Acids, Bases and Salts

Question Paper 3

Level	IGCSE
Subject	Chemistry
Exam Board	CIE
Topic	Acids, Bases and Salts
Sub-Topic	
Paper Type	Alternative to Practical
Booklet	Question Paper 3

Time Allowed: 53 minutes

Score: /44

Percentage: /100

A mixture of two solids, **E** and **F**, was analysed.

Solid ${\bf E}$ was the water-soluble salt aluminium chloride, ${\bf A}l{\bf C}l_3$, and solid ${\bf F}$ was an insoluble salt.

The tests on the mixture and some of the observations are in the following table. Complete the observations in the table.

	tests	observations
boil The and	tilled water was added to the mixture in a ing tube. e contents of the boiling tube were shaken I filtered, keeping the filtrate and residue for following tests.	
test	s on the filtrate	
	e filtrate was divided into five portions in test-tubes.	
(a)	The first portion was used to describe the appearance of the filtrate.	appearance [1]
(b)	Several drops of aqueous sodium hydroxide were added to the second portion of the solution. Excess aqueous sodium hydroxide was then added to the test-tube.	[3]
(c)	Aqueous ammonia was added to the third portion, dropwise and then in excess.	[2]
(d)	To the fourth portion of the solution, dilute nitric acid and aqueous silver nitrate were added.	[2]
(e)	To the fifth portion of the solution, about 1 cm³ of dilute nitric acid and barium nitrate solution were added.	[1]

tests	observations
tests on the residue	
(f) (i) To a little of the residue, dilute hydrochloric acid was added. The gas given off was tested.	rapid effervescence gas turned limewater milky
(ii) The residue was heated, gently then strongly.	solid changed colour from green to black

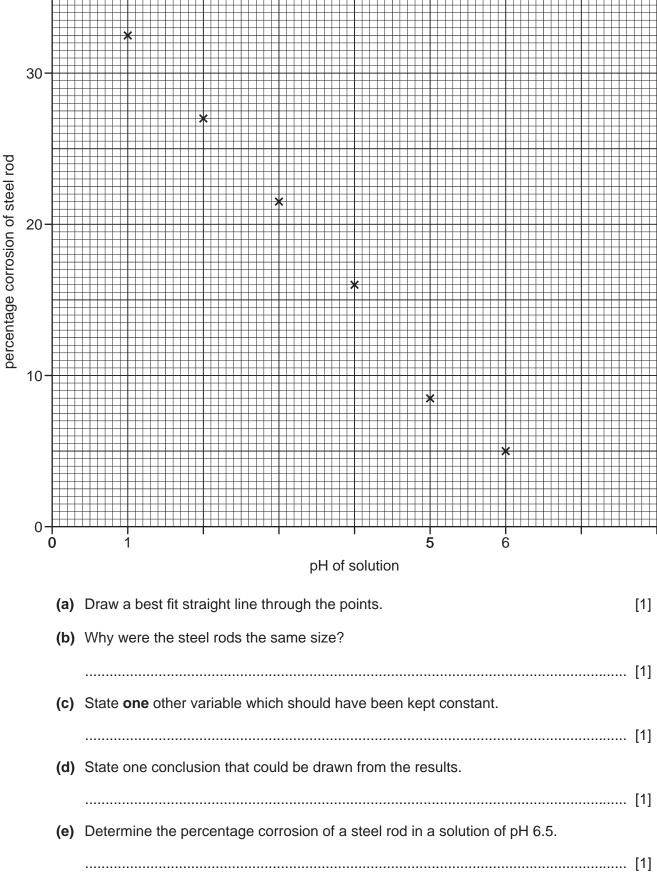
(g)	What conclusions can you draw about solid F ?
	[2

[Total: 11]

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2 Eight steel rods of the same size were placed in solutions of different pH for one week. The percentage corrosion of the rods was measured and the results plotted on the grid below.

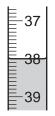


A student investigated the reaction between aqueous sodium hydroxide and acid **K**. Two experiments were carried out.

(a) Experiment 1

Using a measuring cylinder, 25 cm³ of acid **K** was poured into a conical flask. Phenolphthalein indicator was added to the flask. A burette was filled with aqueous sodium hydroxide to the 0.0 cm³ mark. Aqueous sodium hydroxide was added from the burette to the flask and the mixture shaken until the solution showed a permanent colour change.

The final volume was measured. Use the burette diagram to record the final volume in the table and complete the table.



final volume

	burette reading
final volume/cm ³	
initial volume/cm ³	
difference/cm ³	

[2]

(b) Experiment 2

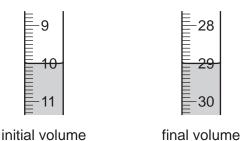
The solution was poured away and the conical flask rinsed.

Using a measuring cylinder, $50\,\mathrm{cm^3}$ of acid **K** was poured into the conical flask. $0.3\,\mathrm{g}$ of powdered calcium carbonate was added to the flask and the flask shaken until no further reaction was observed.

Phenolphthalein was added to the mixture in the flask.

A burette was filled with the same aqueous sodium hydroxide and the initial volume measured. Aqueous sodium hydroxide was added from the burette to the flask and the mixture shaken until the solution showed a permanent colour change.

Use the burette diagrams to record the initial and final volumes in the table and complete the table.



	burette reading
final volume/cm ³	
initial volume/cm ³	
difference/cm ³	

(c)	What flas	at colour change was observed after the sodium hydroxide solution was added to the k?
	fron	n to [2]
(d)	Wh	at type of chemical reaction occurred when acid K reacted with sodium hydroxide?
		[1]
(e)		xperiment 1 were repeated using 50cm^3 of acid \mathbf{K} , what volume of sodium hydroxide ald be required to change the colour of the indicator?
		[2]
(f)	(i)	What were the effects of adding 0.3 g of powdered calcium carbonate to acid K ?
		[2]
	(ii)	Use your answer in (e) to work out the difference between the volume of sodium hydroxide needed to completely react with 50 cm³ of acid K and the volume of sodium hydroxide used in Experiment 2.
		[2]
	(iii)	Estimate the mass of calcium carbonate that would be needed to be added to 50 cm³ of acid K to require 0.0 cm³ of sodium hydroxide.
		[1]
(g)		at would be the effect on the results if the solutions of acid K were warmed before ing the sodium hydroxide? Give a reason for your answer.
	effe	ct on results
	reas	son[2]

Suggest the advantage, if any, of			
(i)	using a pipette to measure the volume of acid K .		
(ii)	using a polystyrene cup instead of a flask.		
(11)			
	[Total: 20]		

4	Coffee beans contain caffeine and other compounds. Caffeine is soluble in water and trichloromethane, an organic solvent. A student obtained crystals of caffeine by the following method.				
	Sta	ge 1	Some coffee beans were crushed into small pieces.		
	Sta	ge 2	Hot water was added to the crushed beans to dissolve the soluble substances.		
	Sta	ge 3	The crushed beans were separated from the liquid solution.		
	Sta	ge 4	The liquid was allowed to cool and shaken with trichloromethane to extract caffeine from the water.	the	
	Sta	ge 5	The caffeine was crystallised from the trichloromethane solution.		
	Sta	ge 6	The caffeine crystals were checked for purity.		
	(a)	Wha	apparatus should be used to crush the beans in Stage 1?		
				[2]	
	(b)	How	could the dissolving process in Stage 2 be speeded up?		
				[1]	
	(c)	Draw	a diagram of the apparatus used in Stage 3.		
				[2]	
	(d)	How	should Stage 5 be carried out?		
				[2]	
	(e)	Wha	t method could be used to check the purity of the crystals in Stage 6?		
				[1]	