KOLEJ MATRIKULASI KELANTAN
KELANTAN MATRICULATION COLLEGE

CHEMXCESS

CHEMISTRY 1
SK015
2 Jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU.
DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

INSTRUCTION TO CANDIDATE

1. This questions paper consists of 6 questions.
2. Answer **ALL** questions and write in the foolscap papers.
3. All the steps must be shown clearly. Use new page for each questions.
4. Maximum marks awarded are shown in the brackets at the end of each questions or section.
5. The use of non- programmable scientific calculator is permitted.

No	Marks allocated	Marks
1	21	
2	10	
3	17	
4	9	
5	9	
6	14	
Total	**80**	

1 (a) Isopropyl alcohol, sold as rubbing alcohol is composed of C, H and O. Combustion of 0.255 g of isopropyl alcohol produces 0.561 g of CO_2 and 0.306 g of H_2O. Determine the empirical formula of isopropyl alcohol.

(6 marks)

(b) A sample of naturally occurring silicon consists Si-28 (amu = 27.9769), Si-29 (amu = 28.9765) and Si-30 (amu = 29.9738). If the atomic mass of silicon is 28.0855 and the natural abundance of Si-29 is 4.67%, what are the natural abundances of Si-28 and Si-30?

(5 marks)

(c) When benzene, C_6H_6 reacts with bromine, Br_2, bromobenzene, C_6H_5Br is obtained as follows:

$$C_6H_6 + Br_2 \longrightarrow C_6H_5Br + HBr$$

If 30.0 g of benzene reacts with 65.0 g of bromine, determine the;

(i) limiting reactant,
(ii) mass of excess remain after the reaction completed,
(iii) percentage yield if the bromobenzene produced is 42.3 g.

(11 marks)

2 (a) A green laser pointer emits light with a wavelength of 532 nm. Determine;

(i) the frequency of the light,
(ii) the energy of the photon.

(4 marks)

(b) The proton number of element **P** and **Q** are 12 and 17 respectively. Draw the orbital diagram for the valence electron of each element. Suggest the most stable ions for **P** and **Q**. Write their respectively electronic configuration.

(4 marks)

(c) Give the formula when **P** reacts with **Q**. State the type of bond formed.

(2 marks)

3 (a) What would you expect SiF_4 to be polar or non polar compound? Justify your answer.

(4 marks)

(b) State the hybridisation of the central atom in $SiCl_4$. Draw the orbital diagram and draw the overlapping of orbitals in $SiCl_4$.

(9 marks)

(c) Give **TWO** factors that influence the strength of the van der Waals forces. Explain your answers.

(4 marks)

4 (a) Two glass flask **R** and **S** connected via a tap. While the tap is closed and there is vacuum in flask **R**, 1.00 dm^3 flask **S** is filled with ammonia gas at 1.00 atm and 300 K.

When the tap is opened, ammonia passes into flask **R** and the total pressure in both flask is 0.45 atm. Determine the volume of flask **R**.

(2 marks)

(b) The reaction of calcium hydride with water represented as

$$CaH_2(s) + 2H_2O(l) \longrightarrow Ca(OH)_2(s) + 2H_2(g)$$

90.0 mL of hydrogen gas was collected over water at 25 °C and at pressure **T** mmHg. If the partial pressure of hydrogen gas is 731.2 mmHg and the vapour pressure of water is **U** mmHg, determine the mass of calcium hydride decomposed in the reaction.

(4 marks)

(c) Explain the process $H_2O(l) \longrightarrow H_2O(s)$ by using kinetic molecular theory.

(3 marks)

5 2.0 mol of SO_2 and 1.0 mol of O_2 were allowed to reach equilibrium in a container of 1.0 dm^3 at 450 °C. The equilibrium mixture was found to contain 1.50 mol of SO_3. The reaction is exothermic.

(a) Calculate the equilibrium constant in terms of concentration for the reaction.
(4 marks)

(b) Sketch a graph to show how the concentration changes with time for each of the species before and after the system has achieved equilibrium.
(3 marks)

(c) Explain the effect of lowering the temperature on the equilibrium constant value.
(2 marks)

6 (a) The pH at equivalence point for the titration between ethanoic acid and sodium hydroxide is about 9. Explain qualitatively the sodium ethanoate salt hydrolysis by using hydrolysis equation.

(2 marks)

(b) The solubility product of iron(III) hydroxide, $Fe(OH)_3$ at 25 °C is 1.0×10^{-36}.

(i) Calculate the solubility (in g/L) of iron(III) hydroxide.

(3 marks)

(ii) Does a precipitate form if 2.0 mL of 0.2 M NaOH is added to 20.0 mL of 0.1 M $Fe(NO_3)_3$. Explain.

(6 marks)

(c) A solution with is prepared by mixing NaF and HF in a mole ratio of 0.50:1.0 in 1.0 dm^3 water. The acid dissociation constant of HF is 7.1×10^{-4}. Calculate the pH of the solution.

(3 marks)

KERTAS SOALAN TAMAT
END OF QUESTION PAPER