

59 th International Mendeleev Olympiad, 2025		
Experimental Exam	Answer sheets	p. 1/6
Workplace number		

1-1

Y	N
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1-2

Y	N
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1-3

$(C_6H_{10}O_5)_n + nH_2O = nC_6H_{12}O_6$
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1-4

(signed) _____	A
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1-5

(signed) _____					
☐ <5	☐ 5–10	☐ 10–20	☐ 20–40	☐ >40	

The correct answer depends on variant

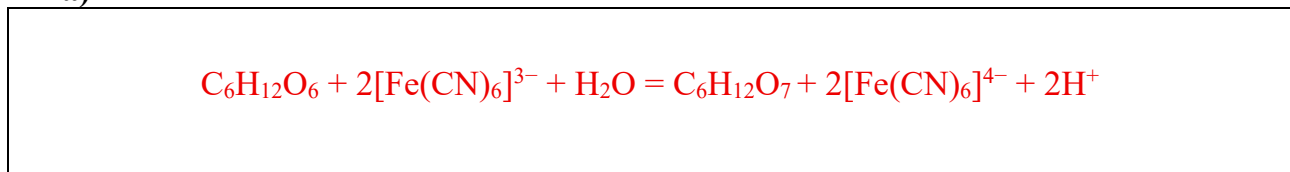
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2-1

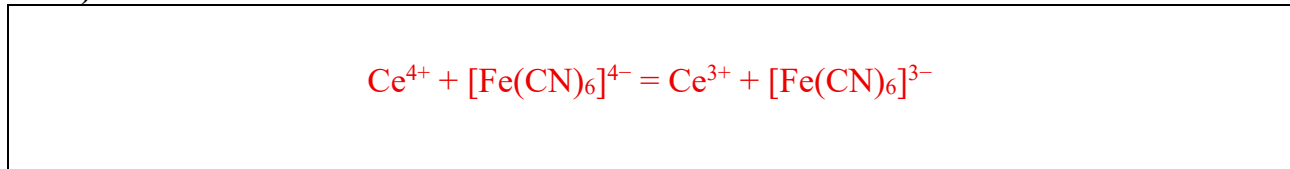
$V_{\text{Ce}} = \underline{\hspace{2cm}}$

Depends on variant

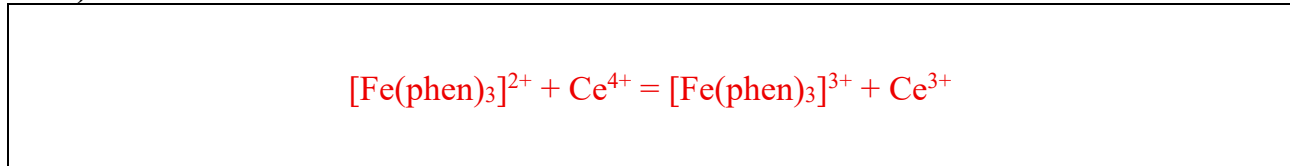
2-2 a)



2-2 b)



2-2 c)



2-3

Calculation of glucose concentration (in mol/L).

According to the stoichiometry of reactions, the amount of glucose is equal to half the amount of hexacyanoferrate, while the amount of cerium is equal to the amount of hexacyanoferrate. Here we have a substitution titration (glucose replacement with hexacyanoferrate). Therefore, the amount of glucose is equal to half the amount of cerium:

$$c(\text{glucose in volumetric flask, M}) = 0.5 V_{\text{Ce}} C_{\text{Ce}}(\text{M}) / V_{\text{glucose}} = V_{\text{Ce}} C_{\text{Ce}} / 20.$$

To get the final answer, the obtained concentration should be multiplied by the dilution factor of the unknown solution in a volumetric flask (50 / 5 = 10).

$C_{\text{glucose}} = \underline{\hspace{2cm}}$

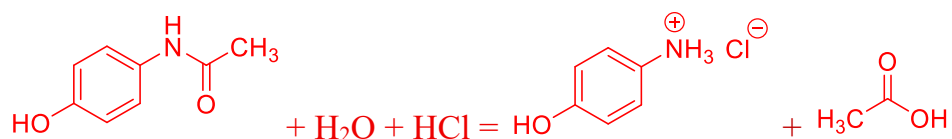
Workplace number

3-1

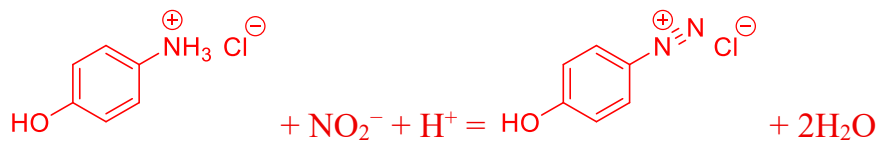
$$V_{\text{NaNO}_2} = \underline{\hspace{2cm}}$$

Depends on variant

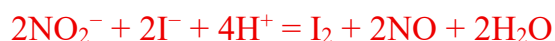
3-2 a)



3-2 b)



3-2 c)



3-3

The amount of paracetamol is equivalent to the amount of 4-aminophenol, while the amount of the latter is equivalent to the amount of nitrite spent on titration:

$$c(\text{parac})V(\text{parac}) = c(\text{NO}_2^-) \cdot V(\text{NO}_2^-)$$

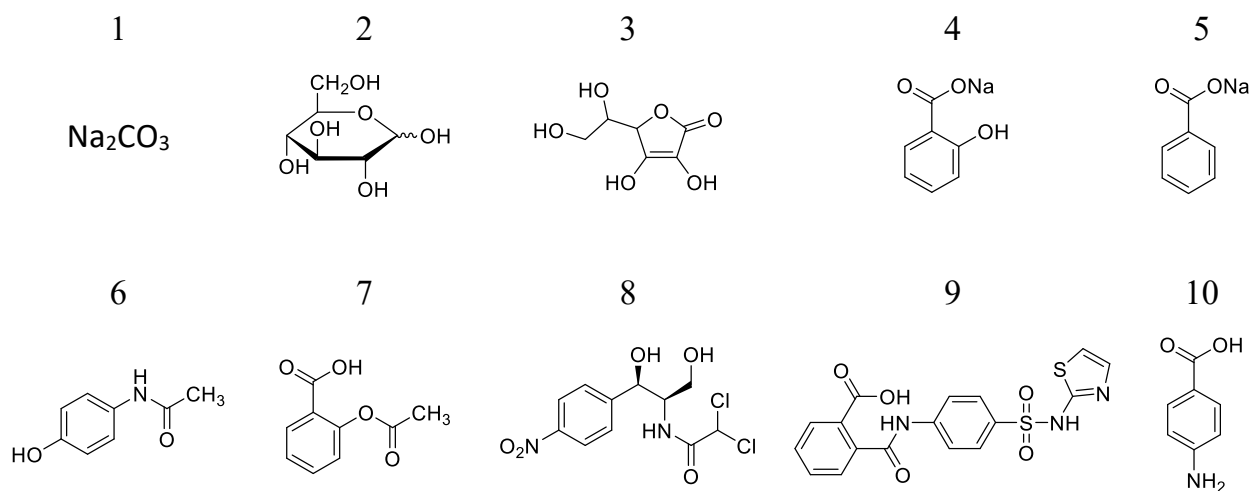
Hence:

$$m(\text{parac. mg}) = c(\text{NO}_2^-, \text{M}) \cdot V(\text{NO}_2^-, \text{mL}) \cdot M(\text{parac}) \cdot V(\text{flask}) / V(\text{aliquot})$$

$$m = \underline{\hspace{2cm}}$$

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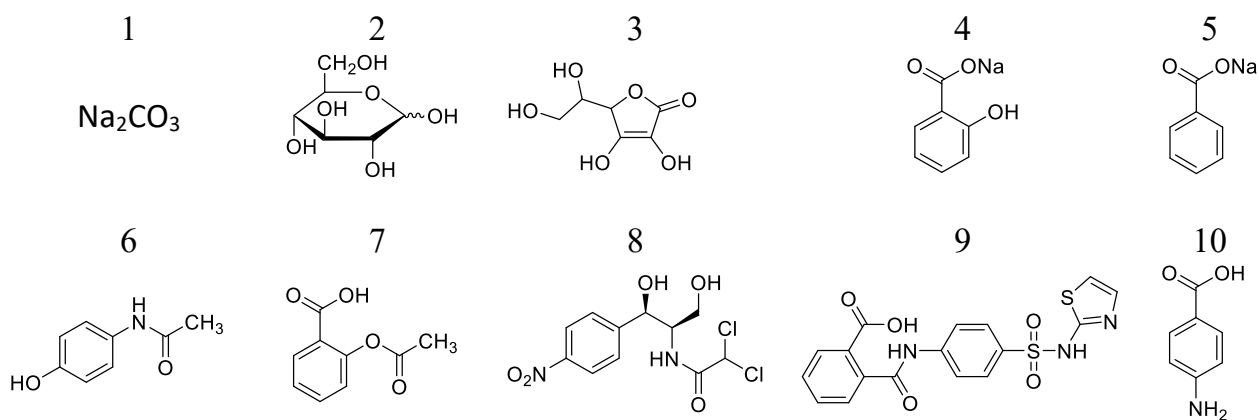
4-1



Selection depends on the variant. In tasks 4–1...4–3, all participants were given the same four compounds: 7, 8, 9, and 10 in different combinations.

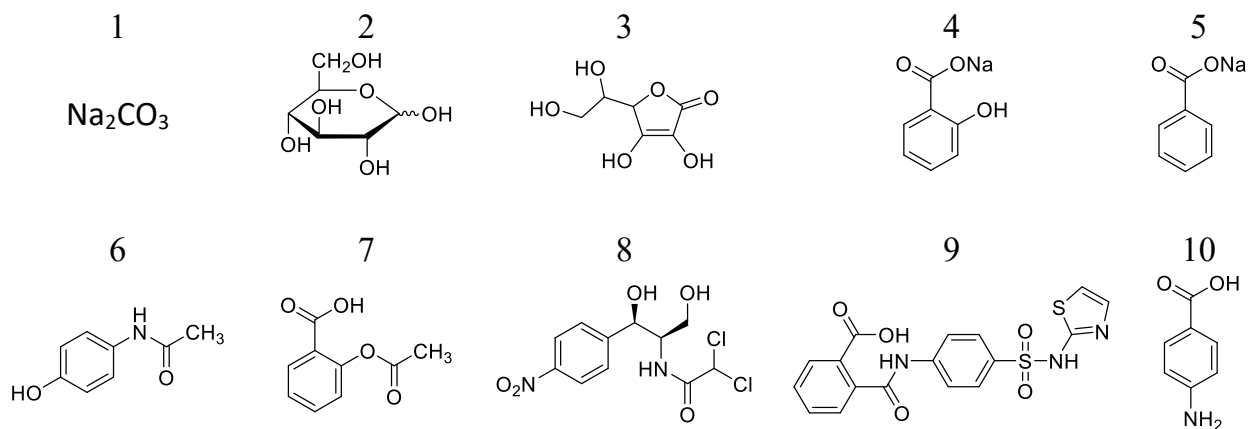
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4-2



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4-3



Main reactions that allow detection of the desired compounds (other approaches are also possible)

Compound	Diazotization – azo coupling	NaOH + heating	Fe(3+) at room temperature
Phthalazol	+ (After hydrolysis)	–	–
Acetylsalicylic acid	–	–	+ (After hydrolysis)
4-Aminobenzoic acid	+	–	(Orange color)
Chloramphenicol	+ (After reduction with Zn)	+ (Yellow → dark)	(Blue color, only in concentrated solution)