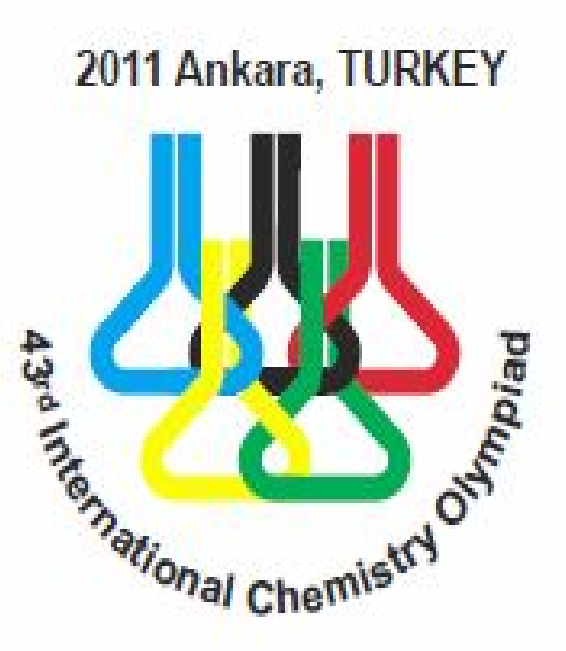
Name: Code:



43rd International Chemistry Olympiad

Practical Tasks Answer Sheets

12 July 2011

Ankara, Turkey

Name: Code:

Task 1 12% of the total

Analysis of Chloride Mixtures

A	B	1	2	3	Task 1	x%
16	16	2	2	6	42	12

A. Determination of total chloride by Fajans Method

Exact concentration of $AgNO_3$ in standard solution = mol/L

Volume of standard $AgNO_3$ solution used

V = mL,

B. Determination of Mg^{2+} by direct titration with EDTA

Exact concentration of EDTA in standard solution = mol/L

Volume of standard EDTA solution used

V = mL

Treatment of Data

1.

Total amount of Cl^- ion in 100.0 mL unknown solution = mmol

2.

Total amount of Mg^{2+} ion in 100.0 mL unknown solution = mmol

3.

For $MgCl_2$ = g/100 mL

For NaCl = g/100 mL

Name: Code:

Task 2

12% of the total

A		B					Task 2	x%
1	2	1	2	3		4		
				i	ii			
3	1	12	2	2	2	2	24	12

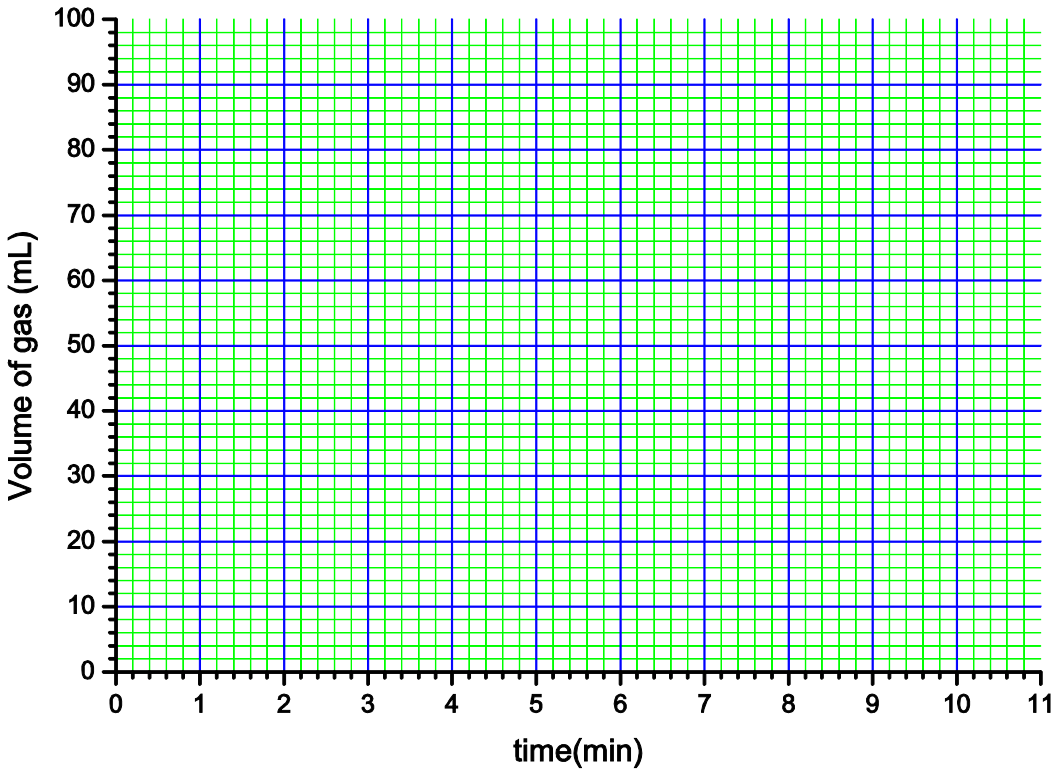
Hydrogen generation from ammonia borane

Part A. Reaction of ammonia borane in the absence of catalyst

1. The gas volume versus time data and the graph for the reaction of ammonia borane in the absence of catalyst

Time (min)	V_{gas} (mL)
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Part A. 4 in the absence of catalyst (mL)



2. Report the volume of gas evolved, $V_{uncatalyzed}$.

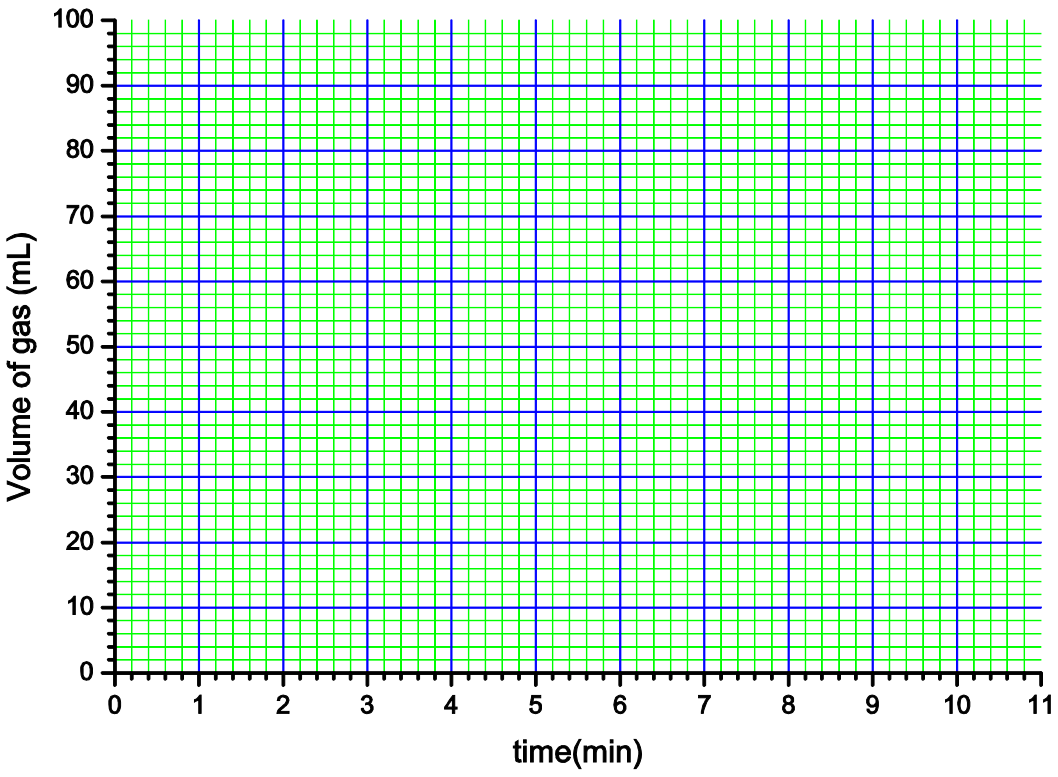
$V_{uncatalyzed}$ = mL (1 point)

Part B. Reaction of ammonia borane in the presence of catalyst

1. The gas volume versus time data and the graph for the reaction of ammonia borane in the presence of catalyst

Time (min)	V_{gas} (mL)
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Part B. Gas volume versus time graph in the presence of catalyst



2. Calculate the maximum number of moles and the maximum volume (mL) of hydrogen gas which will be evolved theoretically from the hydrolysis of 29.5 mg ammonia borane with a purity of 97% w/w at 25 °C. The atmospheric pressure is 690 torr.

$V(H_2)_{max}$ = mL

3. Calculate the rate of hydrogen generation in your experiment.

i) in mL H_2/min

Rate = mL $H_2 \cdot min^{-1}$

ii) in mmol H_2/min by assuming that the temperature is 25 °C. The atmospheric pressure is 690 torr.

Rate = mmol $H_2 \cdot min^{-1}$

4. Calculate the rate of hydrogen production per mole of palladium in (mol H_2)•(mol $Pd)^{-1}$•$(min)^{-1}$. The purity of potassium tetrachloropalladate(II) is 98% w/w.

The rate of hydrogen production per mole of palladium **=** mol $H_2 \cdot (mol\ Pd)^{-1} \cdot min^{-1}$

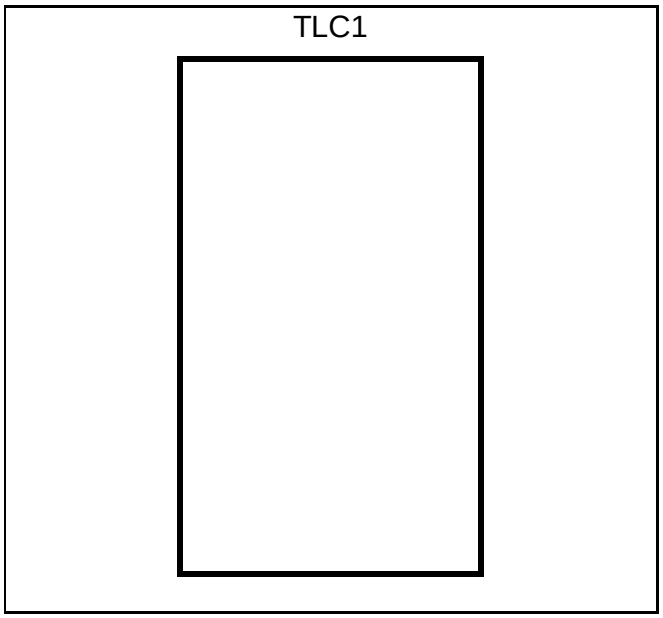
Task 3

16% of the total

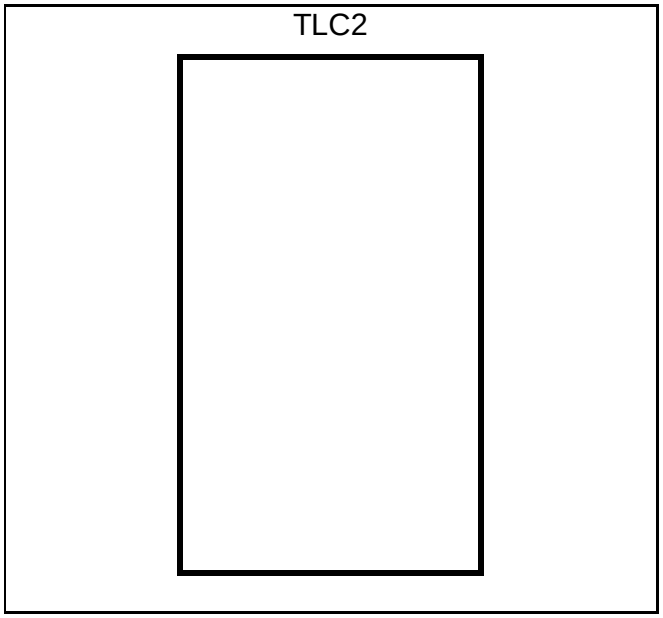
1	2	3	4		Task 3	X%
			i	ii		
5	6	3	12	12	38	16

Synthesis, purification and separation of a diastereomeric mixture

1. Copy (sketch) the TLC1 plate on your answer sheet.



2. Copy (sketch) the TLC2 plate on your answer sheet.



3. Determine and record the R_f values of the spots on the TLC2 plate.

Spots	R_f value
Fraction **A**	
Fraction **B**	
Starting material (**SM**)	

4. Measure and record the volume and absorbance values for fraction **A** and fraction **B**.

Sample	Volume	Absorbance
Fraction **A**	mL	
Fraction **B**	mL	

Calculate the percent yield of fraction **A** and **B**

i) Percent yield of fraction **A** =

ii) Percent yield of fraction **B** =