**Section A**

***Bahagian A***

[60 marks]

[60 *markah*]

Answer **all** questions in this section.

*Jawab* **semua** *soalan dalam bahagian ini.*

|  |  |  |
| --- | --- | --- |
| **1** | Diagram 1 shows the graph of temperature against time when liquid naphthalene is cooled.  *Rajah 1 menunjukkan graf suhu melawan masa apabila cecair naftalena disejukkan.*  Temperature / oC  *Suhu / oC*  T3  **A**  **C**  **B**  T2    T1  **D**  Time / s  *Masa / s*  **Diagram 1**  ***Rajah* 1** | |
|  | (a) | State the freezing point of naphthalene.  *Nyatakan takat beku bagi naftalena*.  ............................................................................................................................................  [1 mark] |
|  | (b) | What is the physical state of naphthalene at :  *Apakah keadaan fizik bagi naftalena pada :*  AB ? : ................................................................................................................................  CD ? : .................................................................................................................................  [2 marks] |

|  |  |  |
| --- | --- | --- |
|  | (c) | Explain why there is no change in temperature from B to C.  *Terangkan mengapa tiada perubahan suhu dari B ke C.*  ............................................................................................................................................  ............................................................................................................................................  [2 marks] |

|  |  |  |  |
| --- | --- | --- | --- |
|  | (d) | State how the movement of naphthalene particles changes between A and B during the cooling.  *Nyatakan bagaimana pergerakan zarah naftalena berubah antara A dan B semasa penyejukan.*  ...........................................................................................................................................  [1 mark] | |
|  | (e) | Draw the arrangement of naphthalene particles at CD.  *Lukiskan susunan zarah naftalena pada CD.*  [1 mark] | |
|  | (f) | Table 1 shows four substances and their respective formulae.  *Jadual 1 menunjukkan empat bahan dan formula kimianya.*   |  |  | | --- | --- | | **Substances**  ***Bahan*** | **Chemical formulae**  ***Formula kimia*** | | Bromine  *Bromine* | Br2 | | Iron  *Besi* | Fe | | Naphthalene  *Naftalena* | C10H8 | | Copper(II) sulphate  *Kuprum(II) sulfat* | CuSO4 |   **Table 1**  ***Jadual 1***  Use information from the Table 1 to answer the following questions.  *Gunakan maklumat daripada Jadual 1 untuk menjawab soalan berikut.* | |
|  |  | (i)  (ii) | State one compound which exist as a molecule.  *Nyatakan satu sebatian yang wujud dalam bentuk molekul.*  ..................................................................................................................................  [1 mark]  Which substance can conduct electricity in the solid state ?  *Bahan yang manakah dapat mengalirkan arus elektrik dalam keadaan pepejal ?*  ..................................................................................................................................  [1 mark] |

|  |  |  |  |
| --- | --- | --- | --- |
| **2** | Diagram 2 shows part of the Periodic Table of the Elements. D, E, G, L, M, and J do not represent the actual symbol of the elements.  Rajah 2 menunjukkan sebahagian daripada Jadual Berkala Unsur. D, E, G, L, M dan J tidak mewakili simbol sebenar unsur-unsur berkenaan.  **L**  **D**  **M**  **G**  **J**  **E**  **Diagram 2**  ***Rajah* 2**  Using the letters in the Periodic Table of the Elements in Diagram 2, answer the following questions.  *Dengan menggunakan huruf-huruf yang terdapat dalam Jadual Berkala pada Rajah 2, jawab soalan-soalan berikut*. | | |
|  | (a) | (i) | State the position of element E in the Periodic Table.  *Nyatakan kedudukan unsur E dalam Jadual Berkala*.  ……………………………………………………………………………………..  [2 marks] |
|  |  | (ii) | Choose the element which exhibit different oxidation numbers in its compounds. *Pilih unsur yang mempunyai pelbagai nombor pengoksidaan di dalam sebatiannya.*  …………………………………………………………...………………………..  [1 mark] |
|  | (b) | Element D combines with element L to form a compound.  *Unsur D bergabung dengan unsur L untuk membentuk suatu sebatian*. | |
|  |  | (i) | Write the chemical formula of this compound.  *Tuliskan formula kimia bagi sebatian ini.*  ..............................…………………………………………………………………  [1 mark] |
|  |  | (ii) | State one physical property of this compound.  *Nyatakan satu sifat fizik sebatian ini.*  ………………………………………………………………………....................... [1 mark] |
|  | (c) | D and E have the same chemical properties.  *D dan E mempunyai sifat-sifat kimia yang sama*. | |
|  |  | (i) | Which element is more reactive?  *Unsur yang manakah yang lebih reaktif?*  ..................................................................................................................................  [1 mark] |
|  |  | (ii) | Explain your answer in (c) (i).  *Terangkan jawapan anda dalam (c) (i).*  ……………………………………………………………………………………..  ……………………………………………………………………………………..  [2 marks] |
|  | (d) | Which element exists as diatomic molecules?  *Unsur yang manakah membentuk molekul dwiatom?*    ……………………………………………………………………………………………  [1 mark] | |

|  |  |
| --- | --- |
| **3** | Diagram 3 shows the set-up of apparatus to investigate the electrolysis of 0.0001 moldm─3 of hydrochloric acid and 1.0 moldm─3 of potassium iodide using carbon electrodes.  *Rajah 3 menunjukkan susunan radas untuk mengkaji elektrolisis 0.0001 moldm─3* *hidroklorik asid dan 1.0 moldm─3 kalium iodida dengan menggunakan elektrod karbon.*  Electrode Y  *Elektrod Y*  Electrode X  *Elektrod X*  Electrode W  *Elektrod W*  Electrode Z  *Elektrod Z*  Potassium iodide solution  *Larutan kalium iodida*  Hydrochloric acid  *Asid hidroklorik*  **Diagram 3**  ***Rajah* 3** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (a) | (i) | Identify all the electrodes which serve as anode and cathode.  *Kenalpastikan semua elektrod yang berfungsi sebagai anod dan katod.*  Anode :  *Anod:*  *................................................................................................................................*  Cathode :  *Katod:*  *................................................................................................................................*  [2 marks] | |
|  |  | (ii) | Name the product formed at electrode W.  *Namakan hasil yang terbentuk pada elektrod W*.  ……………………………………………...………………………………….....  [1 mark] | |
|  |  | (iii) | Write the half equation for the reaction that occurs at electrode W.  *Tuliskan persamaan setengah bagi tindak balas yang berlaku di elektrod W.*  ……………………………………………………………………………………  [2 marks] | |
|  | (b) | (i) | | State the observation at electrode Y.  *Nyatakan pemerhatian pada elektrod Y.*    ……………………………………………………………………………………  [1 mark] |
|  |  | (ii) | | Name the product formed in b(i)  *Namakan hasil yang terbentuk di b(i)*  ................................................................................................................................  [1 mark] |
|  |  | (iii) | | Suggest a test to confirm the product in b(ii).  *Cadangkan satu ujian untuk mengesahkan hasil yang terbentuk di b(ii).*  ………………………...………………………………………………………….  ………………….………………………………………………………………...  [2 marks] |

|  |  |  |  |
| --- | --- | --- | --- |
|  | (c) | In a separate experiment, the 0.0001 mol dm─3 of hydrochloric acid is replaced with 1.0 moldm─3 of hydrochloric acid and electrolysis is carried out.  *Dalam eksperimen yang berlainan, asid hidroklorik yang berkepekatan 0.0001 moldm─3 digantikan dengan asid hidroklorik yang berkepekatan 1.0 moldm─3 dan elektrolisis dijalankan.* | |
|  |  | (i) | State the product formed at electrode W.  *Nyatakan hasil yang akan terbentuk pada elektrod W.*  ………………………...…………………………………………………………  [1 mark] |
|  |  | (ii) | Explain your answer in c(i).  *Terangkan jawapan anda dalam c(i).*  ................................................................................................................................  *.*……….………………………………………………………...………………  [1 mark] |

|  |  |  |
| --- | --- | --- |
| **4** | Diagram 4 shows how ammonium sulphate is produced.  *Rajah 4 menunjukkan bagaimana ammonium sulfat dihasilkan.*  Process X  *Proses X*  Sulphuric acid  *Asid sulfurik*  Reaction P  *Tindak balas P*  Ammonium sulphate  *Ammonium sulfat*  Process Y  *Proses Y*  Ammonia  **Diagram 4**  ***Rajah* 4** | |
|  | (a) | Process X and process Y are industrial processes.  What are the names of each of these processes?  *Proses X dan proses Y adalah proses dalam industri.*  *Apakah nama setiap proses ini?*  Process X : .........................................................................................................................  Process Y : …...…………………………………………………...……………………...  [2 marks] |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (b) | | What are the **three** raw materials needed for process X?  *Apakah* **tiga** *bahan mentah yang diperlukan dalam proses X?*  1. ......................................................................................................................................    2. ......................................................................................................................................  3. ......................................................................................................................................  [3 marks] | |
|  | | (c) | (i) | | Write a balanced chemical equation for reaction P.  *Tulis persamaan kimia yang seimbang bagi tindak balas P.*  ................................................................................................................................  [2 marks] |
|  | |  | (ii) | | Use the answer in 4(c)(i) to determine the number of moles of sulphuric acid and the number of moles of ammonia used to produce 1 mol of ammonium sulphate.  *Guna jawapan di 4(c)(i) untuk menentukan bilangan mol asid sulfurik dan bilangan mol ammonia yang digunakan untuk menghasilkan 1 mol ammonium sulfat.*  Sulphuric acid / *Asid sulfurik:* …………………………………………………  Ammonia: ………………………………………………….  [2 marks] |
|  | (d) | | State **one** use of ammonium sulphate.  *Nyatakan* **satu** *kegunaan ammonium sulfat.*  ...........................................................................................................................................  [1 marks] | |

|  |  |
| --- | --- |
| **5** | Table 5 shows molecular formulae of 4 carbon compounds.  *Jadual 5 menunjukkan formula molekul bagi 4 sebatian karbon.* |

|  |  |
| --- | --- |
| **Compound**  ***Sebatian*** | **Molecular Formula**  ***Formula molekul*** |
| A | C4H8 |
| B | C4H10 |
| C | C4H9OH |
| D | C2H5COOH |

**Table 5**

***Jadual* 5**

|  |  |  |
| --- | --- | --- |
| (a) | Write the general formula of the homologous series of compound B.  *Tuliskan formula umum bagi siri homolog sebatian B.*    .........……..………………………………………………………………………………  [1 mark] | |
| (b) | State the functional group of compound A and compound D.  *Nyatakan kumpulan berfungsi bagi sebatian A dan sebatian D.*  Compound A : …………………………………………………………………………  *Sebatian A*  Compound D : ………………………………………………………………………….  *Sebatian D*  [2 marks] | |
| (c) | Compound B shows isomerism. Draw the structural formula of two isomers of compound B.  *Sebatian B menunjukkan isomerisme. Lukiskan dua formula struktur bagi isomer sebatian B.*  [2 marks] | |
| (d) | Compound D and compound C are reacted with the presence of the concentrated sulphuric acid.  *Sebatian D dan sebatian C bertindak balas dengan kehadiran asid sulfurik pekat.* | |
|  |  | (i) | Name the product formed from the reaction.  *Namakan hasil yang terbentuk daripada tindak balas*  ……………………………………………………….………………………….  [1 mark] |
|  |  | (ii) | State **one** special characteristic of the product formed.  *Nyatakan* **satu** *ciri istimewa bagi hasil yang terbentuk*  ……………………………………………………….…………………………...  [1 mark] |
| (e) | Compound A burns in excess oxygen to produce carbon dioxide and water.  *Sebatian A terbakar dalam oksigen berlebihan menghasilkan karbon dioksida dan air.* | |
|  |  | (i) | Write a balanced chemical equation for the reaction.  *Tuliskan persamaan kimia seimbang bagi tindak balas tersebut*  ................................................................................................................................  [1 mark] |
|  |  | (ii) | 11.2 g of compound A burns in excess oxygen, calculate number of carbon dioxide molecules formed.  *11.2 g sebatian A dibakar dalam oksigen berlebihan, hitungkan bilangan molekul karbon dioksida yang terbentuk.*  [Relative atomic mass C = 12, O = 16 and Avogadro number = 6.02 x 1023]  [*Jisim atom relatif C = 12, O = 16 dan nombor Avogadro =* 6.02 x 1023]  [2 marks] |
| **6** | In an experiment, 25 cm3 of 1.0 moldm-3 dilute nitric acid is poured into a plastic cup and its temperature is measured. Then, 25 cm3 of 1.0 mol dm-3 sodium hydroxide is measured using a measuring cylinder and its temperature is measured. The sodium hydroxide sodium solution is poured carefully and quickly into the plastic cup containing nitric acid. The mixture is stirred and its highest temperature is taken. Table 6 shows the result of the experiment.  *Dalam satu eksperimen, 25cm3 1.0 moldm-3 asid nitrik cair dituang ke dalam cawan plastik dan suhunya dicatat. Kemudian 25 cm3 1.0 moldm-3 larutan natrium hidroksida di sukat dengan menggunakan silinder penyukat dan suhunya dicatat. Dengan cermat dan cepat larutan natrium hidroksida dituang ke dalam cawan plastik yang mengandungi asid nitrik. Campuran dikacau dan suhu tertinggi yang dicapai dicatat. Jadual 6 menunjukkan hasil keputusan eksperimen.*   |  |  | | --- | --- | | Initial temperature of dilute nitric acid (oC)  *Suhu awal asid nitrik cair* | 25.0 | | Initial temperature of sodium hydroxide solution (oC)  *Suhu awal larutan natrium hidroksida* | 25.0 | | Highest temperature of reacting solution (oC)  *Suhu tertinggi campuran larutan* | 31.5 | | Specific heat capacity of reacting solution (J g-1 °C-1)  *Muatan haba tentu bagi larutan yang bertindakbalas* | 4.2 |   **Table 6**  ***Jadual* 6** | | |
|  | (a) | Define ‘heat of neutralisation’.  *Takrifkan ‘ haba peneutralan’.*  ...........................................................................................................................................  ……………………………………………………………………………………………  [1 mark] | |
|  | (b) | Give a reason why a plastic cup is used in this experiment.  *Nyatakan mengapa cawan plastik digunakan dalam eksperimen ini.*  ...........................................................................................................................................  [1 mark] | |
|  | (c) | Write a chemical equation for the reaction in this experiment.  *Tuliskan persamaan kimia untuk tindak balas ini.*  ...........................................................................................................................................  [1 mark] | |
|  | (d) | Calculate the heat change in this experiment.  *Hitungkan perubahan haba dalam eksperimen ini.*  [1 mark] | |
|  | (e) | Calculate the heat of neutralisation for the reaction  *Hitungkan haba tindak balas peneutralan dalam eksperimen ini.*  [2 marks] | |
|  | (f) | Draw the energy level diagram for this reaction.  *Lukiskan gambarajah aras tenaga dalam tindak balas ini.*  [2 marks] | |
|  | (g) | State the type of reaction in this esperiment.  *Nyatakan jenis tindak balas dalam eksperimen ini.*  ...........................................................................................................................................  [1 mark] | |
|  | (h) | Give **two** assumptions made when calculating the heat of neutralisation  *Nyataka* **dua** *anggapan yang dibuat apabila menghitung haba tindak balas peneutralan.*  ...........................................................................................................................................  ...........................................................................................................................................  [2 marks] | |

**Section B**

***Bahagian B***

[20 marks]

[20 *markah*]

Answer any **one** question.

*Jawab mana-mana* **satu** *soalan.*

|  |  |  |  |
| --- | --- | --- | --- |
| **7** | Diagram 7 shows the electron arrangement for atoms P, Q and R.  *Rajah 7 menunjukkan susunan elektron bagi atom-atom P, Q dan R.*  R  Q  P  Atom P Atom Q Atom R  **Diagram 7**  ***Rajah* 7** | | |
|  | (a) | Based on Diagram 7, answer the following questions:  *Berdasarkan Rajah 7, jawab soalan-soalan berikut:* | |
|  |  | (i) | State the location of atom R in the Periodic Table of Elements.  *Nyatakan kedudukan atom R dalam Jadual Berkala Unsur.* |
|  |  | (ii) | Explain how you determine the group and the period of atom R.  *Terangkan bagaimana anda menentukan kumpulan dan kala bagi atom R.*  [5 marks] |
|  | (b) | Atoms P and Q can form chemical bonds with atom R.  *Atom P dan Q boleh membentuk ikatan kimia dengan atom R.*  State the type of chemical bond and explain how the bond is formed between:  *Nyatakan jenis ikatan kimia dan terangkan bagaimana ikatan terbentuk antara:* | |
|  |  | (i) | Atoms P and R  *Atom P dan R* |
|  |  | (ii) | Atoms Q and R  *Atom Q dan R*  [11 marks] |
|  | (c) | State one physical property of the compound formed in (b) (i) and the compound formed in (b) (ii). Explain the differences in the physical property stated.  *Nyatakan satu sifat fizik bagi sebatian yang terbentuk di (b)(i) dan bagi sebatian yang terbentuk di (b)(ii). Terangkan perbezaan bagi sifat fizik yang dinyatakan.*  [4 marks] | |
| **8** | (a) | Figure 8.1 shows the label of a soft drink.  *Rajah 8.1 menunjukkan satu label bagi minuman ringan.*  **Ingredients :**  **Water, aspartame, citric acid,**  **octyl butanoate and tartazine**  ***Ramuan :***  ***Air, aspartame, asid sitrik,***  ***Oktil butanoat dan tartazin***  **Figure 8.1**  ***Rajah 8.1***  Based on the ingredients used, classify the types of food additives in this soft drink.  *Berdasarkan ramuan yang digunakan, kelaskan jenis bahan tambah yang terkandung dalam minuman ringan ini.*  [4 marks] | |
|  |  |  | |
|  | (b) | The information below shows the condition of patient X and patient Y.  *Berikut ialah maklumat tentang keadaan pesakit X dan pesakit Y.*  **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 X mengalami tekanan perasaan yang berpanjangan akibat satu kemalangan.***    Suggest :   * type of medicine that should be taken by each patient * the prescription that must be followed, and * reason why the prescription must be followed by them.   *Cadangkan :*   * *jenis ubat yang patut diberikan kepada setiap pesakit* * *preskripsi yang perlu dipatuhi, dan* * *mengapa preskripsi tersebut perlu dipatuhi* *oleh mereka*.   [6 marks] | |
|  | (c) | Diagram 8.2 shows the set-up of experiment carried out to study the effectiveness of cleansing action of a detergent and soap in hard water and soft water.  *Rajah 8.2 menunjukkan susunan radas bagi eksperimen untuk mengkaji keberkesanan tindakan pencucian oleh detergen dan sabun dalam air liat dan air lembut.*   |  |  | | --- | --- | | Soap in soft water /  *Sabun dalam* *air lembut*  ats_0002 | Soap in hard water /  *Sabun dalam* *air liat*  ats_0002 | | Oily stain removed /  *Kesan minyak tanggal* | Oily stain remains /  *Kesan minyak kekal* | | Detergent in soft water /  *Detergen dalam* *air lembut*  ats_0002 | Detergent in hard water /  *Detergen dalam* *air liat*  ats_0002 | | Oily stain removed /  *Kesan minyak tanggal* | Oily stain removed /  *Kesan minyak tanggal* |   **Diagram 8.2**  ***Rajah* 8.2**  Compare the effectiveness of cleansing action of a detergent and a soap in both hard water and soft water.  *Bandingkan keberkesanan tindakan pencucian detergen dan sabun di dalam air liat dan air lembut.*  [10 marks] | |

**Section C**

***Bahagian C***

[20 marks]

[20 *markah*]

Answer any **one** question.

*Jawab mana-mana* **satu** *soalan.*

|  |  |  |
| --- | --- | --- |
| **9** | (a) | Diagram 9 shows a series of chemical tests carried out by a student to identify the cation and anion present in a salt, P.  *Rajah 9 menunjukkan satu siri ujian kimia yang dijalankan oleh seorang murid bagi tujuan mengenalpasti kation dan anion dalam suatu garam, P.*  Salt P  *Garam P*  Testing for anion  *Ujian anion*  Testing for cation  *Ujian kation*  Testing for cation  *Ujian kation*  Dissolved in water  *Larutkan dalam air*  Heated strongly  *Panaskan*  *dengan kuat*  Aqueous ammonia is added until excess  *Ammonia akues ditambah sehingga berlebihan*  Sodium hydroxide solution is added until excess.  *Larutan natrium hidroksida ditambah sehingga berlebihan*  Dissolved in water  *Larutkan dalam air*  A brown gas that turns moist blue litmus paper red is liberated  *Gas perang yang menukarkan kertas litmus biru lembab ke merah terbebas*  Confirmatory test for anion  *Ujian pengesahan bagi anion*  **Diagram 9**  ***Rajah* 9** |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Based on Diagram 9,  *Berdasarkan Rajah 9,* | |
|  |  | (i) | Name a salt that can possibly be P.  *Namakan satu garam yang mungkin bagi P.*  [1 mark] |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | (ii) | Describe a confirmatory test for the anion present in salt P.  *Terangkan satu ujian pengesahan bagi anion yang hadir dalam garam P.*    [5 marks] |
|  |  | (iii) | For the **salt** named in (a)(i), describe the observations you would obtain, when testing for the **cation**, using sodium hydroxide solution and aqueous ammonia, separately.  *Bagi garam yang dinamakan di (a)(i), jelaskan pemerhatian yang anda perolehi apabila menguji kation dengan larutan natrium hidroksida dan ammonia akues secara berasingan.*  [4 marks] |
|  | (b) | You are required to prepare a sample of dry zinc nitrate.  *Anda dikehendaki menyediakan satu sampel zink nitrat yang kering.*  Describe a laboratory experiment to prepare the salt.  Include these in your answer :   * Name of the reactants * List of apparatus * Procedure * Chemical equation.   *Huraikan satu eksperimen yang boleh dijalankan dalam makmal untuk menyediakan satu sampel garam tersebut.*  *Jawapan anda perlu mengandungi perkara berikut :*   * *Nama bahan tindak balas* * *Senarai radas* * *Prosedur* * *Persamaan kimia terlibat*   [10 marks] | |

|  |  |  |
| --- | --- | --- |
| **10** | (a) | The following are the equations of two reactions:  *Berikut menunjukkan persamaan kimia bagi dua tindak balas kimia:* |
| |  | | --- | | Reaction I : NaOH + HCl 🡪 NaCl + H2O  Reaction II : Mg + Zn(NO3)2 🡪 Mg(NO3)2 + Zn | | | |
|  |  | Determine which reaction is a redox reaction. Explain your answer in terms of changes in the oxidation number.  *Kenalpasti manakah merupakan tindak balas redoks. Jelaskan jawapan anda dari segi perubahan nombor pengoksidaan.*  [4 marks] |
|  | (b) | Diagram 10 shows two redox reactions that take place in test tubes P and Q.  *Rajah 10 menunjukkan dua tindak balas redoks yang berlaku dalam tabung uji P dan Q.*    Chlorine water  *Air klorin*  Iron (II) sulphate *Ferum (II) sulfat*  Potassium iodide  *Kalium iodida*  Test tube P Test tube Q  *Tabung uji P Tabung uji Q*  **Diagram 10**  ***Rajah* 10**  State all the observations and write the ionic equation for the reaction in test tubes P and Q.  *Nyatakan semua pemerhatian dan tuliskan persamaan ionik bagi tindak balas dalam tabung uji P dan Q.*  [6 marks] |

|  |  |  |
| --- | --- | --- |
|  | (c) | Iron(II) ions can be converted to iron(III) ions and iron(III) ions can be converted back to iron(II) ions. By using a named metal as a reducing agent and a named halogen as an oxidising agent , describe briefly how you would carry out these two conversions. Describe a chemical test to show that each conversion has taken place.  *Ion ferum(II) boleh ditukar kepada ion ferum(III) dan ion ferum(III) boleh ditukar semula kepada ion ferum(II). Dengan menggunakan logam yang dinamakan sebagai agen penurunan dan halogen yang dinamakan sebagai agen pengoksidaan, jelaskan bagaimana anda melakukan penukaran tersebut. Jelaskan dengan ujian kimia bagi menunjukkan bahawa penukaran tersebut telah berlaku.*  [10 marks] |

**END OF QUESTION PAPER**

***KERTAS SOALAN TAMAT***