**Course 10, “Mineral Fillers for Paper,” 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):**

**Your affiliation (school, company, etc.):**

**Your email address:**

**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 10 (ten questions)

1 – Which of the following situations typically leads to increased density of a paper sheet?

1. Filler particles creating debonded areas between fibers
2. Decreased content of a fillers, due to their low inherent density
3. Increased refining of kraft fibers
4. A change from a platy filler to a rosette shape at the same level

2 – What type of mineral filler is known to dissolve in the presence of acidity?

1. Kaolin clay
2. Calcium carbonate
3. Titanium dioxide
4. None of the commonly used fillers

3 – What type of filler particle is often specified to have a rosette-type shape?

1. Chalk (coccolith type)
2. Hydrous kaolinite (but the shape is transformed in calcined clay)
3. Titanium dioxide (both rutile and anatase crystal types)
4. Precipitated calcium carbonate (scalenohedral)

4 – Why does ground limestone (the most common form of GCC) typically have a highly negative surface charge when it is delivered to paper mills?

1. That is the inherent charge of the pure mineral (calcite).
2. Dispersants are added during the grinding process.
3. Protons dissociate from the silanol groups at the particle surfaces.
4. Agitation during rail or truck transport affects the particle surfaces.

5 – What do the equations of Kubelka and Munk involve?

1. Angular dependence of scattered light
2. Predicting the refractive index of minerals
3. Light scattering and light absorption
4. Estimation of paper gloss based on smoothness

6 – What type of pump can meter the flow, with only a small dependency on the back-pressure?

1. Kinetic pump
2. Fan pump
3. Cavitation pump
4. Positive displacement pump

7 – What kind of chemical additive works by a bridging mechanism, making it very effective, working independently, in developing strong attachments between particles and fibers in a suspension of cellulosic fibers and mineral fillers?

1. Very high charge cationic polyamine such as polyDADMAC
2. Very high mass cationic acrylamide copolymer
3. Colloidal silica or sodium montmorillonite (bentonite)
4. Sodium hexametaphosphate

8 – Which of the following practices can be expected to give a discrete distribution of mineral particles within paper?

1. Adding the mineral to a fiber suspension that has been polymer-treated to impart the opposite sign of charge
2. Failure to adequately disperse the mineral product, such as by use of an eductor system
3. Treatment of the mineral slurry with a small amount of cationic starch before its addition to the process
4. Addition of very-high-mass cationic acrylamide copolymer (retention aid) to the white water silo

9 – What is the expected result if the filler product is agglomerated together (by use of a cationic polymer such as cationic starch) before its addition to the papermaking furnish?

1. Higher scattering of light compared to the default process
2. Higher paper strength compared to the default process
3. Lower first-pass retention compared to the default process
4. Lower apparent density of the paper compared to the default process

10 – What is composed of pigments, binders, and additives?

1. A conventional size press formulation
2. Pre-agglomerated filler
3. Conventional wet-end addition of filler
4. A coating formulation