Quiz 2 - Gasification

1. What is the effect of having a **steam-to-biomass (S/B) ratio greater than 1.0** in the Battelle Columbus fluidized-bed gasifier?

(A) Increases hydrogen production and improves carbon conversion

(B) Leads to energy loss, dilution of syngas, and lower heating value of the product gas

(C) Results in optimal H_2/CO ratio and stable bed temperature

(D) Causes insufficient steam, leading to poor carbon conversion and tar formation

(E) Has no significant effect on gasifier performance

2. What happens to the **char** produced during the pyrolysis stage in the BCL Twin Bed Gasifier?

(A) It is immediately converted into syngas through catalytic cracking.

(B) It is mixed with cold sand and sent to the reduction zone.

(C) It is combusted with air to generate heat for the gasification process.

(D) It is removed as solid waste along with ash.

(E) It is recycled back into the drying stage to aid moisture removal.

3. Considering the simulation available on Moodle, if the biomass flow rate in the feed is changed to **300,000 kg/h**, what are the new **steam** and **air** mass flow rates? Assume a steam-to-biomass ratio of **0.75**.

(A) Steam: 88333 kg/h ; Air: 308988 kg/h

(B) Steam: 95833 kg/h ; Air: 308988 kg/h

(C) Steam: 88333 kg/h ; Air: 235297 kg/h

(D) Steam: 95833 kg/h ; Air: 237020 kg/h

(E) Steam: 62500 kg/h ; Air: 265388 kg/h

4. Considering the simulation available on Moodle, if the steam-to-biomass ratio is set to 0.7, what is the H_2/CO molar ratio obtained in the RAWSYNG stream?

(A) 2.76

(B) 3.08

(C) 2.26

(D) 3.21

5. If the temperature on the PYROL reactor is changed to 840C, what is the new syngas molar composition in the RAWSYNG stream?

(A) CO: 0.1471 ; CO2: 0.1129 ; H2: 0.3475 ; H2O: 0.3752

(B) CO: 0.2449 ; CO2: 0.2953 ; H2: 0.0416 ; H2O: 0.4016

(C) CO: 0.2200 ; CO2: 0.3141 ; H2: 0.0377 ; H2O: 0.3963

(D) CO: 0.1362 ; CO2: 0.1238 ; H2: 0.3242 ; H2O: 0.3815

(E) CO: 0.1439 ; CO2: 0.1248 ; H2: 0.3262 ; H2O: 0.3665