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

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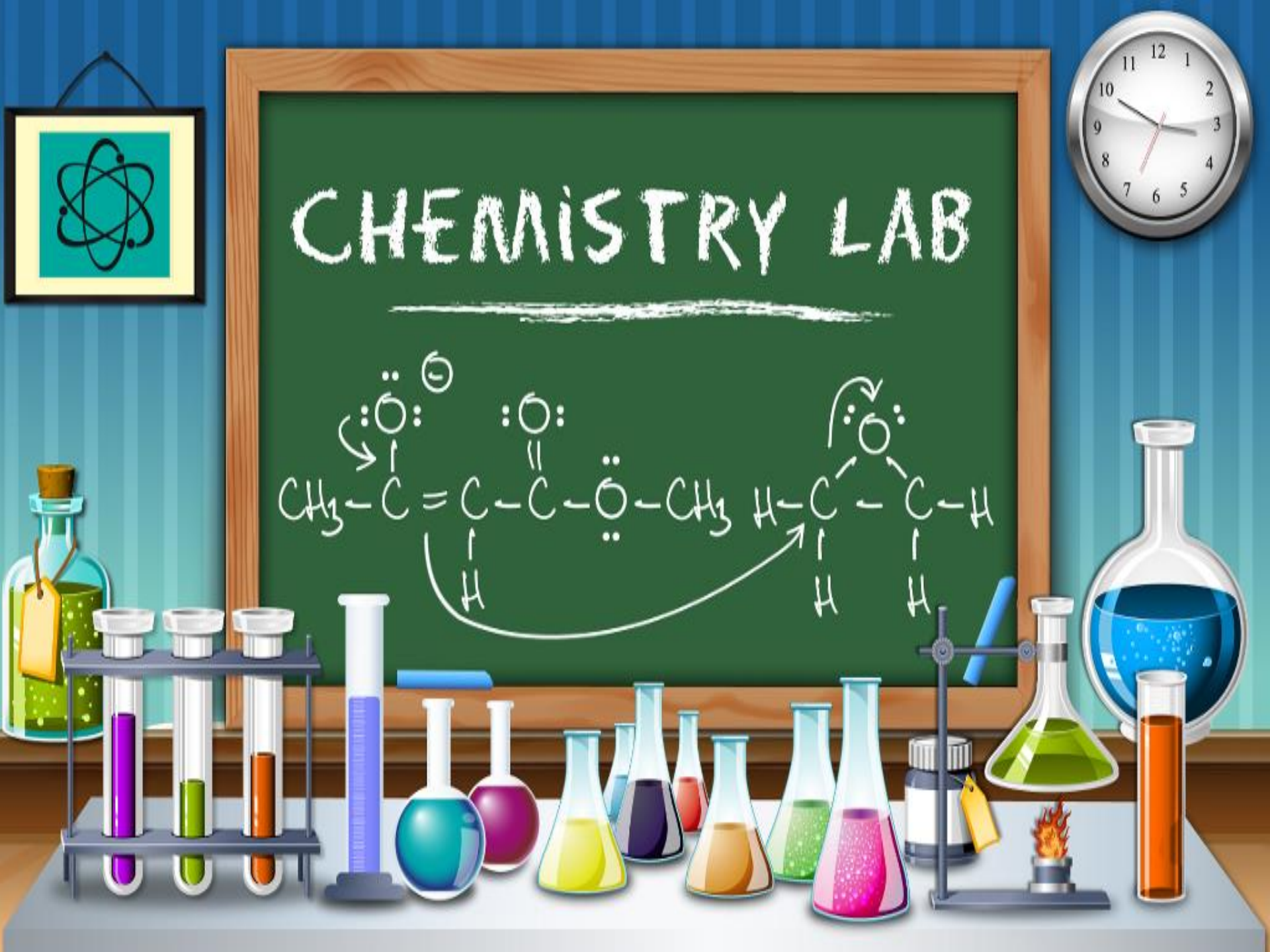
Virtual
Labs


CHEMISTRY LAB

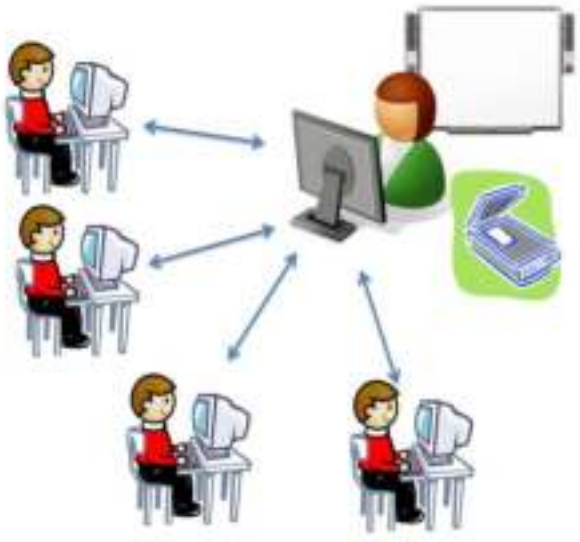
Here, you can study topics and consolidate them with laboratory experience:

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;

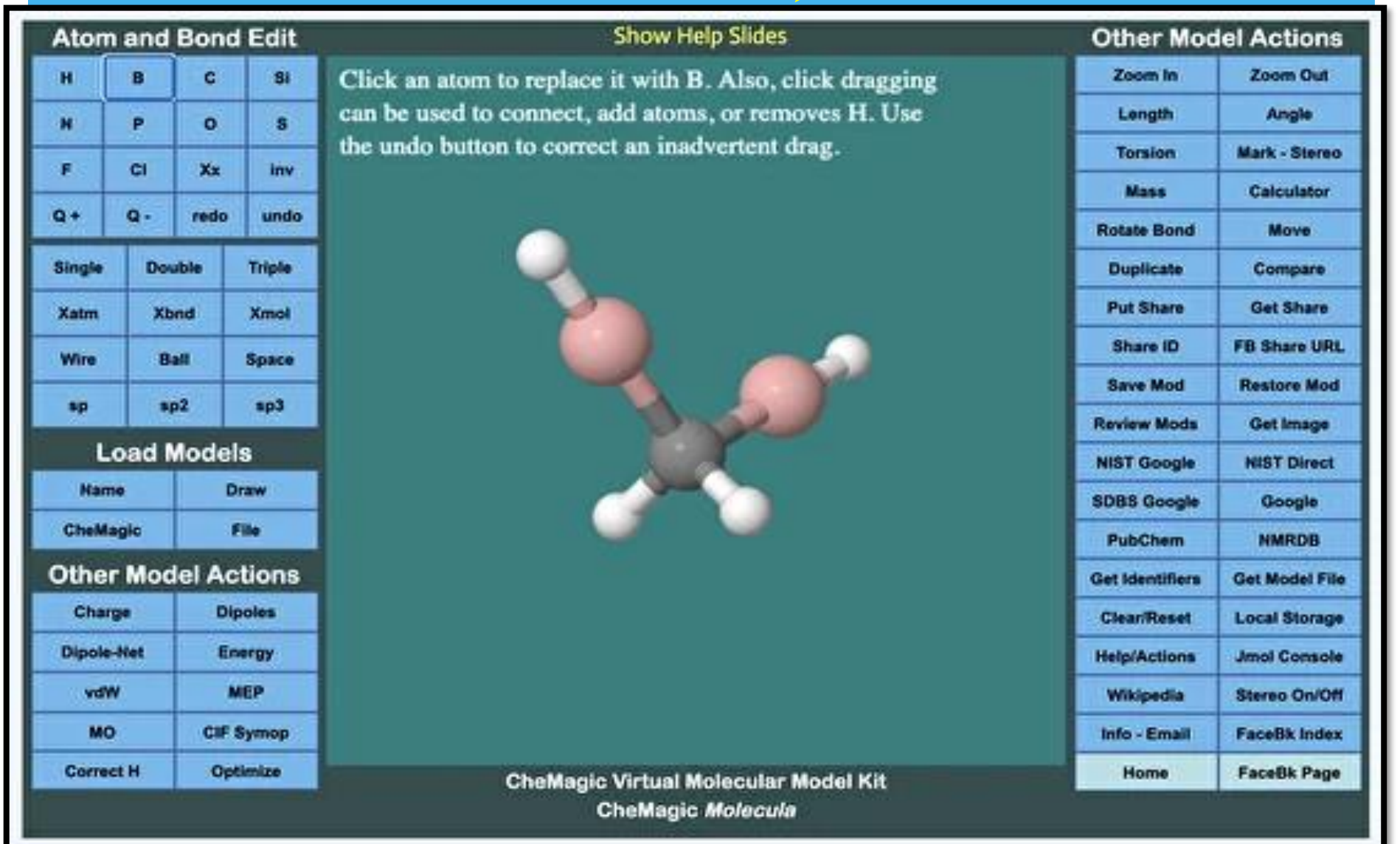
to consolidate and evaluate the studied topic, there are: safety tests; tests for testing your knowledge; calculation tasks.

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.

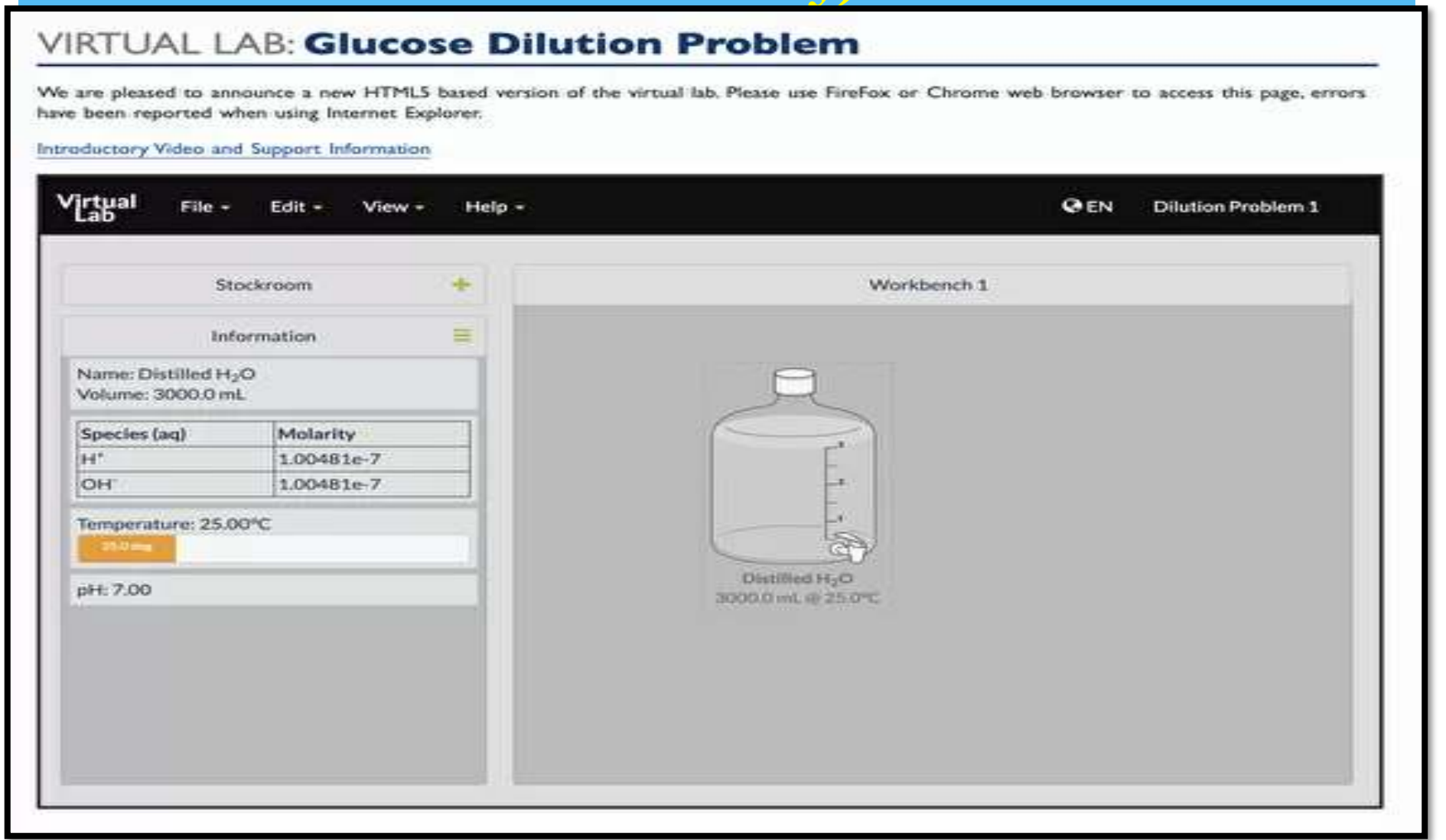


As a teacher, I would like to note another advantage - a student can get knowledge in absolutely any classroom where there are computers and Internet access. However, I believe that it is impossible to go 100% on such a virtual version of training. After all, working directly in contact with the equipment,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



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



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.

Virtual Lab File Edit Unknown Acid Problem 1

Stockroom

Solutions Glassware

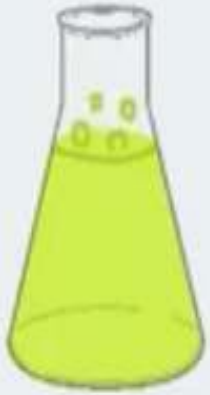
H_2O
Distilled Water
0.1 L

> 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



Report a bug

Virtual Lab File Edit View Help

Unknown Acid Problem 1

Stockroom


Solutions

Glassware


Tools

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

Workbench 1

Virtual Lab File Edit Unknown Acid Problem 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 (18)
- Weak Bases (4)
- Conjugate Acids (4)
- Indicators (4)

Unknown Acid
0.1 L

Virtual Lab File Edit View Help

Unknown Acid Problem 1

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

pH: 14.00

Track Vessel

Workbench 1

1M NaOH
100 mL @ 25.0°C

Virtual Lab File Edit View Help

Unknown Acid Problem 1

Stockroom

Solutions | Glassware | Tools

Erlenmeyers (3)

250 mL Flask
0.25 L

500 mL Flask
0.5 L

1000 mL Flask
1 L

Graduated Cylinders (3)

Pipettes (4)

Beakers (3)

Volumetric Flasks (4)

Workbench 1

1M NaOH
100 mL @ 25.0°C

50 mL Burette
0.000 mL @ 25.0°C

Virtual Lab File Edit View Help

Unknown Acid Problem 1

Stockroom

Solutions | Glassware | Tools

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)

Methyl Orange
Methyl Orange Indicator Solution

Workbench 1

1M NaOH
100 mL @ 25.0°C

50 mL Burette
0.000 mL @ 25.0°C

250 mL Flask
0.00 mL @ 25.0°C

Methyl Orange
100 mL @ 25.0°C

Virtual Lab File Edit View Help

Unknown Acid Problem 1

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

pH: 2.26

Track Vessel

Workbench 1

1M NaOH
100 mL @ 25.0°C

50 mL Burette
0.000 mL @ 25.0°C

250 mL Flask
0.00 mL @ 25.0°C

Methyl Orange
100 mL @ 25.0°C

Unknown Acid
100 mL @ 25.0°C

Virtual Lab File Edit View Help

Unknown Acid Problem 1

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

pH: 2.26

Track Vessel

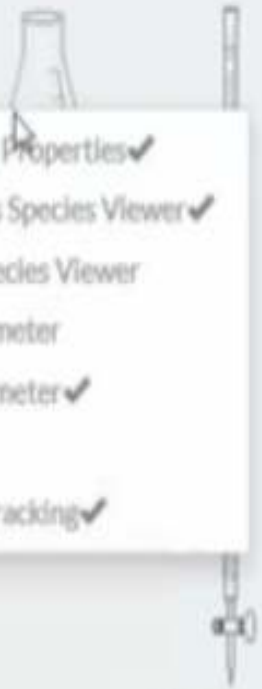
Solution Properties ✓
Aqueous Species Viewer ✓
Solid Species Viewer
Spectrometer
Thermometer ✓
pH ✓
Vessel Tracking ✓

Workbench 1

250 mL Flask
0.00 mL @ 25.0°C

Methyl Orange
100 mL @ 25.0°C

Unknown Acid
100 mL @ 25.0°C



50 mL Burette
0.000 mL @ 25.0°C

Virtual Lab File Edit View Help

Unknown Acid Problem 1

Stockroom

Information

Name: 1M NaOH
Volume: 100.000 mL

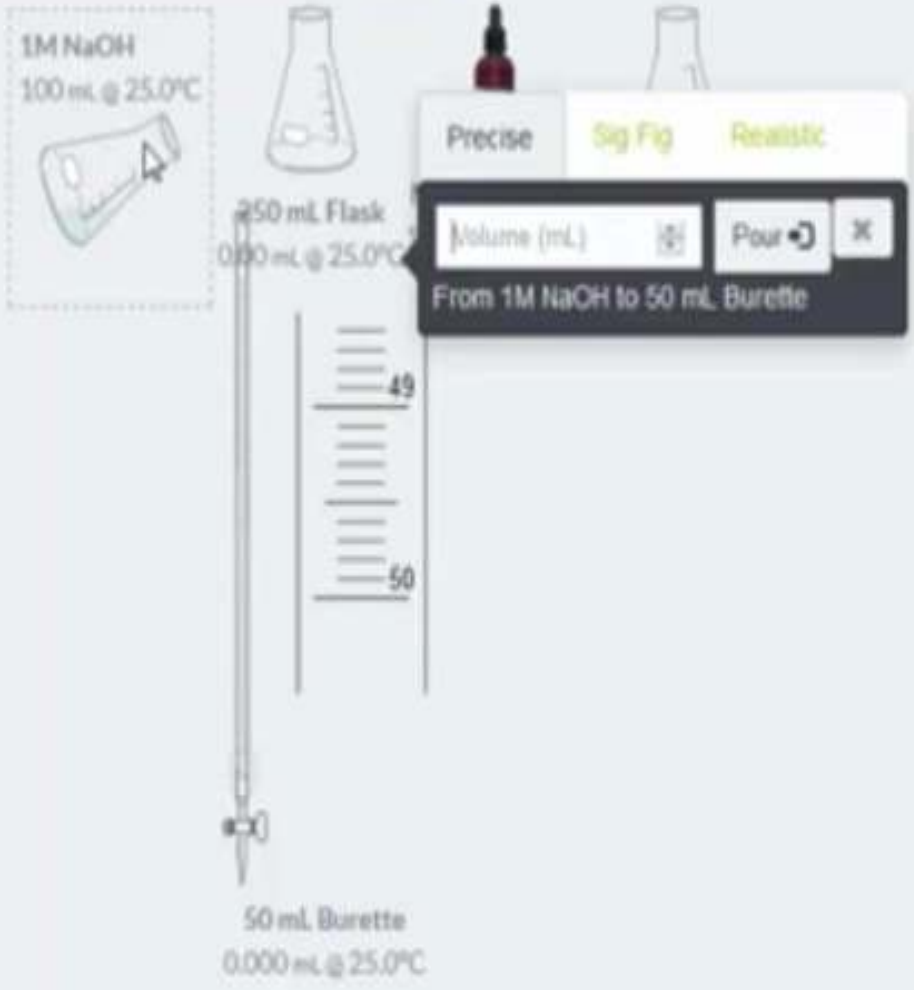
Species (aq)	Molarity
H^+	1.010e-14
OH^-	1.000
Na^+	1.000

Temperature: 25.0°C

pH: 14.00

Track Vessel

Workbench 1



Virtual Lab File Edit View Help

Unknown Acid Problem 1

Stockroom

Information

Name: 25 mL Pipette
Volume: 0.000 mL

Species (aq)	Molarity

Temperature: 25.0°C

pH: 7.00

Track Vessel

Workbench 1

50 mL Burette
40.00 mL @ 25.0°C

1M NaOH
60.0 mL @ 25.0°C

250 mL Flask
0.00 mL @ 25.0°C

Methyl Orange
100 mL @ 25.0°C

25 mL Pipette
0.000 mL @ 25.0°C

25

Unknown 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.

Virtual Lab File Edit View Help

Unknown Acid Problem 1

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

pH: 3.41

Track Vessel

Workbench 1

Precise Sig Fig Realistic

Volume (mL) Pour

From Methyl Orange to 250 mL Flask

Virtual Lab File Edit View Help

Unknown Acid Problem 1

Stockroom

Information

Name: 250 mL Flask
Volume: 32.464 mL

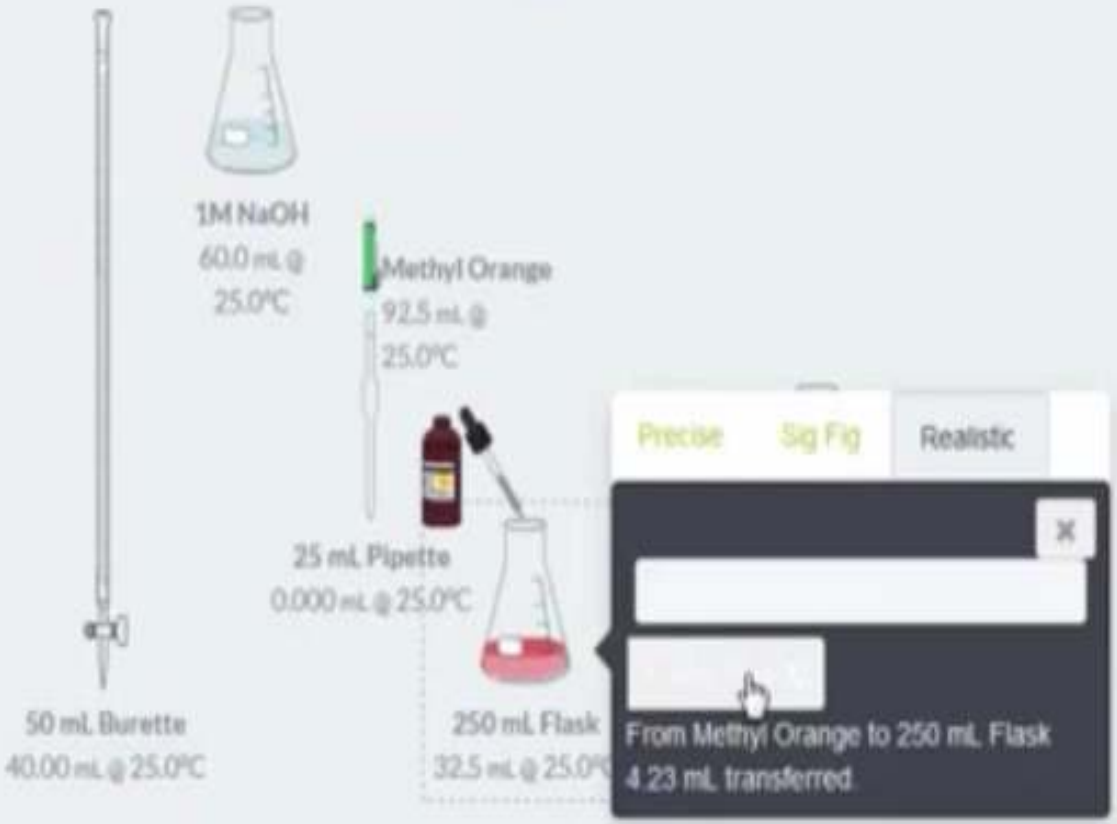
Species (aq)	Molarity
H^+	0.004749
OH^-	2.127e-12
Unknown_A	
Unknown_A$^-$	
MethylOrangeH	0.0002184
MethylOrange$^-$	0.00001155

Temperature: 25.0°C

pH: 2.32

Track Vessel

Workbench 1



Virtual Lab File Edit View Help

Unknown Acid Problem 1

Stockroom

Information

Name: 25 mL Unknown Acid
Volume: 32.464 mL

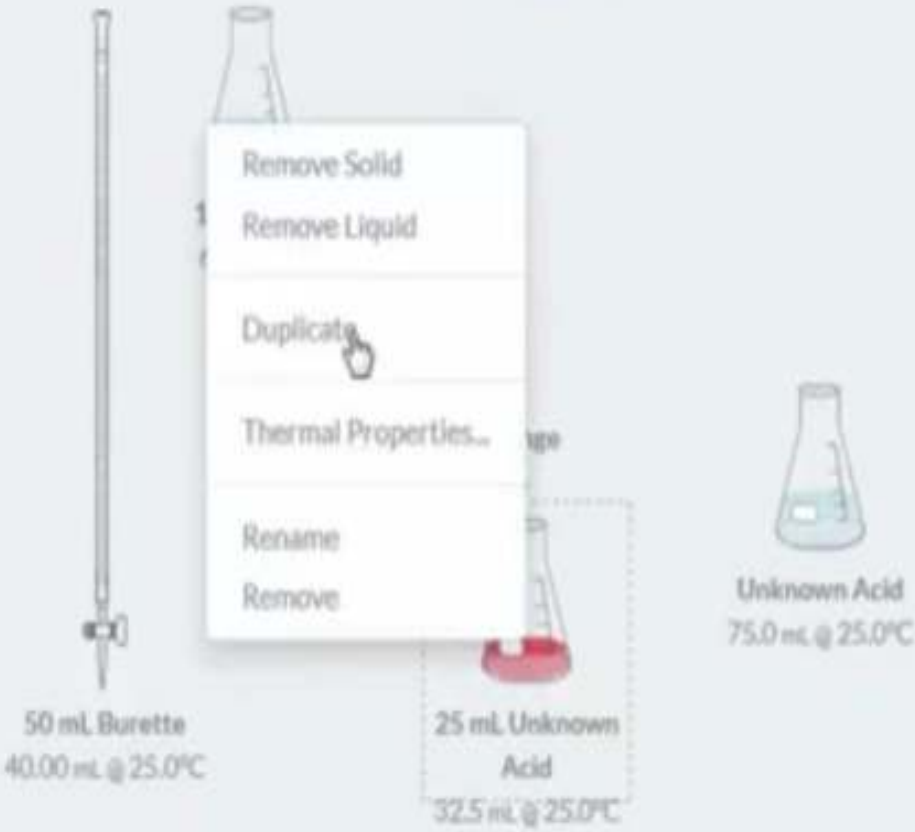
Species (aq)	Molarity
H^+	0.004749
OH^-	2.127e-12
Unknown_A	
Unknown_A$^-$	
MethylOrangeH	0.0002184
MethylOrange$^-$	0.00001155

Temperature: 25.0°C

pH: 2.32

Track Vessel

Workbench 1



Virtual Lab File Edit View Help

Unknown Acid Problem 1

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

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

Unknown Acid
75.0 mL @ 25.0°C

25 mL Unknown Acid
35.5 mL @ 25.5°C

Virtual Lab File Edit View Help

Unknown Acid Problem 1

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

pH: 12.90

Track Vessel

Workbench 1

1M NaOH
60.0 mL @ 25.0°C

25 mL Unknown Acid
32.5 mL @ 25.0°C

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

Unknown Acid
@ 25.0°C

50 mL Burette
@ 25.0°C

25 mL Unknown Acid

thank you for attention