

Table 19.1

Characteristics of the Major Groups of Gram-Negative Photosynthetic Bacteria

Characteristic	Anoxygenic Photosynthetic Bacteria				Oxygenic Photosynthetic Bacteria
	Green Sulfur ^a	Green Nonsulfur ^b	Purple Sulfur	Purple Nonsulfur	Cyanobacteria
Major photosynthetic pigments	Bacteriochlorophylls <i>a</i> plus <i>c</i> , <i>d</i> , or <i>e</i> (the major pigment)	Bacteriochlorophylls <i>a</i> and <i>c</i>	Bacteriochlorophyll <i>a</i> or <i>b</i>	Bacteriochlorophyll <i>a</i> or <i>b</i>	Chlorophyll <i>a</i> plus phycobiliproteins <i>Prochlorococcus</i> has divinyl derivatives of chlorophyll <i>a</i> and <i>b</i>
Morphology of photosynthetic membranes	Photosynthetic system partly in chlorosomes that are independent of the plasma membrane	Chlorosomes present when grown anaerobically	Photosynthetic system contained in spherical or lamellar membrane complexes that are continuous with the plasma membrane	Photosynthetic system contained in spherical or lamellar membrane complexes that are continuous with the plasma membrane	Thylakoid membranes lined with phycobilisomes
Photosynthetic electron donors	H ₂ , H ₂ S, S ⁰	Photoheterotrophic donors—a variety of sugars, amino acids, and organic acids; photoautotrophic donors—H ₂ S, H ₂	H ₂ , H ₂ S, S ⁰	Usually organic molecules; sometimes reduced sulfur compounds or H ₂	H ₂ O
Sulfur deposition	Outside of the cell	N/A ^c	Inside the cell ^d	Outside of the cell in a few cases	N/A
Nature of photosynthesis	Anoxygenic	Anoxygenic	Anoxygenic	Anoxygenic	Oxygenic (some are also facultatively anoxygenic)
General metabolic type	Obligate anaerobic photolithoautotrophs	Usually photoheterotrophic; sometimes photoautotrophic or chemoheterotrophic (when aerobic and in the dark)	Obligate anaerobic photolithoautotrophs	Usually anaerobic photoorgano-heterotrophs; some facultative photolithoautotrophs (in the dark, chemo-organoheterotrophs)	Aerobic photolithoautotrophs
Motility	Nonmotile; some have gas vesicles	Gliding	Motile with polar flagella; some are peritrichously flagellated	Motile with polar flagella or nonmotile; some have gas vesicles	Nonmotile, swimming motility without flagella or gliding motility; some have gas vesicles
Percent G + C	48–58	53–55	45–70	61–72	35–71
Phylum or class	<i>Chlorobi</i>	<i>Chloroflexi</i>	γ-proteobacteria	α-proteobacteria, β-proteobacteria (<i>Rhodocyclus</i>)	<i>Cyanobacteria</i>