

1. The Standard Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG	1
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UGA, UAG	3

2. The Vertebrate Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC	2
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG, AUA	2
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG	4
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG, UGA	2
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UAG, AGA, AGG	4

3. The Yeast Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC	2
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG	2
Met/M	AUG, AUA	2
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGG, AGA, AGG	4
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T4	ACU, ACC, ACA, ACG	4
Thr/T4	CUU, CUC, CUA, CUG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG, UGA	2
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UAG	2

**4. The Mold, Protozoan, and Coelenterate Mitochondrial Code
and the Mycoplasma/Spiroplasma Code**

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG, UGA	2
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UAG	2

5. The Invertebrate Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC	2
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG, AUA	2
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG	4
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG, UGA	2
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC, AGA, AGG	4
STOP	UAA, UAG	2

6. The Ciliate, Dasycladacean and Hexamita Nuclear Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG, UAA, UAG	4
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG	1
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UGA	1

9. The Echinoderm and Flatworm Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAG	1
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG	1
Asn/N	AAU, AAC, AAA	3
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG	4
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG, UGA	2
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC, AGA, AGG	4
STOP	UAA, UAG	2

10. The Euplotid Nuclear Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC, UGA	3
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG	1
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UAG	2

11. The Bacterial, Archaeal and Plant Plastid Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG	1
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UGA, UAG	3

12. The Alternative Yeast Nuclear Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA	5
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG	1
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
Ser1	CUG	1
STOP	UAA, UGA, UAG	3

13. The Ascidian Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG, AGA, AGG	6
His/H	CAU, CAC	2
Ile/I	AUU, AUC	2
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG, AUA	2
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG	4
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG, UGA	2
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UAG	2

14. The Alternative Flatworm Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAG	1
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG	1
Asn/N	AAU, AAC, AAA	3
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG	4
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG, UGA	2
Tyr/Y	UAU, UAC, UAA	3
Ser2/Z	AGU, AGC, AGA, AGG	4
STOP	UAG	1

16. Chlorophycean Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Leu/L	UAG	1
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG	1
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UGA	2

21. Trematode Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC	2
Lys/K	AAG	1
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG, AUA	2
Asn/N	AAU, AAC, AAA	3
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG	4
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG, UGA	2
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC, AGA, AGG	4
STOP	UAA, UAG	2

22. Scenedesmus obliquus Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Leu/L	UAG	1
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCG	3
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG	1
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UGA, UCA	3

23. Thraustochytrium Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUG, CUU, CUC, CUA, CUG	5
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG	1
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UGA, UAG, UUA	4

24. Pterobranchia Mitochondrial Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG	4
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG, AGG	3
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG	4
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG, UGA	2
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC, AGA	3
STOP	UAA, UAG	2

25. Candidate Division SR1 and Gracilibacteria Code

Amino acid	Codons	Codon Count
Ala/A	GCU, GCC, GCA, GCG	4
Cys/C	UGU, UGC	2
Asp/D	GAU, GAC	2
Glu/E	GAA, GAG	2
Phe/F	UUU, UUC	2
Gly/G	GGU, GGC, GGA, GGG, UGA	5
His/H	CAU, CAC	2
Ile/I	AUU, AUC, AUA	3
Lys/K	AAA, AAG	2
Leu/L	UUA, UUG, CUU, CUC, CUA, CUG	6
Met/M	AUG	1
Asn/N	AAU, AAC	2
Pro/P	CCU, CCC, CCA, CCG	4
Gln/Q	CAA, CAG	2
Arg/R	CGU, CGC, CGA, CGG, AGA, AGG	6
Ser4/S	UCU, UCC, UCA, UCG	4
Thr/T	ACU, ACC, ACA, ACG	4
Val/V	GUU, GUC, GUA, GUG	4
Trp/W	UGG	1
Tyr/Y	UAU, UAC	2
Ser2/Z	AGU, AGC	2
STOP	UAA, UAG	2