Novare Science Experiment Parts List

Text: *Novare Physical Science*

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This parts list was compiled to make more convenient the materials procurement for the experiments designed to accompany *Novare Physical Science*, particularly for home schoolers researching parts options. Included in the Digital Resources for this text is the NPS Experiment Resource Manual that includes far more detail about equipment specifications and sourcing options. The present document provides a quick summary, as well as a comparison of the required items to the contents of the HST kit.

In the following parts list, HST refers to HomeScienceTools.com. HST sells a kit containing many of the necessary items. (Note that HST is not affiliated with Novare Science or Classical Academic Press, and CAP receives no revenue from sales of HST kits.) The HST column in the parts list below indicates whether the item is included in the HST kit and notes are added where comments on the HST-supplied parts are warranted. For more information about the HST kits, visit homesciencetools.com.

Five of the experiments (1, 5, 6, 8, and 12) entail the use of special jigs or parts made of wood and metal. Building these special items is not complex or expensive, but does require some time and the use of several power tools. If possible, let students work with a knowledgeable adult to make these items. The adult supervisor can operate the power tools involved, or teach the student(s) how to use the tools in cases where using the tools is age appropriate. The Novare Physical Science Special Parts Kit is available for anyone who does not have the tools, time, or know-how to assemble these items. The kit includes only the special jigs that require cutting and assembly. Ordinary parts and supplies that can be sourced elsewhere are not included in the Special Parts Kit. For those who wish to make these items on your own, the Appendix of the NPS Experiment Resource Manual includes the complete specification we use for making the items in the Special Parts Kit. Students who have the opportunity to work with a teacher, classroom volunteer, or parent to build the experimental apparatus for themselves will have an enhanced experience conducting the experiments. For schools without access to shop tools, see if you can find a parent volunteer who will work with your students to make the special items needing fabrication. For home school families, building the parts can be a great opportunity for parents to be involved with the kids. For families who do not have the needed power tools, try to find a friend or neighbor who does and who is willing to work with you.

Finally, as a science educator, seeking ways to make high school science experiments more accurate is one of my favorite hobbies. As they are described in the NPS Experiment Resource Manual, the experiments are designed to use equipment and apparatus that will give the highest possible accuracy and precision possible, while using a simple setup at a budget accessible to most schools and families. The fabrication requirements are also accessible to schools and families where there is a community of people available with the necessary tools and know-how. The purpose of this list is to provide advice and alternatives for those who need them.

There are always different methods that can be used that make use of different items of equipment. However, making changes to the experimental procedure or the equipment will almost always reduce the accuracy of the results. For schools, I recommend doing the experiments exactly as described in the NPS Experiment Resource Manual. The alternatives included in the list below are for those who must work with a lower budget and need advice on reasonable compromises that can be made. Additional notes about equipments alternatives are available on pages 8–10 of the Experiment Resource Manual.

Here are a few heads-up comments on the specific experiments for *Novare Physical Science* (see the NPS Experiment Resource Manual in the Digital Resources for details):

Experiment 1: This first experiment uses one of the most complex setups in the book. It also requires two of the jigs from the Novare Physical Science Special Parts Kit. It also involves Hot Wheels cars with a cargo area, which can be hard to find. Scouring the shelves at Target, Academy, or Walmart for the cars you need is unavoidable.

Experiment 5: Requires one of the jigs in the Special Parts Kit.

Experiment 6: Requires one of the jigs in the Special Parts Kit (the same one as experiment 5).

Experiment 7: Requires handy access to a refrigerator and freezer. Three of the thermometers in this experiment are frozen during the procedure, requiring the use of digital thermometers.

Experiment 8: Requires one of the jigs in the Special Parts Kit.

Experiment 9: This is best done as a demonstration conducted by an adult with assistance from students for making the solutions.

Experiment 12: This experiment requires a non-metal table set up out in a field or parking lot away from all metal.

Common Household Items			
Item	Quantity	Experiment	Notes
masking tape	roll	1, 2, 10, 12	
3" × 5" index cards	10	1	
wood glue		1	
Styrofoam cups with lids, 12 oz	20	2, 3, 7, 9	The need for lids applies to 3 cups in experiment 2. No lids are required for experiments 3, 7, or 9. Schools can use weigh trays for experiment 9, if available.
small cardboard box	1	2	
duct tape		2	
plasticware lid	1	2	This is modified by cutting holes in the top. Alternatives are plastic lid from a coffee can or a small piece of cardboard.
small flat pieces of Styrofoam or cardboard	2	2	
aluminum foil	6 sq in	3	
refrigerator/freezer	1	4, 7	
clear glass bowl	2	4	
tall, clear drinking glass	2	4	
pencil	1	4, 10	
plastic spoon	1	4	
table salt, non-iodized	1 container	4	
distilled water	1 gal	4, 9	
calculator	1	5, 6	
ice	5 lb	7	
baking soda	30 g	9	
coffee filter	2	9	Schools can use filter paper, if on hand.
plastic spoons	4	9	
ruler	1	10	
graph paper	5 sheets	10	
Common Tools and Hardware—Available at hardware stores.			
Item	Quantity	Experiment	Notes
quick-grip clamps, micro size	2	1, 3	
Gorilla glue, 2 oz	1	3	Any glue that will stick to Styrofoam and fishing line will work.
tape measure	1	8	
small screwdriver	1	8	This should have a blade no wider than 5/32". Acceptable substitutes include a straightened piece of coat-hanger wire or an ice pick.
level	12 or 24 inch	12	
1 × 4	24 to 36 in	12	

Apparatus				
Item	Quantity	Experiment	Included in HST Kit?	Notes
Track Clamp Support	1	1, 12	no	This is included in the NPS Special Parts Kit, or may be fabricated from details in the NPS Experiment Resource Manual.
Double Support Stands with Adjustable Crosspiece	2	1, 12	no	
1 × 10 pine	72 in	1, 12	no	
1 × 2 pine	72 in	1, 12	no	
#8 × 3/4 flat head wood screws	2	1	no	
Hot Wheels track and clamp	2	1	no	Hot Wheels Track Builder Unlimited Speed Clamp Pack (containing 4 pcs track, 4 track connectors, 1 track clamp, and 1 car). These are $12.99 each at Target.
Hot Wheels car with cargo space	2	1	no	The track kits include cars, but getting cars with cargo space are unlikely. These cannot be ordered. One just has to look through car packs until one finds cars that will work. One such model is the orange car shown in the NPS Experiment Resource Manual. Another is the "So Plowed" truck from the "City" 5-car pack. Save the packaging for experiment 10.
lead split-shot, size BB	pack of 60	1, 4	yes	
meter stick	1	1, 8, 12	no	A yard stick can be used instead, but students should convert inch measurements to centimeters.
mass balance	1	1, 4, 6, 8, 9	yes	The HST kit includes as an option the Digital Platform Scale 300 g × 0.01 g, recommended for experiments in all Novare courses.
hot plate	1	2, 4, 7	yes	
beaker, 600 mL	2	2, 4, 7	yes	To do experiment 7 in one class period, you need 2 600-mL beakers and another container to boil water in (the 1000 mL beaker listed below). If the trials are split up into 3 different days, a single beaker will suffice. Note: Do not substitute a kitchen Pyrex measuring cup for this item. See the safety note in the introduction of the NPS Experiment Resource Manual
digital thermometer	4	2, 7	partial	The HST kit includes 1, but 4 are required for the experiment.
graduated cylinder, 100 mL	1	2, 4, 9	yes	To do experiment 7 in one class period, you need 2 graduated cylinders. If the trials are split up into 3 different days, a single graduated cylinder will suffice. The HST kit contains 1.
Styrofoam ice chest	2	2, 7	no	
copper wire, solid, 10 gauge	8 ft	2, 3	yes	The HST kit includes 14 GA wire, which is too small. See the NPS Experiment Resource Manual for details and sources.
monofilament line, 0.1 in diameter	8 ft	2	yes	
aluminum wire, 500 MCM	2 ft	2	yes	
fishing line	24 inches	3, 4	yes	

Apparatus				
Item	Quantity	Experiment	Included in HST Kit?	Notes
beaker, 250 mL	2	4, 9	yes	
beaker tongs	1	4, 7	yes	
Epsom Salt, 0.5 gal	1 carton	4	yes	
alum	1 container	4	yes	
magnifying glass	1	4	yes	
aluminum rod, 3/8 inch diameter × 3 inches long, T-6061 alloy	1	5, 6	no	This is included in the NPS Special Parts Kit, or may be fabricated from details in the NPS Experiment Resource Manual.
aluminum flat bar, 1/8 inch × 3/4 inch × 4 inches long, T-6061 alloy	1	5, 6	no	This is included in the NPS Special Parts Kit, or may be fabricated from details in the NPS Experiment Resource Manual.
aluminum angle, 1/8 in thick, 3/4 × 3/4 × 2.5 inches long, T-6061 alloy	1	5, 6	no	This is included in the NPS Special Parts Kit, or may be fabricated from details in the NPS Experiment Resource Manual.
brass rod, 1/2 inch diameter × 3.5 inches long, 360 alloy	1	5, 6	no	This is included in the NPS Special Parts Kit, or may be fabricated from details in the NPS Experiment Resource Manual.
carbon steel flat bar, 1/2 inch × 1/2 inch × 2 inches long, CF-1018 alloy	1	5, 6	no	This is included in the NPS Special Parts Kit, or may be fabricated from details in the NPS Experiment Resource Manual.
digital caliper	1	5	optional	
heat resistant gloves	1 pair	7, 9	yes	
4-hole spring mounting block	1	8	no	This is included in the NPS Special Parts Kit, or may be fabricated from details in the NPS Experiment Resource Manual.
spring	1	8	no	This is included in the NPS Special Parts Kit, or may be ordered from Hobby Town.
golf ball	1	8	no	
table-tennis ball	1	8	yes	
wooden ball, 1” diam	1	8	yes	
safety goggles	1	8, 9	no	
flask, 250 mL	2	9	yes	
Bunsen burner	1	9	no	These items are for schools. Home schoolers just use the kitchen stove.
burner tripod	1	9	no	
copper sulfate pentahydrate	20 g	9	yes	
sodium hydroxide	10 g	9	yes	
hydrochloric acid	50 mL	9	yes	
plastic funnel	2	9	yes	

Apparatus				
Item	Quantity	Experiment	Included in HST Kit?	Notes
nitrile gloves	1 pair	9	yes	
pH indicator strips	1 pack	9	yes	
6-inch frying pan	1	9	no	Teflon coating is nice, but this experiment will scratch it up, so use an old pan if available.
stainless steel spatula	1	9	no	
ring stand	1	10	no	
rectangular bubble pack	1	10	no	This is a rectangular dish like the packaging Hot Wheels cars come in, so use the one from the car for experiment 1.
clamp holder	1	10	yes	
laser pointer, 5 mW or less	1	10	yes	
acrylic glass prism	1	10	yes	
protractor	1	10	yes	
6-volt lantern batteries	2	11, 12	yes	
lamp base	3	11	yes	
incandescent bulb, two-pack	3	11	yes	
mini-alligator cables, pack of 10	1	11, 12	yes	
digital multimeter	1	11	yes	
spare fuses	pack of 5	11	no	These are recommend for schools because with lots of students someone is likely to blow the fuse in the multimeter. Home schoolers can just be mindful of the cautionary comments in the NPS Experiment Resource Manual.
map compass	1	12	yes	
plastic work clamps	2	12	no	Must be plastic. Obtain from hardware store.
plastic chip clips	2	12	no	
table, non-metallic	1	12	no	This can be a pair of plastic saw horses (available at hardware stores) or wooden sawhorses with a 2-foot square piece of plywood for the table top.