Cross-Bridge Cycle

1. At rest, myosin is bound/not bound to actin.
2. _____ blocks myosin from binding actin.
3. _____ is measured in the blood after a suspected heart attack to assess cardiac muscle cell damage.
4. _____ binds to troponin when released from the SR.
5. _____ ultimately allows myosin to bind actin.
6. Calcium is allowed in the area around the actin and myosin very briefly. Then it is chaperoned back to the _____.
7. Once calcium returns to the SR, what happens to the cross-bridge cycle (and why)?
8. Which molecule is ejected when myosin binds actin?
9. What kind of movement occurs between myosin and actin as ADP is ejected?
10. What position would myosin remain in if there was no ATP available?
11. What happens to myosin when ATP binds to it?
12. What event "recocks" myosin's head for the next cross-bridge cycle?
13. What are two real-world examples that would cause there to be a lack of ATP?
14. To summarize:
    _____ allows myosin to bind actin.
    _____ causes myosin to perform the powerstroke.
    _____ causes myosin to fall off actin.
    _____causes myosin to "recock" for the next cross-bridge cycle.
15. Describe the relative characteristics of a very fit person vs. a very unfit person:
    - size of sarcoplasmic reticulum
    - number of myosin and actin filaments
    - number of mitochondria
    - amount of enzymes involved in glycolysis

Answers:

Cross-Bridge Cycle

1. At rest, myosin is bound/not bound to actin.
   NOT BOUND
2. **TROPONIN/TROPOMYOSIN** blocks myosin from binding actin.
3. **TROPONIN** is measured in the blood after a suspected heart attack to assess cardiac muscle cell damage.
4. **CALCIUM** binds to troponin when released from the SR.
5. **CALCIUM** ultimately allows myosin to bind actin.
6. Calcium is allowed in the area around the actin and myosin very briefly. Then it is chaperoned back to the **SARCOPLASMIC RETICULUM**.
7. Once calcium returns to the SR, what happens to the cross-bridge cycle (and why)?
   TROPONIN ONCE AGAIN BLOCKS MYOSIN FROM BINDING ACTIN. STOPS CROSS-BRIDGE CYCLE.
8. Which molecule is ejected when myosin binds actin?
   ADP
9. What kind of movement occurs between myosin and actin as ADP is ejected?
   POWERSTROKE, MYOSIN MOVES ACTIN FIBERS (PROTEINS).
10. What position would myosin remain in if there was no ATP available?
    BOUND (ASSUMING THERE HAD BEEN CALCIUM AVAILABLE ORIGINALLY)
11. What happens to myosin when ATP binds to it?
    MYOSIN FALLS OFF ACTIN WHEN ATP BINDS IT.
12. What event "recocks" myosin's head for the next cross-bridge cycle?
    HYDROLYSIS OF ATP TO ADP.
13. What are two real-world examples that would cause there to be a lack of ATP?
    EXTREME EXHAUSTION AND RIGOR MORTIS
14. To summarize:
    CALCIUM allows myosin to bind actin.
    EJECTION OF ADP causes myosin to perform the powerstroke.
    ATP causes myosin to fall off actin.
    HYDROLYSIS OF ATP TO ADP causes myosin to "recock" for the next cross-bridge cycle.
15. Describe the relative characteristics of a very fit person vs. a very unfit person:
    - size of sarcoplasmic reticulum:
      LARGER IN FIT PERSON (STORES MORE CALCIUM)
    - number of myosin and actin filaments:
      MORE IN FIT PERSON; FIT PEOPLE <u>TRANSCRIBE</u> MORE MYOSIN AND ACTIN MRNA AND THEN <u>TRANSLATE</u> IT INTO MORE OF THESE PROTEINS.
    - number of mitochondria:
      MORE IN FIT PERSON; ESPECIALLY IN ENDURANCE SPORTS THAT RELY ON OXIDATIVE PHOSPHORYLATION.
    - amount of enzymes involved in glycolysis:
      FIT PERSON HAS MANY MORE OF THESE ENZYMES STORED UP. THEY <u>TRANSCRIBE</u> MORE ENZYME MRNA AND <u>TRANSLATION</u> IT INTO MORE OF THESE ENZYMES.