TECHNICAL WRITING – OVERVIEW, REFERENCE, AND TASK SAMPLES

Persona: Adult-level readers of science education text.
Sources: *MacGyver* show 'bibles' from ViacomCBS; research on various chemical agents.
Styles: Chicago Manual style, with adjustments based on Weldon Owen Publishing in-house guide.
Editing: Ongoing revisions prior to submission.
Verification: Dr. Rhett Allain, PhD., physics consultant for ViacomCBS.

102 Smoke Powder

Traditional black powder combines three substances. Saltpeter or potassium nitrate (KNO_3) makes up 75% of its mass, as both fuel and oxidizer. Charcoal or carbon (C) comprises another 15% as another fuel. Sulfur (S) is the final 10%; it lowers carbon's ignition temperature and improves combustion. Improvise gunpowder by combining sugar, salt substitute, and instant cold packs. The chemical in these packs normally creates an endothermic reaction when water is added. Turn it into gunpowder's primary ingredient, saltpeter, with the following steps.

Reagents and Tools

Item	**Purpose**
Instant cold packs containing ammonium nitrate (NH_4NO_3); Cold packs containing urea (CH_4N_2O) will not work for this formulation.	Primary reactant for saltpeter conversion
Salt substitute containing potassium chloride (KCl)	Secondary reactant for saltpeter conversion
Table sugar ($C_{12}H_{22}O_{11}$)	Tertiary reactant for smoke powder formula
Water (H_2O)	Carrier for primary and secondary reactants
Coffee filters	Filter to remove impurities in primary reactant
Digital scale with metric readings	Precise weight measurements
Graduated beaker or cylinder with metric readings	Precise volume measurements
Clean glass beakers or jars, or clean aluminum cans	Safe containment of reactants without contamination
Bunsen burner or microwave oven	Heat source for saltpeter conversion
Fume hood or well-ventilated area	Safe working space to prevent fume inhalation
Goggles, labcoat, and gloves	Personal protective equipment
1-gallon (3.8-liter) plastic jug with funnel	Safe disposal of saltpeter conversion byproduct

1. Clear the working area. Set up scale, beakers, burner, and ventilation.
2. Put on goggles and other necessary safety gear.
3. Cut open a cold pack and remove the interior packet containing the ammonium nitrate.
4. Weigh 1.4oz (40g) of the ammonium nitrate, and dissolve into 0.4 cups (100mL) of water.
5. Measure out 1.3oz. (37g) of the salt substitute into a glass jar or metal can.
6. Pour the dissolved ammonium nitrate through a coffee filter and into the container.
7. Bring the solution to low heat over a burner, stirring continuously to dissolve the salt substitute. Alternatively, microwave the solution in thirty-second intervals in a microwave-safe container. Stir thoroughly between each cycle until fully dissolved.
8. Put the solution in a freezer for 30 minutes to two hours. As the solution cools, the potassium chloride (KCl) will react with the ammonium nitrate. Saltpeter crystals will precipitate from the solution and sink to the bottom of the container.
9. Ammonium chloride (NH4Cl) is dissolved in the water as a byproduct of the chemical reaction. Pour this solution out of the jar into the disposal container.
10. Remove the saltpeter crystals. Fully dry them under a fume hood or in other well-ventilated area.
11. Crush the crystals into powder. Thoroughly mix with an equal weight of sugar. Keep away from heat, sparks, or flame until ready to use.
12. Use this mixture in a smoke bomb (see *item 084*). Alternatively, pack it into a cannon as a crude gunpowder substitute (see *item 085*).