Nama : .... Tingkatan : ……………...

No.Kad Pengenalan

Angka Giliran

Perak EXcellent

MOCK TEST 2   4541/1
KIMIA
Kertas 1
Julai
1 Jam 15 Minit

## JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini mengandungi* **50** *soalan.*

2. *Jawab* **semua** *soalan.*

3. *Tiap-tiap soalan diikuti oleh empat pilihan jawapan, iaitu* **A**, **B**, **C** *dan* **D**. *Bagi setiap soalan, pilih* **satu** *jawapan sahaja. Hitamkan jawapan anda pada kertas jawapan objektif yang disediakan.*

4. *Jika anda hendak menukar jawapan, padamkan tanda yang telah dibuat. Kemudian hitamkan jawapan yang baru.*

5. *Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*

6. *Anda dibenarkan menggunakan kalkulator saintifik.*

1.   Which of the following diagrams represents iron?
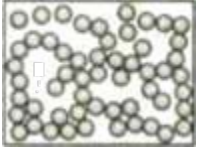   *Antara rajah berikut, yang manakah mewakili besi?*

A   C
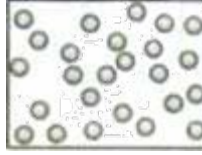
B   D

2.   Diagram 2 shows an atomic symbol for element X
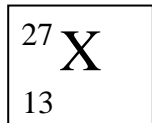   *Rajah 2 menunjukkan simbol atom unsur X*

$$^{27}_{13}X$$

Figure 2
Rajah 2

Nucleus of X atom contains
Nukleus atom X mengandungi

A   13 proton and 14 neutron
    13 proton dan 14 neutron

B   14 proton and 13 neutron
    14 proton dan 13 neutron

C   14 proton and 13 elektron
    14 proton dan 13 elektron

D   13 proton and 27 neutron
    13 proton dan 27 neutron

3. The relative molecular mass of a metal sulphate, XSO4 is 136.
    What is the relative atomic mass of metal X?
    [Relative atomic mass: O, 16; S, 32]

    Jisim molekul relatif bagi satu logam sulfat, XSO4 ialah 136.
    Berapakah jisim atom relatif bagi logam X?
    [Jisim atom relatif: O, 16; S, 32]

A	23	C	40
B	32	D	64

4. Which of the following statements describe an inert gas?
    Antara pernyataan berikut, yang manakah menghuraikan suatu gas adi?

    A   It exists as a diatomic gas.
        Ia wujud sebagai gas dwiatom.

    B   It can only form bonds with one another.
        Ia hanya boleh membentuk ikatan sesama sendiri.

    C   It can shares their electrons.
        Ia boleh berkongsi elektron.

    D   Its outermost shell is achived stable duplet or octet electron arrangement.
        Petala luarnya telah mencapai susunan elektron duplet atau oktet yang stabil.

5. Table 5 shows the proton number of atoms P, Q, R and S.
   Jadual 5 menunjukkan nombor proton bagi atom P, Q, R dan S.

Atom / Atom	P	Q	R	S
Proton number/Nombor proton	11	8	6	3

Table 5 / *Jadual 5*

Which pair of atoms forms a compound that cannot conduct electricity in any state?
Pasangan atom yang manakah membentuk satu sebatian yang tidak boleh mengkonduksi elektrik dalam semua keadaan?

A   P and S
    P dan S

B   Q and R
    Q and R

C   P and Q
    P dan Q

D   Q and S
    Q dan S

6. Which of the following is an electrolyte?
   Antara berikut yang manakah elektrolit?

A   Naphthalene
    Naftalena

B   Aluminium
    Aluminium

C   Glucose solution
    Larutan glukosa

D   Molten Lead(II) bromide
    Plumbum(II) bromida leburan

7. Which of the following substances is acidic when dissolved in water?
   Yang mana antara berikut adalah bersifat asid apabila dilarutkan di dalam air?

   A   Sodium oxide
        Natrium oksida

   B   Pottasium hydroxide
        Kalium hidroksida

   C   Sodium carbonate
        Natrium karbonat

   D   Sulphur dioxide
        Sulfur dioksida

8. Which of the following salts is soluble in water?
   Antara garam yang berikut yang manakah larut dalam air?

   A   Silver chloride
        Argentum klorida

   B   Potassium carbonate
        Kalium karbonat

   C   Lead (II) chloride
        Plumbum (II) klorida

   D   Copper(II) carbonate
        Kuprum(II) karbonat

9. Diagram 9 shows the object made of composite material Z.
Rajah 9 menunjukkan objek diperbuat daripada bahan komposit Z.

Diagram 9
Rajah 9

What is material Z?
Apakah itu bahan Z?

A Fibre glass
Kaca optik

B Optic glass
Kaca konduktor

C Lead-fused glass
Kaca plumbum-terlakur

D Photochromic glass
Kaca fotokromik

10. Which of the followings is the purpose of alloying
Antara berikut yang manakah adalah tujuan pengaloian

A To improve the melleability
Untuk meningkatkan kebolehtempaan

B To increase the elasticity
Meningkatkan kekenyalan

C To increase the hardness and strength
Untuk menambah kekerasan dan kekuatan

D To enhance the resistance to heat and chemical.
Untuk meningkatkan ketahanan terhadap haba dan bahan kimia

11. Which of the following processes has the highest rate of reaction?
Antara proses yang berikut, yang manakah mempunyai kadar tindak balas yang paling tinggi?

    A Digestion of food
      Pencernaan makanan

    B Double decomposition
      Penguraian ganda dua

    C Rusting of iron
      Pengaratan besi

    D Esterification
      Pengesteran

12. What are the products formed from the combustion of ethene in air?
Apakah hasil yang terbentuk daripada pembakaran etena dalam udara?

    A Ethane and water
      Etana dan air

    B Carbon and hydrogen
      Karbon dan hidrogen

    C Carbon dioxide and water
      Karbon dioksida dan air

    D Carbon dioxide and hydrogen
      Karbon dioksida dan hidrogen

13. The half-equation of a reaction is shown as below.
Setengah persamaan bagi suatu tindak balas ditunjukkan seperti di bawah.

$$Ca \rightarrow Ca^{2+} + 2e$$

What is meant by oxidation reaction based on the equation?
Apakah maksud tindak balas pengoksidaan berdasarkan pada persamaan tersebut?

A Calcium atoms received electrons
Atom kalsium menerima elektron

B Calcium atoms donated electrons
Atom kalsium menderma elektron

C Calcium ions received electrons
Ion kalsium menerima elektron

D Calcium ions donated electrons
Ion kalsium menderma elektron

14. A student dissolved a chemical substance in water. It is found that the container becomes cold. Which of the following is the chemical substance?

Seorang pelajar melarutkan suatu bahan kimia dalam air. Didapati bahawa bekas tersebut menjadi sejuk.
Antara yang berikut, yang manakah ialah bahan kimia itu?

A Ammonium nitrate
Ammonium nitrat

B Sodium hydroxide
Natrium hidroksida

C Sodium sulphate
Natrium sulfat

D Hydrochloric acid
Asid hidroklorik

15. Which of the following chemicals produces soap when boiled with animal fats?
Antara bahan kimia berikut, yang manakah menghasilkan sabun apabila dididihkan dengan lemak haiwan.

    A Concentrated sulphuric acid
       Asid sulfurik pekat

    B Potassium hydroxide solution
       Larutan kalium hidroksida

    C Potassium manganate (VII) solution
       Larutan kalium manganat(VII)

    D Hydrogen peroxide solution
       Larutan hidrogen peroksida

16. Substance A is an analgesic medicine. Which of the following is the function of substance A?
Bahan A ialah ubat analgesik. Antara yang berikut, yang manakah ialah fungsi bahan A?

    A To relieve pain
       Untuk melegakan kesakitan

    B To kill or prevent the growth of bacteria
       Untuk membunuh atau menghalang pertumbuhan bakteria

    C To change the emotions and behaviour of a patient
       Untuk mengubah emosi dan kelakuan seseorang pesakit

    D To provide a patient with synthetic hormones
       Untuk membekalkan seseorang pesakit dengan hormon sintetik

17. Elements P and S are in Group 17 of the Periodic Table. P is a liquid while S is a solid at room temperature.
Which of the following properties is true about these halogens?

Unsur-unsur P dan S berada dalam Kumpulan 17 Jadual Berkala. P ialah cecair manakala S ialah pepejal pada suhu bilik.
Antara sifat berikut, yang manakah benar tentang halogen ini?

A P has a higher density than S.
   P mempunyai ketumpatan yang lebih tinggi daripada S.

B P is more reactive than S.
   P adalah lebih reaktif daripada S.

C P has a higher melting point and boiling point than S.
   P mempunyai takat lebur dan takat didih yang lebih tinggi daripada S.

D Both P and S do not react with sodium hydroxide.
   Kedua-dua P dan S tidak bertindak balas dengan natrium hidroksida.

18. A concentrated sodium chloride solution is electrolysed using carbon electrodes. Which are the half equations that represent the reactions at the anode and the cathode?

Larutan natrium klorida pekat dielektrolisis menggunakan elektrod karbon. Setengah persamaan manakah yang mewakili tindak balas di anod dan di katod?

Anode/*Anod*	Cathode/*Katod*
A $2Cl^- \longrightarrow Cl_2 + 2\bar{e}$	$Na^+ + \bar{e} \longrightarrow Na$
B $2Cl^- \longrightarrow Cl_2 + 2\bar{e}$	$2H^+ + 2\bar{e} \longrightarrow H_2$
C $4OH^- \longrightarrow O_2 + 2H_2O + 4\bar{e}$	$Na^+ + \bar{e} \longrightarrow Na$
D $4OH^- \longrightarrow O_2 + 2H_2O + 4\bar{e}$	$2H^+ + 2\bar{e} \longrightarrow H_2$

19. The following equation shows the decomposition reaction of copper(II) carbonate when heated at room temperature and pressure.

Persamaan berikut menunjukkan tindak balas penguraian kuprum (II) karbonat apabila dipanaskan pada suhu dan tekanan bilik.

$CuCO_3 \longrightarrow CuO + CO_2$

Which of the following is not true when 1 mol of copper(II) carbonate is decomposed?
[Relative atomic mass: C = 12, O = 16, Cu = 64 and 1 mol of gas occupies the volume of 24dm³ at room temperature and pressure.]

Antara yang berikut yang manakah tidak benar apabila 1 mol kuprum(II) karbonat terurai?
[Jisim atom relatif: C = 12, O = 16, Cu = 64 dan 1 mol gas menempati isipadu sebanyak 24dm³ pada suhu dan tekanan bilik]

A 1 mol of copper(II) oxide is formed
   1mol kuprum(II) oksida terbentuk

B 1 molecule of carbon dioxide gas is given off
   1 molekul gas karbon dioksida terbebas

C 80g of copper(II) oxide is formed
   80g kuprum(II) oksida terbentuk

D 24 dm³ of carbon dioxide gas is given off
   24 dm³ gas karbon dioksida terbebas

20. Which of the following statements regarding the collision theory is true when the temperature of reaction is increased?
    Manakah antara penyataan berkaitan teori perlanggaran berikut adalah benar apabila suhu tindak balas dinaikkan?

    I   The kinetic energy of the reactant particles increases.
         Tenaga kinetik zarah- zarah bahan tindak balas bertambah.

    II   The total surface area of the reactant particles increases.
         Jumlah luas permukaan zarah-zarah bahan tindak balas bertambah.

    III The frequency of effective collisions between the reactant particles increases.
         Frekuensi perlanggaran berkesan antara zarah- zarah bahan tindak balas bertambah.

    IV   The activation energy of the reaction is lowered.
         Tenaga pengaktifan tindak balas direndahkan

    A   I and II
         I dan II

    B   I and III
         I dan III

    C   I and IV
         I dan IV

    D   I, II and IV
         I, II dan IV

21. Diagram 21 shows a graph of temperature against time of heating of solid   naphthalene
   Rajah 21 menunjukkan graf suhu melawan masa bagi pemanasan pepejal naftalena

   Diagram 21
   Rajah 21

   Which of the following is true about naphthalene at the t minute?
   Antara pernyataan berikut, yang manakah benar mengenai naftalena pada minit ke-t?

   A Naphthalene molecules are in solid state
      Molekul naftalena berada dalam keadaan pepejal

   B Naphthalene molecules move freely and far apart
      Molekul naftalena bergerak bebas dan berjauhan

   C Naphthalene molecules are arranged closely in orderly manner
      Molekul naftalena tersusun rapat dalam tertib yang teratur

   D Naphthalene molecules move freely but still arranged closely
      Molekul naftalena bergerak bebas tetapi masih tersusun rapat

22. How many times does one atom of sulphur heavier than one atom of helium?
   [Relative atomic mass: He, 4; S, 32]
   Berapa kalikah satu atom sulfur lebih berat daripada satu atom helium?
   [Jisim atom relatif: He, 4; S, 32]

   A $\dfrac{1}{8}$ C 4

   B $\dfrac{1}{4}$ D 8

23. Sodium and potassium are elements of the same group. Potassium is placed below sodium. When a small piece of sodium and potassium of the same size are put into different containers containing distilled water, it was found that potassium spins more vigorously. Which of the following statements shows that potassium is more reactive than sodium? [Proton number : Na = 11 ; K = 19]

Natrium dan kalium merupakan unsur-unsur dari kumpulan yang sama. Kalium diletakkan di bawah natrium. Apabila seketul kecil natrium dan kalium yang sama saiz diletakkan di dalam bekas berlainan yang berisi air suling didapati kalium bergerak lebih cergas. Penyataan yang manakah menunjukkan kalium lebih reaktif berbanding natrium? [Nombor proton : Na = 11 ; K = 19]

A Sodium atom is more easily to donate electron because of its smaller size
  Atom natrium lebih mudah mendermakan elektron kerana saiz atomnya lebih kecil

B Potassium atom is more easily to receive electron because of its bigger atomic size
  Atom kalium lebih mudah menerima elektron kerana saiz atomnya lebih besar

C Sodium atom is more easily to receive electron because its nucleus attraction is stronger
  Atom natrium lebih mudah menerima elektron kerana tarikan nukleusnya lebih kuat

D Potassium atom is more easily to release electron because its nucleus attraction is weaker
  Atom kalium lebih mudah melepaskan elektron kerana tarikan nukleusnya lebih lemah

24. Diagram 24 below shows the electrons arrangement of a covalent compound formed between atom P and atom Q.
Rajah 24 di bawah menunjukkan susunan elektron bagi sebatian kovalen yang terbentuk di antara atom P dan Q
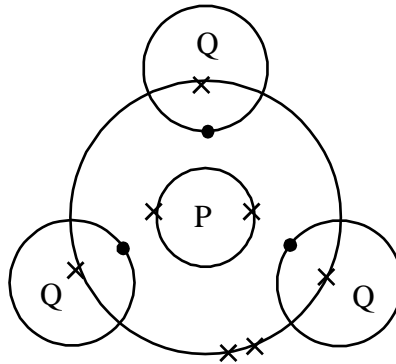

Diagram 24
Rajah 24

Which of the following statements is true about the compound ?
Antara penyataan berikut, yang manakah benar mengenai sebatian itu ?

A Has low boiling point
   Mempunyai takat didih yang rendah

B The compound is formed by electron transfer
   Sebatian itu terbentuk melalui pemindahan elektron

C Conducts electricity in the liquid state
   Mengalirkan elektrik dalam keadaan cecair

D The chemical bond formed is ionic bond
   Ikatan kimia yang terbentuk adalah ikatan ionik

25. Table 25 shows information about three simple voltaic cells.
Jadual 25 menunjukkan maklumat tentang tiga sel voltan ringkas.

Pair of metals *Pasangan logam*	Potential difference(V) *Beza keupayaan(V)*	Positive terminal *Terminal positif*
W and X	0.7	X
X and Y	2.0	Y
W and Z	1.6	Z

Table 25
Table 25

What is the potential difference of a voltaic cell which uses Y and Z as electrodes?
Berapakah beza keupayaan sel voltan yang menggunakan Y dan Z sebagai elektrod?

A   0.4V   C   1.1V

B   0.9V   D   1.3V

26. Table 26 shows the pH values of four solutions which have the same concentrations.
Jadual 1 menunjukkan nilai pH bagi empat larutan yang mempunyai kepekatan yang sama.

Solution Larutan	pH value Nilai pH
P	1.0
Q	5.0
R	9.0
S	13.0

Table 26
Jadual 26

Which solution is alkaline and has a higher degree of dissociation?
Larutan yang manakah adalah bersifat alkali dan mempunyai darjah penceraian yang lebih tinggi?

A   P
B   Q
C   R
D   S

27. Diagram 27 shows the set up of the apparatus of an experiment.
   Rajah 27 menunjukkan susunan radas bagi satu eksperimen.

Lead(II) iodide
Plumbum(II) *iodida*

Lead(II) nitrate solution
Larutan plumbum(II) *nitrat*

Filter/*Turas*

Potassium iodide solution
Larutan kalium iodida
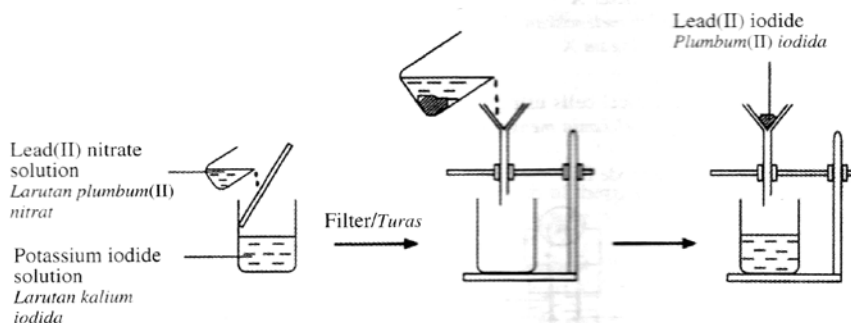
Diagram 27
Diagram 27

What is the process shown in Diagram 1?
Apakah proses yang ditunjukkan dalam Rajah 1?

A Preparation of insoluble salt.
   Penyediaan garam tak terlarutkan

B Purification of insoluble salt.
   Penulenan garam tak terlarutkan

C Preparation of soluble salt
   Penyediaan garam terlarutkan

D Purification of soluble salt
   Penulenan garam terlarutkan

28. Ali wants to increase the rate of dissolving of 1 g of zinc in dilute sulphuric acid. Which of the following steps is not suitable?
   Ali ingin meningkatkan kadar pelarutan 1 g zink dalam asid sulfurik cair.
   Antara langkah yang berikut, yang manakah tidak sesuai digunakan?

A Using zinc powder instead of zinc granules
   Lebih baik gunakan serbuk zink daripada butiran zink

B Adding some copper(II) sulphate solution to the acid
   Tambahkan sedikit larutan kuprum(ll) sulfat kepada asid

C Reacting the zinc and acid at a higher temperature
   Tindak balaskan zink dengan asid pada suhu yang lebih tinggi

D Adding more distilled water to the acid
   Tambahkan lebih air suling kepada asid tersebut

29. Aspirin is a medicine for headache but it may lead to stomach pain. Why?
    Aspirin adalah sejenis ubat bagi sakit kepala tetapi boleh menyebabkan sakit perut. Mengapa?

    I   Aspirin contains an acid.
         Aspirin mengandungi asid.

    II   Aspirin is able to react with the gastric juice to form an acid.
         Aspirin boleh bertindak balas dengan jus gastrik untuk mebentuk asid.

    III Aspirin can react with food to form a poisonous substance.
         Aspirin boleh bertindak balas dengan makanan dan menghasilkan bahan beracun.

    IV   Aspirin contains a poisonous substance.
         Aspirin mengandungi bahan beracun.

    A   I only
         I sahaja

    B   II and III
         II dan III

    C   I, II and IV
         I, III dan IV

    D   I, III and IV
         I, III dan IV

30. Which of the following statement is true about one mole of oxygen gas and one mole of ethane gas?
Antara pernyataan yang berikut, manakah benar tentang satu mol gas oksigen dan satu mol gas etana?

    I   They have same volume at room temperature.
          Mempunyai isipadu yang sama pada suhu bilik.

    II   They have same number of atoms.
          Mempunyai bilangan atom yang sama.

    III   They are alcohol.
          Merupakan alkohol.

    1V   They have same relative atomic mass.
          Mempunyai jisim atom relatif yang sama.

    A   I only
         I sahaja

    B   I and II only
         I dan II sahaja

    C   I, II and III only
         I, II dan III sahaja

    D   II, III and IV only
         II, III dan IV sahaja

31. Diagram 31 below shows the structure of water molecule.
    Rajah 31di bawah menunjukkan struktur bagi molekul air.
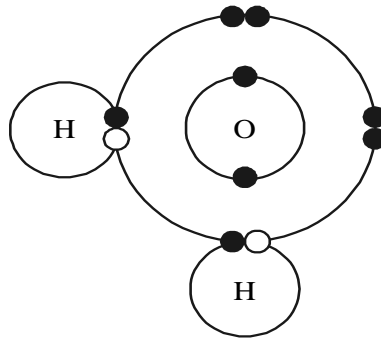
Which of the following is correct about the molecule ?
Manakah antara yang berikut adalah salah tentang molekul tersebut ?

I   Each hydrogen atom contribute one valence electron.
    Tiap atom hidrogen menyumbang satu elektron valens.

II   An oxygen atom share two electrons with two hydrogen atoms.
    Satu atom oksigen berkongsi dua elektron dengan dua atom hidrogen.

III One single covalent bond is formed in the molecule.
    Satu ikatan kovalen tunggal terbentuk dalam molekul.

IV Hydrogen atoms and oxygen atom achieved a stable octet electron arrangement.
    Atom-atom hidrogen dan oksigen mencapai susunan elektron oktet yang stabil.

A   I, II and IV
    I, II dan IV

B   I, III and IV
    I, III dan IV

C   II, III and IV
    II, III dan IV

D   I, II, III and IV
    I, II, III dan IV

32. Diagram 32 shows the apparatus set up for an experiment to determine the rate of reaction between sodium thiosulphate solution and sulphuric acid.

Rajah 32 menunjukkan susunan radas bagi eksperimen untuk menentukan kadar tindak balas antara larutan natrium tiosulfat dan asid sulfurik.

Sodium thiosulphate solution + sulphuric acid
Larutan natrium tiosulfat   + asid sulfurik

White paper
Kertas putih

Cross mark
Tanda pangkah
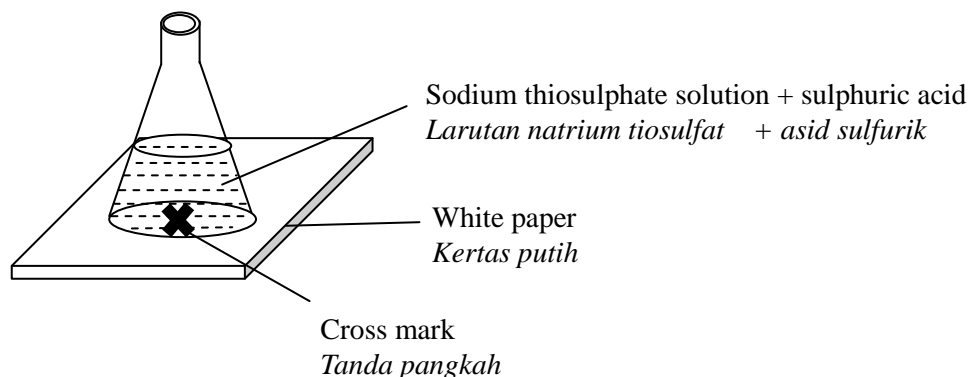
Diagram 32
Rajah 32

Which of following techniques is the most suitable to determine the rate of reaction?
Antara teknik berikut, yang manakah paling sesuai untuk menentukan kadar balas itu?

A Record the time as soon as precipitate is formed
   Mencatat masa sebaik sahaja mendakan mula terbentuk

B Record the time taken to obtain the maximum temperature
   Mencatat masa untuk mendapatkan suhu maksimum

C Record the time as soon as the cross mark cannot be seen
   Mencatat masa sebaik sahaja tanda pangkah tidak kelihatan

D Record the time taken for the change the pressure
   Mencatat masa bagi perubahan tekanan

33. Diagram 33 shows the structural formula of an ester.
    Rajah 33 menunjukkan formula struktur suatu ester.

$$H-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-\overset{\overset{\displaystyle O}{\|}}{C}-O-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-H$$
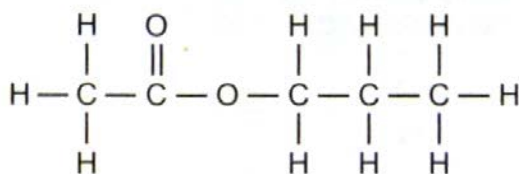
Diagram 33
Rajah 33

The ester can be prepared from the reaction between
Ester ini dapat disediakan daripada tindak balas antara

A   ethanol and ethanoic acid
    etanol dengan asid etanoik

B   ethanol and propanoic acid
    etanol dengan asid propanoik

C   propanol and ethanoic acid
    propanol dengan asid etanoik

D   propanol and propanoic acid
    propanol dengan asid propanoik

34. Diagram 34 shows an energy level diagram for the displacement reaction
Rajah 34 menunjukkan gambar rajah aras tenaga bagi satu tindak balas penyesaran.
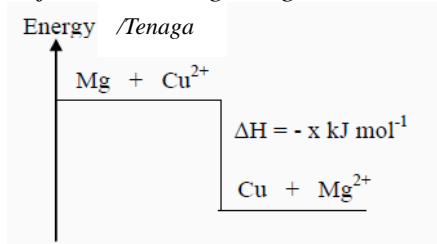
Diagram 34
Rajah 34

Which statement can be deduced from Diagram 34?
Pernyataan manakah yang boleh dideduksikan daripada Rajah 34?

A The heat of displacement is - x kJ mol^{-1}
Haba penyesaran ialah - x kJ mol^{-1}

B x kJ of energy is absorbed for the reaction.
x kJ tenaga diserap untuk tindak balas ini.

C Energy content of products is higher than energy content of reactants
Kandungan hasil tindak balas lebih tinggi daripada kandungan bahan tindak balas.

D The temperature at the end of the reaction is lower than that at the beginning of the reaction.
Suhu akhir tindak balas lebih rendah berbanding dengan suhu awal tindak balas

35. Metal W is located between iron and copper in the reactivity series of metal.
The letters used is not the actual symbol of the elements

Logam W berada di antara ferum dan kuprum dalam siri kereaktifan logam.
Huruf yang digunakan bukan simbol sebenar unsur itu

Which of the following metal oxides can be reduced by metal W.
Antara oksida logam berikut, yang manakah boleh diturunkan oleh logam W.

A Zink oxide
Zink oksida

B Copper(II) oxide
Kuprum(II) oksida

C Magnesium oksida
Magnesium oksida

D Iron(III) oxide
Ferum(III) oksida

36. The electron arrangement of P atom is 2.8.6 and Q atom proton number of Q atom is 6. What is the formula of the compound formed between P and Q?

    Susunan elektron bagi atom P adalah 2.8.6 dan nombor proton bagi atom Q adalah 6. Apakah formula kimia yang akan terbentuk di antara P dan Q ?

    A QP_2
    B Q_2P
    C Q_4P_2
    D Q_2P_4

37.

$$PCO_3 (s) \longrightarrow PO (s) + CO_2 (g)$$
$$PCO_3 (s) \longrightarrow PO (s) + CO_2 (g)$$
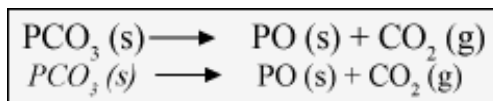
The equation above shows the decomposition of carbonate P when it is heated.
Calculate the mass of carbonate of metal P which is used to produce 336cm^3 of carbon dioxide gas [Relative atomic mass: C, 12; O, 16; P, 64; molar volume: 22.4 dm^3 mol^{-1} at s.t.p.]

Persamaan di atas menunjukkan penguraian karbonat P apabila dipanaskan. Hitungkan jisim karbonat bagi logam P yang digunakan untuk menghasilkan 336cm^3 gas karbon dioksida pada s.t.p.
[Jisim atom relatif: C, 12; O, 16; P, 64; isipadu molar: 22.4 dm^3 mol^{-1} pada s.t.p.]

A 0.02g   C   4.82g

B 1.86g   D   6.22g

38.   Gas X has the following properties.

Colourless
Dissolved in water
Changes blue litmus paper to red and then turn to white
Gas X is

Gas X mempunyai ciri-ciri berikut:

Tanpa warna
Larut dalam air
Mengubah warna kertas litmus biru kepada merah dan seterusnya kepada tidak berwarna
Gas X ialah

A   ammonia
     ammonia

B   Chlorine
     Klorin

C   Carbon dioxide
     Karbon dioksida

D   Hydrogen chloride
     Hydrogen klorida

39. Table 39 shows the volume of gas released at interval time of 30 seconds in an experiment to determined the rate of reaction between zinc and hydrochloric acid.

Jadual 39 menunjukkan isipadu gas yang terbebas pada sela masa 30 saat dalam satu eksperimen untuk menentukan kadar tindak balas di antara zink dan asid hidroklorik.

Time / s Masa / s	0	30	60	90	120	150
Volume of gas / cm^3 Isipadu gas / cm^3	0.0	8.5	15.0	19.0	22.0	25.0

Table 39
Jadual 39

What is the average rate of reaction in the second minute?
Apakah kadar tindak balas purata dalam minit kedua?

A $0.18cm^3s^{-1}$

B $0.12cm^3s^{-1}$

C $0.42cm^3s^{-1}$

D $0.25cm^3s^{-1}$

40. The information below shows the properties of compound W
    Maklumat berikut menunjukkan ciri-ciri bagi sebatian W

> Reacts with alkali to produce salts and water
> *Bertindak balas dengan alkali menghasilkan garam dan air*
>
> React with ethanol to produce sweet smell
> *Bertindak balas dengan etanol menghasilkan sebatian yang berbau harum*

Which of the following is the homologous series for compound W?
Antara berikut yang manakah siri homolog bagi sebatian W?

A Carboxylic acid
  Asid karboksilik

B Alcohol
  Alkohol

C Alkene
  Alkena

D Ester
  Ester

41. What is the oxidation number of sulphur in $K_2S_2O_8$?
    Apakah nombor pengoksidaan sulfur dalam $K_2S_2O_8$?

A -2

B 0

C +7

D +8

42.	Table 42 shows the melting and boiling points of substances P, Q, R and S.
	Jadual 42 menunjukkan takat lebur dan takat didih bagi bahan P, Q, R dan S.

Substance Bahan	Melting point/ °C Takat lebur / °C	Boiling point/ °C Takat didih / °C
P	20	88
Q	50	112
R	–38	56
S	–65	90

Table 42
Jadual 42

Which of the substances exists as a solid at room temperature?
Bahan yang manakah wujud sebagai pepejal pada suhu bilik?

A	P

B	Q

C	R

D	S

43.	0.14 mole of an unknown gas X2 has a mass of 1.4 g. Calculate the relative atomic mass of X?

	0.14 mol gas X2 mempunyai jisim 1.4 g. Kira jisim atom relatif bagi X?

A	2.5	C	10

B	5.0	D	15

44 Diagram shows the apparatus set-up to purify silver.
    Rajah menunjukkan susunan radas untuk menulenkan argentum

Diagram 44
Rajah 44
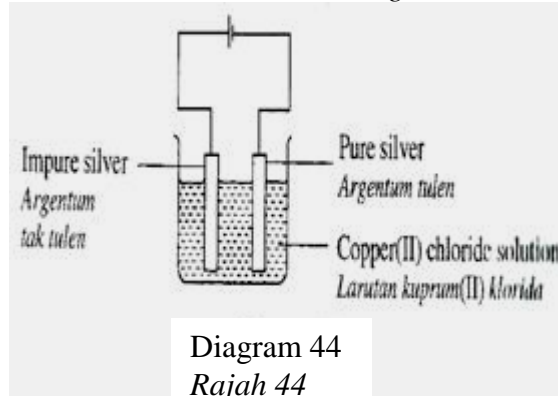
After an hour, it is found that the silver is not purified. What should be done to ensure purification takes place?

Selepas satu jam, didapati argentum tidak ditulenkan.Apakah yang perlu dilakukan untuk memastikan penulenan berlaku?

A Use a bigger pure silver
   Menggunakan argentum tulen yang lebih besar

B Interchange the terminals in the cells
   Saling tukar terminal pada sel

C Increase the concentration of copper(II) chloride solution.
   Tambah kepekatan larutan kuprum(II) klorida

D Use a silver nitrate solution as the electrolyte
   Gunakan larutan argentum nitrat sebagai elektrolit.

45. Diagram 45 shows a test tube containing glacial ethanoic acid and blue litmus paper. It was found that there was no change on the litmus paper. What should be done to cause the blue litmus paper turns red?

Rajah 45 menunjukkan sebuah tabung uji yang mengandungi asid etanoik glasial dan kertas litmus biru. Didapati tiada perubahan yang berlaku terhadap kertas litmus tersebut. Apakah yang perlu dilakukan untuk mengubah warna kertas litmus biru kepada merah?

Glacial ethanoic acid
Asid etanoik glasial

Blue litmus paper
Kertas litmus biru
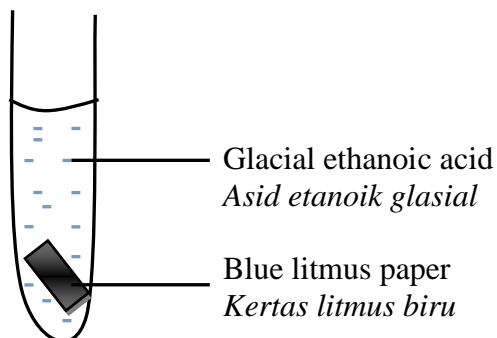
Diagram 45
Rajah 45

A   Add tetrachlorometane into the glacial ethanoic acid
    Menambah tetraklorometana ke dalam asid etanoik glasial

B   Add water into the glacial ethanoic acid
    Menambah air ke dalam asid etanoik glasial

C   Add sodium hydroxide pellets into the glacial ethanoic acid
    Menambah ketulan natrium hidroksida ke dalam asid etanoik glasial

D   Substitute the glacial ethanoic acid with glacial methanoic acid
    Menggantikan asid etanoik glasial dengan asid metanoik glasial

46. Figure 46 shows the set up of apparatus to prepare a lead(II) salt using the precipitation reaction.
Rajah 46 menunjukkan susunan gambarajah bagi menyediakan garam plumbum (II) menggunakan tindakbalas pemendakan.
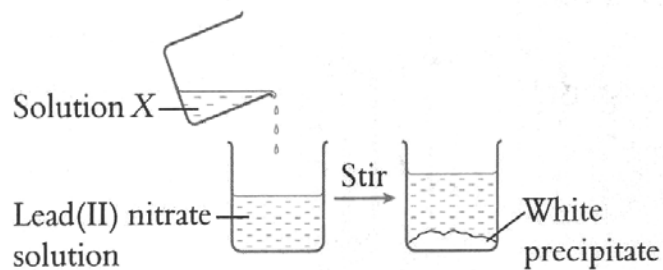
Diagram 46
Rajah 46

Solution X is
Larutan X ialah

I   Hydrochloric acid
      Asid hidroklorik

II   Ammonium sulphate
      Ammonium sulfat

III   Sodium carbonate
      Natrium karbonat

IV   Potassium iodide
      Kalium iodida

A   I, IV

B   II, III

C   I, II, III

D   I, II, III, IV

47. The following information shows the effect of a particular factor on the rate of reaction.

    Maklumat berikut menunjukkan kesan suatu faktor yang mempengaruhi kadar tindak balas.

    > Particles have higher kinetic energy
    > *Zarah mempunyai tenaga kinetik yang lebih tinggi*
    >
    > Frequency of collision between particles increases
    > *Frekuensi pelanggaran antara zarah bertambah*
    >
    > Frequency of effective collision increases
    > *Frekuensi pelanggaran berkesan bertambah*

    Which of the following can cause the above effect?
    Manakah antara berikut akan memberikan kesan di atas?

    A Adding a catalyst.
       Menambah mangkin

    B Increasing temperature of reactants
       Menaikkan suhu bahan tindak balas

    C Increasing the concentration of reactants.
       Menambah kepekatan bahan tindak balas

    D Increasing total surface area of reactants.
       Menambah jumlah luas permukaan bahan tindak balas

48. W, X, Y and Z are four metals. Consider the reactions below involving these metals:
     W ,X, Y dan Z terdiri dari empat logam. Pertimbangkan tindak balas yang melibatkan logam-logam tersebut   di dibawah :

     Z sulphate   +   X $\longrightarrow$ Z   +   X sulphate

     Z sulphate   +   W $\longrightarrow$ No reaction / *tiada perubahan*

     Y sulphate   +   W $\longrightarrow$ Y   +   W sulphate

     Arrange the metals W, X, Y and Z in decreasing order of reactivity.
     Susun kereaktifan logam-logam W,X, Y dan Z mengikut tertib menurun.

     A   X, W, Z, Y

     B   Y, W, Z, X

     C   X, Z, W, Y

     D   Y, Z, W, X

49. Carbon burns in oxygen in a reaction as shown in the equation below.
     Karbon terbakar dalam oksigen seperti ditunjukkan dalam persamaan dibawah
             $C(s) + O_2(g) \longrightarrow CO_2(g)$ ΔH =-394 kJ mol-1
     What is the mass of carbon that must be burnt completely to produce 78.8 kJ of heat?
     [Relative atomic mass: C,12]
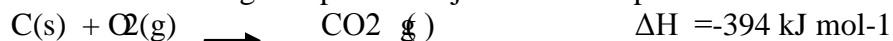
     Berapakah jisim karbon yang mesti terbakar untuk menghasilkan 78.8 kJ haba?
     [Jisim atom relatif: C,12]

     A 0.2g

     B 1.2g

     C 2.4g

     D 6.0g

50. In an experiment, 2g of magnesium powder is added to 50 cm3 of 0.2 mol dm-3 zinc sulphate solution. The temperature of the mixture increases by 12°C. What is the heat of displacement in the experiment?
[Specific heat capacity of a solution = 4.2 Jg– 1 °C – 1; Relative atomic mass of Mg = 24]

Dalam satu eksperimen, 2g serbuk magnesium ditambahkan kepada of 0.2 mol dm – 3 larutan zink sulfat.   Suhu campuran meningkat sebanyak 12 °C.   Berapakah haba penyesaran dalam eksperimen ini?
[Muatan haba tentu larutan = 4.2 Jg– 1 °C – 1, Jisim atom relatif Mg = 24]

A – 50. 4 kJ mol-1

B – 100   kJ mol-1

C – 252   kJ mol-1

D – 340 kJ mol-1

Nama : .... Tingkatan : …………....

No.Kad Pengenalan

Angka Giliran

PerakEXcellent

MOCK TEST 2 4541/2
KIMIA
Kertas 2
Julai
2 Jam 30 Minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tulis* **nombor kad pengenalan** *dan* **angka giliran** *anda pada petak yang disediakan.*

2. *Kertas soalan ini mengandungi* **tiga bahagian :** *Bahagian A, Bahagian B dan Bahagian C.*

3. *Jawab* **semua** *soalan dalam* **Bahagian A**. *Tuliskan jawapan anda di ruang yang disediakan bagi setiap soalan.*

4. *Jawab* **satu** *soalan daripada* **Bahagian B** *dan* **satu** *soalan daripada* **Bahagian C**. *Tuliskan jawapan bagi* **Bahagian B** *dan* **Bahagian C** *pada kertas tulis yang dibekalkan oleh pengawas peperiksaan.*

5. *Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.*

6. *Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogramkan.*

7. *Rajah yang mengiringi soalan tidak dilukiskan mengikut skala kecuali dinyatakan.*

8. *Calon adalah dilarang membawa masuk nota dan cuba meniru daripada calon lain semasa peperiksaan.*

Bahagian	Soalan	Markah Penuh	Markah diperoleh
		Untuk Kegunaan Pemeriksa	
A	**1**	9	
	2	9	
	3	10	
	4	10	
	5	11	
	6	11	
B	**7**	20	
	8	20	
C	**9**	20	
	10	20	
		Jumlah	

Section A
Bahagian A
[60 marks]
[60 markah]
Answer **all** questions in this section
Jawab **semua** soalan dalam bahagian ini

1   Table 1 shows the diagram of electron arrangement of carbon atom, oxygen atom and sodium atom.

Jadual 1 menunjukkan gambar rajah susunan elektron bagi atom karbon, atom oksigen dan atom natrium.
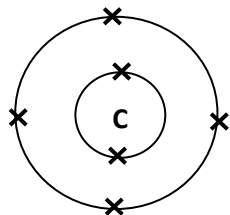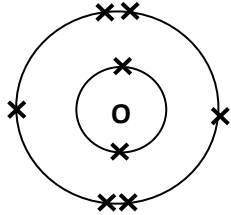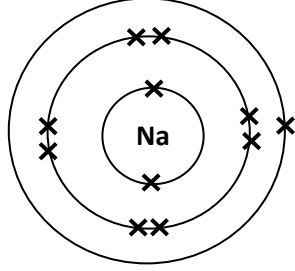

| Carbon atom | Oxygen atom | Sodium atom |
| *Atom karbon* | *Atom oksigen* | *Atom natrium* |

Table 1
Jadual 1

(a)   Write the electron arrangement for carbon atom.
Tuliskan susunan elektron bagi atom karbon.

……………………………………………………………………………
[1 *mark*]

(b)   Carbon atom combines with oxygen atom to form a compound.
Atom karbon bergabung dengan atom oksigen untuk membentuk suatu sebatian

(i)   What is the type of the compound formed?
Apakah jenis sebatian yang terbentuk?

……………………………………………………………………………
[1 *mark*]

(ii)   State one physical property of the compound.
Nyatakan satu sifat fizik bagi sebatian tersebut.

……………………………………………………………………………....
[1 *mark*]

(c) Oxygen atom combines with sodium atom to form another compound.
Atom oksigen bergabung dengan atom natrium membentuk satu lagi sebatian.

    (i)   Write the chemical equation for the reaction between oxygen and sodium.
Tuliskan persamaan kimia bagi tindak balas antara oksigen dan natrium.

…………………………………………………………………………………
[1 *mark*]

    (ii)   State one physical property of the compound.
Nyatakan satu sifat fizik bagi sebatian tersebut.

…………………………………………………………………………………
[2 *marks*]

    (iii)   State the position of oxygen in the Periodic Table of Element.
Nyatakan kedudukan oksigen dalam Jadual Berkala Unsur.

…………………………………………………………………………………
[1 *marks*]

(d)   (i)   Which element exists as a diatomic molecules
Unsur yang manakah wujud dalam keadaan molekul dwiatom?

…………………………………………………………………………………..
[1 *marks*]

    (ii)   Carbon and oxygen are located in the same Period in the Periodic Table of Element. State the chang in the atomic size when go across the Period from left to right.
Karbon dan oksigen berada pada kala yang sama dalam Jadual Berkala Unsur. Nyatakan perubahan saiz apabila merentasi kala dari kiri ke kanan.

…………………………………………………………………………….
[1 *marks*]

2   Diagram 2 shows three industrial processes involved in manufacturing ammonium sulphate.
Rajah 2 menunjukkan tiga proses industri dalam penghasilan ammonium sulfat.
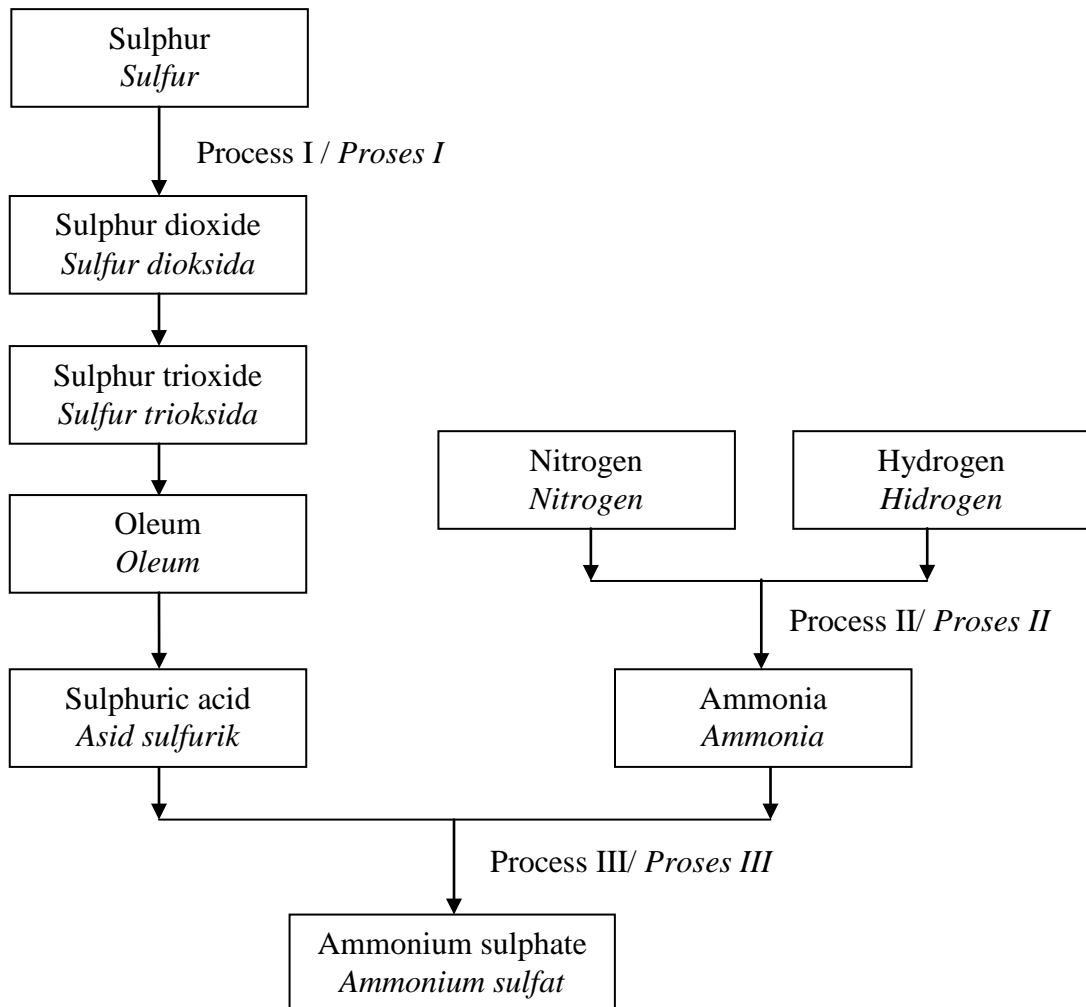
Diagram 2
Rajah 2

From the flow chart shown in Diagram 2, answer the following questions.
Daripada carta alir pada Rajah 2, jawab soalan-soalan berikut.

(a)   For Process I,
      Bagi proses I,

      (i)   Name the industrial proces of producing sulphuric acid.
            Namakan proses industri untuk menghasilkan asid sulfurik.

            ……………………………………………………………………………
                                                                    [1 mark]

(ii) State how to produce sulphur dioxide from sulphur.
Nyatakan bagaimana untuk menghasilkan sulfur dioksida daripada sulfur.

……………………………………………………………………………………
[1 mark]

(iii) Write the chemical formula of sulphur trioxide.
Tuliskan formula kimia bagi sulfur trioksida.

…………………………………………………………………………..
[1 mark]

(iv) State how sulphuric acid is produced from oleum.
Nyatakan bagaimana asid sulfurik dihasilkan dari oleum.

…………………………………………………………………………..
[1 mark]

(v) State the observation if a piece of marble is put into the beakers containing sulphuric acid.
Nyatakan pemerhatian jika sebutir marmar dimasukkan ke dalam bikar yang mengandungi asid sulfurik itu.

…………………………………………………………………………..
[1 mark]

(b) Name a suitable catalyst for Process II.
Namakan mangkin yang sesuai bagi Proses II.

…………………………………………………………………………………..
[1 mark]

(c) For Process III,
Bagi Proses III,

(i) Write the chemical equation for the reaction of ammonia with sulphuric acid.
Tuliskan persamaan kimia untuk tindak balas ammonia dengan asid sulfurik.

…………………………………………………………………………………...
[2 marks]

(ii) State one use of ammonia sulphate in daily life.
Nyatakan satu kegunaan ammonium sulfat dalam kehidupan harian.

……………………………………………………………………………
[1 mark]

3 *(a)* Table 3 shows the observation when litmus paper blue and red is dipped into solution P and Q.
Jadual 3 menunjukkan pemerhatian apabila kertas litmus biru dan merah dicelupkan ke dalam larutan P dan Q.

Solution *Larutan*		Observation *Pemerhatian*
P	Hydrogen chloride in propanon *Hidrogen klorida dalam propanon*	No change on blue and red litmus paper. *Tiada perubahan ke atas kertas litmus biru dan merah*
Q	Hydrogen chloride in solvent X *Hidrogen klorida dalam pelarut X*	Blue litmus paper turns red and no change on red litmus paper *Kertas litmus biru menjadi merah dan tiada perubahan ke atas kertas litmus merah.*

Table 3
Jadual 3

Based on information in Table 3, answer the following questions
Berdasarkan maklumat dalam Jadual 3, jawab soalan berikut :

(i) Write the formula of solvent X.
Tuliskan formula bagi pelarut X.

………………………………………………………………………………………..
[1 mark]

(ii) Write the formula of ion that causes an acid shows its acidic properties
Tuliskan formula bagi ion yang menyebabkan asid menunjukkan sifat asid

………………………………………………………………………………………..
[1 mark]

Explain the differences in the observation
(iii) *Terangkan perbezaan dalam pemerhatian ini*

…………………………………………………………………………………………

…………………………………………………………………………………………
[2 marks]

(b) Diagram 3 shows a series of tests to identify the cation and anion of a colourless solution R.
Rajah 3 menunjukkan suatu siri ujian untuk mengenalpasti kation and anion dalam larutan tidak berwarna, R.

Colourless solution R
Larutan tidak berwarna R

Test l / *Ujian l*

Test ll / *Ujian l*

White precipitate is formed when Barium nitrate solution is added

Mendakan putih terbentuk apabila larutan barium nitrat ditambah.

White precipitate is formed and dissolve in excess ammonia solution

Mendakan putih terbentuk dan larut dalam larutan ammonia berlebihan
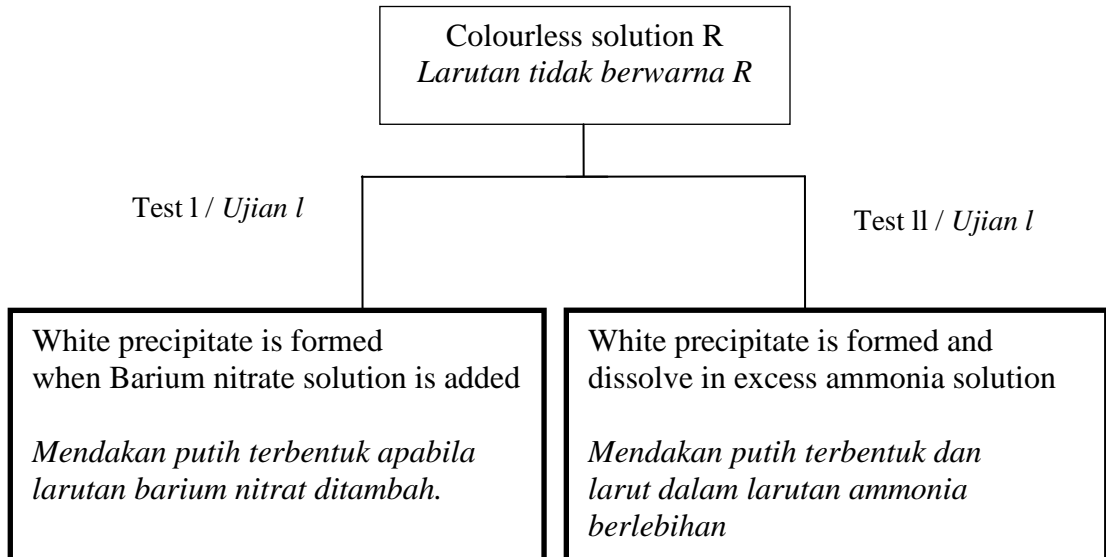
Diagram 3
Rajah 3

Based on the Diagram 3.1 answer the following questions
Berdasarkan Rajah 3.1 answer the following questions

(i)   Name the ions present in solution R
Namakan ion yang hadir dalam larutan R

Cations
Kation : ………………………………………………………………………….

Anions
Anion : …………………………………………………………………………

[2 marks]

(ii)   Write the ionic equation for the formation of white precipitate in test ll
Tuliskan persamaan ion untuk pembentukan mendakan putih dalam ujian II.

………………………………………………………………………………………

[2 mark]

(iii) Calculate the number of mole of cation present in 50 cm^3 0.5 mol dm^{-3} of solution R
Hitungkan bilangan mol kation yang terdapat dalam 50 cm^3 0.5 mol dm^{-3} larutan R

[2 marks]

4 Diagram 4 shows the set-up of apparatus to investigate a chemical cell
Rajah 4 menunjukkan susunan radas untuk mengkaji suatu sel kimia

Magnesium
Magnesium

Copper
kuprum

Magnesium sulphate solution
Larutan magnesium sulfat

copper(ll) sulphate solution
Larutan kuprum(II) sulfat

Solution X
Larutan X
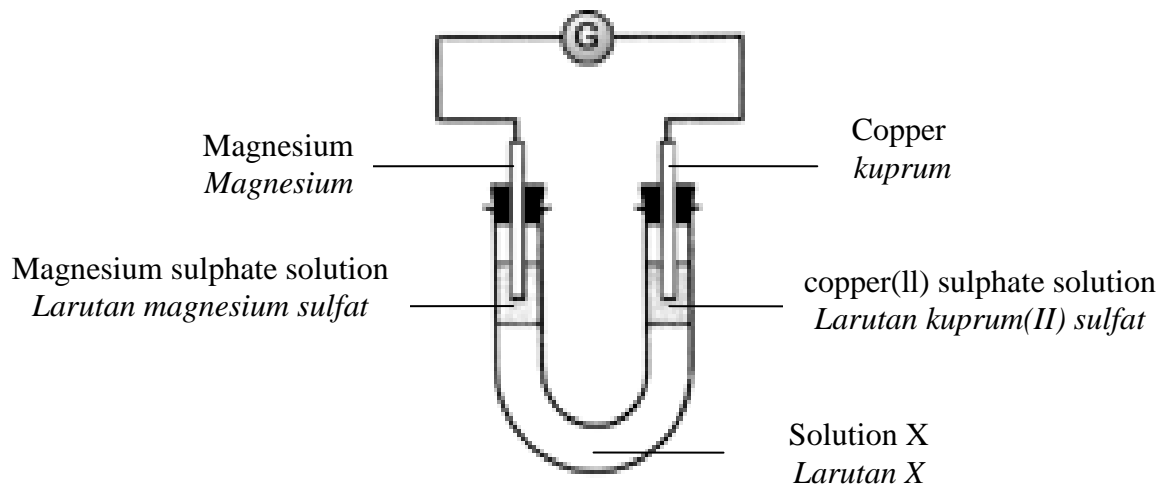
Diagram 4
Rajah 4

Based on Diagram 4, answer the following questions
Berdasarkan Rajah 4, jawab soalan-soalan berikut.

(a) Name chemical substance suitable used as X.
Namakan bahan kimia yang sesuai digunakan sebagai X.

……………………………………………………………………………………………..
[1 mark]

(b) (i) State the negative terminal and the positive terminal of the cell
      Nyatakan terminal negatif dan terminal positif bagi sel

   Negative terminal / *Terminal negatif :*…………………………………………………

   Positive terminal / *Terminal positif :* …………………………………………………

[2 marks]

   (ii) Explain your answer in b(i)
       Terangkan jawapan anda di (b)(i)

       ……………………………………………………………………………………….

       ……………………………………………………………………………………….

[2 marks]

(c) Write the half equation for the reaction at the
     Tuliskan persamaan setengah bagi tindak balas yang berlaku di

   (i)   Negative terminal
         Terminal negatif

         …………………………………………………………………………..

[1 mark]

   (ii) Positive terminal
         Terminal positif

         …………………………………………………………………………..

[1 mark]

(d) Draw the direction of electron flow in Diagram 2
     Lukiskan arah pengaliran elektron dalam Rajah 2

[1 mark]

(e) State the changes of copper(ll) sulphate solution and explain your answer based on electron transfer .
     Nyatakan perubahan pada larutan kuprum(ll) sulfat dan terangkan jawapan anda berdasarkan pemindahan elektron.

     …………………………………………………………………………………………..

     …………………………………………………………………………………………..

[2 mark]

(f) The experiment is repeated by replacing X with glacial ethanoic asid. Give one observation.
     Eksperimen diulang dengan menggantikan X dengan asid etanoik glasial. Berikan satu pemerhatian.

     …………………………………………………………………………………………

[1 mark]

5
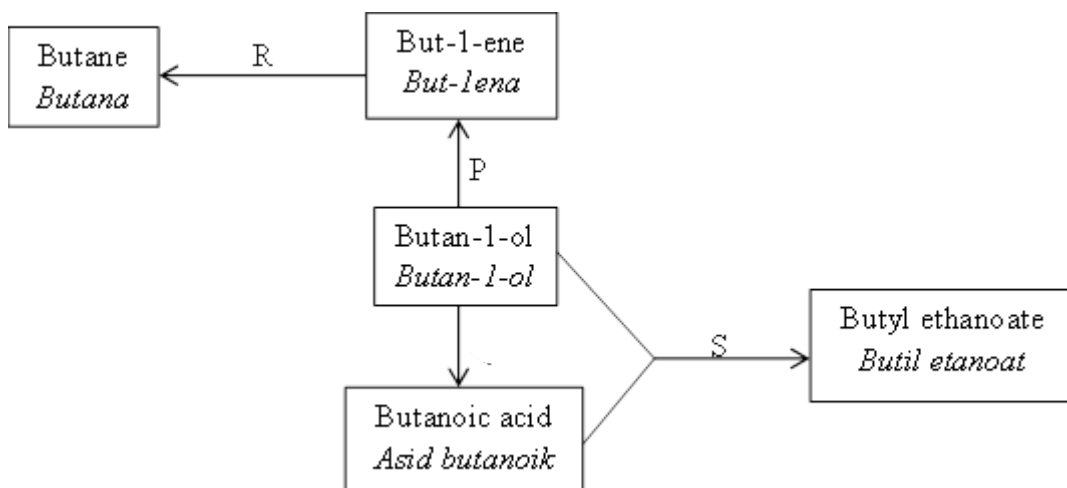
Diagram 5
Rajah 5

Diagram 5 shows a flow chart for a series of changes of organic compounds from one homologous series to another homologous series.
Rajah 5 menunjukkan carta alir perubahan sebatian-sebatian organik dari suatu siri homolog kepada siri homolog yang lain.

(a) But-1-ene can be used to produce butane in Process R.
But-1-ena boleh digunakan untuk menghasilkan butana dalam Proses R.

    (i)   Name process R.
          Namakan proses R.

          ……………………………………………………………………………………
                    [1 mark]

    (ii)   State the condition required for Process R to occur.
          Nyatakan keadaan yang diperlukan untuk Proses R berlaku.

          ……………………………………………………………………………………
                    [1 mark]

    (iii) Draw and name the structural formulae of one the isomer of butane.
          Lukis dan namakan formula struktur untuk satu isomer butana.

                    [2 marks]

(b) Process P converts butan-1-ol to but-1-ene
Proses P menukarkan butan-1-ol kepada but-1-ena

    (i)   Write the chemical equation for the reaction.
        Tuliskan persamaan kimia untuk tindak balas tersebut.

        ……………………………………………………………………………….
                                                                                  [2 marks]

    (ii)   Draw a label diagram for the set-up of apparatus required for process P.
        Lukiskan gambarajah berlabel untuk susunan radas yang diperlukan untuk
        proses P.

                                                                                    [2 marks]

(c) Explain procedures to prepare butyl etanoate in process S.
Terangkan prosedur untuk menyediakan butyl etanoat dalam proses S.

……………………………………………………………………………….

……………………………………………………………………………….

……………………………………………………………………………….
                                                                             [3 marks]

6   The thermochemical equation below represents the combustion reaction of butanol
Persamaan termokimia di bawah mewakili tindak balas pembakaran butanol di udara.

$$C_4H_9OH + 6O_2 \longrightarrow 4CO_2 + 5H_2O \quad \Delta H = -2679 \text{ kJ mol}^{-1}$$
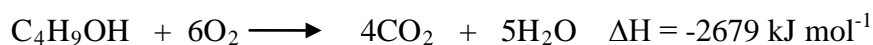
(a) What is meant by '$\Delta H = -2679$ kJ mol^{-1} ' in the above equation?
Apakah yang dimaksudkan dengan '$\Delta H = -2679$ kJ mol^{-1}' dalam persamaan di atas?

………………………………………………………………………………..

………………………………………………………………………………..
[1 *mark*]

(b) The theoretical value for the heat of combustion of butanol is -2679 kJmol^{-1} .
Explain why the experimental value for the heat of combustion of butanol is lower than the theoretical value.
Nilai teori untuk haba pembakaran butanol ialah -2679 kJmol^{-1} .Terangkan mengapa nilai dari eksperimen untuk haba pembakaran butanol adalah lebih rendah daripada nilai teori.

……………………………………………………………………...............

……………………………………………………………………….......

…………………………………………………………………………………
[2 marks]

(c) 0.37g of the butanol is used to heat up 500 g of water.
Calculate,
0.37g butanol digunakan untuk memanaskan 500 g air.
Hitungkan,

(i)   The heat released by the butanol in the reaction.
[Molar mass of the butanol = 74 g mol^{-1}]
Haba yang dibebaskan oleh butanol dalam tindak balas
[*Jisim molar butanol* = 74 gmol^{-1}]

[1 *mark*]

(ii) the temperature change of water expected in the experiment in (c)(i)
[Specific heat capacity of water: 4.2 J g^{-1}°C^{-1}]
Perubahan suhu air yang dijangkakan dalam eksperimen ini dalam (c)(i)
[Muatan haba tentu air: 4.2 J g^{-1}°C^{-1}]

[1 *mark*]

(d) Construct an energy level diagram for the reaction.
Lukis gambar rajah aras tenaga untuk tindak balas tersebut.

[2 *marks*]

(e) Use the substances given, explain how we convert alcohol to substances that can change blue litmus paper red

- Butanol
- Acidified potassium dichromate (VI) solution

Dengan menggunakan bahan berikut, terangkan bagaimana menukarkan alcohol kepada sesuatu yang dapat menukarkan kertas litmus biru kepada merah.

- *Butanol*
- *Larutan kalium dikromat (VI)berasid*

…………………………………………………………………………………….

……………………………………………………………………………………

……………………………………………………………………………………
[3 marks]

Section B
Bahagian B
[20 marks]
[*20 markah*]

Answer any **one** question from this section.
*Jawab mana-mana **satu** soalan daripada bahagian ini.*

7.

Diagram 7
Gambar rajah 7

Diagram 7 shows rusted substances which can be seen in our daily lives.
Gambar rajah 7 menunjukkan bahan-bahan berkarat yang boleh dilihat dalam kehidupan harian.

(*a*)   State the conditions for the rusting to occur.
Nyatakan keadaan-keadaan yang diperlukan untuk pengaratan berlaku.

[2 *marks*]

(*b*)   Iron undergoes oxidation during the rusting process.
Ferum mengalami pengoksidaan semasa proses pengaratan.

(i)   Write the half equation showing the formation of iron(II) ion.
Tuliskan persamaan setengah bagi pembentukan ferum(II).

[2*marks*]

(ii)   State the changes in the oxidation number of iron in (b)(i).
Nyatakan perubahan nombor pengoksidaan ferum dalam (b)(i).

[3 *marks*]

(*c*)   Draw a labelled diagram showing the mechanism of rusting of iron. Explain the process involved in the rusting of iron.
Lukiskan rajah berlabel yang menunjukkan mekanisma pengaratan besi. Terangkan proses-proses yang terlibat.

[7 *marks*]

(*d*)   Rusting of iron occurs faster in the presence of acid or salt. Explain.
Pengaratan besi berlaku dengan lebih cepat dalam kehadiran asid atau garam. Terangkan.

[3 *marks*]

(*e*)   Corrosion of iron can be prevented using a sacrificial metal. Using a suitable example, explain how corrosion of iron can be prevented by using this method.
Kakisan besi boleh dicegah melalui penggunaan logam korban. Dengan menggunakan contoh yang sesuai, terangkan bagaimana kakisan dapat dicegah melalui kaedah ini.

[5 *marks*]

8. An experiment is carried out to investigate the rate of reaction between excess calcium carbonate powder with 40 cm^3 nitric acid, 0.1 mol dm^{-3}. Table 8 shows the volume of carbon dioxide gas collected at 30 seconds interval.

Satu eksperimen dijalankan untuk mengkaji kadar tindak balas antara serbuk kalsium karbonat yang berlebihan dengan 40 cm^3 asid nitrik, 0.1 mol dm^{-3}. Jadual 8 menunjukkan isi padu gas karbon dioksida yang terkumpul pada sela masa 30 saat.

Time (s)	0	30	60	90	120	150	180	210
Volume of CO$_2$ gas, (cm^3)	0.00	17.00	29.00	34.00	37.00	39.00	39.00	39.00

Table 8
Jadual 8

(*a*)   Draw the apparatus set-up for this experiment.
Lukiskan susunan radas bagi eksperimen ini.

[2 *marks*]

(*b*)   Plot a graph of volume of carbon dioxide gas against time.
Lukiskan graf isi padu gas karbon dioksida melawan masa.

[3 *marks*]

(*c*)   Based on the graph plotted, determine the rate of reaction at
Berdasarkan graf yang dilukis, tentukan kadar tindak balas pada

   (i)   30 seconds / 30 *saat*
   (ii)   90 seconds / 90 *saat*

Compare the rate of reaction between 30 seconds and 90 seconds.
Bandingkan kadar tindak balas pada masa 30 saat dan 90 saat.

[5 *marks*]

(*d*)   Calculate the theoretical value of carbon dioxide gas, in cm^3, should be collected in this experiment?
[Molar volume : 24 dm^3 mol^{-1} at room condition]
Hitungkan nilai teori isipadu gas karbon dioksida yang sepatutnya dikumpulkandalam eksperimen ini.

The maximum volume of the carbon dioxide gas collected in this experiment is lesser than the volume that calculated theoretically. Explain why. Suggest how to overcome this problem.

Isipadu maksimum gas karbon dioksida yang dikumpul dalam eksperimen ini adalah lebih rendah jika dibandingkan dengan nilai teori. Terangkan mengapa.Cadangkan bagaimana mengatasi masalah ini.

[6 *marks*]

(*e*)   Another experiment is carried out with using calcium carbonate chips and the samevolume and concentration of nitric acid. Compare the rate of reaction between thesetwo experiments. Explain your answer with using collision theory.

Satu lagi eksperimen dijalankan dengan menggunakan ketulan kalsium karbonat isipadu dan kepekatan asid nitrik yang sama. Bandingkan kadar tindak balas kedua-dua eksperimen ini. Terangkan jawapan anda dengan menggunakan teoriperlanggaran.

[4 *marks*]

Section C
Bahagian C
[20 marks]
[*20 markah*]

Answer any **one** question from this section.
*Jawab mana-mana **satu** soalan daripada bahagian ini*

9 *(a)*

The making of soap is one of the traditional chemical synthesis. In the
past soap is made by mixing animal fats with alkaline wood ashes.
Proses menghasilkan sabun merupakan satu sintesis kimia tradisional.
Pada masa dahulu, sabun disediakan dengan mencampurkan lemak
haiwan dengan abu kayu beralkali.

The following equation shows a reaction for the preparation of soap in a
laboratory.
Berikut ialah persamaan kimia yang menunjukkan tindak balas penyediaan
sabun di makmal.

| Oil | + | Concentrated alkali | → | Soap | + | Glycerol |
| *Minyak* | + | *Alkali pekat* | → | *Sabun* | + | *Gliserol* |
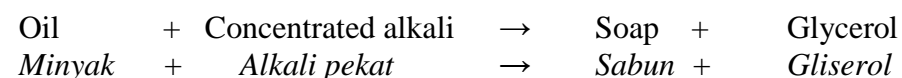
Describe an experiment to prepare soap in a laboratory. In your answer
include :

- Suitable apparatus and materials
- Procedure
- Confirmatory test to verify the product

Huraikan satu eksperimen makmal untuk menyediakan sabun. Dalam
jawapan anda sertakan :

- *Radas dan bahan yang sesuai*
- *Prosedur*
- *Ujian pengesahan untuk mengenalpasti hasil yang terbentuk*

[10 marks]

Diagram 9.1 shows two experiment to investigate the effectiveness of the cleansing action between cleaning agent X and Y.

Rajah 9.1 menunjukkan dua eksperimen untuk mengkaji keberkesanan tindakan pencucian antara agen pencuci X dan agen pencuci Y.
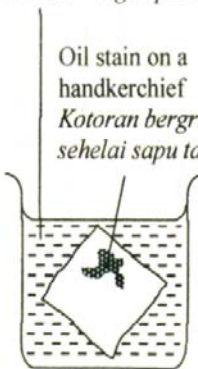
Experiment *Eksperimen*	I	II
Cleaning agent *Agen pencuci*	X	Y
Chemical formula *Formula kimia*	$CH_3(CH_2)_{14}COO^-K^+$	$CH_3(CH_2)_{11}OSO_3^-K^+$
Cleaning in hard water *Pencucian dalam air liat*	Hard water + cleaning agent X *Air liat + agen pencuci X* Oil stain on a handkerchief *Kotoran bergris pada sehelai sapu tangan*	Hard water + cleaning agent Y *Air liat + agen pencuci Y* Oil stain on a handkerchief *Kotoran bergris pada sehelai sapu tangan*
Observation *Pemerhatian*	Oil stain remains *Kesan minyak kekal*	Oil stain is removed *Kesan minyak hilang*

Diagram 9.1
Rajah 9.1

Based on Diagram 9.1, compare and contrast the effectiveness of the cleansing action between cleaning agent X and cleaning agent Y in hard water. Explain your answer.

Berdasarkan Rajah 9.1, banding dan bezakan keberkesanan tindakan pencucian antara agen pencuci X dan agen pencuci Y dalam air liat. Terangkan jawapan anda.

[5 marks]

Diagram 9.2 shows the structure of a particle of agent Y.
Rajah 9.2 menunjukkan struktur bagi suatu zarah agen Y.

Part P
Bahagian P
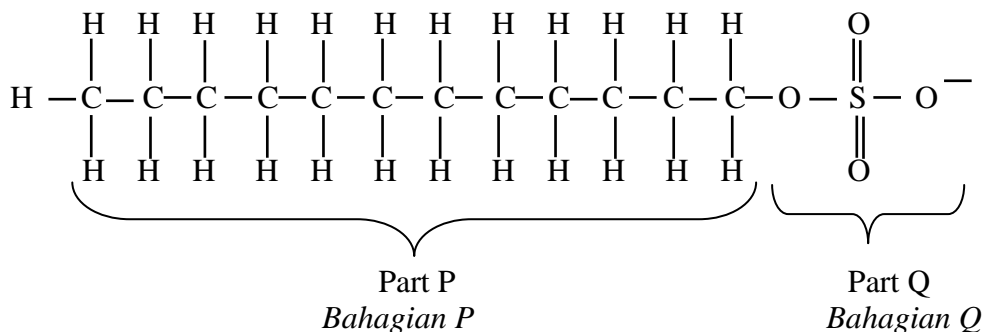
Part Q
Bahagian Q

Diagram 9.2
Rajah 9.2

State the name of part P and part Q. Explain the role of part P and part Q in the cleansing action.
Nyatakan nama bahagian P dan bahagian Q. Terangkan peranan bahagian P dan bahagian Q dalam tindakan pencucian.
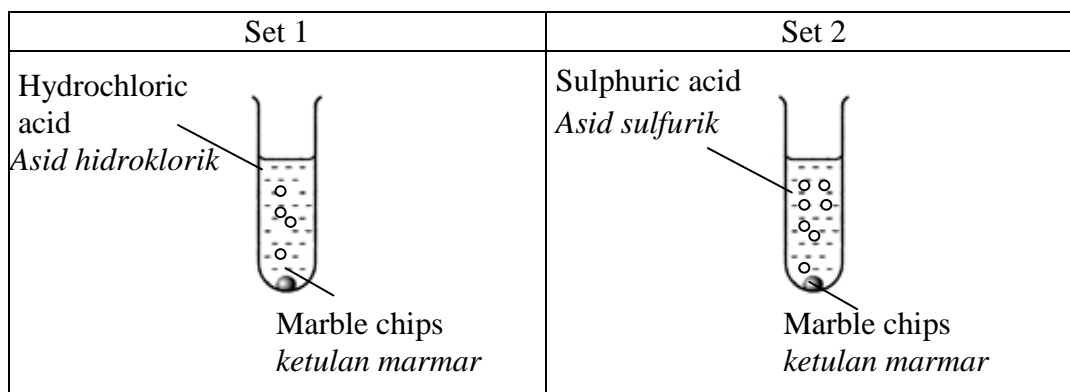
[5 marks]

10

Set 1	Set 2
Hydrochloric acid *Asid hidroklorik* Marble chips *ketulan marmar*	Sulphuric acid *Asid sulfurik* Marble chips *ketulan marmar*

Diagram 10
Rajah 10

(a) Excess marble chips are added into two test tubes containing 5cm^3 hydrochloric acid 1.0 moldm^{-3} and 5cm^3 sulphuric acid 1.0 moldm^{-3} respectively.
Compare the observation between the two test tubes.
Explain your observation.

Ketulan marmar berlebihan ditambahkan kepada dua tabung uji masing-masing berisi 5cm^3 asid hidroklorik 1.0 moldm^{-3} dan 5cm^3 asid sulfurik 1.0 moldm^{-3}.
Bandingkan pemerhatian pada kedua-dua tabung uji.
Terangkan pemerhatian anda.

[3 marks]

(b) Table 10 shows the results of an experiment to compare the strength of acids
Jadual 10 menunjukkan keputusan eksperimen untuk membandingkan kekuatan asid.

Acid	pH value
Hydrochloric acid of 0.1 mol dm⁻³*Asid hidroklorik 0.1 mol dm⁻³*	1
Sulphuric acid of 0.1 0.1 mol dm⁻³*Asid sulfurik 0.1 mol dm⁻³*	1
Ethanoic acid of 0.1 mol dm⁻³*Asid etanoik 0.1 mol dm⁻³*	4

Table 10
Jadual 10

Explain why
- pH values of hydrochloric acid and sulphuric acid are same
- pH values of hydrochloric acid and ethanoic acid are different.

Terangkan mengapa
- *nilai pH asid hidroklorik dan asid sulfurik adalah sama*
- *nilai pH asid hidroklorik dan asid etanoik adalah berbeza berbeza.*

[7 marks]

(c) Describe a laboratory experiment to prepare a standard solution of 100 cm^3 of sodium hydroxide solution 0.1 moldm^{-3} from a sodium hydroxide solution 1.0 moldm^{-3}. Your answer should consist of the following:

- List of materials and apparatus
- Working of calculation
- Procedures of the experiment

(d) *Huraikan suatu eksperimen di makmal untuk menyediakan larutan standard 100cm^3 of larutan natrium hidroksida 0.1 moldm^{-3} daripada larutan natrium hidroksida berkepekatan 1.0 moldm^{-3}. Jawapan anda harus mengandungi perkara berikut:*

- *Senarai radas dan bahan*
- *Jalan pengiraan*
- *Prosedur eksperimen*

[10 marks]

Nama : .... Tingkatan : ……………...

No.Kad Pengenalan

Angka Giliran

PerakEXcellent

MOCK TEST 2   **4541/3**
KIMIA
Kertas 3
Julai
2 Jam 30 Minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini mengandungi dua soalan: **Soalan** 1 dan **Soalan** 2.*

2. *Jawab **semua** soalan. Tulis jawapan anda bagi **Soalan** 1 pada ruang yang disediakan dalam kertas soalan ini.*

3. *Tulis jawapan anda bagi **Soalan** 2 dalam helaian tambahan yang dibekalkan oleh pengawas peperiksaan. Anda boleh menggunakan persamaan, rajah, jadual, graf dan cara lain sesuai untuk menjelaskan jawapan anda.*

4. *Tunjukkan kerja mengira, ini membantu anda mendapatkan markah.*

5. *Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*

6. *Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.*

7. *Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.*

Soalan	Markah Penuh	Markah diperoleh
1	33	
2	17	
	Jumlah	

1. A group of student carried out an experiment to determine the end-point of titration. Table 1.1 describe the activity in this experiment.

Sekumpulan pelajar telah menjalankan satu eksperimen untuk menentukan takat akhir pentitratan. Jadual 1.1 menghuraikan aktiviti dalam eksperimen ini.
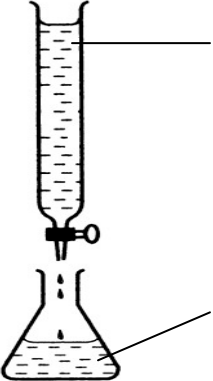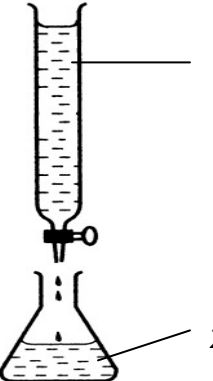
Activity I *Aktiviti I*	Titration between 25.0 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution with hydrochloric acid by using phenolphthalein as the indicator. *Pentitratan di antara 25.0 cm^3 larutan natrium hidroksida berkepekatan 1.0 mol dm^{-3} dengan asid hidroklorik dan menggunakan fenolftalein sebagai penunjuk.* Hydrochloric acid *Asid hidroklorik* 25.0 cm^3 sodium hydroxide 1.0 mol dm^{-3} + phenolphthalein indicator *25.0 cm^3 natrium hidroksida + penunjuk fenolftalein*
Activity II *Aktiviti II*	Titration between 25.0 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution with sulphuric acid by using methyl orange as the indicator. *Pentitratan di antara 25.0 cm^3 larutan natrium hidroksida berkepekatan 1.0 mol dm^{-3} dengan asid sulfurik dan menggunakan metil jingga sebagai penunjuk.* Sulphuric acid *Asid sulfurik* 25.0 cm^3 sodium hydroxide 1.0 mol dm^{-3} + methly orange indicator *25.0 cm^3 natrium hidroksida + penunjuk metil jingga*

Table 1.1
Jadual 1.1

Table 1.2 shows three burette readings for the titrations that have been conducted for activity I.

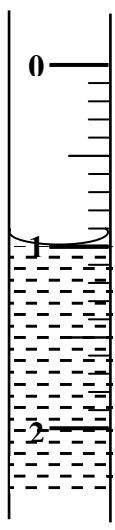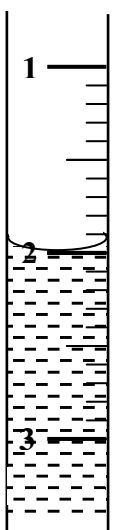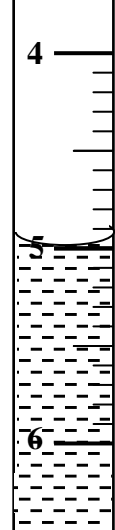*Jadual 1.2 menunjukkan tiga bacaan buret bagi pentitratan yang telah dijalankan dalam aktiviti I*
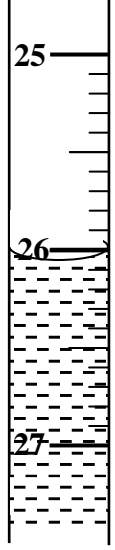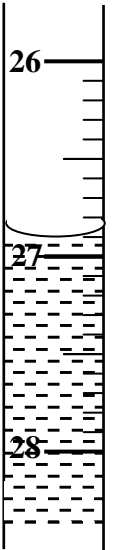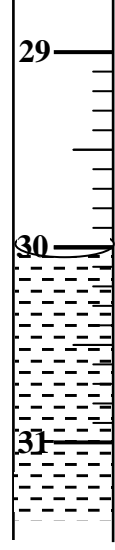
Titration number	1	2	3
Initial burette reading *Bacaan awal buret*	1.00 cm^3	2.00 cm^3	5.00 cm^3
Final burette reading *Bacaan akhir buret*	……………......	……………......	……………......

Table 1.2

Jadual 1.2

http://www.chngtuition.blogspot.com

Table 1.3 shows the three burette readings for the titrations that have been conducted for activity II.

Jadual 1.3 menunjukkan tiga bacaan buret bagi pentitratan yang telah dijalankan dalam aktiviti II
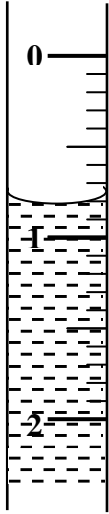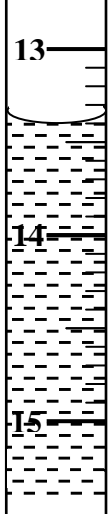
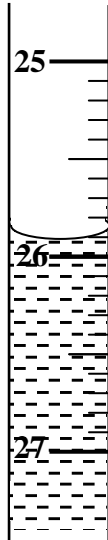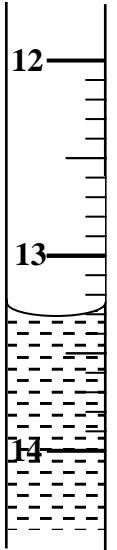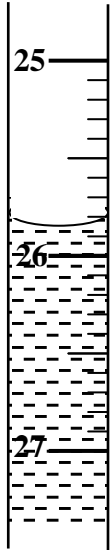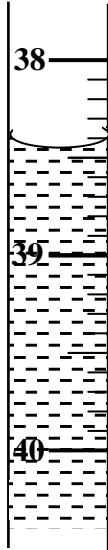| Titration number	1	2	3
Initial burette reading *Bacaan awal buret*	0.80 cm³	13.40 cm³	25.90 cm³
Final burette reading *Bacaan akhir buret*	……………....	……………....	……………....

Table 1.3
Jadual 1.3

(a)	Record the final burette readings for the six titrations in the spaces provided in Table 1.2 and Table 1.3. *Rekod bacaan akhir buret bagi enam pentitratan di dalam ruang yang diberikan pada Jadual 1.2 dan Jadual 1.3.* [3 *marks*]
(b)	Construct a table and record the initial burette reading, final burette reading and the volume of acid used in activity I. *Bina satu jadual dan rekodkan bacaan awal buret, bacaan akhir buret dan isipadu asid yang telah digunakan dalam aktiviti I* [3 *marks*]
(c)	Based on the data from activity II, calculate the concentration of sulphuric acid that is used to neutralize the sodium hydroxide solution. *Berdasarkan data yang diperolehi daripada aktiviti II, kira kepekatan asid sulfurik yang digunakan untuk meneutralkan larutan natrium hidroksida.* [3 marks]

(d)	Hydrochloric acid and sulphuric acid are strong acids. Based on the average volume of the acid in activity I and activity II in (c), what inference can be made for the type of acid. Give a reason for your answer. *Asid hidroklorik dan asid sulfurik adalah asid kuat. Berdasarkan kepada isipadu purata asid dalam aktiviti I dan aktiviti II di(c), apakah inferen yang boleh dibuat tentang jenis asid. Berikan satu sebab bagi jawapan anda.* Type of acid : *Jenis asid* .... Reason : *Sebab* .... [3 *marks*]
(e)	In activity II, if 25.0 cm^3 sulphuric acid 1.0 mol dm^{-3} is added to the sodium hydroxide solution, state the colour of the methyl orange indicator. *Bagi aktiviti II, jika 25.0 cm^3 asid sulfurik 1.0 mol dm^{-3} ditambahkan kepada larutan natrium hidroksida, nyatakan perubahan warna penunjuk metil jingga.* .... [3 *marks*]
(f)	If activity I is repeated by replacing of hydrochloric acid with the same concentration of ethanoic acid, **predict** the volume of ethanoic acid needed to reach the end-point of titration. *Jika sekiranya aktiviti I diulang dengan menggantikan asid hidroklorik dengan asid etanoik yang sama kepekatannya, ramalkan isipadu asid etanoik yang diperlukan untuk mencapai takat akhir pentitratan* .... [3 *marks*]
(g)	State the observation for the changes in colour of the indicator during titration in activity I and activity II. *Nyatakan pemerhatian kepada perubahan warna penunjuk semasa pentitratan bagi aktiviti I dan aktiviti II..* Activity I : *Aktiviti I* .... Activity II : *Aktiviti II* .... [3 *marks*]

(h)	For this experiment, state
	Bagi eksperimen ini, nyatakan
	(i) The manipulated variable :
	   Pembolehubah dimanipulasikan :
	
	....
	
	(ii) The responding variable :
	   Pembolehubah bergerak balas :
	
	....
	
	(iii) The constant variable :
	   Pembolehubah dimalarkan :
	
	....
	[3 marks]

(i)	State one hypothesis for this experiment. *Nyatakan satu hipotesis bagi eksperimen ini.* .... [3 marks]
(j)	Give the operational definition for the end-point of titration in activity I. *Berikan definasi secara operasi takat akhir tindak balas bagi aktiviti I.* .... [3 *marks*]

(k) Classify the following acids into strong acid and weak acid.
Kelaskan asid berikut kepada asid kuat dan asid lemah.

Nitric acid   Ethanoic acid   Phosforic acid   Sulphuric acid
Asid nitrik,   *Asid etanoik*   *Asid fosforik*   *Asid sulfurik*

[3 marks]

2 Lina brought a piece of imitation gold bracelet in a shop . After two years , she found that the colour of the bracelet has faded.
Lina telah membeli seutas gelang emas tiruan di sebuah kedai . Setelah dua tahun beliau mendapati warna pada gelang tersebut telah pudar .

Diagram 2 below shows the change of her gold bracelet.
Rajah 2 di bawah menunjukkan perubahan yang berlaku pada gelang emasnya.

After two years
Selepas dua tahun

Rajah 2 / *Diagram 2*

Lina then send the bracelet back to the shop so that it looks like a new bracelet.
Lina kemudiannya menghantar kembali gelang itu ke kedai supaya gelang itu kelihatan seperti gelang baru .

What should be done by the shop owner ?
Apakah yang patut dilakukan oleh pemilik kedai itu ?

Based on the knowledge about the method done by the shop owner, plan an experiment that can be carried out in the school laboratory.
Berdasarkan pengetahuan tentang kaedah yang dilakukan oleh pemilik kedai itu, Rancang satu eksperimen yang dapat dijalankan di dalam makmal sekolah .

Your planning should include the following aspects :
Perancangan anda hendaklah mengandungi aspek-aspek berikut:

(*a*) Statement of the problem
Pernyataan masalah

(*b*) All the variables
Semua pembolehubah

(*c*) Statement of the hypothesis
Pernyataan hipotesis

(*d*) List of substances and apparatus
Senarai bahan dan radas

(*e*) Procedure of the experiment
Prosedur eksperimen

(*f*) Tabulation of data
Penjadualan data

[17 *marks*]
[17 *markah*]

ENDS OF QUESTION PAPER
KERTAS SOALAN TAMAT

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of two questions : **Question 1** and **Question 2**.
   *Kertas soalan ini mengandungi dua soalan : **Soalan 1** dan **Soalan 2**.*

2. Answer **all** questions. Write your answers for **Question 1** in the spaces provided in this question paper.
   *Jawapan **semua** soalan. Tulis jawapan anda bagi **Soalan 1** pada ruang yang disediakan dalam kertas soalan ini.*

3. Write your answer for **Question 2** on the 'helaian tambahan' provided by the invigilators. You may use equations, diagrams, tables, graphs and other suitable methods to explain your answers.
   *Tulis jawapan anda bagi **Soalan 2** dalam helaian tambahan yang dibekalkan oleh pengawas peperiksaan. Anda boleh menggunakan persamaan, rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda.*

4. Shows your working, it may help you to get marks.
   Tunjukkan kerja mengira, ini membantu anda mendapatkan markah.

5. The diagrams in the questions are not drawn to scale unless stated.
   Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.

6. The marks allocated for each question or sub-part of a question are shown in brackets.
   Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.

7. If you wish to change your answer, cross out the answer that you have done. Then write down the new answer.
   Jika anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.

8. You may use a non-programmable scientific calculator.
   Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.

9. You are advised to spend 45 minutes to answer **Question 1** and 45 minutes for **Question 2.**
   *Anda dinasihati supaya mengambil masa 45 minit untuk menjawab **Soalan 1** dan 45 minit untuk **Soalan 2**.*

10. Hand in your answer sheets at the end of the exammination.
    Serahkan kertas jawapan anda di akhir peperiksaan.

MOCK TEST 2
SIJIL PELAJARAN MALAYSIA (SPM)

KIMIA
SPM

MARKING SCHEME
SKEMA PEMARKAHAN

PERATURAN PEMARKAHAN MOCK TEST 2 2015

PAPER 1

1.	D	11.	B	21.	D	31.	B	41.	D
2.	A	12.	C	22.	D	32.	C	42.	B
3.	C	13.	B	23.	D	33.	C	43.	C
4.	D	14.	A	24.	A	34.	A	44.	D
5.	B	15.	B	25.	C	35.	B	45.	B
6.	D	16	A	26.	D	36.	A	46.	C
7	D	17.	B	27.	A	37.	B	47.	B
8.	B	18.	B	28.	D	38.	D	48.	C
9.	A	19.	B	29.	A	39.	B	49.	C
10.	C	20.	B	30.	A	40.	A	50.	C
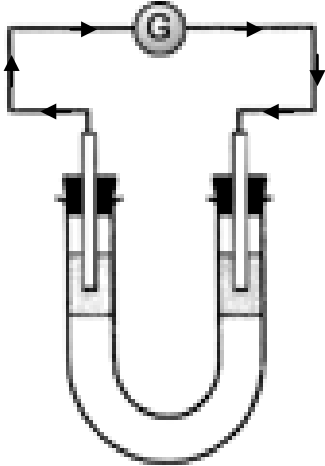
PAPER 2

No.			Rubric	Marks
1	(a)	i	2.4 // 2,4 *reject 2:4 / 2;4*	1
	(b)	i	Covalent bond	1
		ii	Low melting point and boiling point//soluble/dissolve in organic solvent//does not conduct electricity in any state *Choose one* *Reject :insoluble/does not dissolve in water*	1
	(c)	i	$4Na + O_2 \longrightarrow 2Na_2O$ *Correct reactant and product* *Balance*	1 1
		ii	High melting point and boiling point//soluble/ dissolve in water//insoluble/does not dissolve in organic solvent// conduct electricity in molten or aques state *Choose one*	1
		iii	Period: 2 Group: 6	1
	(d)	i	Oxygen	1
		ii	Size becomes smaller	1
			Total	**9**

2	(a)	(i)	Contact process	1
		(ii)	Burn sulphur in air/oxygen	1
		(iii)	SO_3	1
		(iv)	Concentrated sulphuric acid	1
		(v)	Dissolve / dilute in water	1
	(b)		Ferum// iron	1
	(c)	(i)	$2 NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$ Correct formula of reactant and product. Balance equation.	 1 1
		(ii)	As fertilizers	1
			Total	**10**

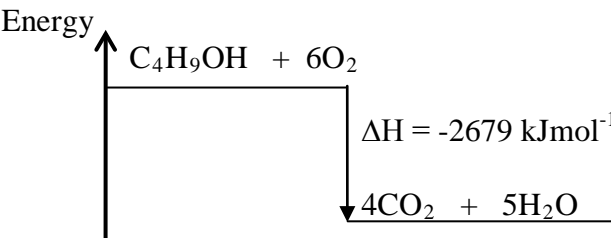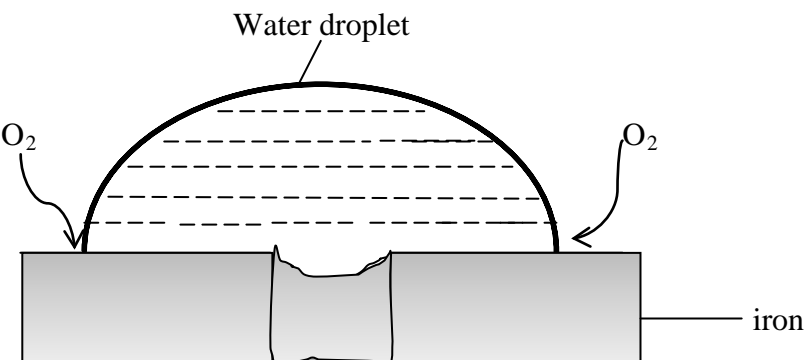|				
3	(a)	i	H_2O	1
		ii	H^+	1
		iii	Hydrogen chloride does not ionised in propanon. Hydrogen chloride ionised in solvent X to produced Hydrogen ion/ H^+ ion.	1 1
	(b)	i	Kation: Zinc ion Anion: Sulphate ion	1 1

		ii	$Zn^{2+} + 2OH^- \longrightarrow Zn(OH)_2$ *Correct reactant and product* *Balanced*	1 1
		iii	Number of mole = = = 0.025 mole *Reject if no unit.*	1 1
			Total	**10**
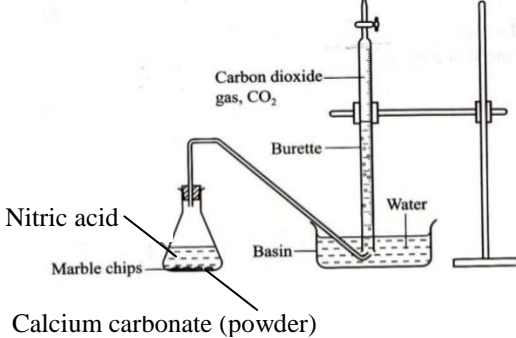
4	(a)	i	Sulphuric acid	1
	(b)	i	Negative terminal: Magnesium Positive terminal: Copper	1 1
		ii	Magnesium is more electropositive than copper	1 1
	(c)	i	Negative terminal: $Mg \longrightarrow Mg^{2+} + e$	1
		ii	Positive terminal : $Cu^{2+} + e \longrightarrow Cu$	1
	(d)		 From electrode P to electrode Q [show on the diagram]	1
	(e)		pointer of galvanometer not deflected/ galvanometer shows no deflection	1
			Total	**10**

5	a	i	Hydrogenation	1
		ii	Nickel, 180°C	1
		iii	 Butane	1+1
	b	i	$C_4H_9OH \rightarrow C_4H_8 + H_2O$	1+1
		ii		1+1
	c		1. Add a few drop of concentrated sulphuric acid into the mixture of butanol and ethanoic acid	1
			2. Warm the mixture	1
			3. Pour the mixture into a basin filled with water.	1
			Total	**10**

6	(a)		The heat given off when 1 mol of butanol burn completely in excess oxygen is 2679 kJ.	1
	(b)		1. Heat is lost to the surrounding/ 2. Incomplete combustion of butanol/ 3. Heat from the flame during the burning of butanol is absorbed by the tin / heat the tin. *Choose any 2*	1+1
	(c)	(i)	1. Number of mole $\qquad = \dfrac{0.37}{74}$ mol //0.005 mol	1
			2. Heat released $\qquad = 0.005 \times 2679/ 13.395$ kJ/ $\qquad 13.395 \times 10^3$ J	1

	(ii)	$$13.395 \times 10^3 = 500 \times 4.2 \times \theta$$ $$\theta = \frac{13.395 \times 10^3}{500 \times 4.2}$$ $$\theta = 6.379/6.4\,^0C$$	1
(d)	1, Draw and label the energy axis in the form of arrow with two level of energy 2. Formula/Name the reactants and products for exothermic reaction		1+1

Energy

$C_4H_9OH \;+\; 6O_2$

$\Delta H = -2679 \text{ kJmol}^{-1}$

$4CO_2 \;+\; 5H_2O$

(e)	1. Pour 10 cm^3 of **acidified potassium dichromate (VI) solution** into the boiling tube. 2. Add about 3 cm^3 of **ethanol** into the boiling tube. 3. Heat the solution gently until boils. 4. Dip the blue litmus paper into the boiling tube. **The blue litmus paper turn red.** *Reagent / Action / Observation.*		3
		Total	**11**

No 7		Explanation	Mark	∑ Marks
(a)		Oxygen and	1	
		water	1	2
(b)		Fe → Fe^{2+} + 2e	2	
		0 to +2	1	3
(c)				
		Functional diagram	1	
		Correct labelling of iron, water droplet, oxygen	1	
		The iron is oxidised / lose electrons to form Fe^{2+} ions. Fe →Fe^{2+} + 2e	1	
		Water molecules and oxygen accept electrons and be reduced to hydroxide ions, OH$^-$ $2H_2O + O_2 + 4e → 4OH^-$	1	
		Fe^{2+} ions and OH$^-$ ions combine to produce iron(II) hydroxide Fe^{2+} + 2OH$^-$ → Fe(OH)$_2$	1	
		Iron(II) hydroxide will be further oxidised into iron(III)	1	
		hydroxide and finally form hydrated iron(III) oxide, Fe$_2$O$_3$, which is rust.	1	7
(d)		The presence of salt increases the electrical conductivity of water and	1 1	
		Acts as a good electrolyte	1	3
		Acidic gases dissolve in water increases the rate of rusting		
(e)		Iron in contact with more electropositive metal	1	
		Magnesium / zinc can act as sacrificial metal	1	
		More electropositive than iron	1	
		More electropositive metal corrodes	1	
		Example : Underground pipe connected with magnesium bags	1	5
			Total	20

No 8	Explanation	Mark	∑ Marks
(a)

Functional diagram
Label nitric acid, calcium carbonate, water and carbon dioxide | 1
1 | 2 |
| (b) | Labelled axes with correct unit
Correct transfer of points
Smooth curve | 1
1
1 | 3 |
| (c) (i) | $\dfrac{(23 - 11)\ cm^3}{(42 - 15)\ s}$ // $\dfrac{12}{27}$
$= 0.44\ cm^3s^{-1}$ (*answer with unit*)

Tangent must be shown in the graph
Correct answer and unit |

1
1 | |
| (ii) | $\dfrac{(37.5 - 30)\ cm^3}{(120 - 63)\ s}$ // $\dfrac{7.5}{57}$
$= 0.13\ cm^3s^{-1}$ (*answer with unit*)

Tangent must be shown in the graph
Correct answer and unit

The rate of reaction at 30 seconds is higher |

1
1

1 | 5 |
| (c) | $CaCO_3 + 2HNO_3 \rightarrow Ca(NO_3)_2 + CO_2 + H_2O$
Number of moles, $HNO_3 = (0.1 \times 40) \div 1000 = 0.004$ mol
2 moles of HNO_3 produces 1 mole of CO_2
Volume of $CO_2 = 0.002 \times 24 = 48$ **cm³**
Some of the carbon dioxide gas released dissolve in water.
Flow the carbon dioxide gas into the water so that the water is saturated with carbon dioxide. | 1
1
1
1
1

1 | 6 |
| (e) | The rate of reaction using calcium carbonate powder is higher [than using calcium carbonate chips].
The total surface area for the reaction using calcium carbonate powder is larger/bigger.
The frequency of collision between **H⁺** ions and **CO₃²⁻** ions is higher
Hence, the frequency of effective collision is also higher | 1

1

1
1 | 4 |
| | | **Total** | 20 |

9	(a)	Apparatus : beaker, tripod stand, Bunsen burner, glass rod, filter funnel, filter paper, conical flask, test tube.	1
		Materials: palm oil/corn oil/olive oil/any vegetable oil, concentrated sodium hydroxide, sodium chloride	1
		Procedure:	
		1. Pour (5-10 cm^3) of palm oil/corn oil/olive oil into a beaker.	1
		2. Add 50 cm^3 of (5-6) mol dm^{-3} sodium hydroxide/ NaOH / concentrated sodium hydroxide // potassium hydroxide/ KOH/ concentrated potassium hydroxide	1
			1
		3. Stir and heat the mixture until it boils	1
		4. Add 50 cm^3 of distilled water and 3 spatulas of sodium chloride / NaCl / Add 50 cm^3 NaCl solution	1
		5. Boil the mixture for another 5 minutes.	1
		6. Filter out the soap.	
		Confirmatory test :	
		7. Put the soap / residue into a test tube filled with water	1
		8. Shake the test tube, foam is form	1
	(b) (i)	P1 : Y is more effective than X in hard water	1
		P2 : Hard water contains magnesium or calcium ion	1
		P3 : X form scum/insoluble salt with magnesium / calcium ion	1
		P4 : Y does not form scum/ insoluble salt	1
		P5 : Amount of agent X is reduced// amount of agent Y is remains	1
	(ii)	P1 : Part P = hydrophobic	1
		P2 : Part Q = hydrophilic	1
		P3 : Hydrophobic part dissolves in the grease/ oil	1
		P4 : Hydrophilic part dissolves in the water	1
		P5 : This reduces the surface tension// Increase the wetting ability of water	1
		Total	**20**

10	a		1. Gas bubbles produced in reaction between hydrochloric acid with marble chips is less than that in reaction between sulphuric acid with marble chips.	1
			2. Hydrochloric acid is a monoprotic acid, sulphuric acid is a diprotic acid.	1
			3. The concentration of hydrogen ion in hydrochloric acid is less than that in sulphuric acid	1
	b		Hydrochloric acid and sulphuric acid 1. Hydrochloric acid and sulphuric acid are strong acids	1
			2. Thus they have same pH value	1
			Hydrochloric acid and ethanoic acid 3. Hydrochloric acid is a strong acid whereas ethanoic acid is a weak acid.	1
			4. Ethanoic acid ionise partially in water to produce a low concentration of hydrogen ions.	1
			5. Hydrochloric acid ionise completely in water to produce a high concentration of hydrogen ions	1
			6. The concentration of hydrogen ions in hydrochloric acid is higher than that in ethanoic acid.	1
			7. Thus, hydrochloric acid has lower value of pH compared to ethanoic acid	1
	c		Apparatus: 1. Volumetric flask of $100cm^3$, pipette of $10cm^3$ and pump, dropper,.	1
			Material: 2. Sodium hydroxide solution of 1.0 $moldm^{-3}$ and distilled water,	1
			Working of calculation: 3. $1.0 \times V_1 = 0.1 \times 100$	1
			4. $V_1 = 10 \ cm^3$	1
			Procedures: 5. Fill in (reasonable volume, below $89cm^3$) of distilled water into the volumetric flask	1
			6. Transfer 10 cm^3 of sodium hydroxide solution into the volumetric flask	1
			7. Using a dropper add distilled water until the calibration level	1
			8. Stopper the volumetric flask	1
			9. Swirl the volumetric flask	1
			10. To form a homogenous solution.	1
			Total	**20**

PAPER 3

No.	Rubric	Marks
1 (a)	Able to record all the readings accurately to **two** decimal points with **units.** Sample answer: Activity I : 26.05 cm^3, 26.90 cm^3, 30.05 cm^3 Activity II : 13.30 cm^3, 25.85 cm^3, 38.45 cm^3	3
	Able to record all the readings correctly without decimal point but with unit // Able to record all the readings correctly without unit but with decimal point // Able to record any 5 readings correctly with units	2
	Able to state at least three readings correctly without units or decimal point *Accept bottom burette readings	1
	No response or wrong response	0

1(b)	Able to construct a table containing the following information:
	  1. Headings in the table
	  2. Transfer all data from 1(a) correctly
	  3. With units
	
	Sample answer:
	<table><tr><td>Titration number</td><td>Initial burette reading / cm^3</td><td>Final burette reading / cm^3</td><td>Volume of acid / cm^3</td></tr><tr><td>1</td><td>1.00</td><td>26.05</td><td>25.05</td></tr><tr><td>2</td><td>2.00</td><td>26.90</td><td>24.90</td></tr><tr><td>3</td><td>5.00</td><td>30.05</td><td>25.05</td></tr></table>
		3

	Able to construct a table containing the following information:
	  1. Headings in the table
	  2. Transfer all data from 1(a) correctly.
	  3. Without units
		2

	Able to construct a table that contains the following information:
	  1. Headings in the table
	  2. Columns with data from 1(a)
		1

	No response or wrong response	0

1(c)	Able to show all the steps to calculate the concentration of sulphuric acid correctly. Sample answer: Step 1: Write the chemical equation: $\quad\quad 2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$ Step 2: Calculating the number of moles of sodium hydroxide $\quad\quad$ Number of mol of NaOH : $\dfrac{1.0 \times 25.0}{1000}$ // 0.025 Step 3: Calculating the concentration of sulphuric acid $\quad$ Concentration of H_2SO_4 : $\left(\dfrac{0.025 \times 1000}{12.50 \times 2}\right)$ // 1.0 mol/dm^3	3
	Able to show incomplete steps. Sample answer: Step 2 and 3	2
	Able to any one step.	1
	No response or wrong response	0
1(d)	Activity I use monoprotic acid whereas activity II use diprotic acid	3
1(e)	Orange	3
1(f)	More than 25.00 cm^3	3
1(g)	(i) Type of acid uses (ii) Volume of acid to neutralize 25.0 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution. (iii) Concentration and volume of sodium hydroxide solution.	3
1(h)	If use different type of acid to neutralize 25.0 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution, the volume of acid use also different.	3
1(i)	Activity I : Pink change to colourless Activity II : Yellow change to orange	3
1(j)	The point that when the colour of phenolphthalein change from pink to colourless	3
1(k)	<table><tr><th>Strong acid</th><th>Weak acid</th></tr><tr><td>Nitric acid</td><td>Ethanoic acid</td></tr><tr><td>Sulphuric acid</td><td>Phosphoric acid</td></tr></table>	3
	Total mark	33

QUESTION	SAMPLE ANSWER	SCORE
2 (a)	How does to electroplate the 'iron key' with silver?	3
2(b)	Manipulated variable : position of iron key at cathode or anode Responding variable : grey solid deposited / plating occur Fixed variable : type of silver nitrate solution	3
2(c)	Iron key at the cathode will be electroplated but iron key at the anode, electroplating does not occur.	3
2(d)	Substances : 1.0 moldm^{-3} silver nitrate, iron key , silver plate Apparatus : beaker, connecting wyre, batteries, measuring cylinder,	3
2(e)	Procedures : 1. Iron key and silver plate is cleaned with sand paper. 2. A beaker a half filled with silver nitrate solution. 3. Iron key is connected to the cathode and silver plate at the anode. 4. Iron key and silver plate are dipped into the silver nitrate solution. 5. Record the observation. 6. Repeat the experiment by change the position of Iron key at the anode and silver plate at the cathode	3
2(f)	<table><tr><td>Position Iron key</td><td>Observation / plating occur</td></tr><tr><td>Anode</td><td></td></tr><tr><td>Cathode</td><td></td></tr></table>	3
	Total mark	Maximum 17