

Equilibria

Question Paper

Level	GCSE
Subject	Chemistry
Exam Board	Edexcel IGCSE
Module	Single Award (Paper 2C)
Topic	Physical Chemistry
Sub-Topic	Equilibria
Booklet	Question Paper

Time Allowed: 25 minutes

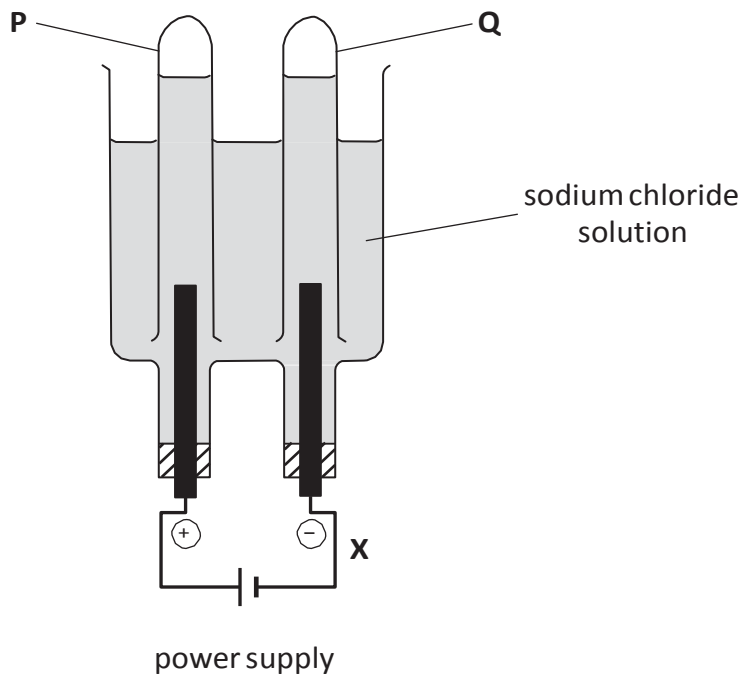
Score: /21

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	70%	60%	55%	50%	<50%

- 1 The diagram shows how sodium chloride solution can be electrolysed and the products of electrolysis collected.



- (a) (i) Draw an arrow on the diagram to show the direction of electron flow at point **X**. (1)
- (ii) The diagram shows one of the gases being collected in test tube **Q**. Identify this gas. (1)

- (iii) When the concentration of the sodium chloride solution is low, the gas collected in test tube **P** is mostly oxygen. The formation of this gas can be represented by an ionic half-equation.

Balance the equation.



- (b) When the concentration of sodium chloride solution is high, the gas that collects in test tube **P** is mostly chlorine. The equation for its formation is:



In one experiment, the volume of chlorine gas collected was 18 cm³.

- (i) Calculate the amount, in moles, of chlorine gas in 18 cm³.

(The volume of 1 mol of a gas at room temperature and pressure is 24 000 cm³)

(2)

Amount = mol

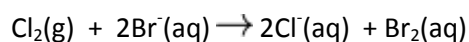
- (ii) Calculate the quantity of electricity, in coulombs, needed to produce this volume of chlorine gas.

(1 faraday = 96 500 coulombs)

(2)

Quantity = C

- (c) Chlorine reacts with potassium bromide solution. The equation for this reaction is:



This reaction can be described as both a displacement reaction and a redox reaction.

- (i) Identify the element that is displaced in this reaction.

(1)

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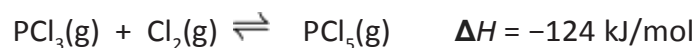
(ii) State the meaning of the term **redox**.

(1)

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(d) Chlorine is used in the manufacture of phosphorus pentachloride, PCl_5

The equation for the reaction is:



(i) What does the \rightleftharpoons symbol indicate about this reaction?

(1)

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(ii) Predict and explain the effect of increasing the pressure on the equilibrium position of this reaction.

(2)

Prediction

Explanation

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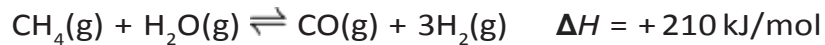
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(Total for Question 1 = 12 marks)

2 The hydrogen needed for the manufacture of ammonia is made by a process called steam reforming.

In this process, a mixture of methane and steam is passed over a nickel catalyst.

The equation for the reaction is



(a) In this part of the question, assume that the reaction reaches a position of equilibrium.

(i) Predict whether a high or low temperature would produce the highest yield of hydrogen.

Give a reason for your choice.

(1)

prediction

reason

(ii) Predict whether a high or low pressure would produce the highest yield of hydrogen.

Give a reason for your choice.

(1)

prediction

reason

(b) Explain how a catalyst increases the rate of a reaction.

(2)

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(c) Some of the carbon monoxide produced is removed in another reaction.

In this reaction, carbon monoxide is mixed with steam and passed over a heated catalyst.

The reaction is reversible and the carbon monoxide is oxidised to carbon dioxide.

(i) Write a chemical equation for this reaction.

(2)

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(ii) Explain why the carbon in carbon monoxide is oxidised in this reaction.

(1)

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(iii) The carbon dioxide produced can be removed by passing the gas through a solution of potassium carbonate, K_2CO_3

The potassium carbonate reacts with carbon dioxide and water to form potassium hydrogencarbonate, $KHCO_3$

Write a chemical equation for this reaction.

(2)

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(Total for Question 2 = 9 marks)