**SKEMA**

**JAWAPAN**

**CHEMISTRY**

**SOLAF 2**

**PAPER 2 (4541/2)**

**CHEMISTRY PAPER 2 (4541/2)**

**Section A**

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| **Question** | **Mark Scheme** | **Sub Mark** | **Total Mark** |
| **1(a)** | T2oC ( answer with unit ) | **1** |  |
| **1(b)** | AB : liquid  CD : solid | **1**  **1** | **2** |
| **1(c)** | heat loss to surrondings is balanced by heat energy liberated (as the particles attracted to one another to form solid) | **1+1** | **2** |
| **1(d)** | the particles move slower | **1** |  |
| **1(e)** | - similar size  - minimum 3 x 3  - no overlapping | **1** |  |
| **1(f)(i)** | Bromine / Naphthalene  a: answer using formulae | **1** |  |
| **1(f)(ii)** | Iron  a: answer using formulae | **1** | **∑ 9** |
| **2(a)(i)** | Group 1 and Period 4 | **1+1** |  |
| **2(a)(ii)** | G | **1** |  |
| **2(b)(i)** | D2L | **1** |  |
| **2(b)(ii)** | Soluble in water// high melting / boiling point// conducts  electricity in molten or aqueous solution | **1** |  |
| **2(c)(i)** | E | **1** |  |
| **2(c)(ii)** | The nuclei attraction towards the valence electrons is weaker in E.  Thus it is easier for E to donate / release an electron to form a positively charged ion. | **1**  **1** | **2** |
| **2(d)** | L//M | **1** | **∑ 9** |
| **3(a)(i)** | Anode: W and Y  Cathode: X and Z | **1**  **1** |  |
| **3(a)(ii)** | Oxygen gas | **1** |  |
| **3(a)(iii)** | 4OH- → O2 + 2H2O + 4e  1. Correct reactant and product  2. Balanced equation | **1**  **1** | **2** |
| **3(b)(i)** | Brown solution is formed//solution turns brown | **1** |  |
| **3(b)(ii)** | Iodine | **1** |  |
| **3(b)(iii)** | Add starch solution into the test tube containing the brown solution,  Brown solution turns to dark blue | **1**  **1** | **2** |
| **3(c)(i)** | Chlorine gas | **1** |  |
| **3(c)(ii)** | The concentration of chloride ions is higher than that of hydroxide ions | **1** | **∑ 11** |

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| **Question** | **Mark Scheme** | **Sub Mark** | **Total Mark** |
| **4(a)** | Process X : Contact  Process Y : Haber | **1**  **1** | **2** |
| **4(b)** | 1. Sulfur  2. Air  3. Water | **1**  **1**  **1** | **3** |
| **4(c)(i)** | 2NH3 + H2SO4 🡪 (NH4)2SO4  Correct reactant  Correct product | **1**  **1** | **2** |
| **4(c)(ii)** | Sulphuric acid : 1 mol  Ammonia : 2 mol | **1**  **1** | **2** |
| **4(d)** | as fertilizer | **1** | **∑ 10** |
| **5(a)** | CnH2n+2 n=1,2,3….. | **1** |  |
| **5(b)** | Compound A : C=C // double bond between carbon-carbon  Compound D : -COOH // carboxyl group | **1**  **1** |  |
| **5(c)** | D:\Documents and Settings\user\My Documents\PNCTROGAYAH\CHEM-DIAGRAMS\KM A90.bmpD:\Documents and Settings\user\My Documents\PNCTROGAYAH\CHEM-DIAGRAMS\KM A88.bmp  D:\Documents and Settings\user\My Documents\PNCTROGAYAH\CHEM-DIAGRAMS\KM A89.bmp  D:\Documents and Settings\user\My Documents\PNCTROGAYAH\CHEM-DIAGRAMS\KM A91.bmp | **1**  **1** | **2** |
| **5(d)(i)** | butylpropanoate | **1** |  |
| **5(d)(ii)** | fruity smell//sweet smell | **1** |  |
| **5(e)(i)** | C4H8 + 6 O2 🡪 4CO2 + 4H2O | **1** |  |
| **5(e)(ii)** | mol C4H8 = 11.2/56 = 0.2  0.2 mol : 0.2 x 4 = 0.8 mol  Number of molecules = 0.8 x 6.02 x 1023 // 4.816 x 1023 | **1**  **1** | **2**  **∑ 10** |
| **6(a)** | The heat of neutralisation is the energy change / energy released when 1 mol of water is formed from the neutralisation between 1 mol of hydrogen ions and 1 mole of hydroxide ions | **1** |  |
| **6(b)** | As a heat insulator to reduce heat loss to environment | **1** |  |
| **6(c)** | NaOH + HNO3  → NaNO3 + H2O | **1** |  |
| **6(d)** | Heat change // heat lost  ΔH = mc  = 50 x 4.2 x 6.5 // 1365 J // 1.365 kJ | **1** |  |
| **Question** | **Mark Scheme** | **Sub Mark** | **Total Mark** |
| **6(e)** | Number of mole of water produce:  n = MV / 1000  = 1.0 (25) / 1000  = 0.025 mol  heat of neutralisation  = 1365 / 0.025 // 1.365 / 0.025  =- 54 600 J // -54.6 kJ | **1**  **1** | **2** |
| **6(f)** | H+ + OH-  H2O  ΔH = -54.6 kJmol-1  **Energy**  Axis energy label correctly.  Formula / name of reactant and product of exothermic is correct | **1**  **1** | **2** |
| **6(g)** | Exothermic | **1** |  |
| **6(h)** | -no heat energy is lost to the environment  -plastic cup does not absorb part of the heat energy  -the specific heat capacity of the mixture is the same as the specific  heat capacity of the water. [any two] | **1**  **1**  **1**  **1** | **Max 2**  **∑ 10** |

**Section B**

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| **Question** | **Mark Scheme** | **Sub Mark** | **Total Mark** |
| **7(a)(i)** | Group 17  Period 3 | **1**  **1** | **2** |
| **7(a)(ii)** | Electron arrangement of atom R is 2.8.7.  It is located in Group 17 because it has seven valence electrons.  It is in Period 3 because it has three shells filled with electron | **1**  **1**  **1** | **3** |
| **7(b)(i)** | 1. atoms P and R form covalent bond.  2. atom P and atom R share electrons  3. to achieve the stable electron arrangement  4. atom P contributes 4 electrons while atom R contributes one  electron  5. 1 atom P shares electron with 4 atoms R // diagram  R  R  R  R  P | **1**  **1**  **1**  **1**  **1** | **5** |
| **7(b)(ii)** | 1. atom Q and atom R form ionic bond.  2. atom Q has the electron arrangement 2.8.1. and atom R has the  electron arrangement 2.8.7  3. to achieve a stable (octet )electron arrangement  4. atom Q donates 1 electron to form a positive ion// equation  5. atom R receives an electron to form ion R-//equation  6. ion Q+ and ion R- are pulled together by the strong electrostatic  forces to form a compound with the formula QR// diagram  Q  R  +  - | **1**  **1**  **1**  **1**  **1**  **1** | **6** |

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| **Question** | **Mark Scheme** | **Sub Mark** | **Total Mark** |
| **7(c)** | The ionic compound/ (b)(ii) dissolves in water  while the covalent compound / (b)(i)does not dissolve in water.  Water is a polar solvent that can cause the ionic compound to dissociate into ions.  Covalent compounds are non-polar and can only dissolve in organic solvents.  OR  The melting point of the ionic compound/ (b)(ii) is higher than that of the covalent compound/ (b)(i) .  This is because in ionic compounds ions are held by strong electrostatic forces.  More energy is needed to overcome these forces.  In covalent compounds, molecules are held by weak intermolecular forces.  Only a little energy is required to overcome the attractive forces.  OR  The ionic compound/(b)(ii) conducts electricity in the molten or aqueous state  whereas the covalent compound/(b)(i) does not conduct electricity.  This is because in the molten or aqueous state, ionic compounds consist of freely moving ions.  Covalent compounds are made up of molecules only | 1  1  1  1  1  1  1  1  1  1  1  1  1 | **4**  **∑ 20** |
| **8 (a)** | |  |  | | --- | --- | | **Ingredient** | **Food additive** | | Aspartame | Sweetener | | Tartazine | Colouring | | Octyl butanoate | Flavouring | | Citric acid | Anti-oxidant | | **1**  **1**  **1**  **1** | **4** |
| **8(b)** | 1. X – antibiotic  2. the patient must complete the whole course  3. prevent patient suffering from same illness/immunisation  4. Y – anti depressant  5. taken only when needed / do not overdose / stop when calmer  6. could cause addiction / death if overdose | **1**  **1**  **1**  **1**  **1**  **1** | **6** |

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| **Question** | **Mark Scheme** | **Sub Mark** | **Total Mark** |
| **8(c)** | 1. Soap effective in soft water  2. Soap ineffective in hard water.  3. In soft water, soap does not form scum.  4. Hard water, contains Ca2+ ion and Mg2+ ion  5. Ca2+ ion and Mg2+ ion react with soap anion  6. to form scum / insoluble precipitate  7. Detergent effective in both soft water and hard water.  8. In hard water, Ca2+ ion and Mg2+ ion react with detergent anion  9. do not form scum / produce soluble salt  10. Cleansing action of detergent is more effective. | **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1** | **10**  **∑ 20** |

**Section C**

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| **Question** | Mark Scheme | **Sub Mark** | **Total Mark** |
| **9(a)(i)** | Any nitrate salt  (except sodium nitrate, potassium nitrate and ammonium nitrate) | **1** | **1** |
| **9(a)(ii)** | 1. correct reagents   2,3 correct procedure  4 correct observation  5 correct inference  (If (a)(i) is not nitrate salt, points 1, 2, 3 and 4 can be given for correct corresponding test)  Example :   1. Dilute sulphuric acid, iron (II) sulphate and concentrated sulphuric acid 2. 2 cm3 of solution P is poured into a test tube. 2 cm3 of dilute sulphuric acid followed by 2 cm3 of iron (II) sulphate solution are added. The mixture is shaken well. 3. A few drops of concentrated sulphuric acid are dropped **carefully / slowly** along the slanted / tilted side of test tube 4. Brown ring is formed 5. Nitrate ion, NO3- is confirmed to be present. | **1**  **1+1**  **1**  **1** | **5** |

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| **Question** | **Mark Scheme** | | **Sub Mark** | **Total Mark** |
| **9(a)(iii)** | | 1. Correct colour precipitate in sodium hydroxide solution 2. Correct observation in excess sodium hydroxide solution 3. Correct colour precipitation in aqueous ammonia 4. Correct observation in excess aqueous ammonia   Example :  Pb2+ (except Na+, K+, NH4+)   1. White precipitate 2. Soluble in excess sodium hydroxide solution 3. White precipitate 4. Insoluble in excess aqueous ammonia. | **1**  **1**  **1**  **1** | **4** |
| **9(b)** | | 1. Name of correct reactant : Zn / ZnO / ZnCO3 and nitric acid.  2. List of apparatus; beaker, filter funnel, filter paper, Bunsen burner, evaporating dish, glass rod.  3. (10 – 100) cm3 of dilute nitric acid is poured into a beaker / suitable container.  4. Solid / powdered Zn / ZnO / ZnCO3 is added into nitric acid until excess  5. Filtered  6. Heat the filtrate in an evaporating dish until becomes **saturated** / one third of original the volume / testing for saturation  7. Solution is cooled and filtered.  8. The crystals are pressed between two pieces of filter paper.  9. Correct formula of reactants and products  10. Balanced equation  Zn + HNO3 Zn(NO3)2 + H2 //  ZnO + HNO3 Zn(NO3)2 + H2O //  ZnCO3 + HNO3 Zn(NO3)2 + CO2 + H2O | **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1** | **10**  **∑10** |

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| **Question** | **Mark Scheme** | **Sub Mark** | **Total Mark** |
| **10(a)** | Reaction II  Oxidation number of magnesium changes from 0 to +2  Oxidation number of zinc changes from +2 to 0  No change in oxidation number for each elements in reaction I | **1**  **1**  **1**  **1** | **4** |
| **10(b)** | Test tube P:  The solution changes colour from pale green to yellow  2Fe2+ + Cl2 🡪 2Fe3+ + 2Cl-  Correct formulae of reactants and products  Balance equation  Test tube Q:  The solution changes colour from colourless to yellow/brown  2I-  + Cl2 🡪 I2 + 2Cl-  Correct formulae of reactants and products  Balance equation | **1**  **1**  **1**  **1**  **1**  **1** | **6** |
| **10(c)** | Sample answer:  Zinc as a reducing agent  Add zinc to iron(III) chloride solution  Heat the solution  Filter the solution / mixture  Add sodium hydroxide solution to the solution produced/ Fe2+  Green precipitate is formed  Chlorine as an oxidising agent  Add chlorine water to iron(II) nitrate solution  Stir/ shake the solution  Add sodium hydroxide solution  Brown precipitate | **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1**  **1** | **Max 10**  **∑ 20** |