

**Physics 10 2nd Midterm (200 pts MAX.) – TEST A**  
**Spring 2005**

1. Units of density are (a)  $\text{kg/m}^3$  (b)  $\text{g/cm}^3$  (c) neither (a) nor (b) (d) both (a) and (b)
2. All materials are to some extent (a) polymers (b) elastic (c) brittle (d) hard
3. Plastic deformation occurs (a) when the elastic limit is reached (b) only for metals (c) only in plastics (d) chiefly in ceramic materials
4. A plastic is (a) a crystalline solid (b) a macromolecular solid (c) made of monomers (d) an alloy
5. Pressure may be increased by (a) decreasing the area of contact (b) decreasing the applied force (c) increasing the force and area by the same factor (d) none of the preceding
6. An object sinks in a liquid when (a) the buoyant force is greater than the object's weight (b) it is completely immersed (c) its density is greater than that of the liquid (d) the weight of the displaced liquid is greater than that of the object
7. A mechanical advantage can be obtained by the application of (a) Archimedes' principle (b) Pascal's principle (c) Bernoulli's principle (d) surface tension
8. Detergents (a) have no effect on surface tension (b) increase surface tension (c) decrease surface tension (d) none of these
9. When an air-filled balloon is put in a freezer and cooled, the balloon has (a) a pressure increase (b) a pressure reduction (c) a volume decrease (d) both (b) and (c)
10. The lungs fill with air (a) when the diaphragm relaxes (b) when the lung pressure is less than atmospheric pressure (c) during exhalation (d) when there is systolic pressure
11. The "relaxation" pressure of the circulatory system is called (a) barometric pressure (b) diastolic pressure (c) systolic pressure (d) air pressure
12. 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
13. Intensity (a) is the same as energy (b) falls off as  $1/r$  (c) has units of  $\text{J/s}\cdot\text{m}^2$  (d) none of the preceding
14. 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
15. 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
16. 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
17. The upper limit of the frequency range of human hearing is (a) 20dB (b) 120dB (c) 20 kHz (d)  $10^9$  Hz
18. 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
19. 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
20. Which of the following is the highest temperature? (a)  $0^\circ\text{F}$  (b)  $0^\circ\text{C}$  (c)  $0^\circ\text{K}$  (d) all are equal
21. The specific heat of substance A is ten times greater than that of substance B. If equal amounts of heat are added to equal masses of the substances, the temperature increase of substance A is (a) the same as that of B (b) ten times greater than that of B (c)  $1/10$  that of B (d) none of the preceding
22. The specific heat of water is  $1.0 \text{ kcal/kg}\cdot^\circ\text{C}$ . If the temperature of 2.0 kg of water is lowered by  $10^\circ\text{C}$ , the amount of heat removed would be (a) 2 kcal (b) 5 kcal (c) 10 kcal (d) 20 kcal
23. A roaring fire transfers heat to a person sitting nearby chiefly by (a) conduction (b) convection (c) radiation (d) both (a) and (b)
24. 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)
25. Sunlight feels warm on the skin primarily because of (a) visible radiation (b) microwaves (c) ultra-violet radiation (d) infrared radiation
26. What is the volume of 1000 kg of water? (a)  $1\text{cm}^3$  (b)  $1000 \text{ m}^3$  (c)  $1 \text{ m}^3$  (d)  $1000 \text{ cm}^3$
27. An "empty" rectangular box has the dimensions 1.0 m x 0.80 m x 0.75 m. What mass of air does it contain? (Density of air =  $1.25 \text{ kg/m}^3$ ) (a) 0.77 kg (b) 0.385 kg (c) 1.155 kg (d) 0.875 kg

28. Given a 2-gal bucket, how much lift force would you have to apply to carry it if it were full of water? (a) 16.22 lb (b) 16.22 kg (c) 16.22 m (d) 16.22 ft
29. The depth of water behind the Hoover Dam in Nevada is 220m. What is the water pressure at the base of this dam? (Neglect the pressure due to the atmosphere.) (a) 220 kPa (b) 2160 kPa (c) 220 kg (d) 220 N
30. A barber's chair rests on a hydraulic piston 10 cm in diameter. The input side has a piston with a cross-sectional area of  $10\text{cm}^2$ , which is pumped on using a foot pedal. If the chair and the client together have a mass of 160 kg, what force must be applied to the input piston? (a) 200 N (b) 300 N (c) 400 N (d) 500 N
31. A tank having a volume of  $1.00\text{ m}^3$  is filled with air at  $0^\circ\text{C}$  to 20.0 times atmospheric pressure. How much volume will that gas occupy at 1.00 atm and room temperature? (a)  $11.5\text{ m}^3$  (b)  $21.5\text{ m}^3$  (c)  $31.5\text{ m}^3$  (d)  $41.5\text{ m}^3$
32. A skipper on a boat notices wave crests passing his anchor chain every 5 sec. He estimates the distance between wave crests to be 15m. He also correctly estimates the speed of the waves. What is this speed? (a) 5 m/sec (b) 15 m/sec (c) 10 m/sec (d) 3 m/sec
33. How much more intense than the threshold of hearing is a sound of 30 dB? (a) 10 times (b) 100 times (c) 1000 times (d) 3 times
34. By international agreement, most orchestras tune to a frequency of 440 Hz, which is called A440 (the A note above middle C). Given that the speed of sound in air at room temperature is 343.9 m/s, what is the wavelength of A440? (a) 0.440 m (b) 0.782 m (c) 1.564 m (d) 1.782 m
35. What would be the final temperature when 100 g of  $25^\circ\text{C}$  water is mixed 75 g of  $40^\circ\text{C}$  water? (a)  $31.4^\circ\text{C}$  (b)  $31.4^\circ\text{F}$  (c)  $31.4^\circ\text{K}$  (d)  $22.1^\circ\text{C}$
36. Find the mass of  $0^\circ\text{C}$  ice that 20 g of  $100^\circ\text{C}$  steam will completely melt. (a) 80 gm (b) 40 gm (c) 160 gm (d) 200 gm
37. In a weather forecast, it is reported that the high temperature for the next day is expected to be  $15^\circ\text{C}$ . How should you dress to go to class tomorrow? (a)  $15^\circ\text{F}$  (b)  $30^\circ\text{F}$  (c)  $59^\circ\text{F}$  (d)  $50^\circ\text{F}$
38. A strict user of the SI tells you that the temperature that day is 288 K. What is the temperature on the Fahrenheit? (a)  $15^\circ\text{F}$  (b)  $59^\circ\text{F}$  (c)  $30^\circ\text{F}$  (d)  $30^\circ\text{C}$
39. A copper pot has a mass of 0.50 kg and is at  $100^\circ\text{C}$ . How much thermal energy must be removed from it if its temperature is to be lowered to precisely  $0^\circ\text{C}$ ? (a) -0.195 kJ (b) -1.95 kJ (c) -19.5 kJ (d) -195.0 kJ
40. A pane of window glass is 0.90 m wide by 1.5 m high and 4.0 mm thick. It's a cold blustery winter's day in the Midwest. The temperature of the inside face of the window is  $10^\circ\text{C}$ , and the outside face is at  $-9.0^\circ\text{C}$ . How much thermal power is being transported through the windows ( $k_T=0.84\text{W/m}\cdot\text{K}$ )? (a) 540 kW (b) 54 kW (c) 5.4 kW (d) 0.54 kW
41. A material might be made denser by (a) burning (b) stretching (c) compacting (d) heating
42. An automobile "fender bender" is an example of (a) elasticity (b) plasticity (c) Hooke's law (d) sublimation
43. A solid that consists of covalently bonded atoms such that the solid consists of one large (a) micromolecular (b) macromolecular (c) amorphous (d) ionic
44. The alloy bronze is made up of (a) iron and carbon (b) copper and zinc (c) copper and tin (d) chromium and nickel
45. Pressure applied to an enclosed liquid is (a) transmitted undiminished (b) reduced with distance (c) described by an inverse square law (d) both (a) and (c)
46. A fixed quantity of gas is held in a cylinder capped at one end by a movable piston. The pressure of the gas is initially 1 atmosphere (101 kPa) and volume is initially  $0.3\text{ m}^3$ . What is the final volume of the gas if the pressure of the gas is increased to 3 atmospheres at constant temperature? (a)  $0.05\text{ m}^3$  (b)  $0.1\text{ m}^3$  (c)  $0.2\text{ m}^3$  (d)  $0.3\text{ m}^3$
47. A heat engine takes in 1200 J of heat from the high temperature heat source in each cycle and does 400 J of work in each cycle. How much heat is released into the environment in each cycle? (a) 1200 J (b) 800 J (c) 400 J (d) 1600 J
48. A hot plate is used to transfer 400 cal of heat to a beaker containing ice and water. 500 J of work are also done on the contents of the beaker by stirring. What is the increase in internal energy of the ice-water mixture? (1 Cal = 4.2 J) (a) 2180 J (b) 400 J (c) 500 J (d) 400 Cal
49. If the specific heat capacity of ice is  $0.5\text{ Cal/g}\cdot^\circ\text{C}$ , and the heat of fusion of ice is 80 Cal/g, how much heat would have to be added to 200g of ice initially at a temperature of  $-10^\circ\text{C}$  to raise the ice to the melting point? (a) 1000 Cal (b) 8000 Cal (c) 17000 Cal (d) 16000 Cal
50. Suppose that a merry-go-round is accelerated at a constant rate of  $0.005\text{ rev/s}^2$ , starting from rest. What is its rotational velocity at the end of 1 min? (a) 0.005 rev/sec (b) 0.10 rev/sec (c) 0.30 rev/sec