

# Theory



54<sup>th</sup> IChO 2022  
International Chemistry Olympiad  
TIANJIN, CHINA

NLD-1 T-1 A-1

# A1-1

nederlands (Netherlands)

## Snelle en visuele nucleïnezuur-test voor COVID-19

9% van het totaal						
Vraag	1.1	1.2	1.3	1.4	1.5	Totaal
Punten	1	1	4	4	4	<b>14</b>
Score						

**1.1** (1.0 pt)

[ ] (a)      [ ] (b)      [ ] (c)      [ ] (d)      [ ] (e)      [ ] (f)

**1.2** (1.0 pt)

[ ] (a)      [ ] (b)      [ ] (c)

**1.3** (4.0 pt)

$N =$  \_\_\_\_\_

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NLD-1 T-1 A-2

# A1-2

nederlands (Netherlands)

1.4 (4.0 pt)

$\epsilon =$  \_\_\_\_\_  $\text{L mol}^{-1} \text{cm}^{-1}$

1.5 (4.0 pt)

$C_X =$  \_\_\_\_\_  $\mu\text{g mL}^{-1}$

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NLD-1 T-2 A-1

# A2-1

nederlands (Netherlands)

## Chroom toen en nu

11% van het totaal										
Vraag	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	Totaal
Punten	2	1	6	1	2	1	1	5	2	21
Score										

2.1 (2.0 pt)

A: \_\_\_\_\_ B: \_\_\_\_\_

2.2 (1.0 pt)

2.3 (6.0 pt)

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NLD-1 T-2 A-2

# A2-2

nederlands (Netherlands)

2.4 (1.0 pt)

2.5 (2.0 pt)

2.6 (1.0 pt)

(A)       (B)       (C)       (D)

2.7 (1.0 pt)

(A)       (B)       (C)       (D)

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NLD-1 T-2 A-3

# A2-3

nederlands (Netherlands)

2.8 (5.0 pt)

CFSE = \_\_\_\_\_  $\text{cm}^{-1}$

2.9 (2.0 pt)

$\mu =$  \_\_\_\_\_  $\mu_{\text{B}}$

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NLD-1 T-3 A-1

# A3-1

nederlands (Netherlands)

## Afvangen en omzetten van koolstofdioxide

14% van het totaal													
Vraag	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	3.10	3.11	3.12	Totaal
Punten	2	5	2	3	2	8	2	2	5	7	2	2	42
Score													

**3.1** (2.0 pt)

A: \_\_\_\_\_

B: \_\_\_\_\_

**3.2** (5.0 pt)

stap 1:

stap 2:

stap 3:

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NLD-1 T-3 A-2

# A3-2

nederlands (Netherlands)

**3.3** (2.0 pt)

A:

C:

**3.4** (3.0 pt)

reactie 1:

reactie 2:

reactie 3:

**3.5** (2.0 pt)

[ ] (a)

[ ] (b)

[ ] (c)

[ ] (d)

[ ] (e)



**3.6** (8.0 pt)

$$r(\text{CO}_2) = \text{_____} \text{mmol min}^{-1}$$

**3.7** (2.0 pt)

**3.8** (2.0 pt)



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NLD-1 T-3 A-4

# A3-4

nederlands (Netherlands)

**3.9** (5.0 pt)

$$S = \text{_____} \text{ m}^2$$

**3.10** (7.0 pt)

$$R = \text{_____}; V_p = \text{_____} \text{ cm}^3$$

**3.11** (2.0 pt)

I: [ ] (a)      [ ] (b)      [ ] (c)      [ ] (d)  
II: [ ] (a)      [ ] (b)      [ ] (c)      [ ] (d)

**3.12** (2.0 pt)

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NLD-1 T-4 A-1

# A4-1

nederlands (Netherlands)

## Een nieuwe reis voor oud zwavel

16% van het totaal													
Vraag	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	4.10	4.11	4.12	Totaal
Punten	2	4	4	3	1	5	2	4	5	4	6	5	45
Score													

4.1 (2.0 pt)

4.2 (4.0 pt)

4.3 (4.0 pt)

\_\_\_\_\_ %

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NLD-1 T-4 A-2

# A4-2

nederlands (Netherlands)

**4.4** (3.0 pt)

(a)

(b)

**4.5** (1.0 pt)

massaverhouding: \_\_\_\_\_

**4.6** (5.0 pt)

\_\_\_\_\_ h

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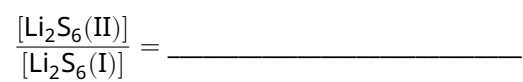
NLD-1 T-4 A-3

# A4-3

nederlands (Netherlands)

4.7 (2.0 pt)

4.8 (4.0 pt)



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NLD-1 T-4 A-4

# A4-4

nederlands (Netherlands)

**4.9** (5.0 pt)

$K_{d1}^{\ominus} =$  \_\_\_\_\_

**4.10** (4.0 pt)

(1) \_\_\_\_\_ > (2) \_\_\_\_\_ > (3) \_\_\_\_\_ > (4) \_\_\_\_\_

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NLD-1 T-4 A-5

# A4-5

nederlands (Netherlands)

4.11 (6.0 pt)

$E^{\ominus}(\text{Li}^+(\text{DME})/\text{Li}) = \text{_____ V}$

4.12 (5.0 pt)

$m(\text{Li}_2\text{S}) = \text{_____ mg}$



## Omzetting tussen stikstofoxiden

15% van het totaal											
Vraag	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	5.10	Totaal
Punten	4	4	2	4	3	8	4	6	4	6	<b>45</b>
Score											

5.1 (4.0 pt)

 $r_+ =$  \_\_\_\_\_

5.2 (4.0 pt)

 $A_+ =$  \_\_\_\_\_,  $E_{a^+} =$  \_\_\_\_\_

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NLD-1 T-5 A-2

# A5-2

nederlands (Netherlands)

5.3 (2.0 pt)

$$k_+(700 \text{ K}) = \text{_____} \text{ L}^2 \text{ mol}^{-2} \text{ min}^{-1}$$

5.4 (4.0 pt)

$$K_p^\ominus(600 \text{ K}) = \text{_____}$$



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NLD-1 T-5 A-3

# A5-3

nederlands (Netherlands)

5.5 (3.0 pt)

$$\Delta_r U_m^\ominus = \text{_____} \text{ kJ mol}^{-1}$$

5.6 (8.0 pt)

$$r_- = \text{_____}, k_-(600 \text{ K}) = \text{_____}$$

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NLD-1 T-5 A-4

# A5-4

nederlands (Netherlands)

5.7 (4.0 pt)

$p_{\text{totaal}} =$  \_\_\_\_\_ kPa

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NLD-1 T-5 A-5

# A5-5

nederlands (Netherlands)

**5.8** (6.0 pt)

$\theta_v =$  \_\_\_\_\_

**5.9** (4.0 pt)

(A)       (B)       (C)       (D)

**5.10** (6.0 pt)

(A)       (B)       (C)

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NLD-1 T-6 A-1

# A6-1

nederlands (Netherlands)

## Fosfines inschakelen

7% van het totaal								
Vraag	6.1	6.2	6.3	6.4	6.5	6.6	6.7	Totaal
Punten	3	6	8	5	6	3	5	36
Score								

6.1 (3.0 pt)

\_\_\_\_\_

6.2 (6.0 pt)



**6.3** (8.0 pt)

**B'** (4,0 pt)

**C'** (4,0 pt)

**6.4** (5.0 pt)

**6**

# Theory



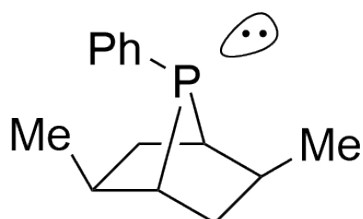
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NLD-1 T-6 A-3

# A6-3

nederlands (Netherlands)

6.5 (6.0 pt)



**P2**

6.6 (3.0 pt)

\_\_\_\_\_

6.7 (5.0 pt)

(a)

(b)

(c)

(d)

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NLD-1 T-7 A-1

# A7-1

nederlands (Netherlands)

## Organische moleculen van het leven

9% van het totaal				
Vraag	7.1	7.2	7.3	Totaal
Punten	12	8	12	32
Score				

### 7.1 (12.0 pt)

7 (4,0 pt)	9 (4,0 pt)	12 (4,0 pt)
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### 7.2 (8.0 pt)

15 (4,0 pt)	16 (4,0 pt)
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NLD-1 T-7 A-2

# A7-2

nederlands (Netherlands)

## 7.3 (12.0 pt)

21 (4,0 pt)

24 (4,0 pt)

25 (4,0 pt)



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NLD-1 T-8 A-1

# A8-1

nederlands (Netherlands)

## Een indrukwekkende chirale spirokatalysator

10% van het totaal									
Vraag	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	Totaal
Punten	16	2	2	2	2	8	2	2	36
Score									

### Deel A

#### 8.1 (16.0 pt)

1(4.0 pt)

2(4.0 pt)

4(4.0 pt)

5(4.0 pt)

#### 8.2 (2.0 pt)

(a)

(b)

(c)

(d)

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NLD-1 T-8 A-2

# A8-2

nederlands (Netherlands)

**8.3** (2.0 pt)

(a)       (b)       (c)       (d)

## Deel B

**8.4** (2.0 pt)

\_\_\_\_\_

**8.5** (2.0 pt)

\_\_\_\_\_

**8.6** (8.0 pt)

**15**(4.0 pt)

**16**(4.0 pt)

**8.7** (2.0 pt)

(a)       (b)       (c)       (d)

**8.8** (2.0 pt)

(a)       (b)       (c)       (d)

**Totaalsynthese van capitulacton**

9% van het totaal					
Vraag	9.1	9.2	9.3	9.4	Totaal
Punten	24	2	16	2	<b>44</b>
Score					

**9.1 (24.0 pt)****3 (4.0 pt)****4 (4.0 pt)****5 (4.0 pt)****8 (4.0 pt)**

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NLD-1 T-9 A-2

# A9-2

nederlands (Netherlands)

## 9.1 (cont.)

9 (4.0 pt)

11(4.0 pt)

## 9.2 (2.0 pt)

(a)

(b)

(c)

(d)

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NLD-1 T-9 A-3

# A9-3

nederlands (Netherlands)

**9.3** (16.0 pt)

**15** (4.0 pt)

**16** (4.0 pt)

**18** (4.0 pt)

**19** (4.0 pt)

**9.4** (2.0 pt)

[ ] (a)

[ ] (b)

[ ] (c)

[ ] (d)