

AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XI EXAMINATION

MAY 2012

Chemistry Paper II

Time allowed: 2 hours 20 minutes Marks 55

INSTRUCTIONS

Please read the following instructions carefully.

1. Check your name and school information. Sign that it is correct.

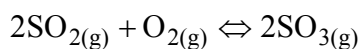
**I agree that this is my name and school.
Candidate's signature**

2. RUBRIC. There are TEN questions. Answer ALL TEN questions. Questions 8, 9 & 10 each offer TWO choices. Attempt any ONE choice from each.
3. When answering the questions:

Read each question carefully.
Use a black pencil for diagrams. DO NOT use coloured pencils.
DO NOT use staples, paper clips, glue correcting fluid, or ink erasers.
Complete your answer in the allocated space only. DO NOT write outside the answer box.
4. The marks for the questions are shown in brackets ().
5. You may use a scientific calculator if you wish.

Q.1. (Total 8 Marks)

a. The key stage in the manufacturing of sulphuric acid is the reaction between sulphur dioxide and oxygen.



How many molecules of oxygen react with 1.2×10^{-2} moles of sulphur dioxide to produce sulphur trioxide? (2 Marks)

b. According to Bohr's atomic theory, atoms possess a flat structure. However, later researches denied it. Mention the postulate of Bohr's theory which shows this phenomenon and also state the reason for its objection. (2 Marks)

c. Which of the following sets of quantum numbers cannot exist? Give a reason for your answer. (2 Marks)

1. $n = 4, l = 2, m = +1, s = +1$
2. $n = 4, l = 3, m = +2, s = +1/2$

d. The given figure represents the atomic emission spectrum of hydrogen. (2 Marks)



i. Why is it composed of lines?

ii. What does each line indicate?

Q.2. (Total 6 Marks)

a. Describe with an example that polar bonds in a molecule can give rise to a non-polar molecule. (2 Marks)

b. Glucose and benzene both are organic compounds. (4 Marks)

i. State the type of bonding present between the molecules of each compound.

Glucose: _____

Benzene: _____

ii. Describe why glucose dissolves in water but benzene is completely insoluble.

Q.3.

(Total 5 Marks)

- a. Why does magnesium oxide have a high melting point and why does it not conduct electricity in solid state? (3 Marks)

- b. Briefly describe why cooking food in a pressure cooker takes lesser time. (2 Marks)

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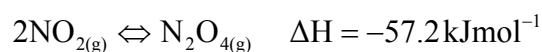
Q.4. (Total 4 Marks)

a. Describe any TWO effects of a catalyst on a reversible reaction. (2 Marks)

1. _____

2. _____

b. Predict and describe the effect of decreasing temperature on the following reaction at equilibrium. (2 Marks)



Prediction: _____

Description: _____

Q.5. (Total 8 Marks)

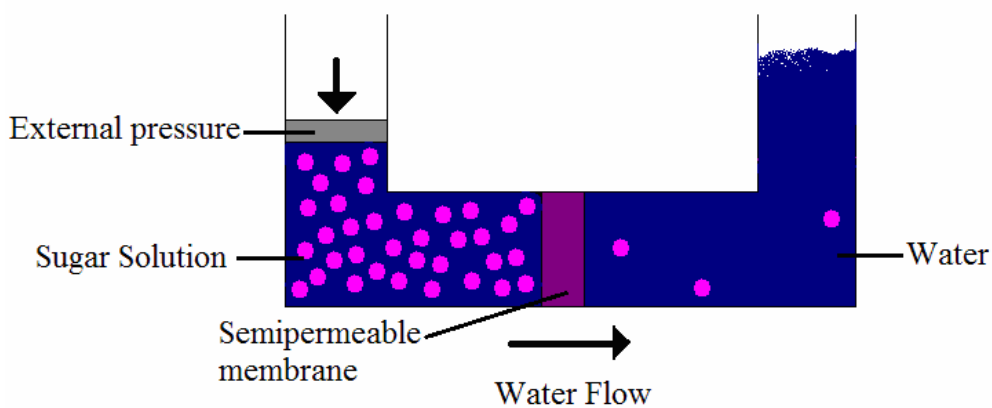
a. When sodium hydrogen sulphate (NaHSO_4) is added to a solution of sodium sulphate (Na_2SO_4) the mixture acts as a buffer solution.

With the help of chemical equations describe how the above mentioned buffer solution responds when an acid or a base is added to it. (2 Marks)

b. State whether the pH of an aqueous solution of pure ammonium chloride (NH_4Cl) would be greater or less than 7 at 25°C . Give a reason to support your answer. (2 Marks)

c. Briefly describe how the colloidal particles stay suspended in a liquid while particles in a suspension settle down. (2 Marks)

d. Identify and describe the phenomenon occurring in the given diagram. (2 Marks)



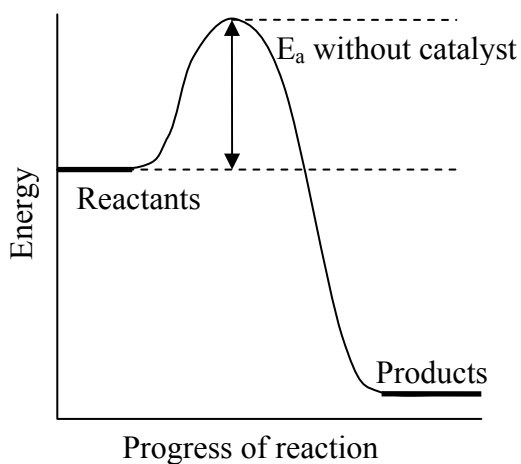
Identification: _____

Description: _____

Q.6. (Total 4 Marks)

a. Define 'activation energy'. (1 Mark)

b. Draw and interpret the effect of catalyst on the activation energy in the given graph. (2 Marks)



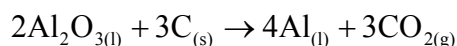
c. State how an increase in temperature can cause an increase in the rate of a reaction. (1 Mark)

Q.7.

(Total 5 Marks)

a. In an endothermic reaction, ΔH is positive. What does the positive sign indicate? (1 Mark)

b. Aluminium metal is electrolytically manufactured on industrial scale by the process shown in the following equation. (4 Marks)



i. Show oxidation and reduction reactions at anode and cathode respectively with the help of chemical equations.

At anode: _____

At cathode: _____

ii Identify the reducing agent in the given reaction. Give ONE reason to support your answer.

Reducing agent: _____

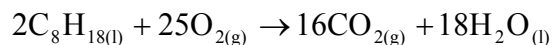
Reason: _____

Q.8.

(Total 5 Marks)

EITHER

a. The octane present in gasoline burns as shown in the following equation.



What is the percentage yield of carbon dioxide if 4 moles of octane are burnt to produce 1350 g of carbon dioxide?

OR

b. Bohr's equation for the calculation of wave numbers of photons of various spectral series is

$$\bar{\nu} = 1.09678 \times 10^7 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2} \right] m^{-1}.$$

Determine the wave number of photon when an electron of hydrogen atom jumps from $n=7$ and 6 to $n=2$. Also identify the name of the series to which the photons belong.

Lined writing area with 20 horizontal lines.

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Q.9.

(Total 5 Marks)

EITHER

a. The solubility product of a sparingly soluble compound, aluminium hydroxide $\text{Al}(\text{OH})_3$ is 3×10^{-34} at 25°C . Calculate the concentrations of ions with respect to solubility of $\text{Al}(\text{OH})_3$.

OR

b. Prove that the mole fraction of each component of a solution in which 5.8 g of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) and 8.2 g of urea (NH_2CONH_2) are dissolved in 56 g of water is equal to one. (Hint: Atomic mass of C = 12 amu, H = 1 amu, O = 16 amu and N = 14 amu)

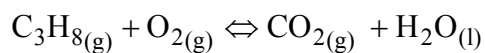
Q.10.

(Total 5 Marks)

EITHER

- a. The standard heat of formation for $C_3H_{8(g)}$, $O_{2(g)}$, $CO_{2(g)}$ and $H_2O_{(l)}$ is $-103.85 \text{ kJmol}^{-1}$, 0 kJmol^{-1} , $-393.5 \text{ kJmol}^{-1}$ and $-285.8 \text{ kJmol}^{-1}$ respectively.

Balance the following equation and calculate ΔH° of the reaction from the given data.

**OR**

- b. Describe the generation of electrical energy by a lead accumulator through the discharge process.

END OF PAPER

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Please use this page for rough work