**Course 1, “Paper Manufacturing Chemistry,” 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.**

**Your full name (print carefully or type):**

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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 1 (ten questions)

1 - What is the device for which the incoming flows are called “thick stock” and “white water” and the outgoing flow is called “thin stock”?

1. Headbox
2. Stuff box
3. Cleaner (hydrocyclone)
4. Fan pump

2 - Which of the following ranges of pH corresponds to typical “acidic papermaking”?

1. 2.5 to 3.8
2. 4 to 5.5
3. 5.5 to 7
4. 7.5 to 9

3 - Which of the following substances is commonly added to paper furnish for purposes of increasing the paper’s strength?

1. Calcium carbonate
2. Cationic retention aid
3. Colloidal silica
4. Cationic starch

4 - Which of the following operations results in internal delamination of the cell walls of fibers, increased swelling of the fiber material, external fibrillation of the fibers, and creation of cellulosic fines?

1. Paper forming
2. Kraft pulping
3. Wet-pressing
4. Refining

5 - Please list at least three types of sizing agent that can be added to papermaking furnish so that the resulting paper will resist water or other fluids.

1. Rosin emulsion, polyamine, and alkylketene dimer
2. Rosin soap, alkylketene dimer, and alkenylsuccinic anhydride
3. Alkenylsuccinic anhydride, alkylketene dimer, and resin
4. Alum, poly-aluminum chloride, and polyamines

6 - What are two of the most important characteristics of a chemical compound that needs to function as a sizing agent to make the resulting paper resist water?

1. A water-hating portion and a mechanism of anchoring to the fiber surface
2. A water-hating portion and a molecular mass of at least 5 million grams per mole
3. A water-hating portion and a water-loving portion
4. A reactive group and an inert group

7 - When running a test to determine the cationic demand of process water in a paper mill system, what kind of solution will be used as the titrant?

1. Papermaker’s alum, i.e. a solution of aluminum sulfate
2. Sodium hydroxide (or HCl, depending on the initial signal)
3. Carboxymethylcellulose (CMC) or other negatively charged polymer
4. A high-charge cationic polymer such as poly-DADMAC

8 - What happens if calcium carbonate filler encounters acidic pH conditions in a paper machine system?

1. Nothing happens.
2. Ca(OH)2 (milk of lime) is formed.
3. CO2 bubbles are released.
4. The system charge becomes more negative.

9 - Which of the following is the correct equation for the first-pass retention (where “C” means consistency or filterable solids)?

1. FPR (%) = 100% \* (Ctray – CHB)/Ctray
2. FPR (%) = 100% \* Ctray / (CHB – Ctray)
3. FPR (%) = 100% \* CHB / (Ctray – CHB)
4. FPR (%) = 100% \* (CHB – Ctray)/CHB

10 - What type of deposit problem in paper machine systems results mainly due to interactions between positively and negatively charged ionic inorganic compounds initially present in the process water?

1. Scale
2. Pitch
3. Slime
4. Stickies