1. In electromagnetic induction a spinning magnet (fluctuating magnetic field) induces _______ into conductive coils, which surround the magnet. S 9,10

2. The electromagnetic induction principle developed by Michael Faraday in 1831 is important to us because it helped trigger the _________ industry. S 9,10

3. James Clerk Maxwell explained Clausius’ entropy as _______. S 6

4. Which of the following is one of the eight great technologies according to Burke: C10 6

5. Throughout history we have witnessed periods of lasting increases in the rate technological development. All these periodic increases are due to improved _______. C10 14

6. Power = volts x _______ C10 24

7. If the power running through a power line is 20,000 watts and the voltage is 1000 volts then what is the current in the line? C10 24

8. Identify at least 3 modern technologies dependant on glass C10 45

9. AC electricity was chosen as the preferred form of electrical power from the power plant because its _____ can easily and efficiently be changed using a ______ C10 23, 26-27

10. AC power of 100 volts and 1 ampere enters a transformer with 5 coils and exits the transformer with 25 coils. What is the exiting voltage and current? C10 26-28

11. AC can be converted into DC by passing the AC through a ____ and "smoothed" by using a _____. C10 33

12. Embryonic stem cells may differentiate into functional cells like: S 30

13. Sir Isaac Newton told us about gravity and gave us a simple elegant
equation to calculate it. The force of gravity is directly proportional to _____ of two objects and inversely proportional to the _______. S 1

14. Daniel Bernoulli told us about the physics of fluids and described it mathematically telling us that \([\text{density} \times \text{velocity}^2/2] + \text{pressure} = \text{constant}\) which means fluid velocity is inversely related to its pressure. How does this principle explain the lifting movement of paper if you blow over it? S 5-6

15. Sulfur and Nitrogen oxides from coal burning combine with water in the atmosphere to form___. C10 44

16. What topics did we discuss in biotechnology and what is the 2007 discovery providing an inexpensive, easy to use method for editing living system’s DNA. S 27-32

17. Albert Einstein won a Nobel Prize in 1922 for telling us about the photoelectric effect. Which one of Burkes major technologies owes its origin to the photoelectric effect? S 12,31 & C9 21-22

18. Einstein also told us \(E=mc^2\) which tells us that the_____ and _______ of an object is directly proportional and possibly interchangeable. S 13

19. Antimatter was first observed in 1955. Since then extremely small amounts have been made. When antimatter contacts matter the matter changes into _______. S 13

20. If we could convert 2 grams of matter into energy it would be equivalent to about ___ Hiroshima size atomic bombs. S 13

21. The simple act of observing or measuring a quantum particle like an atom destroys its _____? This is the basis of emerging quantum cryptography technology. S 32

22. Intel co-founder, Gordon Moore claimed that the number of _______ on a
chip could _____ every 24 months. This has since become know as Moore’s Law. Is there a limit to Moore’s law? C10 37

23. The N side or cathode of a solid state Si (group 4) diode could be doped with a group _____ element. C10 36

24. Electrical power loss in the transmission cable is equal to resistance x current². This electrical power is sent at very high voltage to _____. (Hint: remember power = current x volts) C10 25

25. Which of the following is not an option suggested by Burke to cope with the rapid technological changes we face? C10 15-19

26. In a diode electrons flow in one direction, from the _____ to the ________. C10 30-31

27. Was there inventors or scientists discussed in class which worked alone without any outside influences? C10 14

28. In a special type of solid-state diode the N side is higher energy than the P side and under forward bias current flow electrons combine with holes at the junction interface to produce ____. C10 36-38

29. The _______ is a solid-state replacement for a triode vacuum tube. These are NPN or PNP and require _____ volts across the base to allow electron flow. C10 32 & 36

30. What are the triggers for technological change according to Burke: C10 7-13

31. Graphite, diamonds, and buckminsterfullerene are all allotropes of ____ S 22-25

32. In the garden hose analogy to electricity the _____ is analogous to resistance (ohms) and the _______ is analogous to volts. C10 24

33. Nuclear fission is the ______ of an element while nuclear fusion is the _______ of small elements to make a large element. C2 21
34. The branch of technology, which deals with dimensions and tolerances of $10^{-9}$ meters, especially the manipulation of individual atoms or molecules is called ______. S 26

35. What are Luddites? S 16-17 & Readings

36. Early 20th century, American scientist, inventor and educator responsible for increasing the farmers’ productivity and wealth. S 18-19

37. Burke believes that ordinary people are often prevented from sharing in scientific and technological discussions because they: C10 & video

38. Inventors are generally: C10 4 and video and lecture notes

39. The development of a near perfect vacuum allowed the development of: C9 20, 26-31, C8 22, C10 30-31

40. The uncertainty principle and entanglement theory are topics in __________. S32, Readings Quantum Physics and Quantum Theory

41. Light amplification by stimulated emission radiation results in concentrated ______. C10 39

42. How are communications and technological development related? C10 14

43. Why is technology changing faster now than 200 years ago? C10 14

44. Why is it difficult to predict future technological developments? C10 7-14

45. Give a unit of electrical power equivalent to J/s. C10 24 and lecture notes

46. What is the difference between fusion and fission? C2 21

47. In the simplest terms what were the motivations of A. Einstein, I. Newton, D. Bernoulli and R. Clausius which led to their discoveries? C1 16

48. What is the name of the precise gene editing system adapted from bacteria's virus defense mechanism. S 32

49. How does a light emitting diode, LED, work? C10 38

50. In fluid flow, how are pressure and velocity related? S 3-5