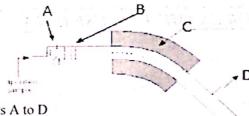
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CHEMISTRY		2
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2 H 5 2 1 H 12 (12/65/22)	
SECTION A: PHYSICAL AND GENERAL CHE	EMISTRY
An iron ore contains iron (II) carbonate, FeCO <sub>3</sub> . The percentage of iron (II) in with acidified potassium dichromate (VI). The ionic equation is shown below. Cr <sub>2</sub> O <sub>7</sub> <sup>2-(</sup> aq) + 14H <sup>+</sup> (aq) + 6Fe <sup>2+</sup> (aq) → Cr <sup>3+</sup> (aq) + 6F <sup>3+</sup> (aq) + 7H <sub>2</sub> O(I)  (a) A 5.00 g sample of the ore was reacted with excess concentrated hydrochloric acides 250 cm <sup>3</sup> in a volumetric flask with distilled water. A 25.0 cm <sup>3</sup> sample of the standard dichromate (VI) solution for complete reaction.	id and filtered. The filtrate was made we
Calculate:	Continue with
(i) the amount, in moles, of dichromate (VI) ions used in the titration.	*1
(ii) the amount, in moles, of Fe <sup>2+</sup> ions present in 25 cm <sup>3</sup> of solution	
(iii) the mass of iron (II) carbonate present in the ore.	
i (iv) the percentage of iron (II) carbonate in the sample	
(b) What do you understand by	(6 marks)
(i) Relative atomic mass?	
	AND WELL TO THE POST OF
(ii) Isotopes?	7.5 mg ab
	(2 marks)
(c) Consider the diagram of a mass spectrometer below.	10.14. 4



DETECTION

(i) On the diagram, label the parts A to D (ii) State what happens at A, B and C

В:			. 1	The second	
C:		1.1749	na i .	U)	
				1.77	(5 1
The f	following re	sults were obtained when	determining the rate of the	e reaction	(5 mark
11101		$O(g) + Cl_2(g) \rightarrow 2 NO(g)$			
	Expt	[NO] mol dm <sup>-3</sup>	mol dm <sup>-3</sup>	Initial rate mol dm <sup>-3</sup> s <sup>-1</sup>	~ -
	LAPI		[Cl <sub>2</sub> ]		
	1	0.10	0.10	0.17	
	3	0.10	0.20	0.35	
Dete		0.20	0.20 on above showing all the st	1.45	
Dete	mine the o	overall order of the reaction	on above showing an the st	eps	
			A secondary of the property of the	P. V.	1 / 11 / 11
 	Consider t	he reaction below 2N <sub>2</sub> O <sub>5</sub> .	$(g) \rightarrow 4NO_2(g) + O_2(g).$	The mechanism for the reacti	ion is given as:
(ii)	) Consider t	he reaction below 2N <sub>2</sub> O <sub>5</sub>	$(g) \rightarrow 4NO_2(g) + O_2(g).$	The mechanism for the reacti	ion is given as:
 (ii)	) Consider t			The mechanism for the reacti	ion is given as:
(ii)	) Consider t	$2N_2O_5(g) \to N_2O_3(g)$	g) + 2NO <sub>2</sub> (g) + $\frac{5}{2}$ O <sub>2</sub> (g)		on is given as:
		$2N_2O_5(g) \rightarrow N_2O_3(g)$ $N_2O_3(g) \rightarrow NO(g)$ $NO(g) + 2N_2O_5(g)$	g) + $2NO_2$ (g) + $\frac{5}{2}O_2$ (g) + $NO_2$ (g) $\rightarrow 3NO_2$ (g) + $2N_2O_5$ (g)	Slow step	ion is given as:
		$2N_2O_5(g) \rightarrow N_2O_3(g)$ $N_2O_3(g) \rightarrow NO(g)$	g) + $2NO_2$ (g) + $\frac{5}{2}O_2$ (g) + $NO_2$ (g) $\rightarrow 3NO_2$ (g) + $2N_2O_5$ (g)	Slow step  Fast step	on is given as:
		$2N_2O_5(g) \rightarrow N_2O_3(g)$ $N_2O_3(g) \rightarrow NO(g)$ $NO(g) + 2N_2O_5(g)$	g) + 2NO <sub>2</sub> (g) + $\frac{5}{2}$ O <sub>2</sub> (g) + NO <sub>2</sub> (g) $\rightarrow$ 3NO <sub>2</sub> (g) + 2N <sub>2</sub> O <sub>5</sub> (g) eaction	Slow step  Fast step	; <sup>1</sup> ( )
		$2N_2O_5(g) \rightarrow N_2O_3(g)$ $N_2O_3(g) \rightarrow NO(g)$ $NO(g) + 2N_2O_5(g)$ the rate equation for the re-	g) + 2NO <sub>2</sub> (g) + $\frac{5}{2}$ O <sub>2</sub> (g) + NO <sub>2</sub> (g) $\rightarrow$ 3NO <sub>2</sub> (g) + 2N <sub>2</sub> O <sub>5</sub> (g) eaction	Slow step Fast step Fast step	; <sup>1</sup> ( )
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	Vrite down t	$2N_2O_5(g) \rightarrow N_2O_3(g)$ $N_2O_3(g) \rightarrow NO(g)$ $NO(g) + 2N_2O_5(g)$ the rate equation for the re-	g) + 2NO <sub>2</sub> (g) + $\frac{5}{2}$ O <sub>2</sub> (g) + NO <sub>2</sub> (g) $\rightarrow$ 3NO <sub>2</sub> (g) + 2N <sub>2</sub> O <sub>5</sub> (g) eaction	Slow step Fast step Fast step	og <sup>1</sup> 4 ( 12) Ethir eg ( 1 - 12)
 ) St	Vrite down t	$2N_2O_5(g) \rightarrow N_2O_3(g)$ $N_2O_3(g) \rightarrow NO(g)$ $NO(g) + 2N_2O_5(g)$ The rate equation for the restriction below and answer the	g) + 2NO <sub>2</sub> (g) + $\frac{5}{2}$ O <sub>2</sub> (g) + NO <sub>2</sub> (g) $\rightarrow$ 3NO <sub>2</sub> (g) + 2N <sub>2</sub> O <sub>5</sub> (g) eaction	Slow step Fast step Fast step	og <sup>1</sup> 4 ( 12 o
 e) Str <sub>2</sub> O <sub>4</sub>	Vrite down t	$2N_2O_5$ (g) $\rightarrow N_2O_3$ ( $N_2O_3$ (g) $\rightarrow NO$ (g) $NO$ (g) $+ 2N_2O_5$ (g) the rate equation for the restriction below and answer the $= 2NO_2$ $\Delta H = +243$ kJ	g) + 2NO <sub>2</sub> (g) + $\frac{5}{2}$ O <sub>2</sub> (g) + NO <sub>2</sub> (g) $\rightarrow$ 3NO <sub>2</sub> (g) + 2N <sub>2</sub> O <sub>5</sub> (g) eaction the questions that follow.	Slow step Fast step Fast step	og <sup>1</sup> 4 ( 12) Ethir eg ( 1 - 12)
 e) Str I <sub>2</sub> O <sub>4</sub>	vrite down t	$2N_2O_5$ (g) $\rightarrow N_2O_3$ ( $N_2O_3$ (g) $\rightarrow NO$ (g) $NO$ (g) $+ 2N_2O_5$ (g) the rate equation for the re- etion below and answer the $= 2NO_2$ $\Delta H = +243$ kJ ease in temperature affects	g) + 2NO <sub>2</sub> (g) + $\frac{5}{2}$ O <sub>2</sub> (g) + NO <sub>2</sub> (g) $\rightarrow$ 3NO <sub>2</sub> (g) + 2N <sub>2</sub> O <sub>5</sub> (g) eaction the questions that follow.	Slow step Fast step Fast step	(4 mark
 e) Str 2O <sub>4</sub>	Vrite down t	$2N_2O_5$ (g) $\rightarrow N_2O_3$ ( $N_2O_3$ (g) $\rightarrow NO$ (g) $NO$ (g) $+ 2N_2O_5$ (g) the rate equation for the re- etion below and answer the $= 2NO_2$ $\Delta H = +243$ kJ ease in temperature affects	g) + 2NO <sub>2</sub> (g) + $\frac{5}{2}$ O <sub>2</sub> (g) + NO <sub>2</sub> (g) $\rightarrow$ 3NO <sub>2</sub> (g) + 2N <sub>2</sub> O <sub>5</sub> (g) eaction the questions that follow.	Slow step Fast step Fast step	(4 mark
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B: E	does an increase and increase an increase an increase an increase an increase an increase and increase an increase	$2N_2O_5$ (g) $\rightarrow N_2O_3$ ( $N_2O_3$ (g) $\rightarrow NO$ (g) $\rightarrow N$	g) + 2NO <sub>2</sub> (g) + $\frac{5}{2}$ O <sub>2</sub> (g) + NO <sub>2</sub> (g) $\rightarrow$ 3NO <sub>2</sub> (g) + 2N <sub>2</sub> O <sub>5</sub> (g) eaction  the questions that follow.  mol <sup>-1</sup> t:  the reaction below.	Slow step Fast step Fast step  and the step step step step step step step ste	(4 marks

Expla	ain the trend.		
i. dan			
(iii) W A) (	rite balanced chemical e Cold dilute KOH	equations to show the reac	tions of Cl <sub>2 (g)</sub> with
B) I	Hot concentrated KOH.		
(iv) Gi	ive the formulae and nar	mes of the oxo-acids of ioc	line in the following oxidation states:
	Oxidation state	Formula	Name
	+1		
	+5		
Perio	odic Table.		p land group II elements in the same period of the
of can by			
Give	a reason for your trend		
(ii) Litl		relationship with magnesits diagonally related?	im.
(ii) Litl A) ———————————————————————————————————	hium shows a diagonal i Why are these elements Give one reaction in whi	s diagonally related?	gonal relationship.
(ii) Litl A) B) ( (iii) W	hium shows a diagonal is Why are these elements.  Give one reaction in which the use of chemical is NO <sub>3</sub>	ich Li and Mg show a diag	gonal relationship.  of heat on the nitrates of lithium and potassium.
(ii) Litl A) B) ( (iii) W Lin	hium shows a diagonal in Why are these elements.  Give one reaction in which the use of chemical in the three diagonal in the transfer of the second in the seco	ich Li and Mg show a diag	gonal relationship.  of heat on the nitrates of lithium and potassium.
(ii) Litl A) B) ( (iii) W Lin KN (iv) Ho	hium shows a diagonal in Why are these elements.  Give one reaction in which the use of chemical in the local	ich Li and Mg show a diagequations show the effect	gonal relationship.  of heat on the nitrates of lithium and potassium.  II elements vary down the group?.
(ii) Litl A) B) ( (iii) W LiN KN (iv) Ho	hium shows a diagonal in Why are these elements.  Give one reaction in which the use of chemical in the local	ich Li and Mg show a diagequations show the effect hydroxides of the group	gonal relationship.  of heat on the nitrates of lithium and potassium.
(ii) Litl A) B) ( (iii) W LiN KN (iv) Ho	hium shows a diagonal in Why are these elements.  Give one reaction in which the use of chemical in the local	ich Li and Mg show a diagequations show the effect hydroxides of the group	gonal relationship.  of heat on the nitrates of lithium and potassium.  II elements vary down the group?.  (7 mark first ionization energy for the elements Sodium to Arg
(ii) Litl A) B) ( (iii) W LiN KN (iv) Ho	hium shows a diagonal in Why are these elements.  Give one reaction in which the use of chemical in the local	ich Li and Mg show a diagequations show the effect hydroxides of the group	gonal relationship.  of heat on the nitrates of lithium and potassium.  II elements vary down the group?.  (7 mar first ionization energy for the elements Sodium to Arg

Formula of stable oxide   (iii) From the list of oxides in c (ii) select an oxide which is likely to be: Amphoteric: Neutral: Acidic:	more free gce quest			, , ,		1,	
Element Li Be B C N F Formula of stable oxide  (iii) From the list of oxides in e (ii) select an oxide which is likely to be:  Amphoterie:  Neutral:  Acidie:  (6 m (TOTAL = 20 m)  4. This question concerns the d-block elements, Sulphur, Nitrogen and Group IV elements.  (a) (i) Distinguish between a d-block element and a transition metal.  (iii) Write down the symbols for the elements of the first transition series in increasing order of atomic num  (iii) State the property of the transition element which enables them to act as catalyst in many industrial processes.  (b) Consider the following complex compound [Na,Fe (CN),6] (i) Give the name of the complex the compound above.  (iii) State  A) the coordination number of iron in the complex compound  B) the oxidation state of iron in the complex compound  (iii) Draw the structure of the complex ion in b (i) and give its shape.					orthographic	- 11/12	
Element Li Be B C N F Formula of stable oxide  (iii) From the list of oxides in e (ii) select an oxide which is likely to be: Amphoteric: Neutral: Acidic:  (6 m (TOTAL = 20 m)  4. This question concerns the d-block elements, Sulphur, Nitrogen and Group IV elements.  (a) (i) Distinguish between a d-block element and a transition metal.  (iii) Write down the symbols for the elements of the first transition series in increasing order of atomic num  (iii) State the property of the transition element which enables them to act as catalyst in many industrial processes.  (b) Consider the following complex compound [Na <sub>4</sub> Fe (CN) <sub>6</sub> ] (i) Give the name of the complex the compound above.  (iii) State A) the coordination number of iron in the complex compound  B) the oxidation state of iron in the complex compound  (iii) Draw the structure of the complex ion in b (i) and give its shape.			-	-			
Element Li Be B C N F  Formula of stable oxide  (iii) From the list of oxides in c (ii) select an oxide which is likely to be:  Amphoteric:  Neutral:  Acidic:  (6 m (TOTAL = 20 m)  4. This question concerns the d-block elements, Sulphur, Nitrogen and Group IV elements.  (a) (i) Distinguish between a d-block element and a transition metal.  (ii) Write down the symbols for the elements of the first transition series in increasing order of atomic num  (iii) State the property of the transition element which enables them to act as catalyst in many industrial processes.  (b) Consider the following complex compound [Na <sub>4</sub> Fe (CN) <sub>6</sub> ] (i) Give the name of the complex the compound above.  (ii) State  A) the coordination number of iron in the complex compound  B) the oxidation state of iron in the complex compound  (iii) Draw the structure of the complex ion in b (i) and give its shape.							te suff o
Formula of stable oxide  (iii) From the list of oxides in c (ii) select an oxide which is likely to be:  Amphoteric: Neutral: Acidic:  (6 m (TOTAL = 20 m)  I. This question concerns the d-block elements, Sulphur, Nitrogen and Group IV elements,.  (a) (i) Distinguish between a d-block element and a transition metal.  (ii) Write down the symbols for the elements of the first transition series in increasing order of atomic num  (iii) State the property of the transition element which enables them to act as catalyst in many industrial processes.  (4 m (b) Consider the following complex compound [Na4Fe (CN)6] (i) Give the name of the complex the compound above.  (ii) State A) the coordination number of iron in the complex compound  B) the oxidation state of iron in the complex compound  (iii) Draw the structure of the complex ion in b (i) and give its shape.	(ii) In Complete the	e table below g	iving the formulae	of the oxides of	the elements		
(iii) From the list of oxides in c (ii) select an oxide which is likely to be:  Amphoteric: Neutral: Acidic:  (6 m (TOTAL = 20 m)  7. This question concerns the d-block elements, Sulphur, Nitrogen and Group IV elements,  (a) (i) Distinguish between a d-block element and a transition metal.  (ii) Write down the symbols for the elements of the first transition series in increasing order of atomic num  (iii) State the property of the transition element which enables them to act as catalyst in many industrial processes.  (b) Consider the following complex compound [Na <sub>1</sub> Fe (CN) 6] (i) Give the name of the complex the compound above.  (ii) State A) the coordination number of iron in the complex compound  B) the oxidation state of iron in the complex compound  (iii) Draw the structure of the complex ion in b (i) and give its shape.		Li ta a	Be	В	C	N	F
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(iii) Draw the structure of the complex ion in b (i) and give its shape.		rdination numb	er of iron in the co	omplex compound	d H ) IS		
	B) the oxid	lation state of	iron in the comple	x compound	bas conceque La cost de la	nmages in con- consistent in a con-	
(5 ma	(iii) Draw the	structure of the	complex ion in b	(i) and give its sl	nape.	iquid Ast its as	er ið i
(5 ma			-				
(c) Give the formula of a fertilizer containing nitrogen and sulphur atoms and state the oxidation state of nitroger sulphur in the compound.			er containing nitro	gen and sulphur a	atoms and state	the oxidation stat	(5 marks) te of nitrogen and
Formula of fertilizer Oxidation state of Nitrogen Oxidation state of sulphur			Oxidation st	ate of Nitrogen	Ox	idation state of su	lphur
(3 m:							(3 marks)

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in anti-chilocome and children and constraints of the section of t	(2 marl
(ii) Catenation and "the inert pair effect" are two phenomena that characterize the	he chemistry of the Group IV
elements. What do you understand by; . Catenation?	1
. Catenation?	
. Inert pair effect?	
1):21.11   D=-12.12   1.13.11	
(iii) Explain why carbon shows a very high ability to catenate?	
	(3 mai
	(5 mai
e) The group IV elements also exhibit allotropy.	
e) The group IV elements also exhibit allotropy.  (i) What is allotropy?	
(i) What is allotropy?	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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(i) What is allotropy?	e de la companya de l
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(i) What is allotropy?  (ii) Give two crystalline forms of each of the following group IV elements:  Carbon	(3 mar (TOTAL = 20 Mar
(ii) Give two crystalline forms of each of the following group IV elements:  Carbon  Tin  SECTION C: ORGANIC CHEMISTRY  This question relates to organic compounds and their reactions.	(3 mar (TOTAL = 20 Mar
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			and de con		-
4		₹81	.1361		
					(2 m
(ii) 0.485 g of comp	ound A reacted co /mol). Determine	ompletely with 1.	700 g of silver nitra	ate in the ratio 1:2	. (Molar mass of sil
A. The molar m	nass of compound	A			
<u> </u>					
R. The molecul	lar formula of a				
b. The molecul	lar formula of com	ipound A			
		1	¥ 57		
		*	<u> </u>		(4 m
(a) Cina tour i	C	- 1-			(4111
(c) Give two is	somers of compour	nd A			1 2 7 7 7
28 M.L	F1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		[21,25]	01	
					(2 m
Class 1°	Structure	Nation of		Name	2 - 2
2°					<u></u>
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3°		od from omides l	IICC	1	, 11
	inas aan ba prapar	ed from annues (	by Hollmann's deg	radation.	
(ii) Primary am	ines can be prepar	and the second second second			
(ii) Primary am	ines can be prepar a general equation	and the second second second			
(ii) Primary am	2.11.2	and the second second second	s c t - t - l*thow		
(ii) Primary am (a) Write a	a general equation	for the reaction.	3 - 1 - 1 - 1 *gc/z		
(ii) Primary am (a) Write a	2.11.2	for the reaction.	r the reaction.		
(ii) Primary am (a) Write a	a general equation	for the reaction.	r the reaction.		
(ii) Primary am (a) Write a	a general equation	for the reaction.	r the reaction.		
(ii) Primary am (a) Write a	a general equation	for the reaction.			
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(ii) Primary am (a) Write a  (b) Give	reagents and reaction	for the reaction.	ir being basic?	Equipment of the property of t	
(ii) Primary am (a) Write a  (b) Give	reagents and reaction	for the reaction.	ir being basic?	Russall and response	(8 mar
(ii) Primary am (a) Write a  (b) Give	reagents and reaction	for the reaction.	ir being basic?	Proposition to the property	(8 mar (Total = 20 m

6.	Study the reaction pathways	below from which compound P may be prepared from ethane, and answer the	
	questions that follow.	$C_2H_6$	
		↓ Br₂,uv	
		$C_2H_5Br \xrightarrow{iv)} CH_3CH_2OH$	
		$\downarrow$ i) $\downarrow$ H <sup>+</sup> /Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>	
		M	
		v) NaCN/dil H <sub>2</sub> SO <sub>4</sub>	
		CH <sub>3</sub> CH <sub>2</sub> CO <sub>2</sub> H	
		Cl <sub>2</sub> /uv <sup>-</sup> CH <sub>3</sub> CH (OH) CN	
		N supplied to the property of	, v
		iii)	
		b A K	
		CH₃CHCO₂H	
		ОН	
	(a) Give the reagents and re	eaction conditions for the conversions (i), (ii), (iii) and (iv)	
	(')	Reagent(s) Reaction conditions	_
	(i) (ii)		_
	(iii)		
	(iv)		 (4 marks)
	(b) (i) Give the names of the		
	Compound	Name	
	M		-
	P		
	(ii) Name the type of org	ganic reactions in steps (i) and (v)	
	Step (i) Step (v)		
		()	5 marks)
	reaction conditions.	test, how would you distinguish the following pairs of compounds. State reage	nts and
	(i) propanal and propano	one ·	
		and the company of the control of th	<u> </u>
		economic aftrophymiddense graftenia kon	
	(ii) Ethene and Ethyne		
	(ii) Ethelie and Ethylie		
		and the state of t	
-		`	4 marks)
	(d) Outline the mechanism for	or the conversion of benzene to methylbenzene	
	/ A 2		
	3 +41		
			(2 marks)
		WAY.	(
201	20/0715/2/A/O		

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(e) 2-	aminopropanoic acid (CH <sub>3</sub> CH(NH <sub>2</sub> )CO <sub>2</sub> H) is amphoteric in nature.	
(i)	Write chemical equations to show the reaction of 2-aminopropanoic acid with:	
	A- HNO <sub>3</sub> (aq)	
	B- NaOH(aq)	
(ii)	Give the structure and general name of 2-aminopropanoic acid when in a neutral solution of $pH = 7$ .	
	- Structure - Name	
(iii	Draw the stereo isomers of 2-aminopropanoic acid.	

(5 marks) (Total = 20 marks)