APPENDIX I

EVALUATION FORM OF THE MULTIMEDIA PROGRAMME FOR STUDENTS

Name:

Class:

School:

Title of multimedia programme:

Date:

Instructions: Please circle your response to the following statements and give your comments in the space provided.

Part A

1. The family earnings per month is
   A Less than RM 1000
   B RM 1001-RM 2000
   C More than RM 2000

2. My computer skills are
   A good
   B average
   C poor

3. I like using the computer.

   A most agree

   B quite agree

   C do not agree

4. My Chemistry score in the school's examination is_____.

Part B

Comments

1. I find this multimedia programme

   A easy to use

   B quite difficult to use

   C very difficult to use

2. At the end of this programme

   A I would like to do this programme again

   B I may want to do this programme again

   C I will not want to do this programme again

3. The pictures, video clips, animation and voice in this programme

   A have greatly helped me understand this topic better

   B have helped a bit to understand this topic better

C did not help me much in understanding this topic

4. During the course of this programme,

A I know what to do in the programme

B I was not sure what to do in the programme

C I did not know what to do in the programme

5. Instructions in this programme are sufficient

A totally agree

B quite agree

C disagree

6. The presentation of the topic is clear, logical and there were no mistakes

A totally agree

B quite agree

C disagree

7. The language used in this programme is

A easy to understand

B quite difficult to understand

C very difficult to understand

8. This programme is relatively lengthy, so

A I prefer to do it in one go

B I prefer to do it in stages

C I would rather not do it at all

9. Using this programme

A can increase my motivation

B slightly increase my motivation

C do not give me any motivation

10. The questions provided in the assessment, in the exercise and in the test are sufficient and suitable

A totally agree

B quite agree

C disagree

11. I can control the rate of this programme.

A totally agree

B quite agree

C disagree

12. The presentation of concepts is clear and effective

A totally agree

B quite agree

C disagree

13. From this multimedia programme

A I have learned all that I should know

B I have learned most of the things that I should know

C I have not learned much

14. I need to think when using this programme

A totally agree

B quite agree

C disagree

15. I feel my friend will like this programme

A totally agree

B quite agree

C disagree

16. I like this multimedia programme because

17. I do not like this multimedia programme because

Thank you for your cooperation.

BORANG PENILAIAN PROGRAM MULTIMEDIA OLEH PELAJAR

Nama:

Tingkatan:

Sekolah:

Tarikh:

Arahan: Bulatkan respon yang berkenaan. Sila berikan komen anda dalam ruang yang disediakan.

Bahagian A: Komen

1. Pendapatan keluarga sebulan

   A Kurang daripada RM 1000

   B RM 1001-RM2000

   C Lebih daripada RM2000

2. Kemahiran komputer saya adalah

   A baik

   B sederhana

   C tidak baik

3. saya suka mengguna komputer

A sangat setuju

B kurang setuju

C tidak setuju

4. Markah mata pelajaran Kimia saya dalam Peperiksaan di sekolah :_____

Bahagian B: Komen

1. Saya dapati program multimedia ini

A mudah digunakan

B agak susah digunakan

C sangat susah digunakan

2. Selepas mengguna program multimedia ini

A saya ingin melakukannya sekali lagi

B saya mungkin menggunakannya sekali lagi

C saya tidak ingin melakukannya lagi

3. Gambar, video, animasi dan suara dalam program multimedia ini

A banyak memebantu pemahaman saya dalam toipk ini

B membantu sedikit pemahaman saya dalam topik ini

C kurang membantu pemahaman saya dalam topik ini

1. Semasa menjalankan program multimedia ini

   A saya tahu apa yang hendak dilakukan

   B saya kurang pasti apa yang hendak dilakukan

   C saya tidak tahu apa yang hendak dilakukan

2. Arahan yang iberikan dalam program multimedia ini adalah mencukupi

   A sangat setuju

   B kurang setuju

   C tidak setuju

6. Persembahan pembelajaran dalam program ini jelas, disusun mengikut logik dan tiada kesilapan

   A sangat setuju

   B kurang setuju

   C tidak setuju

7. Bahasa yang digunakan dalam program multimedia ini

   A mudah difahami

   B agak susah difahami

   C sangat susah difahami

8. Program multimedia ini agak panjang, oleh itu,

   A saya sanggup melakukannya secara berterusan

B saya lebih suka melakukannya secara berperingkat

C saya tidak ingin melakukannya

9. Penggunaan program multimedia ini

A dapat meningkat motivavsi saya

B kurang memberikan saya motivasi

C tidak memberikan saya motivasi

10. Soalan-soalan dalam penilaian, latihan dan ujian adalah sesuai dan mencukupi

A sangat setuju

B kurang setuju

C tidak setuju

11. Saya boleh mengawal kadar pergerakan program ini

A sangat setuju

B kurang setuju

C tidak setuju

12. Penyampaian konsep dalam program ini jelas dan berkesan

A sangat setuju

B kurang setuju

C tidak setuju

13. Dalam program multimedia ini, saya telah mempelajari

A semua konsep yang saya patut tahu

B kebanyakan konsep yang saya patut tahu

C sedikit sahaja konsep yang patut saya tahu

14. Saya perlu berfikir semasa menjalankan program multimedia ini

A sangat setuju

B kurang setuju

C tidak setuju

15. Saya rasa kawan saya akan suka program multimedia ini

A sangat setuju

B kurang setuju

C tidak setuju

16. Saya suka program multimedia ini kerana

17. Saya tidak suka programm multimedia ini kerana

Terima kasih atas segala kerjasama anda.

APPENDIX 2

EVALUATION FORM OF THE PROGRAMME FOR TEACHERS

Teacher's Name:

School:

Title of programme :

Date:

Part I

Please circle your response according to the following scale:

1 = Disagree

2 = Partially agree

3 = Agree

4 = Totally agree

A. Educational value

1.	Topic is important	1	2	3	4
2.	Suitable learning strategy	1	2	3	4
3.	Multiple learning strategy	1	2	3	4
4.	Students encouraged to think	1	2	3	4
5.	Orderly presentation	1	2	3	4
6.	Suitable students' assessment	1	2	3	4

7. Sufficient students' assessment 1 2 3 4
8. Programme's objective achieved 1 2 3 4

B. Content

1. Introduction satisfactory 1 2 3 4
2. Interesting introduction 1 2 3 4
3. Adequate information 1 2 3 4
4. Information suitable and accurate 1 2 3 4
5. Language suitable 1 2 3 4
6. Clear presentation of concepts 1 2 3 4
7. No incorrect concepts 1 2 3 4
8. No mistake in language 1 2 3 4
9. Curriculum needs satisfied 1 2 3 4
10. Level of difficulty suitable 1 2 3 4
11. Can increase students' motivation 1 2 3 4
12. Feedback given acccurate and suitable 1 2 3 4

C. Presentation

1. Text easy to read 1 2 3 4
2. Screen design attractive 1 2 3 4
3. Graphic and animation interesting 1 2 3 4
4. Graphic and animation suitable 1 2 3 4
5. Colour used suitable and attractive 1 2 3 4

6.	Sound effect used effectively	1	2	3	4
7.	Visual effect interesting	1	2	3	4
8.	Sufficient time for students to react	1	2	3	4
9.	Video clips suitable and clear	1	2	3	4
10.	Questions on experiments suitable	1	2	3	4

D. Usage

1.	Easy to use	1	2	3	4
2.	No technical interruptions	1	2	3	4
3.	Students can control the rate of the programme	1	2	3	4
4.	Can do programme unaided	1	2	3	4
5.	Sufficient instructions	1	2	3	4
6.	Students can exit programme anytime.	1	2	3	4
7.	Sufficient time for activity	1	2	3	4
8.	Can control rate of sequence in the program	1	2	3	4
9.	Plenty of interaction available	1	2	3	4

E. Documentation

1.	Information in order	1	2	3	4
2.	Information easy to understand	1	2	3	4
3.	Information easy to follow	1	2	3	4
4.	Instructions easy to follow	1	2	3	4
5.	Information on usage complete	1	2	3	4

F. Overall Impression

1.	Better than other learning aids	1	2	3	4
2.	Can increase students' motivation	1	2	3	4
3.	Achieve learning objectives	1	2	3	4
4.	Can increase students' learning	1	2	3	4

Part II

1.Please comment on the strength of this multimedia programme..

2. Please state the weaknesses of this programme.

3. Overall, the quality of this multimedia programme is (please circle the value below)

1 2 3 4 5 6 7 8 9 10

Poor quality Excellent quality

4. Other comments:

BORANG PENILAIAN PROGRAM MULTIMEDIA OLEH GURU

Nama Guru:

Sekolah :

Tajuk/Topik Perisian :

Tarikh:

Bahagian I

Bulatkan jawapan anda mengikut skala berikut:

1 = Tidak setuju

2 = Kurang setuju

3 = Setuju

4 = Amat setuju

A. Nilai pendidikan

1. Topik ini penting	1	2	3	4
2. Strategi pembelajaran sesuai	1	2	3	4
3. Strategi pembelajaran pelbagai	1	2	3	4
4. Pelajar digalakkan berfikir	1	2	3	4
5. Penyampaian tersusun	1	2	3	4
6. Penilaian pelajar sesuai	1	2	3	4
7. Penilaian pelajar mencukupi	1	2	3	4
8. Objektif program tercapai	1	2	3	4

B. Kandungan

1. Pengenalan baik	1	2	3	4

2.	Pengenalan menarik	1	2	3	4
3.	Maklumat mencukupi	1	2	3	4
4.	Maklumat tepat dan sesuai	1	2	3	4
5.	Bahasa penyampaian sesuai	1	2	3	4
6.	Penyampaian konsep jelas	1	2	3	4
7.	Tiada kesilapan konsep/istilah	1	2	3	4
8.	Tiada kesilapan bahasa	1	2	3	4
9.	Menepati kehendak kurikulum	1	2	3	4
10.	Tahap kesusahan sesuai	1	2	3	4
11.	Boleh meningkatkan motivasi pelajar.	1	2	3	4
12.	Maklum balas yang diberikan tepat dan sesuai	1	2	3	4

C. Persembahan

1.	Teks mudah dibaca	1	2	3	4
2.	Rekabentuk skrin menarik	1	2	3	4
3.	Grafik dan animasi menarik	1	2	3	4
4.	Grafik dan animasi sesuai	1	2	3	4
5.	Warna sesuai dan menarik	1	2	3	4
6.	Kesan bunyi digunakan dengan baik	1	2	3	4
7.	Kesan visual menarik	1	2	3	4
8.	Pelajar mempunyai masa untuk bertindak balas	1	2	3	4
9.	Klip video jelas dan sesuai	1	2	3	4
10.	Soalan untuk eksperimen sesuai	1	2	3	4

D. Penggunaan

1. Mudah digunakan	1	2	3	4
2. Tiada gangguan teknikal	1	2	3	4
3. Pelajar dapat mengawal kadar kecepatan program	1	2	3	4
4. Boleh digunakan tanpa bantuan	1	2	3	4
5. Arahan mencukupi	1	2	3	4
6. Pelajar boleh keluar dari program bila-bila masa	1	2	3	4
7. Masa untuk aktiviti mencukupi	1	2	3	4
8. Dapat mengawal kadar sekuens program	1	2	3	4
9. Banyak peluang untuk berinteraksi	1	2	3	4

E. Dokumentasi

1. Maklumat tersusun	1	2	3	4
2. Maklumat mudah difahami	1	2	3	4
3. Maklumat mudah diikuti	1	2	3	4
4. Arahan mudah diikuti	1	2	3	4
5. Maklumat penggunaan lengkap	1	2	3	4

F. Tanggapan keseluruhan

1. Mempunyai kelebihan berbanding dengan bahan lain.	1	2	3	4

1. Boleh meningkatkan motivasi pelajar	1	2	3	4
2. Menepati objektif pembelajaran	1	2	3	4
3. Berupaya untuk meningkatan pembelajaran	1	2	3	4

Bahagian II

1. Nyatakan ciri-ciri yang dianggap menarik dalam program multimedia ini.

2. Nyatakan ciri-ciri yang yang dianggap kurang memuaskan dalam program multimedia ini.

2. Secara keseluruhan, mutu program multimedia ini ialah (sila bulatkan angka yang berkenaan.)

1 2 3 4 5 6 7 8 9 10

Tidak bermutu Amat bermutu

4. Komen lain.

APPENDIX 3

Interview questions for students

1. What do you think of this programme?
2. Do you like using computers? Why?
3. Do you think this CD is too long?
4. Would you rather do this programme in one go or do you prefer to do it in stages?
5. Would you prefer to do this programme on your own or with a friend?
6. What do you think about the diagrams and animations in this programme?
7. How do you think the diagrams and animations have helped you to understand the topic?
8. What sort of problems did you encounter during the course of the programme?
9. Did you feel you can control the programme?
10. What is your opinion about the music provided at the end of each correct response to the objective questions?
11. What do you think of the objective questions found in this programme?
12. What about the video clips of the experiments? Were they clear?
13. What do you think of the questions set at the end of each experiment? Were you able to answer them?
14. What do you think about the color and the screen design of the programme?
15. What do you think of the introduction segment of the programme? Why?
16. What are the things you don't like about the programme?

Soalan-soalan soalselidik pelajar:

1. Apakah pendapat anda tentang CD ini?
2. Adakah anda suka mengguna komputer? Mengapa?
3. Adakah anda merasakan program CD ini terlalu panjang?
4. Adakah anda lebih suka menjalankan program ini secara berperingkat-peringkat atau secara berterusan?
5. Adakah anda lebih suka menjalankan program CD ini berseorangan atau dengan kawan?
6. Apakah pendapat anda tentang gambar rajah serta animasi dalam program ini?
7. Bagaimanakah gambar rajah serta animasi ini dapat membantu fahaman anda dalam topik ini?
8. Apakah masalah yang anda tempuhi semasa menjalankan program CD in? Sila jelaskan.
9. Adakah anda rasa anda boleh mengawal program CD ini?
10. Apakah pendapat anda tentang muzik yang terdapat di akhir respons yang betul dalam soalan objektif?
11. Apakah pendapat anda tentang soalan-soalan objektif dalam program ini?
12. Bagaimana tentang klip video eksperimen dalam CD ini? Adakah ia jelas?
13. Apakah pendapat anda tentang soalan-soalan yang dikemukakan dalam segmen eksperimen itu? Bolehkah anda menjawab soalan-soalan itu?
14. Apakah pendapat anda mengenai warna dan rekabentuk skrin dalam program ini?
15. Apakah pedapat anda mengenai segmen pengenalan dalam program ini?
16. Apakah yang anda tidak suka tentang program CD ini?

APPENDIX 4

TEST ON THE TOPIC OF ELECTROCHEMISTRY

1. When two different metals, X and Y are immersed in an aqueous solution of hydrochloric acid, an electric bulb attached to the two metals light up. This reaction can occur in a

   A decomposition process
   B neutralization process
   C electrolytic cell
   D chemical/galvanic cel

2. A chemical cell has a pair of metals, zink and silver as electrodes. Which of the following represents the cell equation?

   A $Zn - 2e \longrightarrow Zn^{2+}$ // $Ag^{+} + e \longrightarrow Ag$

   B $Ag - e \longrightarrow Ag^{+}$ // $Zn^{2+} + 2e \longrightarrow Zn$

   C $Zn\,(p) + Ag^{+} \longrightarrow Zn^{2+} + Ag\,(p)$

   D $Zn^{2+} + Ag\,(p) \longrightarrow Zn\,(p) + Ag^{+}$

3. Using carbon electrodes, what are the products from the electrolysis of an aqueous solution of sodium iiodide ?

	Cathode	Anode
A	Hydrogen	Iodine
B	Hydrogen	Oxygen
C	Sodium	Iodine
D	Sodium	Oxygen

4. An aqueus nitrate solution of a metal X is electrolysed using carbon electrodes. A colorless gas is evolved at the cathode which can cause a 'pop' sound when brought near a lighted

splint. From these observations it can be concluded that

A X is above hydrogen in the Electrochemical Series

B the gas evolved is oxygen.

C the carbon electrode used was inert

D nitrate X can be electrolysed because it is very soluble in water.

5. Electricity is conducted into a solution containing the ions K^+, H^+, SO_4^{2-} dan ion OH^-.

Which of the following occurs at the carbon anode?

A Hydrogen gas hidrogen is evolved.

B Sulphur dioxide gas is evolved.

C Oxygen gas is evolved.

D Oxygen gas and water are formed.

6. Which of the following statements are applications of Electrochemical Series?

A To purify an impure metal.

B To recharge a lead accumulator

C To determine the terminals of a simple cell.

D To extract a metal from its compound.

7. Which of the following DO NOT occur in a Daniell cell?

A Electrons move from the copper electrode to the zinc electrode.

B The blue color of the copper(II) sulphate solution become decolorised.

C The zinc electrode becomes thinner.

D The voltage value observed at the voltmeter is 1.10V.

8. The following pairs of metals are immersed in an aqueus solution of nitric acid and left for a period of time.

I Pb/Cu II Mg/Cu III Ag/Cu IV Fe/Cu

Which pair of metals will produce the highest amount of copper (II) ions at the end of the experiment?

A I B II C III D IV

9. What are the particles that will allow electricity to be conducted in the magnesium metal and in an aqueus solution of magnesium nitrate?

	Magnesium	Magnesium nitrat (aq)
A	Electron	Mg^{2+}ion, NO_3^- ion, H^+ ion, OH^- ion
B	Atom	Electron
C	Mg^{2+} ion	H^+ ion and OH^- ion
D	Mg^{2+}ion	Electron

10. Which of the following chemical equations represents the changes that occur at the platinum electrodes during the electrolysis of copper (II) sulphate solution?

	Cathode	Anode
A	$Cu - 2e \longrightarrow Cu^{2+}$	$Cu^{2+} + 2e \longrightarrow Cu$
B	$2H^+ + 2e \longrightarrow H_2$	$Cu - 2e \longrightarrow Cu^{2+}$
C	$Cu^{2+} + 2e \longrightarrow Cu$	$Cu - 2e \longrightarrow Cu^{2+}$
D	$Cu^{2+} + 2e \longrightarrow Cu$	$4\,OH^- - 4e \longrightarrow 2H_2O + O_2$

11. What is the chemical compound added to fused sodium chloride to lower its melting point during the extraction of sodium ?

A Cryolit C Water

B Calcium chloride D Calcium carbonate

12. Which of the following pair of metals will give the lowest potential difference value in a simple cell?

A Mg /Zn B Al /Cu C Sn / Ag D Zn / Fe

13. During purification of copper in an electrolytic cell, which of the following chemical equations represent the reactions taking place at both the electrodes?

	Pure copper	Impure copper
A	$Cu - 2e \longrightarrow Cu^{2+}$	$Cu^{2+} + 2e \longrightarrow Cu$
B	$2H^{+} + 2e \longrightarrow H_2$	$Cu - 2e \longrightarrow Cu^{2+}$
C	$Cu^{2+} + 2e \longrightarrow Cu$	$Cu - 2e \longrightarrow Cu^{2+}$
D	$2H^{+} + 2e \longrightarrow H_2$	$Cu^{2+} + 2e \longrightarrow Cu$

14. Which of the following do not occur during the electrolysis of an aqueus solution of sodium chloride using a mercury cathode?

A Chloride ions are discharged at the anode to form chlorine gas.

B Hydrogen ions are discharged at the cathode to form hydrogen gas.

C Natrium ions are discharged at the cathode to form sodium.

D The mercury amalgam is formed at the cathode.

15. A metal Y is immersed in a sulphate solution of Y. The metal zinc is immersed in an aqueus solution of zinc sulphate. Both solutions are separated by a porous pot. Connecting wires are attached to both metals to complete the circuit. If electrons move from the electrode Y to the electrode zinc, Y could be

A ferum B plumbum C aluminium D kuprum

16. In an experiment to build an Electrochemical Series, the metal copper is paired with four different metals R,S,T and X in succession. Each pair of metals are immersed in aqueus

sulphuric acid and connected to a voltmeter in the outer circuit. The results of the experiments are tabulated below.

Metal pair	Voltage
R/Cu	1.1 V
S/Cu	2.7 V
T/Cu	0.8 V
X/Cu	2.0 V

Arrange the metals in ascending order in the Electrochemical Series.

A T,R,X,S B S,X,R,T C T, R,S,X D X,S,R,T

17. Which of the following compounds can conduct electricity in both the solid and molten state?

A Sulphur monokloride C Copper

B Naphthalene D Copper(II) sulfat

18. Which of the following can be observed during the electrolysis of molten lead (II) bromide?

	Cathode	Anode
A	A brown gas is formed.	A colorless gas is evolved.
B	A brown gas is formed.	A grey deposit was observed.
C	A grey deposit was observed.	A brown gas is formed.
D	A grey deposit was observed	A colorless gas is evolved.

19. Electrolysis of glucose will not take place bacause

A the glucose was not melted first.

B the glucose was in solid form.

C the ions in glucose has not been dissociated.

D glucose is a covalent compound and made up of molecules.

20. The metals of magnesium and stanum are immersed in aqueus dilute sulphuric acid. Both metals are connected to a voltmeter. Which of the following statements is FALSE?

A Stanum becomes the positive electrode.

B A colorless gas is evolved at the positive electrode.

C The gas evolved at the positif electrode is oxygen.

D The metal magnesium becomes thinner.

21. An iron chain can be elctroplated with gold using the principles of electrolysis. This can be done by

A placing the iron chain as the anode.

B placing the gold metal as the anode.

C using copper(II) sulphate solution as the electrolyte .

D using molten gold as the electrolyte.

22. Aluminium cannot be extracted from bauxite through reduction by carbon because

A carbon is not reactive.

B aluminium is more reactive than carbon.

C carbon cannot react with aluminium

D pure aluminium cannot be obtained.

23. Which of the following will displace the metal zinc from zinc nitrate solution?

A ferum B copper C stanum D aluminium

24. An aqueus solution of hydrochloric acid is electrolysed for a period of time. Which of the following DO NOT happen?

A A yellowish green gas is evolved at the anode at the beginning of the experiment.

B A colorless gas is evolved at the cathode which can cause a 'pop' sound with a burning splint.

C A cololess gas is evolved at the anode which can burn a glowing splint at the end of the experiment.

D The concentration of hydrochloric acid becomes higher.

25. During electrolysis of molten lead(II) iodida, the product at the anode can be tested by using

A burming splint

B glowing splint

C starch solution

D moist red litmus paper

26. Which one of the following chemical reactions will NOT occur?

A Pb^{2+} (ak) + Sn (p)

B Cu^{2+} (ak) + Zn (p)

C Zn (p) + Sn^{2+} (ak)

D Pb (p) + Sn^{2+} (ak)

27. A Daniell cell

A can convert electrical energy to chemical energy

B is made up of the metal electrodes copper and iron each immersed in their respective salt solutions

C contains a porous pot or a salt bridge to bring the two solutions together.

D has a potential difference value of 1.10 V between the metal electrodes of zinc and copper.

28. Two metal rods immersed in a beaker filled with powdered copper(II) sulphate are connected to an electric bulb with connecting wires. The bulb will light up if

A both metals occupy the same positions in the Electrochemical Series.

B the copper(II) sulphate is made into a solution.

C the copper (II) sulphate is replaced with glucose.

D both the metals are replaced with carbon electrodes.

29. Electrolysis of a very dilute aqueous solution of hydrochloric acid will not yield a yellowish green gas at the platinum anode because

A the gas evolved will react with the platinum electrodes.

B the concentration of chloride ions are too low to be discharged.

C the H^+ ions are selected for discharge.

D the OH^- ions are discharged at the cathode.

30. Electrolysis of an aqueus solution of sodium sulphate using platinum electrodes will yield

A hydrogen gas at the cathode.

B oxygen gas at the cathode.

C hydrogen gas at the anode.

D the metal sodium deposited at the cathode.

31. Which of the following chemical cells are secondary cells?

I alkali cells II dry cells III nickel-cadmium cells IV mercury cells

A III only B I,III C III,IV D I,III,IV

32. In a Daniell cell, the chemical compound used as a salt bridge can be

I glucose solution III sulphur monochloride solution

II potassium nitrate solution IV dilute hydrochloric acid

A II,III B II,IV C II,III,IV D I,II,III,IV

33. The industrial uses of electrolysis include

I metal extraction III electroplating

II Purification of metals IV Preparation of other chemicals

A I,II,IV BI,II,III C II,III,IV D I,II,III,IV

34. A chemical cell can be built by

I using two different metals

II using a chemical compund which can conduct electricity in the solid state or in the aqueous solution

III using carbon electrodes

IV using an ionic compound in the aqueus state

A I, IV B I,II,IV C I,III,IV D I,II,III,IV

35. Choose the correct statements about the Daniell cell

I The zinc electrode becomes the positive terminal

II The copper electrode becomes the negative terminal

III The electrons move from the zinc electrode to the copper electrode.

IV The chemical cell equation is as follows:

$Zn^{2+} + Cu \longrightarrow Zn + Cu^{2+}$

A III only B I,II, C I , II D I,II,III,IV

36. During electrolysis of dilute sulphuric acid using platinum electrodes,

I the ions present are the H^+ ions, OH^- ions and the SO_4^{2-} ions.

II only the H^+ ions are discharged at the anode to form hydrogen

III the OH^- ions are selected to be discharged at the cathode to form oxygen and water.

IV the ratio of the hydrogen gas : oksigen gas evolved at both the electrodes is 2:1

A I,IV B II,III C I,II,III D I,II,III,IV

37. Powdered lead(II) bromide cannot be electrolysed because

I the lead (II) bromide molecules cannot conduct electricity in the solid form.

II the lead ions and the bromide ions in the solid lead(II) bromide are not able to move freely in the solid state

III lead(II) bromide has a high melting point.

IV lead(II) bromide is insoluble in water.

A II only B II,III C II,III,IV D I,III,IV

38. When magnesium ribbon is immersed in a copper(II) sulphate solution

I the copper (II) sulphate solution becomes blue in color.

II a brown solid is formed.

III a displacement reaction takes place.

IV magnesium sulphate solution is formed.

A I,II,III B I,II,IV C II,III,IV D I,II,III,IV

39. A simple cell can be built by using a tin electrode and a copper electrode both immersed in acid sulphuric solution. At the positive terminal

I a colorless gas is evolved.

II a copper atom is deposited

III the mass of the metal increase.

IV the electrons enter the electrolyte.

A I,IV B II,III C II,III,IV D I only

40.

Metal pair	The value of potentila difference
P/Q	3.2V
P/R	2.5V
P/S	0.8V
P/T	1.1V

Table 1

Table 1 shows the various potential difference values for the different pairs of metals . The metal P becomes the negative terminal in all the chemical cells. Which of the following are TRUE?

I P is more electropositive than the metals Q,R,S dan T

II The distance between the metals P and S are the furthest in the Electrochemical Series .

III The increasing order of the arrangement of metals in the Electrochemical Series is S,T,R,Q P

IV The increacing order of arrangement of the metals in the Electrochemical Series is Q,R,T,S,P

A I, IV B II,III C I,II,III D I,II,IV

UJIAN BAGI TOPIK ELEKTROKIMIA

1. Apabila logam X dan logam Y direndamkan ke dalam asid hidroklorik, mentol yang disambungkan kepada kedua-dua logam itu akan menyala. Tindak balas ini berlaku dalam satu

   A proses penguraian
   B proses peneutralan
   C sel elektrolisis
   D sel kimia

2. Satu sel kimia dibina dengan menggunakan sepasang logam iaitu logam zink dan logam argentum sebagai elektrod. Manakah antara berikut mewakili persamaan keseluruhan bagi tindak balas sel ini?

   A $Zn - 2e \longrightarrow Zn^{2+}$ // $Ag^{+} + e \longrightarrow Ag$
   B $Ag - e \longrightarrow Ag^{+}$ // $Zn^{2+} + 2e \longrightarrow Zn$
   C $Zn\ (p) + Ag^{+} \longrightarrow Zn^{2+} + Ag\ (p)$
   D $Zn^{2+} + Ag\ (p) \longrightarrow Zn\ (p) + Ag^{+}$

3. Elektrolisis larutan akueus natrium iodida dijalankan menggunakan elektrod karbon . Hasil di kedua-dua elektrod ialah

	Katod	Anod
A	Hidrogen	Iodin
B	Hidrogen	Oksigen
C	Natrium	Iodin
D	Natrium	Oksigen

4. Satu larutan nitrat X akueus dielektrolisiskan mengguna elektrod karbon. Suatu gas tak berwarna yang menyebabkan letupan 'pop' dengan kayu uji bernyala terbebas di katod. Dari pemerhatian ini dapat disimpulkan bahawa

A X terletak di atas hidrogen dalam Siri Elektrokimia

B Gas yang terbebas ialah gas oksigen.

C Elektrod karbon yang digunakan adalah lengai

D Sulfat X dapat di elektrolisiskan kerana sangat larut dalam air.

5. Arus elektrik dialirkan ke dalam larutan yang mengandungi ion-ion K^+, H^+, SO_4^{2-} dan ion OH^-.

Manakah antara berikut yang berlaku di anod karbon?

A Gas hidrogen dibebaskan.

B Gas sulfur dioksida dibebaskan.

C Gas oksigen dibebaskan.

D Gas oksigen dan air terbentuk.

6. Manakah antara pernyataan berikut merupakan kegunaan Siri Elektrokimia?

A Menulenkan logam yang tak tulen.

B Mengecas semula akumulator asid plumbum.

C Menentukan kekutuban terminal bagi sel kimia ringkas.

D Mengektsrakkan logam daripada sebatiannya.

7. Dalam suatu sel Daniell, yang manaka antara berikut TIDAK berlaku?

A Elektron bergerak dari elektrod kuprum ke elektrod zink.

B Warna biru larutan kuprum(II) sulfat menjadi semakin pudar.

C Elektrod zink semakin menipis.

D Nilai voltan yang dicatat pada voltmeter ialah 1.10V.

8. Pasangan logam-logam berikut direndamkan dalam asid nitrik cair dan dibiarkan seketika.

I Pb/Cu II Mg/Cu III Ag/Cu IV Fe/Cu

Pasangan logam yang manakah akan menghasilkan ion kupurm(II) yang paling banyak?

A I B II C III D IV

9. Apakah jenis zarah yang membolehkan magnesium dan larutan akueus magnesium nitrat mengkonduksikan elektrik?

	Magnesium	Magnesium nitrat akueus
A	Elektron	Ion Mg^{2+}, ion NO_3^-, ion H^+, ion OH^-
B	Atom	Elektron
C	Ion Mg^{2+}	Ion H^+ dan ion OH^-
D	Ion Mg^{2+}	Elektron

10. Manakah antara persamaan berikut berlaku untuk mewakili perubahan yang berlaku di kedua-dua elektrod platinum dalam elektrolisis larutan kuprum(II) sulfat?

	Katod	Anod
A	$Cu - 2e \longrightarrow Cu^{2+}$	$Cu^{2+} + 2e \longrightarrow Cu$
B	$2H^+ + 2e \longrightarrow H_2$	$Cu - 2e \longrightarrow Cu^{2+}$
C	$Cu^{2+} + 2e \longrightarrow Cu$	$Cu - 2e \longrightarrow Cu^{2+}$
D	$Cu^{2+} + 2e \longrightarrow Cu$	$4\,OH^- - 4e \longrightarrow 2H_2O + O_2$

11. Dalam pengekstrakan natrium dari leburan natrium klorida, apakah bahan yang ditambahkan untuk menurunkan takat lebur natrium klorida?

A Kriolit C Air

B Kalsium klorida D Kalsium karbonat

12. Dalam satu sel ringkas ,pasangan logam yang manakah akan menghasilkan beza keupayaan yang paling rendah?

A Mg /Zn B Al /Cu C Sn / Ag D Zn / Fe

13. Semasa penulenan logam kuprum dijalankan, yang manakah antara persamaan berikut mewakili perubahan yang berlaku di kedua-dua elektrod?

	Logam tulen	Logam tak tulen
A	$Cu - 2e \longrightarrow Cu^{2+}$	$Cu^{2+} + 2e \longrightarrow Cu$
B	$2H^{+} + 2e \longrightarrow H_2$	$Cu - 2e \longrightarrow Cu^{2+}$
C	$Cu^{2+} + 2e \longrightarrow Cu$	$Cu - 2e \longrightarrow Cu^{2+}$
D	$2H^{+} + 2e \longrightarrow H_2$	$Cu^{2+} + 2e \longrightarrow Cu$

14. Elektrolisis larutan natrium klorida dijalankan dengan menggunakan merkuri sebagai katod dan grafit sebagai anod. Yang manakah atara berikut TIDAK berlaku?

A Ion klorida didiscaskan di anod untuk membentuk klorin.

B Ion hidrogen didiscaskan di katod untuk membentuk hidrogen

C Ion natrium didiscaskan di katod untuk membentuk natrium.

D Amalgam merkuri terbentuk di katod.

15. Satu logam Y direndamkan ke dalam larutan sulfat logam Y. Logam zink direndamkan ke dalam larutan zink sulfat. Kedua-dua larutan ini diasingkan dengan mengguna pasu berliang. Wayar disambung antara kedua-dua logam untuk melengkapkan litar.Jika elektron mengalir dari elektrod Y ke elektrod zink, logam Y mungkin

A ferum B plumbum C aluminium D kuprum

16. Dalam eksperimen untuk membina Siri Elektrokimia bagi logam-logam, sekeping logam kuprum dipasangkan dengan logam-logam R, S, T dan X secara bergilir-gilir. Kedua-dua pasangan logam direndamkan ke dalam asid sulfurik dan disambungkan sebuah voltmeter melalui litar luar. Keputusan eksperimen dicatakan dalam jadual berikut.

Pasangan logam	Voltan
R/Cu	1.1 V
S/Cu	2.7 V
T/Cu	0.8 V
X/Cu	2.0 V

Susunan menaik bagi logam-logam ini dalam Siri Elektrokimia ialah

A T,R.X,S B S,X,R,T C T, R,S,X D X,S,R,T

17. Bahan yang manakah mengkonduksikan arus elektrik dalam keadaan pepejal dan dalam keadaan leburan?

A Sulfur monoklorida C Kuprum

B Naftalena D Kuprum(II) sulfat

18. Yang manakah antara berikut diperhatikan apabila elektrolisis leburan plumbum(II) bromida dijalankan?

	Katod	Anod
A	Gas berwarna perang terbentuk	Gas tak berwarna terbebas
B	Gas berwarna perang terbentuk	Pepejal kelabu berkilat terenap.
C	Pepejal kelabu berkilat terenap.	Gas berwarna perang terbentuk.
D	Pepejal kelabu berkilat terenap.	Gas tak berwarna terbebas

19. Elektrolisis glukosa tidak dapat djalankan kerana

A glukosa tidak dileburkan dahulu.

B glukosa berada dalam keadaan pepejal.

C ion-ion dalam glukosa belum diuraikan.

D glukosa adalah sebatian kovalen yang terdiri daripada molekul.

20. Logam magnesium dan logam stanum direndamkan ke dalam larutan asid sulfurik cair. Kedua-dua logam disambungkan dengan wayar kepada sebuah voltmeter. Yang manakah antara pernyataan berikut adalah TIDAK benar?

A Logam stanum dijadikan elektrod positif.

B Gelembung gas tak berwarna terhasil di elektrod positif.

C Gas yang terbentuk di elektrod positif ialah gas oksigen.

D Logam magnesium menjadi semakin nipis di akhir eksperimen.

21. Gelang besi boleh disadurkan dengan emas melalui keadah elektrolisis. Caranya ialah dengan

A menjadikan gelang besi sebagai anod.

B menjadikan emas sebagai anod.

C menggunakan larutan kurum(II) sulfat sebagai elektrolit .

D menggunakan leburan emas sebagai elektrolit

22. Aluminium tidak dapat diekstrakkan daripada bauksit secara penurunan dengan karbon kerana

A karbon tidak reaktif

B aluminium lebih reaktif daripada karbon

C karbon tidak akan bertindak balas dengan aluminium

D aluminium yang tulen tiak dapat dihasilkan.

22. Antara logam-logam berikut,yang manakah yang dapat mengenapkan logam zink daripada larutan zink nitrat?

A Ferum B Kuprum C Stanum D Aluminium

23. Satu larutan akueus asid hidroklorik dielektrolisiskan untuk satu jangka masa yang agak lama. Antara berikut yang manakah TIDAK akan berlaku?

A Gas yang terbebas di anod pada awal eksperimen berwarna kuning kehijauan.

B Gas tidak berwarna terbebas di katod dan boleh menyebabkan kayu uji bernyala meletup dengan bunyi 'pop'.

C Gas yang terbebas di anod di akhir eksperimen adalah tidak berwarna dan boleh menyalakan kayu uji berbara.

D Kepekatan asid hidoklorik menjadi semakin tinggi.

24. Semasa elektrolisis leburan plumbum(II) iodida dijalankan, hasil di anod boleh diuji dengan

A kayu uji menyala
B kayu uji berbara
C larutan kanji
D kertas litmus merah lembap

25. Yang manakah antara tindak balas berikut TIDAK akan berlaku?

A Pb^{2+} (ak) + Sn (p)
B Cu^{2+} (ak) + Zn (p)
C Zn (p) + Sn^{2+} (ak)
D Pb (p) + Sn^{2+} (ak)

26. Suatu sel Daniell

A membolehkan tenaga elektrik bertukar menjadi tenaga kimia
B terdiri daripada logam kuprum dan logam ferum masing-masing direndamkan dalam larutan ion masing-masing.
C mempunyai pasu berliang atau titian garam untuk mendekatkan kedua-dua larutan.
D mempunyai nilai beza keupayaan sebanyak 1.10 V antara logam zink dan logam kuprum.

27. Dua batang logam direndamkan ke dalam bikar yang berisi serbuk kuprum(II) sulfat dan disambungkan dengan wayar kepada sebuah mentol. Mentol itu akan menyala jika

A kedua-dua logam itu mempunyai kedudukan yang sama dalam Siri Elektrokimia.
B kuprum(II) sulfat itu dijadikan larutan.
C kuprum(II) sulfat digantikan dengan larutan glukosa.
D kedua-dua batang logam itu digantikan dengan elektrod karbon.

28. Elektrolisis larutan akueus asid hidroklorik yang sangat cair tidak akan menghasilkan gas berwarna kuning kehijauan di anod platinum kerana

A Gas yang terbentuk akan bertindak balas dengan elektrod platinum itu.

B kepekatan ion klorida adalah sangat rendah untuk didiscaskan.

C ion H^+ yang akan dipilih untuk didiscaskan.

D ion OH^- akan didiscaskan di katod.

29. Dalam elektrolisis larutan akueus natrium sulfat menggunakan elektrod platinum,

A gas hidrogen akan terhasil di katod.

B gas oksigen akan terhasil di katod.

C gas hidrogen akan terhasil di anod.

D logam natrium akan terenap di katod platinum.

30. Manakah antara sel-sel kimia berikut merupakan sel-sel sekunder?

I sel alkali II sel kering III sel nikel-kadmium IV sel merkuri

A III sahaja B I,III C III,IV D I,III,IV

31. Dalam sel Daniell, titian garam boleh dihasilkan dengan menggunakan

I larutan glukosa III larutan sulfur monoklorida

II larutan kalium nitrat tepu IV larutan asid hidroklorik cair

A II,III B II,IV C II,III,IV D I,II,III,IV

32. Proses elektrolisis digunakan dalam industri berikut.

I Pengekstran logam III Penyaduran logam

II Penulenan logam IV Penyediaan bahan kimia lain

A I,II,IV BI,II,III C II,III,IV D I,II,III,IV

33. Suatu sel kimia boleh dibina dengan

I mengguna dua logam yang berlainan

II mengguna bahan kimia yang boleh mengkonduksikan arus elektrik sama ada dalam keadaan pepejal atau cecair.

III mengguna elektrod karbon

IV mengguna sebatian ionik dalam keadaan akueus.

A I,IV B I,II,IV C I,III,IV D I,II,III,IV

34. Pilih pernyataan yang BENAR bagi suatu sel Daniell.

I Elektrod zink dijadikan terminal positif

II Elektrod kuprum dijadikan terminal negatif

III Elektron bergerak dari elektrod zink ke elektrod kuprum.

IV Persamaan sel keseluruhan ialah seperti berikut :

$Zn^{2+} + Cu \longrightarrow Zn + Cu^{2+}$

A III sahaja B I,II, C I , II D I,II,III,IV

35. Semasa elektrolisis asid sulfurik cair menggunakan elektrod platinum,

I ion-ion yang hadir ialah ion H^+, ion OH^- dan ion SO_4^{2-} sahaja

II hanya ion H^+ akan discaskan di anod untuk membentuk hidrogen

III Ion OH^- dipilih untuk didiscaskan di katod untuk membentuk oksigen dan air.

IV Nisbah gas hidrogen : oksigen yang terhasil di kedua-dua elektrod ialah 2:1

A I,IV B II,III C I,II,III D I,II,III,IV

36. Serbuk plumbum(II) bromida tidak dapat dielektrolisiskan kerana

I terdapat molekul-molekul plumbum dan bromin yang tidak dapat mengkonduksikan arus elektrik dalam keadaa pepejal.

II terdapat ion-ion plumbum dan ion bromida yang tidak dapat bergerak bebas dalam keadaan pepejal.

III Plumbum(II) bromida mempunyai takat lebur yang sangat tinggi.

IV Plumbum(II) bromida merupakan sebatian yang tidak larut dalam air.

A II sahaja B II,III C II,III,IV D I,III,IV

37. Apabila pita magnesium dicelupkan ke dalam larutan kuprum(II) sulfat

I warna larutan kuprum(II) sulfat menjadi biru

II pepejal perang akan terbentuk

III tindak balas penyesaran berlaku

IV larutan magnesium sulfat akan terbentuk.

A I,II,III B I,II,IV C II,III,IV D I,II,III,IV

38. Suatu sel ringkas boleh dibina dengan menggunakan elektrod zink dan elektrod kuprum yang direndamkan ke dalam larutan asid sulfurik. Di terminal positif

I gas yang tidak berwarna terhasil

II atom kuprum akan terenap

III jisimnya bertambah

IV elektron masuk ke dalam elektrolit.

A I,IV B II,III C II,III,IV D I sahaja

40.

Pasangan logam	Nilai voltan beza keupayaan
P/Q	3.2V
P/R	2.5V
P/S	0.8V
P/T	1.1V

Jadual 1

Jadual 1 menunjukkan beza keupayaan bagi sel kimia yang dibina daripada pasangan logam P dengan logam-logam Q,R,S dan T secara bergilir-gilir. Logam P menjadi terminal negatif dalam setiap sel yang dibina. Yang manakah antara berikut adalah BENAR?

I P lebih elektropositif daripada logam-logam Q,R,S dan T

II Jarak antara logam P dan logam S yang paling jauh dalam Siri Elektrokimia

III Susunan menaik logam dalam Siri Elektrokimia ialah S,T,R,Q P

IV Susunan menaik logam dalam Siri Elektrokimia ialah Q,R,T,S,P

A I, IV B II,III C I,II,III D I,II,IV

APPENDIX 5

Narrated Questions in the ELEKTROKIMIA programme.

Question 1: What is meant by Electrochemistry?

Question 2 : What is the difference between the process of electrolysis and a chemical/galvanic cell?

Question 3 : What is the relationship between electrolysis and chemical/galvanic cell?

Question 4 : What is meant by electrolysis?

Question 5 : What are the requirements needed in order to perform electrolysis?

Question 6 : What is happening during the electrolytic process?

Question 7 : What is happening at the electrodes during the electrolytic process?

Question 8 : What are the products obtained at the electrodes at the end of electrolysis?

Question 9 : What is meant by the Ionic Theory?

Question 10 : What are the factors affecting electrolysis?

Question 11: How does the concentration of ions affect the products of electrolysis?

Question 12 : Which ions are selected for discharge at both the electrodes?

Question 13 : How does the position of ions in the Electrochemical Series affect the products of electrolysis?

Question 14 : How does the type of electrodes used determine the products of electrolysis?

Question 15 : What will happen if a carbon electrode or a copper electrode is used in the electrolysis of the copper (II) sulphate solution?

Question 16 : What are the applications of electrolysis?

Question 17 : What are the requirements needed during metal electroplating?

Question 18 : What happens during electroplating?

Question 19 : How does the purification of metals take place?

Question 20 : How is electrolysis used in the extraction of metals?

Question 21 : What is a chemical cell?

Question 22 : What is happening in a chemical cell?

Question 23 : What is a Daniell cell?

Question 24 : What is the function of the salt bridge or a porous pot?

Question 25 : What is happening in a Daniell cell?

Question 26 : What are your observations in a Daniell cell?

Question 27 : How can the Electrochemical Series be developed?

Question 28 : What are the uses of the Electrochemical Series?

Question 29 : What is happening in a dry cell?

Question 30 : What is happening in a lead accumulator?

Soalan-soalan audio dalam program ELEKTROKIMIA.

Soalan 1: Apakah yang dimaksudkan dengan elektrokimia?

Soalan 2 : Apakah perbezaan antara elektrolisis dengan sel kimia?

Soalan 3 : Apakah perhubungan antara elektrolisis dengan sel kimia?

Soalan 4 : Apakah yang dimaksudkan dengan elektrolisis?

Soalan 5 : Apakah yang diperlukan untuk menjalankan proses elektrolisis?

Soalan 6 : Apakah yang berlaku semasa proses elektrolisis?

Soalan 7 : Apakah yang berlaku di elektrod semasa proses elektrolisis?

Soalan 8 : Apakah yang terhasil di akhir proses elektrolisis?

Soalan 9 : Apakah yang dimaksudkan dengan teori ion?

Soalan 10 : Apakah faktor-faktor yang mempengaruhi hasil elektrolisis?

Soalan 11 : Bagaimanakah kepekatan ion mempengaruhi hasil elektrolisis?

Soalan 12 : Ion yang manakah dipilih untuk didiscaskan di kedua-dua elektrod?

Soalan 13 : Bagaimanakah kedudukan ion dalam Siri Elektrokimia mempengaruhi hasil elektrolisis?

Soalan 14 : Bagaimanakah jenis elektrod mempengaruhi hasil elektrolisis?

Soalan 15 : Apakah yang berlaku jika elektrod karbon atau elektrod kuprum digunakan dalam elektrolisis larutan kuprum(II) sulfat?

Soalan 16 : Apakah kegunaan elektrolisis?

Soalan 17 : Apakah yang diperlukan untul proses penyaduran?

Soalan 18 : Apakah yang berlaku semasa proses penyaduran?

Soalan 19 : Bagaimanakah penulenen logam dijalankan?

Soalan 20 : Bagaimakah elektrolisis digunakan untuk pengekstrakan logam?

Soalan 21 : Apakah sel kimia?

Soalan 22 : Apakah yang berlaku dalam sel kimia?

Soalan 23 : Apakah sel Daniell?

Soalan 24 : Apakah fungsi titian garam atau pasu berliang?

Soalan 25 : Apakah yang berlaku dalam sel Daniell?

Soalan 26 : Apakah yang pemerhatian anda dalam sel Daniell?

Soalan 27 : Bagaimanakah Siri Elektrokimia dibina?

Soalan 28 : Apakah kegunaan Siri Elektrokimia?

Soalan 29 : Apakah yang berlaku dalam sel kering ?

Soalan 30 : Apakah yang berlaku dalam akumulator asid plumbum?

APPENDIX 6

STORYBOARD FOR ELEKTROKIMIA programme

Screen 1 :	Text:	WELCOME TO THE WORLD OF ELECTROCHEMISTRY.
	Background:	Three images to represent Electrochemistry move around the screen to the rhythm of the music *gamelan (Authorware)*. The images selected from clipart were further edited (use Adobe Photoshop 4.0). Design and color scheme of the background have to blend with the three images.
	Cue:	Click mouse to next screen.
Screen 2	: Video clip :	Overview of ELEKTROKIMIA program by researcher (to be executed by researcher and production house). Tape of video clip need to be captured and then digitized into computer
	Cue:	Click mouse to next screen.
Screen 3:	Text :	Main Menu: INTRODUCTION, TOPIC, EXPERIMENT, EXERCISE, TEST (hotspot on each of these words).
	Cue:	Click on any word in The Main Menu to go into each section.

(All questions will be in audio and text. Narrated question will be executed at recording studio. Diskette of recorded questions need to be edited and digitized into computer. Answers to questions in text form only).

(INTRODUCTION section)

Screen 4	Text::	Text of objective statement.
	Cue:	Click on Next button to next screen.
Screen 5	Text :	Question 1. Answers to Question 1 in text only (use Arial type-font).
	Cue:	Click mouse on Next button to next screen,
Screen 6:	Text::	Question 2. Text answers to Question 2. Text and graphics to show difference between electrolysis and chemical cell.
	Cue:	Click mouse on Next button to next screen.
Screen 7:	Text :	Question 3. Text answers to Q.3. Graphics to show the relationship between electrolysis and chemical cell.
	Cue:	Click mouse on Next button to next screen.
Screen 8:	Text:	Instructions on Assessment.
	Cue:	Click on Next button to answer each assessment questions.

(One assessment question appear on one screen. Either click on correct response or click and drag correct response to the blanks in the question. Correct answers rewarded with music hit. Incorrect response is shown the incorrect sign. At the end of the five assessment questions, students' score is shown.)

	Cue:	Next button become inactivated. Click on Main Menu button to go to another section.

(TOPIC section)

Screen 9	Text :	Text on objective statement.
	Cue:	Click on Menu Topic button to go to each of the sub-topics.
Screen 10	Text :	(Menu Topic) Objective, Electrolysis, Chemical Cell
	Cue :	Click on any of the words to go to next screen. If click on the word Electrolysis, Electrolysis Menu appear on next screen. If click on the word Chemical Cell, Chemical cell Menu appear.
Screen 11	Text :	If (Electrolysis Menu) : Electrolysis, Ionic Theory, Factors affecting electrolysis, Uses of Electrolysis, Assessment.
	Cue:	Click on any of the words in the Electrolysis Menu to go the each of the sub-sections.
		(Electrolysis Menu)
Electrolysis		
Screen 12	Text :	Question 4. Text answers to Q.4. Hypertext on underlined words: *Bahan kimia, arus elektrik, leburan and akues.* Animations for each of the three words.
	Cue:	Click mouse on Next button to next screen.
Screen 12a	Text:	Text on definition of *bahan kimia* (use scroll bar for elaboration of text) and *arus elektrik*. Animations on formation of ions from atoms and formation of atoms from ions. Animations on how an ionic compound is formed. Animations also on how aqueus solutions are formed and how a molten compound is obtained.
	Cue:	Click forward arrow within hypertext to go to next page or click the reverse arrow to repeat the previous text.
Screen 13:	Text:	Question 5: Text answers to Q.5. Hypertext for underlined words: *elektrod, elektrolit.*
	Cue:	Click on underlined words to go to hypertext
Screen 13a	Text :	Text on definition of *elektrod.* Still image of an electrolytic cell. Animations to show what happens when electricity is conducted through the cell. Second animation to show what happens at the two electrodes when the mouse is clicked on them.
	Cue:	Click forward or reverse button for next or previous screen. Click anywhere on screen for animations.
Screen 13b	Text:	Text on definition of *elektrolit.* (Use of scroll bar for text elaboration of *elektrolit* and *bukan elektrolit.* Animation on the movement of free-moving ions in aqueus form.
	Cue:	Click anywhere on screen or on the electrodes for animation. Click on Next button to go to next screen.

Screen 14	Text :	Question 6. Text answers to Q.6. Still image of electrolytic cell. Animation on the formation of a positive and negative ion. Animation also on the movement of ions to the electrodes when electricity is passed into the electrolyte.
	Cue:	Click on Next button to go to next screen.
Screen 15	Text :	Question 7. Text answers to Q.7. Still image of electrodes. Animation of the movement of ions to electrodes and the discharge of ions at the electrodes.
	Cue:	Click on electrodes to view the movement and discharge of ions at cathode and anode. Click on Next button to next screen.
Screen 16	Text :	Question 8. Text answers to Q.8.
	Cue:	Click on electrodes to view the formation of products of electrolysis. Next button inactivated. Click on Electrolysis Menu button to go next screen.
(Ionic Theory)		
Screen 17	Text :	Question 9. Text answers to Q.9.
	Cue:	Next button inactivated. Click on Electrolysis Menu to go next screen
(Factors affecting electrolysis)		
Screen 18	Text :	Question 10 . Text answers to Q.10.
	Cue:	Click on Next button to go to next screen.
Screen 19	Text :	Question 11. Text answers to Q. 11. Still image of electrolytic cells. Animations of the movement of ions to the electrodes.
	Cue:	Click anywhere on the screen to view the animations. Click on Next button the go to next screen.
Screen 20	Text :	Question 12. Text answers to Q.12. Still images of electrodes. Animations of the movement of ions to the two electrodes and the subsequent discharge of the ions to form the products.
	Cue:	Click anywhere on the screen to view the animations. Click on Next button the go to next screen.
Screen 21	Text :	Question 13. Text answers to Q. 13. Hypertext for underlined word Electrochemical Series.
	Cue:	Click on Next button to go to next screen.
Screen 22	Text :	Question 14. Text answers to Q. 14.
	Cue:	Click on Next button to go to next screen.

Screen 23	Text :	Question 15. Text answers to Q. 15. Still image of two labeled electrolytic cells, one using carbon electrodes and the other using copper electrodes. A table to depict the difference between the electrolytic process occurring in the two cells.
	Cue :	Next button inactivated. Click on Electrolysis Menu button to go to next scree
(Uses of Electrolysis)		
Screen 24	Text:	Question 16. Text answers to Q.16. Each of the uses of electrolysis underlined (made into hotspot): Metal electroplating, Purification of metals, Extraction of metals and Preparation of other chemicals.
	Cue :	Click on any of the phrases in the Uses of Electrolysis to go to the each of the content.
(Metal Electroplating)		
Screen 25	Text:	Question 17. Text answers to Q.17.
	Cue:.	Click on Uses of Electrolysis Menu to go to next screen.
Screen 26	Text :	Question 18. Text answers to Q.18. Still image of electrolytic cell. Animation to show what happens during electroplating of metal
	Cue:	Click on any part of screen to view animations. Click on Uses of Electrolysis Menu to go to next screen.
(Purification of metals)		
Screen 27	Text :	Question 19. Text answers to Q.19. Still image of electrolytic cell. Animation to show what happens during the purification of metals.
	Cue :	Click on any part of screen to view animations. Click on Uses of Electrolysis Menu to go to next screen.
(Extraction of metals)		
Screen 28	Text :	Question 20. Text answers to Q.20. Still image of electrolytic cell of the extraction of aluminium from bauxite. Still picture of electrodes of the cell. Animation to show the discharge of aluminium ions at the cathode and the oxygen gas evolved at the anode.
	Cue:	Click on electrodes to view the movement and subsequent discharge of ions at the two electrodes. Click on Next button to next screen.
Screen 29	Text :	Text on how electrolysis can be used in the preparation of other Chemicals. Still image of electrolytic cells involved in the production of chlorine and the production of sodium hydroxide. Animations to show the movement of ions to the electrodes and the subsequent discharge to form the chemicals.
	Cue:	Click on electrodes to view the animations. Click on Next button to go Assessment.

(Assessment)

Screen 30	Text :	Instructions on Assessment.
	Cue:	Click on **Next** button to answer each assessment questions. Click on **Menu** topic button to go to next screen.

(One assessment question appear on one screen. Either click on correct response or click and drag correct response to the blanks in the question. Correct answers rewarded with music hit. Incorrect response is shown the incorrect sign. At the end of the seven assessment questions, students' score is shown.)

(Chemical cells Menu)

Chemical cell

Screen 31	Text :	if(Chemical cell) : Chemical cell, Daniell cell, Other chemical cells, Uses of Electrochemical Series, Assessment.
	Cue:	Click on any of the sub-topics in the Chemical cell menu to go to each section.
Screen 32	Text :	Question 21. Text answers to Q.21. Still image of a chemical cell.
	Cue:	Click on **Next** button to go to next screen.
Screen 33.	Text:	Question 22. Text answers to Q.22. Still image of a chemical cell. Animations to show the movement of electrons in a chemical cell.
	Cue:	Click anywhere on the screen to view the movement of the electrons in a chemical cell. Click on Chemical cell **Menu** button to go to next screen.

(Daniell cell)

Screen 34.	Text :	Question 23. Text answers to Q. 23. Still image of Daniell cell.
	Cue:	Click anywhere on the screen to view the movement of electrons in the Daniell cell. Click on Chemical cell **Menu** button to go to next screen.
Screen 35	Text :	Question 24. Text answers to Q.14. Still image of an enlarged pores of the porous pot in a Daniell cell. Animations to show the movement of ions through the pores of the porous pot.
	Cue:	Click anywhere on the screen to view the movement of the ions. Click on the **Next** button to go to the next screen.
Screen 36	Text :	Question 25. Text answers to Q.25. Still image of Daniell cell. Animation to show movement of electrons from the zinc electrode to the copper electrode.
	Cue:	Click anywhere on the screen to view the movement of electrons in the Daniell cell. Click on the **Next** button to go to the next screen.

Screen 37	Text :	Question 26. Text answers to Q. 26. Still image of the electrodes in a Daniell cell. Animations to show the formation of zinc ions at he zinc electrodes and the formation of copper atoms at the copper electrodes. Animations to show the thickening and thinning of the copper and zinc electrodes respectively.
	Cue:	Click anywhere on the screen to view the animations. Click on the Chemical cell Menu button to go to the next screen.

(The building up of an Electrochemical series)

Screen 38	Text :	Question 27. Text answers to Q. 27. Still image of chemical cell. Animations to show experiment on how an Electrochemical Series can be built up.
	Cue :	Click on Next button to go to next screen.
Screen 39	Text :	Question 28. Text answer to Q. 28.
	Cue :	Click on Chemical cell Menu button to go to next screen.

(Other chemical cells)

Screen 40	Text :	(A list of other chemicals cells displayed): Dry cells, Lead accumulator, Mercury cell, Alkali cell, Nickel-cadmium cell. All the cells underlined and made into hotspot.
	Cue:	Click on any of the sub-sections of Other chemical cells to go into each section.
Dry cells		
Screen 40a	Text :	Question 29. Text answers to Q. 29. Photograph of a dry cell. Cross-section still image of dry cell. Animations to show how the electrons move in the dry cell.
	Cue :	Click anywhere on the screen to view the movements of electrons in the dry cell. Click on the Other chemical cell Menu button to go to next screen.
Lead accumulator		
Screen 40b	Text :	Question 30. Text answers to Q. 30. Photograph of a lead accumulator. Cross-section still image of lead accumulator.
	Cue:	Click on Other chemical cell button to go to next screen.
Alkali cell		
Screen 40c	Text :	Still image of alkali cell. Text on alkali cells.
	Cue:	Click on Other chemical cell button to go to next screen.
Nickel-cadmium cell		
Screen 40d	Text :	Photograph of nickel-cadmium cell. Text on nickel-cadmium cells.
	Cue:	Click on Chemical cell Menu button to go to Uses of Electrochemical Series.

(Uses of Electrochemical Series)

Screen 41	Text :	What are the uses of an Electrochemical Series? Text answers to the question. Graphics and animations are shown on the ability of displacement reactions to occur.
	Cue:	Click on Chemical cell Menu button to go to Assessment.

(Assessment)

Screen 42	Text :	Instructions on Assessment.
	Cue:	Click on Next button to answer each assessment questions. Click on Menu topic button to go to next screen.

(One assessment question appear on one screen. Either click on correct response or click and drag correct response to the blanks in the question. Correct answers rewarded with music hit. Incorrect response is shown the incorrect sign. At the end of the five assessment questions, students' score is shown.)

(EXPERIMENT section)

Screen 43	Text :	Objective statement of the EXPERIMENT section.
	Cue :	Click on Next button to go to next screen.
Screen 44.	Text :	(Experiment Menu) : Electrolysis, Chemical cells, Assessment.
	Cue:	Click on any of the words to view the video clips of each section.
Electrolysis		
Screen 45	Text :	If (Electrolysis Menu): Electrolysis: of Lead(II) bromide, dilute sulphuric acid, dilute hydrochloric acid, copper sulphate solution (using carbon electrodes), copper sulphate solution (using copper electrodes), electroplating of a metal spoon.
	Cue:	Click on any of the experiments to view the respective demonstrated experiments.
Screen 46	Text:	If (Chemical cell Menu): Chemical/Simple cell, Daniell cell, electrical energy from chemical energy, the building up of an Electrochemical Series.
	Cue:	Click on the Experiment Menu button to go to the Assessment.

(Each of the above experiments will in video-tape. The execution of the video will be done by the researcher and the production house. The edited tape have to be captured into the computer, digitized and compressed using *MPEGator*. At the end of each experiment, a series of questions will be presented in text form only. The text answers to each of these questions will appear after a 10-second break .)

(Assessment)

Screen 47	Text :	Instructions on Assessment.
	Cue:	Click on Next button to answer each assessment questions. Click on Menu topic button to go to next screen.

(One assessment question appear on one screen. Either click on correct response or click and drag correct response to the blanks in the question. Correct answers rewarded with music hit. Incorrect response is shown the incorrect sign. At the end of the seven assessment questions, students' score is shown.)

(EXERCISE section)

Screen 48	Text :	Objective statement of the EXERCISE section. Forty multiple-response questions presented. Each question can only be attempted once. Score of the answers are shown at the end of the forty questions.
	Cue:	Click on Next button to go to the following question. At the end of the section, click on the Main Menu button to go to other sections.

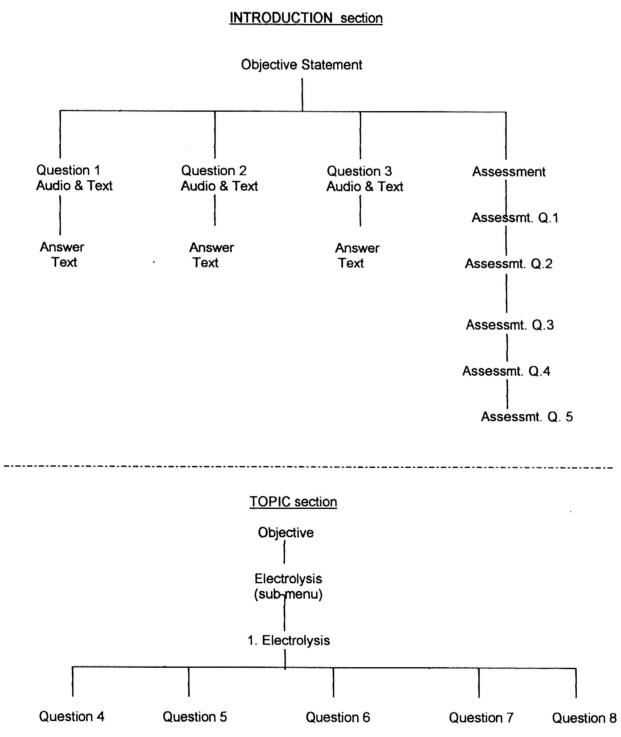
(TEST section)

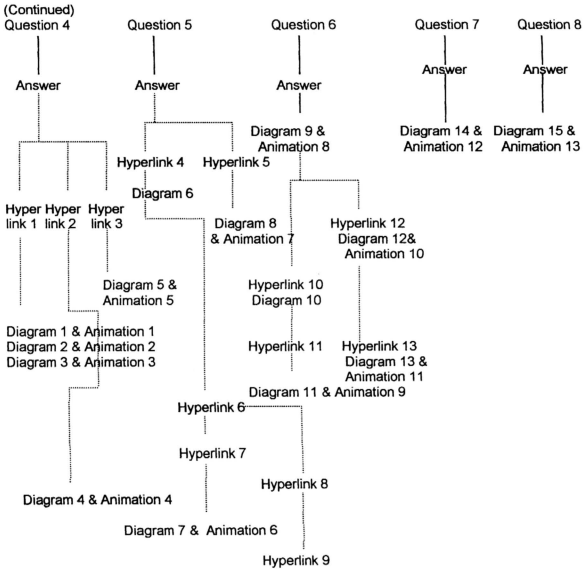
Screen 49	Text :	Objective statement of the TEST section. Forty multiple-response questions presented. Each question can only be attempted once. Score of the answers are shown at the end of the forty questions.
	Cue:	Click on Next button to go to the following question. At the end of the section, click on the Main Menu button to go to other sections.

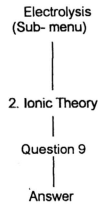
APPENDIX 6a

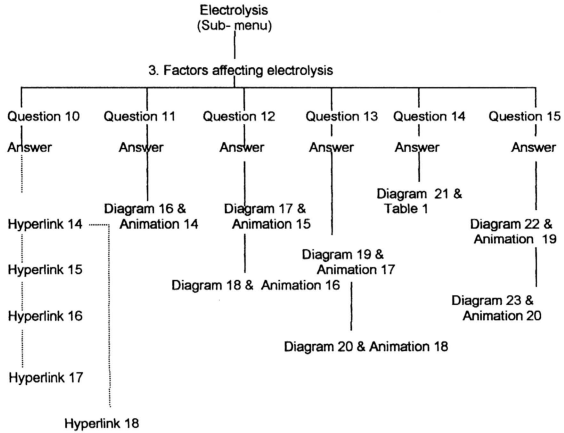
Flow Chart of the ELEKTROKIMIA Programme

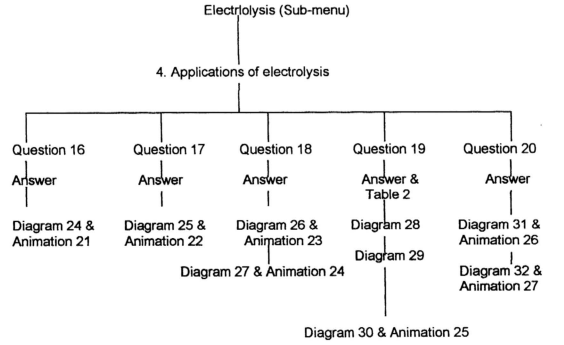
(Based on the Concept Map of the programme)

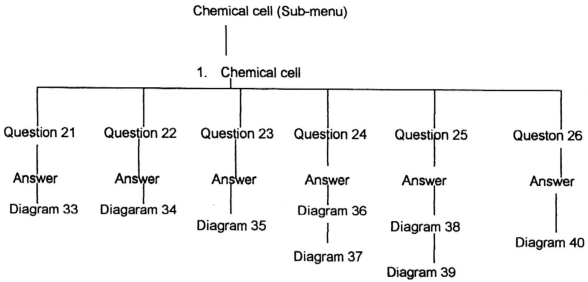


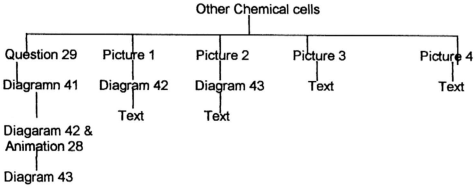

(Continued)
Question 4
Question 5
Question 6
Question 7
Question 8
Answer
Answer
Answer
Answer
Answer
Diagram 9 &
Animation 8
Diagram 14 &
Animation 12
Diagram 15 &
Animation 13
Hyperlink 4
Hyperlink 5
Diagram 6
Hyper
link 1
Hyper
link 2
Hyper
link 3
Diagram 8
& Animation 7
Hyperlink 12
Diagram 12&
Animation 10
Diagram 5 &
Animation 5
Hyperlink 10
Diagram 10
Diagram 1 & Animation 1
Diagram 2 & Animation 2
Diagram 3 & Animation 3
Hyperlink 11
Hyperlink 13
Diagram 13 &
Animation 11
Diagram 11 & Animation 9
Hyperlink 6
Hyperlink 7
Hyperlink 8
Diagram 4 & Animation 4
Diagram 7 & Animation 6
Hyperlink 9

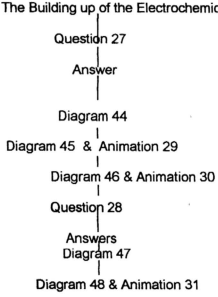

Electrolysis
(Sub- menu)
2. Ionic Theory
Question 9
Answer

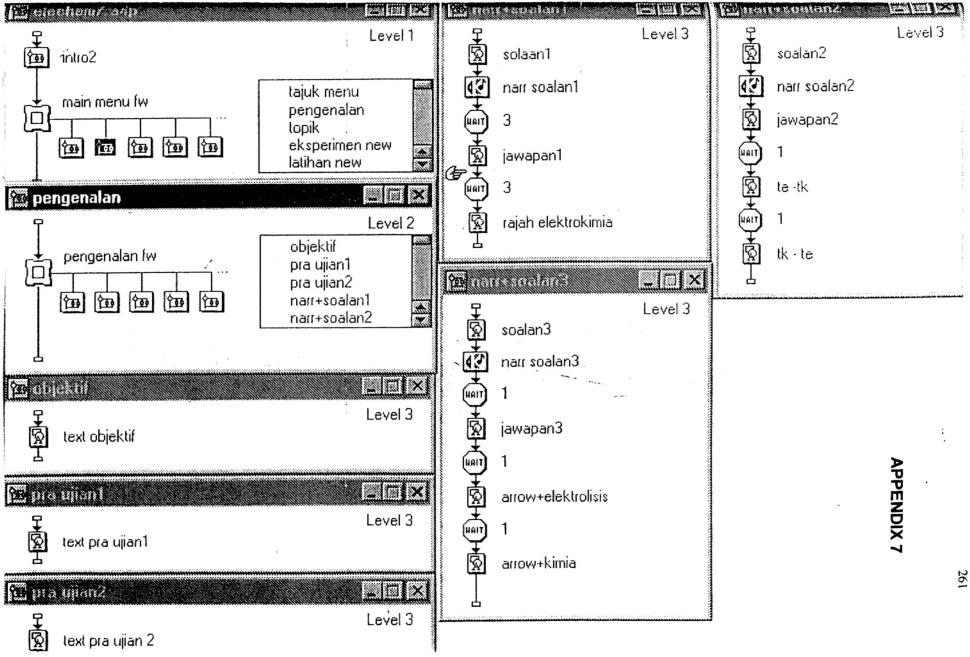

Electrolysis
(Sub- menu)
3. Factors affecting electrolysis
Question 10
Question 11
Question 12
Question 13
Question 14
Question 15
Answer
Answer
Answer
Answer
Answer
Answer
Diagram 21 &
Table 1
Diagram 16 &
Animation 14
Diagram 17 &
Animation 15
Hyperlink 14
Diagram 22 &
Animation 19
Diagram 19 &
Animation 17
Hyperlink 15
Diagram 18 & Animation 16
Diagram 23 &
Animation 20
Hyperlink 16
Diagram 20 & Animation 18
Hyperlink 17
Hyperlink 18

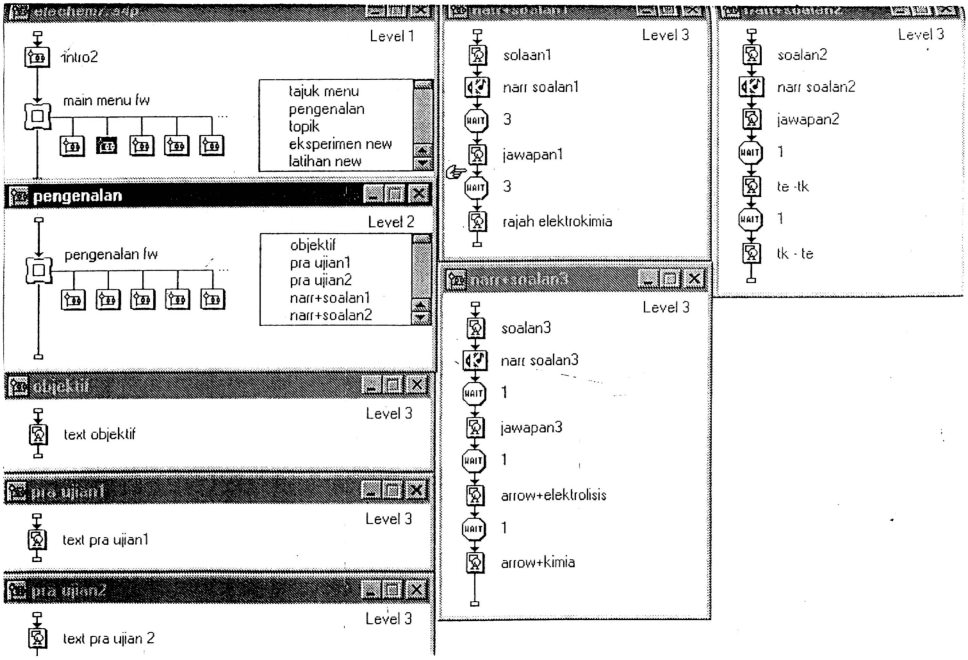

Electrolysis (Sub-menu)
4. Applications of electrolysis
Question 16
Question 17
Question 18
Question 19
Question 20
Answer
Answer
Answer
Answer &
Table 2
Answer
Diagram 24 &
Animation 21
Diagram 25 &
Animation 22
Diagram 26 &
Animation 23
Diagram 28
Diagram 31 &
Animation 26
Diagram 29
Diagram 27 & Animation 24
Diagram 32 &
Animation 27
Diagram 30 & Animation 25


Chemical cell (Sub-menu)
1. Chemical cell
Question 21
Answer
Diagram 33
Question 22
Answer
Diagaram 34
Question 23
Answer
Diagram 35
Question 24
Answer
Diagram 36
Diagram 37
Question 25
Answer
Diagram 38
Diagram 39
Queston 26
Answer
Diagram 40


Other Chemical cells
Question 29
Diagramn 41
Diagaram 42 & Animation 28
Diagram 43
Picture 1
Diagram 42
Text
Picture 2
Diagram 43
Text
Picture 3
Text
Picture 4
Text


4. The Building up of the Electrochemical Series
Question 27
Answer
Diagram 44
Diagram 45 & Animation 29
Diagram 46 & Animation 30
Question 28
Answers
Diagram 47
Diagram 48 & Animation 31


elechem7.scp
Level 1
intro2
main menu fw
tajuk menu
pengenalan
topik
eksperimen new
latihan new
pengenalan
Level 2
pengenalan fw
objektif
pra ujian1
pra ujian2
narr+soalan1
narr+soalan2
objektif
Level 3
text objektif
pra ujian1
Level 3
text pra ujian1
pra ujian2
Level 3
text pra ujian 2
narr+soalan1
Level 3
solaan1
narr soalan1
3
jawapan1
3
rajah elektrokimia
narr+soalan2
Level 3
soalan2
narr soalan2
jawapan2
1
te -tk
1
tk - te
narr+soalan3
Level 3
soalan3
narr soalan3
1
jawapan3
1
arrow+elektrolisis
1
arrow+kimia


elechemz.sdp
Level 1
intro2
main menu fw
tajuk menu
pengenalan
topik
eksperimen new
latihan new
pengenalan
Level 2
pengenalan fw
objektif
pra ujian1
pra ujian2
narr+soalan1
narr+soalan2
objektif
Level 3
text objektif
pra ujian1
Level 3
text pra ujian1
pra ujian2
Level 3
text pra ujian 2
narr+soalan1
Level 3
solaan1
narr soalan1
WAIT
3
jawapan1
WAIT
3
rajah elektrokimia
narr+soalan2
Level 3
soalan2
narr soalan2
jawapan2
WAIT
1
te -tk
WAIT
1
tk - te
narr+soalan3
Level 3
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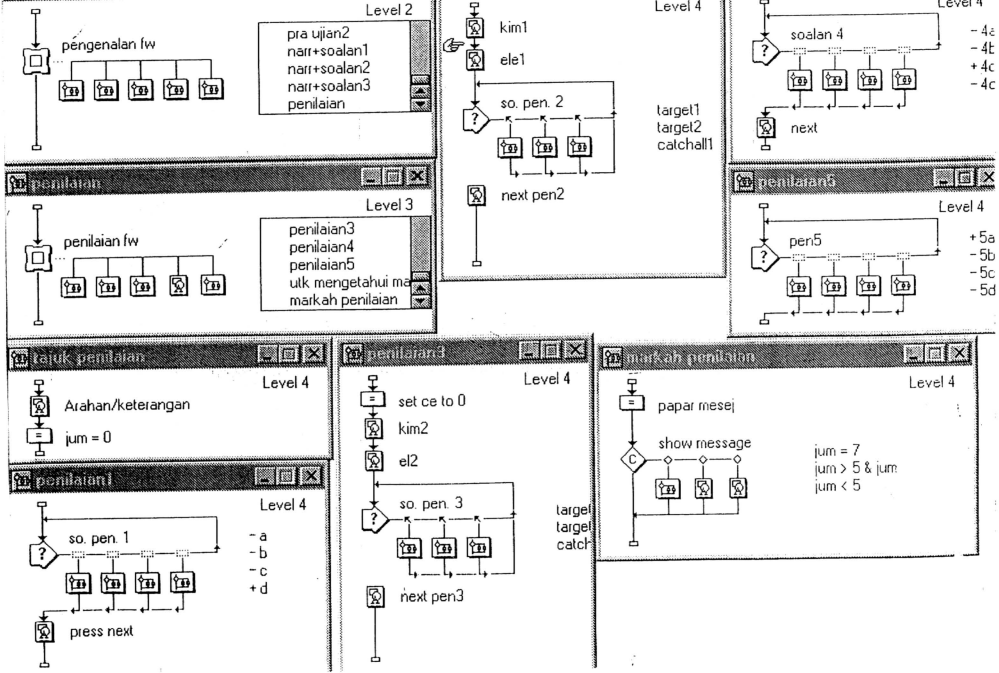
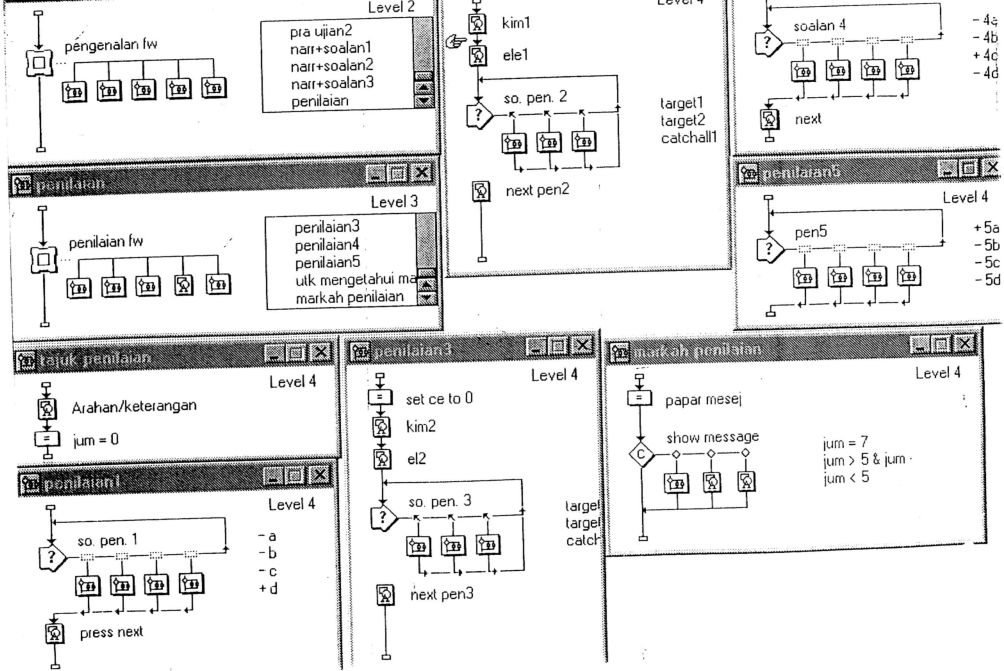
WAIT
1
arrow+kimia


Level 2
pengenalan fw
pra ujian2
narr+soalan1
narr+soalan2
narr+soalan3
penilaian
Level 4
kim1
ele1
so. pen. 2
target1
target2
catchall1
next pen2
Level 4
soalan 4
- 4a
- 4b
+ 4c
- 4c
next
penilaian
Level 3
penilaian fw
penilaian3
penilaian4
penilaian5
utk mengetahui ma
markah penilaian
penilaian5
Level 4
pen5
+ 5a
- 5b
- 5c
- 5d
tajuk penilaian
Level 4
Arahan/keterangan
jum = 0
penilaian3
Level 4
set ce to 0
kim2
el2
so. pen. 3
next pen3
markah penilaian
Level 4
papar mesej
show message
jum = 7
jum > 5 & jum
jum < 5
penilaian1
Level 4
so. pen. 1
- a
- b
- c
+ d
press next

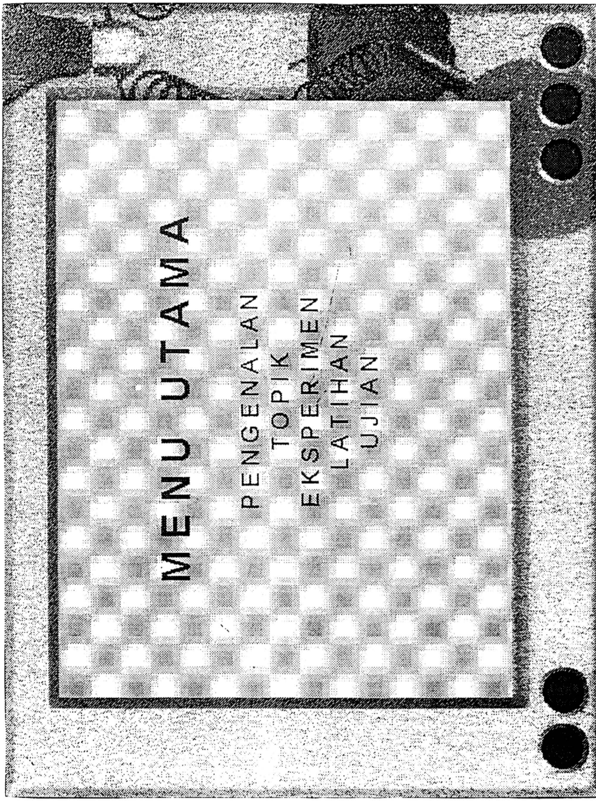

Level 2
pengenalan fw
pra ujian2
narr+soalan1
narr+soalan2
narr+soalan3
penilaian
penilaian
Level 3
penilaian fw
penilaian3
penilaian4
penilaian5
utk mengetahui ma
markah penilaian
kim1
ele1
so. pen. 2
next pen2
Level 4
target1
target2
catchall1
soalan 4
next
penilaian5
Level 4
pen5
+5a
-5b
-5c
-5d
tajuk penilaian
Level 4
Arahan/keterangan
jum = 0
penilaian1
Level 4
so. pen. 1
-a
-b
-c
+d
press next
penilaian3
Level 4
set ce to 0
kim2
el2
so. pen. 3
next pen3
markah penilaian
Level 4
papar mesej
show message
jum = 7
jum > 5 & jum
jum < 5

APPENDIX 8

Selamat Datang Ke Dunia

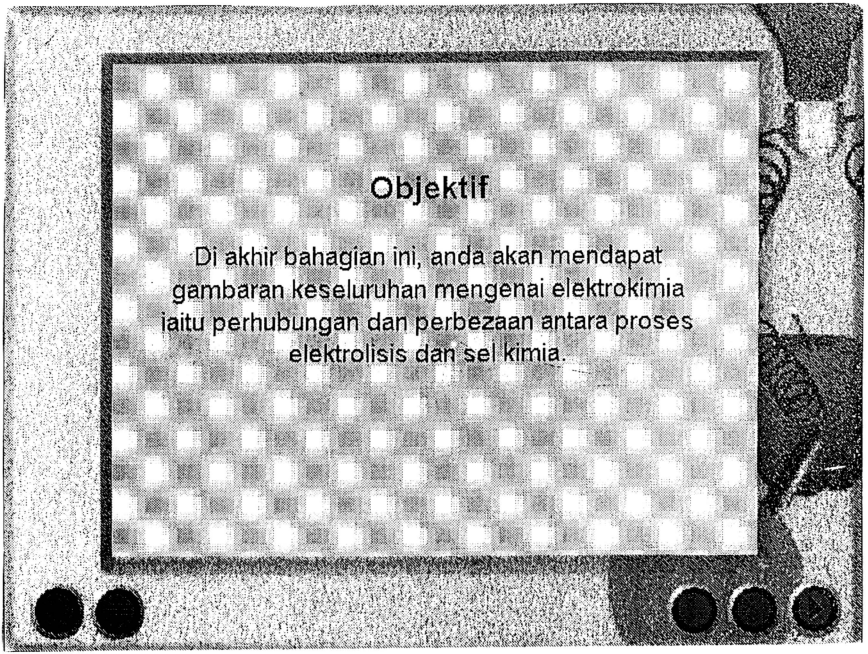
ELEKTROKIMIA

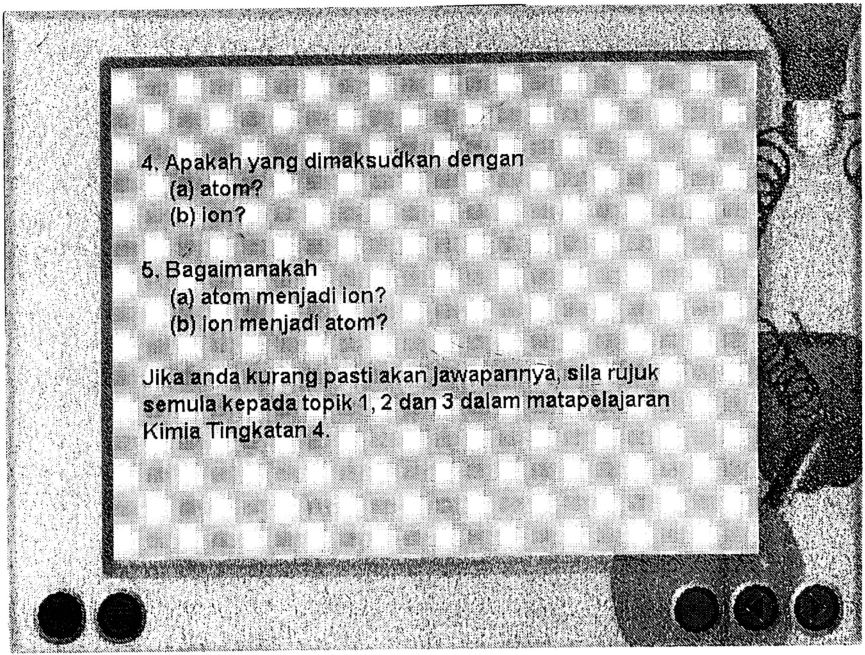
APPENDIX 9



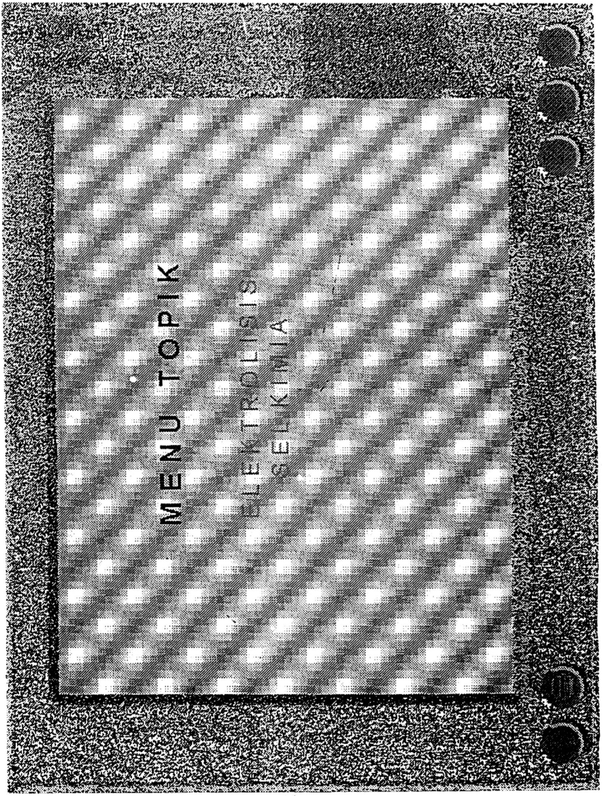
MENU UTAMA

PENGENALAN
TOPIK
EKSPERIMEN
LATIHAN
UJIAN

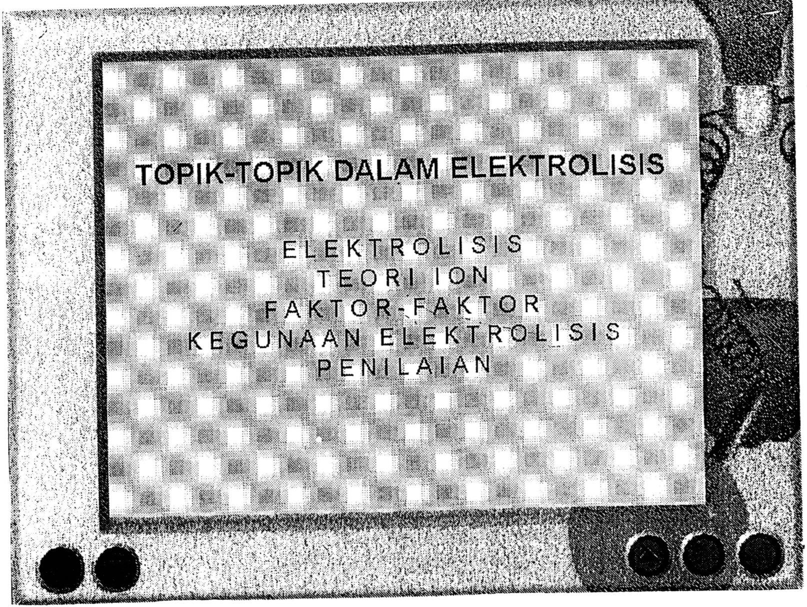

Objektif
Di akhir bahagian ini, anda akan mendapat gambaran keseluruhan mengenai elektrokimia iaitu perhubungan dan perbezaan antara proses elektrolisis dan sel kimia.


4. Apakah yang dimaksudkan dengan
(a) atom?
(b) ion?
5. Bagaimanakah
(a) atom menjadi ion?
(b) ion menjadi atom?
Jika anda kurang pasti akan jawapannya, sila rujuk semula kepada topik 1, 2 dan 3 dalam matapelajaran Kimia Tingkatan 4.

APPENDIX 12



APPENDIX 13



TOPIK-TOPIK DALAM ELEKTROLISIS

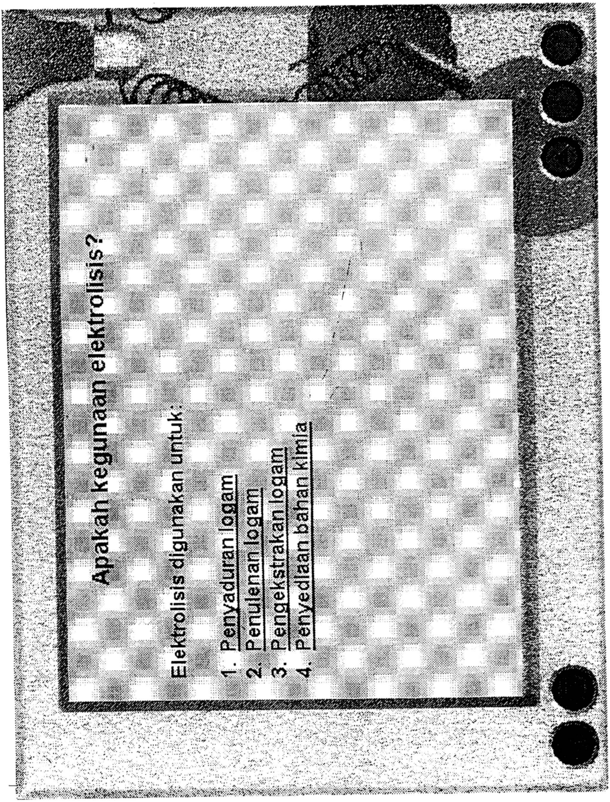
ELEKTROLISIS
TEORI ION
FAKTOR-FAKTOR
KEGUNAAN ELEKTROLISIS
PENILAIAN

APPENDIX 14

TOPIK-TOPIK DALAM SEL KIMIA

SEL RINGKAS / SEL KIMIA
SEL DANIELL
SEL ELEKTROKIMIA LAIN
PEMBINAAN SIRI ELEKTROKIMIA
KEGUNAAN SIRI ELEKTROKIMIA
PENILAIAN

APPENDIX 15

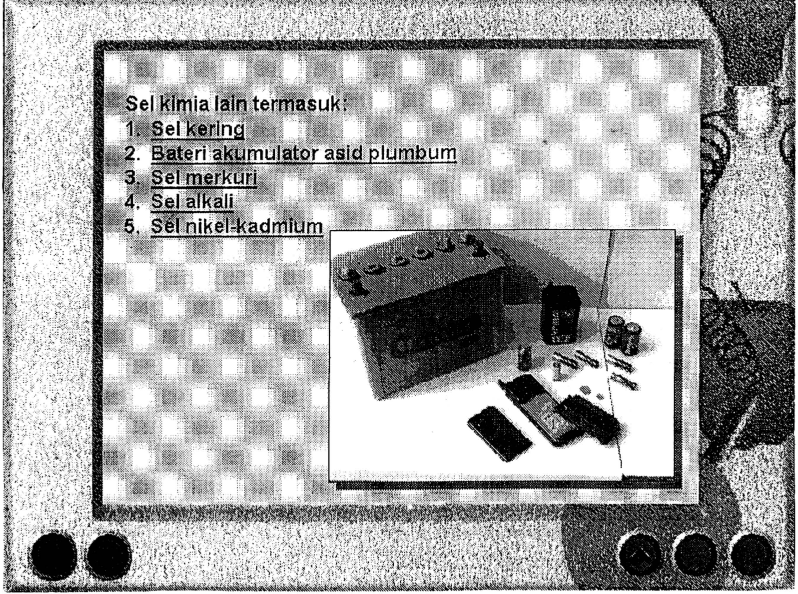


Apakah kegunaan elektrolisis?

Elektrolisis digunakan untuk:

1. Penyaduran logam
2. Penulenan logam
3. Pengekstrakan logam
4. Penyediaan bahan kimia

APPENDIX 16



Sel kimia lain termasuk:

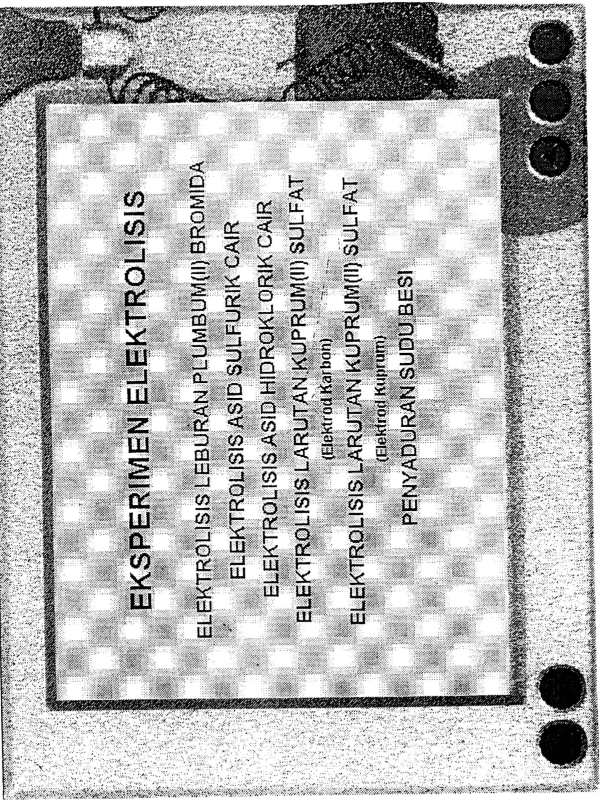
1. Sel kering
2. Bateri akumulator asid plumbum
3. Sel merkuri
4. Sel alkali
5. Sel nikel-kadmium

APPENDIX 17

EKSPERIMEN

ELEKTROLISIS
SEL KIMIA
PENILAIAN

APPENDIX 18



EKSPERIMEN ELEKTROLISIS

ELEKTROLISIS LEBURAN PLUMBUM(II) BROMIDA

ELEKTROLISIS ASID SULFURIK CAIR

ELEKTROLISIS ASID HIDROKLORIK CAIR

ELEKTROLISIS LARUTAN KUPRUM(II) SULFAT
(Elektrod Karbon)

ELEKTROLISIS LARUTAN KUPRUM(II) SULFAT
(Elektrod Kuprum)

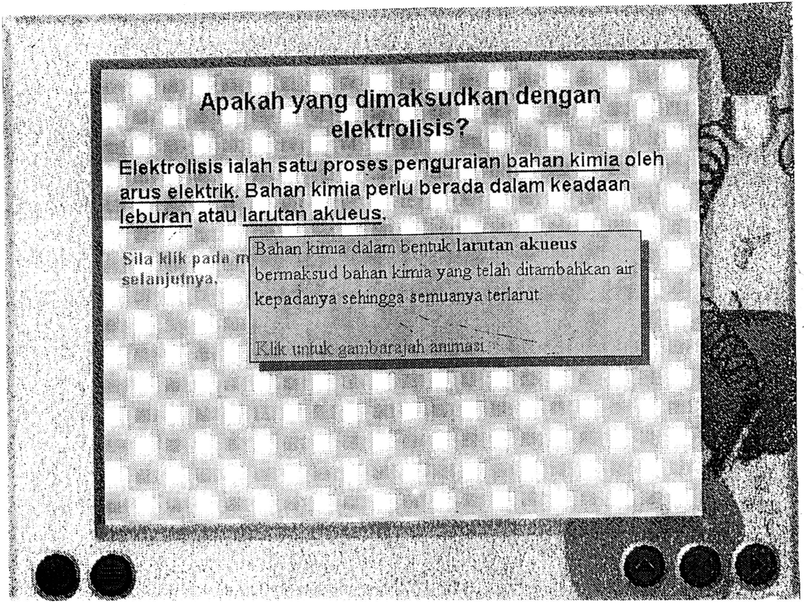
PENYADURAN SUDU BESI

APPENDIX 19

EKSPERIMEN SEL KIMIA

EKSPERIMEN SEL RINGKAS
EKSPERIMEN SEL DANIELL
EKSPERIMEN TENAGA ELEKTRIK DARI TENAGA KIMIA
EKSPERIMEN PEMBINAAN SIRI ELEKTROKIMIA

APPENDIX 20



Apakah yang dimaksudkan dengan elektrolisis?

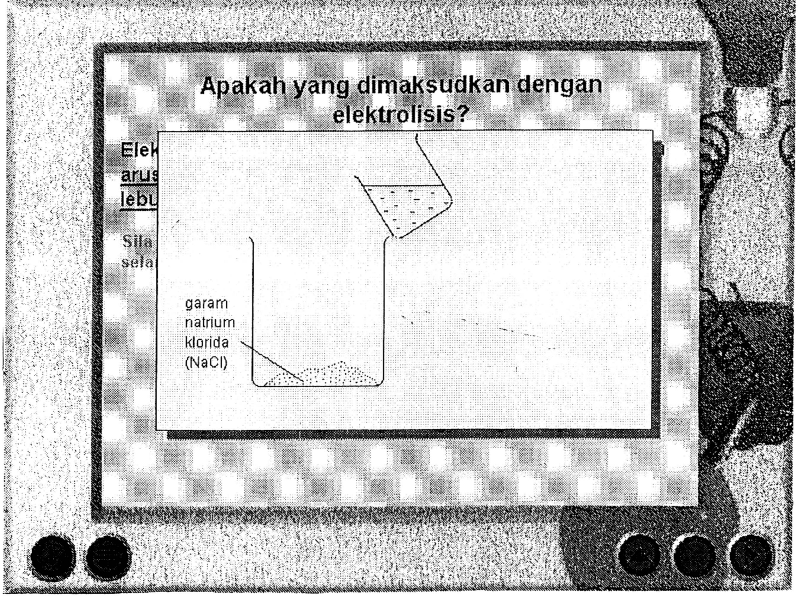
Elektrolisis ialah satu proses penguraian bahan kimia oleh arus elektrik. Bahan kimia perlu berada dalam keadaan leburan atau larutan akueus.

Sila klik pada m
selanjutnya.

Bahan kimia dalam bentuk **larutan akueus** bermaksud bahan kimia yang telah ditambahkan air kepadanya sehingga semuanya terlarut.

Klik untuk gambarajah animasi.

APPENDIX 21

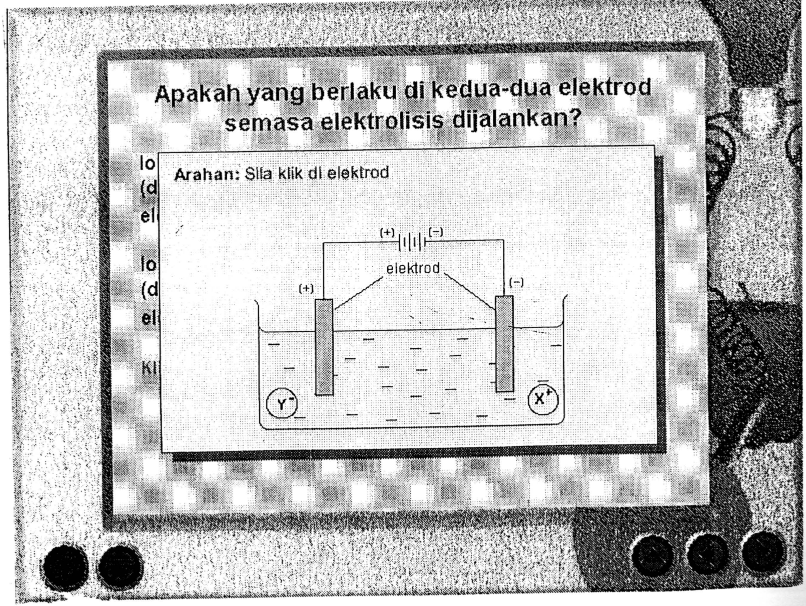


Apakah yang dimaksudkan dengan elektrolisis?

Elek
arus
lebu

Sila
sela

APPENDIX 22



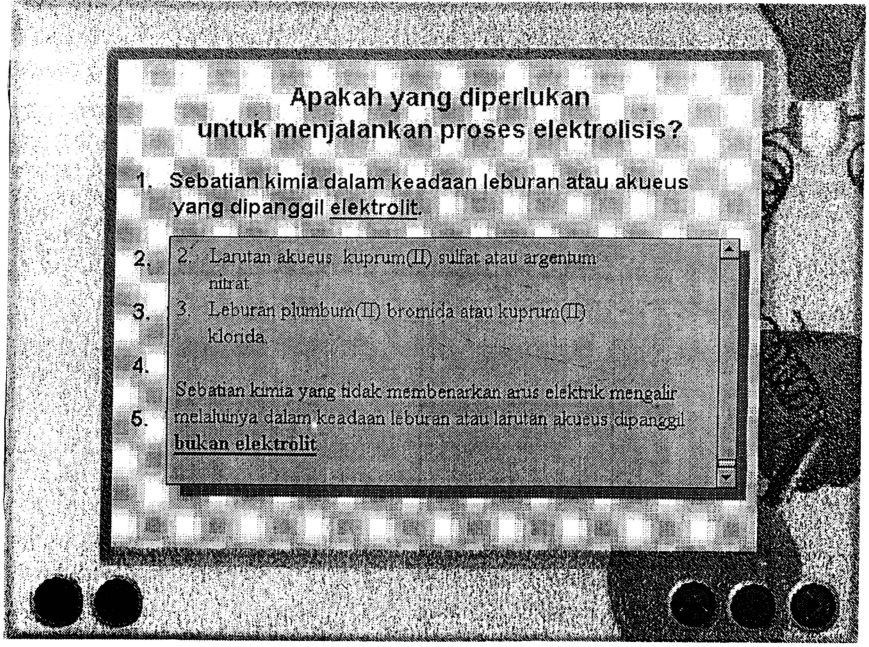
Apakah yang berlaku di kedua-dua elektrod semasa elektrolisis dijalankan?

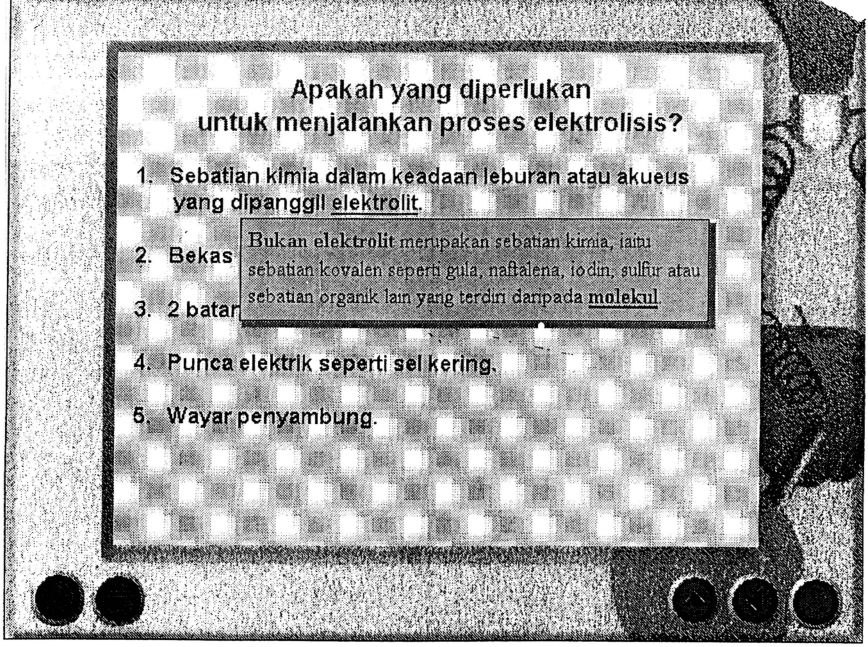
Io
(d
el

Io
(d
el

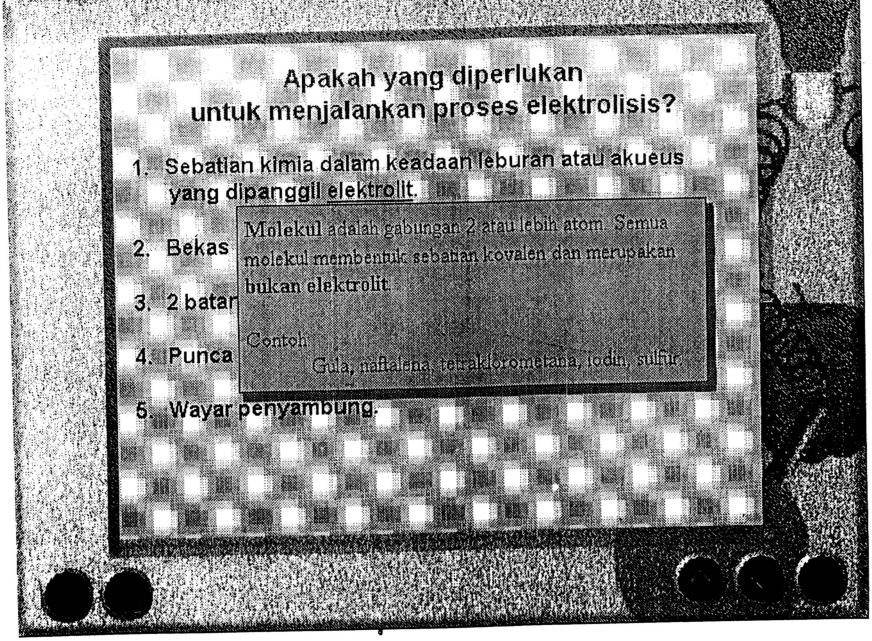
Kl

Arahan: Sila klik di elektrod


Apakah yang diperlukan
untuk menjalankan proses elektrolisis?
1. Sebatian kimia dalam keadaan leburan atau akueus yang dipanggil elektrolit.
2. Larutan akueus kuprum(II) sulfat atau argentum nitrat.
3. Leburan plumbum(II) bromida atau kuprum(II) klorida.
4.
Sebatian kimia yang tidak membenarkan arus elektrik mengalir
5. melaluinya dalam keadaan leburan atau larutan akueus dipanggil bukan elektrolit.


Apakah yang diperlukan
untuk menjalankan proses elektrolisis?
1. Sebatian kimia dalam keadaan leburan atau akueus yang dipanggil elektrolit.
2. Bekas
3. 2 batar
4. Punca elektrik seperti sel kering.
5. Wayar penyambung.
Bukan elektrolit merupakan sebatian kimia, iaitu sebatian kovalen seperti gula, naftalena, iodin, sulfur atau sebatian organik lain yang terdiri daripada molekul.

APPENDIX 24


Apakah yang diperlukan
untuk menjalankan proses elektrolisis?
1. Sebatian kimia dalam keadaan leburan atau akueus yang dipanggil elektrolit.
2. Bekas
3. 2 batan
4. Punca
5. Wayar penyambung.
Molekul adalah gabungan 2 atau lebih atom. Semua molekul membentuk sebatian kovalen dan merupakan bukan elektrolit.
Contoh:
Gula, naftalena, tetraklorometana, iodin, sulfur

APPENDIX 25

APPENDIX 26

DOCUMENTATION

How to use the ELEKTROKIMIA CD.

1. Place the CD in the CD-ROM player.
2. The window 'Ekimia(E)' appears on the screen.
3. Click the mouse on the word 'Setup' (with the computer graphic). The program will be automatically installed. Follow the directions on the screen.
4. Click on the word 'Next' on all ensuing screens until the instruction "Finish' appear. Then click 'Finish'.
5. Close the 'Setup' window.
6. To view the program:
   (i) Click the 'Start' button on the computer screen.
   (ii) Click on the word 'Program'.
   (iii) Click on the word E-kimia.
   (iv) Double-click on Elektrokimia- Tingkatan 4.
7. The program welcomes the user with a traditional *gamelan* music with the words " *Selamat Datang Ke Dunia Elektrokimia*" or 'Welcome to the world of Electrochemistry".
8. This is then followed by a video clip movie of the researcher presenting an overview of the program.
9. At the end of the movie, click anywhere to go to the next screen.
10. Using the keyboard, type in your name. Then press ENTER.
11. Type in your class. Press ENTER again.

12. The 'PRA-UJIAN' or 'Pre-Test' presents to the user several important concepts that are considered pre-requisites to the topic Electrochemistry. Students are advised to review these concepts before going through the programme.
13. Click on the green Forward button (at the bottom right hand-side of the screen) to go to the Main Menu.
14. Within the Main Menu, the user can either go to the Introduction section, the Topic section, the Experiment section, the Exercise section or the Test section.
15. Navigation within the program is executed through various buttons.
    (i) The green round button found at the bottom extreme left hand corner of the screen is meant for exit from the program. This Exit button is active throughout the program; the user can exit from the program at any time.
    (ii) The Main Menu button is located next to the Exit button.
    (iii) The round green button located at the bottom extreme right hand corner of the screen is used to go to the next screen. This is the Forward button.
    (iv) The Forward button becomes inactive when the particular text section has ended.
    (v) The Reverse button next to the Forward button is meant for going back to the previous screen.
    (vi) The green button located next to the Reverse button can either be the Sub-menu button of a particular section or the menu button for the particular sub-section. (Refer to the Concept Map where another menu is available within the dotted boxes).
    (vii) A triangular blue button appears at the bottom of the screen for the user to go forward in a particular sub-section. The reverse blue button is also available.

(viii) All underlined words contain hypertext. The user need to click once on the underlined words to go to the hypertext.

(ix) To view the animations, the user can click anywhere on the screen or as directed. At the end of the animations, the user need to click again anywhere on the screen to proceed.

(x) To respond to the assessment questions, the user need to click on the answers for the multiple-choice questions. For the fill-in-the –blank-type of questions, the user need to click and drag the answers to the blanks. An incorrect answer will be bounced back while the correct answer will stay on the blank.

DOKUMENTASI

Cara mengguna CD ELEKTROKIMIA.

1. Letakkan CD ke dalam Pemain-CD.
2. Tingkap 'Ekimia(E)' akan muncul pada skrin komputer.
3. Klik tetikus pada perkataan 'Setup' (pada grafik komputer). Program ini akan dipasang secara automatik. Ikut arahan yang tertulis pada skrin.
4. Klik pada perkataan 'Next' pada skrin-skrin berikutnya sehingga terdapat arahan untuk klik pada perkataan 'Finish'. Klik 'Finish'.
5. Tutup tingkap 'Setup'.
6. Untuk meneruskan dengan program:
   (i) Klik pada butang 'Start' pada skrin komputer.
   (ii) Klik pada perkataan 'Program'.
   (iii) Klik pada perkataan 'E-Kimia'.
   (iv) Klik dua kali pada perkataan Elektrokimia- Tingkatan 4.
7. Program bermula dengan dendangan gamelan berserta dengan ucapan "Selamat Datang Ke Dunia Elektrokimia".
8. Ini diikuti oleh tayangan klip video bagi penerangan ringkas mengenai keseluruhan program ini.
9. Di ahkir tayangan ini, klik pada mana-mana bahagian skrin untuk meneruskan dengan program ini.
10. Dengan menggunakan papan kekunci, taipkan nama anda. Kemudian tekan ENTER.
11. Taipkan kelas anda. Tekan ENTER sekali lagi.

12. Soalan-soalan PRA-UJIAN disediakan untuk menguji fahaman pelajar mengenai konsep-konsep asas bagi memahami topik Elektrokimia. Pelajar digalakkan untuk mengulangkaji konsep-konsep berkenaan sebelum meneruskan dengan program ini.
13. Klik pada butang hijau Ke Hadapan, yang terdapat di sudut kanan skrin bawah untuk pergi ke Menu Utama.
14. Dalam Menu Utama, anda boleh pergi ke mana-mana bahagian yang disediakan; sama ada bahagian Pengenalan, bahagian Topik, bahagian Eksperimen, bahagian Latihan atau pun bahagian Ujian.
15. Beberapa jenis butang yang terdapat pada skrin akan membantu anda menjelajahi program ini.

    (i) Butang bulat berwarna hijau yang teletak di sudut kiri di bahgian bawah skrin adalah Butang Keluar. Butang ini sentiasa aktif untuk membolehkan anda keluar dari program ini pada bila-bila masa.

    (ii) Butang Menu Utama terletak bersebelahan dengan Butang Keluar.

    (iii) Butang bulat hijau di sudut kanan bahagian bawah skrin adalah Butang Ke Hadapan untuk meninjau skrin seterusnya.

    (iv) Butang ini menjadi tidak aktif sekiranya sesuatu bahagian teks telah tamat.

    (v) Butang Ke Belakang yang terletak bersebelahan dengan Butang Ke Hadapan adalah untuk mengulangi skrin sebelumnya.

    (vi) Sebuah lagi butang hijau yang terletak di sebelah kiri Butang Ke Belakang adalah butang sub-menu bagi bahagian-bahagian tertentu (Sila rujuk kepada Peta Konsep yang terdapat di sarung CD. Kotak-kotak yang bergaris putus menunjukkan bahawa terdapat sub-menu bagi bahagian-bahagian tersebut.

(vii) Butang biru tigasegi yang terdapat di sudut kanan skrin adalah untuk ke hadapan atau ke belakang dalam sub-sub-bahagian tertentu.

(viii) Semua perkataan yang bergaris mengandungi teks hyper. Anda perlu klik pada perkataan bergaris itu untuk mendalami istilah tersebut.

(ix) Untuk menonton animasi, anda perlu klik pada mana-mana bahagian skrin atau seperti yang diarahkan. Di akhir animasi, klik pada mana-mana bahagian skrin untuk meneruskan dengan program ini.

(x) Untuk menjawab soalan-soalan penilaian, anda parlu klik pada jawapan yang disediakan bagi soalan-soalan objektif. Bagi soalan-soalan jenis isikan tempat kosong, anda perlu klik dan tarik jawapan ke tempat kosong itu. Sekiranya jawapan itu tidak betul, jawapan itu akan terpantul keluar. Sekiranya jawapan itu betul, jawapan itu akan tinggal di tempat kosong tersebut.

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Ruj. Kami : KP(BPPDP) 13/15 Jld.49( )
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Tuan/Puan,

Kebenaran Untuk Menjalankan Kajian Di Sekolah-Sekolah, Maktab-Maktab Perguruan, Jabatan-Jabatan Pendidikan Dan Bahagian-Bahagian Di Bawah Kementerian Pendidikan Malaysia

---

Adalah saya dengan hormatnya diarah memaklumkan bahawa permohonan tuan/puan untuk menjalankan kajian bertajuk:

"The Development And Evaluation Of An Interactive Multimedia Courseware Programme In Electrochemistry"

telah diluluskan

2. Kelulusan ini adalah berdasarkan apa yang terkandung di dalam cadangan penyelidikan yang tuan/puan kemukakan ke Bahagian ini. Kebenaran bagi menggunakan sampel kajian perlu diperolehi daripada Ketua Bahagian/Pengarah Pendidikan negeri yang berkenaan. Sila kemukakan ke Bahagian ini senaskah laporan kajian tuan/puan setelah ia selesai kelak.

Sekian untuk makluman dan tindakan tuan/puan selanjutnya. Terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(DR. AMIR BIN MOHD SALLEH)
b.p. Pengarah,
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