Additional questions on calculating and interpreting Kc

**1.** The diagrams below represent equilibrium mixtures for the reaction P2 + Q ⇌ PQ + P at 25 °C and 300 °C respectively. Deduce and explain whether the reaction is exothermic or endothermic.

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**2.** For the reaction

4NH3 (g) + 5O2 (g) ⇌ 4NO (g) + 6H2O (g) △H = - 46.2 kjmol-1

**a)** write an expression for the equilibrium constant

**b)** Calculate the value of Kc given the following equilibrium concentrations at 400 °C

[NH3] = 0.1 mol L-1 [O2] = 0.125 mol L-1 [NO] = 0.1 mol L-1 [H2O] = 0.15 mol L-1

**c)** Discuss the effect of each of the following on the value of the equilibrium constant

**i)** some product is removed

**ii)** the temperature decreases

**iii)** more reactant is added

**iv)** the volume is increased

**v)** a catalyst is used

**vi)** the pressure is increased by decreasing the volume

**3.** The gas-phase conversion reaction between the geometric isomers cis-2-butene and

trans-2-butene is represented by the equation below. The value of the equilibrium

constant, Kc, for the reaction is 3.2 at 25 °C and 1.01325 x 105 Pa



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**a)** In a mixture of the isomers at equilibrium at 25 °C and 1.01325 x 105 Pa, which is present at a

higher concentration, cis-2-butene or trans-2-butene? Justify your answer.

**b)** Given that K for the reaction at 127 °C has the value of 1.3, predict whether the

reaction is endothermic or exothermic. Justify your answer.

*edited from reference:* [*http://www.glimme.net/bhs/unt09/AP-Q-2-ans.pdf*](http://www.glimme.net/bhs/unt09/AP-Q-2-ans.pdf)

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