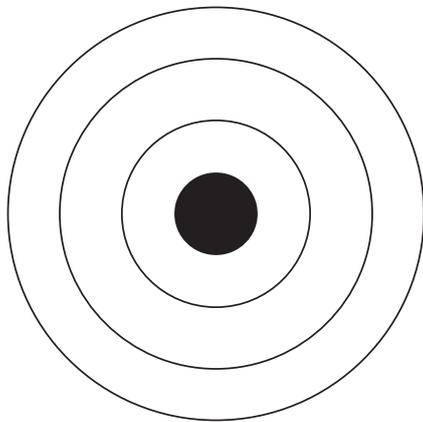
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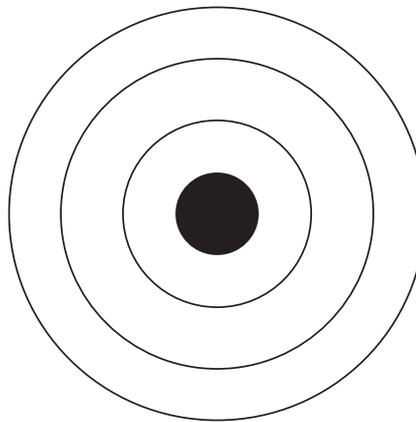
20GDW2207

4 Sodium reacts with sulfur to form a compound called sodium sulfide.

(a) Complete the diagrams below to show the electronic structures of:



a sodium atom



a sulfur atom

[2]



5 This question is about covalent bonding.

(a) Complete the three sentences below by adding the missing words:

Covalent bonding is typical of _____ elements and compounds.

Covalent bonds are strong and _____ amounts

of _____ are needed to break them.

Forces between covalent molecules are _____ and are

called _____ forces.

[5]

(b) Draw a dot and cross diagram to show the bonding in carbon dioxide, CO_2 .
Show the outer electrons only.

[3]





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20GDW2211

6 This question is about relative formula masses, moles and the percentage of an element by mass in a compound.

(a) Complete the sentence below to define the term **relative atomic mass**.

The relative atomic mass (A_r) of an atom is the _____

_____ [3]

(b) Calculate the relative formula mass of each of the following substances.
(relative atomic masses: C = 12, N = 14, O = 16, Mg = 24, Ca = 40)

(i) calcium carbonate, CaCO_3

_____ [1]

(ii) magnesium nitrate, $\text{Mg}(\text{NO}_3)_2$

_____ [1]



(c) The relative formula mass of ethane, C_2H_6 , is 30.

(i) Calculate the number of moles in 150 g of ethane.

_____ g [1]

(ii) Calculate the percentage of carbon, by mass, in ethane, C_2H_6 .

Show your working out.

_____ [3]

[Turn over



- 7 (a) The table below gives information about the salts formed when three bases react with acids. Complete the table by filling in all the gaps.

Base	Acid	Formula of cation in salt	Formula of anion in salt	Formula of salt produced
calcium hydroxide	hydrochloric acid		Cl^-	CaCl_2
	sulfuric acid	Cu^{2+}		CuSO_4
sodium hydroxide	nitric acid	Na^+	NO_3^-	

[2]

- (b) A word equation is given below:



Use this equation to help write an **ionic** equation to show the formation of sodium chloride.

[2]

- (c) What happens to the pH of an acidic solution if the concentration of the hydrogen ions increases?

[1]

- (d) A strong acid like nitric acid (HNO_3) is completely ionised in water. What does this mean?
You may use words and/or an equation in your answer.

[2]





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20GDW2215

- 8 The table below gives information about the physical properties of four substances (A, B, C and D). Use the information to help you answer the questions which follow.

Substance	Melting point/ °C	Boiling point/ °C	Electrical conductivity when solid	Electrical conductivity when molten
A	808	1465	poor	good
B	3650	4200	good	good
C	660	2500	good	good
D	-182	-161	poor	poor

- (a) Which substance (A, B, C or D) has a molecular covalent structure? Explain your choice.

Substance with a molecular covalent structure: _____

Explanation: _____

_____ [2]

- (b) Which substance (A, B, C or D) is made up of oppositely charged ions in a giant lattice structure? Explain your choice.

Substance made up of oppositely charged ions in a giant lattice structure:

Explanation: _____

_____ [2]



(c) Which substance (A, B, C or D) could be graphite? Explain your choice.

Substance which could be graphite: _____

Explanation: _____
_____ [2]

(d) Which substance (A, B, C or D) is a metal with a relatively low melting point? Explain your choice.

Substance which is a metal: _____

Explanation: _____
_____ [2]

[Turn over



9 Gallium is an element with atoms which have different mass numbers.

- (a) Use the information in the table to calculate the relative atomic mass of gallium to one decimal place.

Show your working out.

Mass Number	Abundance
69	60%
71	40%

Answer _____ [2]

- (b) Explain, in terms of atomic structure, why some atoms of gallium are heavier than others.

_____ [2]



10 (a) When chlorine gas is bubbled into sodium iodide solution, it causes a chemical reaction which results in a colour change in the solution.

(i) Write a balanced symbol equation for this reaction.

_____ [3]

(ii) Describe the colour change in the solution.

The colour changes from _____ to _____ [2]

(iii) What is displaced in the reaction between chlorine and sodium iodide?

_____ [1]

(b) When bromine is added to sodium iodide solution a similar reaction occurs to that of chlorine with sodium iodide solution.

Explain why **chlorine** and **bromine** react in similar ways.

_____ [2]

THIS IS THE END OF THE QUESTION PAPER



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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

Examiner Number

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