PAPER 3

1 (*a*) 50.0, 27.5, 22.5

   (*b*) (i)   Surface area of calcium carbonate.

           Luas permukaan kalsium karbonat.

     (ii)   Rate of reaction. / *Kadar tindak balas.*

     (iii) Concentration of hydrochloric acid.

           Kepekatan asid hidroklorik.

   (*c*) The larger the total exposed surface area of calcium carbonate, the higher the rate of reaction.

     Semakin besar jumlah luas permukaan terdedah bagi kalsium karbonat, semakin tinggi kadar tindak balas.
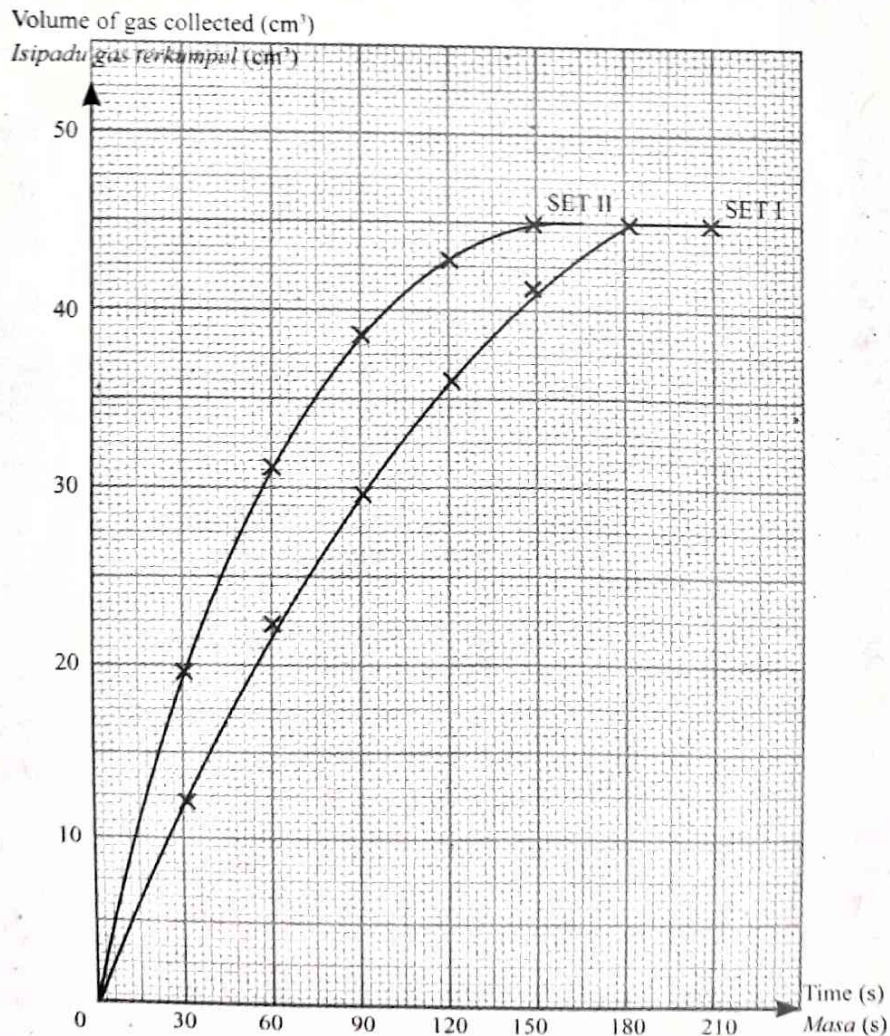
   (*d*) (i)   A gas is released.

           Satu gas dibebaskan.

     (ii)   Calcium carbonate reacts with hydrochloric acid to release carbon dioxide.

           Kalsium karbonat bertindak balas dengan asid hidroklorik untuk membebaskan karbon dioksida.

   (*e*) (i)

Volume of gas collected (cm³)
Isipadu gas terkumpul (cm³)

     (ii)   44.5 cm³

(f) The volume of gas increase with time.

Isi padu gas bertambah dengan masa.

(g) Volume of gas collected at time t

Isi padu gas yang dikumpulkan pada masa t

(h) The rate of reaction of Set II is higher than the rate of reaction of Set I.

The surface area of calcium carbonate is larger in Set II.

Kadar tindak balas bagi Set II adalah lebih tinggi daripada kadar tindak balas Set I.

Luas permukaan kalsium karbonat adalah lebih besar dalam Set II.

(i)

Fast reaction *Tindak balas cepat*	Slow reaction *Tindak balas perlahan*
Double decomposition *Penguraian ganda dua*	Fermentation *Penapaian*
Combustion *Pembakaran*	Rusting *Pengaratan*

(a) Problem statement: How can the electrochemical series be constructed based on the displacement reaction of metal from its salt solution?

Penyataan masalah: Bagaimanakah siri elektrokimia dibina berdasarkan tindak balas penyesaran logam daripada larutan garamnya?

(b) Manipulated variable: Pair of metal and the salt solution

Pembolehubah dimanipulasikan: Pasangan logam dan larutan garam

Responding variable: Deposition of metal and change in colour of salt solution

Pembolehubah bergerak balas: Mendakan logam dan perubahan warna larutan garam

Fixed variable: Volume of salt solution and time

Pembolehubah dimalarkan: Isi padu larutan garam dan masa

(c) Hypothesis: A more electropositive metal displaces a lee electropositive metal from its salt solution.

Hipotesis: Suatu logam yang lebih elektropositif menyesarkan suatu logam yang kurang elektropositif daripada larutan garamnya.

(d) Materials and apparatus: Test tubes, test tube rack, aluminium and zinc nitrate solution, zinc and ferum(II) nitrate solution, ferum and stanum(II) nitrate solution, stanum and lead(II)nitrate solution

Bahan dan radas: Tabung uji, rak tabung uji, aluminium dan larutan zink nitrat, zink dan larutan ferum(II) nitrat, ferum dan larutan stanum(II) nitrat, stanum dan larutan plumbum(II) nitrat

(e) Procedure / *Prosedur*:

1. 5 cm³ of 0.5 mol dm³ zinc nitrate solution is poured into a test tube.

   5 cm³ larutan zink nitrat 0.5 mol dm³ dituang ke dalam tabung uji.

2. A strip of aluminium is cleaned with sandpaper. The strip is dropped into the test tube as shown in the diagram below.

   Satu jalur aluminium dibersihkan dengan kertas pasir. Jalur itu dimasukkan ke dalam tabung uji seperti yang ditunjukkan dalam rajah di bawah.

Test tube
Tabung uji

Zinc nitrate solution
Larutan zink nitrat

Aluminium strip
Jalur aluminium
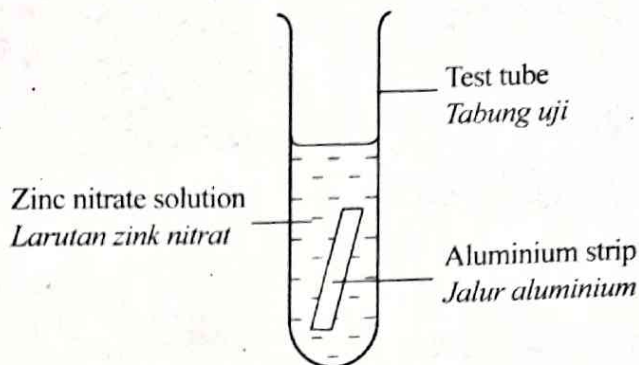
3. Observe whether there is any change in colour of solution and deposition of metal.

   Perhatikan sama ada terdapat sebarang perubahan warna pada larutan dan pemendakan logam.

4. Record the observations.

   Catatkan pemerhatian itu.

   Step 1 to 4 are repeated by using the following pairs:

   Langkah 1 hingga 4 diulang dengan menggunakan pasangan yang berikut:

   - Zinc and ferum(II) nitrate solution
     Zink dan larutan ferum(II) nitrat
   - Ferum and stanum(II) nitrate solution
     Ferum dan larutan stanum(II) nitrat
   - Stanum and lead(II) nitrate solution
     Stanum dan larutan plumbum(II) nitrat

(f)

Pair of metal and salt solution *Pasangan logam dan larutan garam*	Observation *Pemerhatian*	Inference *Inferens*
$Al + Zn(NO_3)_2$		
$Zn + Fe(NO_3)_2$		
$Fe + Sn(NO_3)_2$		
$Sn + Pb(NO_3)_2$		