

O Level Combined Chemistry Structured

Salts Test 1.0

Q1

Lead (II) sulfate is a salt that can be prepared by the precipitation method.

(a) Name suitable reagents for the preparation of lead (II) sulfate.

..... [2]

(b) Explain why the precipitation method is suitable for the preparation of lead (II) sulfate.

..... [1]

(c) Describe how a pure and dry sample of lead (II) sulfate can be prepared in the laboratory.

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..... [3]

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Q2

The equation below shows the salts formed from the reaction between lead(II) nitrate and zinc sulfate.



A student wanted to prepare one of the two products in the above reaction in the laboratory. He was told that only the following reagents are available for use.

dilute nitric acid	lead(II) hydroxide powder	aqueous lead(II) nitrate
dilute sulfuric acid	aqueous zinc chloride	zinc carbonate powder

- (b) Suggest two reagents from the above list that can be used to prepare one of the products.

State the product which you wish to prepare:

Two reagents that can be used to prepare your chosen product:

..... and [1]

- (c) Describe the steps needed to prepare a pure and dry sample of the product you have chosen in (b).

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..... [4]

Q3

- (a) A chemical company makes salts for use in industries. The table shows some names and formulae of salts with the names of the acids and other compounds used to make them.

Complete the table by filling in the missing information.

name of salt	formula of salt	name of acid used to make salt	name of the other compound used to make salt
sodium sulfate	Na_2SO_4		
potassium phosphate	K_3PO_4	phosphoric acid	
silver chloride	AgCl		
calcium phosphate			calcium hydroxide

[4]

Q4

- (a) Describe how pure crystals of potassium chloride can be prepared using a solution of potassium carbonate and an acid.

name of acid:

method of preparation:

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[6]

- (b) Explain why potassium chloride has a high melting point.

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[2]

- (c) Name an insoluble salt and state the reagents that can be used to prepare the salt.

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[2]

Q5

Table 7.1 shows the analysis of samples of river water from three different countries P, Q and R.

Table 7.1

ion present	concentration of ions in country P (mg/dm ³)	concentration of ions in country Q (mg/dm ³)	concentration of ions in country R (mg/dm ³)
magnesium, Mg ²⁺	32	67	2
sodium, Na ⁺	0	12	11
potassium, K ⁺	2	3	0
hydrogen, H ⁺	30	12	13
chloride, Cl ⁻	14	28	0
sulfate, SO ₄ ²⁻	31	82	52
phosphate, PO ₄ ³⁻	0	10	10

- (a) Based on Table 7.1, suggest a reason which country has the most acidic water.

.....
..... [1]

- (b) Give the name and formula of the salt that can be found in the river water from the three different countries P, Q and R.

..... [2]

- (c) Phosphate ions are contaminants from factories. One way of treating river water to remove these phosphate ions is by adding calcium ions to form a precipitate.

Construct an ionic equation, with state symbols, to show the reaction between calcium ions and phosphate ions.

..... [2]

Answers

Salts Test 1.0

Q1

(a)	Lead(II) nitrate Any soluble sulfate salt Accept : sulphuric acid	[1] [1]
(b)	Lead(II)sulfate is an insoluble salt.	[1]
(c)	<u>Add/ Mix</u> lead(II)nitrate and soluble salt named in part (a) in a beaker. Allow e.c.f for wrong reagent named in part (a)	[1] [1]
	<u>Filter</u> to remove the lead(II)sulfate as the residue. <u>Wash with distilled water</u> (½ mark)and pat <u>dry in between filter paper</u> (1/2 mark).	[1]

Q2

(b)	PbSO ₄ : <u>dilute sulfuric acid</u> and <u>aqueous lead(II) nitrate</u> or Zn(NO ₃) ₂ : <u>dilute nitric acid</u> and <u>zinc carbonate</u>	Both correct – 1m
(c)	PbSO ₄ <ul style="list-style-type: none"> • <u>Mix a fixed volume of aq. lead(II) nitrate with excess sulfuric acid. Stir until no more precipitate of lead(II) sulfate forms.</u> • <u>Filter to collect the precipitate, lead(II) sulfate</u> • <u>Wash the precipitate with a small amount of distilled water.</u> • <u>Dry precipitate in between sheets of filter paper.</u> Zn(NO ₃) ₂ <ul style="list-style-type: none"> • <u>Add zinc carbonate in excess to a fixed volume of dilute nitric acid.</u> • <u>Filter to remove unreacted zinc carbonate and collect filtrate, zinc nitrate solution.</u> • <u>Heat the zinc nitrate solution until a saturated solution is obtained.</u> • <u>Leave the saturated zinc nitrate solution to cool and crystallise.</u> • <u>Then wash with a little cold distilled water and dry in between sheets of filter paper</u> 	5 points – 4m 4 points – 3m 3 points – 2m 2 points – 1m

Q3

(a)	sulfuric acid, sodium hydroxide potassium hydroxide hydrochloric acid, silver nitrate Ca ₃ (PO ₄) ₂ , phosphoric acid,	1
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Q4

(a)	Dilute hydrochloric acid Titration: Add acid into burette. Pipette 25.0 cm ³ of aqueous potassium carbonate into conical flask Add 3 drops indicator, methyl orange into flask Titrate acid with alkali till end point. Record volume of acid used. Repeat titration for accuracy Crystallisation: Add 25.0 cm ³ of potassium carbonate and volume of acid found from titration into evaporating dish No indicator Evaporate to get saturated solution Cool to get crystallise Wash crystals with distilled water pat dry between filter paper	1 3m 2m
(b)	Positive ions attract negative ions to form Strong ionic bond Lots of energy needed to break ionic bond	1 1
(c)	Any insoluble salt eg, barium sulfate, silver chloride etc Reagents stated must be aqueous salts or one aqueous salt and one acid	1 1

Q5

(a)	P as it has the <u>highest concentration of hydrogen ions.</u>	[1]
(b)	Magnesium sulfate [1] MgSO ₄ [1]	[2]
(c)	$3 \text{Ca}^{2+} (\text{aq}) + 2 \text{PO}_4^{3-} (\text{aq}) \rightarrow \text{Ca}_3(\text{PO}_4)_2 (\text{s})$ Balanced ionic equation [1] State symbols [1] only if equation is balanced	[2]