Name: Ms. KC McCarthy
Subject: Biology, Mitosis

Date: June 25, 2013
Period: 2
Time: 45 minutes

Objective: TSW list the events that occur in each step of mitosis. (DOK 1, 4b)

Bell Ringer (5 minutes): How many molecules of ATP are produced *in total* by aerobic respiration?
a. 2 b. 36 c. 4 d. 72

a. is incorrect because 2 ATP are produced in glycolysis or in the Krebs cycle, not the overall process
b. is correct because 36 ATP includes the ATP produced by each of the three steps in aerobic cellular respiration
c. is incorrect because 4 ATP is the total produced by only the first two steps
d. is incorrect because 72 ATP is double the total amount of ATP produced in aerobic cellular respiration

Materials: PowerPoint, guided notes worksheet (x4),

Set (3 minutes) <8 minutes>: TTW show picture of lizard with it's tail cut off and ask class if they can explain what is going on in the picture. *The lizard's tail has been cut off but it is not dying.* TTW ask students what will happen to lizard and encourage students towards the correct answer if no one has heard of this phenomenon before. *The lizard will be able to regrow it's tail.* TTW ask students what allows lizard to regrow it's tail, and what is happening during the regrowth process. *The lizard is able to create more tail cells, and for this to happen, cell division must occur.* TTW ask if this happens in humans. *Cell division does happen in humans but not to the extent that it does for the lizard's tail – human's cannot regrow a limb but humans do increase in size and are able to repair damaged tissues (ie. cuts)*. TTW introduce today's topic as cell division in animal cells, Mitosis.

Procedure (35 minutes) <43 minutes>
A. TTW take attendance.
B. TTW project PowerPoint, pass out notes/worksheet while introducing the concept of the Cell Cycle and Mitosis. (1 minute)
C. TTW go through Interphase of the cell cycle briefly and the students will fill in graphic organizer. (2 minutes) <11 minutes>
- Interphase:
  - Cell is not dividing
  - DNA present as **chromatin**
  - DNA replicates
  - Cell grows
- Chromatin: uncoiled genetic information (DNA)
- TTW ask students why it makes sense to replicate DNA before beginning the process of cell division to make more cells (Mitosis). *So that when the cell splits, each new cell will have the proper amount of DNA.*

D. TTW give an overview of the 4 phases of Mitosis (to be discussed in more detail soon). (1 minute)
E. TTW provide students with necessary vocabulary before introducing the first stage of mitosis. TSW fill in vocabulary definitions on notes sheet. (2 minutes) <14 minutes>
- **Chromosomes:** bundles of coiled DNA
- **Centromere:** point where duplicated chromosomes attach
- **Chromatid** or **Sister Chromatid:** each strand of DNA inside of a duplicated chromosome

F. TTW project notes for prophase, TSW copy notes into organizer, TTW review quickly. (3 minutes) <17 minutes>
- NOTES:
  - Prophase: TSW copy notes into organizer, TSW read slide.
    - Genetic material condenses into visible *duplicated* **chromosomes** in nucleus
    - *Duplicated* chromosomes attached by **centromere**
    - Outside nucleus, spindle begins to form from **centrioles**
  - Vocab: **Centriole:** small structures outside the nucleus that the spindle forms from
- TTW ask students to recall vocabulary by indicating structures on labeled diagram.
- TTW explain that prophase is the very first step in Mitosis, so it involves a lot of initial preparation for cell division.

G. TTW project notes for metaphase, TSW copy notes into organizer, TTW review quickly. (3 minutes) <20 minutes>
- NOTES:
  - Metaphase: TSW copy notes into organizer, TSW read slide.
    - Chromosomes line up in the middle of the nucleus
    - This line of chromosomes is called the **Metaphase Plate**
    - spindle fibers connect to centromeres
- TTW call on student to identify Metaphase plate on diagram.

H. TTW project notes for anaphase, TSW copy notes into organizer, TTW review quickly. (3 minutes) <23 minutes>
- NOTES:
  - Anaphase: TSW copy notes into organizer, TSW read slide.
    - Begins when sister chromatids of duplicated chromosomes separate and move apart
    - Each sister chromatid is now considered an individual chromosome

- TTW emphasize change in chromosomal structure between metaphase and anaphase. *In metaphase, chromosomes were paired, now chromosomes are individuals.*

I. TTW project notes for telophase, TSW copy notes into organizer, TTW review quickly. (3 minutes) <26 minutes>

- NOTES:
  - Telophase: TSW copy notes into organizer, TSW read slide.
    - Chromosomes begin to form chromatin again
    - Nuclear membrane reforms around each daughter cell nucleus
    - Spindle breaks apart
- TTW ask student to explain why it makes sense to call new cells of Mitosis "daughter" cells. *Because one "parent" cell creates two new cells, "daughter" cells.*

J. TTW project notes for cytokinesis, TSW copy notes into organizer, TTW review quickly. (3 minutes) <29 minutes>

- NOTES:
  - Cytokinesis: TSW copy notes into organizer, TSW read slide.
    - Splits cytoplasm to form two separate daughter cells
- TTW ask student to explain how telophase is different from cytokinesis. *Telophase completes separation of nuclei of new daughter cells, and cytokinesis separates cytoplasm, allowing the cells to be separate.*

K. TSW review the day's objective with white board questions. (5 minutes) <34 minutes>

- TTW ask a student to read the white board procedure: 1. Do not write until the teacher says. 2. Only write the answer. When finished writing, put paddle face down and show paddle to teacher when she says "1,2,3…up!"
- Questions (TSW have ~20 seconds each to write an answer)
  - 1. What is the first phase of mitosis? *prophase*
  - 2. In which stage of mitosis do chromosomes line up in the center of the cell? *metaphase*
  - 3. In which stage of mitosis do sister chromatids become individual chromosomes? *anaphase*
  - 4. In which phase of mitosis does the nuclear membrane reform around two new daughter cells? *telophase*
  - 5. From what structure does the spindle form? *centriole*
  - 6. What is the name of the point at which two chromosomes are connected? *centromere*

K. TSW work on independent practice questions on back of guided notes for the remainder of the class. (9 minutes) <43 minutes>

Closure (2 minutes) < 45 minutes>:

During this period we were introduced to aerobic cellular respiration.

- "Mitosis is the process of…*class*?" *cell division*
- "Who can tell me one phase of mitosis?" "And what number phase is it…*name*"
- "Who can tell me another phase?" "And what number phase is it…*name*"
- "Who can tell me a third phase?" "And what number phase is it…*name*"
- "And the last phase?"

Keep these processes in mind for next period when Ms. Smith does a review activity with you about the phases of Mitosis.

Assessment:

Informal: TTW observe students answering questions on white board paddles (M) to determine whether or not students can distinguish the phases of mitosis (C).

Formal: TSW take a test on the Cell Unit during 4th period tomorrow (6/26) and TTW grade students' tests (M) to determine whether or not the students have mastered the parts of a cell, cell respiration, and cell division (C) and record the grades in the grade book (D).