KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI PERAK

MODUL DEFRA KIMIA

EDISI MURID

TINGKATAN 4

SEKTOR PEMBELAJARAN

JABATAN PENDIDIKAN NEGERI PERAK
We Deliver

SEKALUNG BUDI

SEKTOR PEMBELAJARAN, JPN PERAK

PN HJH BAINAH BINTI AB. DOLAH
KETUA PENOLONG PENGARAH KANAN
MATEMATIK DAN SAINS

PN MUSFIRAH SALMA BINTI MOHD RADZI
PENOLONG PENGARAH MATEMATIK DAN SAINS

PANEL PENULIS

PN NORIZA BINTI AWANG
SMK ANDERSON
PN KOMATHY A/P VEERASINGHAN
SMK AVE MARIA CONVENT
PN NOOR HAFIZAH BT HUSSAIN
SMK RAJA CHULAN
CIK WAN NORAZIEAN BT WAN ZAWAWI
SMK TARCISIAN CONVENT
PN AINI RASYIDAH BT AHMAD ZUHAIRI
SMK ANDERSON

BAB 2: JIRIM DAN STRUKTUR ATOM / MATTER AND ATOMIC STRUCTURE *FORM 4*

A. Definisi / *Definition*

Soalan / Question	Jawapan / Answer	Nota/ notes
1. Nyatakan maksud jirim? *State the meaning of matter?*		
2. Nyatakan maksud takat lebur? *State the meaning of melting poing?*		
3. Nyatakan maksud takat didih? *State the meaning of boiling point?*		
4. Nyatakan jenis zarah yang wujud di dalam wayar kuprum. *State the type of particle exist in copper wire.*		
5. *Nyatakan zarah-zarah subatom dalam nukleus.* *State the type of subatomic particles in the nucleus.*		

6. Berikan definisi nombor proton. *Define the meaning of proton number.*	
7. Nyatakan maksud nombor nukleon. *State the meaning of nucleon number.*	
8. Nyatakan definisi isotop. *State the meaning of istotop.*	

B. Rajah/ Diagram

Melukis gambar rajah yang **berfungsi** dan **berlabel** dengan **lengkap**
*Draw the **functional** diagram with a **complete label***

Soalan / Question	Jawapan / Answer	Nota/ notes
1. Lukis gambar rajah berlabel pemanasan naftalena . *Draw a labelled diagram heating of naphthalene* a) Perlu **label bahan** seperti air dan nafftalena*/ It is necessary to label ingredients such as water and naphthalene* b) Termometer **tidak boleh** *sentuh dasar tabung uji/* It is necessary to label ingredients such as water and naphthalene/The thermometer must not touch the bottom of the test tube c) *Air mesti meliputi naftalena dan **dilorek**/*Water must cover the naphthalene and shaded		

2. Berdasarkan jadual di bawah.
   Based on the table below:

Unsur	Bilangan proton	Bilangan neutron
X	10	10
Y	11	12
Z	19	20

i. Lukiskan rajah susunan elektron atom X, Y dan Z
   Draw a diagram of the electron arrangement of atoms X, Y and Z

   a) Lukis dengan **bilangan elekron** yang tepat.*/Draw with the correct number of electrons*
   b) **Mesti** lukis nukleus*/ must draw the nucleus*

ii. Lukiskan rajah struktur atom X,Y dan Z
    Draw a diagram of X,Y and Z atomic structure

   a) Lukis dengan **bilangan elekron** yang tepat.*/Draw with the correct number of electrons*
   b) **Mesti** lukis nukleus dengan bilangan proton dan nukleon yang tepat*/ must draw the nucleus with the correct number of proton and nucleon*

C. Pengiraan / Calculation

Soalan / Question	Jawapan / Answer	Nota/ notes
1. Magnesium secara semula jadi wujud dalam tiga isotop, iaitu 79.0% ^{24}Mg, 10.0% ^{25}Mg dan 11.0% ^{26}Mg. Hitungkan jisim atom relatif magnesium. *Magnesium exist naturally as three isotopes which are wujud dalam tiga isotop, iaitu 79.0% ^{24}Mg, 10.0% ^{25}Mg dan 11.0% ^{26}Mg. Calculate the relative atomic mass of magnesium.*		

BAB 3: KONSEP MOL, FORMULA KIMIA DAN PERSAMAAN KIMIA / *THE MOLES CONCEPT, CHEMICAL FORMULA AND EQUATION.*

A. Definisi / *Definition*

Soalan / *Question*	Jawapan / *Answer*	Nota/*Notes*
1. Nyatakan maksud Jisim Atom Relatif (JAR) *State the meaning of Relative atomic Mass (RAM)*		
2. Nyatakan maksud Formula Molekul? *State the meaning of Molecular Formula?*		
3. *Nyatakan maksud Formula Empirik?* *State the meaning of Empirical Formula?*		

B. Rajah/ Diagram

Melukis gambar rajah yang **berfungsi** dan **berlabel** dengan **lengkap**
*Draw the **functional** diagram with a **complete label***

Soalan / *Question*	Jawapan / *Answer*	Nota/ *Notes*
1. Lukis gambar rajah berlabel untuk menentukan formula empirik Magnesium Oksida. *Draw a labelled diagram to determine the empirical formula of Magnesiun Oxide.* a) **Tidak** menggunakan kasa dawai/*Do not use a wire gauze* b) **Anak panah** untuk menunjukkan dipanaskan./*Arrow to show heated.*		
2. Lukis gambar rajah berlabel untuk menentukan formula empirik Kuprum (II) Oksida. *Draw a labelled diagram to determine the empirical formula of Copper (II) Oxide.* a) *Mesti menunjukkan **label bahan** seperti ketulan zink,serbuk kuprum (II) oksida , asid hidroklorik dan air/* Must show material labels such as zinc lumps, copper (II) oxide powder. hydrochloric acid and water. b) ***Mesti** lorek air dan asid/* Make a shade of water and acid c) *Pemanasan pada kuprum oksida/Heat on copper(II) oxide*		

C.Pengiraan / *Calculation*

Soalan / *Question*	Jawapan / *Answer*	Nota/*Notes*
1. Satu sampel Ferum (III) Oksida Fe_2O_3 dipanaskan dalam aliran gas hidrogen, H_2 -berlebihan untuk menghasilkan 5.6g logam besi mengikut persamaan berikut. $Fe_2O_3(g) + 3H_2(g) \longrightarrow 2Fe(p) + H_2O(ce)$ Hitungkan jisim sampel Ferum(III) Oksida itu. [JAR :H=1, O=16,Fe=56] *A sample of Iron (III) Oxide Fe_2O_3 is heated in a stream and excess Hydrogen gas H_2 to produce 5.6g of iron metal according to the following equation.* $Fe_2O_3(g) + 3H_2(g) \longrightarrow 2Fe(p) + H_2O(ce)$ *Calculate the mass of the Iron (III) Oxide sample* [RAM :H=1, O=16,Fe=56] 1. **Langkah 1** : Bilangan Mol Fe / no of mole of Fe 2. **Langkah 2** : Nisbah mol Fe_2O_3 : Fe 3. **Langkah 3** : Jisim Sampel Ferum(III) Oksida		

BAB 4: JADUAL BERKALA/ *PERIODIC TABLE*

A. **Definisi /** *Definition*

Soalan / *Question*	Jawapan / *Answer*	Nota/*Notes*
1. Nyatakan maksud kumpulan *State the meaning of group*		
2. Nyatakan maksud kala. *State the meaning of period*		

BAB 5: IKATAN KIMIA */ CHEMICAL BOND*

A. Definisi / *Definition*

Soalan / *Question*	Jawapan / *Answer*	Nota/*Notes*
1. Nyatakan maksud ikatan kimia *State the meaning of chemical bond*		
2. Nyatakan maksud ikatan ion *State the meaning of ionic bond*		
3. Nyatakan maksud ikatan kovalen *State the meaning of covalent bond*		
4. Nyatakan maksud ikatan hidrogen *State the meaning of hidrogen bond*		

5. Nyatakan maksud ikatan datif *State the meaning of dative bond*		
6. Nyatakan maksud ikatan logam *State the meaning of metallic bond*		

B. Rajah/ *Diagram*

Melukis gambar rajah yang **berfungsi** dan **berlabel** dengan **lengkap**
*Draw the **functional** diagram with a **complete label***

1. Lukiskan susunan elektron untuk menunjukkan pemindahan elektron dalam pembentukan ikatan ion dalam sebatian Natrium Klorida, NaCl *Draw the electron arrangement to show the electron transferred in formation of chemical bond in Sodium Chloride, NaCl* a) Mempunyai **nukleus**/.*Has a nucleus* b) **Bilangan** petala dan susunan/ elektron setiap atomnya betul/*The number of shell and electron arrangement for each atom are correct* c) Mempunyai **cas** yang betul bagi setiap ion./*Has a correct charge of each ions.*		

2. Lukiskan pembentukan ikatan kovalen di dalam molekul air *Draw the formation of covalent bond in water molecule.* a) Mempunyai **nukleus.**/*Has a nucleus* b) **Bilangan** petala dan susunan elektron setiap atomnya betul. *The number of shell and electron arrangement for each atom are correct*		

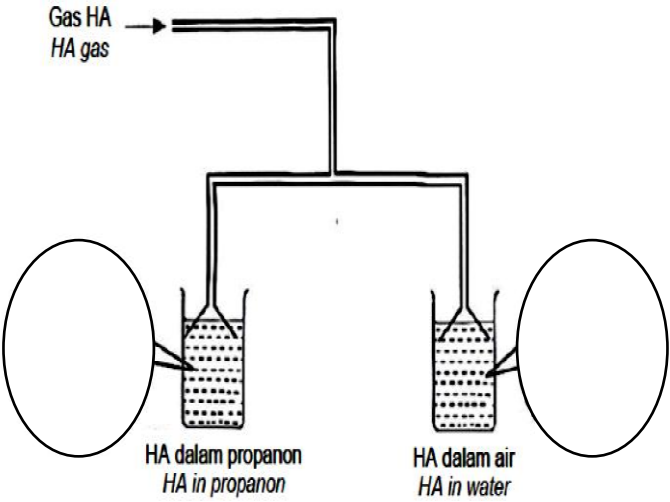## BAB 6: ASID, BES DAN GARAM/ ACID, BASE AND SALT

A. Definisi / *Definition*

Soalan / *Question*	Jawapan / *Answer*	Nota/ *notes*
1. Nyatakan maksud asid. *State the meaning of acid.* 2. Nyatakan maksud asid monoprotik. *State the meaning of monoprotic acid.* Nyatakan maksud asid diprotik. *State the meaning of diprotic acid.*		

3. Nyatakan maksud asid triprotik. *State the meaning of triprotic acid.*	
4. Nyatakan maksud bes. *State the meaning of base.*	
5. Nyatakan maksud alkali. *State the meaning of alkali.*	
6. Nyatakan maksud pH. *State the meaning of pH.*	
7. Nyatakan maksud asid kuat. *State the meaning of strong acid.*	
8. Nyatakan maksud asid lemah. *State the meaning of weak acid.*	
9. Nyatakan maksud alkali kuat. *State the meaning of strong alkali*	
10. Nyatakan maksud alkali lemah. *State the meaning of weak alkali.*	
11. Apakah maksud kepekatan suatu larutan? *What is the meaning of concentration of a solution?*	

12. Apakah maksud kepekatan dalam unit g dm^{-3}? *What is the meaning of concentration in unit g dm^{-3}?*		
13. Apakah maksud kepekatan dalam unit mol dm^{-3}? *What is the meaning of concentration in unit mol dm^{-3}?*		
14. Apakah maksud kemolaran? *What is the meaning of molarity*		
15. Apakah maksud larutan piawai? *What is the meaning of standard solution?*		
16. Apakah maksud peneutralan? *What is the meaning of neutralization?*		
17. Apakah maksud kaedah pentitratan? *What is the meaning of titration method?*		
18. Apakah maksud takat akhir? *What is the meaning of end point?*		
19. Apakah maksud garam? *What is the meaning of salt?*		

20. Apakah maksud garam terlarutkan? *What is the meaning of soluble salts?*		
21. Apakah maksud garam tak terlarutkan? *What is the meaning of insoluble salts?*		
22. Apakah maksud kation? *What is the meaning of cation?*		
23. Apakah maksud anion? *What is the meaning of anion?*		

D. Diagram/ gambarajah

Soalan / *Question*	Jawapan / *Answer*	Nota/ *notes*
1. Rajah menunjukkan gas HA dialirkan ke dalam dua biakr masing-masing mengandungi propanon dan air untuk mengkaji sifat asid. Lukiskan **zarah-zarah** dalam bulatan yang disediakan. *Diagram shows gas HA is flowed into two beakers containing propanone and water respectively to study the properties of acid. Draw the particle in the circle.* ****Zarah** = atom/ ion/ molekul ***Particles= atom/ ion/ molecule*	Gas HA / HA gas HA dalam propanon / HA in propanon HA dalam air / HA in water	

2. Serbuk magnesium bertindak balas dengan asid hidroklorik menghasilkan gas tidak berwarna. Lukis dan label gambar rajah. Tuliskan persamaan kimia seimbang untuk tindak balas ini. *Magnesium powder reacts with hydrochloric acid producing a colourless gas. Draw and label the diagram. Write down a balanced chemical equation for this reaction.* a) Kayu uji menyala **pada** bibir tabung uji/ The burning wooden splinter on the lips of the test tube.		
3. Serbuk kalsium karbonat bertindak balas dengan asid sulfurik menghasilkan gas tidak berwarna. Lukis dan label gambar rajah. Tuliskan persamaan kimia seimbang untuk tindak balas ini. *Calcium carbonate powder reacts with sulphuric acid producing a colourless gas. Draw and label the diagram. Write down a balanced chemical equation for this reaction.* a Gabus (*cork*) tidak boleh tenggelam dalam tabung uji/ tabung didih. b Tidak perlu lukis kaki retort (*retort stand*).		

	Lukis pengepit (clamps) sahaja. c Salur penghantar (*delivery tube*) mesti tenggelam dalam air kapur (*limewater*).		
4.	Lakarkan gambar rajah berfungsi untuk pentitratan antara 25 cm^3 asid sulfurik 1.0 mol dm^{-3} dan 50cm^3 larutan natrium hidroksida 1.0 mol dm^{-3} menggunakan penunjuk fenolftalein. *Sketch a functional diagram for titration between 25 cm^3 of 1.0 mol dm^{-3} sulphuric acid and 50cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution using the phenolphthalein indicator.* a) Buret (*burette*) dikepit dengan pengepit (*clamps*). b) Label **bahan** sahaja *Label **materials** only*		
5.	Hakim ingin menyediakan garam tak terlarutkan kuprum (II) karbonat. Lukis dan label gambar rajah yang sesuai untuk penyediaan garam tersebut. *Hakim wants to prepare insoluble salt of copper (II) carbonate. Draw and label the appropriate diagram for the preparation of the salt.* a) Rajah berfungsi **b)** Label **bahan**		

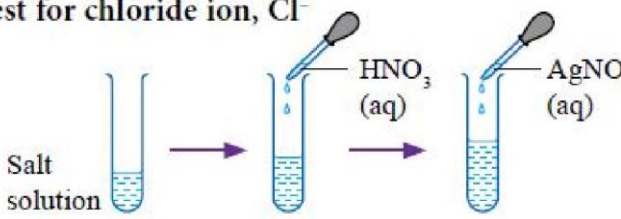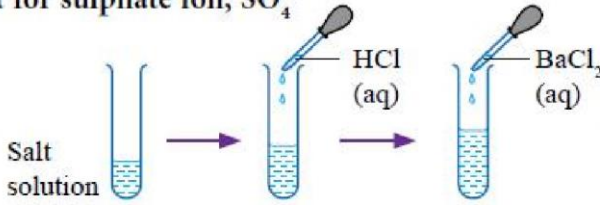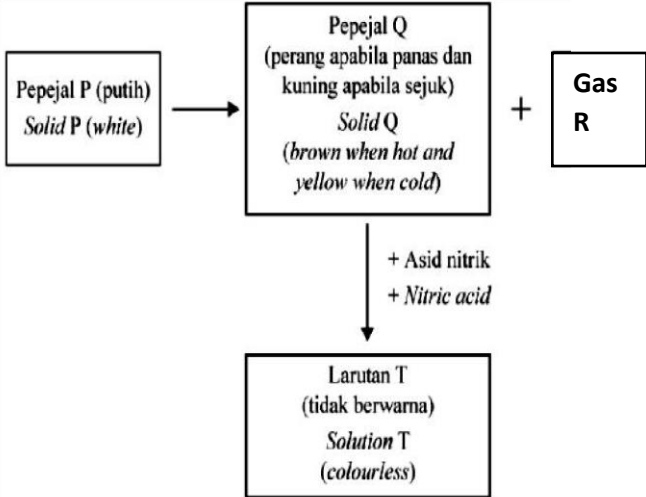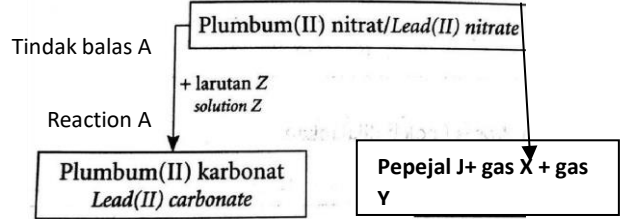|	

Ujian anion – ujian ion karbonat.
 	
Anion test – carbonate ion test.
 	
MOC method:
 	
  1. Method
  2. Observation
  3. Conclusion
 	
*Tambahkan sebarang asid dalam sampel larutan garam.
Add any acid in sample of salt solution.
Eg: HCl, HNO₃, H₂SO₄
	Test for carbonate ion, CO_3^{2-}
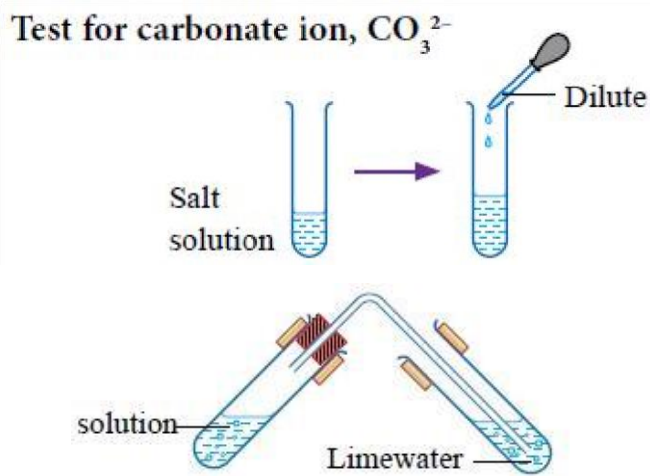	
	1. …………….. 2.0 cm3 …………………….. 2.0 mol dm–3 ke dalam tabung uji berisi larutan garam.
	2. …………… gas itu ke dalam ………………………….
	3. Air kapur bertukar ………………………
	4. Ion …………….. hadir.
	1. ………….. 2 cm3 of 2.0 mol dm3 ……………………… into the test tube containing salt solution.
	2. ………. the gas into …………………..
	3. Lime water turns ………………….
	4. …………………… ion presents.

Ujian anion – ujian ion klorida *Anion test – chloride ion test.* MOC method: 1. Method 2. Observation 3. Conclusion	Test for chloride ion, Cl^- Salt solution → HNO_3 (aq) → $AgNO$ (aq) 1. Tambahkan …………………… 2.0 mol dm$^-$^{3} secara …………… ke dalam tabung uji berisi larutan garam, diikuti dengan 2.0 cm^3 ……………………….0.1 mol dm^{-3}. 2. Mendakan …………….. terbentuk. 3. Ion k…………… hadir. 1. *Add …………….. of 2.0 mol dm$^-$ ^{3} ……………………….. into the test tube containing salt solution, followed by 2 cm^3 of 0.1 mol dm^{-3} …………………………..* 2. *…………….. precipitate formed.* 3. *…………… ion present.*	
Ujian anion – ujian ion sulfat. *Anion test – sulphate ion test.* MOC method: 1. Method 2. Observation 3. Conclusion	Test for sulphate ion, SO_4^{2-} Salt solution → HCl (aq) → $BaCl_2$ (aq) 1. Tambahkan …………………… 2.0 mol dm^{-3} secara berlebihan ke dalam tabung uji, diikuti dengan 2.0 cm^3 larutan ……………………….1.0 mol dm^{-3}. 2. …………………………………………….. 3. ……………………………………………..	

| | 1. Add 2.0 mol dm^{-3} …………………………… into the test tube containing salt solution , followed by 2.0 mol dm^{-3} ……………………….. solution. 2. ……………………………………………….. 3. ……………………………………………… | |

Ujian anion – ujian ion nitrat. MOC method: 1. Method 2. Observation 3. Conclusion	Test for nitrate ion, NO_3^- *1.* Tambahkan 2.0 cm³ ………………………… 1.0 mol dm⁻³ ke dalam tabung uji berisi larutan garam, diikuti dengan 2.0 cm³ larutan …………………………….. 1.0 mol dm₋₃. *2.* Goncangkan campuran. *3.* Dengan cermat, titiskan beberapa titis…………………….. pekat secara perlahan-lahan melalui dinding tabung uji yang dicondongkan. *4.* …………………………………………………. *5.* …………………………………………………. *1. Add 2 cm³ of 1.0 mol dm⁻³ ………………… into the test tube containing salt solution, followed by 2 cm³ of 1.0 mol dm⁻³ ………………………………….. solution.* *2. Shake the mixture.* *3. Carefully, drip a few drops of concentrated ……………………………. Slowly down the wall of the tilted test tube.* *4. …………………………………………..* *5. ……………………………………………..*

Rajah menunjukkan tindak balas melibatkan pepejal P. Pepejal P ialah garam karbonat. Apabila pepejal P dipanaskan dengan kuat, ia terurai kepada pepejal Q dan gas R. Pepejal Q ditambah dengan asid nitrik menghasilkan larutan T. Kenalpasti P, Q, R dan T. *The diagram shows the reaction involving the solid P. Solid P is a carbonate salt. Solid Q added with nitric acid produces solution T. When solid P is strongly heated, it decomposes into solid Q and gas R.* *Identify P, Q, R and T.*	 P= ………………………………………… Q= ………………………………………… R= ………………………………………… T= …………………………………………
Rajah menunjukkan tindak balas melibatkan plumbum (II) nitrat. Apabila plumbum (II) nitrat dipanaskan dengan kuat, ia terurai kepada pepejal J, gas X dan gas Y. Apabila larutan plumbum (II) nitrat ditambah dengan larutan Z, mendakan plumbum (II) karbonat terbentuk. Kenalpasti tindak balas A, larutan Z, pepejal J, gas X dan gas Y.	 A= ………………………………………… Z= ………………………………………… X = ………………………………………… Y= …………………………………………

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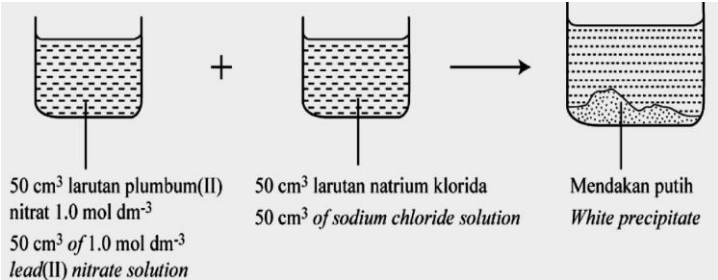|		
The diagram shows the reaction involving lead (II) nitrate. When lead (II) nitrate is strongly heated, it decomposes into solid J, gas X and gas Y. When lead (II) nitrate solution is added with a solution Z, lead (II) carbonate precipitate is formed. *Identify reaction A, solution Z, solid J, gas X and gas Y.*		

C. Pengiraan / Calculation

Soalan / Question	Jawapan / Answer	Nota/ notes

1. Tentukan nilai pH larutan barium hidroksida , $Ba(OH)_2$ yang berkepekatan 0.05 mol dm^{-3}.
 	
Determine the pH value of the barium hydroxide solution, $Ba(OH)_2$ which is 0.05 mole dm^{-3}. [Ans: 12.7]   **Masukkan nilai**
    kepekatan
 	
    1. $pOH = -\log [OH^-] = X$
    2. pH= 14- X
	$pOH = -\log [0.05] = X$
	     $= -(X)$
	pH= 14- X
	
	=_____	

2. Berapakah kemolaran larutan natrium hidroksida , NaOH dengan nilai pH 12.0?
 	
What is the molarity of sodium hydroxide solution, NaOH with a pH value is 12.0?
[Ans: 0.01 mol dm^{-3}]
    1. pOH= 14- pH
    2. pOH = -log [OH$^-$]
	pOH= 14 – 12 = 2
	
	2 = –log [OH$^-$]
	
	=_____	

3. Dalam penyediaan larutan piawai natrium karbonat, Na_2CO_3, 10.6g natrium karbonat, dilarutkan dalam air suling menjadikan isi padu sehingga $100cm^3$. Berapakah isi padu larutan piawai yang disediakan perlu digunakan jika Ahmad ingin menyediakan $50cm^3$ larutan natrium karbonat 0.5 mol dm^{-3}?
 	
In preparing the standard solution of sodium carbonate, Na_2CO_3, 10.6g of sodium carbonate, is dissolved in distilled water and making the volume up to $100cm^3$.
 	
What is the volume of standard solution prepared that should be used if Ahmad wants to prepare $50cm^3$ of 0.5 mol dm^{-3} sodium carbonate solution?
 	
[JFR/RFM of Na_2CO_3: 106]
[Ans: $25.0cm^3$]
 	
  1. Cari bil.mol Na_2CO_3
     Find no.of mole of Na_2CO_3, n
  2. n= MV/1000
  3. M_1V_1= M_2V_2		

4. 20cm^3 0.5 mol dm^{-3} larutan hidroksida logam X bertindak balas lengkap dengan 20cm^3 larutan asid nitrik 1.0 mol dm^{-3}. Apakah formula garam nitrat logam X yang dihasilkan? *20cm^3 of 0.5 mol dm^{-3} metal X hydroxide solution reacts completely with 20cm^3 of 1.0 mole dm^{-3} nitric acid solution.* *What is the formula of metal X nitrate salt produced?* [Ans: X(NO$_3$)^2] Step 1: kenal pasti a=?, b=? 2. $\dfrac{MM}{MM} = \dfrac{a}{b}$		

5. Persamaan kimia berikut mewakili tindak balas antara asid sulfurik dengan larutan natrium hidroksida. *The following chemical equation represents a reaction between sulphuric acid and sodium hydroxide solution.*
 	
      H$_2$SO$_4$ + 2NaOH → Na$_2$SO$_4$ + 2H$_2$O
 	
Apakah isi padu asid sulfurik 0.5 mol dm^{-3} yang diperlukan untuk meneutralkan 25cm^3 larutan natrium hidroksida 0.1 mol dm^{-3}?
 	
What is the volume of 0.5 mol dm^{-3} sulphuric acid required to neutralize 25cm^3 of 0.1 mol dm^{-3} sodium hydroxide solution?
 	
[Ans: 25cm^3]
 	
   1. $\dfrac{MM}{MM} = \dfrac{a}{b}$ or
 	
   2. MRS		

6. Persamaan kimia berikut menunjukkan perceraian barium hidroksida dalam air.
 	
The following chemical equation shows the dissociation of barium hydroxide in water.
 	
$$Ba(OH)_2 \rightarrow Ba^+ + 2OH^-$$
 	
Berapakah bilangan mol ion hidroksida dalam 250cm^3 barium hidroksida 0.2 mol dm^{-3}?
 	
What is the number of mole of hydroxide ions in250cm^3 of 0.2 mol dm^{-3} barium hydroxide? [Ans: 0.10 mol]
 	
    1. MRS
 	
       Nisbah bil mol/ Ratio of mole		

7. Rajah menunjukkan penyediaan plumbum (II) klorida. *Diagram shows the preparation of lead (II) chloride.*
 	
50 cm^3 larutan plumbum(II) nitrat 1.0 mol dm^{-3}
50 cm^3 *of* 1.0 mol dm^{-3} *lead*(II) *nitrate solution*
 	
50 cm^3 larutan natrium klorida
50 cm^3 *of sodium chloride solution*
 	
Mendakan putih
White precipitate
 	
Berapakah kepekatan larutan natrium klorida yang diperlukan untuk berrindak balasdengan larutan plumbum (II) nitrat?
 	
What is the concentration of sodium chloride solution needed to react completely with lead (II) nitrate?
 	
[Ans: 2.0 mol dm^{-3}]
 	
    1. Persamaan kimia seimbang
       Balanced chemical equation.
    2. MRS		

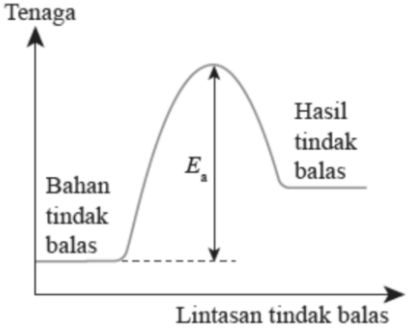**BAB 7:**   **KADAR TINDAK BALAS**
               RATE OF REACTION

A.Definisi / *Definition*

Soalan / *Question*	Jawapan / *Answer*	Nota/ *notes*
1. Nyatakan maksud kadar tindak balas. *State the meaning of rate of reaction.*		
2. Nyatakan maksud kadar tindak balas purata. *State the meaning of the average rate of reaction*		
3. Nyatakan maksud kadar tindak balas pada masa tertentu. *State the meaning of the instantaneous rate of reaction.*		

B. Rajah/ Diagram

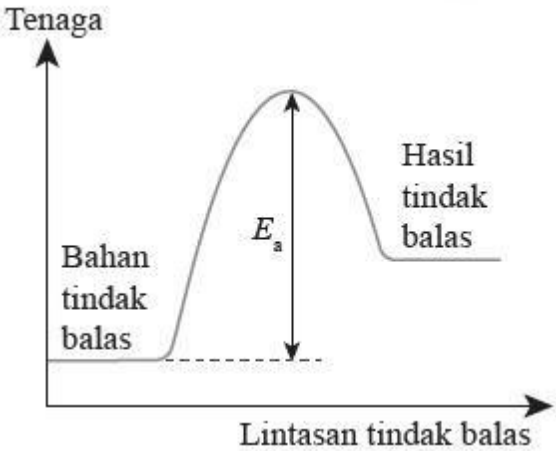| Soalan / Question	Jawapan / Answer	Nota/ notes
1. Lukis gambar rajah kaedah **mengumpul gas** terbebas untuk menghitung kadar tindak balas antara asid hidroklorik, HCl dan zink, Zn. • Buret dipegang oleh kaki retort. • Larutan dilorekkan. • Salur kaca masuk ke dalam buret. • Buret boleh diganti dengan picagari. • Bahan dilabelkan. *Draw diagram to collect gas method to calculate the rate of reaction of hydrochloric acid, HCl and zinc, Zn.* • *Burette is clamped with retort stand.* • *Solution is shaded.* • *Tube delivery enter the burette properly.* • *Materials are labelled.* • *Burette can be displaced with syringe.*		
2. Lukis gambar rajah kaedah **pembentukan mendakan** untuk menghitung kadar tindak balas antara larutan natrium tiosulfat, $Na_2S_2O_3$ dengan asid sulfurik, H_2SO_4. • Larutan dilorekkan. • Bahan dilabelkan. *The method of formation of a precipitate to calculate the reaction rate between a solution of sodium thiosulphate, $Na_2S_2O_3$ with sulfuric acid, H_2SO_4.* • *Solution is shaded.* • *Materials are labelled.*		

3. Lakar graf pembebasan gas melawan masa.
Sketch graph of gas released against time.

Eksperimen/ *experiment I*:
Serbuk $CaCO_3$ berlebihan + $20cm^3$ HCl 1.0 mol dm^{-3}
Excess of $CaCO_3$ powder + $20cm^3$ HCl 1.0 $moldm^{-3}$
Eksperimen/ *experiment II*:
Serbuk $CaCO_3$ berlebihan + $20cm^3$ HCl 0.5 mol dm^{-3}
Excess of $CaCO_3$ powder + $20cm^3$ HCl 0.5 $moldm^{-3}$

Eksperimen/ *experiment III*:
Ketulan $CaCO_3$ berlebihan + $20cm^3$ HCl 1.0 mol dm^{-3}
Excess of $CaCO_3$ granules + $20cm^3$ HCl 1.0 $moldm^{-3}$

- Paksi berlabel dan berunit.
- Graf tidak mendatar pada hujungnya selagi tindak balas belum tamat)
- Isi padu gas terbebas - bilangan mol HCl (isi padu Eksp.I mesti **dua kali ganda** Eksp.II dan III).
- *Axes must be labelled with correct unit.*
- *Graph are not horizontal at the end as long as the reaction still not complete yet.*
- *The volume of gas released – number of mole of HCl (volume of gas released in Exp.I is twice than Exp.II and III)*

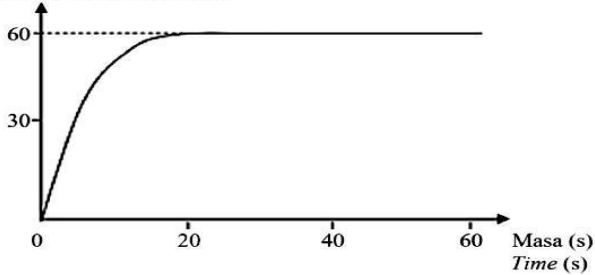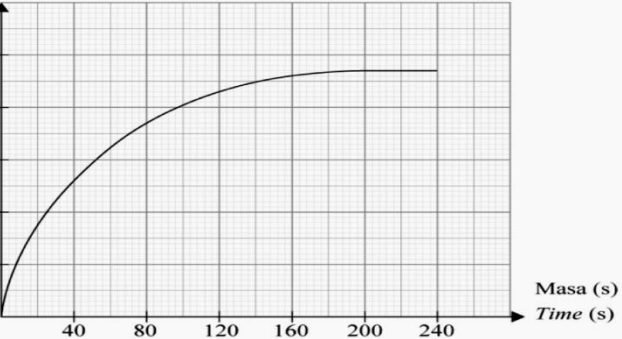|		
4. Lakar gambar rajah aras tenaga (eksotermik) bagi penggunaan mangkin dan tanpa mangkin. *Sletch energy level diagram (exothermic) while using catalyst and without catalyst.* • Dua aras tenaga berbeza antara bahan tindak balas dan hasil tindak balas- aras bahan tindak balas lebih **tinggi**. • Aras tenaga pengaktifan menggunakan mangkin, Ea' mesti **lebih rendah** daripada yang tiada mangkin, Ea. • *Two energy levels differ between the reactants and the products of the reaction- the level of the reactants is **higher**.* • *The activation energy level using the catalyst, Ea' is **lower** than without catalyst, Ea.*		
5. Lakar gambar rajah aras tenaga (endotermik) bagi penggunaan mangkin dan tanpa mangkin. *Sketch energy level diagram (endothermic) while using catalyst and without catalyst.* • Dua aras tenaga berbeza antara bahan tindak balas dan hasil tindak balas- aras bahan tindak balas lebih **rendah**. • Aras tenaga pengaktifan menggunakan mangkin, Ea' mesti **lebih rendah** daripada yang tiada mangkin, Ea. • *Two energy levels differ between the reactants and the products of the reaction- the level of the reactants is **lower**.* • *The activation energy level using the catalyst, Ea' is **lower** than without catalyst, Ea.*	Tenaga Hasil tindak balas E_a Bahan tindak balas Lintasan tindak balas	

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untuk menghitung kadar tindak balas antara larutan natrium tiosulfat, $Na_2S_2O_3$ dengan asid sulfuric, H_2SO_4. • Larutan dilorekkan. • Bahan dilabelkan. *The method of formation of a precipitate to calculate the reaction rate between a solution of sodium thiosulphate, $Na_2S_2O_3$ with sulfuric acid, H_2SO_4.* • *Solution is shaded.* • *Materials are labelled.*		
6. Lakar graf pembebasan gas melawan masa. *Sketch graph of gas released against time.* Eksperimen/ *experiment I*: Serbuk $CaCO_3$ berlebihan + $20cm^3$ HCl 1.0 mol dm^{-3} *Excess of $CaCO_3$ powder + $20cm^3$ HCl 1.0 $moldm^{-3}$* Eksperimen/ *experiment II*: Serbuk $CaCO_3$ berlebihan + $20cm^3$ HCl 0.5 mol dm^{-3} *Excess of $CaCO_3$ powder + $20cm^3$ HCl 0.5 $moldm^{-3}$* Eksperimen/ *experiment III*: Ketulan $CaCO_3$ berlebihan + $20cm^3$ HCl 1.0 mol dm^{-3} *Excess of $CaCO_3$ granules + $20cm^3$ HCl 1.0 $moldm^{-3}$*		

• Paksi berlabel dan berunit. • Graf tidak mendatar pada hujungnya selagi tindak balas belum tamat) • Isi padu gas terbebas - bilangan mol HCl (isi padu Eksp.I mesti **dua kali ganda** Eksp.II dan III). • *Axes must be labelled with correct unit.* • *Graph are not horizontal at the end as long as the reaction still not complete yet.* • *The volume of gas released – number of mole of HCl (volume of gas released in Exp.I is twice than Exp.II and III)*		
7. Gambar rajah aras tenaga (eksotermik) bagi penggunaan mangkin dan tanpa mangkin. *Energy level diagram (exothermic) while using catalyst and without catalyst.* • Dua aras tenaga berbeza antara bahan tindak balas dan hasil tindak balas- aras bahan tindak balas lebih **tinggi**. • Aras tenaga pengaktifan menggunakan mangkin, Ea'		

mesti **lebih rendah** daripada yang tiada mangkin, Ea. • *Two energy levels differ between the reactants and the products of the reaction- the level of the reactants is* **higher***.* • *The activation energy level using the catalyst, Ea' is* **lower** *than without catalyst, Ea.*		
8. Lakar gambar rajah aras tenaga (endotermik) bagi penggunaan mangkin dan tanpa mangkin. *Sketch energy level diagram* *(endothermic) while using catalyst and without catalyst.* • Dua aras tenaga berbeza antara bahan tindak balas dan hasil tindak balas- aras bahan tindak balas lebih **rendah**. • Aras tenaga pengaktifan menggunakan mangkin, Ea' mesti **lebih rendah** daripada yang tiada mangkin, Ea. • *Two energy levels differ between the reactants and the products of the reaction- the level of the reactants is* **lower***.* • *The activation energy level using the catalyst, Ea' is* **lower** *than without catalyst, Ea.*		

D. Pengiraan / Calculation

Soalan / Question	Jawapan / Answer	Nota/ notes

1. Apakah kadar tindak balas purata bagi tindak balas ini?
 	
What is the average rate of reaction for this reaction?
 	
Isi padu gas karbon dioksida (cm³)
Volume of carbon dioxide gas (cm³)
 	
[Ans: $3.0 cm^3 s^{-1}$]
 	
Kadar tindak balas purata bagi keseluruhan tindak balas
 	
= Jumlah isi padu gas yang terkumpul = V/ t cm³ s⁻¹
     Tempoh masa yang diambil
 	
The overall average rate of reaction
= *Total volume of gas collected* = *V/ t cm³ s⁻¹*
      Time taken		

2. Berapakah kadar tindak balas pada masa 60 saat? *What is the rate of reaction at the 60th second?* Isi padu gas hidrogen (cm³) *Volume of hydrogen gas* (cm³)		

[Ans: 0.25 cm^3 s^{-1}]

- Lukis tangen pada lengkung pada 60s.
- Gunakan tangen untuk lengkapkan satu segitiga bersudut tegak.
- Hitung kecerunan tangen lengkung graf.

Kadar tindak balas pada masa 60s = Kecerunan tangen pada masa 60s

$$\underline{\Delta V} = \underline{V2 - V1} \text{ cm}^3 \text{ s}^{-1}$$
$$\Delta t \qquad (t2 - t1)$$

- *Draw a tangent to the curve at time 60s.*
- *Use the tangent to complete a vertically-angled triangle.*
- *Calculate the gradient of the tangent to the curve.*

Rate of reaction at time 60s = Gradient of the tangent at time 60s

$$= \underline{\Delta V} = \underline{V2 - V1} \text{ cm}^3 \text{ s}^{-1}$$
$$\Delta t \qquad t2 - t1$$

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

Masa (s) Time (s)	0	30	60	90	120	150	180	210	240
Isipadu CO$_2$ (cm^3) Volume of CO$_2$ (cm^3)	0	20.0	30.0	31.0	32.0	32.5	33.0	33.0	33.0

[Ans: 0.18 cm^3 s^{-1}]

BAB 8:   BAHAN BUATAN DALAM INDUSTRI
**   MANUFACTURED SUBSTANCES IN INDUSTRY**

A. **Definisi /** *Definition*

Soalan / *Question*	Jawapan / *Answer*	Nota/ *notes*
1. Nyatakan maksud aloi. *State the meaning of alloy.*		
2. Nyatakan maksud seramik. *State the meaning of ceramic.*		
3. Nyatakan maksud bahan komposit. *State the meaning of composite material.*		

B. **Rajah/ Diagram**

Soalan / *Question*	Jawapan / *Answer*	Nota/ *notes*
1. Lukiskan susunan atom logam tulen (kuprum) dan aloinya (gangsa). *Draw the arrangement of atom in pure metal (copper) and its alloy (bronze).* Atom logam tulen / *Pure metal atoms:* a) Susunan atom teratur/ *atoms arrange in orderly manner.* b) saiz atom yang sama/ *same size.*		

Aloi/ *alloy:* a) Atom tidak tersusun/ *atoms not in orderly manner.* b) Dua saiz atom yang berbeza (saiz atom stanum lebih besar daripada saiz atom kuprum) *Two different size of atoms (size of tin atom is bigger than copper atom)* Buku teks m/s257		
2. Lukiskan susunan radas menkaji perbandingan sifat aloi dengan logam tulen. *Draw an apparatus arrangement studying the comparison of the properties of an alloy with a pure metal.* [Buku teks m/s256]		

KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI PERAK

Sektor Pembelajaran,
Jabatan Pendidikan Negeri Perak
Jalan Tawas Baru Utara
Tasek Damai
30010, Ipoh,
Perak

Tahun 2022

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