

**Light and Color**

Equipment	Quantity required for 20 students working:		Unit cost	Supplier and catalog number	Comments	First use
	together as a class	semi-self paced				
Clear plastic ruler, 1 ft length	1/student	1/student	approx. \$1.50	Local stores	Students can supply. Ruler should be clear plastic, with both inch and centimeter scales.	
Clear plastic protractor Semicircular with 0.5 degrees divisions	1/student	1/student	approx. \$1.50	Local stores	Students can supply.	
Rechargeable batteries and charger: Batteries, D-cell NiCad rechargeable, 1.25 V, 1.600 A•h Battery recharger Holds 10 NiCad batteries: 9V, D, C, AA, AAA, or N	20  2	10  2	\$6.49/pk 2  \$29.99	Radio Shack 23-123 or local stores  Radio Shack 23-134*	See also EC and EM. D-cells are preferred. Note: For best results, completely discharge NiCad rechargeable before recharging.	1.1
Batteries, D-cell alkaline, 1.5 V	16	16	\$7.99/pk 8 \$9.99/pk 12	Radio Shack 23-650* or local stores	Optional: Have some on hand in case you run low on fully charged nicad batteries.	OPT 1.1
Battery holders (D cell) Use one of the following: (A) steel, single cell (B) plastic, single cell with male and female button snaps on ends to permit connection without using wire (C) plastic, with electrical clip set. Includes: 8 holders, 16 clips per set	15  10  4 sets	15  10  4 sets	\$1.45  \$0.75 each for 10 or more  \$9.95/set	NASCO SB10831M  NASCO SB19023M  Delta WW-020-1530		1.1
Miniature bulbs: Use one of the following: (A) threaded base, 2.5 V #14 bright blue ceramic (B) threaded base, 2.47V, 300 mA	30	30	\$4.65/pk 10  \$1.49/pk 2	(A) Frey 15563636 or local stores  (B) Radio Shack PR 2 lamps 272-1132*	See also EC.	1.1
Miniature bulb sockets: Use one of the following: (A) plastic screw base (B) white plastic w/mounting holes (C) masonite base with Fahnstock clips	20 20 20	20 20 20	\$15.15/pk 12 \$22.99/pk 12 \$0.75/ea	Sargent-Welch CP33008K Sargent-Welch CP84165-70A NASCO SB17079M	See also EC.	1.1
Chalkboard eraser	4 or 5	2 or 3		Local stores/supply	The erasers must be full of chalkdust.	1.1

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Connecting wires Use one of the following: (A) wires with alligator clips (B) PVC covered copper connecting wire, white pvc, 22 gauge	See EC 100 ft.	See EC 100 ft.	See EC \$4.10/100 ft.	See EC NASCO SB10520M	See also EC.	1.1
Battery holders: Use one of the following: (A) Steel, for 1 D cell (B) Plastic, for 1 D cell (C) Plastic, for 1 D cell, with 2 electrical clips for ends Extra electrical clips for Delta battery holders (option C)	20 20 20 20	20 20 20 20	\$1.45/ea \$0.75/ea (10 +) \$9.95/pk 8 \$8.95/pk 20	NASCO SB10831M NASCO SB19023M Delta WW-020-1530 Delta WW-030-5030	See also EC.	1.1
Flashlight, plastic, requires 2 D cells	10	5		Frey F05388 or local stores	These are also useful for completely discharging the rechargeable batteries.	1.2
Construction paper, black, red and other assorted colors	1 pk black, 1 pk colors	1 pk black, 1 pk colors		Local stores/supply	Construction paper of different colors and textures is required. Red is used in Experiment 1.2. Black is used to make masks with slits.  Subsequent experiments require construction paper that is as black as possible.	1.2
Various materials of different types of surfaces				Local stores/supply	Include sandpaper, foil, shiny paper, black velvet, etc.	1.2
Scissors	10	5		Local stores/supply		1.2
Index cards; tape	1 pk	1 pk		Local stores/supply	Ordinary clear tape is fine.	1.2
Mask with variable hole: Materials needed: 1. Flat piece of corrugated cardboard, approx. 9" x 12" 2. Manila file folder or sheet of cardstock 3. Brass paper fastener 4. Single-hole paper punch 5. T-pin 6. Razor blade or sharp knife	10 2 10 1 of each of 2 different sizes 1 1	10 2 10 1 of each of 2 different sizes 1 1		Local stores/supply Local stores/supply Local stores/supply Local stores/supply Local stores/supply Local stores/supply	See Instructor's Guide for details on making the mask.  One standard size punch and one smaller. Use a punch so that makes holes with smooth edges.	2.1

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Apparatus to model a hole in a mask: Materials needed: 1. Ring stand, base approx. 6" x 9", rod approx. 0.5" x 24" 2. Support ring for ring stand, 10 cm diameter 3. Wooden dowels (approx. 36" length x 0.25" diameter) 4. Washers (two sizes): Approx. 1" outer diameter x 0.4" inner diameter x 0.1" thick Approx. 1" outer diameter x 0.6" inner diameter x 0.1" thick 5. Buret clamp (single), (A) with plain jaws, or (B) with plastic-coated jaws	10 10 10 10 each size 10 10	5 5 5 5 each size 5 5	\$10.95 \$5.25  \$6.95 \$6.95	Frey 15574176 Frey 15574101 Local supply/stores Local hardware store/stock Frey 15574110 Frey 15574266	Required for experiment 2.2 and 3.4. See also POM, H&T, Mag, EM, and AbS.  See also H&T, Kin  Used to attach washers to ring stand. See also POM, EM.	2.2
Long filament bulb and socket:  Medium screw base porcelain socket  Cord about 6' long, with molded two prong plug  Long filament incandescent bulb medium screw base, 40 W	20 20 20	10 10 10	\$2.40  \$3.85/pk 2	Frey 15594681 or local hardware store Local hardware store Frey 15598389 or local hardware store (e.g., Philips Tubular Bulb, 40 Watt, BC40T10)	Same size socket as for household bulbs. Note: On some, the screws are exposed and "live" when the socket is plugged in. Use sockets in which the screws are safely hidden.	2.7
Multiple-outlet power strip	5	5	\$25.70 ea.	Frey 15592740 (Surge suppressor)	See also L&O, Kin. These can be purchased from local hardware stores at lower prices. They are used to plug in multiple long filament bulbs from one outlet and to turn the bulbs on and off.	OPT 2.7
Frosted light bulbs, 40 W	10	5		Local stores	These can be used in the same socket as the long filament bulb.	2.9
Pinhole camera Materials needed: 1. Shoe box, with lid	1/student or 1/group	1/student or 1/group		Local stores/supply	Students are much more involved in this section if they build their own pinhole cameras.  Students can provide.	3.1

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2. Cardboard tubing, approx. 3 cm long	1/student or 1/group	1/student or 1/group		Local stores/supply	Students can provide. Empty paper towel rolls, aluminum foil rolls, etc., are fine.	
3. Opaque black tape (e.g., electrical)	2 rolls	1 roll	\$2.70/roll	Frey 15574364 or local hardware store		
Cardboard or photocopy paper boxes	10	5		Local supply	To serve as screens.	3.4
Overhead projector	1	1		Local supply		3.5
Transparencies	5 to 10	5 to 10		Local stores/supply		3.5
Modeling clay	2 lb.	1 lb.	\$3.95/lb	Delta WW-030-4897 or local stores/supply	See also POM. Not essential for Experiment 4.1 but required for Experiment 4.3.	4.1
Nails, 8-10 cm in length	10	5		Local stores/hardware store	See also POM.	4.1
Butcher paper, white (20" x 1300' roll)	1 roll	1 roll	approx. \$26.00/roll	Local art store/stock	Important: Use white paper when specifically noted. Use paper that has no glossy sheen.	4.3
Shadow box Materials needed:						
1. Large box (empty photocopy paper box, or one of similar size, is ideal)	10	10		Local supply	See Experiment 4.3 for instructions on making a shadow box.	4.3
2. Small ball of clay (about 1 cm in diameter)	10	10			Use clay from Experiment 4.1.	
3. Thread	1 spool	1 spool		Local stores/supply	Thread is used to suspend the ball of clay; color is unimportant.	
4. Tape	1 roll	1 roll			Any type of tape will work.	
5. White paper					Tape white paper to the back of the box to serve as a screen.	
Tempera paints (Prang):						
1. blue (828)	6-8 oz. of each color	6-8 oz. of each color		Local art store	If other brands or colors of paints are used, they should be tested for color mixing.	5.1
2. cyan (turquoise) (408)						
3. green (826)						
4. magenta (purplish-pink) (836)						
5. red (820)						
6. yellow (824)						
Artist's paint tray (6 compartments)	10	5	approx. \$1.00 ea.	Local art store	These are useful so that each group can take a small amount of each color of paint.	5.1
Paintbrush, #5 Cameo	10	5		Local stores/supply	Optional if students finger paint (see below).	OPT 5.1
Finger-painting paper	1 pk	1 pk		Local art store	Optional: Some students prefer to use their fingers rather than a brush.	OPT 5.1

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White paper towels	1 roll	1 roll		Local stores/supply	Use white paper towels for this experiment.	5.3
Beaker (e.g., 600 mL) or other container.	10	5	\$19.95/pk 6	Frey 15593982	Used to hold water. See also POM.	5.3
Water soluble marking pens of various colors, incl. green, black, and brown	6 to 8 markers	6 to 8 markers		Local stores/supply	Pens must be water soluble. Avoid scented pens which can affect students with allergies.	5.3
Roscolux acetates: Medium red, royal blue, dark yellow green, medium yellow, medium purple (magenta)  Gamcolor acetates: Nile blue (cyan/blue-green)	10 pcs, approx. 6-7 cm square, of each color  1 piece approx. 12" x 12", of red, blue, green	10 pcs, approx. 6-7 cm square, of each color  1 piece approx. 12" x 12", of red, blue, green	Roscolux acetates: \$6.25 for 20" x 24" sheet  Gamcolor acetates: \$6.00 for 20" x 24" sheet	Pacific Northwest Theater Associates, Inc. 615 S. Alaska St. Seattle, WA 98108 1-800-622-7850	These filters work well. If others are used, they should be tested for color mixing.	6.1
Light box: Materials needed: 1. Light bulb, 200 W (General Electric 6" clear glass) 2. Keyless porcelain lampholder, medium base (#9875 Leviton, 660 W, 250 V) 3. Cord and plug (approx. 6' cord with molded two prong plug) 4. Sturdy cardboard box, approx. 12" cube or 5 gal. Ice cream container	10  10  10  10	10  10  10  10		Local stores/supply  Local hardware stores  Local hardware stores  Local stores/supply	See <i>Light &amp; Color</i> Instructor's Guide for instructions on making a light box.	6.1
Plane mirrors, approx. 10 cm square	10	10	\$12.65/pk 12	NASCO SB16721M	See also L&O. If desired, attach mirrors to small wooden blocks so that they stand upright.	6.1
Holographic diffraction grating  or  Prism	10 pcs, approx. 2" square   10	5 pcs, approx. 2" square   5	\$9.00/5" x 9" sheet   See L&O	Learning Technologies PS-08 A <a href="http://www.starlab.com/pspi.html">www.starlab.com/pspi.html</a>  See L&O	Prisms are preferred from a conceptual point of view, but gratings give better results.  If using a diffraction grating, one sheet can supply an entire class. Use a hole punch to make a hole in the middle of a small piece of black construction paper. Tape a small piece of the diffraction grating over the hole. The paper makes the grating easy to hold.	6.4
Magnifier Use one of the following: (A) Magnifying glass (convex lens) (B) Page magnifiers (approx. 7" by 11")	10 10	5 5	\$1.60	NASCO SB20299M	If students work through <i>Light and Optics</i> , use the convex lenses from that module.	7.4

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Color pictures produced using four-color process	10	5		Local supplier	Color pictures from a newspaper work very well. Also try cereal or cracker boxes.	7.4
Dichro-color flood lamps 150 W, red, green, and blue	1 each color	1 each color	\$35.59 ea. (University price)	Pacific Lamp and Supply Co. 5935 4th Ave. S, Seattle, WA 98108; 1-800-637-0489 red: 19468 green: 19467 blue: 19465	Optional: Fits in same socket as long filament bulb. The colors are very saturated.	OPT 7.6
Black poster board or cardboard	1 large sheet	1 large sheet		Local stores/supply	Used as backing for colored sheets in demonstration for Experiment 7.6.	7.6