SULIT
4541/1
CHEMISTRY
Kertas 1
26 Ogos 2010
1¼ jam

4541/1

PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA SEKOLAH MENENGAH NEGERI KEDAH DARUL AMAN

PEPERIKSAAN PERCUBAAN SPM 2010

CHEMISTRY

Paper 1

One hour and fifteen minutes

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa.*

2. *Soalan dalam Bahasa Inggeris mendahului soalan yang sepadan dalam Bahasa Melayu.*

3. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*

Kertas soalan ini mengandungi 20 halaman bercetak

1   Which of the following substances consists of atoms?
Antara berikut, bahan manakah terdiri daripada atom?

    A   Water
    B   Oxygen
    C   Helium
    D   Naphthalene

2   Diagram 1 shows a graph of temperature against time for the heating of naphthalene.
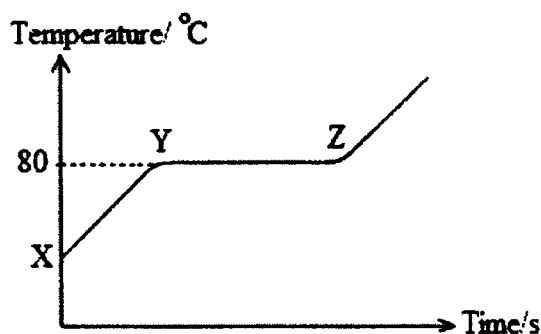*Rajah 1 menunjukkan graf suhu melawan masa bagi pemanasan naftalena.*

Diagram 1

Which of the following statements is true?
Antara berikut, pernyataan manakah yang benar?

    A   The melting point is 80°C.
          Takat lebur ialah 80°C.
    B   Heat is released at Y.
          Haba dibebaskan pada Y.
    C   Naphthalene exists as liquid at X.
          Naftalena wujud sebagai cecair pada X.
    D   The particles are far from each other at Z
          Zarah-zarah adalah jauh antara satu sama lain pada Z.

3   Which of the following scientists **did not** contribute to the development of the Periodic Table?
*Antara ahli sains berikut yang manakah **tidak** menyumbang terhadap kemajuan Jadual Berkala?*

    A   Lothar Meyer
    B   John Newlands
    C   Michael Faraday
    D   Dmitri Mendeleev

http://chngtuition.blogspot.com

4 Diagram 2 is the standard representation of element X.
Rajah 2 menunjukkan perwakilan piawai bagi unsur X.

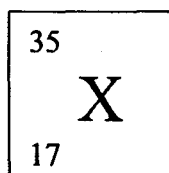$$\begin{array}{|c|} \hline 35 \\ X \\ 17 \\ \hline \end{array}$$

Diagram 2

Which of the following, is true about X?
Antara berikut, yang manakah benar tentang X?

A Atom X has 35 neutrons.
B X exists as solid at room temperature.
C Electron arrangement of atom X is 2.8.8.
D X is in group 17 and period 3 in the Periodic Table of element.

5 Neon does not react with other elements.
Which of the following statements is true about neon?
Neon tidak bertindak balas dengan unsur lain.
Antara pernyataan berikut, yang manakah benar mengenai neon?

A Neon always combines with itself
Neon sentiasa bergabung dengan diri sendiri
B Neon exists as monoatomic gas
Neon wujud sebagai gas monoatom
C Neon has stable octet electron arrangement
Neon mempunyai susunan elekron oktet yang stabil
D
Neon has stable duplet electron arrangement
Neon mempunyai susunan elektron duplet yang stabil

6 Which of the following pairs are the properties of sodium chloride, NaCl?
Antara pasangan berikut, yang manakah sifat natrium klorida, NaCl?

	Solubility *Keterlarutan*	Electrical conductivity in molten state *Kekonduksian elektrik dalam leburan*
A	Soluble in water *Larut dalam air*	Conducting *Mengkonduksi*
B	Soluble in organic solvent *Larut dalam pelarut organik*	Not conducting *Tidak mengkonduksi*
C	Insoluble in water *Tidak larut dalam air*	Conducting *Mengkonduksi*
D	Insoluble in organic solvent *Tidak larut dalam pelarut organik*	Not conducting *Tidak mengkonduksi*

http://chngtuition.blogspot.com

7   Which of the following substances are electrolytes?
Bahan manakah adalah elektrolit?

     I   Glucose
          Glukosa
     II   Ethanol
          Etanol
     III   Lead(II) bromide
          Plumbum(II) bromida
     IV   Potassium chloride
          Kalium klorida

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

8   Diagram 3 shows the set up of the apparatus for the electrolysis of 0.01 mol dm^{-3} sodium sulphate solution using carbon electrodes.
Rajah 3 menunjukkan susunan radas bagi elektrolisis larutan natrium sulfat 0.01 mol dm^{-3} menggunakan elektrod-elektrod karbon.
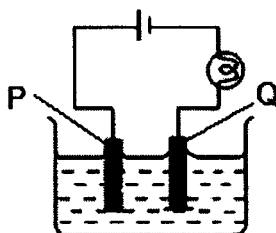

Diagram 3

Which of the following are the products formed at the electrodes P and Q?
Antara berikut yang manakah hasil yang terbentuk pada elektrod P dan Q?

	Electrode P	Electrode Q
A	Hydrogen gas	Oxygen gas
B	Oxygen gas	Sodium metal
C	Oxygen gas	Hydrogen gas
D	Sulphur dioxide gas	Sodium metal

9   Which of the following is a weak acid?
Antara berikut yang manakah asid lemah?

     A   Hydrochloric acid
     B   Sulphuric acid
     C   Ethanoic acid
     D   Nitric acid

http://chngtuition.blogspot.com

10 Which of the following is **not** true about the properties of alkali?
*Antara berikut yang manakah **tidak** benar dengan sifat alkali?*

A Has a pH value greater than 7
Mempunyai nilai pH melebihi 7

B Undergoes neutralization with acid
Mengalami tindak balas peneutralan dengan asid

C Reacts with metal carbonates to produce carbon dioxide
Bertindak balas dengan logam karbonat untuk menghasilkan karbon dioksida

D React with ammonium salt when heated to produce ammonia gas
Bertindak balas dengan garam ammonium apabila dipanaskan untuk menghasilkan gas ammonia

11 Which of the following compounds ia a soluble salt?
Antara sebatian berikut yang manakah garam terlarutkan?

A Calcium chloride
Kalsium klorida

B Barium sulphate
Barium sulfat

C Lead (II) iodide
Plumbum (II) iodida

D Magnesium carbonate
Magnesium karbonat

12 The followings are the properties of a manufactured substance.
Berikut adalah sifat-sifat satu bahan buatan dalam industri.

> - Hard but brittle.
>   *Keras tetapi rapuh*
> - Inert towards chemicals.
>   *Lengai terhadap bahan kimia.*
> - Transparent.
>   *Lutsinar.*
> - Sensitive to light intensity.
>   *Sensitif terhadap keamatan cahaya.*

Which of the following products uses the above substance?
Antara berikut, yang manakah menggunakan bahan tersebut?

A Prism
B Spectacles
C Racing car
D Kitchen utensils

13   Diagram 4 shows part of a structure of a polymer.
Rajah 4 menunjukkan struktur sebahagian suatu polimer.
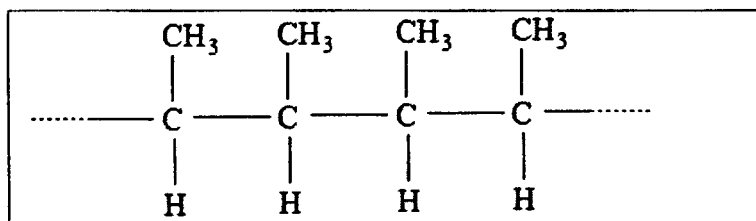

Diagram 4

Identify the monomer of the polymer.
Kenalpastikan monomer bagi polimer tersebut.

A $CH_2 = CH_2$
B $CH_3 = CH_3$
C $CH_2 = CHCH_3$
D $CH_3CH = CHCH_3$

14   The chemical equation shows the reaction between hydrochloric acid and calcium carbonate.

$$2HCl + CaCO_3 \rightarrow CaCl_2 + H_2O + CO_2$$

Which of the following **does not** affect the rate of reaction?
*Antara berikut, yang manakah **tidak** mempengaruhi kadar tindak balas?*

A   Size of calcium carbonate
      Saiz kalsium karbonat
B   Volume of hydrochloric acid
      Isipadu asid hidroklorik
C   Concentration of hydrochloric acid
      Kepekatan asid hidroklorik
D   Temperature of reactant mixture
      Suhu campuran bahan tindak balas

15 Diagram 5 shows the molecular formulae of two hydrocarbon compounds.
Rajah 5 menunjukkan formula molekul bagi dua sebatian hidrokarbon.

$$C_4H_8 \qquad C_4H_{10}$$

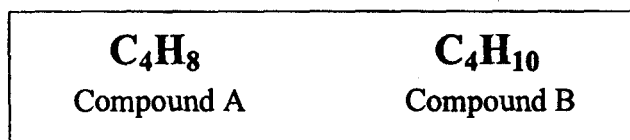Compound A   Compound B

Diagram 5

Which of the following is true about compounds A and B?
*Antara berikut, yang manakah benar tentang sebatian A dan B ?*

A. Compound A produces more soot when burnt in air.
   Sebatian A menghasilkan lebih jelaga apabila terbakar dalam udara.
B. Compound B decolorises brown bromine water, compound A does not.
   Sebatian B menyahwarnakan warna perang air bromin, sebatian A tidak.
C. Compound A is a saturated hydrocarbon, compound B is an unsaturated hydrocarbon.
   Sebatian A adalah hidrokarbon tepu, sebatian B adalah hidrokarbon tak tepu
D. Compound A undergoes substitution reaction, compound B undergoes addition reaction.
   Sebatian A mengalami tindak balas penukargantian, sebatian B mengalami tindak balas penambahan.

16. An ester which has the formula $C_3H_7COOCH_3$ can be produced from the reaction between
   Ester yang berformula $C_3H_7COOCH_3$ boleh dihasilkan daripada tindak balas antara

A. C_2H_5OH and CH_3COOH
B. C_2H_5OH and $HCOOCH_3$
C. CH_3OH and C_3H_7COOH
D. CH_3OH and $HCOOC_2H_5$

17 Which of the following is **not** correctly matched?
*Antara yang berikut yang manakah **bukan** padanan yang betul?*

	Food additives	Function
A	Acacia gum	add colour to food *menambah warna pada makanan*
B	Ascorbic acid	slows down the oxidation of food *melambatkan pengoksidaan makanan*
C	Sodium benzoate	slows down the spoilage of food *melambatkan kerosakkan makanan*
D	Monosodium glutamate	makes the food tastier *menjadikan makanan lebih sedap*

http://chngtuition.blogspot.com

18 The following is the thermochemical equation for the Haber process.
Beikut adalah persamaan tindak balas termokimia bagi proses Haber.

$$3H_{2(g)} + N_{2(g)} \rightarrow 2NH_{3(g)} \qquad \Delta H = -180 \text{ kJmol}^{-1}$$
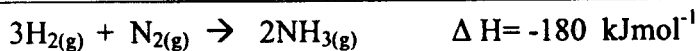
Which is **true** about the reaction?
*Yang manakah **benar** tentang tindak balas tersebut?*

A Chemical bonds are formed.
Ikatan-ikatan kimia terbentuk.
B The reactant mixture is cooler.
Campuran bahan tindak balas adalah lebih sejuk.
C Heat is absorbed from the surroundings.
Haba diserap dari sekeliling.
D The energy content of the products is lower than that of the reactants.
Kandungan tenaga hasil tindak balas lebih rendah daripada bahan tindak balas

19 Which substance is commonly used to manufacture dyes and detergents?
Bahan manakah yang lazim digunakan untuk membuat pewarna dan detergen?

A Ammonium chloride
B Phosphoric acid
C Sodium chloride
D Sulphuric acid

20 Given are the steps for preparing soap in the laboratory.
What is the use of adding common salt in the process?
Diberi adalah langkah-langkah penyediaan sabun dalam makmal.
Apakah gunanya menambah garam biasa dalam proses?

| 1- Heat oil with concentrated sodium hydroxide solution. |
| *Panaskan minyak bersama larutan natrium hidroksida pekat.* |
| 2- Add some water and boil for 5 minutes. |
| *Tambahkan air dan didihkan 5 minit.* |
| 3- Add some common salt , boil another 5 minutes. |
| *Tambahkan garam biasa dan didihkan 5 minit lagi.* |
| 4- Cool and filter the solution. |
| *Sejukkan dan turas larutan terhasil.* |

A To increase the effectiveness of soap.
Untuk menambahkan keberkesanan sabun.
B To reduce the solubility of soap in water.
Untuk mengurangkan keterlarutan sabun dalam air.
C To remove excess alkali.
Untuk menyingkirkan alkali berlebihan.
D To dry the soap.
Untuk mengeringkan sabun.

21   Diagram 6 shows the sublimation process of iodine when heated.
       Rajah 6 menunjukkan proses pemejalwapan iodine apabila dipanaskan.
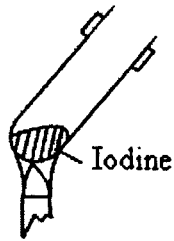

Diagram 6

When iodine sublimes, the particles
Apabila iodine memejalwap, zarah-zarahnya

A   shrink to a smaller size
       mengecut ke size yang lebih kecil
B   move further apart
       bergerak lebih jauh
C   vibrate about their fixed positions
       bergetar pada kedudukan yang tetap
D   lose energy to the surroundings
       bebaskan tenaga ke persekitaran

22   Diagram 7 shows the electron arrangement of an ion M.
       Atom M has 14 neutrons.
       Rajah 7 menunjukkan susunan elektron bagi ion M.
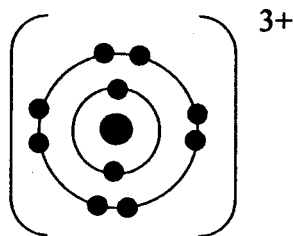   *Atom M mempunyai 14 neutron.*

Diagram 7

The nucleon number of atom M is
Nombor nukleon untuk atom M ialah

A   27
B   24
C   22
D   17

23   Why is it that the reactivity of elements in Group 1 increases when going down the group?
      Mengapakah kereaktifan unsur-unsur dalam Kumpulan 1 bertambah apabila menuruni kumpulan?

      A   Size of atom increases
           Saiz atom bertambah
      B   The boiling point decreases
           Takat didih berkurang
      C   The number of shells containing electrons increases
           Bilangan petala yang mengandungi elekton bertambah
      D   The attraction of nucleus towards valence electrons decreases
           Tarikan nukleus terhadap elektron valen berkurang

24   How are the elements in the Periodic Table arranged?
      Bagaimanakah unsur-unsur dalam Jadual Berkala disusun?

      A   According to increasing relative molecular mass
           Mengikut pertambahan jisim molekul relatif
      B   According to increasing relative atomic mass
           Mengikut pertambahan jisim atom relatif
      C   According to increasing nucleon number
           Mengikut pertambahan nombor nukleon
      D   According to increasing proton number
           Mengikut pertambahan nombor proton

25   Diagram 8 shows the electrons arrangement of a covalent compound formed between atom P and atom Q.
      Rajah 8 menunjukkan susunan elektron bagi sebatian kovalen yang terbentuk antara atom P dan atom Q.
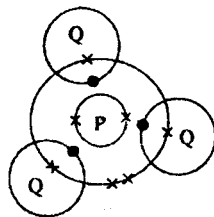
                              Diagram 8

      Which of the following statements is true about the compound?
      Antara pernyataan 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 ialah ikatan ionik

26   Compound X has the following properties.
      Sebatian X mempunyai sifat-sifat berikut.

      - Soluble in water
      - Has high melting point
      - Conducts electricity in aqueous solution

      Which of the following is compound X?
      Antara berikut, yang manakah ialah sebatian X?

      A   Sulphur
      B   Naphthalene
      C   Sodium nitrate
      D   Lead(II) bromide

27   Diagram 9 shows how copper is purified by electrolysis
      Rajah 9 menunjukkan bagaimana kuprum ditulenkan secara elektrolisis.
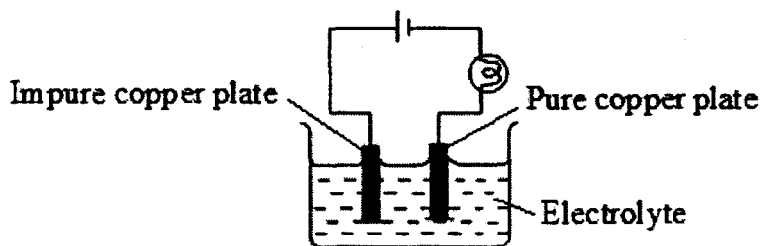
      Diagram 9

      Which of the following electrolyte is suitable to be used?
      Elektrolit manakah yang sesuai untuk digunakan?

      A   Hydrocloric acid
      B   Copper(II) sulphate solution
      C   Aluminium nitrate solution
      D   Magnesium sulphate solution

28   The following equations represent some displacement reactions of metals.
      Persamaan berikut mewakili beberapa tindak balas penyesaran logam.

      $X + Y$ sulphate $\longrightarrow$ $Y + X$ sulphate
      $X + Z$ sulphate $\longrightarrow$ $Z + X$ sulphate
      $Y + Z$ sulphate $\longrightarrow$ No reaction
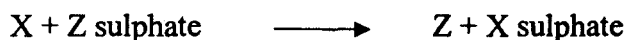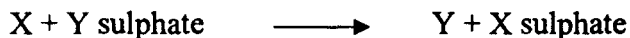
      The arrangement of metals X, Y and Z in ascending order of reactivity is
      Susunan logam X, Y dan Z mengikut susunan kereaktifan menaik adalah

      A   X, Z, Y
      B   Y, Z, X
      C   Z, X, Y
      D   Z, Y, X

http://chngtuition.blogspot.com

29 Ammonium sulphate is used as a chemical fertilizer. This fertilizer can be prepared in the labolatory through the reaction between
Ammonium sulfat digunakan sebagai baja kimia. Baja ini boleh disediakan dalam makmal melalui tindak balas antara

A ammonia gas and sulphur trioxide
B ammonia gas, sulphur and oxygen
C aqueous of ammonia solution and sulphur dioxide
D aqueous of ammonia solution and dilute sulphuric acid

30 Which of the following is the reason why discarded plastic item polluting the environment?
Antara yang berikut, yang manakah merupakan sebab barangan plastik mencemarkam persekitaran?

A Non biodegradable
   Tidak terbiodegradasia
B Extremely toxic
   Sangat toksik
C Flammable
   Mudah terbakar
D Radioactive
   Radioaktif

31 The following statements are related to the collision theory of a reaction. Which of the following combinations is true about the effect of the rise of temperature on the reactant particles?
Antara kombinasi berikut,yang manakah benar tentang kesan peningkatan suhu ke atas zarah bahan tindak balas?
Pernyataan berikut adalah berkaitan dengan teori pelanggaran bagi satu tindak balas

I   The total surface area of the reactant particles increases
     Jumlah luas permukaan zarah bahan tindak balas bertambah
II   The kinetic energy of the reactant particles increases
     Tenaga kinetik zarah bahan tindakbalas bertambah
III The frequency of the collision between the reactant particles increases
     Frekuensi perlanggaran antara zarah bahan tindak balas bertambah
IV   The number of the reactant particles per one unit of volume increases
     Bilangan zarah bahan tindak balas dalam satu unit isipadu bertambah

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

32. Diagram 10 shows the conversion of X to two organic compounds through oxidation process and dehydration process. What is X?
Rajah 10 menunjukkan penukaran X kepada dua sebatian organik melalui proses pengoksidaan dan penurunan. Apakah X?
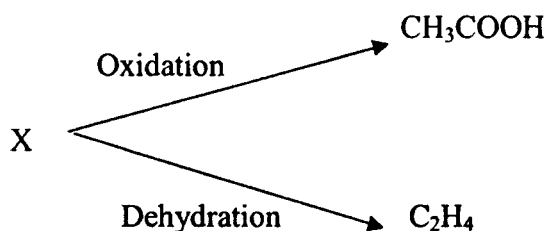

Diagram 10

- **A.** $CH_3COOC_2H_5$
- **B.** C_2H_5COOH
- **C.** C_2H_5OH
- **D.** CH_3OH

33 The following equation shows the reaction between carbon and copper(II) oxide
Berikut ialah persamaan yang menunjukkan tindak balas di antara karbon dan kuprum(II) oxide

$$C + 2CuO \rightarrow CO_2 + 2Cu$$
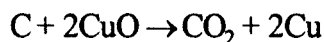
Which statement is true about this reaction?
Pernyataan yang manakah benar untuk tindak balas di atas?

- **A** Copper(II) oxide is oxidised to copper
  Kuprum(II) oksida dioksidakan kepada kuprum
- **B** Carbon is the reducing agent
  Karbon ialah agen penurunan
- **C** The oxidation number of carbon decreases
  Nombor pengoksidaan karbon berkurang
- **D** The oxidation number of oxygen increases
  Nombor pengoksidaan oxygen bertambah

34 Lead metal can be obtained by heating a mixture of lead(II) oxide and magnesium powder. The reaction happens because
Logam plumbum diperoleh dengan memanaskan suatu campuran plumbum(II) oksida dan serbuk magnesium. Tindak balas berlaku kerana

- **A** lead is less dense compared to magnesium
  plumbum kurang tumpat berbanding magnesium
- **B** magnesium burns faster in oxygen
  magnesium terbakar lebih cepat dalam oksigen
- **C** lead is less reactive than magnesium
  plumbum kurang reaktif daripada magnesium
- **D** melting point of magnesium is higher
  takat lebur magnesium lebih tinggi

35 The relative formula mass of XSO_4 is 160.
What is the relative atomic mass of element X ?
Jisim formula relatif bagi XSO_4 ialah 160.
Berapakah jisim atom relatif bagi unsur X ?
[Relative atomic mass: O = 16, S = 32]

A 32
B 64
C 96
D 112

36 Diagram 11 shows the energy level diagram for the reaction between silver ions and chloride ions.
Rajah 11 menunjukkan gambarajah aras tenaga bagi tindak balas antara ion argentum dan ion klorida

Diagram 11
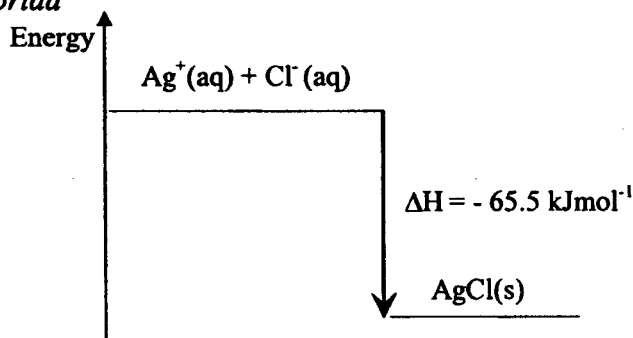
Which of the following statements is **true** about this reaction?
*Manakah antara berikut adalah **benar** tentang tindak balas tersebut?*

A Endothermic reaction occurs
Tindak balas endotermik berlaku
B The energy content of the product is higher than the reactants
Kandungan tenaga hasil tindak balas lebih tinggi daripada bahan tindak balas
C 65.5 kJ of heat is absorbed when 1 mol of silver chloride is formed
65.5 kJ haba diserap apabila 1 mol argentum klorida terbentuk
D The final temperature at the end of the reaction is higher than the initial temperature
Suhu akhir pada akhir tindak balas lebih tinggi daripada suhu awal.

37 A sample of M oxide contains 2.7 g of element X and 2.4 g of oxygen.
What is the empirical formula of this compound?
Suatu sampel oksida M mengandungi 2.7 g unsur X dan 2.4 g oksigen.
Apakah formula empirik bagi sebatian ini?
[Relative atomic mass: X = 27, O = 16]

A XO
B XO_2
C X_2O
D X_2O_3

http://chngtuition.blogspot.com

38 The following equation shows the reaction of heating zinc carbonate.
    Persamaan berikut menunjukkan tindakbalas pemanasan zink karbonat.

$$ZnCO_3 \rightarrow ZnO + CO_2$$
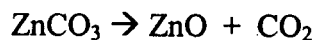
2.5 g zinc carbonate is heated. What is the mass of zinc oxide formed?
2.5 g zink karbonat telah dipanaskan. Berapakah jisim zink oksida yang terbentuk?
[Relative atomic mass: C=12, O=16, Zn=65]

A   1.62 g
B   16.2 g
C   2.50 g
D   3.85 g

39

Relative atomic mass of element M is 40
Jisim atom relatif unsur M ialah 40

1.2 g of element M reacts completely with 0.48 g of element Z to form MZ
compound. Calculate the relative atomic mass of element Z.
*1.2 g unsur M bertindakbalas lengkap dengan 0.48 g unsur Z membentuk sebatian
MZ. Hitungkan jisim atom relatif bagi unsur Z.*

A   12
B   16
C   24
D   32

40 The following equation represents the reaction between sodium hydroxide solution
    and dilute sulphuric acid.
    *Persamaan berikut mewakili tindak balas antara larutan natrium hidroksida dengan
    asid sulfurik cair.*

$$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$$
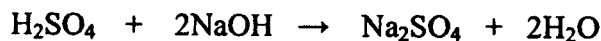
What is the volume of 0.5 mol dm^{-3} sulphuric acid needed to neutralise 50 cm^3 of
0.5 mol dm^{-3} sodium hydroxide solution?
*Apakah isipadu 0.5 mol dm^{-3} asid sulfurik yang diperlukan untuk meneutralkan 50
cm^3 0.5 mol dm^{-3} larutan natrium hidroksida?*

A   75.0 cm^3
B   50.0 cm^3
C   25.0 cm^3
D   12.5 cm^3

http://chngtuition.blogspot.com

41   Which of the following pairs of substances is most suitable to prepare
      copper(II) sulphate salt ?
      Yang manakah antara pasangan bahan kimia berikut paling sesuai untuk
      menyediakan garam kuprum(II) sulfat ?

      A   Copper with dilute sulphuric acid
           Kuprum dan larutan asid sulfurik cair
      B   Copper(II) chloride with dilute sulphuric acid
           Kuprum (II) klorida dan larutan asid sulfurik cair
      C   Copper(II) carbonate with dilute sulphuric acid
           Kuprum(II) karbonat dan larutan asid sulfurik cair
      D   Copper(II) nitrate solution with sodium sulphate solution
           Larutan kuprum(II) nitrat dan larutan natrium sulfat

42   The equation below represents the reaction between calcium carbonate and
      hydrochloric acid.
      Persamaan di bawah mewakili tindak balas antara kalsium karbonat dengan
      asid hidroklorik.

      $$CaCO_3(s) + 2HCl(aq) \longrightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

      Which of the following graphs shows the changes of volume of carbon dioxide
      against the time of reaction?
      Antara berikut, graf yang manakah menunjukkan perubahan isipadu gas karbon
      dioksida terhadap masa tindak balas?

      A   Volume CO_2/cm^3

      B   Volume CO_2/cm^3

      C   Volume CO_2/cm^3

      D   Volume CO_2/cm^3

http://chngtuition.blogspot.com
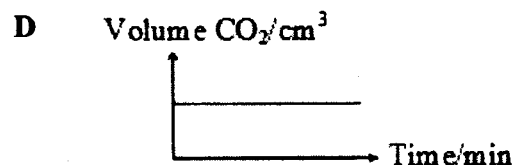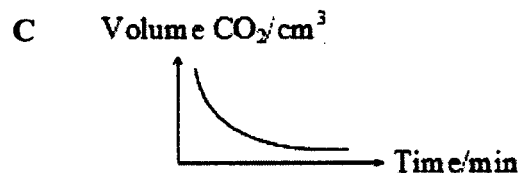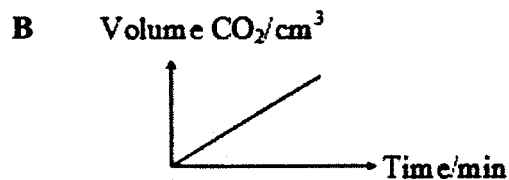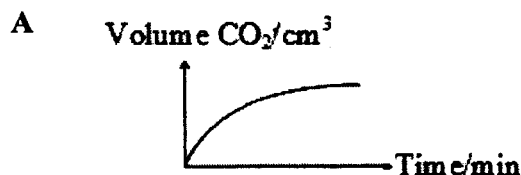
43   Which is **not** the uses of ceramic?
        *Manakah **bukan** suatu kegunaan seramik?*

    A   Spark plugs
        Palam pencucuh
    B   Microchips
        Cip mikro
    C   Tiles
        Jubin
    D   Nail
        Paku

44   Table 1 shows the total volume of oxygen, collected in the decomposition of hydrogen peroxide catalyzed by manganese(IV) oxide.

Jadual 1 menunjukkan jumlah isipadu oksigen yang dikumpul dalam penguraian hidrogen peroksida yang dimangkinkan oleh mangan(IV) oxida.

Time (min)	0	1	2	3	4	5
Volume of gas (cm^3)	0	11.20	23.60	29.70	31.40	31.40

Table 1

What is the average rate of reaction?
Berapakah kadar tindak balas purata?

    A $6.28 \ cm^3 min^{-1}$
    B $7.85 \ cm^3 \ min^{-1}$
    C $9.90 \ cm^3 \ min^{-1}$
    D $11.80 \ cm^3 \ min^{-1}$

45   When X is heated with acidified potassium manganate (VII) solution, it decolourised the potassium managanate (VII) solution.
        The molecular formula for X is
        Apabila X dipanaskan bersama larutan kalium manganat(VII) berasid, ia menyahwarna larutan kalium manganat(VII) berasid itu.
        Formula molekul X ialah

    A. $CH_3COOC_2H_5$
    B. CH_3COOH
    C. C_3H_7OH
    D. C_3H_8

46   Iron(III) ion, Fe^{3+} in solution can be converted into iron(II) ion, Fe^{2+} by adding zinc powder.
      Which of the following can replace zinc powder in the reaction?
      Larutan yang mengandungi ion ferum(III), Fe^{3+} boleh ditukarkan ke ion ferum(II), Fe^{2+} dengan menambahkan serbuk zink.
      Antara berikut yang manakah boleh menggantikan serbuk zink di dalam tindak balas ini?

      A   Bromine water
      B   Potassium iodide solution
      C   Potassium hexacyanoferrate(II) solution
      D   Acidified potassium manganate(VII) solution

47   Which of the following is true when a mixture of carbon and copper(II) oxide is heated strongly?
      Antara berikut yang manakah benar apabila satu campuran karbon dengan kuprum(II) oksida dipanaskan dengan kuat?

      A   The oxide ion loses two electrons
           Ion oksida kehilangan dua elektron
      B   The copper(II) ion releases two electrons
           Ion kuprum(II) melepaskan dua elektron
      C   The copper(II) oxide acts as a reducing agent
           Kuprum(II) oksida bertindak sebagai agen penurunan
      D   The oxidation number of carbon increases from 0 to +4
           Nombor pengoksidaan karbon bertambah dari 0 ke +4

48   Diagram 12 shows the energy profile diagram for the following reaction:
      Rajah 12 menunjukkan gambar rajah aras tenaga bagi tindak balas berikut:

$$W + X \rightarrow Y + Z$$
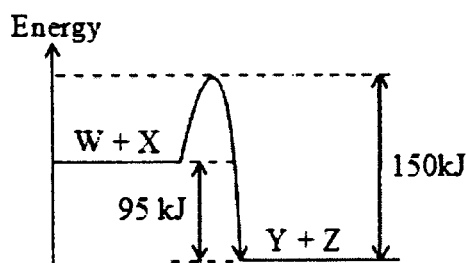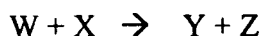
Diagram 12

      What is the value of the activation energy?
      Apakah nilai tenaga pengaktifan?

      A   15kJ
      B   55kJ
      C   95kJ
      D   150kJ

http://chngtuition.blogspot.com

49   25.0cm^3 of hydrochloric acid and 25.0cm^3 of sodium hydroxide solution were mixed together in a polystyrene cup. The mixture was stirred. The temperature of the mixture increased from 29°C to 39°C. Determine the heat released during the experiment.

[Specific heat capacity of a solution = 4.2 J g^{-1} °C^{-1}
Assume that 1 cm^3 of a solution is equal to 1 g of the solution]

25.0 cm^3 asid hidroklorik dan 25.0 cm^3 larutan natrium hidroksida telah dicampurkan di dalam satu cawan polistirena. Campuran ini dikacau. Suhu campuran bertambah dari 29°C kepada 39°C. Tentukan haba yang dibebaskan semasa eksperimen ini.

*[Muatan haba tentu larutan = 4.2 J g^{-1} °C^{-1}
Anggap 1 cm^3 larutan sama dengan 1 g larutan]*

A   1050J
B   2100J
C   6090J
D   8190J

50   Which of the following medicines is used to relief toothache?
Manakah antara ubat-ubat berikut dapat mengurangkan sakit gigi?

A   Paracetamol
B   Streptomycin
C   Barbiturate
D   Quinine

http://chngtuition.blogspot.com

SULIT   4541/2
4541/2
CHEMISTRY
Kertas 2
26 Ogos 2010
2½ jam

No.Kad Pengenalan: ………..………...………..............   Angka Giliran: …...…….…....

Nama : ……………......……...................……………   Tingkatan: ….......…....……….

PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA SEKOLAH MENENGAH NEGERI KEDAH DARUL AMAN

PEPERIKSAAN PERCUBAAN SPM 2010

CHEMISTRY

Paper 2

Two hours and thirty minutes

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa.*

2. *Soalan dalam Bahasa Inggeris mendahului soalan yang sepadan dalam Bahasa Melayu.*

3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam Bahasa Inggeris atau Bahasa Melayu.*

4. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*

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

Kertas soalan ini mengandungi **26 halaman bercetak**

SULIT

Section A
[60 *marks*]
Answer **all** questions
Jawab semua soalan

1 Diagram 1 shows the symbols of atom for element P, Q ,R and S.
Rajah 1 *menunjukkan simbol- simbol atom bagi unsur* P, Q, R dan S.

$$^{23}_{11}P \qquad ^{35}_{17}Q \qquad ^{37}_{17}R \qquad ^{20}_{10}S$$

Diagram 1

(a) (i) What is meant by proton number?
Apakah yang dimaksudkan dengan nombor proton ?

....

[1 *mark*]

(ii) What is the proton number for atom Q ?
Apakah nombor proton untuk atom Q?

....

[1 *mark*]

(b) (i) Write the electron arrangement for atom P.
Tuliskan susunan elektron bagi atom P.

....

[1 *mark*]

(ii) Which group is atom P located in the Periodic Table? Explain your answer.
Di kumpulan manakah atom P berada di dalam Jadual Berkala?
Terangkan jawapan anda.

....

....

[2 *marks*]

(iii) State one chemical property of atom P.
Nyatakan satu sifat kimia atom P.

....

[1 *mark*]

http://chngtuition.blogspot.com

(c)   Which atoms are isotopes? Explain why?
        Atom-atom manakah adalah isotop? Terangkan mengapa?

        ....

        ....

                                                                        [2 marks

(d)   Which atom exists as a monoatom?
        Atom manakah yang wujud sebagai monoatom?

        ....

                                                                        [1 mark

(e)   Arrange atoms P, Q and S in increasing atomic size.
        Susun atom-atom P, Q dan S mengikut saiz atom menaik.

        ....

                                                                        [1 mark

2   Diagram 2.1 shows the structural formula of a carbon compound, Y.
     Rajah 2.1 menunjukkan formula struktur bagi suatu sebatian karbon, Y.
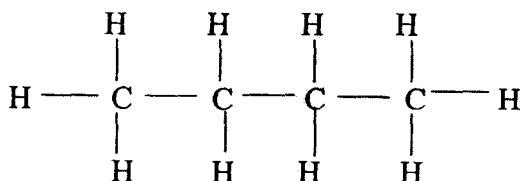
                            Diagram 2.1

(a)   Name the homologous series of compound Y.
      Namakan siri homolog sebatian Y.

      ....

                                                                        [1 mark

(b)   Compound Y burns completely in oxygen to produce carbon dioxide and water
           as in the equation below :
           Sebatian Y terbakar dengan lengkap dalam oksigen untuk menghasilkan karbon
           dioksida dan air seperti dalam persamaan di bawah :

           $$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$$

(i)   Calculate the relative molecular mass of compound Y.
      Hitungkan jisim molekul relatif sebatian Y tersebut.
      [Relative atomic mass: H =1, C = 12]

[1 *mark*]

(ii) Calculate the mass of compound Y burnt if 120 cm^3 of carbon dioxide is
      produced at room temperature.
      *Kira jisim sebatian Y yang terbakar jika 120 cm^3 karbon dioksida terbentuk pada
      keadaan bilik.*
      [1 mol of gas occupies 24 dm^3 at room conditions]

[3 *marks*]

(c)   Diagram 2.2 shows the structural formula of another carbon compound, Z.
   *Rajah 2.2 menunjukkan formula struktur bagi satu lagi sebatian karbon,Z.*
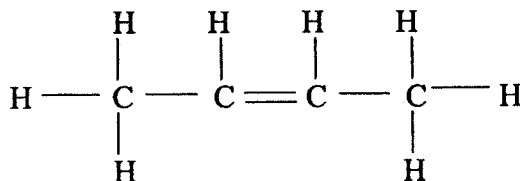
Diagram 2.2

(i)   Name compound Z.
      Namakan sebatian Z.

      ....
[1 *mark*]

(ii) State the functional group of compound Z?
      Nyatakan kumpulan berfungsi bagi sebatian Z?

      ....
[1 *mark*]

(d) Compound Y has isomers. Draw **one** isomer of compound Y.
     Sebatian Y mempunyai isomer. Lukiskan satu isomer bagi sebatian Y.

[1 *mark*]

(e) Compound Y can be used to produce an alcohol.
Sebatian Y boleh digunakan untuk menghasilkan alkohol.
(i) Name the reaction to produce the alcohol.
Namakan tindak balas untuk menghasilkan alkohol.

....
[1 *mark*]

(ii) State **one** condition for this reaction to take place.
Nyatakan satu keadaan untuk tindak balas ini berlaku.

....
[1 *mark*]

3 Table 3 shows the description and observation for two experiments, I and II.
Rajah 3 menunjukkan huraian dan pemerhatian untuk dua eksperimen, I dan II.

Exp.	Description	Observation
I	Electrolysis of 0.01 mol dm^{-3} copper(II) chloride solution using carbon electrodes.	Gas bubbles are released at the anode.
II	Electrolysis of 1.0 mol dm^{-3} copper(II) chloride solution using carbon electrodes.	Gas bubbles are released at the anode.

Table 3

(a) Based on Experiment I :
Berdasarkan Eksperimen 1:

(i) Draw the set-up of the apparatus to carry out this experiment.
In your diagram, show how the product at the anode is collected.
Lukis gambar rajah susunan radas untuk menjalankan eksperimen ini.
Dalam rajah anda, tunjukkan bagaimana hasil di anod dikumpulkan.

[3 *marks*]

http://chngtuition.blogspot.com

(ii)   State how you would verify that the gas released at the anode is oxygen.
Nyatakan bagaimana anda mengesahkan bahawa gas yang terhasil di anod adalah oksigen.

....

....

[1 *mark*]

(iii)   Explain how oxygen gas is produced at the anode.
Terangkan bagaimana gas oksigen dihasilkan di anod.

....

....

[2 *marks*]

(b)   Based on Experiment II:
Berdasarkan Eksperimen II:

(i)   Write the formulae of ions that are attracted to the anode.
Tuliskan formula bagi ion-ion yang tertarik ke anod.

....

[1 *mark*]

(ii)   State the ion that is selected to be discharged at the anode. Explain your answer.
Nyatakan ion yang dipilih untuk didiscas di anod. Terangkan jawapan anda.

....

....

[2 *marks*]

(iii)   Write the half equation for the reaction at the anode.
Tuliskan setengah persamaan untuk tindak balas di anod.

....

[1 *mark*]

http://chngtuition.blogspot.com

4   An experiment is carried out to investigate the neutralisation reaction between 1.0 mol dm^{-3} of sulphuric acid and 25 cm^3 of sodium hydroxide solution. A few drops of phenolphthalein are added to the sodium hydroxide solution in the conical flask. The acid is added slowly into the conical flask until the end point . The result of the experiment is shown in Table 4.

Satu eksperimen dijalankan untuk menyiasat tindak balas peneutralan antara 1.0 mol dm^{-3} asid sulfurik dan 25 cm^3 larutan natrium hidroksida. Beberapa titis penunjuk fenolftalein ditambah kepada larutan natrium hidroksida di dalam kelalang kon. Asid ditambahkan perlahan-lahan ke dalam kelalang kon sehingga takat akhir.

Keputusan eksperimen adalah seperti yang ditunjukkan dalam Jadual 4.

	1	2	3
Initial reading of burette (cm^3) *Bacaan awal buret (cm^3)*	17.30	17.00	17.70
Final reading of burette (cm^3) *Bacaan awal buret (cm^3)*	39.70	39.20	39.70
Volume of acid used (cm^3) *Isipadu asid yang digunakan (cm^3)*			

Table 4

(a)   State the colour change of phenolphthalein at the end point.
Nyatakan perubahan warna fenolftalein pada takat akhir.

....

[1 *mark*]

(b)   Complete Table 4 by calculating the volume of sulphuric acid used in the experiment.
Lengkapkan Jadual 4 dengan menghitung isipadu asid sulfurik yang digunakan dalam eksperimen ini.

[2 *marks*]

c)   Write the chemical equation for the reaction in this experiment.
Tuliskan persamaan kimia bagi tindak balas yang berlaku dalam eksperimen ini.

....

[2 *marks*]

(d) (i) Calculate the average volume of sulphuric acid used in this reaction.
Hitung purata isipadu asid sulfurik yang diguna dalam tindak balas ini.

[1 *mark*]

(ii) Calculate the number of mol of sulphuric acid used in this reaction.
Hitung bilangan mol asid sulfurik yang diguna dalam tindak balas ini.

[1 *mark*]

(e) Name another substance that can be used to replace phe nolphthalein.
Namakan satu bahan lain yang dapat menggantikan fenolftalein.

....

[1 *mark*]

(f) Draw a labeled functional apparatus set up used in this experiment.
Lukiskan gambar rajah berlabel bagi susunan radas yang berfungsi yang digunakan dalam eksperimen ini.

[2 *marks*]

5

Diagram 5 .1 shows the apparatus set-up of an experiment to investigate the transfer of electrons at a distance.

Rajah 5.1 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji pemindahan elektron pada suatu jarak..
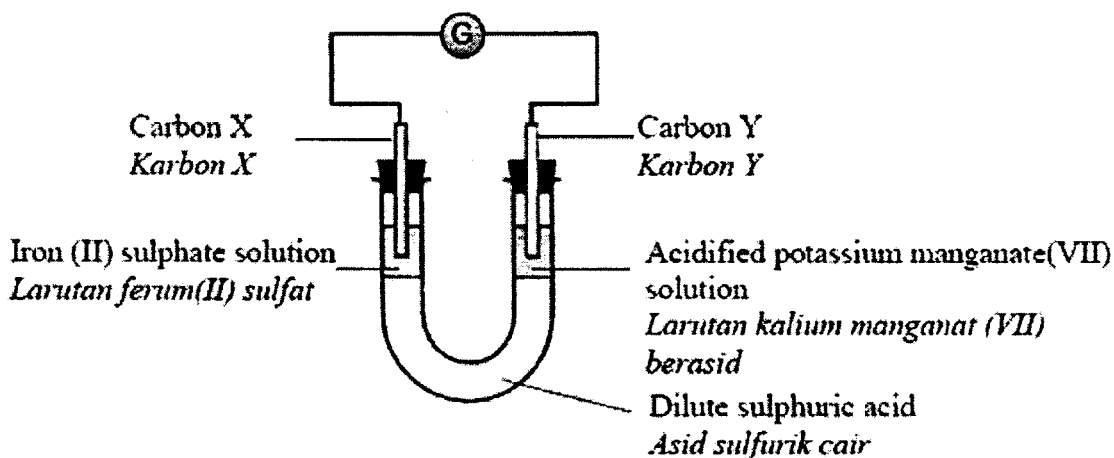

Carbon X
Karbon X

Carbon Y
Karbon Y

Iron (II) sulphate solution
Larutan ferum(II) sulfat

Acidified potassium manganate(VII) solution
Larutan kalium manganat (VII) berasid

Dilute sulphuric acid
Asid sulfurik cair

Diagram 5.1

(a)   Name of the oxidizing agent in this reaction.
       Nama kan agen pengoksidaan dalam tindak balas ini.

       ....
                                                                                                    [1 *mark*]

(b)   Write the half equation for the reaction at carbon X.
       Tuliskan setengah persamaan untuk tindak balas di karbon X.

       ....
                                                                                                    [1 *mark*]

(c)   State one observation in this experiment.
       Nyatakan satu pemerhatian dalam eksperimen ini.

       ....
                                                                                                    [1 *mark*]

(d)   Draw the direction of electron flow in Diagram 5.1
       Lukiskan arah aliran elektron dalam Rajah 5.1

                                                                                                    [1 *mark*]

http://chngtuition.blogspot.com

(e) The half equation for the reaction at carbon Y is as follows:
Setengah persamaan bagi tindak balas di karbon Y adalah seperti berikut:

$$MnO_4^- + 8H_2O + 5e \rightarrow Mn^{2+} + 4H_2O$$
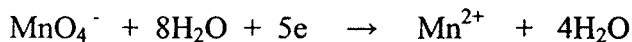
Does the reaction at carbon Y involve oxidation or reduction?
Explain your answer in terms of oxidation number.
Adakah tindak balas di karbon Y melibatkan pengoksidaan atau penurunan?
Terangkan jawapan anda berdasarkan nombor pengoksidaan.

....

....

[2 *marks*]

(f) Diagram 5.2 shows the apparatus set-up to investigate the displacement of halogen from its halide solution. Chlorine water is added to a test tube containing potassium iodide solution and an organic solvent, 1,1,1-trichloroethane.
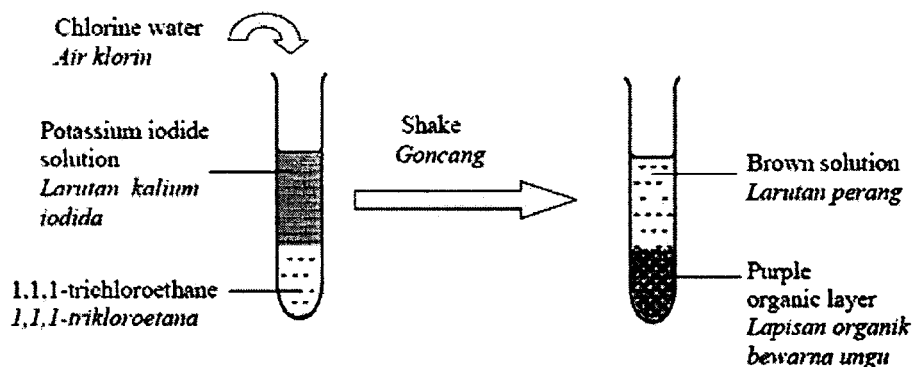
Rajah 5.2 menunjukkan susunan radas untuk mengkaji penyesaran halogen daripada larutan halidanya. Air klorin ditambah ke dalam tabung uji yang mengandungi larutan kalium iodida dan pelarut organik 1,1,1-trikloroetana.

Diagram 5.2

(i) Write an ionic equation for the displacement reaction.
Tuliskan persamaan ion bagi tindak balas penyesaran itu.

....

[1 *mark*]

(ii) State the function of chlorine water?
Nyatakan fungsi air klorin?

....

[1 *mark*]

http://chngtuition.blogspot.com

(iii)   State the change of oxidation number for iodine.
Nyatakan perubahan nombor pengoksidaan bagi iodin.

....

[1 *mark*]

(iv)   Name another reagent that can replace chlorine water.
Namakan satu bahan uji lain yang boleh menggantikan air klorin.

....

[1 *mark*]

6   An experiment was conducted to investigate the effect of temperature on rate of reaction as shown in Figure 6.
5 cm^3 of 2.0 mol dm^{-3} hydrochloric acid is added to 50 cm^3 of 0.1 mol dm^{-3} of sodium thiosulphate solution at different temperature. The time taken for a fixed quantity of sulphur produced was recorded as shown in Table 6.1
Satu eksperimen telah dilakukan untuk mengkaji kesan suhu ke atas kadar tindak balas seperti ditunjukkan dalam Rajah 6.
5 cm^3 asid hidroklorik 2.0 mol dm^{-3} ditambah kepada 50 cm^3 larutan natrium tiosulfat 0.1 mol dm^{-3} pada suhu yang berlainan. Masa yang diambil untuk suatu kuantiti tetap sulfur dihasilkan dicatatkan seperti dalam Jadual 6.1.
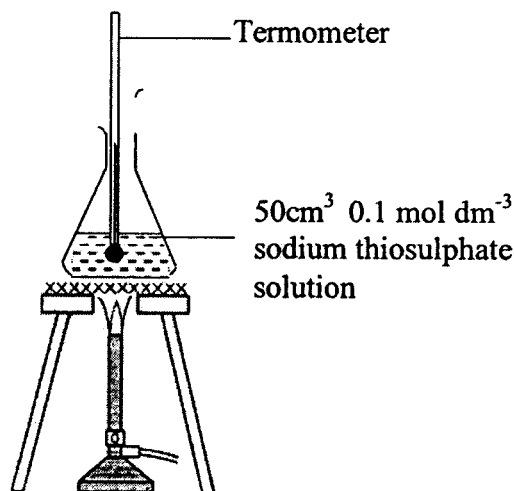
Diagram 6

Set	Temperature / ^{0}C Suhu / ^{0}C	Time, t / s Masa / s	1/ time / s^{-1} 1/masa / s^{-1}
I	28	33	
II	35	24	
III	40	19	
IV	45	16	
V	50	14	

Table 6.1

(a)   Suggest how you would determine that 'a fixed quantity of sulphur is produced' in this experiment.
Cadangkan bagaimana anda dapat menentukan 'kuantiti sulfur yang tetap telah dihasilkan' dalam eksperimen ini.

....

....

[2 marks]

(b)   Based on your answer in (a), define the rate of reaction?
Berdasarkan jawapan anda di (a), takrifkan kadar tindak balas?

....

[1 mark]

(c)   (i)   Complete the value of 1/ time in Table 6.1.
Lengkapkan nilai 1/masa dalam Jadual 6.1

[1 mark]

      (ii)   Draw a graph of temperature against 1/time on the graph paper provided.
Lukiskan graf suhu melawan 1/masa di atas kertas graf yang dibekalkan.

[3 marks]

(d)   (i)   Based on the graph, state the relationship between rate of reaction and temperature.
Berdasarkan graf, nyatakan hubungan antara kadar tindak balas dengan suhu.

....

[1 mark]

http://chngtuition.blogspot.com

(ii)   Explain your answer in (d)(i) using the collision theory.
       Terangkan jawapan anda di (d)(i) menggunakan teori perlanggaran.

       ....

       ....

       ....

       ....

                                                                                           [2 *marks*]

http://chngtuition.blogspot.com

Graph of temperature against 1/time
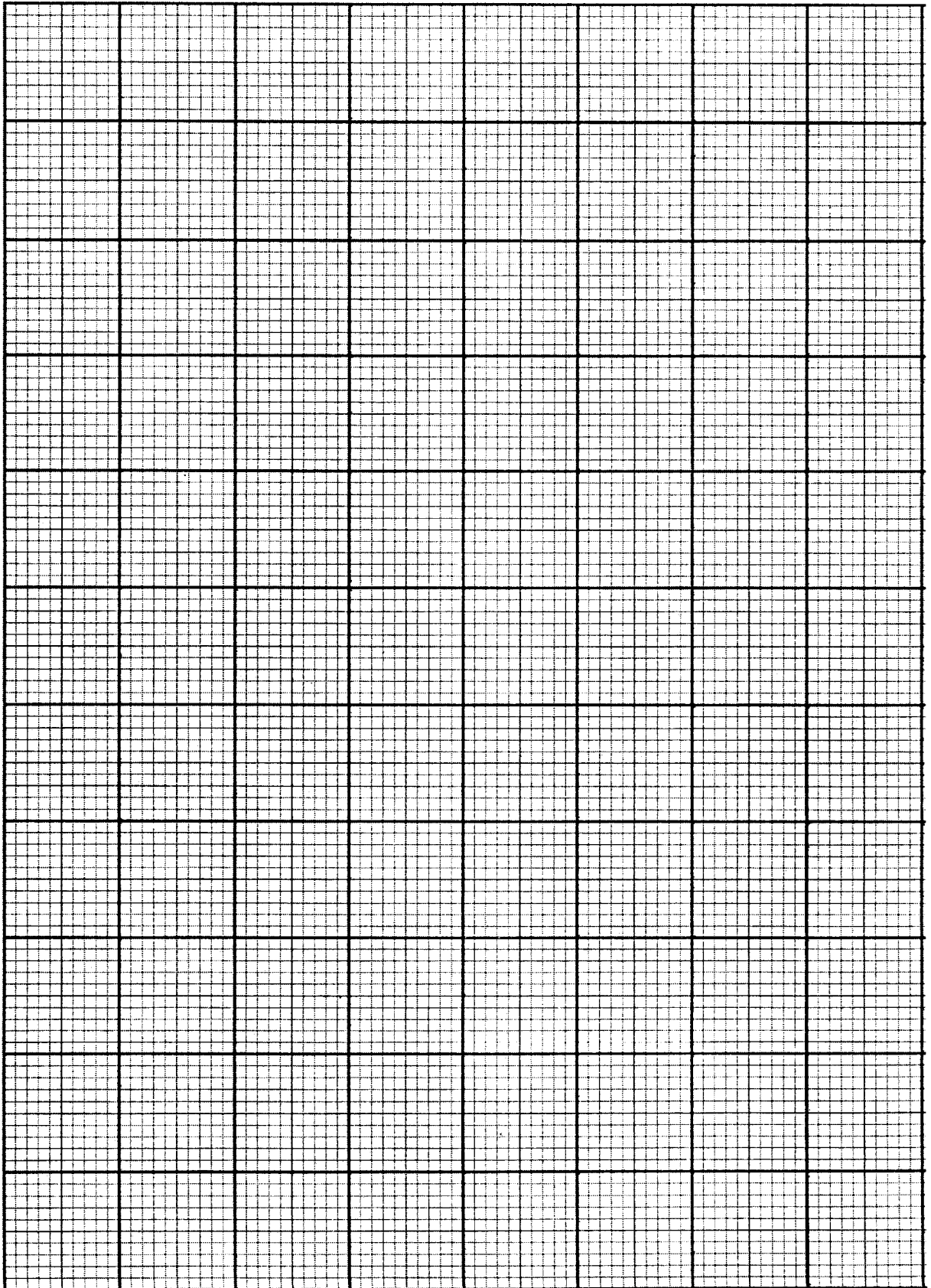
Section B
[20 *marks*]
Answer any **one** question.
*Jawab mana-mana **satu** soalan.*

7   Electron arrangement for atoms of three different elements are given in Table 7 below. The alphabets used do not represent the actual symbol of elements.
Susunan elektron atom untuk tiga unsur adalah seperti dalam Jadual 7 di bawah. Huruf-huruf yang digunakan tidak mewakili simbol sebenar unsur.

Atom	Electron arrangement *Susunan elektron*
X	2.8.1
Y	2.8.7
Z	2.8.8

Table 7

(a)   From the given information, explain the position of element Y in the Periodic Table.
Berdasarkan maklumat yang diberikan, terangkan kedudukan unsur Y di dalam Jadual Berkala.

[4 *marks*]

b)   State the group in the Periodic Table where element X is placed. Explain the changes in atomic size when moving down this group. Explain, by giving reason why the reactivity of the elements in this group changes when moving down the group.
Nyatakan kumpulan untuk unsur X di dalam Jadual Berkala. Terangkan perubahan saiz atom apabila menuruni kumpulan ini. Terangkan juga dengan memberi sebab-sebab mengapa kereaktifan unsur berubah apabila menuruni kumpulan ini.

[7 *marks*]

c)   Atom of element X can form a chemical bond with oxygen. State the type of bond and explain how the bond is formed.
(Proton number of oxygen = 8)
Atom unsur X dapat membentuk satu ikatan kimia dengan oksigen. Nyatakan jenis ikatan dan terangkan bagaimana ikatan ini terbentuk.

[7 *marks*]

d)   Can atom of element Z form a chemical bond with atom of element X dan Y? Explain your answer.
Bolehkah atom unsur Z membentuk ikatan kimia dengan atom unsur X dan Y? Terangkan jawapan anda.

[2 *marks*]

http://chngtuition.blogspot.com

8 Diagram 8.1 shows the apparatus set up of an experiment to compare the hardness of a pure metal and its alloy.
Rajah 8 .1 menunjukkan susunan radas bagi satu eksperimen untuk membandingkan kekerasan logam tulen dengan aloinya.

1 kg weight

Steel ball
Metal block
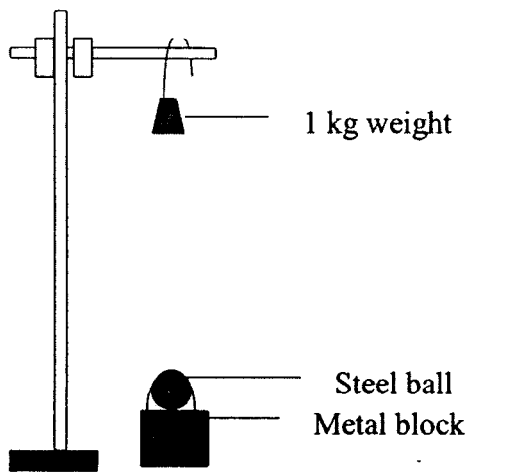
Diagram 8.1

(a) Name a suitable metal block and an alloy of the metal to be used in the experiment.
Namakan blok logam dan aloi yang sesuai digunakan dalam eksperimen tersebut.

[2 *marks*]

(b) The results obtained from the experiment are recorded in table 8.2.

Type of block	Diameter of dent/cm		Average/cm
	1	2	
Diameter of dent on metal block/cm	3.00	3.20	
Diameter of dent on alloy block/cm	1.90	2.00	

Table 8.2

Calculate the average diameter for both the blocks. Explain the differences.
Hitungkan diameter purata untuk kedua-dua blok. Terangkan perbezaannya.

[8 *marks*]

(c)   These information are written on the back of a soft drink pack.
Maklumat berikut ditulis di belakang sebuah kotak minuman ringan.

> **Ingredients:**
> *Ramuan:*
>
>   **Water, aspartame, citric acid, octyl butanoate and tartazine**
>
>   *Air, aspartame, asid sitrik, oktil butanoat dan tartazin*

Based on the ingredients used, classify the types of food additives used in this soft drink.
Berdasarkan ramuan yang digunakan, kelaskan jenis bahan tambah yang terkandung dalam minuman ringan ini.

[4 *marks*]

(d)

> Patient X suffers from tuberculosis which is caused by a certain bacteria.
> Patient Y suffers from long depression caused by an unfortunate accident.
> *Pesakit X mengalami batuk kering yang disebabkan oleh sejenis bakteria.*
> *Pesakit Y mengalami tekanan perasaan yang berpanjangan akibat satu kemalangan.*

Suggest a type of medicine that should be taken by each patient, the prescription that must be followed and a reason why the prescription must be followed by them.
Cadangkan ubat yang patut diberikan kepada setiap pesakit, preskripsi yang perlu dipatuhi dan mengapa preskripsi tersebut perlu dipatuhi oleh mereka.

[6 *marks*]

Section C

[20 *marks*]

Answer any **one** question.

Jawab mana-mana satu soalan.

9   Diagram 9.1 shows a chemical cell.

Rajah 9.1 menunjukkan sebuah sel kimia.
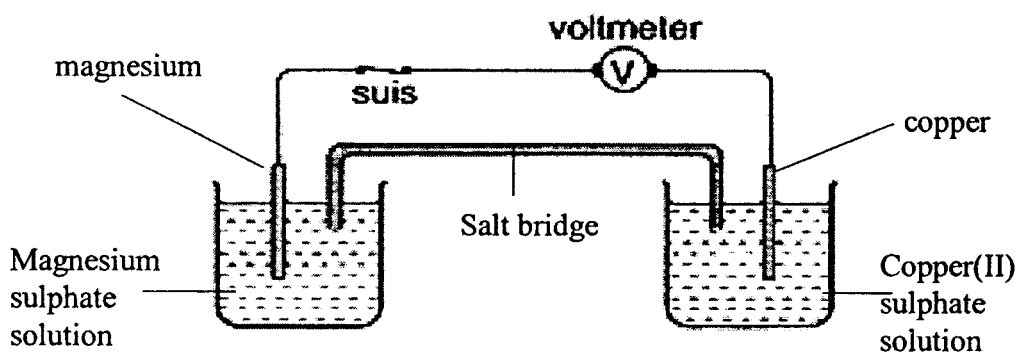
Diagram 9.1

The reaction that takes place in this cell is a redox reaction

Tindak balas yang berlaku di dalam sel di atas adalah satu tindak balas redoks

---

(a)   Explain the above statement. Your explanation should include :

Terangkan pernyataan di atas. Penerangan anda perlu mengandungi :

- **the definition of redox reaction**
  definisi tindak balas redoks
- **the half equations for the reactions at both the terminals**
  setengah persamaan untuk tindak balas yang berlaku di kedua-dua terminal

[*6 marks*]

(b)   Diagram 9.2 shows two types of cells.
Rajah 9.2 menunjukkan dua jenis sel.
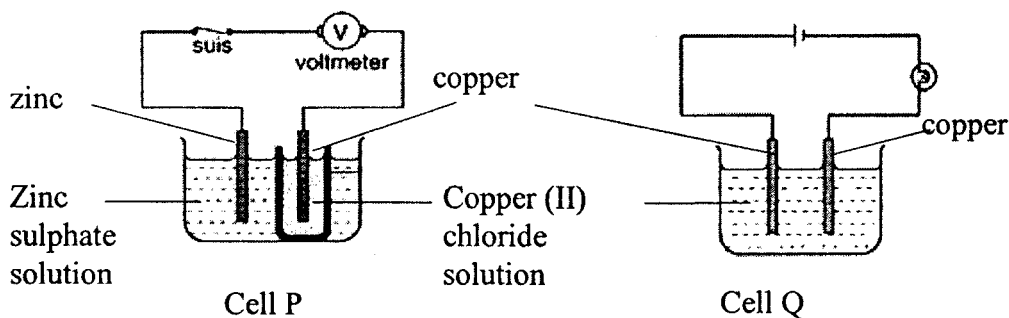
Diagram 9.2

Compare and contrast cell P and cell Q. Include in your answer
- the energy change in the cells
- the observations and half equations for the reactions at the electrodes in both cells.

Banding dan bezakan sel P dan sel Q. Sertakan dalam jawapan anda
- *perubahan tenaga di dalam sel-sel tersebut*
- *pemerhatian dan setengah persamaan bagi tindakbalas di elektrod-elektrod di kedua-dua sel.*

[6 *marks*]

(c)   A student intends to electroplate an iron spoon with silver to prevent it from rusting.
Seorang pelajar ingin menyadur kan sudu besi dengan argentum untuk mengelakkannya daripada berkarat.

Design a laboratory experiment to electroplate the iron spoon.
Rancangkan satu eksperimen untuk menyadurkan sudu besi tersebut.

Your answer should consist of the following
- Procedures of the experiment.
- A labelled diagram showing the set up of apparatus.
- Half equations for the reactions at both electrodes.
- Observation at both electrodes

Jawapan anda hendaklah mengandungi perkara-perkara berikut:
- *Langkah-langkah eksperimen.*
- *Gambar rajah susunan radas berlabel.*
- *Setengah persamaan bagi tindak balas di kedua-dua elektrod.*
- *Pemerhatian di kedua-dua elektrod.*

[8 *marks*]

http://chngtuition.blogspot.com

10 (a) What is meant by the heat of combustion of alcohol ?
Apakah maksud haba pembakaran alkohol ?

[2 *marks*]

(b) Table 10 shows the molecular formula and the heat of combustion for alcohol X and alcohol Y.
Jadual 10 menunjukkan formula molekul dan haba pembakaran bagi alkohol X dan alkohol Y.

Alcohol *Alkohol*	Molecular Formula *Formula molekul*	Heat of Combustion/ kJ mol^{-1} *Haba Pembakaran/ kJ mol^{-1}*
X	C_3H_7OH	-2100
Y	C_4H_9OH	-2877

Table 10

Based on the information in Table 10, compare the heat of combustion between alcohol X and alcohol Y. Explain why there is a difference in the values of the heat of combustion between alcohol X and alcohol Y.
Berdasarkan maklumat dalam Jadual 10, bandingkan haba pembakaran antara alkohol X dan alkohol Y. Terangkan mengapa nilai haba pembakaran bagi alkohol X dan alkohol Y berbeza.

[3 *marks*]

(c) Name **one** example of an alcohol and describe a laboratory experiment to determine the heat of combustion of that alcohol.

In your description, include a labelled diagram and the calculation involved.

[Relative atomic mass : C=12, O=16 , H=1]

[Specific heat capacity of solution = 4.2.J g^{-1} °C^{-1} ;Density of solution =1gcm^{-3}]

Dengan menggunakan satu contoh alkohol yang dinamakan, huraikan satu eksperimen makmal untuk menentukan haba pembakaran alkohol itu. Dalam penerangan anda, sertakan gambar rajah berlabel dan langkah pengiraan yang terlibat.

[Jisim atom relatif : C=12, O= 16, H=1]

[Muatan haba tentu larutan = 4.2 J g^{-1} °C^{-1} ; Ketumpatan larutan = 1 g cm^{-3}]

[12 *marks*]

(d) In an experiment to determine the heat of displacement, excess zinc is added to 100 cm^3 of 0.5 mol dm^{-3} silver nitrate solution. Calculate the temperature change if the heat of displacement is -105 kJ mol^{-1}

[Specific heat capacity of the solution = 4.2Jg^{-1} °C^{-1}; Density of solution=1gcm^{-3}]

Dalam satu eksperimen untuk menentukan haba penyesaran, zink berlebihan ditambahkan kepada 100 cm^3 0.5 mol dm^{-3} larutan argentum nitrat. Hitungkan perubahan suhu jika haba penyesaran dalam eksperimen itu ialah -105 kJ mol^{-1}.

[Muatan haba tentu larutan =4.2 Jg^{-1} °C^{-1}; Ketumpatan larutan = 1gcm^{-3}]

[3 *marks*]

END OF QUESTION PAPER

SULIT
4541/3
CHEMISTRY
Kertas 3
26 Ogos. 2010
1½ jam

4541/3

No. Kad Pengenalan: …………................…......…….....   Angka Giliran: ......……….......

Nama: ……………….......…..…..............…………….   Tingkatan: ……….....…….…..

PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA SEKOLAH MENENGAH NEGERI KEDAH DARUL AMAN

PEPERIKSAAN PERCUBAAN SPM 2010

CHEMISTRY

Paper 3

One hour and thirty minutes

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa.*

2. *Soalan dalam Bahasa Inggeris mendahului soalan yang sepadan dalam Bahasa Melayu.*

3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam Bahasa Inggeris atau Bahasa Melayu.*

4. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*

Untuk Kegunaan Pemeriksa		
Soalan	Markah penuh	Markah diperoleh
1	18	
2	15	
3	17	
JUMLAH		

Kertas soalan ini mengandungi **10 halaman bercetak**

1.

Group 1 elements also known as alkali metals are very reactive metals **These elements react actively with air (oxygen) and water** *Unsur-unsur Kumpulan 1 yang juga dikenali sebagai logam alkali adalah sangat aktif* *Unsur-unsur ini bertindak balas secara aktif dengan udara (oksigen) dan air*

Diagram 1 shows the set-up of apparatus for an experiment to compare the reactivity of alkali metals with oxygen.
Rajah 1 menunjukkan susunan radas bagi satu eksperimen untuk membandingkan kereaktifan logam-logam alkali dengan oksigen.

Gas jar

Oxygen gas
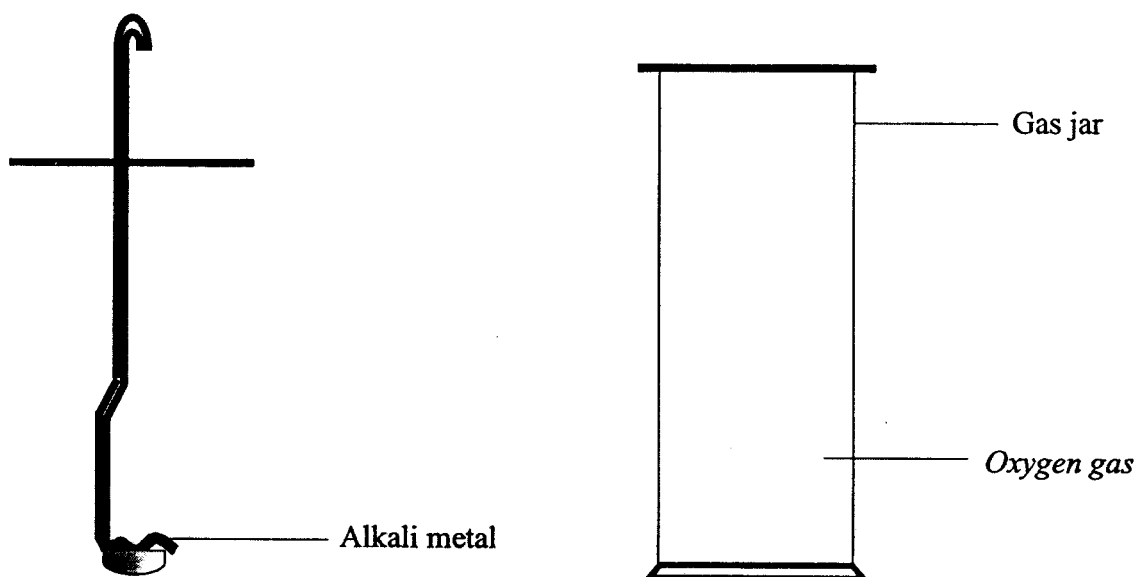
Alkali metal

Diagram 1

The experiment is carried out using small pieces of lithium, sodium and potassium respectively to react with oxygen gas.
Observations on the alkali metals in the experiment are shown in Table 1
Eksperimen dijalankan menggunakan kepingan kecil litium, natrium dan kalium secara berturutan bertindak balas dengan gas oksigen.
Pemerhatian ke atas logam-logam alkali dalam eksperimen ditunjukkan dalam Jadual 1

http://chngtuition.blogspot.com
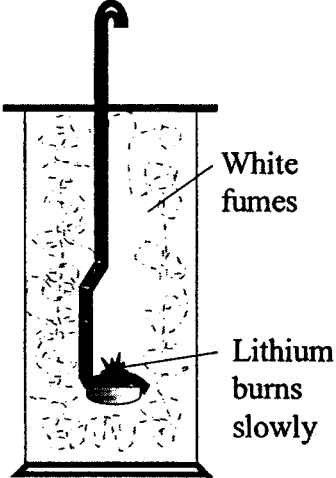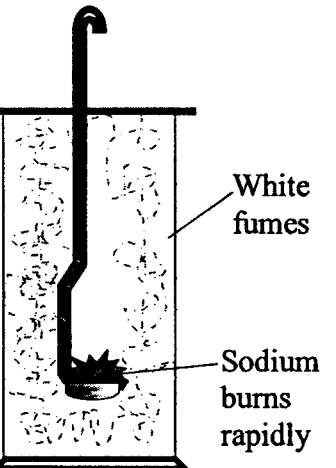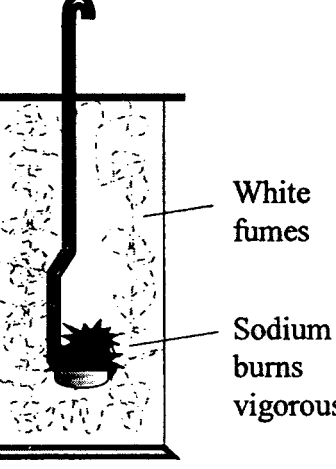
Set	Set-up of apparatus *Susunan radas*	Observation *Pemerhatian*	Inference *Inferens*
I	White fumes Lithium burns slowly		
II	White fumes Sodium burns rapidly		
III	White fumes Sodium burns vigorously		

Table 1

(a) Write the observation and inference for each reaction of the alkali metals towards oxygen in Table 1
Tuliskan pemerhatian dan inferens bagi setiap tindak balas logam alkali terhadap oxygen dalam Jadual 1

[6 *marks*]

http://chngtuition.blogspot.com

(b) Based on the experiment, state
Berdasarkan eksperimen, nyatakan
   (i)   the manipulated variable
         pemboleh ubah yang dimanipulasikan

   ....

   (ii) the responding variable
         pemboleh ubah yang bergerak balas

   ....

   (iii) the constant variable
         pemboleh ubah yang dimalarkan

   ....

[3 *marks*]

(c) State the hypothesis for the experiment.
Nyatakan hipotesis bagi eksperimen ini.

....

....

[3 *marks*]

(d) Based on the observation in Table 1, arrange lithium, sodium and potassium in ascending order of reactivity towards oxygen.
Berdasarkan pemerhatian dalam Jadual 1, susunkan litium, natrium dan kalium mengikut tertib kereaktifan logam terhadap oksigen secara menaik.

....

[3 *marks*]

(e) State the operational definition for the reactivity of Group I elements with oxygen.
Nyatakan definisi operasi bagi kereaktifan unsur-unsur Kumpulan 1 dengan oxygen

....

....

[3 *marks*]

2 Diagram 2.1 shows the apparatus for investigating the effect of the quantity of manganese(IV) oxide as catalyst on the rate of decomposition of hydrogen peroxide.
Rajah 2.1 menunjukkan susunan radas untuk mengkaji kesan kuantiti mangkin mangan(IV) oksida terhadap kadar penguraian hidrogen peroksida.
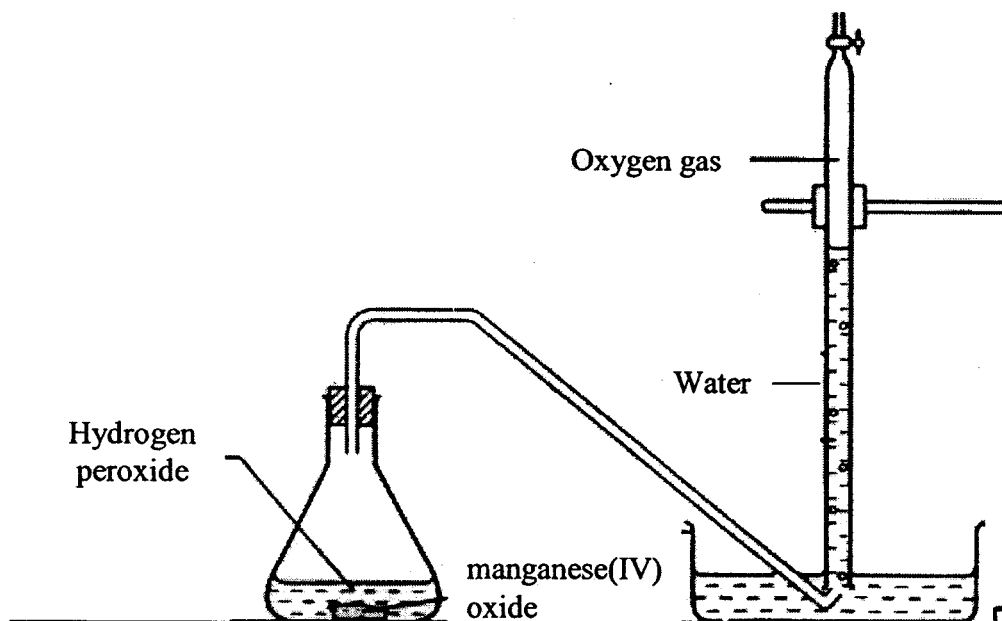
Diagram 2.1

The oxygen gas produced is collected in a burette.
Table 2.1 and 2.2 show the results of two experiments, **Experiment I** and **Experiment II** that were carried out using different quantities of catalyst.

Gas oksigen yang dihasilkan dikumpulkan di dalam buret.
Jadual 2.1dan 2.2 menunjukkan keputusan dua eksperimen, Eksperimen I dan Eksperimen II yang telah dijalankan dengan menggunakan kuantiti mangkin yang berbeza.

http://chngtuition.blogspot.com

Experiment I : 0.1 g of powdered manganese(IV) oxide
Eksperimen I : 0.1 g serbuk mangan(IV) oksida

Time(s) Masa(s)	Burette reading(cm³) Bacaan buret (cm³)	Volume of gas evolved(cm³) Isi padu gas yang terbebas (cm³)
0	50.00	0.00
30	36.00	14.00
60		
90		
120	13.50	36.50
150	10.00	40.00
180	8.00	42.00
210	2.00	48.00
240	2.00	48.00

Table 2.1

Diagram 2.2 shows the burette readings at 60 seconds and 90 seconds
Rajah 2.2 menunjukkan bacaan buret pada saat ke- 60 dan saat ke-90

At 60 seconds
Pada saat ke-60

At 90 seconds
Pada saat ke-90
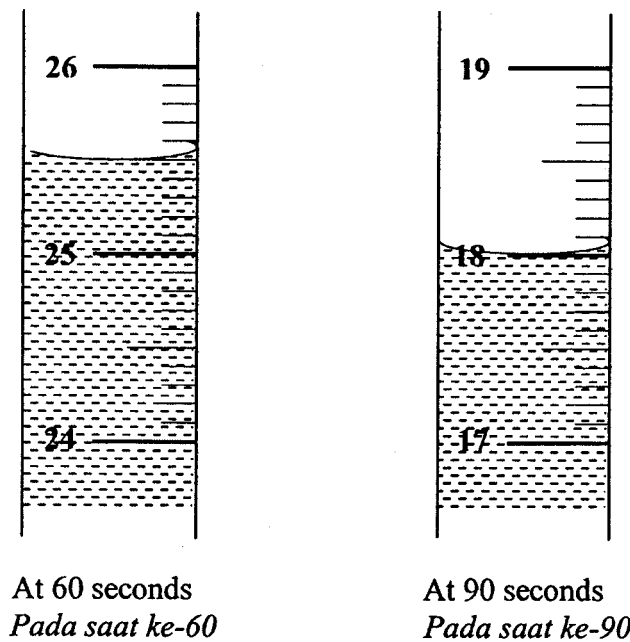
Diagram 2.2

(a)   (i) Based on Diagram 2.2, record the burette readings and volume of gas
            evolved at 60 seconds and 90 seconds in Table 2.1
            Berdasarkan Rajah 2.2 rekodkan bacaan buret dan isi padu gas yang
            terbebas pada saat ke-60 dan saat ke-90 dalam Jadual 2.1

[*3 marks*]

       (ii) Determine the average rate of reaction for **Experiment I.**
            Tentukan kadar tindak balas purata bagi Eksperimen I.

[*3 marks*]

Experiment II : 0.4 g of powdered manganese(IV) oxide
Eksperimen II : 0.4 g serbuk mangan(IV) oksida

Time(s) *Masa(s)*	Burette reading(cm^3) *Bacaan buret (cm^3)*	Volume of gas evolved(cm^3) *Isi padu gas yang terbebas (cm^3)*
0	50.00	0.00
30	33.00	17.00
60	19.50	30.50
90	11.00	39.00
120	8.50	41.50
150	5.00	45.00
180	2.00	48.00
210	2.00	48.00
240	2.00	48.00

Table 2.2

http://chngtuition.blogspot.com

(b)   (i)   By using the same axes, draw a graph of volume against time for
      Experiment I and **Experiment II** on the graph paper provided.
      [Use the scale 1cm : 10 seconds for the axes *time* and 2 cm : 1.0 cm^3 gas for
      the axes *volume*]
      *Dengan menggunakan paksi yang sama, lukiskan graf isipadu gas melawan
      masa bagi **Eksperimen I** dan **Eksperimen II** pada kertas graf yang
      disediakan.*
      *[Gunakan skala 1 cm : 10 saat pada paksi masa dan 2 cm : 1.0 cm^3 gas pada
      paksi isipadu.]*

      [3 *marks*]

      (ii) Based on the graphs drawn in (b) (i), state an inference for the two
      experiments.
      *Berdasarkan graf-graf yang telah dilukiskan dalam (b)(i), nyatakan satu
      Inferens untuk kedua-dua eksperimen itu.*

      ....

      ....

      [3 *marks*]

(c)   Based on this experiment, what is the meaning of catalyst?
      Berdasarkan eksperimen ini, apakah maksud mangkin?

      ....

      ....

      [3 marks]

Graph of Volume / cm³ against time / s

http://chngtuition.blogspot.com [Lihat sebelah
SULIT
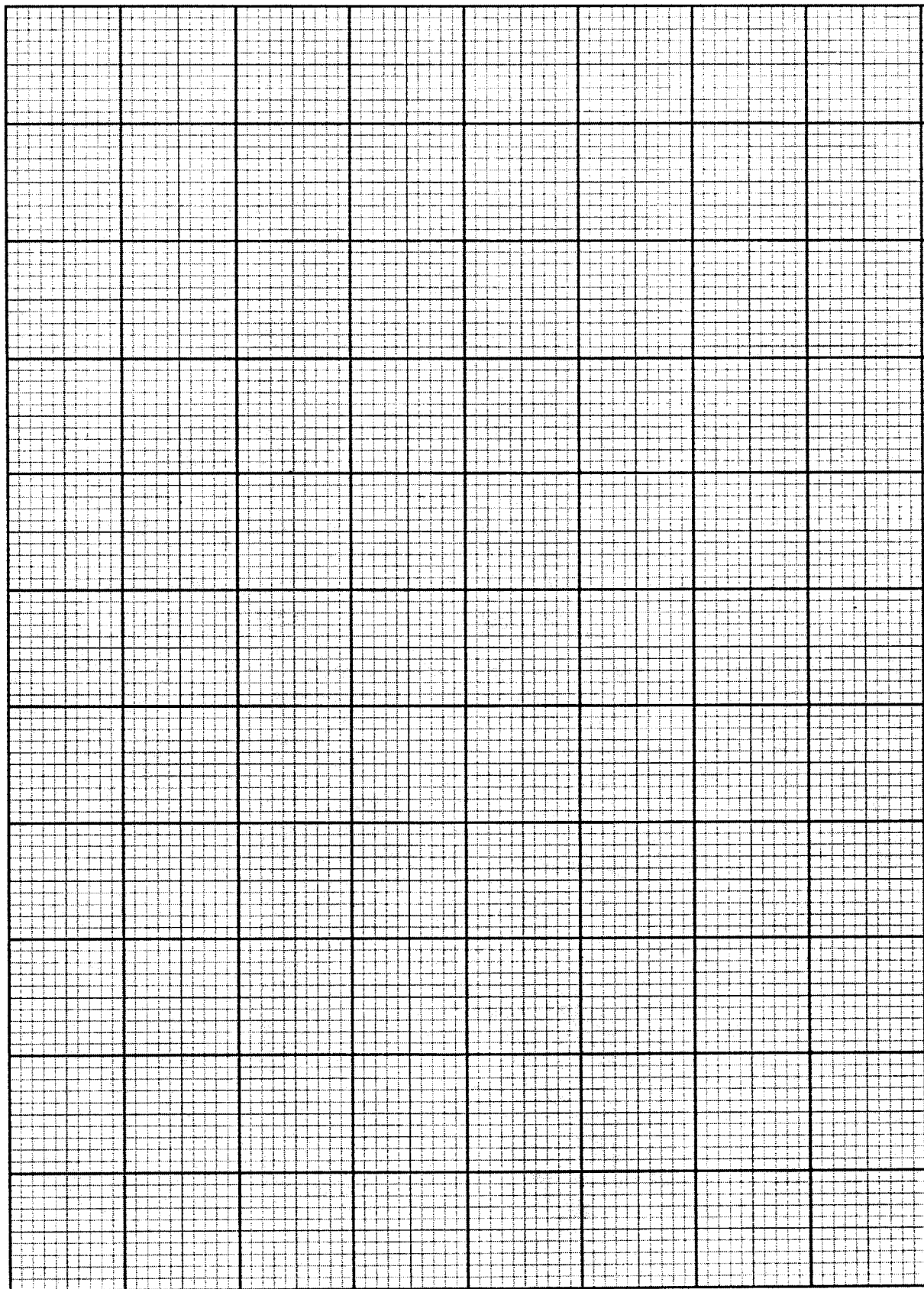
3　Diagram 3 shows the apparatus set-up to study the effects of metals X and Y on the rusting of iron.
Rajah 3 menunjukkan susunan radas untuk mengkaji kesan logam X dan logam Y ke atas pengaratan besi.

Apparatus set-up *Susunan radas*

Hot jelly solution

Iron nail

Metal X / Y
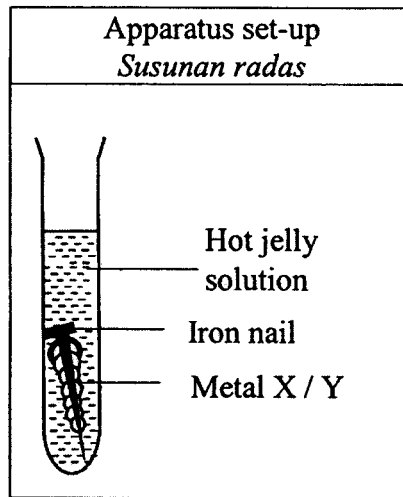
Diagram 3

Referring to the information above, plan a laboratory experiment to investigate the effect of **named** metals X, Y on the rusting of iron.
*Merujuk kepada maklumat di atas, rancangkan satu eksperimen dalam makmal untuk mengkaji kesan logam-logam X , Y yang **dinamakan** ke atas pengaratan besi.*

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

(a)　Aim of experiment
　　　Tujuan eksperimen

(b)　All the variables
　　　Semua pembolehubah

(c)　Hypothesis
　　　Hipotesis

(d)　List of materials and apparatus
　　　Senarai bahan dan radas

(e)　Procedure
　　　Prosedur

(f)　Tabulation of data
　　　Penjadualan data

[17 *marks*]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT
http://chngtuition.blogspot.com

CHEMISTRY

PAPER		MARKS
Paper 1		50
Paper 2		100
Paper 3		50
	Total	**200**

Jumlah markah diskalakan kepada 100%

CHEMISTRY
Paper 1

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

A = 12 ; B = 13 ; C = 13 ; D = 12

Mark scheme

1   Markah

    (a)   (i)   The number of protons in the nucleus of an atom   1

            (ii) 17   1

    (b)   (i)   2.8.1   1

            (ii) Group 1, because it has one valence electron   1+1

            (iii) Reacts with water to produce hydrogen and metal hydroxide
                   Reacts with oxygen to form metal oxide
                   Reacts with chlorine gas to produce metal chloride
                      [Any one]   1

    (c)   Q and R because they have the same proton number but different   1+1
                nucleon number/ number of neutrons

    (d)   S   1

    (e)   S, Q, P   **1**

                                                  Total   **10**

2   a   alkane   1
   b   (i)   58   1
       (ii)   No. of mole of CO_2 = $\dfrac{120 \text{ cm}^3}{24000 \text{ cm}^3}$ //

                        = 0.005 mol
                                               1

                No of mole of C_4H_{10} = 0.005 / 4 //
                             = 0.00125 mol   1

                Mass of C_4H_{10} = 0.0125 x 58 = 0.0725 g   1
   (c)   (i)   Butene // But – 2 - ene   1
         (ii)   C = C // Double bond between carbon atoms   1

   (d)   Accept any one of the isomers   1

   (e)   (I)   Hydration

                                                1

		(ii)	Catalyst - phosphoric acid Temperature – 300 ^{o}C Pressure - 60 atm.		1

Any one

Total   **10**

3   (a)   (i)   Diagram :   functional   apparatus   1

: label - copper(II) chloride solution
- carbon electrodes   1

: draw test tube to collect gas at anode   1

(ii)   Gas produced is **tested with a glowing (wooden) splinter**   1

Gas relights the glowing (wooden) splinter

(iii)   **Hydroxide ions will be attracted to the anode** and
discharged to **form oxygen molecules**
1
(b)   (i)   Cl$^-$,   OH$^-$ 1

(ii)   Cl$^-$ //   chloride ion   1

Cl$^-$ ion //   chloride ion is more concentrated than OH$^-$ 1
ion // hydroxide ion

(iii)   2 Cl$^-$ → Cl$_2$ + 2e   1
Total   **10**

4   a   Pink to colourless
1
b   Experiment 1= 22.40 cm^3 2= 22.20 cm^3 3= 22.00 cm^3

All correct with two decimal places -   2 marks
All correct with one decimal place /
2 correct with 2 decimal places   -   1 mark   2
c   H$_2$SO$_4$ +   2 NaOH   →   K$_2$ SO$_4$ +   2H$_2$O

Correct formula for reactants and products   1
Balanced equation   1

http://chngtuition.blogspot.com

d (i) Average volume = (22.40 + 22.20 + 22.00) / 3 = 22.30 cm^3

1

ii) The number of mol of sulphuric acid = (22.30 × 1.0) / 1000

= 0.0223 mol

1

e Methyl orange

1

f Functional apparatus set- up : conical flask, burette 1

Label : Sulphuric acid, Potassium hydroxide and phenolphthalein

1

Total **10**

5	(a)		Acidified potassium manganate (VII) solution // Manganate(VII) ions	1	
	(b)		$Fe^{2+} \longrightarrow Fe^{3+} + e^{-}$	1	
	(c)		Green solution turns tbrown // Purple coloured solution becomes colourless	1	
	(d)		From electrode carbon X to Y [show on diagram 4.1]	1	
	(e)		Reduction because the oxidation number of MnO_4^- changes from +7 to +2 / decreases	1 1	
	(f)	(i)	$Cl_2 + 2I^- \longrightarrow I_2 + 2Cl^-$	1	
		(ii)	Acts as an oxidizing agent	1	
		(iii)	-1 to 0	1	
		(iv)	Bromine water // any other suitable oxidizing agent	1	
			Total		**10**

6 (a) [able to explain how to measure a fixed quantity of sulphur
produced correctly]
Example:
- A piece of white paper marked 'X' was placed under the 1
conical flask
- Time taken for (enough sulphur to produce and cover) the 1

mark 'X' disappear from sight

(b) Rate of reaction is the time taken for the 'X' mark to disappear 1
from sight

(c) (i) [able to calculate the 1/ time   correctly]
Example:

1/ time (s^{-1})	0.030	0.042	0.053	0.063	0.071

                           1

(ii) [able to draw the graph correctly]
  1. both axes are labelled correctly   1
  2. All 5 points transferred correctly   1
  3. a straight line   1

(d) (i) [able to state the relationship correctly]
  Example:
  When the temperature increases, the rate of reaction increases 1

(ii) [able to explain using the collision theory correctly]
  Example:
  - Increase in temperature increases the kinetic energy of
  thiosulphate ions / particles // Thiosulphate ions move faster 1
  - Frequency of collision between thiosulphate ions   and
  hydrogen ions increase.
  - Frequency of effective collision increases   1

                   Total **10**

7	(a)	#Atom of element# Y has three shells containing electrons	1	
		Y is in Period 3	1	
		The number of electron valence of #atom# Y is 7	1	
		Y is in Group 17	1	
				4
	(b)	X is in Group 1	1	

		When going down the group, the number of shells containing electrons increases	1
		So atomic size increases.	1
		Atom of each element in the group has 1 valence electron	1
		The valence electron becomes further away from the nucleus.	1
		Therefore, the force of attraction between nucleus and valence electron becomes weaker	1
		It is easier for the atom to donate electron,	1
		so reactivity increases	1
			Max 7
	(c)	X and oxygen form ionic bond	1
		Atom X donates one electron to form X^+ ion	1
		to achieve a stable /octet electron arrangement // (electron arrangement of 2.8)	
		Oxygen atom has an electron arrangement of 2.6	1
		and accept two electrons from two X atoms	1
		to form ion O^{-2}	1
		to achieve a stable/octet electron arrangement // (electron arrangement of 2.8)	1
		X^+ and O^{2-} are attracted to each other and form X_2O	1
		// [Can be inferred from correct electron arrangement diagram]	1
			max 7
	(d)	Cannot	1
		Atom Z has achieved the stable electron arrangement //	
		Atom Z does not need to (donate), accept or share electron with X or Y	1
			2
		Total	20

8	(a)	Metal: copper.	1	
		Alloy: brass//bronze	1	
				2
	(b)	Average diameter:		
		3.10 cm	1	
		1.95 cm	1	
		The size of atoms in metal block are the same// The atoms are arranged in an orderly manner.	1	
		The atoms/layers of atoms can slide easily over each other (when 1 kg weight hit on it.)	1	

http://chngtuition.blogspot.com

As a result the average diameter of dent on metal/copper block is larger/bigger//the metal block is softer. | 1

The sizes of atoms in alloy/bronze/brass block are not the same//alloy/brass/bronze are made up of different elements/copper and zinc/copper and tin | 1

The foreign /zinc/tin atoms disrupt the orderly arrangement of copper/metal atoms | 1

The atoms/layers of atoms cannot slide easily /hardly slide over each other when 1 kg weight hit on it. | 1

As a result the average diameter of dent on alloy/brass/bronze block is smaller//lthe metal block is harder. | 1

Max: 8

8	(c)	Substance/ingredients	Food additives	
		aspartame	sweetener	1
		tartazine	Colouring	1
		octyl butanoate	Flavouring agent	1
		citric acid	anti oxidant	1
				4
	(d)	X : antibiotic		1
		- the patient must complete the whole course		1
		- immunization/ prevent the disease from coming back		1
		Y : anti depressant		1
		- taken only when needed/ do not overdose/ stop when calmer		1
		- could cause addiction/ death if overdose		1
				6
			Jumlah	**20**

9	(a)	1. Redox reaction is a chemical reaction where oxidation and reduction takes place simultaneously.	1
		2. Half equation at negative terminal: $Mg \rightarrow Mg^{2+} + 2e$	1
		3. So, oxidation occurs at the negative terminal.	1
		4. Half equation at the positive terminal: $Cu^{2+} + 2e \rightarrow Cu$	1
		5. Reduction occurs at the positive terminal.	1
		6. Thus , the reaction in this cell is a redox reaction.	1
			6

(b)		Cell P	1 + 1
		Cell Q	

<table>
<tr><td rowspan="1">(b)</td><td>
<p style="text-align:center">Cell P
Cell Q</p>
Energy Change
Chemical energy to electrical energy
Electrical energy to chemical energy
Observation
<u>Negative terminal:</u>
Zinc strip becomes smaller/ mass of zinc decreases
<u>Positive terminal:</u>
A brown solid is deposited// mass of copper increases
<u>Cathode :</u>
A brown solid is deposited// mass of copper increases
<u>Anode:</u>
Anode/ copper strip dissolves
Half equation
Negative terminal:
$Zn \rightarrow Zn^{2+} + 2e$

Positive terminal:
$Cu^{2+} + 2e \rightarrow Cu$
Cathode :
$Cu^{2+} + 2e \rightarrow Cu$

Anode:
$Cu \rightarrow Cu^{2+} + 2e$
</td><td>
1 + 1

1 + 1

1 + 1

6
</td></tr>
<tr><td>
Procedure:

Iron spoon is connected to the negative terminal on the battery while the silver plate is connected to the positive terminal of the battery//Iron spoon is made as cathode while silver plate is made as anode.
Both plates are immersed into the silver nitrate solution.
The circuit is completed

</td><td>
1
1
1
</td></tr>
</table>

				1 1	
		Functional apparatus set-up			
		Label correctly:			
		silver plate			
		Silver nitrate solution			
		Iron spoon		1	
		Observation: Grey /silvery solid is deposited		1	
		Cathode: $Ag^+ + e \rightarrow Ag$		1	
		Anode : $Ag \rightarrow Ag^+ + e$		8	
			Jumlah	**20**	

10	(a)		Heat release when **1 mol of a alcohol** is **completely burnt in excess oxygen** to produce carbon dioxide and water.	1 1
	(b)		Heat of combustion of alcohol Y is higher than alcohol X	1
			The molecular size/ number of carbon atom per molecule	
			Alcohol Y is bigger/ higher than alcohol X	1
			Alcohol Y produce more carbon dioxide and water molecule	
			than alcohol X // release more heat energy.	1/3

	(c)	Methanol/ ethanol / propanol / any alcohol	1
		Diagram : labeled	1
		: apparatus functional	1/3

		Procedure :	
		1. (100-250 cm^3) of water is measured and poured into a copper/tin can and the copper can is placed on a tripod stand .	
		2. The initial temperature of the water is measured and recorded .	1
			1
		3.A spirit lamp with ethanol/ any alcohol is weighed and its mass is recorded.	1
		4. The lamp is then placed under the copper can and the wick of the lamp is light up immediately.	1
		5. The water in the can is stirred continuously until the temperature of the water increases by about 30 °C	1
		6.The flame is put off and the highest temperature reached by the water is recorded..	1
		7.The lamp and its content is weighed and the mass is recorded.	1
			Max 6
		Data:	
		The highest temperature of water = t2	
		The initial temperature of water = t1	

		Increase in temperature, $= t_2-t_1 = \theta$	
		Mass of lamp after burning $= m_2$	
		Mass of lamp before burning $= m_1$	1
		Mass of lamp ethanol burnt, m $= m_2 – m_1 = m$	
		Calculation:	
		Number of mole of ethanol / any alcohol, C_2H_5 OH, n = m/46	
		The heat energy given out during combustion by ethanol	
		= the heat energy absorbed by water	
		$= 100 \times c \times \theta$ J	1
		Heat of combustion of ethanol = mcθ / n Jmol^{-1} = p	
		= p/1000 kJ	1
			1
			1
			Max3
	(d)	Number of mol silver nitrate = $100\times 0.5/1000$ // 0.05	1
		1 mol of silver nitrate reacted to release 105kJ heat	
		Therefore, 0.05 mol silver nitrate reacted to produce $105\times0.05/1$ /	1
		$= -5.2$kJ /mol	
		$5250 = 100 \times 4.2 \times\theta$	
		$\theta = 12.5\ °C$	1
			3/12
		TOTAL	20

3(a) Pink to colourless

   (b) Experiment 1= 22.40 cm^3 2= 22.20 cm^3 3= 22.00 cm^3

   (c) H_2SO_4 +   2 NaOH   → K_2SO_4 + $2H_2O$

   (d) (i) Average volume = (22.40 + 22.20 + 22.00) / 3 = 22.30 cm^3

      (ii) The number of mol of sulphuric acid = (22.30 × 1.0) / 1000

         = 0.0223 mol

   (e) Funtional set- up : conical flask, burette

      Label : Sulphuric acid, Patassium hydroxide and phenolphthalein

   (f) (i) Add drops of acid a little at a time- towards the end point

(ii) Conical flask with content –shaken during experiment

(g) soluble salt

mark

10.(a) Heat release when **1 mol of a alcohol** is **completely burnt in excess oxygen** to produce carbon dioxide and water.   2/**2**

(b) Heat of combustion of alcohol Y is higher than alcohol X   1

The molecular size/ number of carbon atom per molecule

Alcohol Y is bigger/ higher than alcohol X   1

Alcohol Y produce more carbon dioxide and water molecule

than alcohol X // release more heat energy.   1 / **3**

(c) Methanol/ ethanol / propanol / any alcohol   1

Diagram : labeled   1

: apparatus functional   1

Procedure :

1. (100-250 cm^3) of water is measured and poured into a copper/tin can and the copper can is placed on a tripod stand .   1

2. The initial temperature of the water is measured and recorded .   1

3. A spirit lamp with ethanol/ any alcohol is weighed and its mass is recorded.   1

4. The lamp is then placed under the copper can and the wick of the lamp is light up immediately.   1

5. The water in the can is stirred continuously until the temperature of the water increases by about 30 °C.   1

http://chngtuition.blogspot.com

6. The flame is put off and the highest temperature reached by the water is recorded..   1

7. The lamp and its content is weighed and the mass is recorded.   1

                         Max=6

Data:

The highest temperature of water	$= t2$
The initial temperature of water	$= t1$
Increase in temperature,	$= t2-t1 = \theta$ 1

Mass of lamp after burning	$= m2$
Mass of lamp before burning	$= m1$
Mass of lamp ethanol burnt, m	$= m2 - m1 = m$ 1

Calculation:

Number of mole of ethanol / any alcohol, C_2H_5 OH, $n = m/46$ 1

The heat energy given out during combustion by ethanol

          = the heat energy absorbed by water

       $= 100 \times c \times \theta$ J   1

Heat of combustion of ethanol $= mc\theta / n$ Jmol^{-1} = p

             $= p/1000$ kJ   1

                        Max 3

(d) Number of mol silver nitrate $= 100 \times 0.5/1000 // 0.05$ 1

   1 mol of silver nitrate reacted to release 105kJ heat

   Therefore, 0.05 mol silver nitrate reacted to produce $105 \times 0.05/1$ /

               $= -5.2$kJ /mol   1

$5250 = 100 \times 4.2 \times \theta$

$\theta = 12.5\ °C$ 1

Mark scheme

1				Marks
	(a)	(i)	The number of protons in the nucleus of an atom	1
		(ii)	17	1
	(b)	(i)	2.8.1	1
		(ii)	Group 1, because it has one valence electron	1+1
		(iii)	Reacts with water to produce hydrogen and metal hydroxide Reacts with oxygen to form metal oxide Reacts with chlorine gas to produce metal chloride [Any one]	1
	(c)		Q and R because they have the same proton number but different nucleon number/ number of neutrons	1+1
	(d)		S	1
	(e)		S, Q, P	**1**
			Total	**10**

2	a		alkane	1
	b	(i)	58	1
		(ii)	No. of mole of CO_2 = $\dfrac{12.0\ cm^3}{24000\ cm^3}$ // = 0.005 mol No of mole of C_4H_{10}. = 0.005 / 4 // = 0.00125 mol Mass of C_4H_{10}. = 0.0125 x 58 = 0.0725 g	1 1 1
	(c)	(i)	Butene // But – 2 - ene	1
		(ii)	C = C // Double bond between carbon atoms	1
	(d)		Accept any one of the isomers	1

http://chngtuition.blogspot.com

	(e)	(I)	Hydration		1
		(ii)	Catalyst - phosphoric acid Temperature – 300 ^{o}C Pressure - 60 atm. Any one		1
				Total	**10**

3	(a)	(i)	Diagram : functional apparatus
			
			    : label - copper(II) chloride solution
			       - carbon electrodes
			
			    : draw test tube to collect gas at anode
				1
				
				1
				
				1

		(ii)	Gas produced is **tested with a glowing (wooden) splinter** **Gas relights the glowing (wooden) splinter**	1
		(iii)	**Hydroxide ions will be attracted to the anode** and discharged to **form oxygen molecules**	1
	(b)	(i)	Cl^{-} , OH^{-}	1
		(ii)	Cl^{-} // chloride ion Cl^{-} ion // chloride ion is more concentrated than OH^{-} ion // hydroxide ion	1 1
		(iii)	$2\,Cl^{-} \rightarrow Cl_{2}\ + 2e$	1
			Total	**10**

	a	From pink to colourless	1

	b	Experiment 1= 22.40 cm^3 2= 22.20 cm^3 3= 22.00 cm^3 All correct with two decimal places - 2 marks All correct with one decimal place / 2 correct with 2 decimal places - 1 mark			2
	c	H_2SO_4 + $2\,NaOH$ $\rightarrow$ K_2SO_4 + $2H_2O$ Correct formula for reactants and products Balanced equation			1 1
	d	(i)	Average volume = (22.40 + 22.20 + 22.00) / 3 = 22.30 cm^3		1
		ii)	The number of mol of sulphuric acid = (22.30 $\times$ 1.0) / 1000 = 0.0223 mol		1
	e		Methyl orange		1
	f	Functional apparatus set- up : conical flask, burette Label : Sulphuric acid, Potassium hydroxide and phenolphthalein			1 1
				Total	**10**

5	(a)		Acidified potassium manganate (VII) solution // Manganate(VII) ions	1	
	(b)		Fe^{2+} $\longrightarrow$ Fe^{3+} $+\ e^-$	1	
	(c)		Green solution turns tbrown // Purple coloured solution becomes colourless	1	
	(d)		From electrode carbon X to Y [show on diagram 4.1]	1	
	(e)		Reduction because the oxidation number of MnO_4^- changes from +7 to +2 / decreases	1 1	

	(f)	(i)	$Cl_2 + 2I^- \longrightarrow I_2 + 2Cl^-$	1	
		(ii)	Acts as an oxidizing agent	1	
		(iii)	-1 to 0	1	
		(iv)	Bromine water // any other suitable oxidizing agent	1	
			Total	**10**	

6	(a)		[able to explain how to measure a fixed quantity of sulphur produced correctly] Example: - A piece of white paper marked 'X' was placed under the conical flask - Time taken for (enough sulphur to produce and cover) the mark 'X' disappear from sight	1 1	
	(b)		Rate of reaction is the time taken for the 'X' mark to disappear from sight	1	
	(c)	(i)	[able to calculate the 1/ time correctly] Example: | $1/\text{time (s}^{-1})$	0.030	0.042	0.053	0.063	0.071
---	---	---	---	---	---		1	
		(ii)	[able to draw the graph correctly] both axes are labelled correctly All 5 points transferred correctly a straight line	1 1 1	
	(d)	(i)	[able to state the relationship correctly] Example: When the temperature increases, the rate of reaction increases	1	
		(ii)	[able to explain using the collision theory correctly] Example: - Increase in temperature increases the kinetic energy of thiosulphate ions / particles // Thiosulphate ions move faster - Frequency of collision between thiosulphate ions and hydrogen ions increase.	1	

			- Frequency of effective collision increases	1	
			Total		**10**

7	(a)	#Atom of element# Y has three shells containing electrons	1	
		Y is in Period 3	1	
		The number of electron valence of #atom# Y is 7	1	
		Y is in Group 17	1	
			4	
	(b)	X is in Group 1	1	
		When going down the group, the number of shells containing electrons increases	1	
		So atomic size increases.	1	
		Atom of each element in the group has 1 valence electron	1	
		The valence electron becomes further away from the nucleus.	1	
		Therefore, the force of attraction between nucleus and valence electron becomes weaker	1	
		It is easier for the atom to donate electron,	1	
		so reactivity increases	1	
			Max 7	
	(c)	X and oxygen form ionic bond	1	
		Atom X donates one electron to form X^+ ion	1	
		to achieve a stable /octet electron arrangement		
		// (electron arrangement of 2.8)		
		Oxygen atom has an electron arrangement of 2.6	1	
		and accept two electrons from two X atoms	1	
		to form ion O^{-2}	1	
		to achieve a stable/octet electron arrangement //	1	
		(electron arrangement of 2.8)		
		X^+ and O^{2-} are attracted to each other and form X_2O	1	
		// [Can be inferred from correct electron arrangement diagram]	1	
			max 7	
	(d)	Cannot	1	
		Atom Z has achieved the stable electron arrangement //		
		Atom Z does not need to (donate), accept or share electron with X or Y	1	

			2
		Total	20

8	(a)	Metal: copper. Alloy: brass//bronze	1 1 2
	(b)	Average diameter: 3.10 cm 1.95 cm	 1 1

	The size of atoms in metal block are the same// The atoms are arranged in an orderly manner.	1	
	The atoms/layers of atoms can slide easily over each other (when 1 kg weight hit on it.)	1	
	As a result the average diameter of dent on metal/copper block is larger/bigger//the metal block is softer.	1	
	The sizes of atoms in alloy/bronze/brass block are not the same//alloy/brass/bronze are made up of different elements/copper and zinc/copper and tin	1	
	The foreign /zinc/tin atoms disrupt the orderly arrangement of copper/metal atoms	1	
	The atoms/layers of atoms cannot slide easily /hardly slide over each other when 1 kg weight hit on it.	1	
	As a result the average diameter of dent on alloy/brass/bronze block is smaller//lthe metal block is harder.	1	
			Max: 8

8	(c)			
		Substance/ingredients	Food additives	
		aspartame	sweetener	1
		tartazine	Colouring	1
		octyl butanoate	Flavouring agent	1
		citric acid	anti oxidant	1
				4
	(d)	X : antibiotic		1
		- the patient must complete the whole course		1
		- immunization/ prevent the disease from coming back		1

		Y : anti depressant	1	
		- taken only when needed/ do not overdose/ stop when calmer	1	
		- could cause addiction/ death if overdose	1	
				6
		Jumlah		**20**

9	(a)	1. Redox reaction is a chemical reaction where oxidation and reduction takes place simultaneously.	1	
		2. Half equation at negative terminal: $Mg \rightarrow Mg^{2+} + 2e$	1	
		3. So, oxidation occurs at the negative terminal.	1	
		4. Half equation at the positive terminal: $Cu^{2+} + 2e \rightarrow Cu$	1	
		5. Reduction occurs at the positive terminal.	1	
		6. Thus , the reaction in this cell is a redox reaction.	1	
			1	6

	(b)		Cell P	Cell Q	
		Energy Change	Chemical energy to electrical energy	Electrical energy to chemical energy	1 + 1
		Observation	Negative terminal: Zinc strip becomes smaller/ mass of zinc decreases Positive terminal: A brown solid is deposited// mass of copper increases	Cathode : A brown solid is deposited// mass of copper increases Anode: Anode/ copper strip dissolves	1 + 1
		Half equation	Negative terminal: $Zn \rightarrow Zn^{2+} + 2e$ Positive terminal: $Cu^{2+} + 2e \rightarrow Cu$	Cathode : $Cu^{2+} + 2e \rightarrow Cu$ Anode: $Cu \rightarrow Cu^{2+} + 2e$	1 + 1
					6

		Procedure: ● Iron spoon is connected to the negative terminal on the battery while the silver plate is connected to the positive terminal of the battery//Iron spoon is made as cathode while silver plate is made as anode. ● Both plates are immersed into the silver nitrate solution. ● The circuit is completed	1 1 1	

Functional apparatus set-up
Label correctly:
     silver plate
     Silver nitrate solution
     Iron spoon

Observation: Grey /silvery solid is deposited

Cathode: $Ag^+ + e \rightarrow Ag$

Anode : $Ag \rightarrow Ag^+ + e$

				1
				1
				1
				1
				1
				8
		Jumlah		**20**

10	(a)		Heat released when **1 mol of a alcohol** is **completely burnt in excess oxygen** to produce carbon dioxide and water.	1 1 2
	(b)		Heat of combustion of alcohol Y is higher than alcohol X	1
			The molecular size/ number of carbon atom per molecule	
			Alcohol Y is bigger/ higher than alcohol X	1
			Alcohol Y produce more carbon dioxide and water molecule	
			than alcohol X // release more heat energy.	1 3

http://chngtuition.blogspot.com

	(c)	Methanol/ ethanol / propanol / any alcohol	1
		Diagram : functional apparatus : label - thermometer , copper can , spirit lamp, water, alcohol	1 1
		Procedure : 1. (100-250 cm3) of water is measured and poured into a copper/tin can and the copper can is placed on a tripod stand .	1
		2. The initial temperature of the water is measured and recorded .	1
		3. A spirit lamp with ethanol/ any alcohol is weighed and its mass is recorded.	1
		4. The lamp is then placed under the copper can and the wick of the lamp is light up immediately.	1
		5. The water in the can is stirred continuously until the temperature of the water increases by about 30 °C	1
		6.The flame is put off and the highest temperature reached by the water is recorded..	1
		7.The lamp and its content is weighed and the mass is recorded. **Max 5**	1
		Data: The highest temperature of water = t2 The initial temperature of water = t1 Increase in temperature, = t2-t1 =	1
		Mass of lamp after burning = m2 Mass of lamp before burning = m1 Mass of ethanol burnt, m = m2 – m1 = m Calculation:	1
		Number of mole of ethanol / any alcohol, C_2H_5OH, n = m/46 The heat energy given out during combustion by ethanol = the heat energy absorbed by water = $100 \times c \times$ J	1
		Heat of combustion of ethanol = mc / n $Jmol^{-1}$ = p = -p/1000 kJ	1 1 **Max 12**

	(d)	Number of mol silver nitrate = $100 \times 0.5/1000$ // 0.05	
		1 mol of silver nitrate reacted to release 105kJ heat	
		Therefore, 0.05 mol silver nitrate reacted to produce $105 \times 0.05/1$ / $= -5.2$kJ /mol	1
		$5250 = 100 \times 4.2 \times \theta$	
		$\theta = 12.5 \,°C$	1
		Total	**20**

END OF MARK SCHEME

Question	Chemistry 3 - (Mark Scheme)	Marks
1(a)	*Able to state **all the observations and inferences** correctly* *Sample answer :*	

Set	Observation / Inference
I	Observation: Lithium burns slowly and produces white fumes. Inference: 1. Lithium is the least reactive metal towards oxygen. 2. Lithium oxide is formed.
II	Observation: Sodium burns rapidly and produces white fumes. Inference: 1. Sodium is reactive towards oxygen. 2. Sodium oxide is formed.
III	Observation: Potassium burns vigorously rapidly and produces white fumes. Inference: 1. Potassium is the most reactive metal towards oxygen. 2. Potassium oxide is formed.

		6
	Able to state any 5 of the above correctly	5
	Able to state any 4 of the above correctly	4
	Able to state any 3 of the above correctly	3
	Able to state any 2 of the above correctly	2
	Able to state any 1 of the above correctly]	1

	[No response given or wrong response]	0

Question	Mark Scheme	Marks
1 (b)	*Able to state three variables correctly* *Sample answer:* Manipulated variable: Type of alkali metals Responding variable: Reactivity of alkali metals Fixed variable: Oxygen gas // size of alkali metals	3
	[Able to state any 2 of the above correctly]	2
	[Able to state any 1 of the above correctly]	1
	[No response given or wrong response]	0

Question	Mark scheme	Marks
1 (c)	*Able to state the relationship between the manipulated variable and the responding variable with direction correctly* *Sample answer*: The lower the position of an alkali metal in the Periodic Table, the more reactive it is when reacts with oxygen.	3
	Able to state the relationship between the manipulated variable and the responding variable *Sample answer*: The lower the position of an alkali metal in the Periodic Table, the more reactive is the metal.	2

	Able to state an idea of hypothesis *Sample answer*: Alkali metal have different reactivity.	1
	[No response given or wrong response]	0

Question	Marks scheme	Marks
1 (d)	*Able to arrange the position of all metals in descending order of reactivity correctly* *Sample answer*: Potassium/K, Sodium/Na, Lithium/Li	3
	Able to arrange the position of at least two metals in descending order of reactivity correctly *Sample answer:* Potassium/K, Sodium/Na // Sodium/Na, Lithium/Li	2
	Able to give an idea to arrange the metals Sample answer: Lithium/Li, Sodium/Na, Potassium/K	1
	No response given or wrong response	0

Question	Mark Scheme	Marks
1(e)	*Able to state the operational definition for the reactivity of Group I elements with oxygen correctly* Sample answer: An alkali metal that reacts more vigorously with oxygen is a more reactive metal.	3

	Able to state the operational definition for the reactivity of Group I elements with oxygen *Sample answer:* An alkali metal reacts vigorously with oxygen	2
	Able to state the operational definition for the reactivity of Group I elements with oxygen An alkali metal is reactive.	1
	[No response given or wrong response]	0

Question	Mark Scheme	Marks
2(a)(i)	*Able to record the burette readings accurately and write the volume of gas correctly* Sample answer	**3**
	Able to record the burette readings and one volume of gas less accurately Sample answer	**2**
	Able to record at least one burette reading	**1**
	No response or wrong response	**0**
2(a)(ii)	*Able to calculate average rate of reaction with correct unit* Sample answer $48cm^3/210s = 0.23cm^3s^{-1}$	**3**
	Able to calculate average rate of reaction without unit	**2**

Sample answer (2(a)(i), 3 marks):

Time/s	Burette reading/cm^3	Volume of gas evolved/cm^3
60	25.50	24.50
90	18.00	32.00

Sample answer (2(a)(i), 2 marks):

Time/s	Burette reading/cm^3	Volume of gas evolved/cm^3
60	25.5	24.5
90	18.0	32.00

	Sample answer 48/210 = 0.23	
	Able to calculate average rate of reaction at any time *Able to draw the graph of the volume of gas against time by showing the following **two** information* 1. The axes 2. Curve of the graph	**1**
	No response or wrong response	**0**
2(b)(i)	*Able to draw the two graphs of the volume of gas against time by showing the following **three** information* 1. The axes are labeled correctly and correct unit 2. Label curves 3. All points are transferred correctly	**3**
	*Able to draw the two graphs of the volume of gas against time by showing the following **two** information* 1. The axes are labeled correctly without unit 2. Label curves 3. All points are transferred correctly	**2**
	*Able to draw the two graphs of the volume of gas against time by showing the following **two** information* 1. The axes 2. Curve of the graph	**1**
	No response or wrong response	**0**
2(b)(ii)	*Able to state an inference for the two experiments correctly* Sample answer The rate of reaction for the experiment using 0.4 g of manganese(IV) oxide powder is higher than of 0.1 g of manganese(IV) oxide powder	**3**
	Able to state an inference for the two experiments less accurately Sample answer	**2**

	The rate of reaction is higher for the experiment using more manganese(IV) oxide powder.	
	Able to give an idea of inference for the experiment Sample answer The rate of reaction for the experiment using manganese(IV) oxide powder is higher	**1**
	No response or wrong response	**0**
2(c)	*Able to state the meaning of catalyst correctly* Sample answer A chemical that can increase the rate of reaction	**3**
	Able to state the meaning of catalyst Sample answer A chemical that can alter the rate of reaction A chemical that lowers the activation energy	**2**
	Able to give an idea for the meaning of catalyst Sample answer Substance added to a chemical reaction	**1**
	No response or wrong response	**0**

Question	Marks Scheme	Marks
3(a)	*Able to state the aim by relating to the following 3 information correctly*: 1. *different metals / metals X and Y* 2. *contact* 3. *rusting* Sample answer To investigate the effect of metals X, Y / different metals when in contact with iron to the rusting of iron.	3
	Able to state the aim of the experiment. Sample answer To investigate the effect of metals X, Y / different metals on the rusting of iron.	2
	Able to give an idea of statement of the problem. <u>Sample answer</u>: To investigate the effect of metals on rusting // To investigate rusting	1
	No response or wrong response.	0

Question	Marks Scheme	Marks
2(b)	*Able to state all variables correctly*: <u>Sample answer</u>: *Manipulated variable*: metal X and metal Y // stating 2 metals which one metal is less electropositive and one metal is more electropositive than iron.// pairs of X-Fe and Y-Fe *Responding variable*: the rusting of iron // iron rusts or does not rust // [any suitable observations: e.g. the formation of blue spot// the formation of pink colour // the formation of brown solid]	

	Fixed variable: iron nail// electrolyte/(named) // agar/jelly solution //temperature	3
	*Able to state **any two** variables correctly.*	2
	*Able to state **any one** variable correctly.*	1
	No response or wrong response.	0

Question	Marks Scheme	Marks
2(c)	*Able to state the relationship between the manipulated variable and the responding variable with direction correctly*: Sample answer: Metal Y causes iron nail rusting while metal X does not.// A more electropositive metal/(metal X) will prevent iron from rusting while a less electropositive metal (metal Y) will be rusting iron.	3
	Able to state the relationship between the manipulated variable and the responding variable: <u>Sample answer</u>: Metal Y speeds up iron nail rusting while metal X slows down rusting.	2
	Able to state an idea of hypothesis: <u>Sample answer</u>: Metal X / Y affect the rusting of iron.	1
	No response or wrong response.	0

Question	Marks Scheme	Marks
2(d)	*Able to give a complete list of materials and apparatus that involves the following*: *1. iron nails* *2. 1 metal above iron in electrochemical series* *3. 1 metal below iron in electrochemical series* *4. A suitable electrolyte, test-tubes, sand paper* <u>Sample answer:</u> Iron nails, magnesium/zinc/aluminium strip, tin/copper/lead/silver strip, [potassium hexacyanoferrate(III) solution+phenolphthalein indicator] / [any suitable electrolyte] / [water], test-tubes/ boiling-tubes, sand paper	3
	Able to give a list of materials and apparatus that involves the following: *1. 1 metal above iron in electrochemical series* *2. 1 metal below iron in electrochemical series* *3. Any suitable electrolyte, any suitable container*	2
	Able to give a list of materials and apparatus that involves the following: *1. 1 metal above/below iron in electrochemical series// any suitable electrolyte.* *2. any container*	1
	No response or wrong response.	0

Question	Marks Scheme	Marks
2(e)	*Able to state the following 6 steps:* *1. [Clean the iron nails and metals strip with sand paper]* *2. [Coil iron nails with the metals]* *3. [Place iron nails in separate container]* *4. [Pour/add/fill the [named electrolyte] into the container]* *5. [Leave them aside for several days]*	3

	6. *[Record your observation]* Sample answer: 1. Clean iron nails, magnesium ribbon and copper strip with sand paper. 2. Coil two iron nails tightly with magnesium ribbon and copper strip. 3. Place all the iron nails in separate test tubes. 4. Pour the hot agar containing potassium hexacyanoferrate(III) solution and phenolphthalein indicator into the test tubes. 5. Keep the test tubes in a test tube rack and leave them aside for 3 days. 6. Record your observations.	
	Steps 2,4,6	2
	Step 2[coil iron nail with Mg/Cu], 4	1
	No response or wrong response.	0

Question	**Marks Scheme**	**Marks**
2(f)	*Able to exhibit the tabulation of data that includes the following four information.* *1. Heading for the manipulated variables Set//pair of metals* *2. Examples of Sets//pair of metals I, II//Mg-Fe, Cu-Fe* *3. Heading for responding variable observation* *4. 2x3 or 3x2 table* Sample answer: | Set//Pair of metals	Observation
---	---
I//Mg-Fe	
II//Cu-Fe			2

	Able to exhibit the tabulation of data that includes the following two information. *1. 1/3 from score 2* *2. 2x2 table* <u>Sample answer:</u> 	1	

Set//Pair of metals	Observation

	No response or wrong response.	0

END OF MARKING SCEME