## Essay {Paper02}

**[SBPmidyearF508-09c]**

c(i) Procedure :

1 100 $cm^3$ of 0.1 $moldm^{-3}$ sulphuric acid is poured into a beaker and heated slowly.
2 zinc carbonate is added into the sulphuric acid until in excess/no longer dissolves
3 Stir the solution and filtered.
4 The filtrate is poured into an evaporating dish and heat until saturated
5 The hot saturated salt solution is allowed to cool
6 The crystals formed are filtered out, rinsed with distilled water
7 dried between sheets of filter paper.

$ZnCO_3 + H_2SO_4 \rightarrow ZnSO_4 + H_2O + CO_2$

(ii) 1. Number of mole , $H_2SO_4 = 0.1( 100 )/1000$
$= 0.01$
1 mol of $H_2SO_4$ produce 1 mol of $ZnSO_4$
2. Mole of $ZnSO_4 = 0.01$

3. Mass of $ZnSO_4 = 0.01 \times 161$
4. $= 16.1$ g

d Sample answer :
1 ammonium chloride as a fertilizer
2 copper (II) sulphate as a pesticide
3 hydrated calcium sulphate to make plaster casts
4 sodium chloride food additive
Any 2 suitable anwers(1+1)

**----------oooOO aĎaŽ OOooo----------**

**[SBPtrial05-09c]**

((c) 1. [ Bahan yang betul ] cth asid sulfurik dan kuprum(II) oksida/kuprum(II) karbonat/kuprum(II) hidroksida
2. [(25 – 100 $cm^3$) asid sulfurik cair [0.1 – 2 mol $dm^{-3}$] dimasukkan ke dalam bikar / kelalang kon / bekas yang sesuai
3. dan dipanaskan
4. pepejal kuprum(II)oksida / kuprum(II) karbonat/kuprum(II) jidroksida ditambahkan ke dalamnya secara berlebihan/sehingga terdapat pepejal yang tak larut lagi
5. campuran dikacau
6. hasil tindakbalas dituras
7. Panaskan hasil turasan sehingga 1/3 isipadu asal / tepu
8. Sejukkandan turaskan
9. Keringkan hablur garam dengan kertas turas
10. [Persamaan] $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$ //
$CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + CO_2 + H_2O$// $Cu(OH)_2 + H_2SO_4 \rightarrow CuSO_4 + H_2O$

**[SBPmidyearF507-10b]**

(b) 1. Copper ( II ) oxide is added into a beaker filled with nitric acid solution and is heated 1
2. Stir the mixture during heating 1
3. Filter the mixture to remove excess solid 1
4. The filtrate is filled into a beaker and is added with sodium carbonate.
5. Stir and then filter the mixture. 1
6. Rinse the residue collected using distilled water. 1
7. Dry the residue 1
8. Chemical equations : 1
$CuO + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_2O$
$Cu(NO_3)_2 + Na_2CO_3 \rightarrow CuCO_3 + 2NaNO_3$ 1
1

Max = 8 M

**----------oooOO aĎaŽ OOooo----------**

**[SBPdiag07-10]**

(a) (i) [Description of three complete reactions]
eg. The reaction of magnesium with sulphuric acid to produce magnesium sulphate and hydrogen.
Suggested reactions:

- $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$
- $MgO + H_2SO_4 \rightarrow MgSO_4 + H_2O$
- $Mg(OH)_2 + H_2SO_4 \rightarrow MgSO_4 + 2H_2O$
- $MgCO_3 + H_2SO_4 \rightarrow MgSO_4 + H_2O + CO_2$

1+1+1

(ii) 1.Pour **50 cm$^3$ of 2 mol dm$^{-3}$** sulphuric acid into a beaker. 1
[Volume: 20 – 100 cm$^3$, molarity: 0.5 – 2.0 mol dm$^{-3}$]
2.Warm the acid. 1
3.Use a spatula to add magnesium oxide powder [or any suitable reactant mentioned above] into the acid. 1
4.Stir the mixture evenly. 1
5 Continue adding magnesium oxide [or any suitable reactant] until some of it no longer dissolves. 1
6.Filter to remove the excess magnesium oxide. 1
7.Pour the filtrate into an evaporating dish and heat the salt solution to produce a saturated solution. 1
8.Cool the saturated solution until crystals are formed. 1
9. The content are filtered to obtain the magnesium sulphate crystals. 1
10.The crystals are pressed between a few pieces of filter paper to be dried. 1 10

(b) (i) Ammonia gas 1 1

(ii) $NH_3 + H_2O \rightarrow NH_4^+ + OH^-$ /
$NH_3 + H_2O \rightarrow NH_4OH$ 1 1

(iii) 1.Dip a glass rod into concentrated hydrochloric acid and then bring it to the mouth of the test tube. 1
2.White fumes is formed. 1 2

(iv) 1. Blue precipitate is formed. 1
2. Precipitate dissolves in excess ammonia 1
3. A dark blue colouration/solution is formed. 1 3

**----------oooOO aĎaŽ OOooo----------**

**[SBPdiag06-10]**

(a) [Name any insoluble salt] 1
[Name any two suitable solution] 1+1
[Write correct ionic equation] 1

Example:
Lead(II) sulphate
Lead(II) nitrate solution and sodium sulphate solution
$Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$ **4**

(b) **<u>Test for $Zn^{2+}$ ion</u>**

Procedure I:
- A few drops of **sodium hydroxide** solution are added into the salt solution of X until **in excess**. 1

*Observation* **:**
- **White precipitate dissolved** in excess sodium hydroxide solution to produce a **colourless solution**. 1

Procedure II:
- A few drops of **ammonia solution** are added into the salt solution of X until **in excess**. 1

*Observation* **:**
- **White precipitate dissolved** in excess ammonia solution to produce a **colourless solution**. 1

*Inference:*
$Zn^{2+}$ ion is present

**<u>Test for $SO_4^{2+}$ ion</u>**
- 5 $cm^3$ of **hydrochloric acid** is added into the salt solution of X follow by 2 $cm^3$ of **barium chloride** solution.

*Observation*: 1
- **White precipitate is formed**.

*Inference:* 1
$SO_4^{2+}$ion is present. **6**

(c)
- Chemicals : **sulphuric acid** and **copper(II) oxide / copper(II) carbonate** 1
- 50 $cm^3$ of 1.0 $moldm^{-3}$ **sulphuric acid** is pour into a beaker and **warmed** carefully 1
- **Copper(II) oxide** powder is added a little at a time into the acid using spatula. 1
- The mixture is stir well with a glass rod. 1
- Copper(II) oxide powder is added continuously until some of it **no longer dissolves**. 1
- The mixture is filtered **to remove the excess copper(II) oxide**. 1
- The filtrate is pour into an evaporating dish and heated gently to produce a **saturated solution** / heated until the filtrate is evaporated to about 1/3 of its original volume. 1
- The saturated solution is then **allowed to cool to room temperature** for crystallisation to occur. 1
- The copper(II) sulphate crystals are filtered and dry by **pressing them between a few pieces of filter paper**. 1
- $H_2SO_4 + CuO \rightarrow CuSO_4 + H_2O$ 1

**----------oooOO aĎaŽ OOooo----------**

**[SBPtrial06-08]{Translate}**

(a) (i) 1. Tindak balas asid dengan oksida bes(hidroksida, oksida logam)
2. Tindak balas asid dengan logam
3. Tindak balas asid dengan karbonat

(ii) (Contoh jawapan mengikut jenis tindak balas yang diberi di (a)(i))
1. $2HCl + MgO \rightarrow MgCl_2 + H_2O$
2. $2HNO_3 + Zn \rightarrow Zn(NO_3)_2 + H_2$
3. $2HNO_3 + MgCO_3 \rightarrow Mg(NO_3)_2 + H_2O + CO_2$

(b) [Senarai bahan kimia - 1 markah]
[Senarai alat radas - 1 markah]
[Kaedah - 7 markah]
[Persamaan - 1 markah]

Contoh jawapan :
1. Serbuk magnesium/magnesium oksida(Hidroksida, karbonat) dan asid sulfurik
2. Bikar(bekas yang sesuai), corong turas, kertas turas
3. [20 – 300] $cm^3$ asid sulfurik [0.5 – 2.0 ] mol $dm^{-3}$ dituangkan ke dalam bikar (bekas yang sesuai)
4. Serbuk magnesium ditambahkan ke dalam asid sulfurik
5. sehingga tidak larut/sehingga berlebihan/sehingga tiada pembuakan
6. Turaskan
7. Hasil turasan dipanaskan sehingga tepu(pekat, satu pertiga isipadu larutan tertinggal)
8. [Sejukkan] dan turaskan

9. Hablur dikeringkan dengan kertas turas/dimasukkan ke dalam ketuhar/ditekan antara kertas turas
10. Persamaan: $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

(c) 1. Isikan kedua-dua larutan dalam 2 tabung uji berasingan
2. Tambahkan beberapa titis larutan plumbum(II) nitrat/argentum nitrat kepada kedua-dua larutan
3. Jika tiada perubahan menunjukkan larutan magnesium nitrat
4. Jika mendakan putih terbentuk menunjukkan larutan magnesium sulfat

*atau* [ujian cincin perang untuk nitrat]
1. Isikan kedua-dua larutan dalam 2 tabung uji berasingan
2. [Tambahkan] asid sulfurik cair, larutan ferum(II) sulfat, asid sulfurik pekat kepada setiap tabung uji
3. [Teknik] contoh: tambah asid dengan perlahan/jangan goncang
4. Membentuk cincin perang menunjukkan magnesium nitrat/tiada cincin perang menunjukkan magnesium sulfat

**----------oooOO aĎaŽ OOooo----------**

**[SBPdiag05-essay04]**

(a) *Contoh*, $Pb(NO_3)_2 + CuSO_4 \rightarrow PbSO_4 + Cu(NO_3)_2$ 1
Pencampuran dua larutan iaitu larutan plumbum(II) nitrat dengan larutan kuprum(II) sulfat menghasilkan mendakan plumbum(II) sulfat. 1
(*Atau contoh lain yang sesuai)*

(b)(i)

| Perkara | Eksperimen I | Eksperimen II | |
|---|---|---|---|
| Jenis tindak balas | Tindak balas peneutralan antara asid dengan **alkali** | Tindak balas peneutralan antara asid dengan **bes** | 1+1 |
| Kaedah penyediaan garam | Tidak melibatkan penurasan | Melibatkan penurasan | 1+1 |
| Pemerhatian | Larutan merah jambu menjadi tidak berwarna | Larutan tidak berwarna menjadi warna biru | 1+1 |
| Persamaan kimia | $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$ | $H_2SO_4 + CuO \rightarrow CuSO_4 + H_2O$ | 1+1 |

(ii)
- 50 $cm^3$ asid sulfurik cair (0.5 $moldm^{-3}$) disukat dan dimasuk ke dalam sebuah bikar. 1
- Asid sulfurik itu dipanaskan. 1
- Serbuk kuprum(II) okaida dicampurkan kepada asid itu dan dikacau dengan rod kaca 1
- Campuran serbuk kuprum(II) oksida dihentikan apabila terdapat sedikit kuprum(II) oksdia yang tidak larut lagi. 1
- Campuran dituraskan. 1

- Hasil turasan dipanaskan dalam sebuah mangkuk pijar sehingga tepu // tinggal 1/3 isi padu asalnya. 1+1
- Hasil turasan dibiarkan sejuk. 1
- Hablur kuprum(II) sulfat yang terbentuk dituras dan 1
- dikeringkan dengan menggunakan kertas turas. 1

**----------oooOO aĎaŽ OOooo----------**

**[SBPtrial04-09] {Translate}**

(a) 1. Sebatian ion yang terhasil apabila ion hidrogen suatu asid digantikan dengan ion logam atau ion ammonium

(b) 1. Larutkan ferum(II) sulfat dengan air suling. Bahagikan kepada dua bahagian
2. Tambahkan larutan natrium hidroksida sedikit demi sedikit
3. sehingga berlebihan [atau reagen yang sesuai]
4. Mendakan hijau tak larut dalam natrium hidroksida berlebihan mengesahkan kehadiran ion ferum(II)
5. Tambahkan larutan garam barium (barium klorida/barium nitrat)
6. Mendakan putih terbentuk
7. mengesahkan kehadiran ion sulfat.

(c) 1. Bahan : Asid hidroklorik (0.1 – 2.0 mol $dm^{-3}$ ), kuprum(II) oksida/kuprum(II) hidroksida/ kuprum(II) karbonat
2. Radas : Bikar, corong turas, kertas turas, penunu bunsen, tungku kaki tiga, mangkuk pijar, silinder penyukat 100$cm^3$
3. [20 – 50$cm^3$] asid hidroklorik dimasukkan ke dalam bikar dan dipanaskan /dihangatkan
4. Masukkan serbuk kuprum(II) oksida/kuprum(II) hidroksida/kuprum(II) karbonat ke dalam bikar itu
5. Kacau
6. sehingga berlebihan/terdapat pepejal tak larut
7. Turaskan
8. Pindahkan hasil turasan ke dalam mangkuk pijar
9. Panaskan
10. sehingga larutan menjadi tepu/isipadu menjadi 1/3 daripada isipadu asal
11. Sejukkan pada suhu bilik
12. Turaskan
13. Keringkan dengan menggunakan kertas turas

**----------oooOO aĎaŽ OOooo----------**

**[SBPtrial07-07c]**

(c) 1. Pour [20-100]$cm^3$ of zinc nitrate solution [0.1-1.0]mol $dm^{-3}$ into a beaker
2. Add [20-100]$cm^3$ of sodium carbonate solution [0.1-1.0]mol $dm^{-3}$
3. Stir and filter the mixture
4. Pour [20-100]cm3 dilute/[0.1-1.0]mol $dm^{-3}$ sulphuric acid into a beaker

5. Add the residue/precipitate into the acid until in excess
6. Stir and filter the mixture
7. Heat the filterate until saturated/1/3 of original volume
8. Cool the saturated solution
9. Filter and dry the crystal
10. $Zn(NO_3)_2 + Na_2CO_3 \rightarrow ZnCO_3 + 2NaNO_3$
11. $ZnCO_3 + H_2SO_4 \rightarrow ZnSO_4 + H_2O + CO_2$

**----------oooOO aĎaŽ OOooo----------**

**[MRSM06-10b,c]**

(b) 1. a little solution X was poured into 2 test tube.
2. first test tube was added with sodium iodide solution
3. if yellow precipitate produce, that confirm that $Pb^{2+}$ ions present
4. If no yellow precipitate, that will confirm $Ca^{2+}$ ions present
5. The second test tube was added with dilute sulphuric acid, then followed by iron(II) sulphate.
6. 3 drop of concentrated sulphuric acid was slowly added
7. brown ring formed, that confirm that nitrate ions present.

(c) 1. Zinc chloride solution was added into sodium carbonate solution
2. mixture was stir and filter
3. the residue/ solid/ precipitate was spray (bilas) with distilled water
4. add the residue/ precipitate into the sulphuric acid until excess
5. filter the mixture. Collect the filtrate
6. heat the filtrate until saturated
7. cool it at room temperature for crystallisation/ crystal formed
8. filter and dry the crystal by using 2 filter paper

9. Chemical equation for formation of $ZnCO_3$
$ZnCl_2 + Na_2CO_3 \rightarrow ZnCO_3 + 2NaCl$

10. Chemical equation for formation of $ZnSO_4$
$ZnCO_3 + H_2SO_4 \rightarrow ZnSO_4 + CO_2 + H_2O$

**----------oooOO aĎaŽ OOooo----------**

**[MRSM05-07b,c]**

(b) (i) $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

(ii) 1. Mol Zn = mass/ molar mass = 5/65 = 0.08 mol

2. ratio between Zn to $H_2SO_4$
1 mol : 1 mol
0.08 mol : 0.08 mol

3. Volume $H_2SO_4$ = Mol X 1000/M
= 0.08 X 1000/0.5 = 160 $cm^3$

(iii) 1. filter the mixture by using filter funnels
2. rinse the little distilled water and dry by filter paper

(c) Test for Anion
1. 2 $cm^3$ of solutions of calcium nitrate, magnesium nitrate and magnesium chloride in 3 different test tube.
2. then add 2 $cm^3$ of silver nitrate solution in 3 test tube.
3. if white precipitate formed, that confirm the chloride ions present
4. if no white precipitate was formed, that confirm nitrate ion present

Test for cation
5. 2 $cm^3$ of solutions of calcium nitrate, magnesium nitrate and magnesium chloride in 3 different test tube.
6. then add 2 $cm^3$ of ammonia solution until excess
7. if white precipitate formed, then not dissolves in excess, that confirm Magnesium ion, $Mg^{2+}$ present.
8. if no white precipitate formed, that confirm Calcium ion, $Ca^{2+}$ ion

9. Confirm Calcium Nitrate when test with silver nitrate no white precipitate formed and no white precipitate when add with ammonia until excess.
10. Confirm Magnesium nitrate when test with silver nitrate there is no white precipitate and white precipitate formed and no dissolve in excess ammonia.
11. Confirm Magnesium Chloride when test with silver nitrate that will formed white precipitate and white precipitate not dissolve in excess ammonia.

**----------oooOO aĎaŽ OOooo----------**

**[MRSM04-09c]**

(c) **A. Prepare $Zn(NO_3)_2$**
1. Add Zinc oxide into 100 $cm^3$ of 0.1 mol $dm^{-3}$ of hot nitric acid solution in 200 $cm^3$ beaker
2. Stir the mixture
3. and continue adding zinc oxide until excess.
4. filter the mixture. The filtrate is Zinc nitric, $Zn(NO_3)_2$
5. $ZnO + 2\ HNO_3 \rightarrow Zn(NO_3)_2 + H_2O$

**B. Prepare $ZnCO_3$**
6. 100 $cm^3$ solution of 0.1 mol $dm^{-3}$ of Zinc nitrate then added with 100 $cm^3$ with of 0.1 mol $dm^{-3}$ of sodium carbonate solution in the 250 $cm^3$ beaker
7. stir the mixture then filter the mixture
8. then rinse the little distilled water and dry by using filter paper

9. $Zn(NO_3)_2 + Na_2CO_3 \rightarrow ZnCO_3 + 2\ NaNO_3$

**----------oooOO aĎaŽ OOooo----------**

**[MRSM03-09a]**

1(a) (i) Agriculture : Example : Magnesium sulphate (Epsom salt) as fertiliser
(ii) Food preparation : Example : Sodium chloride, NaCl – as flavouring

**[MRSM03-09c]**

(c) 1. Prepare 6 different test tube and labelled it as A, B, C, D, E and G.
2. Test tube labelled A, B and C was added with ammonia solution until excess
3. If the white precipitate formed then dissolved in excess ammonia solution, confirm Zinc ion present.
4. If the white precipitate formed then not dissolved in excess ammonia solution, confirm lead(II) ion and aluminium ions

5. Test tube labelled D, E and F add with potassium iodide solution.
6. if yellow precipitate formed, then confirm that lead(II) ion present.

7. Lead(II) nitrate confirm when formed white precipitate when add with ammonia solution and not dissolved in excess and formed yellow precipitate when added with KI
8. Zinc nitrate confirm when formed white precipitate when add with ammonia solution and white precipitate dissolved in excess.
9. Aluminum nitrate confirm when formed white precipitate when add with ammonia solution and not dissolved in excess. And not formed precipitated when added with potassium iodide.

**----------oooOO aĎaŽ OOooo----------**

**[SPM09-10c]**

(c) **Test nitrate ion : Brown Ring Test**
1. Pour about 2 $cm^3$ of the mixture into the test tube.
2. Add 2 $cm^3$ of dilute sulphuric acid followed by 2 $cm^3$ of iron(II) sulphate and shake well.
3. Concentrated sulphuric acid is added slowly down the side of the test tube by using dropper. Do not shake the test tube.

Observation : 4. Brown ring formed
Conclusion : confirm nitrate ion is present

**Test chloride ions**
1. Pour 2 $cm^3$ of the mixture into the test tube followed by silver nitrate solution
Observation : 2. White precipitation formed
Conclusion : 3. confirm chloride ion present

**Test for Iron(III) ion**
1. Pour 2 $cm^3$ of the mixture into the test tube followed by potassium hexacyanoferrate(II), $K_4Fe(CN)_6$
Observation : 2. A dark blue precipitate is observed.
Conclusion : 3. Confirm the present of iron(III) ions

**----------oooOO aĎaŽ OOooo----------**

**[SPM08-10b]**

(b) 1. Substances – Lead (II) nitrate// lead (II) ethanoate and sodium sulphate / sulphuric acid
2. Apparatus – beaker, glass rod, filter funnel, filter paper

Procedure
3. Pour (20 – 100) cm3 of (0.5 – 2.0) mol dm-3 lead (II) nitrate / lead (II) ethanoate
4. Pour (20 – 100) cm3 of (0.5 – 2.0) mol dm-3 sodium sulphate / sulphuric acid
5. Stir the mixture
6. Filter
7. Wash/ rinse the residue / solid / PbSO4 / salt / precipitate using water

Equation
$Pb(NO_3)_2 + Na_2SO_4 \rightarrow PbSO_4 + 2NaNO_3$ or ionic equation

**----------oooOO aĎaŽ OOooo----------**

**[SPM05-08]**

(a)
- Hydrochloric acid(strong acid) ionises completely in water to produce a high concentration of hydrogen ions
- if the concentration of $H^+$ ions is high, the pH value is low
- Ethanoic acid (weak acid) ionises partially in water to produce low concentration of hydrogen ions
- If the concentration of $H^+$ ions is high, the pH value is high

(b) Test for $Cl^-$ in HCl
1. Pour 2 $cm^3$ of hydrochloric acid into a test tube
2. Add nitric acid solution , then add silver nitrate solution
3. A white precipitate is formed, confirmed the presence of chloride ions

Test for $NH_4^+$ ions in ammonium chloride solution
1. Pour 2 $cm^3$ of ammonium chloride solution into a test tube
2. Add Nessler's reagent
3. A brown precipitate is formed, confirmed the presence of ammonium ions

OR
1. Pour 2 $cm^3$ of ammonium chloride solution into a test tube
2. Add dilute sodium hydroxide solution and warm it
3. A colourless gas given off that change moist red litmus paper to blue

Test for $Cl^-$ ions in ammonium chloride solution
1. Pour 2 $cm^3$ of hydrochloric acid into a test tube
2. Add nitric acid solution , then add silver nitrate solution
3. A white precipitate is formed, confirmed the presence of chloride ions

(c) (i) n = 0.5 x 50/1000 = 0.025
Mass of $CuCl_2$ = 0.025 x 124 = 3.1 g
(ii) Solid X = Copper(II) oxide , black in colour
(iii) Carbon dioxide , flow the gas into lime water, lime water turns chalky

**[SPM07-07]**

(a) (i)

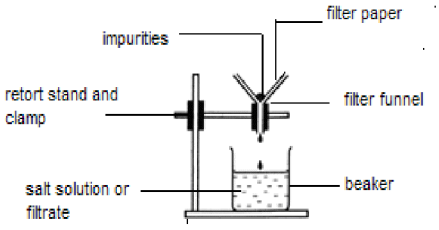
| Soluble salt | Insoluble salt |
|---|---|
| Potassium sulphate, $K_2SO_4$ | Lead(II) sulphate, $PbSO_4$ |
| Zinc sulphate, $ZnSO_4$ | |

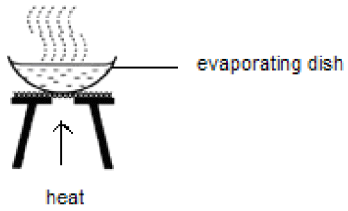
(ii)

- lead(II) nitrate, $Pb(NO_3)_2$ or lead(II) ethanoate$(CH_3COO)_2Pb$ and
- sodium sulphate or potassium sulphate or all soluble sulphate salt

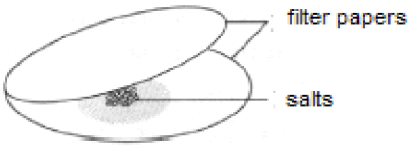
(b) The crystallisation method for preparing a soluble salt from its aqueous solution;-

- Filter the solution to remove impurities and pour the filtrate into an evaporating dish




- Gently heat the solution to obtain a saturated solution
- Cool the hot saturated solution to allow it to crystallise
- Filter and wash or rinse the crystals using distilled water
- Press the crystals with a few pieces of filter papers to dry them




*[refer to the Chemistry Practical Book on Page 114]*

(c) (i) Brown gas is nitrogen dioxide gas and the anion is nitrate

Test for nitrate ions

1. Pour 2 $cm^3$ salt X solution into a test tube
2. Acidify the solution with about 2 $cm^3$ of dilute sulphuric acid
3. Add 2 $cm^3$ of iron(II) sulphate solution and shake to mix well
4. Slant the test tube and carefully add concentrated sulphuric acid down the side of the test tube. Do not shake the test tube.
5. A brown ring is formed

*[refer to the Chemistry Practical Book on Page 133]*

(ii) The cations :- Magnesium ions, aluminium ions and lead(II) ions (any two ions)

1. Pour 2 $cm^3$ salt X solution into a test tube
2. Add sodium hydroxide solution into the test tube until in excess
3. A white precipitate is formed soluble in excess of NaOH, shows the present of lead(II) ions or aluminium ions
4. A white precipitate is formed insoluble in excess of NaOH, shows the present of magnesium ions

OR
1. Pour 2 $cm^3$ salt X solution into a test tube
2. Add potassium sulphate solution or potassium chloride solution or potassium iodide solution or sulphuric acid or hydrochloric acid into the test tube
3. A white or yellow precipitate is formed, shows the present of lead(II) ions
4. If no precipitate is formed, indicates the presence of magnesium ions or aluminium ions

**----------oooOO aĎaŽ OOooo----------**

**[MRSM11-09]**

(*a*) (i) 1. Lead(II) sulphate is insoluble salt.
2. Lead(II) sulphate will be form protective coating that will be stop further reaction

(ii) **Step I**
1. Add lead(II) oxide into 100 $cm^3$ of 0.1 mol $dm^{-3}$ of hot nitric acid bit by bit
2. Stir the mixture and continue adding PbO until excess.
3. Filter the mixture. The filtrate is lead(II) nitrate.
4. Observation: PbO powder is dissolved in the acid
5. $PbO + 2\ HNO_3 \rightarrow Pb(NO_3)_2 + H_2O$

**Step II**
1. Add 100 $cm^3$ of 0.1 $moldm^{-3}$ lead(II) nitrate into 100 $cm^3$ of 0.1 $moldm^{-3}$ sodium sulphate.
2. Stir the mixture then filter it.
3. Observation : white precipitate is formed
4. $Pb(NO_3)_2 + Na_2SO_4 \rightarrow PbSO_4 + 2NaNO_3$

Maximum marks = 8

(*b*) **Test of carbonate ion**
1. Put half spatula of lead(II) carbonate powder into 3 $cm^3$ of sulphuric acid in the test tube.
2. then channels the gas released into the other test tube that contains lime water
3. Lime water will turns to cloudy/ milky
4. Confirm present of $CO_2$. $CO_2$ derive from nitrate salt.

Test of Lead(II) ion
1. Put one spatula of lead(II) carbonate powder into 6 $cm^3$ of nitric acid in the test tube to make a lead(II) ions solutions.
2. The put 2 $cm^3$ of the solution into 2 test tube.
3. First test tube, added with NaOH until excess
4. White precipitate formed then dissolves in the excess
5. Other test tube, added with ammonia solution
6. White precipitate formed then dissolves in the excess
7. Confirm present of lead(II) ion.

**----------oooOO aĎaŽ OOooo----------**

**[SPM03-10]**

(a) By adding
- quick lime and slaked lime or calcium oxide and calcium hydroxide to the soil
- fertilizers or organic fertilizers or compost
[calcium phosphate or polyphosphate fertilizers or superphosphate fertilizers]

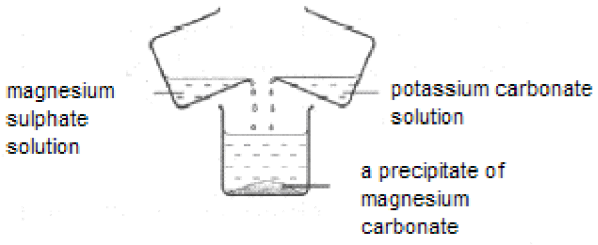
(b) **Cation test**
1. Add Salt X into nitric acid, $HNO_3$
2. A colourless solution is formed
3. Then add 2 $cm^3$ of hydrochloric acid into the colourless solution
4. A white precipitate is formed
5. Heat the mixture
6. White precipitate dissolve
7. Confirmed the presence of lead(II) ions,$Pb^{2+}$

Anion test
1. Add Salt X into nitric acid, $HNO_3$
2. Then heat the mixture
3. The gas evolved is flowed into lime water
4. Lime water turns chalky / milky
5. Confirmed the presence of carbonate ion, $CO_3^{2-}$

(c) To prepare a dry magnesium chloride salt:-
Materials : magnesium sulphate solution, dilute hydrochloric acid, potassium carbonate solution, filter papers, distilled water
Apparatus: 100 $cm^3$ measuring cylinder, filter funnel, evaporating dish, Bunsen burner, retort stand and clamp, beakers, glass rod,spatula and wire gauze

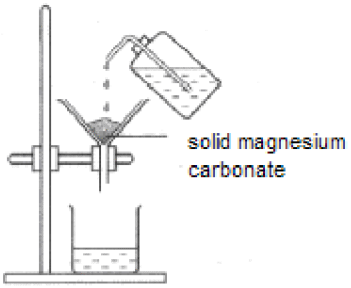
- Measure required volume (50 -100 $cm^3$) of molarity(0.5 - 1.0 mol $dm^{-3}$)
- magnesium sulphate solution by using a measuring cylinder and poured into a beaker
- Measure required volume (50 -100 $cm^3$)of molarity(0.5 – 1.0 mol $dm^{-3}$) potassium carbonate solution by using a measuring cylinder and poured into another beaker

- Mix the two solutions and a white precipitate ,magnesium carbonate,($MgCO_3$) is formed




$$K_2CO_3 + MgCl_2 \rightarrow 2KCl + MgCO_3$$

- Filter out magnesium carbonate ($MgCO_3$) to remove potassium sulphate or impurities




- Magnesium carbonate ($MgCO_3$) is washed with a little cold distilled water
- Measure required volume (50 -100 $cm^3$) of molarity(0.5 – 1.0 mol $dm^{-3}$ )of hydrochloric acid solution by using a measuring cylinder and poured into a beaker
- Carefully warm the acid
- Add magnesium carbonate powder bit by bit by using a spatula and stir using a glass rod until some of it no longer dissolves

$$MgCO_3 + 2HCl \rightarrow MgCl_2 + H_2O + CO_2$$

- Remove the unreacted magnesium carbonate ($MgCO_3$) by filtration
- Pour the filtrate into an evaporating dish.
- Gently heat the salt to produce a saturated solution
- Cool the saturated solution until crystals are formed
- Filter out the magnesium chloride, $MgCl_2$ , crystals
- Wash or rinse the crystals with distilled water
- Press the crystals with a few pieces of filter paper to dry them

**----------oooOO aĎaŽ OOooo----------**