6 pts. 1. (Two answers needed.)

   a) Delay planting of inbred B by 45 GDD to coordinate pollen release and silk receptivity.

   b) Plant inbred A and B at the same time but flame inbred B early in the season (e.g. at about 2 or three leaf stage to slow its growth relative to inbred A (synchronize silking and pollen release).

   c) Plant inbred A and B at the same time but mow inbred B early in the season (e.g. at about 2 or three leaf stage to slow its growth relative to inbred A (synchronize silking and pollen release).

   d) Plant inbred A and B at the same but use a polymer seed coating on inbred B to delay its germination.

6 pts. 2. (Two answers)

   a) Harvest early (at high moisture) allows field damage to be avoided (e.g. frost, ear drop, insect damage, mold).

   b) Harvest on the ear allows the sorting and removal of off type ears at the seed plant.

      Ear harvest allows for more uniform air movement (lower possibility of seed damage) during artificial drying at the seed plant.

      Harvest on the ear lessens damage potential (high moisture corn is otherwise especially prone to mechanical damage).

5 pts. 3. (Two answers)

   a) Soil fertility levels (particularly P and K) will vary greatly among mangers.

   b) N rate.

   c) Timing of N application (Fall, Pre-Plant, Side dress).

   d) Plant populations may be unique.

   e) Planting date has a major impact on overall yield as well as on other factors such as population. On site testing of hybrids will bring out optimal combinations for unique management packages.

   f) Use of N-Serve

   g) Tillage and planting system (e.g. no-till, residue management, etc).
4 pts. 4. (110 days) 23.5 GDD per day relative maturity) = 2585 GDD relative maturity.

10pts. 5. (Five answers)

a) Grain yield and profit potential increase as total season length increases to provide greater total interception of solar radiation.

b) Increased harvest index due to affect of low temperature early (vegetative growth) and high temperatures mid- to late season (grain development). Increases harvest index contributes directly to increased yield.

c) Plant height is reduced due to the low temperature affect on early growth. This results in less potential for lodging and improved tolerance to higher plant populations which could be used to enhance yield potential.

d) Pre-harvest losses are reduced as early-planted corn matures quickly and dries down early in the fall while temperatures are high and relative humidity is low.

e) Early-planted corn will likely require less expense for artificial drying as it matures more quickly and therefore dries down earlier in the fall while temperatures are high and relative humidity is low.

f) Early planting results in a broad choice among alternative hybrids.

g) Early planting allows replanting with the first-choice hybrids.

h) Early planting generally results in an avoidance of high temperature and drought stress during pollination.

i) Early planting also allows earlier planting of soybeans for higher yield potential.

4 pts. 6. A practical temperature and depth goal is greater than or equal to 50 degrees Fahrenheit depth at 7 a.m. at 2 inch depth. Seed depth and therefore the depth of temperature measurement may be as shallow as 1 inch when planting early.

2 pts. 7. PSNT may be quite valuable where there is relatively high uncertainty as to the level of plant available N present in the soil just prior to side dressing. Examples of such situations include;
N applied in the Fall of the Spring followed by unusually warm, wet conditions over a prolonged period. Under these conditions there is a high potential for N loss through denitrification and leaching.

On soils with high organic matter levels or on soils which have received heavy applications of livestock waste. Under these conditions significant amounts of N are mineralized from the organic sources but the amount of N made available can be quite variable. PSNT will allow a snapshot in time to determine side dress needs with greater precision.

10 pts.  8. All of these strategies improve the efficiency of N fertilizer use by the crop. Without these precautions, the potential for N loss through leaching and/or denitrification is particularly high for Fall applications because of the extended time that the fertilizer nitrogen would be exposed to loss when fall applied.

a) Application of N as ammonia only, allows for maximum security from loss as ammonia reacts with soil moisture to produce ammonium (NH₄⁺), a cation which is held by a soil’s exchange sites.

b) At temperatures below 50 F the conversion of ammonium (NH₄⁺) to Nitrite (NO₂⁻) (and ultimately to Nitrate (NO₃⁻ )) is slowed sufficiently to lessen the potential for N loss to acceptable levels.

c) At more northern latitudes soil temperatures generally reach the 50 C threshold earlier in the Fall and remain low longer in the Spring, thus slowing nitrification.

d) Fall N application is not recommended unless a soil has a C.E.C. of at least 10 meq/100 grams as a means of assuring adequate negative charge to retain ammonium which is a cation (positive charge).

e) Well drained soils demonstrate less potential for loss to denitrification as atmospheric oxygen is more readily available in pore spaces of these soils which are not waterlogged for extended periods.

10pts.  9. (Two answers)  a) Cost effective, efficient, least potential for environmental contamination. Side-dressing results in very low levels of loss and maximum N availability to the developing crop.

b) Allows N rate adjustment as conditions dictate in the spring.

c) Allows switch to soybeans where losses are extreme.

d) Best option for soils with low CEC (less potential loss).
7pts. 10.a) 110+[(1.36)(225-100)] = 280 Lbs N/acre
- 30 Previous crop credit (soybeans)
250 Lbs fertilizer N/ Acre

2pts. b) 250 Lbs fertilizer N per acre – 20 Lbs N per acre as UAN solution = 230
Lbs N as side dress

230 Lbs. N per acre / .82 = 280.5 Lbs. NH3 per acre

11. Critical Level = 15 ppm
   Maintenance Plateau = 15 through 30 ppm
   Soil Test Level = 37 ppm
   Drawdown Range = 31 ppm through 40 ppm

   Maintenance Rate:

6 pts. (225 Bu / Acre) (0.37 Lbs P₂O₅ / Bu) = 83.25 Lbs P₂O₅ / Acre

7 pts. Drawdown Rate:

   Maintenance Rate Lbs./Acre -

   [(Maintenance Rate P₂O₅ ) X (Soil Test Level ppm - (Critical Level ppm + 15))] =

   Lbs. P₂O₅ / Acre.

   83.25 Lbs P₂O₅ / Acre -

   [ (83.25 Lbs P₂O₅ / Acre) X (37 ppm - 30 ppm )] = 25 Lbs. P₂O₅ / Acre

   10

2 pts 25 Lbs. P₂O₅ / Acre = 54.4 Lbs. 0 – 46 – 0 / Acre


12. Critical Level = \(75 + (2.5 \times 14)\) = 110
   Maintenance Plateau = 110 through 140 ppm
   
   Soil Test Level = 155 ppm
   Drawdown Range = 141 ppm through 160 ppm

6 pts. Maintenance Rate:

\[[(225 \text{ Bu} / \text{ Acre}) \times (0.27 \text{ Lbs. K}_2\text{O} / \text{ Bu})] + 20 = 80.75 \text{ Lbs. K}_2\text{O} / \text{ Acre}\]

7 pts. Drawdown Rate:

\[
\text{Maintenance Rate Lbs./Acre - } \frac{[(\text{Maintenance Rate K}_2\text{O} / \text{ Acre}) \times (\text{Soil Test Level ppm} - (\text{Critical Level ppm} + 30))]}{20} \text{ Lbs. K}_2\text{O} / \text{ Acre}
\]

\[80.75 \text{ Lbs. K}_2\text{O} / \text{ Acre} - \frac{[(80.75 \text{ Lbs. K}_2\text{O} / \text{ Acre}) \times (155 \text{ ppm} - 140)]}{20} = 20.2 \text{ Lbs. K}_2\text{O} / \text{ Acre}\]

2 pts \(\frac{20.2 \text{ Lbs. K}_2\text{O} / \text{ Acre}}{0.60} = 33.7 \text{ lbs. 0 – 0 – 60 / Acre}\)

4 pts. 13. a) Any root restrictive conditions e.g.
   Early planting date (cool soils)
   No-till soils with heavy surface residue
   Poor soil drainage
   Dry soils
   
   b) Low to very low soil test levels
   
   c) Low rates of fertilizer application (especially where soil test levels are relatively low).
5 pts. BONUS

a) Production / Agronomic traits include;

Yield
Drought tolerance (including morphology such as leaf upright leaf angle)
Harvest index
Lodging resistance
Population tolerance
Insect resistance (including GMO transformation)
Disease resistance
Herbicide resistance (including GMO transformation)
Etc.

b) End Use or Quality traits include;

Protein or oil quantity and quality (e.g. high lysine or high oleic)
Starch composition (e.g. highly fermentable for ethanol production or amylose amylopectin composition for food and other uses).
Composition for feed use with minimal environmental impact (e.g. phytate content which can influence P content of land applications of livestock waste).