Black powder

This page contains 43 formulas in 9 tables.

CAUTION: Black powders are highly flammable and explosive if confined. Some so-called "cocoa" powders are inherently friction sensitive. Most black powders are at the peak of their sensitivity when a few percent of moisture is present.

NOTE: Black powder is the one composition in pyrotechnics that varies greatly from type to type. The most important component of black powder (BP) is charcoal. It is important to use a very reactive charcoal such as willow or grapevine that contains many volatiles (oxygen and hydrogen) to increase the speed of burning.

Simply mixing the three components together does not give good results. It is usually wise to "impregnate" the charcoal with the potassium nitrate by ball milling the two chemicals together for several hours, or by the precipitation method where the potassium nitrate is dissolved in hot water and charcoal is added.

The following table gives a number of BP formulas. If a specific type charcoal is required for a composition, it will be noted in brackets beside the charcoal percentage. Bear in mind that if the charcoal is not very reactive the BP will merely fizzle and burn slowly. Examples of unreactive charcoals are activated charcoal which contains virtually no volatiles, and barbeque briquettes which usually contain clay.

General black powder

NOTE: The term "general" is applied loosely here, referring to any black powder composition that was not designed for a specific purpose, or if it was then the specific application was not given.

	Watson	Graecus	Graecus	Graecus	Bacon	Bacon	Urbanski
name	**Standard BP**	(composition as of 8th century)	(composition as of 8th century)	**Ignis Volatilis**	(composition as of 1249)	(composition as of 1252)	(composition as of 1300)
Potassium nitrate	75	66.66	69.22	50	41	37.5	67
Charcoal	15	22.22	23.07		29.5	31.25	16.5
Sulfur	10	11.11	7.69	25	29.5	31.25	16.5
Resin				25			

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General black powder II

	Arderne	Whitehorne	Bruxelles Studies	British Government
	(laboratory recipe, composition as of 1350)	(composition as of 1560)	(composition as of 1560)	(powder made under contract, composition as of 1635)
Potassium nitrate	66.6	50.0	75.0	75.0
Charcoal	22.2	33.3	15.62	12.5
Sulfur	11.1	16.6	9.38	12.5

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Lift-specific powder

NOTE: The following composition is optimized for firing aerial shells from fireworks mortars.

	Pyrotechnics Guild International
name	**PGI optimum**
Potassium nitrate	74
Charcoal	14
Sulfur	12

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Firearms-specific powder

CAUTION: Cocoa powders are more sensitive to friction than ordinary black powder. Accidents have resulted from shaking of the composition in a canvas sack.

NOTE: These compositions are intended for firing projectiles from small-bore, hand-held weapons. They may also be used for lifting aerial shells from fireworks mortars, however some testing as to the suitability of a certain composition might be necessary.

	Davis	Davis	Davis	Davis	Davis	Noble and Abel
name	**English Cocoa powder I**	**English Cocoa Powder II**	**German Cocoa Powder I**	**German Cocoa Powder II**	**French Cocoa Powder**	**Cocoa powder**
Potassium nitrate	79	77.4	78	80	78	80
Charcoal	18 (rye straw)	17.6 (rye straw)	19 (rye straw)	20 (rye straw)	19 (rye straw)	18 (rye straw)
Sulfur	3	5	3		3	2

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Military-specific powder

NOTE: The following compositions were used in France for military purposes. Specific applications are listed in the table. A date as to when these compositions were put into use was not given.

	Urbanski	Urbanski	Urbanski	Urbanski	Urbanski
name	**Cannon**	**Sporting**	**Normal (rifle powder)**	**Cannon modified**	**Delay fuse powder**
Potassium nitrate	75	78	75	78	75
Charcoal	12.5	12	15	19	13-15
Sulfur	12.5	10	10	3	10-12
grain size	7 - 21 mm	0.1 - 1 mm	various	hexagonal "nut"	0.3 - 0.6 mm

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Blasting-specific powder I

	Urbanski	Urbanski	Urbanski	Urbanski	Urbanski	Urbanski	Urbanski	Urbanski	Urbanski
name	**Strong blasting**	**Slow blasting**	**No.1 blasting powder**	**No.1 Bobbinite**	**No.2 Bobbinite**	**No.1 black blasting powder**	**American blasting powder**	**No.3 black blasting powder (Petroclastite or Haloclastite)**	**No.2 black blasting powder**
Potassium nitrate	75	40	73-77	62-65	63-66				
Sodium nitrate						70-75	70-74	71-76	70-75
Charcoal	15	30	10-15	17-19.5	18.5-20.5	10-16	15-17	15-19 of coal-tar pitch	10-16 of lignite
Sulfur	10	30	8-15	1.5-2.5	1.5-2.5	9-15	11-13	9-11	9-15
Paraffin				2.5-3.5					
Starch					7-9				
Ammonium sulfate and copper sulfate				13-17					

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Blasting-specific powder II

	Davis	Davis	Davis
	French *Forte*	**French *Lente***	**French *Ordinaire***
Potassium nitrate	72	40	62
Charcoal	15	30	18
Sulfur	13	30	20

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Ammonium-based powders

CAUTION: Ammonium picrate is a sensitive high explosive compound. Its use is discouraged.

DANGER: Potassium picrate is a very sensitive high explosive compound. Its use is strongly discouraged.

NOTE: These compositions were generally used as propellants, but have been largely superceded by smokeless nitrocellulose-based mixtures.

	Gaens	unknown	*Brugere*	*Starke*
name	**Amide powder**	**Ammonpulver**	***Brugere powder***	***Gold Dust Powder***
Ammonium nitrate	35-38	85		
Potassium nitrate	40-45		***57***	
Charcoal	14-22	15		
Ammonium picrate			***43***	***55***
Potassium picrate				***25***
Ammonium dichromate				***20***

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Sulfurless powders

	Lancaster	Noble	Noble	Thomas
name	**Sulfurless powder**	**Sulfurless powder**	**Sulfurless powder (stoichiometric)**	**Sulfurless powder SFG.12**
Potassium nitrate	70.5	80	87.1	70
Charcoal	29.5	20	12.9	30

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