

AE 469/569 - Exam 1

Part 1 Closed Book

Name _____

Multiple Choice: 2 pts each

1. When a load of corn is taken to an elevator a calculation of the number of bushels on the load is made. In this instance, a bushel is defined as
 - a) 56 lbs of corn.
 - b) a quantity of corn which will weigh 56 lbs at 15.5% MC.
 - c) the test weight (lbs/bu) as determined from a sample.
 - d) 1.25 cubic feet of corn.
2. The contribution of bacteria to grain deterioration is
 - a) never of importance.
 - b) not really understood.
 - c) always the most important of any agent.
 - d) seldom of importance.
3. Broken corn and foreign material will cause a decrease in Allowable Storage Time because
 - a) they have lower test weights than whole grain.
 - b) breaks in the seed coat allow invasion of fungi.
 - c) airflow is reduced, reducing the drying rate.
 - d) they have a lower equilibrium relative humidity at the same moisture.
 - e) all of the above
4. Mycotoxins are produced in stored grain
 - a) when the grain has been contaminated with aflatoxin during harvest.
 - b) when common grain fungi strains are exposed to certain air conditions.
 - c) when conditions favor growth of certain rare strains of fungi.
 - d) whenever storage conditions favor growth of fungi.
5. The lower limit of corn moisture content for mold growth is:
 - a) 13%
 - b) 14%
 - c) 15%
 - d) whatever moisture content is in equilibrium with 65% relative humidity.
 - e) whatever moisture content is in equilibrium with 80% relative humidity.
6. Stress cracking of corn occurs mainly during the

- a) cooling period.
 - b) shelling period.
 - c) transition from heating to cooling.
 - d) first few seconds of drying.
 - e) heating period.
7. The most common type of continuous-flow column dryer is
- a) a counterflow dryer.
 - b) a concurrent flow dryer.
 - c) a crossflow dryer.
 - d) any of the above.
 - e) none of the above.
8. Of the continuous-flow dryer types, this one has the highest fuel efficiency:
- a) concurrent flow
 - b) crossflow
 - c) counterflow
 - d) they all have about the same fuel efficiency.
9. An in-storage natural air dryer is operating with 10 ft of grain in the bin; increasing grain depth to 15 ft will
- a) decrease drying rate.
 - b) increase drying rate.
 - c) have no effect on drying rate.
10. Addition of heat to a drying bin will
- a) not affect the Allowable Storage Time of the grain.
 - b) cannot tell from information given.
 - c) lengthen the Allowable Storage Time of the grain.
 - d) shorten the Allowable Storage Time of the grain.
11. Heating the air will _____ equilibrium moisture content of grain being aerated.
- a) have no effect on
 - b) increase
 - c) decrease
 - d) cannot tell from the information given.
12. Relative humidity of interspace air within a grain mass not being aerated depends on:
- a) grain temperature
 - b) grain moisture content
 - c) outside air temperature
 - d) outside air relative humidity
 - e) a & b
 - f) c & d

13. Increasing bin diameter for a constant depth of grain and the same fan will have what effect on total CFM delivered by that fan?
- a) increase
 - b) decrease
 - c) no effect
 - d) cannot determine from this information.
14. Increasing grain depth will have what effect on the fan performance curve?
- a) decrease
 - b) no effect
 - c) increase
 - d) cannot tell from given information
15. A fan develops maximum airflow at
- a) cutoff point
 - b) free delivery operating point
 - c) midway between cutoff point and free delivery

- (10) 16. Hexane is continually recycled in a hexane oil extraction process. Explain everything that happens to the hexane from the time it leaves the hexane storage tank to the time when it is placed back in the storage tank.

- (10) 17. Explain how the germ is removed and isolated during a corn wet milling process, and then contrast this with the way the germ is removed and isolated during a dry milling process.

Part 2
Open book and notes
Show your work

Name _____

- (25) 16. A bin contains 300,000 lb of corn at 17% moisture. The bin is fitted with a fan which delivers 20,000 cfm to the corn. Outside air is 75°F, and 20% RH. The fan motor and a heater heat the air 10°F.
- (a) To what moisture content can the corn be dried?
 - (b) How many lb of water must be removed to do this?
 - (c) How long will it take to complete drying?
 - (d) What temperature is the undried corn stored at?
 - (e) How long can drying take in order to avoid spoiled corn?
 - (f) How many days of storage time were lost due to the 10°F temperature rise?
 - (g) How many dry bushels of corn are in the bin?

- (25) 17. A 30-ft diameter bin is equipped with a Rolfes 28-inch diameter, 10-hp axial fan. The bin contains dry corn, placed with a spreader. A static pressure gage on the plenum reads 3 in H₂O. What is the cfm/bu aeration rate of the corn?