

Physics 10 Final (300 Pts MAX.) – TEST A

T TH 3:50 PM, Spring 2004

1. Electric charge (a) is not a fundamental property (b) is given an arbitrary sign designation (c) always experiences an attractive force (d) is found associated only with electrons
2. Lightning takes place by (a) intracloud discharges (b) cloud-to-cloud discharges (c) could to ground discharges (d) all of these
3. Electric potential is (a) the force per charge (b) the same as electric potential energy (c) the electric potential energy per charge (d) given by Coulomb's law
4. A heat engine converts (a) work to heat energy (b) heat energy to work (c) heat from a low-temperature reservoir to heat in a high-temperature reservoir (d) none of the preceding
5. According to the first law of thermodynamics, if heat is added to a closed system, it goes into (a) entropy (b) work (c) internal energy (d) work and/or internal energy
6. A heat engine with 100% efficiency would not violate the (a) first law (b) second law (c) third law
7. A method of heat transfer that generally does not involve mass transfer is (a) conduction (b) convection (c) radiation (d) both (a) and (c)
8. Boiling starts in a heated liquid when the vapor pressure in formed bubbles is (a) negative (b) zero (c) greater than one atmosphere (d) below the triple-point pressure
9. Radiation is a method of heat transfer by means of (a) convection currents (b) molecular interaction (c) electromagnetic waves (d) all of these
10. Temperature is (a) a measure of heat (b) a relative measure of hotness and coldness (c) internal energy in transit (d) both (b) and (c)
11. The degree Fahrenheit is equal to the unit interval on (a) the Celsius scale (b) the Kelvin scale (c) both (a) and (b) (d) none of the preceding
12. Which of the following units could be used for specific heat? (a) Cal/g° C (b) kcal/kg-K (c) Btu/lb-degree F (d) all of the preceding
13. A cucumber has a food energy value of 5 Calories. If all this energy could be transferred to a kilogram of water, it would raise the temperature by (a) 5°F (b) 5K (c) 10°C (d) 50°C
14. Which of the following sound frequencies would not be heard by the human ear? (a) 15 Hz (b) 900 Hz (c) 15000 Hz (d) 19 kHz
15. If a sound source and an observer both move with the same constant velocity, the frequency heard by the observer relative to the source frequency would be (a) higher (b) lower (c) the same
16. The upper limit of the frequency range of human hearing is (a) 20dB (b) 120dB (c) 20 kHz (d) 10^9 Hz
17. A change in the sound level intensity from 100 dB to 70 dB corresponds to a decrease in sound intensity by a factor of (a) 10 (b) 100 (c) 1,000 (d) 10,000
18. The period of an SHM oscillation (a) increases with amplitude (b) is equal to $1/f$ (c) has units of hertz (d) is always in phase
19. Intensity (a) is the same as energy (b) falls off as $1/r$ (c) has units of $J/s \cdot m^2$ (d) none of the preceding
20. Standing waves (a) have no motion at all (b) are always out of phase (c) have zero amplitude at the nodal positions (d) can have only one characteristic frequency
21. The electric force between two charged particles (a) is repulsive for unlike charges (b) varies as $1/r$ (c) depends only on the magnitudes of the charges (d) is much, much greater than the gravitational force
22. Lightning rods prevent damage by making contact with (a) streamers (b) stepped leaders (c) return strokes (d) dart leaders
23. Electric potential energy is given by (a) Coulomb's law (b) the law of charges (c) electric field lines (d) charge times voltage
24. The work output of a heat engine is equal to (a) the work input (b) the heat input (c) the heat output (d) the heat input minus the heat output
25. The second law of thermodynamics states that (a) a cyclic heat engine cannot convert heat completely to work (b) a cyclic heat engine cannot have 100 percent efficiency (c) heat will not flow spontaneously from a colder body to a hotter body (d) all of the preceding

26. The difference between a diesel engine and a gasoline engine is (a) the type of fuel used (b) the type of ignition (c) cycle processes (d) all of these
27. A roaring fire transfers heat to a person sitting nearby chiefly by (a) conduction (b) convection (c) radiation (d) both (a) and (b)
28. The freezing point of water is decreased by (a) the addition of more water (b) pressure (c) dissolved table salt (d) both (b) and (c)
29. Sunlight feels warm on the skin primarily because of (a) visible radiation (b) microwaves (c) ultra-violet radiation (d) infrared radiation
30. Heat is (a) a form of energy (b) energy transferred because of a temperature difference (c) internal energy in transit (d) all of the preceding
31. What is the frequency in vibrations per second of 60-Hz wave? What is its period? (a) 0.01666 sec (b) 60 sec (c) 0.0332 sec (d) 30 sec
32. Radio waves travel at the speed of light 300,000 km/s. What is the wavelength of radio waves received at 100.1 MHz on your FM radio dial? (a) 300,000 km (b) 100.1 km (c) 3 m (d) 100.1 m
33. Gusts of wind make the Sears Building in Chicago sway back and forth at a vibration frequency of about 0.1 Hz. What is its period vibration? (a) 0.1 sec (b) 5 sec (c) 10 sec (d) 20 sec
34. What is the approximate distance of a thunderstorm when you note a 3-s delay between the flash of lightning and the sound of thunder? (speed of sound in air = 340 m/s) (a) 340 m/sec (b) 680 m/sec (c) 1020 m (d) 680 m
35. What is the wavelength of a 340-Hz tone in air? (a) 340 m (b) 1 m (c) 10 m (d) 100 m
36. What beat frequencies are possible with tuning forks of frequencies 259, and 261 Hz? (a) 1 Hz (b) 2 Hz (c) 3 Hz (d) 4 Hz
37. What would be the final temperature of a mixture of 50 g of 10° C water and 50 g of 50° C water? (a) 10°C (b) 20°C (c) 30°C (d) 40°C
38. Suppose a bar 1 m long expands 0.8 cm when heated. By how much will a bar 100 m long of the same material expand when similarly heated? (a) 100.5 m (b) 100.8 m (c) 100 m (d) 10 m
39. Convert the temperature -30°C to the Fahrenheit scale: (a) 32°F (b) -22°F (c) 14°C (d) 10°F
40. A child has a temperature of 40° C. Is this serious? Explain in terms of Fahrenheit temperature. (a) 40°F (b) 60°F (c) 80°F (d) 104°F
41. If you wish to warm 100 kg of water by 30° C for your bath, how much heat is required? (a) 1000 Kcal (b) 2000 Kcal (c) 3000 Kcal (d) 4000 Kcal
42. If you wish to warm 100 kg of water by 30° C for your bath, how much heat is required? (Give your answer in calories and joules.) (a) 1000 Kcal (b) 2000 Kcal (c) 3000 Kcal (d) 4000 Kcal
43. During a certain thermodynamic process a sample of gas expands and cools, reducing its internal energy by 3000 J, while no heat is added or taken away. How much work is done during this process? (a) 3000 cal (b) 3000 Joule (c) 4000 Joule (d) 4000 cal
44. Two point charges are separated by 6 cm. The attractive force between them is 20 N. Find the force between them when they are separated by 12 cm. (What can you answer this problem without knowing the magnitudes of the charges?) (a) 6 N (b) 5 N (c) 12 N (d) 20 N
45. Rearrange the equation Current = voltage/resistance to express resistance in terms of current and voltage. Then solve the following: A certain device in a 120-V circuit has a current rating of 20 A. What is the resistance of the device (how many ohms)? (a) 20Ω (b) 120Ω (c) 6Ω (d) 10Ω
46. What is the force on a proton located in an electric field of 3000 N/C? What is the proton's acceleration? (a) 4.8×10^{-16} N (b) 9.6×10^{-16} N (c) 2.4×10^{-16} N (d) 1.2×10^{-16} N
47. Two 1 1/2 -V batteries are connected in series to a 3- Ω resistor. How much current flows through each battery? (a) 6 amp (b) 2.5 amp (c) 1.5 amp (d) 1 amp
48. Two pellets, each with a charge of 1 microcoulomb (10^{-6} C), are located 3 cm (0.03 m) apart. What is the electric force between them? What mass object would experience this same force in the Earth's gravitational field? (a) 6 N (b) 10 N (c) 3 N (d) 20 N