

**Physics 10 1st Midterm (200 pts MAX.) – TEST B**  
**3:50 T Th, Spring 2004**

1. What is “destroyed” in destructive interference? a) Energy b) Wave form c) electric and magnetic fields d) all of the preceding
2. The polarizing direction of polarizing sunglasses is a) vertical b) horizontal c) at a 45 degree angle d) immaterial
3. Polarization involves a) orientation of field vectors b) interference c) bending of light around corners d) longitudinal waves
4. For ray reflection from a surface, a) the angle of reflection equals the angle of incidence b) the reflection angle is measured from a normal to the surface c) all the rays lie in the same plane d) all of these
5. In refraction, which of the following wave properties is unchanged? a) wavelength b) speed c) frequency d) all of these
6. In most transparent materials, which color of light has the greatest angle of refraction from the incident ray direction? a) red b) green c) yellow d) blue
7. Dispersion is responsible for a) a diamond’s brilliance b) diffuse reflection c) spherical aberration d) chromatic aberration
8. If an optical cable has an index of refraction of 1.5, how long will it take a signal to travel between two points on opposite coasts of the United States separated by a distance of 5000 km? (a) 1.5 sec (b) 1.0 sec (c) 0.5 sec (d) 0.25 sec
9. If it takes light 5ns to travel 1 m in an optical cable, what is the index of refraction in the cable? (a) 1.3333 (b) 1.5 (c) 2.0 (d) 3.0
10. 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
11. 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
12. Light in air is incident on a surface at an angle of  $60^\circ$ . What is its angle of refraction in glass? ( $n_G = 1.5$ ) (a)  $22^\circ$  (b)  $35.264^\circ$  (c)  $40^\circ$  (d)  $60^\circ$
13. How far does the light travel in one year? This distance is known as a light-year and is commonly used length in astronomy. (a)  $9.46 \times 10^8$  km (b)  $9.46 \times 10^{12}$  km (c)  $9.46 \times 10^{13}$  km (d)  $2.592 \times 10^{10}$  km
14. What is the average speed of a cheetah that sprints 100 meters in 4 seconds? (a) 100 m/sec (b) 50 m/sec (c) 25 m/sec (d) 5 m/sec
15. A particular car can go from rest to 90 km/hr in 10 seconds. What is its acceleration? (a) 0.5 m/sec (b) 1.0 m/sec (c) 2.5 m/sec (d) 2.5 m
16. What is the acceleration of a 40 kg block of cement when pulled sideways with a net force of 200N? (a)  $1 \text{ m/s}^2$  (b)  $4 \text{ m/s}^2$  (c)  $5 \text{ m/s}^2$  (d)  $10 \text{ m/s}^2$
17. If a mass of 1 kg is accelerated  $1 \text{ m/s}^2$  by a force of 1N, what would be the acceleration of 2 kg acted on by a force of 2N? (a)  $2 \text{ m/sec}^2$  (b)  $4 \text{ m/sec}$  (c)  $1 \text{ m/sec}^2$  (d)  $1 \text{ m/sec}$
18. Your initial speed is 10m/sec. You push accelerator so that the velocity increase (2m/sec) each second i.e. 10 m/sec, 12 m/sec, 14 m/sec. What is the acceleration? (a) 1 m/sec (b) 2 m/sec (c)  $2 \text{ m/sec}^2$  (d) 1 sec
19. A golf ball (0.142 kg) left a player’s hand at a speed of 20.0 m/sec. If the straight throw lasted 0.050 sec, determine the force exerted on the ball? (a) 20.0 N (b) 142 N (c) 56.8 N (d)  $56.8 \text{ m/s}^2$
20. A firefighter of a mass 80 kg slides down a vertical pole with an acceleration of  $4 \text{ m/s}^2$ . What is the friction force that acts on the firefighter? (a) 80 N (b) 4 N (c) 464 N (d) None
21. A car moving at 50 km/h skid 15 m with locked brakes. How far will the car skid with locked brakes at 150 km/h?(a) 45 m (b) 90 m (c) 135 m (d) 180 m
22. If force-in = 2N, force-out = 10N, then AMA is? (a) 10 (b) 5 (c) 1 (d) 20
23. Due to friction, a constant force of 100 Newtons is needed to slide a box across a room. If the box moves 3 meters, how much work is done? (a) 100 Joules (b) 300 Joules (c) 100 N (d) 300 N
24. Michael drove on the freeway 50 mph (= 22.35 m/sec). The mass of the car is 2000 kg. It has to stop in 10 sec. What is the impact force? (a) -4470 N (b) -2000 N (c) 4470 N (d) 2000 N

25. Let's estimate the average force on a tennis ball as it is served. The ball's mass is 0.06 kg, and it leaves the racquet with a speed of 40 m/sec (90 mph) and contact time 5 milliseconds (0.005 sec). (a) 40 N (b) 80 N (c) 240 N (d) 480 N
26. For a car to accelerate, it must a) have a constant speed b) start from rest c) have a change in velocity d) none of the preceding.
27. When Newton's second law is used to express weight, the acceleration is then a) zero b) due to gravity c) directly proportional to the mass d) none of the preceding
28. When a car moves at constant speed on a straight road a) There are no forces acting on it b) There is a constant net force acting on it c) There is no net force acting on it d) The net force is downward
29. Which of the followings are the fundamental properties used to describe motion a) Length and weight b) Weight and speed c) Weight and height d) Length and time
30. Work is done on an object when it is a) moved b) stationary c) acted upon by a balanced force d) none of the preceding.
31. Kinetic energy is the energy of a) motion b) position c) power d) work
32. The random motion of molecules in a substance is associated with a) chemical energy b) electrical energy c) heat energy d) all of the preceding
33. A machine a) can have a mechanical advantage greater than one b) multiplies the work input c) can run perpetually d) is not subject to the conservation of energy.
34. A change in momentum may result from a) an acceleration b) a force c) an impulse d) all of the preceding.
35. Which of the following are conserved in an inelastic collision? a) Momentum b) kinetic energy c) Impulse d) both (a) and (b)
36. Padded dashboards in automobiles reduce injury by a) increasing friction b) increasing the contact time c) decreasing friction d) stopping the passenger more quickly
37. For a system of constant mass, the conservation of momentum is essentially stated in Newton's first law b) Newton's second law c) Newton's third law d) Newton's law of gravitation
38. For a projection at an angle, the common factor for the x- and y-components of motion is a) direction b) time c) speed d) acceleration
39. A cannon ball is projected at a 45-degree angle with an initial velocity  $v$ . Neglecting air resistance, at its maximum height it will have a) no velocity b) a maximum horizontal velocity c) no vertical velocity d) vertical acceleration of  $9.8\text{m/s}^2$
40. Kepler stated that the geometric shape of the orbits of the planets is a(n) a) circle b) parabola c) ellipse d) rectangle
41. A vertically projected object a) has zero acceleration at maximum height b) has a constant velocity c) has a greater acceleration than a horizontally projected object. d) returns to its starting point with the same initial speed
42. Ocean tides occur a) once daily b) because of lunar gravitation c) only in the Southern Hemisphere d) exactly 12 hours apart
43. Which planet's discovery was a direct result of using Newton's law of gravitation? a) Neptune b) Uranus c) Planet X d) Saturn
44. Compared with its value on the Earth's surface, the acceleration due to gravity at an altitude of one Earth radius is a) the same b) two times greater c) one-half as great d) one-fourth as great
45. The weakest fundamental force is the a) electromagnetic force b) gravitational force c) weak nuclear force d) strong nuclear force
46. A particle a) has no physical dimensions b) does not have rotation c) can be accurately located d) all of the preceding apply
47. The farther the mass of a body is from the axis of rotation, a) the smaller its rotational speed b) the larger the moment of inertia c) the larger the number of radians in a circle d) none of the preceding
48. An object in stable equilibrium will remain so as long as its center of gravity is a) at the same location as its center of mass b) inside and above its original base of support c) outside the object d) none of the preceding
49. A spiraling football is an example of a) pure translational motion b) a non rigid body c) pure rotational motion d) the general motion of a rigid body
50. White light is a) fluorescent b) ultraviolet c) polychromatic d) waves with only magnetic field

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**5:25 T Th, Spring 2004**

1. Light may be polarized by a) absorption b) reflection c) scattering d) all of these
2. When the temperature of an incandescent solid is increased, a) the emitted light intensity is less b) there is an ultraviolet catastrophe c) the most intense spectral component is shifted to a higher frequency d) nothing changes
3. The bending of waves of around corners is called a) interference b) diffraction c) reflection d) polarization
4. A light ray is a line drawn perpendicular to a) a wavelength b) a wave front c) a beam d) none of the preceding
5. Dispersion is a factor in a) a diamond's fire b) the rainbow c) chromatic aberration d) all of these
6. A spherical converging lens a) is free of aberrations b) cannot form images on a screen c) is thicker at its center than at its periphery
7. Fiber optics is based on a) diffuse reflection b) total internal reflection c) dispersion d) diverging mirrors
8. If an optical cable has an index of refraction of 1.5, how long will it take a signal to travel between two points on opposite coasts of the United States separated by a distance of 5000 km? (a) 1.5 sec (b) 1.0 sec (c) 0.5 sec (d) 0.25 sec
9. If it takes light 5ns to travel 1 m in an optical cable, what is the index of refraction in the cable? (a) 1.3333 (b) 1.5 (c) 2.0 (d) 3.0
10. What is the speed of light in glass with an index of refraction of 1.6? (a)  $1.6 \times 10^8$  m/sec (b)  $1.875 \times 10^8$  m/sec (c)  $3.0 \times 10^8$  m/sec (d)  $4.0 \times 10^8$  m/sec
11. How many diopters are there for a converging lens with a focal length of 0.4 cm? (a) 100 diopter (b) 200 diopter (c) 250 diopter (d) 300 diopter
12. Locate the image of an arrow placed 60 cm from a diverging lens with a focal length of 30 cm. (a) 20 cm (b) -20 cm (c) 60 cm (d) -60 cm
13. Light from the bottom of a swimming pool is incident on the surface at an angle of 30 degrees. What is the angle of refraction? ( $n_w = 1.3333$ ) (a)  $30^\circ$  (b)  $60^\circ$  (c)  $41.8^\circ$  (d)  $20^\circ$
14. If a car moves with an average speed of 60 km/h, how far would it travel for 4 hours? (a) 60 km (b) 120 km (c) 240 km (d) 360 km
15. In 2.5 seconds a car increases its speed from 60 km/hr to 65 km/hr while a bicycle goes from rest to 5 km/hr. Which undergoes the greater acceleration?(a) different (b) the same (c) car greater (d) bicycle greater
16. What is the acceleration of 20 kg pail of cement that is pulled upward with a force of 300N? (a)  $5.2 \text{ m/s}^2$  (b)  $5.2 \text{ m}$  (c)  $5.2 \text{ m/sec}$  (d)  $2.6 \text{ m/s}^2$
17. Suppose you drove a distance of 100 km in 2 hours. What is your speed? (a) 100 km/hr (b) 50 km/hr (c) 200 km/hr (d) 150 km/hr
18. Suppose a force of 15 newton acts on an object with a mass of 5 kg. What is the acceleration of the object? (a)  $15 \text{ m/sec}^2$  (b)  $3 \text{ m/sec}^2$  (c)  $15 \text{ m/sec}$  (d)  $5 \text{ m/sec}^2$
19. How much acceleration does a 747 jumbo jet of mass 30,000 kg experience in take off when the thrust for each of the four engines is 30,000N? (a)  $4 \text{ m/s}^2$  (b)  $\text{m/s}$  (c)  $4 \text{ m}$  (d)  $4 \text{ N}$
20. A firefighter of a mass 80 kg slides down a vertical pole with an acceleration of  $4 \text{ m/s}^2$ . What is the friction force that acts on the firefighter? (a) 80 N (b) 4 N (c) 464 N (d) None
21. How much work is done on 75N bowling ball when you lift it 1 m? What power is expended if you lift it this distance in 1 sec? (a) 75 N (b) 75 Joules (c) 25 N (d) 50 Joules
22. What is the impulse needed to stop a 10 kg bowling ball moving at 6 m/sec? (a) 10 kg (b) 10 kg·m/sec (c) 60 kg·m (d) 60 kg·m/sec
23. A car crashes into a wall at 25 m/sec and is brought to rest in 0.1 sec. Calculate the average force exert on a 75 kg test dummy by the seat belt. (a) -18,750 N (b) -75 N (c) 18,750 N (d) 150 N
24. Michael drove on the freeway 50 mph (= 22.35 m/sec). The mass of the car is 2000 kg. It has to stop in 10 sec. What is the impact force? (a) -4470 N (b) -2000 N (c) 4470 N (d) 2000 N
25. Let's estimate the average force on a tennis ball as it is served. The ball's mass is 0.06 kg, and it leaves the racquet with a speed of 40 m/sec (90 mph) and contact time 5 milliseconds (0.005 sec). (a) 40 N (b) 80 N (c) 240 N (d) 480 N

26. A force a) is a scalar quantity b) is capable of producing a change in motion c) always produces motion d) both (a) and (c)
27. All objects in free fall near the Earth's surface have the same a) Speed b) Velocity c) Acceleration d) Weight
28. For two objects of different mass in free fall a) The accelerations are different b) The acting forces are different c) Air resistance is a consideration d) The more massive object will reach the ground first if released simultaneously
29. Galileo's legendary Leaning Tower of Pisa experiment a) Confirmed Aristotle's views on motion b) Showed objects of different weights fall at different rates c) Was actually done in Venice d) Is seriously questioned with regard to authenticity
30. If motor A has twice as much horsepower as motor B, then motor A has the power capability to do a) the same work in half the time b) Twice the work in half the time c) Half the work in twice the time d) none of the preceding
31. Energy cannot be a) transferred b) conserved c) created d) both (a) and (c)
32. The gravitational potential energy a) is independent of height b) is always positive c) is independent of path d) decreases with increasing height
33. The time rate of doing work is a) power b) momentum c) energy d) efficiency
34. By manipulating the impulse, one can change the a) force b) contact time c) momentum d) all of the preceding
35. In order to reduce the "string" in catching a hard ball, one usually a) increases the change in momentum b) increases the impulse c) increases the contact force d) increases the contact time
36. The impulse is equal to the a) force times time b) force times distance c) mass times acceleration d) distance divided by force
37. Momentum takes into account a) space and time b) inertia and motion c) collisions and heat d) shape and size
38. Centrifugal force is a) the reaction force to centripetal force b) the same as centripetal force c) a pseudo force d) a requirement for circular motion
39. The braking action of a large jet plane after landing is chiefly due to a) tire friction b) mechanical brakes c) reverse thrust d) resistance on wing foils
40. A projectile a) has no vertical acceleration b) is always projected in one dimension c) has no forces acting on it d) has a constant speed in the horizontal direction
41. An object in uniform circular motion has constant a) velocity b) momentum c) tangential acceleration d) speed
42. During a full-moon spring tide, the gravitational attractions of the Sun and moon on the Earth a) cancel each other b) produce higher low tides c) are generally in opposite directions d) produce very high tides because the moon is closer to the Sun
43. The theory of gravity as being a warping of space-time was proposed by a) Newton b) Halley c) Einstein d) Lowell
44. Rockets are made more efficient by a) greater fuel capacities b) in-flight mass reduction c) achieving escape velocity on blast-off d) all of the preceding
45. At an altitude equal to the Earth's radius, a person would weigh what percentage of his or her weight on Earth? a) 200% b) 100% c) 50% d) 25%
46. If every particle of a body has the same instantaneous velocity, it is a) in translational motion b) in rotational motion c) in rolling motion d) at rest
47. The moment of inertia is a measure of a) rotational speed b) angular acceleration c) torque d) rotational inertia
48. As a planet or a comet approaches the Sun its speed increases so as to maintain constant a) velocity b) angular momentum about the Sun c) kinetic energy d) linear momentum
49. A circus stilt walker stand balanced on one stile. He is in a) stable equilibrium b) neutral equilibrium c) unstable equilibrium d) universal equilibrium
50. The process of an atom absorbing radiation of one wavelength and emitting another is called a) interference b) fluorescence c) incandescence d) polarization

**Physics 10 1st Midterm (200 pts MAX.) - TEST B**  
**Wednesday, Spring 2004**

1. Elements in a vertical column in the periodic table a) have the same number of protons b) form a period c) have similar atomic masses d) have similar chemical properties
2. A polar bond is a type of a) ionic bond b) bond with symmetrical sharing c) covalent bond d) bond involving magnetic poles.
3. A liquid has a) definite shape and volume b) definite volume but no definite shape c) no definite shape or volume d) none of the preceding
4. A material might be made denser by a) burning b) stretching c) compacting d) heating
5. All materials are to some extent a) polymers b) brittle c) elastic d) hard
6. Plastic deformation occurs a) chiefly in ceramic materials b) only for metals c) only in plastics d) when the elastic limit is reached
7. A solid that consists of covalently bonded atoms such that the solid consists of one large a) micromolecular b) macromolecular c) amorphous d) ionic
8. If a car moves with an average speed of 60 km/h, how far would it travel for 4 hours? (a) 60 km (b) 120 km (c) 240 km (d) 360 km
9. What is the acceleration of a 40 kg block of cement when pulled sideways with a net force of 200N? (a) 1 m/s<sup>2</sup> (b) 4 m/s<sup>2</sup> (c) 5 m/s<sup>2</sup> (d) 10 m/s<sup>2</sup>
10. If a mass of 1 kg is accelerated 1 m/s<sup>2</sup> by a force of 1N, what would be the acceleration of 2 kg acted on by a force of 2N? (a) 2 m/sec<sup>2</sup> (b) 4 m/sec (c) 1 m/sec<sup>2</sup> (d) 1 m/sec
11. Suppose you drove a distance of 100 km in 2 hours. What is your speed? (a) 100 km/hr (b) 50 km/hr (c) 200 km/hr (d) 150 km/hr
12. Suppose a force of 15 newton acts on an object with a mass of 5 kg. What is the acceleration of the object? (a) 15 m/sec<sup>2</sup> (b) 3 m/sec<sup>2</sup> (c) 15 m/sec (d) 5 m/sec<sup>2</sup>
13. A golf ball (0.142 kg) left a player's hand at a speed of 20.0 m/sec. If the straight throw lasted 0.050 sec, determine the force exerted on the ball? (a) 20.0 N (b) 142 N (c) 56.8 N (d) 56.8 m/s<sup>2</sup>
14. How much acceleration does a 747 jumbo jet of mass 30,000 kg experience in take off when the thrust for each of the four engines is 30,000N? (a) 4 m/s<sup>2</sup> (b) m/s (c) 4 m (d) 4 N
15. A firefighter of a mass 80 kg slides down a vertical pole with an acceleration of 4 m/s<sup>2</sup>. What is the friction force that acts on the firefighter? (a) 80 N (b) 4 N (c) 464 N (d) None
16. The motor boat can go 18 mph in still water. If a trip down stream takes 4 hours and the return trip takes 5 hours, find the speed of the current? (a) 18 mph (b) 6 mph (c) 2 mph (d) 1 mph
17. How much work is done on 75N bowling ball when you lift it 1 m? What power is expended if you lift it this distance in 1 sec? (a) 75 N (b) 75 Joules (c) 25 N (d) 50 Joules
18. A car moving at 50 km/h skid 15 m with locked brakes. How far will the car skid with locked brakes at 150 km/h? (a) 45 m (b) 90 m (c) 135 m (d) 180 m
19. If force-in = 2N, force-out = 10N, then AMA is? (a) 10 (b) 5 (c) 1 (d) 20
20. Due to friction, a constant force of 100 Newtons is needed to slide a box across a room. If the box moves 3 meters, how much work is done? (a) 100 Joules (b) 300 Joules (c) 100 N (d) 300 N
21. Michael drove on the freeway 50 mph (= 22.35 m/sec). The mass of the car is 2000 kg. It has to stop in 10 sec. What is the impact force? (a) -4470 N (b) -2000 N (c) 4470 N (d) 2000 N
22. A ball is thrown horizontally from a cliff at a speed of 10 m/s. What is its speed 1 second later. (a) 10 m/sec (b) 9.8 m/sec (c) 14 m/sec (d) 20 m/sec
23. Suppose you throw a ball straight up into the air with an initial speed of 25 m/sec, how long will it reach to the highest pt? (a) 1 sec (b) 2 sec (c) 2.55 sec (d) 5.1 sec
24. Calculate the force of gravity between the Earth (mass =  $6 \cdot 10^{24}$  kg) and the sun (mass =  $2 \cdot 10^{30}$  kg, distance =  $1.5 \times 10^{11}$  m) (a)  $35.573 \times 10^{21}$ N (b)  $35.573 \times 10^{18}$ N (c)  $35.573$  kg (d)  $71.146 \times 10^{21}$ N
25. Find the density of a 5-kg solid cylinder. The cylinder is 10 cm tall and has a radius of 3 cm. (a) 17.7 kg/m<sup>3</sup> (b) 17.7 g/cm<sup>3</sup> (c) 17.7 kg/cm<sup>3</sup> (d) 17.7 g/cm
26. The inertia of a body may be expressed in terms of it's a) mass b) speed c) acceleration d) all of the preceding

27. Unless acted upon by an unbalanced force, an object will a) remain at rest b) remain in motion with a constant velocity c) change its inertia d) either (a) or (b) depending on initial conditions
28. Kinetic friction is generally \_\_\_\_\_ static friction. a) Less than b) More than c) better than d) equal to
29. An automobile is traveling due east on an interstate highway at a constant velocity of 65 miles per hour. The unbalanced force acting on the car with respect to the highway is a) Toward the east b) Toward the west c) Directed vertically d) Zero
30. The unit of power in the SI is the a) Newton b) horsepower c) joule d) watt
31. The combustion of gasoline involves the release of a) electrical energy b) chemical energy c) Electromagnetic energy d) radiant energy
32. The total energy is conserved in a) a conservative system b) a nonconservative system c) the universe d) all of the preceding
33. When the efficiency of a machine is increased a) the work output increases b) the work input is increased c) perpetual motion occurs d) the total energy is not conserved
34. For momentum to be conserved there must be an absence of a force that is a) unbalanced b) external c) internal d) both (a) and (b)
35. Automobile air bags protect passengers during collisions by a) reducing the impulse b) decreasing the impulse time and increasing the impulse force c) increasing the impulse time and decreasing the impulse force d) decreasing both the impulse time and force
36. When objects stick together after collision a) the momentum is not conserved b) the momentum is zero c) the collision is completely inelastic d) the collision is elastic
37. Impulse does not depend on a) force b) contact time c) temperature d) velocity
38. Uniform circular motion requires a) centripetal acceleration b) centripetal force c) tangential velocity d) all of the preceding
39. The orbits of the planets have the following shape(s): a) circle b) square c) ellipse d) a variety of shapes
40. The laws of planetary motion were developed by a) Newton b) Galileo c) Brahe d) Kepler
41. If air resistance is a factor in a horizontal projection or a projection at an angle, the range of the projectile would be a) greater b) less c) the same
42. The force of gravity a) keeps the moon in orbit b) causes us to have weight c) produces ocean tides d) all of the preceding
43. The acceleration due to gravity,  $g$ , a) does not depend on the mass of an object b) is a universal constant c) increases with altitude d) does not depend on the mass of the Earth
44. A location in a gravitational field is a) on a line of force b) the gravitational force per unit mass at that point c) the acceleration due to gravity at that point d) all of the preceding
45. To be truly weightless would require a) micro gravity b) zero gravity c) a  $g$  of force d) a gravitational field
46. If every particle of a body moves in circles about a fixed axis of rotation, it is a) in translational motion b) in rotational motion c) in rolling motion d) at rest
47. The torque on a body can be increased by increasing the a) lever arm b) force c) inertia d) both (a) and (b)
48. A marble in a bowl is in a) unstable equilibrium b) stable equilibrium c) both (a) and (b) d) neither (a) nor (b)
49. The time rate of change of angular velocity is known as angular a) momentum b) rotational velocity c) acceleration d) inertia
50. An atomic species is defined by the number of a) electrons b) protons c) neutrons d) both (b) and (c)