CLONING
(use with PowerPoint Presentation)

Cloning is the process of forming ___________ offspring using the ___________ material of a donor cell.

Examples of organisms that have been cloned include: ________________ / ________________ / __________________
______________ / ________________ / ________________

CLONING A FROG

1. Remove ___________ from an ________________ ________ cell using a micropipette to form an ________________ egg (recipient).
2. Remove ________________ from a ________________ cell of a separate frog (donor) and insert it into the ________________ egg cell.
3. Egg cell with new ________________ divides by _____________ to form a ________________ (embryo).
4. The blastula grows into a ________________ frog with genetic material identical to the ________________ donor.

CLONING A WHITE MOUSE

1. Obtain ________________ cell from a ________________ mouse (donor).
2. Extract WHITE mouse _____________ to clone.
3. Obtain ________________ egg from ________________ mouse (recipient) and remove ________________ (enucleate it).
4. Insert WHITE ________________ into BROWN enucleated unfertilized ________.
5. After cells divide, implant ________________ into BROWN mouse uterus (____________________).
6. BROWN surrogate mouse gives birth to a cloned ________________ mouse that is ________________ identical to donor.
CLONING A SHEEP

It is very hard to create a clone from an __________ __________________ cell. Early embryonic cells are ________________, meaning any __________ can direct the development of an entire organism.

In adult cells, the nuclear material has __________ so that a nucleus will normally not develop into an entire organism because the cells are too _________________.

Scientists found away around this when they cloned __________, the sheep. By ________________ adult cells of nutrients, they began to act like the unspecialized cells of an _________________.

Thus, the ________________ of an adult somatic cell could be used for cloning.

THERAPEUTIC CLONING

1. Extract _______________ of healthy adult _______________ cell from patient.
2. Insert patient nucleus into enucleated human ____ cell.
3. Grow cells to ____________ state (_______ cells).
4. Separate stem cells and grow complete ___________ or ___________.
   ie. ___________ / ___________ / spinal-cord / __________-producing cells, etc.
5. Insert tissue or organ back into ______________ with no __________ problems.