Template MC Question

Title	**The spindle assembly checkpoint (SAC)**
Introduction/ Description	**Checkpoints ensure the dependency of cell-cycle transitions on the completion of earlier events.** **The surveillance mechanism of a checkpoint consists of 3 components: sensors, signaling cascade and effectors.** **The SAC inhibits anaphase onset until bipolar chromosome attachment has been reached.**
Question	**How can the spindle assembly checkpoint influence the cell cycle progression?**

Choice sheet - As the material will serve as a study aid, please put the correct answer randomly as one of the 4 choices.

Choice 1	**Mad2 binds to the APC^{Cdc20} complex. This disrupts the effector cascade which ends in the opening of the protein complex Cohesin. Since the chromatids cannot be separated, the transition to anaphase is blocked.**
Choice 2	**Binding of Mad2 to the Cdc20 protein of the APC^{Cdc20} complex results in a conformational change of Cdc20. This leads to the dissociation of Cdc20/Mad2 from APC. Thus, APC cannot degrade Securin which is prerequisite for chromatid cohesion disruption, blocking the onset of anaphase.**
Choice 3	**Securin cannot find Separase. Therefore Separase is folded and inactivated. As Separase is inactivated, the separation of the chromatids is inhibited. Without the separation of the chromatids the cell cycle cannot progress.**
Choice 4	**When Securin is not degraded, Separase remains inactive. Separase is needed for the proteolysis of the connections between the 5 beta sheets of the Cohesin beta barrel. Therefore, the cell cycle is arrested.**

Feedback sheet – Please **label** the feedback to the choices as “CORRECT” or “INCORRECT”. Provide detailed feedback to explain why the choice was correct or incorrect.

Feedback Choice 1	**Correct answer. Mechanism described in script. Some steps were intentionally left out like the degradation of Securin by APC^{Cdc20} complex and the separation of the chromatids by Separase.**
Feedback Choice 2	**It is true that Securin has to be degraded in order to separate the chromatids. Binding of Mad2 to Cdc20 however does not lead to a conformational change, therefore Mad2/Cdc20 remains bound to APC. The Mad2 bound to the APC^{Cdc20} complex inhibits the APC^{Cdc20} complex activity (ubiquitination of Securin).**
Feedback Choice 3	**It is wrong, since Separase is only folded, when Securin finds Separase. Moreover, Separase is inactivated upon Securin binding. It is true that the inactivated Separase inhibits chromatid separation. This leads to a cell cycle arrest.**
Feedback Choice 4	**Cohesin is not a beta barrel, it is a ring consisting of Smc1, Smc3 and Scc1. Separase performs the proteolysis at the Scc1 protein. The rest of the statement is correct.**