Multiple Choice Questions – Lecture 2

Only one answer per question is correct!!

1. What is the final step in the melting down of a soda lime silicate glass batch?
    a. Dissociation of the carbonates in the batch
    b. Solid state reactions between the powder particles
    c. Dissolution of residual sand grains in the primary melt phases
    d. Rising of water vapor containing bubbles to the melt surface

2. What is the **refining** process of a glass melt?
    a. The removal of bubbles from the melt by promoting the growth of bubbles with fining agents
    b. Mixing of the melt by fine stirrers
    c. Removal of dissolved gases from the melt, just after the batch melting process
    d. Re-absorption of the gases present in small, remaining bubbles by the glass melt during cooling

3. Which process will take place at the highest temperature?
    a. Primary fining
    b. Refining
    c. Primary and secondary fining will take place at the same temperature

4. Immediately after an efficient primary fining process the concentration of dissolved gases in the melt will be:
    a. Larger than just before the primary fining
    b. Lower than just before the primary fining
    c. Similar to the concentration of these gases in a saturated melt

5. Which statement is most probable:
    a. After primary fining only few, very large bubbles will remain in the melt
    b. After primary fining only small bubbles will remain in the melt
    c. After primary fining the remaining bubbles in the melt have a broad size distribution
    d. After primary fining the melt does not contain bubbles any more

6. The main role of a fining agent is to bring about:
    a. A chemically homogeneous glass melt
    b. A melt without un-dissolved sand particles
    c. A melt without bubbles and having the lowest possible concentration of dissolved gases
    d. A clear glass melt

7. How do sand grains ‘melt’ in the glass melting process:
    a. By heating the sand above the SiO_2 melting temperature
    b. Spontaneous, instantaneous dissolution of sand grains in the molten glass
    c. By a diffusion process of SiO_2, this SiO_2 dissolving and diffusing from the surface of the sand grain into the surrounding glass melt
    d. By stirring of the melt, which will promote the grinding or powdering of the sand in the melt

8. Sodium sulfate is a **melting flux,** because:
    a. Addition of sodium sulfate will reduce the endothermic reaction enthalpy of the batch during melting-in
    b. Sodium sulfate in the raw material batch will enhance the transmission of radiative heat through the batch blanket
    c. Sodium sulfate in the primary melting phases will reduce the surface tension of these phases
    d. Sodium sulfate oxidizes the organic or reducing components before the batch starts to melt

9. Consider a sulfate-fined glass melt (using sodium sulfate as fining agent). The glass is melted under oxidizing conditions, using a large quantity of cullet. The cullet used is usually clean, but the last delivery contained a significant amount of organic contamination, and this cullet is introduced in the furnace. What will be observed in the fining process:
    a. No significant change is observed in the fining process
    b. The fining onset will be shifted to higher temperatures, which may lead to incomplete fining
    c. The fining onset temperature will be lowered, leading to inefficient fining as the fining gases are released too early / at too low temperatures

10. Mention three common fining agents used in the glass industry:
    a. Na_2SO_4, TiO_2, NaCl
    b. SnO_2, As_2O_3, Li_2O
    c. As_2O_3, Sb_2O_3, Na_2SO_4
    d. B_2O_3, Na_2SO_4, SiO_2

11. A given glass is melted and fined at 1500°C. Suddenly, the temperature of the melt is increased. What is the expected effect on the bubble ascension velocity:
    a. The bubbles will rise faster to the surface of the melt
    b. The bubbles will rise slower to the surface of the melt
    c. The bubble ascension velocity will remain the same