



CHEMISTRY ONLINE
— **TUITION** —

Phone: +442081445350

www.chemistryonlinetuition.com

Email: asherrana@chemistryonlinetuition.com

CHEMISTRY

PHYSICAL CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	CHEMICAL EQUILIBRIA
PAPER TYPE:	QUESTION PAPER - 4
TOTAL QUESTIONS	10
TOTAL MARKS	37

ChemistryOnlineTuition Ltd reserves the right to take legal action against any individual/ company/organization involved in copyright abuse.

Chemical Equilibria - 4

1. Chemical companies are using catalysts to develop processes that are more sustainable.

These processes reduce costs and are less harmful to the environment. Suggest two ways in which the use of catalysts helps chemical companies to make their processes more sustainable.

(4)

2. Use the information about the following solutions to answer the question below.

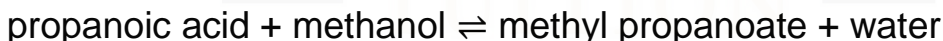
Solution F:

This is a mixture of 1 mol of propanoic acid, 1 mol of methanol and 2 mol of water.

Solution G:

This was originally the same mixture as solution F but it has been left to reach equilibrium. Solution G was found to contain 0.5 mol of propanoic acid.

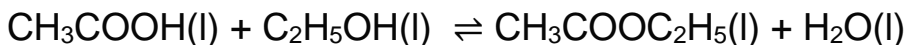
Which one of the following is the value of the equilibrium constant (K_c) for the following equilibrium?



- A.** 0.2
B. 1
C. 5
D. 10

(Total 1 mark)

3. A flask containing a mixture of 0.200 mol of ethanoic acid and 0.110 mol of ethanol was maintained at 25 °C until the following equilibrium had been established.



The ethanoic acid present at equilibrium required 72.5 cm³ of a 1.50 mol dm⁻³ solution of sodium hydroxide for complete reaction.

- (a) Calculate the value of the equilibrium constant, K_c , for this reaction at 25 °C.

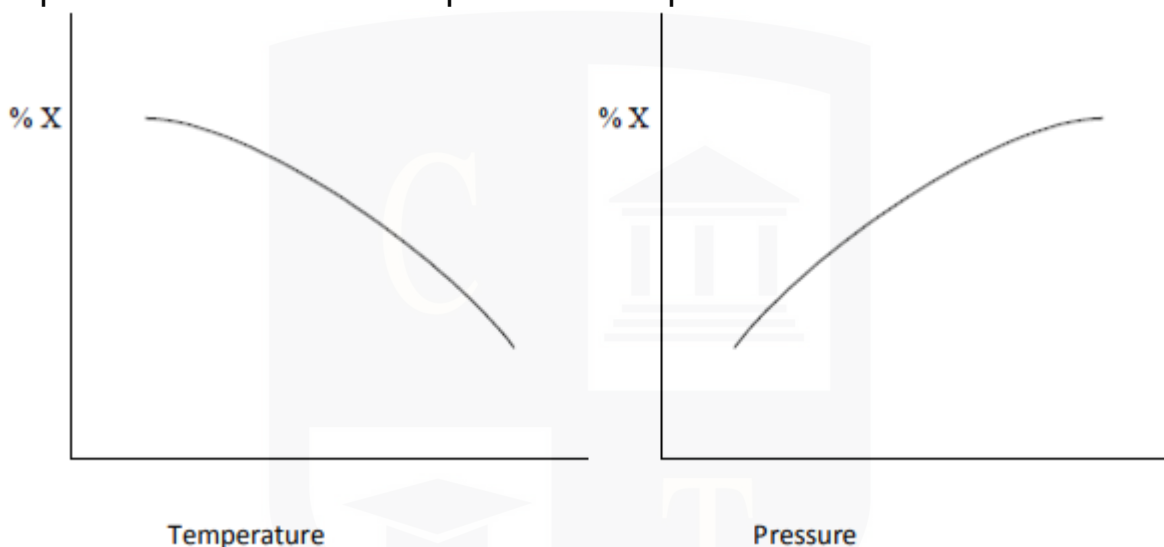
(5)

- (b) The enthalpy change for this reaction is quite small. By reference to the number and type of bonds broken and made, explain how this might have been predicted.

I am Sorry !!!!!

(4)

4. A compound X is formed during a gas phase reaction. The graphs below show how the percentage of a compound X present at equilibrium varies with temperature and pressure.

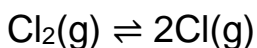


Temperature Pressure Which one of the following statements concerning the formation of X is correct?

- A. The reaction is exothermic and involves a decrease in the number of moles of gas.
- B. The reaction is exothermic and involves no change in the number of moles of gas.
- C. The reaction is exothermic and involves an increase in the number of moles of gas.
- D. The reaction is endothermic and involves a decrease in the number of moles of gas.

(Total 1 mark)

5. A sample of chlorine gas was sealed in a tube, heated and an equilibrium was established.

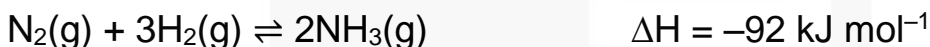


Which one of the following is not true?

- A. The concentration of chlorine atoms remains the same when a catalyst is added to the tube.
- B. Increase in temperature causes an increase in the concentration of chlorine atoms.
- C. Increase in pressure causes an increase in the concentration of chlorine atoms relative to chlorine molecules.
- D. Addition of more chlorine gas to the tube causes an increase in the concentration of chlorine atoms.

(Total 1 mark)

6. Ammonia, NH_3 , is made industrially by the Haber process. This is an equilibrium reaction.



- (a)** State the pressure and temperature that are used in the Haber process.

(2)

- (b)** Describe and explain why these conditions are a compromise between rate and equilibrium.

CHEMISTRY ONLINE
— TUITION —

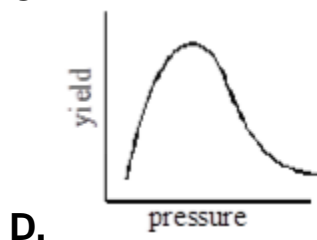
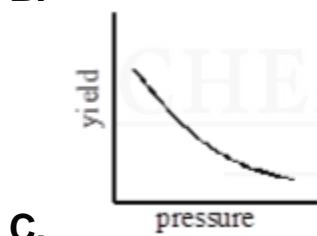
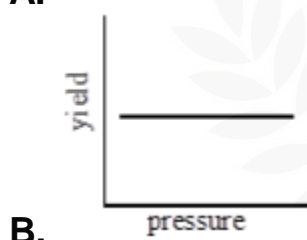
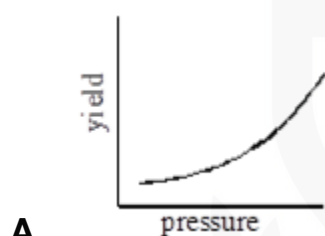
I am Sorry !!!!!

(6)

7. Phosphorus(V) chloride decomposes at high temperatures into phosphorus(III) chloride and chlorine according to the equation.



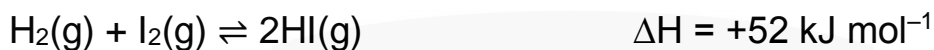
Which one of the graphs best represents the variation with pressure of the yield of chlorine at equilibrium?



I am Sorry !!!!!

(Total 1 mark)

8. The reaction between hydrogen and iodine can be represented by the following equation:



- (a)** Write a K_c expression for the decomposition of hydrogen iodide. At a given temperature, the value of K_c for this reaction is 20. What will be the value of K_c for the reaction between hydrogen and iodine at this temperature?

(2)

- (b)** The pressure of an equilibrium mixture of hydrogen iodide, hydrogen and iodine was increased. State what, if anything, would happen to:

- i. The rates of both forward and reverse reactions:

(2)

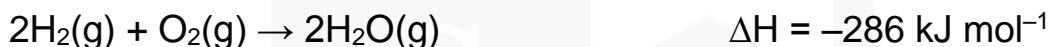
- ii. The position of equilibrium:

(1)

- iii. The value of the equilibrium constant:

(1)

9. The rate of the reaction between hydrogen and oxygen depends on the pressure as well as the temperature.



- (a) Describe and explain the effect of increasing the pressure on the rate of this reaction.

(2)

- (b) A sudden rapid increase in the rate of a reaction causes an explosion to occur.

Suggest why highly exothermic reactions such as this one are more likely to explode than other reactions.

CHEMISTRY ONLINE
— TUITION —

(2)

10. What is meant by homogeneous catalyst?

(2)



DR. ASHAR RANA
M.B.B.S / MS. CHEMISTRY



- Founder & CEO of Chemistry Online Tuition Ltd.
- Completed Medicine (M.B.B.S) in 2007
- Tutoring students in UK and worldwide since 2008
- CIE & EDEXCEL Examiner since 2015
- Chemistry, Physics, Math's and Biology Tutor

CONTACT INFORMATION FOR CHEMISTRY ONLINE TUITION

- UK Contact: 02081445350
 - International Phone/WhatsApp: 00442081445350
 - Website: www.chemistryonlinetuition.com
 - Email: asherrana@chemistryonlinetuition.com
- Address: 210-Old Brompton Road, London SW5 OBS, UK