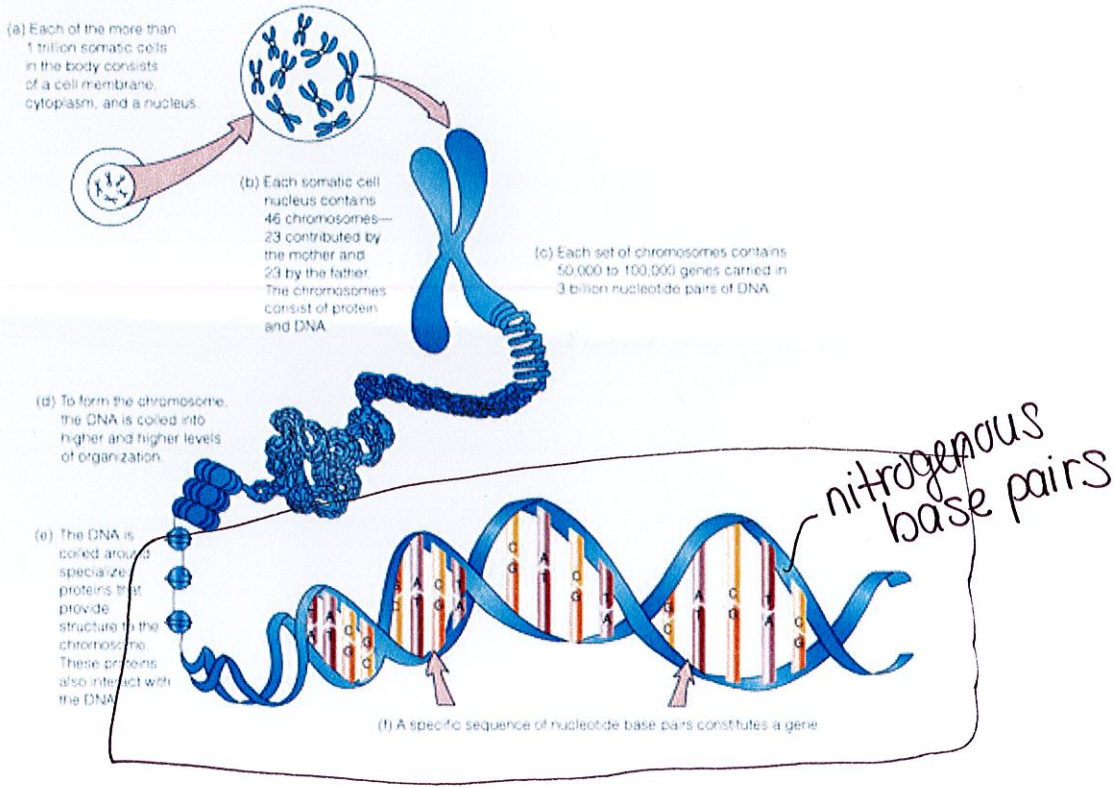
(a) Each of the more than 1 trillion somatic cells in the body consists of a cell membrane, cytoplasm, and a nucleus.
(b) Each somatic cell nucleus contains 46 chromosomes—23 contributed by the mother and 23 by the father. The chromosomes consist of protein and DNA.
(c) Each set of chromosomes contains 50,000 to 100,000 genes carried in 3 billion nucleotide pairs of DNA.
(d) To form the chromosome, the DNA is coiled into higher and higher levels of organization.
(e) The DNA is coiled around specialized proteins that provide structure to the chromosome. These proteins also interact with the DNA.
(f) A specific sequence of nucleotide base pairs constitutes a gene.
nitrogenous base pairs

# DNA Fingerprinting (chapter 7)
(Profiling)

↳ short for deoxyribonucleic acid

- 2 kinds of dna

(1) nuclear dna
- found in the nucleus, 23 pairs inherited genes from each parent

(2) mitochondrial dna
- found in cytoplasm, only comes from mom, found in skeletal remains

- DNA fingerprinting determines identity or parentage
  - dna is extrated from small amounts of biological evidence
    ↳ skin, blood, saliva, urine, semen, hair

## 1. Structure & Function of DNA

- chromosomes - structures made of dna molecules
  ↳ 2 strands, each strand is coiled around protein molecules in a double-helix (twisted ladder)

A. 4 DNA base pairs
(1) adenine (A)
(2) cytosine (C)
(3) guanine (G)
(4) thymine (T)

A only bonds/pairs w/ T
C only bonds/pairs w/ G
} base pairs

If one strand is CGTCTA
then the 2nd strand is GCAGAT

| | |
|---|---|
| C | G |
| G | C |
| T | A |
| C | G |
| T | A |
| A | T |

B. 46 total chromosomes - in 23 pairs
- one set from each parent

C. Genes & Alleles

1. gene - specific dna sequences that have instructions for specific traits
   Ex) blood type, hair color
2. allele - 1 or 2 or more alternative forms of a gene

3. DNA chromosomes contain 3 billion base pairs
   (A) 2 kinds of chromosomes
   (1) encoded DNA (exons) — used to make proteins & other molecules, like RNA
   (2) unencoded DNA) (introns) — important for gene splicing
   (B) Human cell contains 23,688 exons
   (↓ 1.5% of total chromosome)
   (avg. 3000 base pairs)
   The rest are introns - no known function "junk DNA"

3. DNA Identifications

- 99.9% of DNA amongst dna is identical, some variation makes you - you!
  found in the introns
  ↳ individuals have unique patterns of repeating base pairs, called polymorphisms

A. DNA fingerprint (profile) - pattern of bands on x-ray film where different polymorphisms are in different locations

B. 2 types of repeating DNA sequences

2 purposes
(1) tissue matching
(2) inheritance matching

1. VNTR - variable #'s of tandem repeats
   Ex. person 1 has 3 copies of CATACAGAC - can be between 9-80 base pairs long
   person 2 have 7 copies of ↗

2. STR - short tandem repeats (2-5 pairs)
   Ex person can have GATA repeating 4 x's
   preferred method - more accurate, smaller sample size, can use degraded samples

## C. Population Genetics & DNA Databases

study of the variation of genes among a group of people

Ex) % of population that has type O blood
or
sickle-cell vulnerable

ancestry.com
23andme.com

CODIS - combined DNA index system (FBI)
↳ launched in 1998
↳ requires 4 RFLP markers or 13 STR markers

4. Sources of DNA
- saliva, blood, seminal fluid, skin, hair, bone, teeth, but most abundant in cheek (buccal) cells

- If only tiny amounts of DNA found at a crime scene, they make copies using

polymerase chain reaction (PCR) (1985)