**Course 2: “Paper Sizing & Resistance to Fluids,” Final Quiz**

**Complete the following form and take the quiz to receive a certificate of course completion. Please enter your information in the way you would like it to appear on your certificate. Send your completed form (in WORD or PDF format) as an email attachment to hubbe@ncsu.edu.**

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**Having taken this course will help me to…**

**This course could be improved by…**

**My idea for a future course in this series would be…**

FINAL QUIZ FOR COURSE 2 (ten questions)

1 – What kind of “bonding”, involving a water molecule and the surface of a cellulose fiber, helps to explain why untreated cellulosic fibers are easily wetted by water?

1. Covalent bonding
2. Polar bonding
3. Hydrogen bonding
4. Hydrolysis

2 – What reaction makes rosin more storage-stable and improves its ability to interact with alum?

1. Epichlorohydrin and levopimeric acid (stabilization)
2. Detergent and rosin acid (saponification)
3. Fumeric acid and abietic acid (fortification)
4. Micro-cellulose and resin acids (mycellization)

3 – What prevents typical formulated rosin emulsion particles from coming together and agglomerating with each other?

1. Negative charges (charge-charge repulsion) due to some saponification of the rosin
2. A layer of water-loving cationic polymer such as cationic starch or a synthetic cationic polymer
3. Hydrogen bonding of the adjacent water molecules with the surface of rosin particles
4. The “Teflon effect” due to the low surface energy of the rosin material

4 – What critical step in rosin emulsion sizing happens in the dryer section of the paper machine?

1. Bonding is formed between rosin and aluminum species at the surface of the paper.
2. Aluminum compounds present in the process water become deposited on fiber surfaces.
3. Aluminum abietate present in the process water become deposited on fiber surfaces.
4. Aluminum ions interact with the carboxylate groups of the rosin (which is often fortified).

5 - Alkenyl succinic anhydride (ASA) can undergo two reactions, one favorable and one unfavorable. What type of chemical structure is formed during the favorable reaction of ASA with a fiber surface?

1. An anhydride bond
2. A hydrogen bond
3. An ester bond
4. A hydrolysate bond

6 - Why do typical ASA emulsion droplets ordinarily cling with high efficiency to surfaces of cellulose (fines and fibers) in the wet end of a paper machine?

1. The hydrophobic nature of ASA oil makes it want to come out of the solution phase onto a surface.
2. Covalent bonding develops between the ASA and fiber surfaces in the wet end of the machine.
3. Alum in the wet end of most paper machines will “set” the size, even under alkaline conditions.
4. They are stabilized by cationic polymer, so there is a charge attraction to negative fiber surfaces.

7 – Why is it often recommended to acidify and cool starch solution that is about to be used for emulsification of ASA sizing agent?

1. Those measures will decrease the amount of hydrolysis of the ASA during the preparation and transportation of the emulsion.
2. Those measures will increase the efficiency of retention of the ASA in the paper during its formation.
3. Those measures will decrease the particle size of the ASA emulsion droplets due to higher fluid viscosity and increased positive charge at the lower pH.
4. Those measures will convert much of the ASA to its more effective “hydrolysate” form.

8 – What is the potential advantage of injecting AKD at the stuff-box or “drop-leg before the stock valve” before the fan pump?

1. The most important benefit of such a practice is the good mixing of the stock in the fan pump.
2. Because AKD is slower to react, it is important to add it earlier to the wet end system.
3. By adding AKD to the thick stock, a larger amount can be accommodated onto the surface of solid materials.
4. Such a practice favors attachment to surface of fibers, which are retained at high efficiency during paper formation.

9 – Why are there typically a lot fewer web breaks when starch solution is being applied by a “film press” rather than the more traditional “pond” type of size press?

1. The film press holds the paper together tighter, keeping it from breaking.
2. The starch film solidifies on the applicator rolls before transfer to the paper.
3. The paper is exposed to less of the hot starch solution for a shorter period of time.
4. In a film press the starch is not forced into the core of the paper, whereas a pond-type size press pushes the starch into the paper directly.

10 – Two features need to be present in order to achieve super-hydrophobic character of a surface. Which of the following is a correct listing of these two features?

1. Very low surface area at the nano-scale and a low-energy surface treatment
2. Very low surface area at the nano-scale and a high-energy surface treatment
3. Very high surface area at the nano-scale and a high-energy surface treatment
4. Very high surface area at the nano-scale and a low-energy surface treatment