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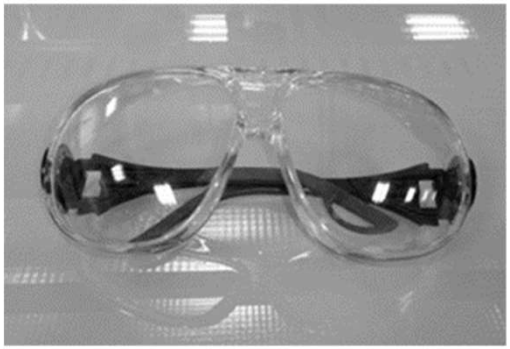
Work-Safety Rules in Labs of Dept. Of Material Engineering

Globally Harmonized System of Classification and Labelling of chemicals (EU)

- CH_3COCH_3
- $NaOH$
- H_2SO_4
- CH_3COOH
- $Na_2S_2O_4$
- $SnCl_2$
- $NaClO$

General guidelines

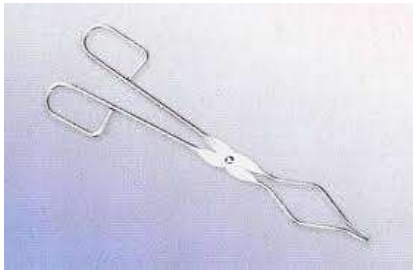


General guidelines

- Do not smoke
- Do not eat and drink
- Do not taste chemicals
- Read carefully laboratory manual
- Wear laboratory clothing and protective glasses
- Keep face and eyes away from boiling equipments
- Tie back your long hair
- Do not wear contact lenses

General guidelines

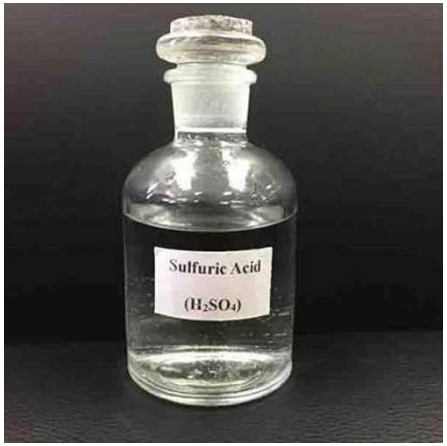
- Use tongs or protective gloves to carry hot objects



- Do not use damaged or broken glassware
- Clean up your lab area
- Wash your hands with soap and water after finishing your experiments

General rules – conc. acids

Pour conc. acids to water!!!



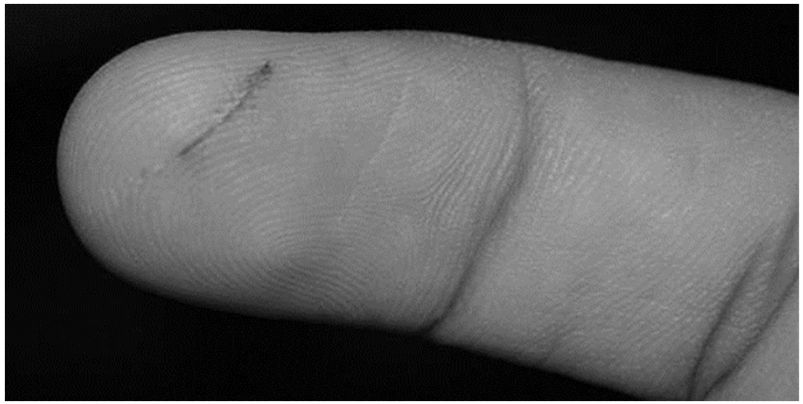
First aid for skin and eye injury – wash the affected area with plenty of water!

General rules - fire

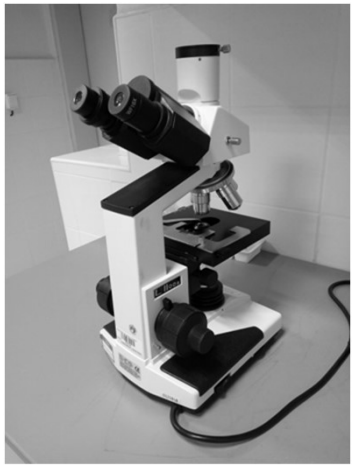
- **Exits (2)**
- **Run away**
- **Sream loudly**

General rules – accident or injury

- **Inform your teacher about spill, breakage**
- **Injury caused by Sharp Object – glass rod**
  - **First aid – inform your teacher, wash the bleeding injury with water, apply disinfectant**



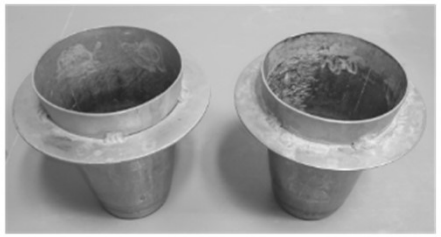
Lab devices



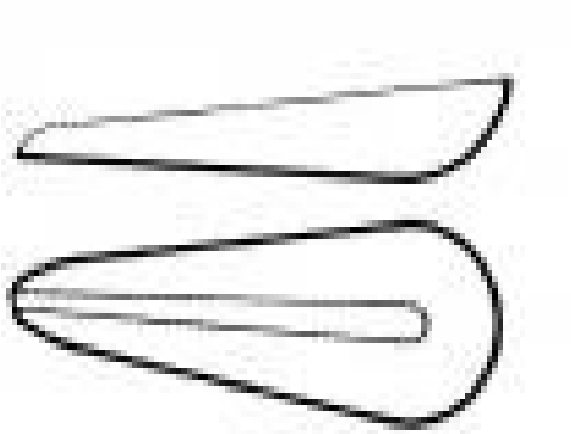
Lab devices


Venticell


DOPLŇOVAT POUZE
DESTILOVANOU VODOU
COMPLETE ONLY
DISTILLED WATER

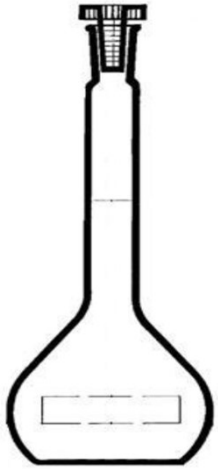


Lab equipment

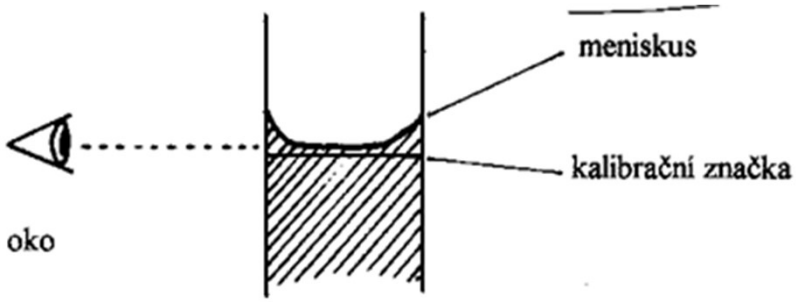


Stock solution

1 g.l^{-1} **sodium chloride NaCl**



Method: weight 1 g sodium chloride NaCl and refill up to 1 l with water



Conversion of units

1 kg	= 1000 g	1 g	= 0,001 kg
1 g	= 1000 mg	1 mg	= 0,001 g
1 l	= 1000 ml	1 ml	= 0,001 l

1 dm^3 = 1 l

1 dm^3 approx. 1 kg
Water has density 1 kg/l (valid also for diluted solutions)

Frequent mistakes

Using of wrong quantities or units

Using of wrong ratio and direct/inverse proportion

Basic terms in dyeing of textiles

Liquor ratio: ratio between **weight of fibers** and the **volume of liquor**

- **Examples: 1:50 1:100**

Basic terms

% of dye: weight of fabric or fibers

- Light shades 0.3-0.5%
- Middle shades 1-1.5%
- Dark shades about 3%

An example of calculation

Dye 5 g textile material in dyeing bath with following content:

2 % dye

15 % Glauber´s salt ($Na_2SO_4 . 10H_2O$)

10 $g.l^{-1}$ sodium carbonate (Na_2CO_3)

Liquor ratio 1 : 50

Total volume of dyeing bath ???

An example of calculation

Dye 5 g textile material in dyeing bath with following content:

2 % dye

15 % Glauber´s salt ($Na_2SO_4 . 10H_2O$)

10 $g.l^{-1}$ sodium carbonate (Na_2CO_3)

Liquor ratio 1 : 50

Total volume of dyeing bath:

5 g mat. x 50 ml = 250 ml

Calculation of 2 % dye

2 % dye – from the weight of material 5 g

5 g …… 100%

x g …… 2%

$$\frac{x}{5} = \frac{2}{100}$$

$$x = \frac{2 \times 5}{100} = 0.1\ g$$

Stock solution of dye: 10 g.l^{-1}

10 g….1000ml

0.1 g…. x ml

$$\frac{0.1}{10} = \frac{x}{1000}$$

$$x = \frac{0.1 \times 1000}{10} = 10\ ml$$

Calculation of 15 % Glauber´s salt

15 % Glauber´s salt

($Na_2SO_4 . 10H_2O$)

- **weight of material 5 g**

5 g 100%

x g 15%

$$\frac{x}{5} = \frac{15}{100}$$

$$x = \frac{5 \times 15}{100} = 0.75\ g$$

Stock solution

$Na_2SO_4 . 10H_2O$: 50 $g.l^{-1}$

50 g....1000ml

0,75 g.... xml

$$\frac{0.75}{50} = \frac{x}{1000}$$

$$x = \frac{0.75 \times 1000}{50} = 15\ ml$$

Calculation of 10 $g.l^{-1}$ Na_2CO_3

Liquor ratio 1:50, weight of material 5 g,
Total volume of dyeing bath 250ml

10 $g.l^{-1}$ sodium carbonate, tj. Na_2CO_3

10 g 1000ml

x g 250ml

$$x = \frac{10 \times 250}{100} = 2.5\ g$$

Stock solution

100 $g.l^{-1}$ Na_2CO_3

100g ..... 1000 ml

2.5g ..... x ml

$$x = \frac{2.5 \times 1000}{100} = 25\ ml$$

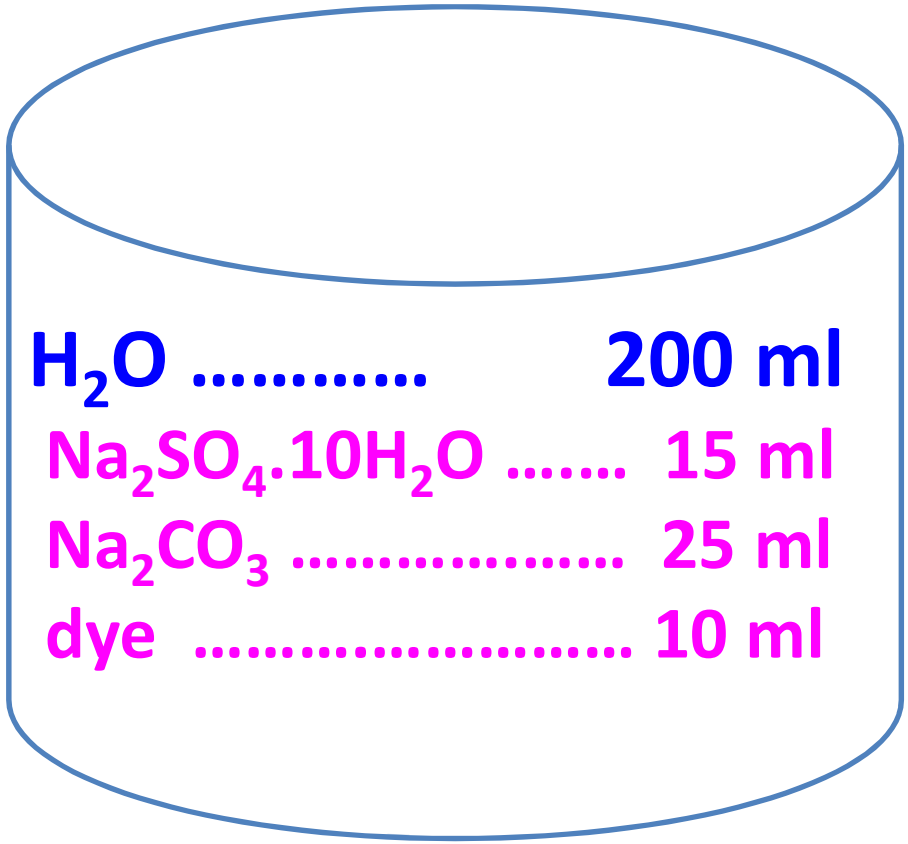
Dyeing bath

Calculation:

dye – 2 % from 5 g = 0,1 g dye…….. ……..10 ml

Glauber´s salt – 15 % from 5 g = 0,75 g G. S…… 15ml

Sodium carbonate – to 250 ml weight 2,5 g s.c……25ml



Liquor ratio 1 : 50

Total volume of dyeing bath

5 g mat. x 50 ml = 250 ml

An example

Dye 4 g textile material in dyeing bath with following content:

5 % reactive dye

6 % NaCl

10 g.l^{-1} sodium carbonate (Na_2CO_3)

Liquor ratio 1 : 50

Total volume of dyeing bath:

4 g mat. x 50 ml = 200 ml

Calculation of 4 % dye

4 % dye – from the weight of material 5 g

5 g …… 100%

x g …… 4%

$$\frac{x}{5} = \frac{4}{100}$$

$$x = \frac{4 \,.\, 5}{100} = 0.2\ g$$

Stock solution of dye: 10 g.l^{-1}

10 g….1000 ml

0.2 g…. x ml

$$\frac{x}{1000} = \frac{0.2}{10}$$

$$x = \frac{0.2 \,.1000}{10} = 20\ \text{ml}$$

Calculation of 6 % NaCl

6 % dye – from the weight of material 4 g

4 g …… 100%

x g …… 6%

$$\frac{x}{4} = \frac{6}{100}$$

$$x = \frac{4 \cdot 6}{100} = 0.24\ g$$

Stock solution of NaCl: 10 g.l^{-1}

10 g….1000ml

0.24 g…. x ml

$$\frac{x}{1000} = \frac{0.24}{10}$$

$$x = \frac{0.24 \cdot 1000}{10} = 24\ ml$$

Calculation of 2 % dye

10 g.l^{-1} dye – from the total volume of bath

10 g …… 1000 ml

x g …… 200 ml

$$\frac{x}{10} = \frac{200}{1000}$$

$$x = \frac{200 \,.\, 10}{1000} = 2\ g$$

Stock solution of dye: 50 g.l^{-1}

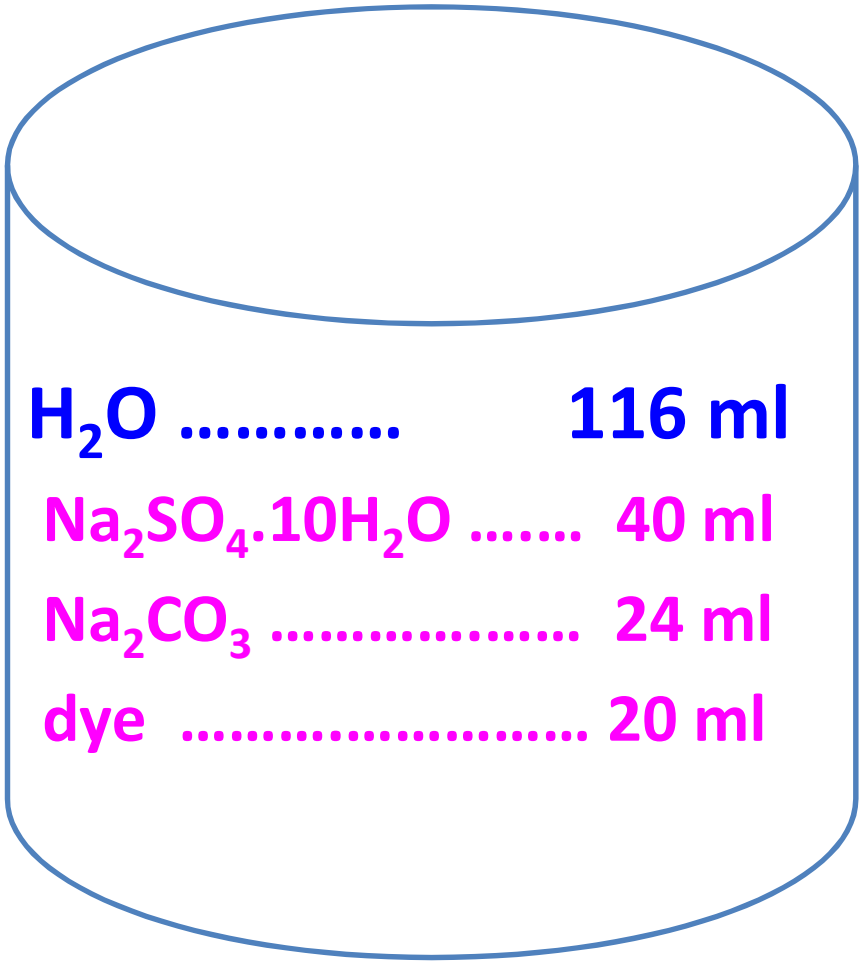
50 g….1000 ml

2 g…. x ml

$$\frac{x}{1000} = \frac{2}{50}$$

$$x = \frac{2 \,.\, 1000}{50} = 40\ \text{ml}$$

Dyeing bath



Total volume of dyeing bath

4 g mat. x 50 ml = 200 ml

Grey scale

to evaluate colour shade **change** in colour fastness tests, eg washing, water, perspiration

Change in colour 1-5 (with four half steps)

Change in staining 1-5 (with four half steps)

Requirements for credit

- Presence in lab excercises
- Work out the report
- Seminar work
- Write the test (10 questions)

Thank you!