		Name
UNIVER		E INTERNATIONAL EXAMINATIONS
CHEMISTRY		5070/03
Paper 3 Prac	ctical Test	May/luna 2006
		May/June 2006
	swer on the Question Pap erials: As listed in the Instr	
Write in dark blue or bla You may use a pencil fo Do not use staples, pap You may use a calculat Answer all questions.	per, candidate number an ack pen in the spaces pro or any diagrams, graphs o per clips, highlighters, glue for.	
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1 Compound **X** is an oxidising agent. An acidified solution of **X** oxidises potassium iodide to iodine which can be titrated with sodium thiosulphate.

Solution **P** was prepared by dissolving 1.70 g of compound **X** in 1.00 dm³ of distilled water.

You are to determine the relative molecular mass of **X**.

Solution **Q** is 0.100 mol/dm³ sodium thiosulphate, $Na_2S_2O_3$.

(a) Fill the burette with solution Q.

Pipette a 25.0 cm³ (or 20.0 cm³) portion of **P** into a flask and add about a test-tubeful of dilute sulphuric acid followed by about a test-tubeful of aqueous potassium iodide. The solution should turn red-brown. **Do not add the starch indicator at this stage.**

Add **Q** from the burette until the red-brown colour fades to pale yellow, **then** add a few drops of the starch indicator. This will give a dark blue solution. Continue adding **Q** slowly from the burette until one drop of **Q** causes the blue colour to disappear, leaving a colourless solution. Record your results in the table, repeating the titration as many times as you consider necessary to achieve consistent results.

Results

Burette readings

titration number	1	2	
final reading / cm ³			
initial reading / cm ³			
volume of Q used / cm^3			
best titration results (\checkmark)			

Summary

Tick (\checkmark) the best titration results.

[12]

(b) Q is 0.100 mol/dm^3 sodium thiosulphate.

One mole of **X** reacts with potassium iodide to produce iodine. The iodine produced reacts with **two** moles of sodium thiosulphate.

3

Calculate the concentration, in mol/dm³, of X in solution P.

	Concentration of X in solution P ismo	ol/dm ³ . [2]
(c)	P contains $1.70 \text{ g/dm}^3 \text{ X}$.		

Using your answer to (b), calculate the relative molecular mass of X.

Relative molecular mass of **X** is

[2]

2 You are provided with solid **R** and solution **S** both of which contain a compound of the same transition metal. Carry out the following experiments and record your observations in the table. You should test and name any gas evolved.

Tests on solid R

test no.	test	observations
1	Add a portion of aqueous hydrogen peroxide to a small sample of R .	
2	Add 1-2 cm ³ of concentrated hydrochloric acid to a sample of R and warm gently .	[9]

test no.	test	observations
3	 (a) To a portion of S, add aqueous sodium hydroxide until a change is seen. 	
	(b) Add excess aqueous sodium hydroxide to the mixture from (a) and allow to stand for a few minutes, shaking occasionally.	
	(c) To a portion of the mixture from (b), add a few drops of aqueous hydrogen peroxide.	
4	 (a) To a portion of S, add an equal volume of aqueous silver nitrate. 	
	(b) Add dilute nitric acid to the mixture from (a).	
5	 (a) To a portion of S, add an equal volume of aqueous barium nitrate. 	
	(b) Add dilute nitric acid to the mixture from (a).	

5

test no.	test	observations
6	To a portion of acidified potassium manganate(VII), add an equal volume of solution S .	

[12]

Conclusions

In test 1 , solid R is acting as	
In test 2 , solid R is acting as	
The anion (negative ion) present in solution S is	[3]

[3]

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NOTES FOR USE IN QUALITATIVE ANALYSIS

Tests for anions

anion	test	test result
carbonate (CO ₃ ^{2–})	add dilute acid	effervescence, carbon dioxide produced
chloride (C <i>l</i> ⁻) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
iodide (I ⁻) [in solution]	acidify with dilute nitric acid, then add aqueous lead(II) nitrate	yellow ppt.
nitrate (NO ₃) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulphate (SO ₄ ^{2–}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.

Tests for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
aluminium (Al ³⁺)	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
ammonium (NH ₄ ⁺)	ammonia produced on warming -	
calcium (Ca ²⁺)	white ppt., insoluble in excess	no ppt. or very slight white ppt.
copper(II) (Cu ²⁺)	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe ²⁺)	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe ³⁺)	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn ²⁺)	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

Tests for gases

gas	test and test result
ammonia (NH ₃)	turns damp red litmus paper blue
carbon dioxide (CO ₂)	turns limewater milky
chlorine (Cl ₂)	bleaches damp litmus paper
hydrogen (H ₂)	"pops" with a lighted splint
oxygen (O ₂)	relights a glowing splint
sulphur dioxide (SO ₂)	turns aqueous potassium dichromate(VI) from orange to green

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