

Properties of Matter

Equipment	Quantity required for 20 students working:		Unit cost	Supplier and catalog number	Comments	First use
	together as a class	semi-self paced				
Rulers, 6"	1 pk 6	1/2 pk 6	\$6.95/pk12	Delta WW 180-9730	Students can provide.	
Multipurpose balance kit	10	10	\$17.95	Delta WW-020-0562	Alternatively, see Section 1 in the Instructor's Guide on constructing a homemade balance.	1.1
Metersticks 100 cm or 50 cm	12 24	12 24	\$1.80 \$1.47	NASCO S00938M NASCO SB12163M		1.1
Modeling clay	2 lb.	1 lb.	\$3.10	Delta ESS 16-030-8615	Used to balance pans.	1.1
Square nuts (small-0.5 ")	200	200		Hardware store	Used as a mass standard. Must be uniform.	1.2
Clothespins, spring-type	60	60		Grocery/hardware store	Used as an alternative mass standard. (Both clothespins and nuts required.)	1.4
Large paper clips	200	200		Local supplier	Use to suspend square nuts from balance.	2.2
Small cylinder	10	10			Cylinder can be one from the Sink and Float kit (see below, first use 12.1).	2.11
Equal arm balance (Blue Plastic Base)	10	10	\$39.00	Fisher Sci. Educ. S52021	See also H&T.	3.4
Mass set for balance (including tweezers)	10	10	\$33.50	Frey 15595398		3.2
Translucent tape (0.5")	10 roll	10 roll		Local supplier	Students must be able to write on the tape.	3.5
String or thread				Local supplier		5.1
Plastic cubes (1 cm ³)	1 pk (1000)	5 pk (100)	\$34.95/pk1000 \$4.95/pk100	Delta WW-030-5480 for 1000 pk WW-030-5491 for 100 pk	Used to measure volume.	6.1
Assorted objects of various sizes and shapes	60	30		Local supplier	Some objects should be irregular in shape (e.g., wood blocks cut into various sizes).	6.1
Optional: Refraction dishes semicircular, 12 cm diameter x 3.2 cm deep	1 pk 12	1 pk12	\$22.50	Sargent-Welch WL3502		
Density of Solids kit	5 kits	3 kits	\$8.95	Frey 15589662	Kit contains two cubes of identical volume: one is iron, the other is aluminum.	6.3
Graduated cylinders (plastic) 250 mL 100 mL 50 mL 10 mL	10 10 10 10	10 10 10 10	\$5.95 \$3.95 \$3.95 \$2.95	Delta WW-070-1062 Delta WW-070-2140 Delta WW-070-2085 Delta WW-070-2130	See also H&T.	6.4
Dropper pipette (3" medicine dropper)	2 pk 12	1 pk 12	\$1.95	Frey 15569723		6.6
Burets and related equipment 1. 50 mL x 0.1 mL - flint glass 2. stopcock grease (5.3 oz)	2 1 tube	2 1 tube	\$29.95 \$19.95	Frey 15587175 Frey 15593076	These are for the optional demonstration in Experiment 7.1. See the Instructor's Guide.	OPT 7.1

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Safety goggles	20	10	\$4.75	Frey 15596229		7.1
Beakers (Pyrex)					Beakers should be marked so students can easily estimate the volume of liquid.	7.1
1000 mL	2 pk 6	1 pk 6	\$38.60	Frey 15594045		
600 mL	3 pk 6	2 pk 6	\$19.95	Frey 15593982		
250 mL	2 pk 12	2 pk 12	\$26.60	Frey 15593976		
150 mL	2 pk 12	2 pk 12	\$26.95	Frey 15593973		
10 mL (accurate to 0.1 mL)	10	10	31.65/pk 12	Frey 15593961		
Conservation of Mass kit or flint glass bottles	10	10	5.1 \$18.60/ pk 24	Frey 15589656	Consists of a thick walled bottle with a rubber gasket inside a screw-on lid.	7.4
Alka Seltzer	1 bottle	1 bottle		Local supplier	Tablets go stale if kept too long. Only a small amount is needed for Experiment 7.4; the rest is used in Section 19 and later.	7.4
Plastic syringe with tip (30 cc)	10	4	12.95/pk 6	Delta WW-190-9270		7.6
Triple beam balance and weight set Use one of the following: (A) Ohaus model (0.1 to 610 grams) With weights to extend range to 2610 g (B) Ohaus model (0.1 to 610 g) Requires separate weight set 1-500 g, 2-1000 g weight.	1 1 1	1 1 1	\$104.95 \$88.85 28..60	Frey 15572090 Frey 15572096 Frey 15595797	Optional. The balance is used in an optional demonstration in Section 7 and is optional in Section 9.	OPT 7
Block of material				Local supplier	Use material of a very different density from that of aluminum, e.g., paraffin, wood, or iron.	9.1
Scrap aluminum (3 piece. set) 50 g to 1 kg, eg., 100 g, 300 g, 800 g	10 sets	5 sets		Local supplier	Use an irregularly shaped piece, the volume of which can be determined in a graduated cylinder or beaker, and two rectangular pieces, the volumes of which can be determined by multiplying the dimensions.	9.1
Pail, polyethylene (5 qt)	10	10		Local supplier	May use painter's pails.	11.4
Test tubes (25 x 150 mm, stopper size 5)	1 pk 72	1 pk 72	\$75.50	Frey 15599343		11.4
Glycerin or other lubricant	500 mL	500 mL	\$9.20	Sargent-Welch WLC3841E		11.4
Test tube support (12 holes-double row), 28 mm hole	10	10	\$8.50	Frey 15581868	Optional: Test tubes can instead be placed in beakers to hold them upright.	OPT 11.4
Glass tubing in assorted lengths	1 set	1 set	\$20.30	Frey 15581868	Used in gas collection apparatus.	11.4
Glass tube cutter	1	1	\$10.40	Frey 15585183	Glass tubing should start from 24" length.	
Plastic tubing in assorted lengths	1 set	1 set	\$11.30	Frey 15576888		

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Gloves (heavy cotton or leather-palm)	2 pair			Local supplier	Protection for inserting glass tube into stopper.	11.4
Narrow mouth bottles (polypropylene) Use 16 oz. or 8 oz. size.	2 pk 12	2 pk 12	30.45/16 oz. 21.15/8 oz.	Frey 15560344 Frey 15560341	Clear plastic soda bottles may instead be used to collect gas sample.	11.4
Mohr's pinchcock, 2.25"	1 pk 10	1 pk 10	\$15.95	Frey 15573141	Optional: For pinching rubber tubing closed.	11.4
Rubber Stoppers, size 5, 27 mm (top)					Stoppers or test tubes and plastic bottles.	11.4
0 hole	2 lb.	2 lb.	\$8.10/ lb.	Frey 15560797		
1 hole	2 lb.	2 lb.	\$8.10/ lb.	Frey 15560800		
2 hole	2 lb.	2 lb.	\$8.10/ lb.	Frey 15560803		
Sink and Float kit						12.1
<i>Aluminum cubes:</i>						
3/4"	2 pk 6	1 pk 6	\$4.35	Delta ESS 16-030-7768		
1/2"	2 pk 6	1 pk 6	\$3.75	Delta ESS 16-030-7757		
<i>Aluminum cylinders:</i>						
1" x 1"	2 pk 6	1 pk 6	\$9.15	Delta ESS 16-030-8538		
1/2" x 1/2"	2 pk 6	1 pk 6	\$4.45	Delta ESS 16-030-8516		
<i>Plastic cubes, clear</i>						
3/4"	2 pk 6	1 pk 6	\$2.75	Delta ESS 16-030-7834		
1/2"	2 pk 6	1 pk 6	\$1.85	Delta ESS 16-030-7779		
<i>Plastic cylinders, clear</i>						
1" x 1"	2 pk 6	1 pk 6	\$5.55	Delta ESS 16-030-8560		
1/2" x 1/2"	2 pk 6	1 pk 6	\$1.75	Delta ESS 16-030-8550		
<i>Plastic cubes, milky</i>						
3/4"	2 pk 6	1 pk 6	\$2.70	Delta ESS 16-030-7867		
1/2"	2 pk 6	1 pk 6	\$2.25	Delta ESS 16-030-7856		
<i>Plastic cylinders, milky</i>						
1" x 1"	2 pk 6	1 pk 6	\$6.60	Delta ESS 16-030-8571		
1/2" x 1/2"	2 pk 6	1 pk 6	\$1.60	Delta ESS 16-030-8483		
<i>Wood cubes</i>						
3/4"	6 pk 6	3 pk 6	\$0.80	Delta ESS 16-030-7955		
1/2"	2 pk 6	1 pk 6	\$0.95	Delta ESS 16-030-7977		
<i>Wood cylinders</i>						
1" x 1"	2 pk 6	1 pk 6	\$1.50	Delta ESS 16-030-8593		
1/2" x 1/2"	2 pk 6	1 pk 6	\$0.55	Delta ESS 16-030-8604		
<i>Spheres</i>						
glass 1"	2 pk 8	1 pk 8	\$0.95	Delta ESS 16-190-4253		
plastic 1"	2 pk 6	1 pk 6	\$5.95	Delta ESS 16-190-4297		

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wood 1"	2 pk 8	1 pk 8	\$1.35	Delta ESS 16-190-4363		
Pliable wax	20 piece.	5 piece.		Local supplier	Red wax from gouda cheese works well.	12.1
Wooden dowel set 1/2" diameter x 10 cm, 15 cm, 20 cm lengths	10 sets	5 sets		Local supplier: hardware, home improvement center	Make the dowels waterproof by coating them with melted paraffin or spraying them with polyurethane.	12.11
Paraffin	1 lb. box	1 lb. box		Local supplier	Used to waterproof the wooden dowels.	12.11
Circular Objects (set of 4 with diameters from 3 to 10 cm).	20 sets	5 sets		Local supplier	Empty tin cans, cardboard tubes, etc.	13.10
Funnel, long stem, heavy wall 75 mm diameter x 150 mm stem	1 pk 12	1 pk 12	68.95/pk 12	Frey 15599796	The funnels are handy for pouring methanol or other liquids, but are optional. See also H&T.	OPT 17
Stirring rods (5 x 200 mm)	2 pk 10	1 pk 10	\$3.25	Frey 15599778		17.1
Laboratory scoop stainless steel 6.5" long	12	6	\$0.65/\$0.74	NASCO SB08211M		17.1
Cups, medicine, 1 oz.	120	30	\$3.75/pk 100	Frey 15595068		17.3
Salt, noniodized	3 lb.	1 lb.		Local supplier	Can be used instead of reagent grade salt, but may be cloudy in solution.	17.3
Ring stands	10	5	\$10.95	Frey 15574176	Any support designed to hold a beaker over a flame may be used. See also H&T, L&C, Mag, EM, AbS vI+II, Kin.	21.1
Support rings, 5" diameter	10	5	\$6.00	Frey 15574104		
Wire gauze, 5" x 5"	2 pk 6	1 pk 6	\$5.95	Frey 15574134		
Beaker Tongs, plain jaws	10	5	\$4.85	Frey 15563588	See also H&T.	21.1
Balloons, round 4"	36	24		Local supplier		26.1
Erlenmeyer flask, 250 mL (Pyrex, narrow mouth)	1 pk 12	1 pk 12	\$28.60	Frey 15594090	Test tubes/small beakers may instead be used.	27.2
Evaporating dish, 70 mm diameter	10	10	\$2.85	Frey 15563600		24.2
Test tube clamp, Stoddard's	12 or more	12 or more	\$0.71	NASCO SA04398M	Used to hold hot test tubes.	21.1
Alcohol burners						
Burners and stand kit (2 burners & stand)	10 kits	5 kits	\$13.95	Frey 15576468		21.1
Replacement wicks	2 pk 12	2 pk 12	\$4.10	Frey 15576621		
Ethyl alcohol, denatured (burner fuel)	4.0 L	500 mL	\$23.85 \$ 8.90	NASCO KM01030M NASCO KM01029M		
Thermometer, red spirit filled, 305 mm length scaled in both Celsius and Fahrenheit	20	10	2.65, 10+ ea. 2.95 ea	Frey 15568961 (white back) Frey 15585027 (yellow back)	See also H&T.	24.2
Chemicals						
Sodium Chloride, NaCl, crystal reagent	2.5 kg	500 g	\$17.50/2.5 kg \$6.65/500 g	Frey 15580119 Frey 15580116	Non iodized table salt is not recommended because it turns the solution cloudy. Thus students can rank concentrations by sight.	12.8

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Potassium chloride, KCl, crystal reagent	500 g	100 g	\$9.65/500 g \$4.05/100 g	Frey 15579717 Frey 15579714		17.1
Potassium sulfate, K ₂ SO ₄ crystal reagent anhydrous	500 g	100 g	\$19.95/500 g \$8.85/100 g	Frey 15579897 Frey 15579894		17.1
Methyl alcohol, CH ₃ OH absolute reagent	4 L	500 mL	\$32.50/4 L \$6.05/500 mL	Frey 15579372 Frey 15579366		17.2
Cupric acetate, Cu(CH ₃ COO) ₂ •H ₂ O crystal. reagent	500 g	100 g	\$22.95/500 g	Frey 15578541		19.1
Citric acid, C ₆ H ₈ O ₇ anhydrous fine crystal pure	500 g	100 g	\$12.15/500 g \$7.70/100 g	Frey 15578400 Frey 15567983		25.1
Naphthalene (C ₁₀ H ₈) technical grade flakes	500 g	500 g	\$8.45	Frey 15579477		
Sugar. granular pure	2 lb.	2 lb.		Local supplier		25.1
Chalk dust or Magnesium carbonate, 4MgCO ₃ •Mg(OH) ₂ •5H ₂ O, light powder lab grade	500 g	100 g	\$14.15/500 g \$6.60/100 g	Frey 15579213 Frey 15579210		25.1
Hydrochloric acid, HCl, grade 35-37% Safety bottle (11.5-12.0 M)	2.5L	500 mL	\$27.45/ 2.5 L \$13.10/500 mL	Frey 15578928 Frey 15578925		27.2