Simple introductory questions for High Voltage Engineering

Try to explain briefly each of the following questions from basic electrical physics ☺

1. What is an insulator?
2. What is a conductor?
3. A metallic sphere contains a charge Q. What is the electric field inside it – explain.
4. What does uniform field mean?
5. A uniform field extends between two equipotential surfaces with a distance 10 cm. The electric potential between theses surfaces is 100 V. What is the electric field strength in the middle?
6. How is electric potential defined?
7. What does Gauss' law give a relation between? What can we use it for?
8. Two metallic spheres are located in the vicinity of each other but far from other objects. One of them possesses a charge Q. Draw the electric field lines between spheres.
9. What does permittivity mean?
10. Explain the concept of relative permittivity. What is causing this?
11. What is a capacitor and how is the concept capacitance defined? What does it mean?
12. What is an electric spark? What is causing it?
13. Calculate the losses in a 10 nF capacitor energized with 100 V 50 Hz AC
14. Does electric current have any influence with regard to electrical insulation?
15. What is a transformer? How does it work? Draw its equivalent scheme.
16. A three-phase system consists of three parallel plates each energized with one of the phase voltages. The voltage is 420 kV and 1 m is between plates. Calculate the maximum electric field strength E_{max}
17. We have two metallic rods with a hemispherical capping. One is 1 cm in diameter; the other one is 2 cm in diameter. They are energized with the same voltage. Which of them possesses the highest electric field?
18. Is electricity dangerous? Why? How would you protect yourself from electric chock?
19. Explain the concepts "time-domain" and "frequency-domain"
20. In real life engineering how do we assure things are made properly so they can be used in a proven way without having to do excessive research every time we want to build new things?

I would like each group to answer the questions in common and hand me your reply to these 20 questions before lecture 2 (just one from each group). I don't expect nice report and/or computer drawing. Just use paper and pencil. There's no solution sheet but you are always welcome to discuss the stuff with me.

Regards

Claus