

Physics 10 2nd Midterm (350 pts MAX.) – TEST C
Spring 2005

1. Thermal efficiency is equal to the ratio of (a) work out/heat in (b) heat out/heat in (c) heat in/heat out (d) heat out/work out
2. The heat output of a heat pump is equal to (a) work input (b) heat input (c) sum of (a) and (b) (d) none of the preceding
3. For every natural process, the entropy of the universe (a) decreases (b) remains constant (c) is destroyed in part (d) increases
4. An insulator may be electrostatically charged by (a) friction (b) contact (c) induction (d) all of these
5. The electric field has units of (a) m/s (b) N-m (c) N/C (d) none of these
6. Electric charge is measured in units of (a) volts (b) coulombs (c) newtons (d) de Graaffs
7. When two waves interfere in phase, the result is (a) fluorescence (b) decreased wave amplitude (c) destructive interference (d) none of the preceding
8. Light may be polarized by (a) absorption (b) reflection (c) scattering (d) all of these
9. The dual nature of light refers to the (a) quantum properties of light (b) wave and particle characteristic properties of light (c) frequency and wavelength properties of light (d) none of these
10. Incandescent lamps produce predominantly (a) monochromatic light (b) polarized light (c) visible light (d) infrared radiation
11. A light ray is a line drawn perpendicular to (a) a wavelength (b) a wave front (c) a beam (d) none of the preceding
12. In refraction, which of the following wave properties is unchanged? (a) frequency (b) wavelength (c) speed (d) all of these
13. Dispersion is a factor in (a) a diamond's fire (b) the rainbow (c) chromatic aberration (d) all of these
14. Fiber optics is based on (a) diffuse reflection (b) dispersion (c) total internal reflection (d) diverging mirrors
15. Dispersion is responsible for (a) a diamond's brilliance (b) diffuse reflection (c) spherical aberration (d) chromatic aberration
16. Which of the following is *not* an additive primary color? (a) Red (b) Green (c) Yellow (d) Blue
17. Light with wavelengths greater than 600nm appears to have the general color of (a) blue (b) green (c) yellow (d) red
18. Various types of telescope, use (a) visible light (b) radio waves (c) infrared radiation (d) all of the preceding
19. Classical theory predicted (a) photocurrent to be proportional to light intensity (b) electron energy to depend on light frequency, but not on intensity (c) no photoemission below a certain light frequency regardless of intensity (d) both (b) and (c)
20. The *s* in the acronym laser stands for (a) simple (b) spontaneous (c) specific (d) stimulated
21. Laser light is which of the following (a) coherent (b) stimulated emission (c) nochromatic (d) a, b and d (e) c and d
22. Population inversion has (a) more atoms in lower energy level (b) less atoms in higher energy level (c) more atoms in higher energy level (d) the same number of atoms in all energy level
23. When a hydrogen electron is excited to a higher energy level, (a) it must be in the ground state (b) a photon of any frequency may be absorbed (c) a photon must be emitted (d) energy is absorbed
24. The most important component in a laser is (a) pencil (b) active medium (c) resistor (d) capacitor
25. Suppose the heat engine with 60% efficiency had a heat input of 180 kcal per cycle. What would be the heat output? (a) 40 Kcal (b) 120 Kcal (c) 108 Kcal (d) 72 Kcal
26. A cylinder containing a gas is sealed with a nearly frictionless piston at a pressure of 0.20 MPa. The cylinder is placed in contact with a source of heat, and the gas very slowly expands, moving the piston, whose area is 1000 cm^2 , a distance of 5.0 cm. Assuming the process is isobaric, and given that 400 J of heat enters the system, determine its change in internal energy (a) -0.70 kJ (b) -0.60 kJ (c) -70kJ (d) -700 kJ
27. A droplet of ink in an industrial ink-jet printer carries a charge of $1.6 \cdot 10^{-10} \text{ C}$ and deflected onto paper by a force of $3.2 \cdot 10^{-4} \text{ N}$. Find the strength of the electric field to produce this force. (a) $2.0 \times 10^6 \text{ N/C}$ (b) $3.2 \times 10^6 \text{ N/C}$ (c) $2.0 \times 10^6 \text{ N}$ (d) $3.2 \times 10^6 \text{ N}$
28. How much does it cost to operate a 100-W lamp continuously for 2 week if the power utility rate is 15 cents/kWh. (a) \$15.00 (b) \$2.52 (c) 5.04 (d) 10.00

29. What is the force on a proton located in an electric field of 3000 N/C? (a) 480×10^{-16} N (b) 48×10^{-16} N (c) 4.8×10^{-16} N (d) 0.48×10^{-16} N
30. Two 1 1/2 -V batteries are connected in series to a 3- Ω resistor. How much current flows through each battery? (a) 1.0 Amp (b) 1.5 Amp (c) 3 Amp (d) 2 Amp
31. A 4-cm diameter ball is located 40 cm from a point source and 80 cm from a wall. What is the size of the shadow on the wall? (a) 4 cm (b) 8 cm (c) 2 cm (d) 10 cm
32. If light in air is incident at 30° , at what angle is it refracted in water? ($n_w = 1.3333$) (a) 22° (b) 44° (c) 12° (d) 41.8°
33. The focal length of a converging lens is 30 cm. Locate the image of an object placed 60 cm from the center of this lens. (a) 30 cm (b) 60 cm (c) 90 cm (d) 15 cm
34. The speed of light in diamond is $1.24 \cdot 10^8$ m/s. What is the index of refraction for diamond? (a) 1.24 (b) 2.4194 (c) 3.0 (d) 1.5
35. For crown glass, the index of refraction for violet light is 1.532, and the index of refraction for red light is 1.515. How much faster is red light than violet light in this medium? (a) 2.22×10^6 m/sec (b) 3.00×10^6 m/sec (c) 3.22×10^6 m/sec (d) 4.22×10^6 m/sec
36. What is the wavelength of light in water if it has a frequency of $6.6 \cdot 10^{14}$ Hz? (a) 3.41 nm (b) 34.10 nm (c) 341.0 nm (d) 3,410 nm
37. A heat engine with 40 percent thermal efficiency has a heat input of 100 J per cycle, the heat output of the engine is (a) 40 J (b) 50 J (c) 80 J (d) none of the preceding
38. For a refrigerator, the high-temperature reservoir is (a) the freezer compartment (b) the room (c) the inside of the refrigerator (d) the refrigerator compress
39. Entropy is a measure of (a) thermal efficiency (b) internal energy (c) the capability to do work (d) temperature
40. Electrostatic charging (a) occurs best on dry days (b) must be done with a conductor (c) does not involve a transfer or movement of charge (d) none of the preceding
41. Electric fields are represented graphically by (a) dots (b) lines of force (c) arrows that point in the direction of the force on a negative charge (d) a series of straight lines
42. Electrostatic charges can be placed on an object by (a) friction (b) contact (c) induction (d) all of these
43. What is "destroyed" in destructive interference? (a) Wave form (b) Energy (c) Electric and magnetic fields (d) All of the preceding
44. The polarizing direction of polarizing sunglasses is (a) vertical (b) horizontal (c) at a 45 degree angle (d) immaterial
45. The excited mercury vapor in a fluorescent lamp emits what type of radiation? (a) Infrared (b) Ultraviolet (c) Visible (d) Heat
46. Light in which the electric field is in only one direction is (a) monochromatic (b) polarized (c) produced by interference (d) not an electromagnetic wave
47. During a certain thermodynamic process a sample of gas expands and cools, reducing its internal energy by 5000 J, while no heat is added or taken away. How much work is done during this process? (a) 3000 cal (b) 3000 Joule (c) 5000 Joule (d) 4000 cal
48. Determine the maximum possible efficiency for a steam engine operating between 200°C and 27.0°C . (a) 3.65% (b) 36.5 % (c) 365% (d) 0.365%
49. The wattage marked on a light bulb is not an inherent property of the bulb but depends on the voltage to which it is connected, usually 110 or 120 V. How many amperes flow through a 120-W bulb connected in a 120-V circuit? (a) 0.5 A (b) 2.0 A (c) 0.75 A (d) 1.0 A
50. A chlorine ion contains 17 protons, 18 neutrons, and 18 electrons. What is the charge of the ion? (a) Positive (b) Negative (c) No charge (d) None of the above