UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	PHYSICAL CHEMISTRY
COURSE CODE	:	DAS 12303
PROGRAMME CODE	:	DAU
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTIONS	:	ANSWER **ALL** QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) States number of proton, electrons, and neutron in the following species

  (i) $^{12}_{6}C$ (3 marks)
  (ii) $^{37}_{17}Cl^-$ (3 marks)
  (iii) $^{39}_{19}K^+$ (3 marks)

(b) Write the name for the following compound;

  (i) $AlCl_3$ (1 mark)
  (ii) CaO (1 mark)
  (iii) $FeCl_2$ (1 mark)

(c) Carborundum is silicon carbide, SiC, a very hard material used as an abrasive on sandpaper and in other applications. It is prepared by the reaction of pure sand, SiO_2, with carbon at high temperature. Carbon monoxide, CO, is the byproduct of this reaction. (A_n Si=28 u, C=12 u, O=16 u).

  (i) Write the balanced equation for the reaction. (2 marks)
  (ii) Compute formula mass for SiC. (1 mark)
  (ii) Calculate how much SiO_2 is required to produce 3.00 kg of SiC. (5 marks)

(d) Write the following for hydrogen gas.

  (i) Molecular formula (1 mark)
  (ii) Structural formula (1 mark)

(e) Label family name (group) for the following elements

  (i) Zinc (1 mark)
  (ii) Lithium (1 mark)
  (iii) Chlorine (1 mark)

Q2 (a) The pressure of a sample of gas is measured at sea level with a closed-end manometer as shown in **Figure Q2 (a)**. The liquid in the manometer is mercury. Determine the pressure of the gas in:

(i) torr (2 marks)
(ii) Pa (2 marks)
(iii) bar (2 marks)

(b) Sketch the ideal behavior of gas for the following relations

(i) P with V at constant n and T (2 marks)
(ii) V with T at constant n and P (2 marks)
(iii) P with T at constant n and V (2 marks)
(iv) $\frac{1}{P}$ with V at constant n and T (2 marks)

(b) 1 L of Ethane C_2H_6(g) at STP react with oxygen in combustion reaction at 600 °C and 0.888 atm and produce carbon dioxide CO_2 (g) and water vapor H_2O(g) :

(i) Write complete chemical equation for the following reaction. (1 mark)
(ii) Find the total volume of CO_2 (g) and H_2O (g) released. (4 marks)
(ii) Calculate partial pressure of H_2O (g) release. (2 marks)

(c) State **two (2)** differences of volatile and non-volatile substance.

(4 marks)

Q3 (a) State difference between solubility of gas and solid in water in relation with temperature.

(2 marks)

(b) A concentrated solution of nitric acid contain 68.0% HNO_3 by mass.

   (i) State the difference between solutions and compounds and from other mixtures. (2 marks)

   (ii) Calculate molality of the nitric acid. (3 marks)

   (A_n H=1u, N= 14 u, O=16 u)

(b) In one experiment, Br react with H_2 to form Hydrogen bromide HBr. The changing of concentration for Br and H_2 related to the reaction rate is given by **Table 1**.

   (i) Write **TWO (2)** factors affecting reaction rates. (2 marks)
   (ii) Write the balanced chemical equation for the reaction. (1 mark)
   (iii) Draw lewis structure for HBr. (1 mark)
   (iv) Find the reaction order for H_2. (3 marks)
   (v) Find the reaction order for Br. (3 marks)
   (vi) Write the complete reaction rate for the chemical reaction given according to finding in (iv) and (v). (3 marks)
   (vii) Calculate the reaction constant, k for the reaction taking place. (5 marks)

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Q4   (a)   Define galvanic and electrolytic cells.

(2 marks)

(b)   Electrolysis of Sodium chloride usually carried out to produce sodium metal and chlorine gas shown in **Figure Q4 (b)**.
   (i)   State which element undergoes oxidation and reduction.   (2 marks)
   (ii)   Write half-cell reaction taking place at anode and cathode   (2 marks)
   (iii) Determine overall cell reaction.   (2 marks)

(c)   Explain why battery-powered electronics perform poorly in low temperatures.

(2 marks)

(d)   Write the definition for the followings.

   (i)   Aufbau Principle   (2 marks)
   (ii)   Pauli Exclusion Principle   (2 marks)
   (iii) Hund's Rule   (2 marks)

(e)   An atom containing 8 proton in nucleus and 8 electron.

   (i)   Draw orbital diagram for the atom   (1 mark)
   (ii)   Write electron configuration for the atom   (1 mark)
   (iii) State the name of the atom   (1 mark)

(f)   Molecule found in nature usually bound in different states and geometry.

   (i)   Define ionic and covalent bond.   (2 marks)
   (ii)   List at least **one (1)** example substance or molecule having each type of bonding.   (2 marks)

(g)   Sketch diagram of enthalpy changes in Exothermic and Endothermic Reactions

(2 marks)

-END OF QUESTIONS –

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FINAL EXAMINATION

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Closed end

Gas

26.4 cm

Figure Q2 (a)

Voltage source

Porous screen

Anode

Cathode

Cl^-

Na^+

Molten NaCl
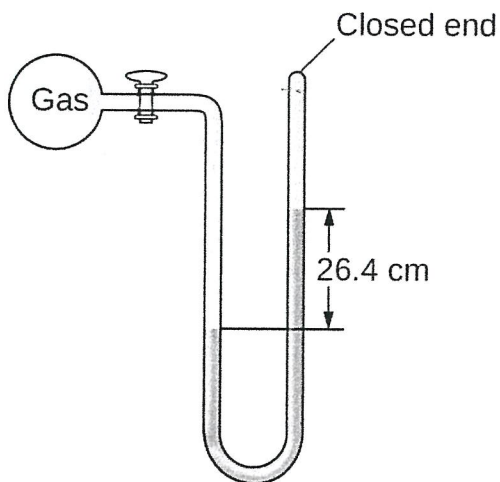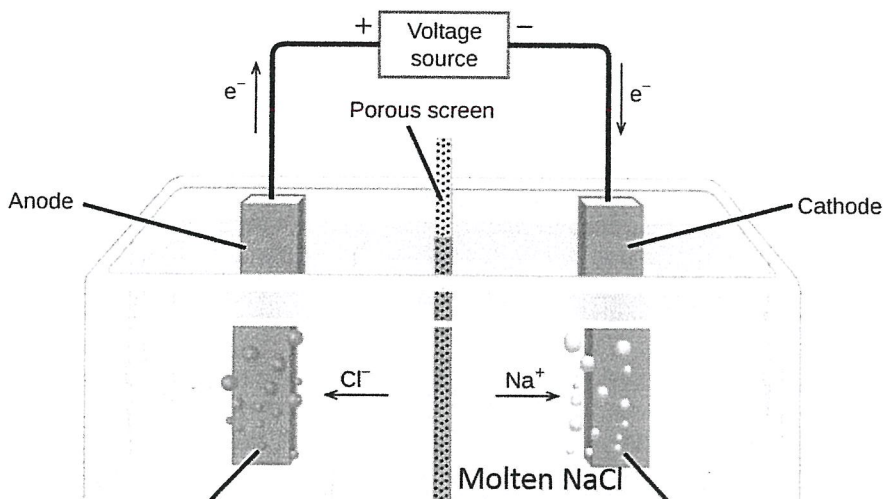
Figure Q4 (b)

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Table 1: Reaction of H_2 with Br

No of Trial	[H_2] (M)	[Br] (M)	Initials Rate (mol.L/s)
1	0.02	0.01	2.0×10^{-3}
2	0.02	0.02	4.0×10^{-3}
3	0.06	0.01	1.8×10^{-2}