

Atyrau University named after H. Dosmukhamedov
Faculty of natural and agricultural Sciences
Department of chemistry and chemical technologies

Distance learning methods and platforms in chemical laboratory



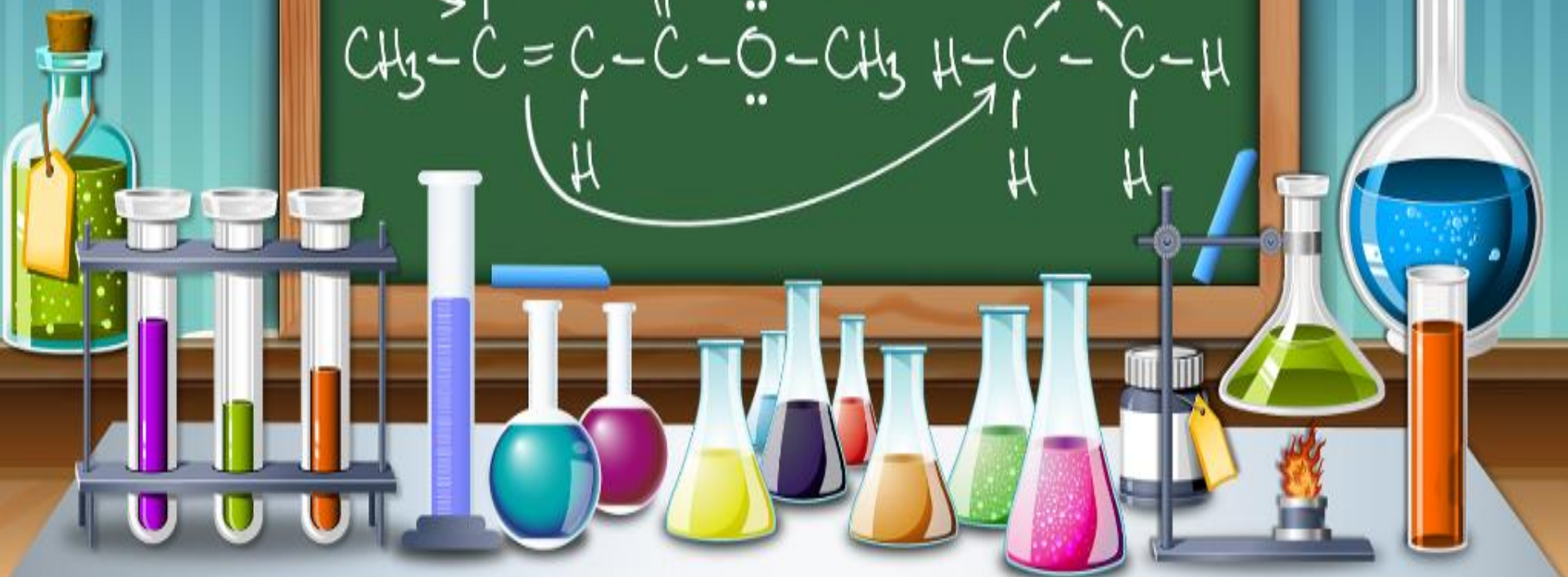
master, teacher Indira Kuanyshbek



Virtual
Labs



$\text{CH}_3 - \overset{\text{..}}{\underset{\text{..}}{\text{O}}}^- \text{C} = \underset{\text{H}}{\text{C}} - \overset{\text{..}}{\underset{\text{..}}{\text{O}}} \text{C} - \overset{\text{..}}{\underset{\text{..}}{\text{O}}} - \text{CH}_3 \quad \text{H} - \overset{\text{..}}{\underset{\text{..}}{\text{O}}} \text{C} - \text{C} - \text{H}$



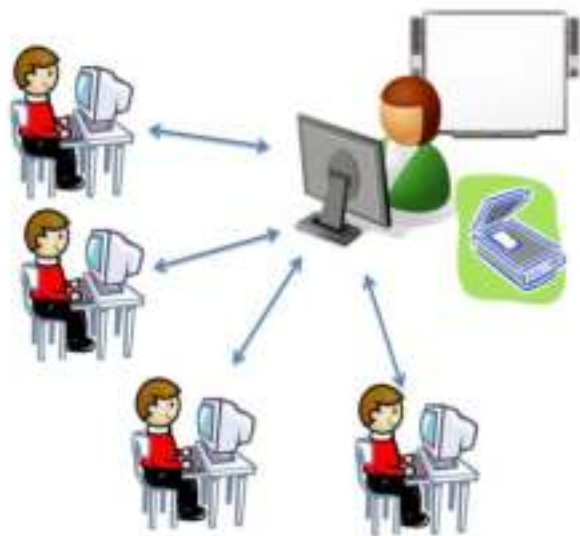
Here, you can study topics and consolidate them with laboratory experience:

the virtual laboratory has all the necessary equipment and reagents. For the visual appearance of chemical equipment, animation and 3D graphics are used. In the process of conducting the experiment itself, students can make observations (shooting virtual photos) and independently write down the equations of any chemical reaction in the attached virtual journal;

you can independently design various organic molecules and inorganic substances from the proposed set;

to consolidate and evaluate the studied topic, there are: safety tests; tests for testing your knowledge; calculation tasks.

Another important advantage of such laboratories is that the student learns to organize himself for work, this is due to the emerging interest in the assembly of various devices, installations for experiments. The student takes the measurements himself. It can test itself, see the correctness of the experiment, for this you can turn on the video fragment and watch it in a real laboratory. It is also important for a modern student to learn how to highlight the main thing in a large flow of educational information, search for information, analyze and prove their decisions. It is in such a laboratory that you can prepare for Olympiads and scientific and practical conferences, study theoretical issues. There is also a "helper" that can give a hint. The laboratory allows you to study and perform absolutely any experiments and more than once. In general, the program of the "Virtual Laboratory" is built in such a way that it is interesting to work with it.



As a teacher, I would like to note another advantage - a student can get knowledge in absolutely any classroom where there are computers and Internet access. However, I believe that it is impossible to go 100% on such a virtual version of training. After all, working directly in contact with the equipment, collecting devices, various devices in reality, the student more effectively fixes the practical skill of working with the equipment.

Chemagic (simulation of the creation of a molecule)

Atom and Bond Edit

H	B	C	Si
N	P	O	S
F	Cl	Xx	inv
Q +	Q -	redo	undo

Single	Double	Triple
Xatm	Xbnd	Xmol
Wire	Ball	Space
sp	sp2	sp3

Load Models

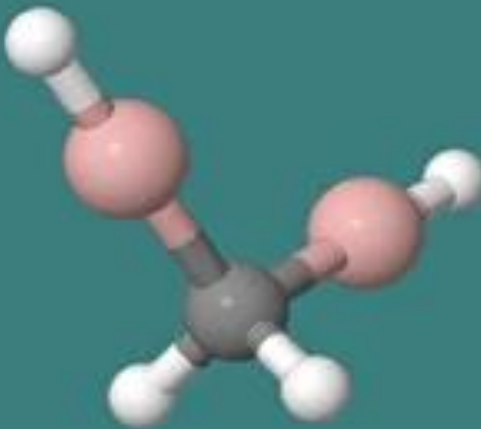
Name	Draw
CheMagic	File

Other Model Actions

Charge	Dipoles
Dipole-Net	Energy
vdW	MEP
MO	CIF Symop
Correct H	Optimize

Show Help Slides

Click an atom to replace it with B. Also, click dragging can be used to connect, add atoms, or removes H. Use the undo button to correct an inadvertent drag.



Other Model Actions

Zoom In	Zoom Out
Length	Angle
Torsion	Mark - Stereo
Mass	Calculator
Rotate Bond	Move
Duplicate	Compare
Put Share	Get Share
Share ID	FB Share URL
Save Mod	Restore Mod
Review Mods	Get Image
NIST Google	NIST Direct
SDBS Google	Google
PubChem	NMRDB
Get Identifiers	Get Model File
Clear/Reset	Local Storage
Help/Actions	Jmol Console
Wikipedia	Stereo On/Off
Info - Email	FaceBk Index
Home	FaceBk Page

CheMagic Virtual Molecular Model Kit
CheMagic Molecule

ChemCollective (an online resource for teaching chemistry from Carnegie Mellon University)

VIRTUAL LAB: **Glucose Dilution Problem**

We are pleased to announce a new HTML5 based version of the virtual lab. Please use Firefox or Chrome web browser to access this page, errors have been reported when using Internet Explorer.

[Introductory Video and Support Information](#)

Virtual Lab File Edit View Help EN Dilution Problem 1

Stockroom +

Information ≡


Name: Distilled H₂O
Volume: 3000.0 mL

Species (aq)	Molarity
H ⁺	1.00481e-7
OH ⁻	1.00481e-7

Temperature: 25.00°C
25.0 mg

pH: 7.00

Workbench 1



Distilled H₂O
3000.0 mL @ 25.0°C

In addition, on the site you will find interesting examples of gamification in training. For example, students can play the game Mixed Reception – it will need to use the calculation of molar mass, scientific method and basic knowledge of chemical reactions to solve the murder mystery. In the game, students will be able to interview suspects and collect evidence. However, if the game is not suitable for the content, we still recommend that you look at it – at least as a way to use the game method in teaching chemistry.



Stockroom



Solutions



Glassware

 H_2O

Distilled Water

0.1 L

- Strong Bases (6)
- Conjugate Bases (11)
- Strong Acids (14)
- Weak Acids (18)
- Weak Bases (4)
- Conjugate Acids (4)
- Indicators (4)



Unknown Acid

0.1 L

Virtual
Lab

Beta 0.6



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Stockroom



Solutions



Glassware



Tools



H₂O
Distilled Water
0.1 L



➤ Strong Bases (6)

➤ Conjugate Bases (11)

➤ Strong Acids (14)

➤ Weak Acids (18)

➤ Weak Bases (4)

➤ Conjugate Acids (4)

➤ Indicators (4)



Unknown Acid
0.1 L



Workbench 1

Unknown Acid Problem 1



Use the available chemicals to perform an experiment to determine the concentration and pKa of the unknown acid.

Stockroom



Solutions



Glassware



Tools

 H_2O

Distilled Water

0.1 L



➤ Strong Bases (6)

➤ Conjugate Bases (11)

➤ Strong Acids (14)

➤ Weak Acids (10)

➤ Weak Bases (4)

➤ Conjugate Acids (4)

➤ Indicators (4)

Unknown Acid

0.1 L



Stockroom



Information



Name: 1M NaOH

Volume: 100.000 mL

Species (aq)	Molarity
H ⁺	1.010e-14
OH ⁻	1.000
Na ⁺	1.000

Temperature: 25.0°C

25.0 °C

pH: 14.00

Track Vessel

Workbench 1

1M NaOH
100 mL @ 25.0°C

Stockroom



Solutions



Glassware



Tools

▼ Erlenmeyers (3)

250 mL Flask
0.25 L500 mL Flask
0.5 L1000 mL Flask
1 L

► Graduated Cylinders (3)

► Pipettes (4)

► Beakers (3)

▼ Volumetric Flasks (4)

Workbench 1

1M NaOH
100 mL @ 25.0°C50 mL Burette
0.000 mL @ 25.0°C

Stockroom



Solutions



Glassware



Tools



H₂O
Distilled Water
0.1 L



➤ Strong Bases (6)

➤ Conjugate Bases (11)

➤ Strong Acids (14)

➤ Weak Acids (18)

➤ Weak Bases (4)

➤ Conjugate Acids (4)

▼ Indicators (4)



Methyl Orange
Methyl Orange Indicator
Solution



Workbench 1



1M NaOH
100 mL @ 25.0°C



250 mL Flask
0.00 mL @ 25.0°C



Methyl Orange
100 mL @ 25.0°C



50 mL Burette
0.000 mL @ 25.0°C

Stockroom +

Information ≡

Name: Unknown Acid

Volume: 100.000 mL

Species (aq)	moles
H ⁺	0.0005459
OH ⁻	1.849e-13
Unknown_A	
Unknown_A ⁻	

Temperature: 25.0°C

25.0 deg

pH: 2.26

Track Vessel

Workbench 1

1M NaOH
100 mL @ 25.0°C50 mL Burette
0.000 mL @ 25.0°C250 mL Flask
0.00 mL @ 25.0°CMethyl Orange
100 mL @ 25.0°CUnknown Acid
100 mL @ 25.0°C

Stockroom



Information



Name: Unknown Acid

Volume: 100.000 mL

Species (aq)	Molarity
H ⁺	0.005459
OH ⁻	1.849e-12
Unknown_A	
Unknown_A ⁻	

Temperature: 25.0°C

25.0 °C

pH: 2.26

Track Vessel

Workbench 1

250 mL Flask
0.00 mL @ 25.0°CMethyl Orange
100 mL @ 25.0°CUnknown Acid
100 mL @ 25.0°C50 mL Burette
0.000 mL @ 25.0°C

Stockroom



Information



Name: 1M NaOH

Volume: 100.000 mL

Species (aq)	Molarity
H ⁺	1.010e-14
OH ⁻	1.000
Na ⁺	1.000

Temperature: 25.0°C

25.0°C

pH: 14.00

Track Vessel

Workbench 1

1M NaOH
100 mL @ 25.0°C250 mL Flask
0.00 mL @ 25.0°C

Precise

Sig Fig

Realistic

Volume (mL)



Pour



From 1M NaOH to 50 mL Burette

50 mL Burette
0.000 mL @ 25.0°C

Stockroom



Information



Name: 25 mL Pipette

Volume: 0.000 mL

Species (aq)

Molarity

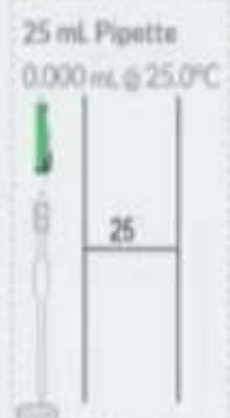
Temperature: 25.0°C

25.0 deg

pH: 7.00

Track Vessel

Workbench 1

50 mL Burette
40.00 mL @ 25.0°C1M NaOH
60.0 mL @
25.0°C250 mL Flask
0.00 mL @ 25.0°CMethyl Orange
100 mL @ 25.0°CUnknown Acid
100 mL @ 25.0°C

Precise

Sig Fig

Realistic

Volume (mL)



Withdraw

Pour

From 25 mL Pipette to Unknown Acid
40.0 mL transferred

Stockroom



Information



Name: Methyl Orange

Volume: 100.000 mL

Species (aq)	Molarity
H ⁺	0.0003911
OH ⁻	2.582e-11
MethylOrangeH	0.0006089
MethylOrange ⁻	0.0003911

Temperature: 25.0°C

25.0°C

pH: 3.41

Track Vessel

Workbench 1

Diagram of Workbench 1 showing the following items:

- 50 mL Burette:** 40.00 mL @ 25.0°C
- 1M NaOH:** 60.0 mL @ 25.0°C
- Methyl Orange:** 100 mL @ 25.0°C
- 25 mL Pipette:** 0.000 mL @ 25.0°C
- 250 mL Flask:** 25.0 mL @ 25.0°C
- Unknown Acid:** 75.0 mL @ 25.0°C

Precise

Sig Fig

Realistic

Volume (mL)

Pour



From Methyl Orange to 250 mL Flask

Stockroom



Information



Name: 250 mL Flask

Volume: 32.464 mL

Species (aq)	Molarity
H ⁺	0.004749
OH ⁻	2.127e-12
Unknown_A	
Unknown_A ⁻	
MethylOrangeH	0.0002184
MethylOrange ⁻	0.00001155

Temperature: 25.0°C

25.0 mg

pH: 2.32

Track Vessel

Workbench 1

50 mL Burette
40.00 mL @ 25.0°C1M NaOH
60.0 mL @
25.0°CMethyl Orange
92.5 mL @
25.0°C25 mL Pipette
0.000 mL @ 25.0°C250 mL Flask
32.5 mL @ 25.0°C

Precise

Sig Fig

Realistic

From Methyl Orange to 250 mL Flask
4.23 mL transferred.

Stockroom



Information



Name: 25 mL Unknown Acid

Volume: 32.464 mL

Species (aq)	Molarity
H ⁺	0.004749
OH ⁻	2.127e-12
Unknown_A	
Unknown_A ⁺	
MethylOrangeH	0.0002184
MethylOrange ⁻	0.00001155

Temperature: 25.0°C

25.0 mg

pH: 2.32

Track Vessel

Workbench 1

50 mL Burette
40.00 mL @ 25.0°C

25 mL Unknown Acid
32.5 mL @ 25.0°C

Unknown Acid
75.0 mL @ 25.0°C

Context menu options:

- Remove Solid
- Remove Liquid
- Duplicate
- Thermal Properties...
- Rename
- Remove

Stockroom



Information



Name: 25 mL Unknown Acid

Volume: 35.464 mL

Species (aq)	Molarity
H ⁺	1.872e-13
OH ⁻	0.05584
Unknown_A	
Unknown_A ⁻	
MethylOrangeH	1.572e-13
MethylOrange ⁻	0.0002105
Na ⁺	0.08459

Temperature: 25.5°C

25.5 deg

pH: 12.73

Track Vessel

Workbench 1

Precise

Sig Fig

Realistic

1



From 50 mL Burette to 25 mL Unknown Acid
1.00 mL transferred



1M NaOH
60.0 mL @
25.0°C



Methyl Orange
92.5 mL @
25.0°C

25 mL Pipette
0.000 mL @ 25.0°C



25 mL Unknown Acid
32.5 mL @ 25.0°C
14
15
Unknown Acid
75.0 mL @ 25.0°C



25 mL Unknown
Acid
35.5 mL @ 25.5°C

Stockroom



Information



Name: 25 mL Unknown Acid

Volume: 36.464 mL

Species (aq)	Molarity
H ⁺	1.264e-13
OH ⁻	0.08173
Unknown_A	
Unknown_A ⁻	
MethylOrangeH	1.031e-13
MethylOrange ⁻	0.0002047
Na ⁺	0.1097

Temperature: 25.3°C

25.3 deg

pH: 12.90

Track Vessel

Workbench 1

1M NaOH
60.0 mL @
25.0°C25 mL Unknown Acid
32.5 mL @ 25.0°CUnknown Acid
25.0 mL @ 25.0°C

0.25

50 mL Burette

6.00 mL @ 25.0°C

25 mL Unknown
Acid

36.5 mL @ 25.0°C

- Remove Solid
- Remove Liquid
- Duplicate
- Thermal Properties...
- Rename
- Remove



thank you for attention