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There are 10 There are 24	pages in	this questi	on pap			nk pag	es are	indic	ated.				
A Periodic T	able is giv	ven on pag	ge 2.										
Advice to C	Candidat	tes											Ì

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Write your answers neatly and in good English.

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	7		Fluorine 9 35.5 Chlorine	80 Bromine 35 35 127 127	Asiatine 85	
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H H				Cobail Cobail 27 103 Hhodium		
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		u.				

1.	The	pictures	show	some	uses	of me	etal	İs

a coating to prevent rusting

aircraft bodies

electrical wiring

railway tracks







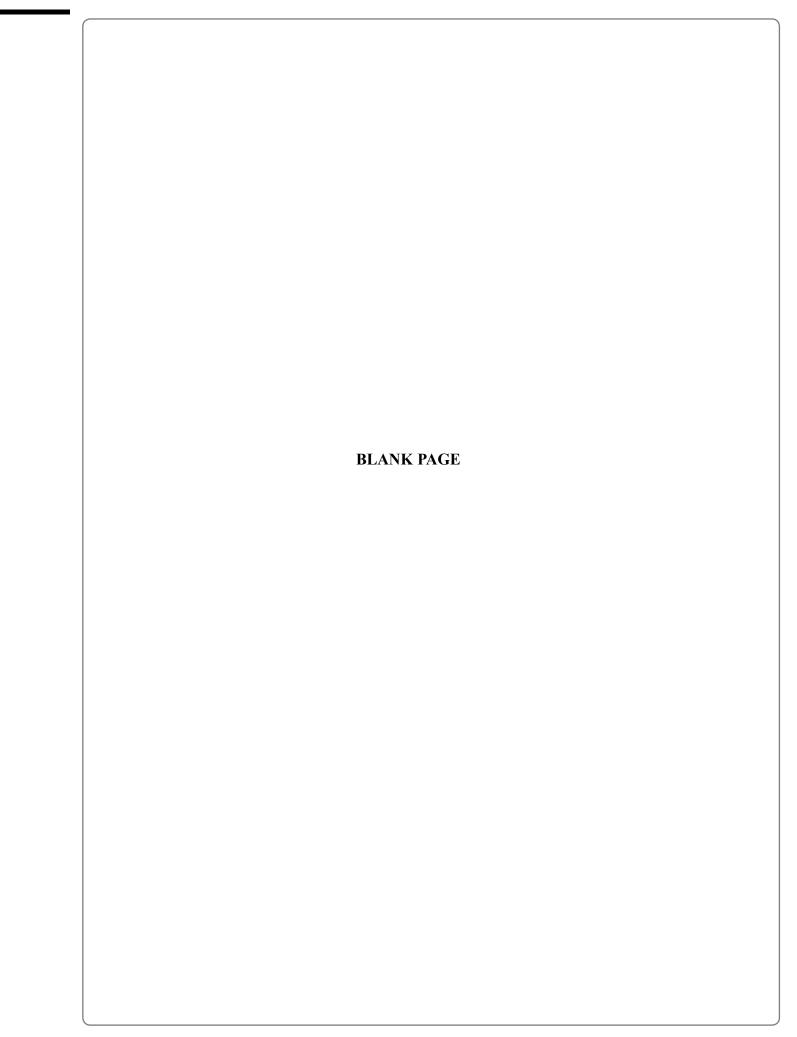


Complete the table.

Use	Name of metal with this use	Property on which the use depends
a coating to prevent rusting		
aircraft bodies		
electrical wiring		
railway tracks		

Q1

(Total 8 marks)



	riodic Table.	a) Identify the most reactive metallic element in the Periodic Table.						
	(1)							
	n sodium and the most reactive	Give the formula of the compound formed betwee element in Group 7.						
	(1)							
		All of the metals in Group 1 react with water. To reactions. Put a cross (⋈) in <b>three</b> boxes to short reactions of <b>all</b> Group 1 metals with water.						
		a flame is seen						
	$\boxtimes$	a solution of the metal hydroxide is formed						
	$\boxtimes$	a solution of the metal oxide is formed						
	$\boxtimes$	carbon dioxide is formed						
	$\boxtimes$	hydrogen is formed						
	$\boxtimes$	the metal sinks						
	$\boxtimes$	the solution formed is acidic						
	(2)	the solution formed is alkaline						
	(3)							
	•	The elements in Group 0 were originally thought to in 1962 the first compound of xenon was made but compound of argon was made.						
	rend in reactivity of the elements	What does this order of discovery suggest about the in Group 0?						
<b>Q2</b>	(1)							
	(Total 6 marks)							

3.	Methane, CH <sub>4</sub> , is an organic compound. It is the first member of an homologous series of <b>saturated hydrocarbons</b> .  The displayed formula of methane is	blaı
	H	

	H	
(a)	What is meant by the term <b>hydrocarbon</b> ?	
		 (2)
( <b>h</b> )	What is moont by the term seturated?	

(b)	What is meant by the term <b>saturated</b> ?				
(c)	Name the homologous series of which methane is the first member.	(1)			

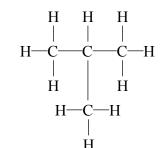
(d)	Draw the displayed	formula of the	second member	of this homologo	us series.

(2)

····· (1)

Leave blank

(e) The displayed formulae of two other organic compounds are



(i) What is the molecular formula of these two compounds?

(1)

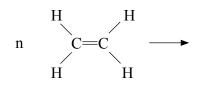
(ii) What name is given to compounds that have the same molecular formula but different displayed formulae?

(1)

(f) Some other organic compounds are used to make polymers.

Poly(ethene) is an addition polymer made from many identical monomer molecules.

Complete the following equation to show the formation of poly(ethene).



**(2)** 

(g) Nylon is another example of a polymer.

(i) What type of polymer is nylon?

(1)

(ii) Put a cross (⋈) in the **two** boxes to show the types of monomers used in the manufacture of nylon.

alcohol 🔲

alkene [

diamine 🗵

(2) Q3

(Total 13 marks)

	ew crystals of a green salt are placed in a beaker of cold water. The crystals start to solve.
	——— water
	salt crystals
(a)	Describe how the appearance of the contents of the beaker change over a period of time.
	(2)
(h)	Name the process that occurs after the crystals dissolve.
(0)	
	(1)
	· ·
(c)	How will the results of the experiment differ if hot water is used in place of cold water? Explain your answer.
(c)	How will the results of the experiment differ if hot water is used in place of cold
(c)	How will the results of the experiment differ if hot water is used in place of cold water? Explain your answer.
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	How will the results of the experiment differ if hot water is used in place of cold water? Explain your answer.  Difference  Explanation
	How will the results of the experiment differ if hot water is used in place of cold water? Explain your answer.  Difference  Explanation  (2)  A sample of the solution is removed from the beaker. Describe a test, and its result,
	How will the results of the experiment differ if hot water is used in place of cold water? Explain your answer.  Difference  Explanation  (2)  A sample of the solution is removed from the beaker. Describe a test, and its result, that would show the sample contains ammonium ions.

5.		One way of obtaining the metal copper is by heating copper(I) sulphide in air. The equation for the reaction is						
		$Cu_2S + O_2 \rightarrow 2Cu + SO_2$						
	(a)	Explain why this reaction could be described as the oxidation of sulphur.						
			(1)					
	(b)	The sulphur dioxide produced reacts with water to form a single product. product is an acid.	This					
		(i) Write a chemical equation for the reaction of sulphur dioxide with water.						
			(1)					
		(ii) Identify the ion in the product which causes it to be acidic.						
			(1)					

(iii) Name a substance that could be added to confirm the presence of this ion. What would be seen if this ion were present?

Substance added .....

What would be seen .....

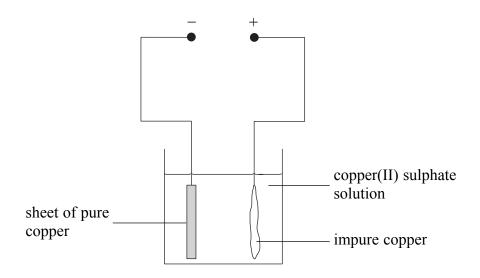
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Leave blank

**(2)** 

Leave blank

(c) Impure copper can be purified using the circuit shown:



The equation for the reaction at the positive electrode is

$$Cu \rightarrow Cu^{2+} + 2e^{-}$$

The equation for the reaction at the negative electrode is

$$Cu^{2+} + 2e^{-} \rightarrow Cu$$

What happens to the mass of the sheet of pure copper as the reactions occur? Explain your answer.

(2)

	opper forms when magnesium reacts with copper(II) nitrate solution. The ionic uation for the reaction is	
	$Cu^{2+}(aq) + Mg(s) \rightarrow Cu(s) + Mg^{2+}(aq)$	
	What does this reaction indicate about the reactivity of copper?	(i)
	(1)	
	) Describe the colour change of the solution if an excess of magnesium is added.	(ii)
	Colour at start	
	Colour at finish	
Q5	(2)	
	(Total 10 marks)  TOTAL FOR SECTION A: 45 MARKS	

SECTION B

6. Alkenes are unsaturated hydrocarbons.

(a) State the general formula of all alkenes.

(b) Draw the displayed formula of ethene.

(c) Alkenes can be shown to be unsaturated using bromine water. Describe the colour change that occurs when an alkene reacts with bromine water.

(2)

		Dogation 1		Desertion 1		٦
	ethene	Reaction 1	ethanol	Reaction 2	ethanoic acid	
(i)	State the o	ther reagent, th	e catalyst, and	one other condi	tion used in Rea	action 1
	Reagent					
	Catalyst					
	Condition					
(::)	Th			4: 4:-1	h (VIII)	(3
(11)		ents used in Racid. State the t		potassium dicl that occurs.	nromate(VI) an	id dilut
<	. Tud	:1 av accu		au au au		(1
(111)	ethanoate.	tructural formu		CH <sub>3</sub> CH <sub>2</sub> OH, rea		
	to winch it	t octoligs.				
	Structural	formula				
	Structural	formula				
	Structural	formula				
			es			
			es		(Total 10	(2
			es			(2
			es			(2
			es			(2
			es			(2
			es			(2
			es			(2

	btained.	which each element is o	e raw material from v	(i) State th	(a)
					()
(2)			en	Hydrog	
en.	nitrogen and hydroge	r the reaction between	chemical equation fo	(ii) Write a	
			1 1 1 1 1 1	( )	
(2)				•••••	
C and a	emperature of 450 °C	Haber process are a to	ditions used in the I	Typical cor	(b)
	•	•		pressure of	` '
ع ما ما م	e of reaction and the	would happen to the rat	e table to show what	Complete th	
yieia oi	ose from these respo	hanged as shown. Cho	the conditions were c	ammonia if	
-	1				
-	no change	ncreased	ased i	decre	
-		ncreased	ased i	decre	
-		ncreased  Pressure changed to 100 atm	Temperature changed to 600 °C	decre	
-	no change Iron catalyst	Pressure changed	Temperature	Rate of	
-	no change  Iron catalyst added	Pressure changed	Temperature		_1
-	no change Iron catalyst	Pressure changed	Temperature	Rate of reaction	1
-	no change  Iron catalyst added	Pressure changed	Temperature	Rate of reaction Yield of	1
onses:	no change  Iron catalyst added  no change	Pressure changed	Temperature changed to 600 °C	Rate of reaction Yield of ammonia	1
onses:	no change  Iron catalyst added  no change	Pressure changed to 100 atm	Temperature changed to 600 °C	Rate of reaction Yield of ammonia	1
onses:	no change  Iron catalyst added  no change	Pressure changed to 100 atm	Temperature changed to 600 °C	Rate of reaction Yield of ammonia	1
onses:	no change  Iron catalyst added  no change	Pressure changed to 100 atm	Temperature changed to 600 °C	Rate of reaction Yield of ammonia	1
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onses:	no change  Iron catalyst added  no change	Pressure changed to 100 atm	Temperature changed to 600 °C	Rate of reaction Yield of ammonia	1
onses:	no change  Iron catalyst added  no change	Pressure changed to 100 atm	Temperature changed to 600 °C	Rate of reaction Yield of ammonia	1

**(1)** 

(d) Ammonia and gulnhuria gold rogat together to make a	blan
(d) Ammonia and sulphuric acid react together to make a	
<ul><li>(i) Name the compound formed when ammonia and and write a chemical equation for the reaction that</li></ul>	
Name	
Equation	
	(3)
(ii) State the type of reaction occurring.	
	I
	(1) Q7
	(Total 16 marks)



(a)	The combustion of hydrogen gives out a lot of heat. What term is used to describe reactions that give out heat?
	(1)
(b)	The atoms in a molecule of hydrogen are joined by a strong covalent bond.
	What is a covalent bond?
	(2)
(c)	Explain why hydrogen is a gas at room temperature.
	(2)
(d)	A molecule of oxygen can be represented by a dot and cross diagram:
	$\mathbf{\dot{O}} \overset{*}{\times} \overset{\circ}{O_{\times}} \overset{\times}{\circ}$
	Draw a dot and cross diagram, showing only the outer electrons, to represent a molecule of water.
	(2)

Leave blank

(e) The equation for the combustion of hydrogen is

$$2H_2(g)+\mathrm{O}_2(g)\to 2H_2\mathrm{O}(g)$$

The table shows the values of some average bond dissociation energies.

Bond	Н—Н	0=0	О—Н
Dissociation energy (kJ/mol)	436	496	463

Use the values in the table to calculate the energy change for the combustion of hydrogen.

(3)

(f) The reaction can be represented by an energy level diagram.

Complete the diagram by inserting the reactants.

energy 2H<sub>2</sub>O(g)

**(1)** 

H <sub>2</sub> O(l).  Describe how the speed of, and the distance between, the particles change during this conversion.  Speed of particles  Distance between particles  (2)	Describe how the speed of, and the distance between, the particles change during this conversion.  Speed of particles  Distance between particles  (2)  (h) When water is added to white anhydrous copper(II) sulphate, blue hydrated copper(II) sulphate is formed.  Write a chemical equation for the reaction that occurs. Include state symbols in the equation.		
conversion.  Speed of particles	conversion.  Speed of particles	(g)	
Distance between particles	Distance between particles  (2)  (h) When water is added to white anhydrous copper(II) sulphate, blue hydrated copper(II) sulphate is formed.  Write a chemical equation for the reaction that occurs. Include state symbols in the equation.  (3)		
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equation.  (3)	equation. (3)	(h)	
(3)	(3)		
(Total 16 marks)	(Total 16 marks)		
			(10tal 16 marks)

						(2)
(b)	(i) Compl	ete the table	for these isoto	pes of copper.		
	Atomic number	Mass number	Number of protons	Number of neutrons	Percentage of each isotope in sample	
	29	63			69	
			29	36	31	
						(3)
	* *			to calculate the ver to one decir	e relative atomic mass mal place.	of this
	* *					of this
(c)	sample	e of copper.	Give your ansv	ver to one decin		(2)
(c)	sample	e of copper.	Give your ansv	ver to one decin	mal place.	(2)
	Identify the atomic mas	e element, ar	Give your answ	wer to one decin	mal place.	(2)
	Identify the atomic mas	e element, ar	Give your answ	wer to one decin	nal place.  used in the definition of the second se	(2)

1	
2	
2	(2)
f) Two reactions involving copper compounds are shown in this sequence:	
$\frac{1}{\text{opper(II) carbonate}} \xrightarrow{\text{Reaction } 1} \text{copper(II) oxide} \xrightarrow{\text{Reaction } 2} \text{copper(II)}$	) chloride
(i) Reaction 1 occurs when copper(II) carbonate is heated. Carbon d other product of this reaction.	ioxide is the
Describe the colour change seen and write a chemical equation for Include state symbols in the equation.	the reaction.
Colour change	
Colour Change	
Chemical equation	(4)
Chemical equation	(4) id. Write the
(ii) The other substance needed for Reaction 2 is dilute hydrochloric aci chemical equation for Reaction 2.	(4) id. Write the
Chemical equation  (ii) The other substance needed for Reaction 2 is dilute hydrochloric aci chemical equation for Reaction 2.	(4) id. Write the
Chemical equation  (ii) The other substance needed for Reaction 2 is dilute hydrochloric acichemical equation for Reaction 2.	(4) id. Write the

-	7
Leave	
1.11.	

CaCl₂(aq) + H₂SO₄(aq) → CaSO₄(s) + 2HCl(aq)  (a) State three steps needed to produce a pure dry sample of calcium sulphate from the mixture formed in this reaction.  Step 1  Step 2  Step 3  (3)  (b) A 5.55 g sample of calcium chloride (M₁=111) is dissolved in water to make a solution.  (i) Calculate the amount, in moles, in the sample of calcium chloride.  (ii) What amount, in moles, of sulphuric acid is needed to react completely with the calcium chloride solution?  (1)  (iii) Calculate the relative formula mass of calcium sulphate. Use data from the Periodic Table on page 2.  (b)  (c)  (c)  (c)  (d)  (iv) Calculate the mass, in grams, of calcium sulphate formed.	10.		cium sulphate can be prepared using a precipitation reaction between calcium chloration and dilute sulphuric acid.	ide
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Step 2  Step 3  (3)  (b) A 5.55 g sample of calcium chloride ( <i>M<sub>r</sub></i> =111) is dissolved in water to make a solution.  (i) Calculate the amount, in moles, in the sample of calcium chloride.  (2)  (ii) What amount, in moles, of sulphuric acid is needed to react completely with the calcium chloride solution?  (1)  (iii) Calculate the relative formula mass of calcium sulphate. Use data from the Periodic Table on page 2.  (1)  (iv) Calculate the mass, in grams, of calcium sulphate formed.		(a)		the
Step 3			Step 1	
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(iv) Calculate the mass, in grams, of calcium sulphate formed.			• /	the 
				 (1)
			(iv) Calculate the mass, in grams, of calcium sulphate formed.	
(2)				 (2)

	Leave blank
(c) The following equation represents a reaction used to prepare the salt lead(II) nitrate.	Olalik
$PbCO3(s) + 2HNO3(aq) \rightarrow Pb(NO3)2(aq) + H2O(l) + CO2(g)$	
In this experiment the amount of nitric acid used was 0.0400 mol.	
(i) The concentration of the dilute nitric acid used was 0.500 mol dm <sup>-3</sup> . Calculate the volume, in cm <sup>3</sup> , of dilute nitric acid used.	
(3)	
<ul> <li>(ii) In this experiment, 0.0200 mol of carbon dioxide gas was produced. Calculate the volume, in cm³, that this amount of carbon dioxide occupies at room temperature and pressure (rtp).</li> <li>(molar volume of any gas = 24 000 cm³ at rtp)</li> </ul>	
(1)	Q10
(Total 13 marks)	
TOTAL FOR SECTION B: 75 MARKS	
TOTAL FOR PAPER: 120 MARKS	
END	

