

**Paper Reference(s) 1CH0/2F**

**Pearson Edexcel Level 1/Level 2 GCSE (9–1)**

**Chemistry**

**Paper 2**

**Foundation Tier**

<b>Total Marks</b>
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**Wednesday 10 June 2020 – Morning**

**Time: 1 hour 45 minutes plus your additional time allowance**

**In the boxes below, write your name, centre number and candidate number.**

<b>Surname</b>					
<b>Other names</b>					
<b>Centre Number</b>					
<b>Candidate Number</b>					

**YOU MUST HAVE**

**Calculator, ruler**

**YOU WILL BE GIVEN**

**Periodic table, Diagram Book**

**INSTRUCTIONS**

**Answer ALL questions.**

**Answer the questions in the spaces provided – there may be more space than you need.**

**Calculators may be used.**

**Any diagrams may NOT be accurately drawn, unless otherwise indicated.**

**You must show all your working out with your answer clearly identified at the end of your solution.**

## **INFORMATION**

**The total mark for this paper is 100.**

**The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.**

**In questions marked with an ASTERISK (\*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.**

**A periodic table is provided.**

## **ADVICE**

**Read each question carefully before you start to answer it.**

**Try to answer every question.**

**Check your answers if you have time at the end.**

**Answer ALL questions. Write your answers in the spaces provided.**

**Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.**

**1 (a) The two most common gases in today's atmosphere are nitrogen and oxygen.**

**(i) What is the third most common gas in today's atmosphere? (1 mark)**

- ☐ **A argon**
- ☐ **B butane**
- ☐ **C chlorine**
- ☐ **D hydrogen**

**(continued on the next page)**

**1 continued.**

**(ii) What is the percentage of oxygen in today's atmosphere? (1 mark)**

☐ **A     0·04**

☐ **B     1**

☐ **C     21**

☐ **D     78**

**(b) Give the name of the most common gas in the Earth's EARLY atmosphere. (1 mark)**

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**(continued on the next page)**

**1 continued.**

**(c) This early atmosphere was hot and contained water vapour.**

**The atmosphere today contains less water vapour.**

**Explain what caused the amount of water vapour in the atmosphere to decrease. (2 marks)**

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**(continued on the next page)**

**1 continued.**

**(d) Look at Figure 1 for Question 1(d) in the Diagram Book.**

**The concentration of carbon dioxide in the atmosphere can be measured in parts per million (ppm).**

**Figure 1 shows the measurements in January 2018 and January 2019.**

**(i) Calculate the increase in the concentration, in ppm, of carbon dioxide from January 2018 to January 2019.**

**Give your answer to the nearest whole number. (2 marks)**

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**increase in  
concentration of carbon dioxide = \_\_\_\_\_ ppm**

**(continued on the next page)**

**Turn over**

**1 continued.**

- (ii) Give a possible cause for this increase in the concentration of carbon dioxide. (1 mark)**

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**(TOTAL FOR QUESTION 1 = 8 MARKS)**

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- 2 (a) Look at Figure 2 for Question 2(a) in the Diagram Book.**

**Figure 2 shows information about three different materials, a composite, a glass and a metal.**

**Explain which material in Figure 2 is the most suitable material to use in electrical circuits.**

**(2 marks)**

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**(continued on the next page)**

2 continued.

(b) (i) Nanoparticles are very small.

Some nanoparticles have a radius of 17 nm.  
The radius of a magnesium atom is 0.16 nm.

Approximately how many times larger is the  
radius of these nanoparticles than the radius  
of the magnesium atom? (1 mark)

☐ A      0.01

☐ B      0.10

☐ C      10

☐ D      100

(continued on the next page)

**2 continued.**

**(ii) Look at Figure 3 for Question 2(b)(ii) in the Diagram Book.**

**A catalyst contains cube-shaped nanoparticles. Figure 3 shows a diagram of a cube-shaped nanoparticle.**

**The length of each side of the cube is 9 nm.**

**Calculate the surface area of the cube, in nm<sup>2</sup>.  
(2 marks)**

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**surface area = \_\_\_\_\_ nm<sup>2</sup>**

**(continued on the next page)**

**2 continued.**

- (iii) Nanoparticles have many uses.  
Some scientists are concerned about the  
possible risks of using nanoparticles.**

**Give ONE possible risk of using  
nanoparticles. (1 mark)**

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**(TOTAL FOR QUESTION 2 = 6 MARKS)**

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**3 (a) A student investigated the reaction between potassium iodide and lead nitrate.**

**(i) Look at the word equation for Question 3(a)(i) in the Diagram Book.**

**Solutions of potassium iodide and lead nitrate were mixed together.**

**Lead iodide and potassium nitrate were formed.**

**Complete the word equation. (2 marks)**

**(ii) Look at Figure 4 for Question 3(a)(ii) in the Diagram Book.**

**The student recorded the total mass of the reactants and the total mass of the products.**

**The results are shown in Figure 4.**

**State how the results in Figure 4 show that mass is conserved in this reaction. (1 mark)**

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**(continued on the next page)**

**3 continued.**

**(b) Look at Figure 5 for Question 3(b) in the Diagram Book.**

**In another experiment, a student investigated the temperature decrease when different amounts of ammonium nitrate crystals were dissolved in 100 cm<sup>3</sup> of water.**

**The apparatus used is shown in Figure 5.**

**The student used the following method.**

**step 1** pour 100 cm<sup>3</sup> of water into the polystyrene cup

**step 2** add one spatula of ammonium nitrate crystals to the water

**step 3** stir the mixture

**step 4** use the thermometer to record the lowest temperature reached by the mixture

**step 5** repeat steps 1 to 4 using different amounts of ammonium nitrate

**(continued on the next page)**

**3 continued.**

- (i) Name a piece of apparatus that should be used to measure the  $100\text{ cm}^3$  of water in step 1. (1 mark)**
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- (ii) The student cannot work out the temperature decrease using the method described.**

**State what the student must do before step 2 to be able to work out the temperature decrease. (1 mark)**

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**3 continued.**

**(iii) State why a polystyrene cup is used in this experiment. (1 mark)**

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**(iv) Look at Figure 6 for Question 3(b)(iv) in the Diagram Book.**

**Figure 6 shows the reaction profile for this reaction.**

**Use the words below to complete the labels on Figure 6. (2 marks)**

**activation energy**

**products**

**reactants**

**(TOTAL FOR QUESTION 3 = 8 MARKS)**

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**4 Tests are carried out to identify the ions in two solids, P and Q.**

**(a) A flame test is used to identify the metal ions in each of these solids.**

**(i) Describe how to do a flame test. (2 marks)**

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**(ii) Look at the diagram for Question 4(a)(ii) in the Diagram Book.**

**Different metal ions produce different coloured flames.**

**Draw one straight line from each metal ion to its flame colour. (2 marks)**

**(continued on the next page)**

4 continued.

(b) **P** and **Q** dissolve in water to form colourless solutions.

Figure 7 shows the results of tests on these solutions.

**FIGURE 7**

<b>test</b>	<b>results</b>	
	<b>solution of P</b>	<b>solution of Q</b>
<b>dilute hydrochloric acid added, then barium chloride solution</b>	<b>a white precipitate</b>	<b>remains colourless</b>
<b>dilute nitric acid added, then silver nitrate solution</b>	<b>remains colourless</b>	<b>a yellow precipitate</b>

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**4 continued.**

- (i) Look at the diagram for Question 4(b)(i) in the Diagram Book.**

**The anions in solutions of P and Q can be identified from the results of the tests shown in Figure 7.**

**Draw one straight line from each solution to the anion present. (2 marks)**

- (ii) The formula of barium chloride is  $\text{BaCl}_2$ .**

**Give the total number of ions in the formula  $\text{BaCl}_2$ . (1 mark)**

**(continued on the next page)**

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**4 continued.**

**(c) A few drops of sodium hydroxide solution are added to a solution of iron(II) sulfate. Iron(II) hydroxide is formed.**

**(i) State what would be SEEN. (2 marks)**

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**(ii) One other product is formed in this reaction.**

**What is the name of this other product?  
(1 mark)**

- ☐ **A iron(II) chloride**
- ☐ **B sodium chloride**
- ☐ **C sodium sulfate**
- ☐ **D water**

**(TOTAL FOR QUESTION 4 = 10 MARKS)**

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- 5 Chlorine, bromine and iodine are elements in group 7 of the periodic table.**

**(a) Chlorine is toxic.**

**State ONE safety precaution that should be taken when using chlorine in the laboratory. (1 mark)**

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**(b) Chlorine reacts with hydrogen to form hydrogen chloride.**

**(i) Write the word equation for this reaction. (1 mark)**



**(continued on the next page)**

**5 continued.**

- (ii) Hydrogen chloride dissolves in water to form an acidic solution.**

**State what is SEEN when blue litmus paper is placed into this solution. (1 mark)**

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- (iii) Look at the diagram for Question 5(b)(iii) in the Diagram Book.**

**A chlorine atom has seven electrons in its outer shell.**

**A hydrogen atom has one electron in its outer shell.**

**Complete the dot and cross diagram of a molecule of hydrogen chloride.**

**Show outer shell electrons only. (1 mark)**

- (iv) Name the type of bonding in a molecule of hydrogen chloride. (1 mark)**
- 

**(continued on the next page)**

**5 continued.**

**(c) If chlorine solution is added to sodium bromide solution a reaction occurs.**

**chlorine + sodium bromide  $\longrightarrow$  sodium chloride + bromine**

**Give a reason why this reaction occurs. (1 mark)**

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**(continued on the next page)**

**5 continued.**

**(d) Look at Figure 8 for Question 5(d) in the Diagram Book.**

**Figure 8 shows apparatus used to find out if a solution conducts electricity.**

**Glucose solution and sodium chloride solution are tested.**

**Glucose is a typical simple molecular covalent compound.**

**Sodium chloride is an ionic compound.**

**(i) State what would happen to the lamp when glucose solution is tested. (1 mark)**

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**(continued on the next page)**



**5 continued.**

- (ii) State what would happen to the lamp when sodium chloride solution is tested. (1 mark)**

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**5 continued.**

**(e) Look at Figure 9 for Question 5(e) in the Diagram Book.**

**Figure 9 shows how the conductivity of one solution changes as its concentration increases.**

**Describe how the conductivity of this solution changes as its concentration increases from 0 to 500 g dm<sup>-3</sup>. (2 marks)**

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**(TOTAL FOR QUESTION 5 = 10 MARKS)**

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6 (a) Methane is a hydrocarbon fuel.

- (i) Complete the word equation for the **COMPLETE** combustion of methane in oxygen. (2 marks)

methane + \_\_\_\_\_ →

water + \_\_\_\_\_

- (ii) The **INCOMPLETE** combustion of methane can produce carbon and carbon monoxide.

Give the reason why carbon and carbon monoxide are produced in the **INCOMPLETE** combustion of methane.  
(1 mark)

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(continued on the next page)

**6 continued.**

**(b) Look at Figure 10 for Question 6(b) in the Diagram Book.**

**Crude oil is a complex mixture of hydrocarbons.  
Crude oil can be separated into useful fractions by  
fractional distillation.**

**Figure 10 shows a fractional distillation column  
and the fractions produced when crude oil is  
distilled.**

**(i) Name the fraction in Figure 10 that is used to  
surface roads. (1 mark)**

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**(ii) Name the fraction in Figure 10 that contains  
hydrocarbons with the lowest boiling point.  
(1 mark)**

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**(continued on the next page)**

**6 continued.**

**(c) Look at Figure 11 for Question 6(c) in the Diagram Book.**

**When crude oil is fractionally distilled, the demand for some fractions is more than the amount produced.**

**Figure 11 shows the relative amounts of each fraction in a crude oil and the relative demand for each of these fractions.**

**Which of the following shows the fractions where the relative demand is greater than the relative amount in the crude oil? (1 mark)**

- ☐ **A kerosene, diesel oil, bitumen**
- ☐ **B gases, petrol, diesel oil**
- ☐ **C gases, petrol, kerosene**
- ☐ **D petrol, diesel oil, fuel oil**

**(continued on the next page)**

6 continued.

(d) Cracking involves the breaking down of large hydrocarbon molecules into smaller hydrocarbon molecules.

(i) Octane,  $C_8H_{18}$ , can be cracked to produce one molecule of ethene,  $C_2H_4$ , and one molecule of  $C_xH_{14}$ .



Determine the value of x in the molecule of  $C_xH_{14}$ . (1 mark)

x = \_\_\_\_\_

(continued on the next page)

6 continued.

- (ii) Dodecane is a large hydrocarbon molecule. When one molecule of dodecane is cracked the products are one molecule of octane and one molecule of butene.



Calculate the maximum mass of octane that could be produced when 340 g of dodecane is cracked in this reaction. (2 marks)

(relative formula masses: dodecane = 170, octane = 114)

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Turn over

6 continued.

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mass of octane = \_\_\_\_\_ g

(TOTAL FOR QUESTION 6 = 9 MARKS)

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- 7 (a) Ethanol can be produced by the fermentation of glucose solution.

Which of these shows the word equation for the fermentation of glucose solution? (1 mark)

- ☐ A glucose  $\longrightarrow$  ethanol + water
- ☐ B glucose  $\longrightarrow$  ethanol + carbon dioxide
- ☐ C glucose  $\longrightarrow$  ethanol + hydrogen
- ☐ D glucose  $\longrightarrow$  ethanol + water + carbon dioxide

- (b) Look at Figure 12 for Question 7(b) in the Diagram Book.

The names and formulae of the first four alcohols in the homologous series of alcohols are given in Figure 12.

- (i) Pentanol is the next member of this series.

A molecule of pentanol contains five carbon atoms.

Suggest the formula of a molecule of pentanol. (1 mark)

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**7 continued.**

- (ii) Draw the structure of a molecule of ethanol.  
Show all bonds. (2 marks)**

**(continued on the next page)**

7 continued.

- (c) Ethanol is present in alcoholic drinks, such as wine.

When a bottle of wine is left open some of the ethanol reacts with the oxygen in the air to form ethanoic acid,  $\text{CH}_3\text{COOH}$ , and water.

- (i) Complete the equation for this reaction.  
(2 marks)



(continued on the next page)

7 continued.

- (ii) Which calculation shows the percentage by mass of hydrogen in ethanoic acid? (1 mark)

(relative atomic mass of hydrogen,  $H = 1$ ,  
relative formula mass of ethanoic acid,  
 $CH_3COOH = 60$ )

☐ A  $\frac{1}{60} \times 100$

☐ B  $\frac{3}{60} \times 100$

☐ C  $\frac{4}{60} \times 100$

☐ D  $\frac{60}{1} \times 100$

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**7 continued.**

**\*(d) Look at Figure 13 for Question 7(d) in the Diagram Book.**

**Polymers have many uses.**

**However, the disposal of polymers after use can be a problem.**

**The uses of polymers are related to their properties.**

**Some uses of three common polymers are given in Figure 13.**

**Discuss the reasons for using these polymers in the ways shown in Figure 13 and the problems in disposing of these polymers. (6 marks)**

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**7 continued.**

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**7 continued.**

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**7 continued.**

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**(TOTAL FOR QUESTION 7 = 13 MARKS)**

- 8 (a) An atom of potassium has atomic number 19 and mass number 39.

(i) Give the electronic configuration of this potassium atom. (1 mark)

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(ii) This potassium atom forms the ion  $K^+$ .

Which row shows the number of protons and the number of neutrons in this potassium ion,  $K^+$ ? (1 mark)

	number of protons	number of neutrons
<input type="checkbox"/> A	19	19
<input type="checkbox"/> B	19	20
<input type="checkbox"/> C	20	19
<input type="checkbox"/> D	20	20

(continued on the next page)

**8 continued.**

**(b) Potassium and caesium are in the same group of the periodic table.**

**Explain, in terms of electrons, why potassium and caesium are in the same group. (2 marks)**

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8 continued.

(c) Fluorine boils at  $-188^{\circ}\text{C}$ .

There are forces between fluorine molecules.

Explain, in terms of these forces, why the boiling point of fluorine is low. (2 marks)

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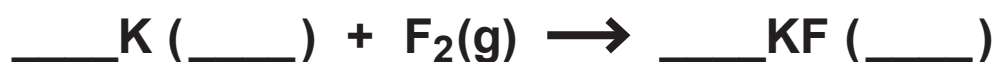
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(d) Potassium reacts with fluorine to form potassium fluoride.

Potassium fluoride is a solid.

Complete the balanced equation for this reaction and add the state symbols. (3 marks)



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Turn over

**8 continued.**

**(e) What are the elements in group 1 of the periodic table called? (1 mark)**

☐ **A alkali metals**

☐ **B fullerenes**

☐ **C halogens**

☐ **D noble gases**

**(continued on the next page)**

**8 continued.**

**(f) Look at Figure 14 for Question 8(f) in the Diagram Book.**

**Figure 14 shows the melting points and boiling points of elements in group 7 of the periodic table.**

**(i) Give, using Figure 14, the boiling point of bromine. (1 mark)**

**boiling point of bromine = \_\_\_\_\_ °C**

**(ii) State which TWO elements from Figure 14 are solids at room temperature. (1 mark)**

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**(TOTAL FOR QUESTION 8 = 12 MARKS)**

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- 9 (a) Look at Figure 15 for Question 9(a) in the Diagram Book.

Calcium carbonate reacts with dilute hydrochloric acid to produce carbon dioxide gas.

The rate of reaction between calcium carbonate and dilute hydrochloric acid at room temperature was investigated.

- (i) The investigation was carried out with different sized calcium carbonate pieces.

The mass of calcium carbonate and all other conditions were kept the same.

The results are shown in Figure 15.

State, using the information in Figure 15, the effect of the surface area of the calcium carbonate on the rate of this reaction.  
(1 mark)

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9 continued.

- (ii) The calcium carbonate powder produced  $90\text{ cm}^3$  of carbon dioxide in five minutes.

Calculate the average rate of reaction in  $\text{cm}^3\text{ s}^{-1}$ .  
(3 marks)

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average rate of reaction = \_\_\_\_\_  $\text{cm}^3\text{ s}^{-1}$

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**9 continued.**

- (iii) The experiments were repeated at a higher temperature.  
The rate of reaction for each experiment increased.**

**Explain, in terms of particles, why the rate of reaction increased when the temperature was increased. (3 marks)**

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**Turn over**

**9 continued.**

**\*(b) Zinc metal reacts with dilute hydrochloric acid to produce hydrogen gas.**

**zinc + hydrochloric acid  $\longrightarrow$  zinc chloride + hydrogen**

**A student investigated the effect of doubling the concentration of the hydrochloric acid on this reaction.**

**The student made the following prediction.**

**When the concentration of the hydrochloric acid is doubled the rate of reaction will double and the reaction will be more exothermic.**

**Devise a plan, including the apparatus you would use, to test the student's prediction.**

**You are provided with pieces of zinc and two bottles of dilute hydrochloric acid.**

**One bottle of hydrochloric acid is double the concentration of the other. (6 marks)**

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**9 continued.**

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**9 continued.**

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**9 continued.**

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**9 continued.**

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**(TOTAL FOR QUESTION 9 = 13 MARKS)**

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**10 Look at Figure 16 for Question 10(a)(i) in the Diagram Book.**

**Figure 16 shows the structure of a molecule of dichloroethene.**

**(a) (i) Describe how dichloroethene monomers form a polymer. (2 marks)**

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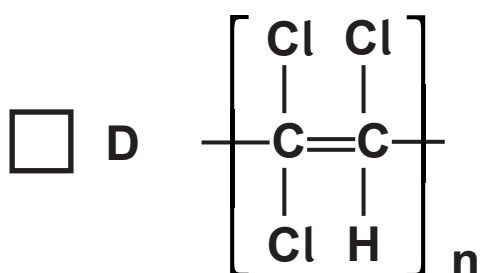
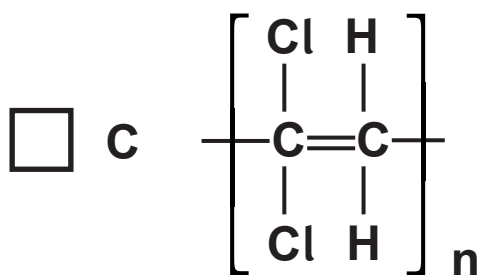
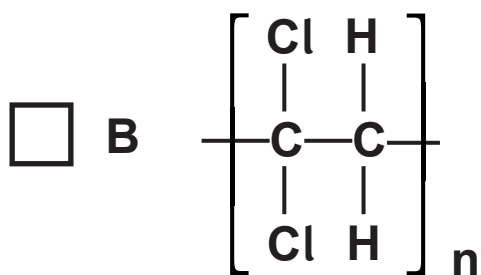
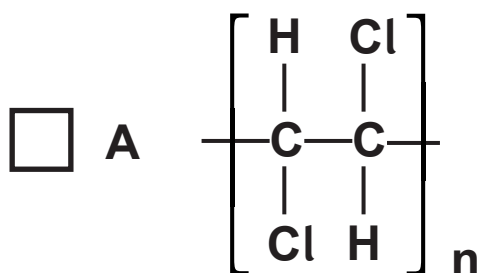
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10 continued.

- (ii) Which of these represents the structure of the polymer formed from the monomer in Figure 16? (1 mark)



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**10 continued.**

**(iii) Separate samples of dichloroethene and poly(dichloroethene) are shaken with a few drops of bromine water.**

**What would be SEEN? (1 mark)**

- ☐ **A both mixtures remain orange**
- ☐ **B only the dichloroethene and bromine water goes colourless**
- ☐ **C only the poly(dichloroethene) and bromine water goes colourless**
- ☐ **D both mixtures go colourless**

**(continued on the next page)**

10 continued.

- (b) Dichloroethene is produced from ethene and chlorine.

In the overall reaction, ethene reacts with chlorine and forms dichloroethene and hydrogen chloride.

Complete the balanced equation for the overall reaction. (2 marks)



- (c) Poly(dichloroethene) was used to wrap food to keep it fresh.

Explain ONE property that a plastic food wrapping must have. (2 marks)

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Turn over

**10 continued.**

**(d) An industrial process uses 500 tonnes of dichloroethene.**

**In the process only 96.5% of the dichloroethene molecules react.**

**Calculate the mass of dichloroethene that has NOT reacted.**

**Give your answer to two significant figures.  
(3 marks)**

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**mass = \_\_\_\_\_ tonnes**

**(TOTAL FOR QUESTION 10 = 11 MARKS)**

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**TOTAL FOR PAPER = 100 MARKS**

**END**