Practice Question Set For A-Level
Subject : Chemistry
Paper-1 Topic: Physical 1

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Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Q1.

(a) The gaseous reactants **W** and **X** were sealed in a flask and the mixture left until the following equilibrium had been established.

$2W(g) + X(g) \rightleftharpoons 3Y(g) + 2Z(g)$ $\Delta H = -200$ kJ mol^{-1}

Write an expression for the equilibrium constant, K_p, for this reaction.
State one change in the conditions which would both increase the rate of reaction and decrease the value of K_p. Explain your answers.

(7)

(b) Ethyl ethanoate can be prepared by the reactions shown below.

Reaction 1
$CH_3COOH(l) + C_2H_5OH(l) \rightleftharpoons CH_3COOC_2H_5(l) + H_2O(l)$ $\Delta H^{\ominus} = -2.0$ kJ mol^{-1}

Reaction 2
$CH_3COCl(l) + C_2H_5OH(l) \rightarrow CH_3COOC_2H_5(l) + HCl(g)$ $\Delta H^{\ominus} = -21.6$ kJ mol^{-1}

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(i) Give one advantage and one disadvantage of preparing ethyl ethanoate by **Reaction 1** rather than by **Reaction 2**.

(2)

(ii) Use the information given above and the data below to calculate values for the standard entropy change, $\Delta S^{\ominus}$, and the standard free-energy change, $\Delta G^{\ominus}$, for **Reaction 2** at 298 K.

	$CH_3COCl(l)$	$C_2H_5OH(l)$	$CH_3COOC_2H_5(l)$	$HCl(g)$
$S^{\ominus}/JK^{1}mol^{1}$	201	161	259	187

(6)

(Total 15 marks)

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Q2.

The following information concerns the equilibrium gas-phase synthesis of methanol.

$CO(g) + 2H_2(g) \rightleftharpoons CH3OH(g)$

At equilibrium, when the temperature is 68 °C, the total pressure is 1.70 MPa.
The number of moles of CO, H_2 and CH_3OH present are 0.160, 0.320 and 0.180, respectively.

Thermodynamic data are given below.

Substance	$\Delta H_f^{\ominus}$ / kJ mol^{-1}	$S^{\ominus}$ / J K^{-1} mol^{-1}
CO(g)	−110	198
$H_2(g)$	0	131
$CH_3OH(g)$	−201	240

Which one of the following statements applies to this equilibrium?

A The value of K_p increases if the temperature is raised.

B The value of K_p increases if the pressure is raised.

C The yield of methanol decreases if the temperature is lowered.

D The yield of methanol decreases if the pressure is lowered.

(Total 1 mark)

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Q3.

A weak acid HA dissociates in aqueous solution as shown below

$$HA(aq) \rightleftharpoons H^+(aq) + A^-(aq) \qquad \Delta H = +20 \text{ kJ mol}^{-1}$$

Which one of the following changes will result in a decrease in the pH of an aqueous solution of the acid?

A addition of a little aqueous sodium hydroxide solution

B raising the temperature of the solution

C dissolving a little of the sodium salt, NaA, in the solution

D adding a platinum catalyst to the solution

(Total 1 mark)

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