Multiple Alleles

• An individual may carry only 2 alleles for a given gene
• In a population there may be any number of alleles for a gene
• ABO blood type gene is an example of a gene with multiple alleles: $I^A$, $I^B$ or $i$

Fig. 3.11

Chapter 3  *Human Heredity* by Michael Cummings ©2006 Brooks/Cole-Thomson Learning
Blood Transfusion

Recipient: *Genotype* predicts antibodies in the serum

Donor: *Genotype* predicts sugars on the Red Blood Cells

Concern in choosing Donor (ABO) *genotype*: Recipient’s serum should not coagulate the donor’s red blood cells
## Human Heredity

### Blood Type (Red Cells)

<table>
<thead>
<tr>
<th>RECIPIENT Blood Type</th>
<th>Serum</th>
<th>DONOR Blood Type (Red Cells)</th>
<th>A</th>
<th>B</th>
<th>AB</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>anti-B</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>B</td>
<td>anti-A</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>AB</td>
<td>NO</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>O</td>
<td>anti-A</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>anti-B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**: compatible  
- : incompatible

**AB: Universal Recipient  
O: Universal Donor**
Variations in Inheritance

- Codominance – both alleles fully expressed in the heterozygotes

- Incomplete dominance – have a distinctive phenotype in heterozygotes
• Codominance

• Both traits are visible in the F1 hybrid

• The alleles still obey Mendel’s laws
Incomplete dominance

- In incomplete dominance, heterozygote does not resemble either parent.
- Mendel chose traits that showed complete dominance
- The alleles obey Mendel’s laws.
Incomplete Dominance

Red

AA

Gametes

A

Pink

Aa

White

X

a

aa