

!"\$%&"#\$

:LI@BL8I:6L85%>A@N:4IBO%65ON;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@; C-5:>%&+!, %

; . = T / G =

We are happy to introduce the Preparatory Problems for the 50<sup>th</sup> International Chemistry Olympiad. These problems are intended to make the preparation

:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%





:LI@BL8I:6L85%>A@N:4IBO%65ON;:8M%





:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%



:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

;B@;8B8I6BO%;B6-5@N4%IA@6B@I:>85

:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

;B@;8B8I6BO%;B6-5@N4%IA@6B@I:>85



:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%



:LI@BL8I:6L85%>A@N:4IBO%65ON;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

:LI@BL8I:6L85%>A@N:4IBO%65ON;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

:LI@BL8I:6L85>A@N:4IBO%65ON;:8M%456789:8%

:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@; C - 5:>3%&+!, %

7.4 Now, let us consider the electrochemical system of two reactions that can occur in a cooled experimental cell, where one of them is pH-dependent and the other is not:



:LI@BL8I:6L85>A@N:4IBO#65ON;:8M#

:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

;B@;8B8I6BO%;B6-5@N4%IA@6B@I:>85

:LI@BL8I:6L85>A@N:4IBO%65ON;:8M%456789:8%Q%

:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%



:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@; C - 5:>3%&+! , %

; .HS)=Y% !&R% C. /U\*)%=a#. /G#0HU%

Bis(2-



:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@; C-5:>3%&+!,%

:LI@BL8I:6L85>A@N:4IBO%65ON;:8M%456789:8%Q%







:LI@BL8I:6L85>A@N:4IBO%65ON;:8M%456789:8%

:LI@BL8I:6L85>A@N:4IBO#65ON;:8M#









:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%









:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@; C-5:>3%&+!,%

; .HS)=Y%&!E%V)(H.0U/#=W%. /WOH#. /G=.1



:LI@BL8I:6L85%>A@N:4IBO%65ON;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

; .HS)=Y%&&E% J \$=.=%01%)0#\$0 ( Yb%%

Aryl



:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

;B@;8B8I6BO%;B6-5@N4%IA@6B@I:>85



:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

:LI@BL8I:6L85>A@N:4IBO%65ON;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

(MOM–Cl), yielding compound **P**. Compound **P** reacts with a protected aryllithi

:LI@BL8I:6L85>A@N:4IBO%65ON;:8M%456789:8%





:LI@BL8I:6L85%>A@N:4IBO%65ON;:8M%



:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

;B@;8B8I6BO%;B6-5@N4%IA@6B@I:>85

:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@;C-5:>%&+!,%

:LI@BL8I:6L85>A@N:4IBO%65ON;:8M%456789:8%

:L I@BL8I:6L85%>A@N:4 IBO%65ON ;:8M%456789:8%Q%>?@>A%B@; C-5:>%&+!,%

!

"#\$%!

!

!



:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!P!456789:8!

:LI@BL8I:6L85!>A@N:4IBO!65ON;:8M!

:LI@BL8I:6L85!>A@N:4IBO!65ON;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+",!

; .HS)=X!; "E!M=\$=.X0U/\$0HU!HT!/!X=\$/))0G!H.=!GHXYH10\$0HU!

Slovakia has a rich history in mining. Since

:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!

C<sub>20</sub>H<sub>12</sub>

:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!

:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!



:L I@BL8I:6L85!>A@N:4 I BO!65ON ;:8M!P!456789:8!Q!







:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!

:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!

Accepted

:LI@BL8I:6L85!>A@N:4IBO!65ON;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+",!

; .HS)=X!; \E!8!G%=X0G/)!H1G0))/\$H.!/UW!0\$1!/G\$02/\$0HU!=U=.<0=1!



:L I@BL8I:6L85!>A@N:4 I BO!65ON ;:8M!P!456789:8!Q!

:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!

integers, even for all the products. Only the following bromine-containing species are considered: Br , Br<sub>2</sub>, HBrO, HBrO<sub>2</sub>, BrO<sub>2</sub>, BrO<sub>3</sub> .

:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@; C-5:>3!&+" ,!

; .HS)=X! ; FE!90U=\$0G1!HT! /!G%=X0G /)!D / 2=!T.HU\$!Y.HY / < / \$0HU!

We usually tend to think of synthesis as of making substances. In this task, however, you will use chemical reagents to synthesize *patterns*.



:L I@BL8I:6L85!>A@N:4 I BO!65ON ;:8M!P!456789:8!Q!



:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!

:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!

;B@;8B8I6BO!;B6-5@N4!;B8>I:>85







:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!

;B@;8B8I6BO!;B6-5@N4!;B8>I:>85



:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!



:L I@BL8I:6L85!>A@N:4 IBO!65ON ;:8M!456789:8!Q!>?@>A!B@;C-5:>3!&+" ,!

