

Your semester grade is determined by counting your accumulated semester classwork as 4/5 and the semester final as 1/5 of the final grade. The comprehensive semester test will cover all of the topics we have studied since winter vacation, including:

friction
 linear momentum
 uniform circular motion
 the law of universal gravitation
 rotation
 work, energy, and power
 electrostatics
 electrical circuits
 magnetism
 electromagnetism

The semester test will consist of around twenty multiple choice items. Consequently, partial credit will not be possible on this test. The items will include both conceptual questions and math problems. The basic physics equations listed below will be provided on the test.

Complete the practice final and then review your old test and quiz questions and your notes for any weak areas you identify.

PRACTICE FINAL

(Answers are given after the last question. Your final will be around 20 questions.)

electron mass = 9.11×10^{-31} kg
 proton mass = 1.67×10^{-27} kg
 elementary q = 1.60×10^{-19} C
 $G = 6.67 \times 10^{-11}$ Nm²/kg²
 $k = 9.00 \times 10^9$ Nm²/C²

$$F = ma$$

$$F_f \leq \mu N$$

$$F_c = \frac{mv^2}{r}$$

$$a_c = \frac{v^2}{r}$$

$$F_s = k \Delta x$$

$$W = F_{\perp} d = \Delta E$$

$$P = \frac{W}{t}$$

$$U_g = mgh$$

$$K = \frac{1}{2}mv^2$$

$$U_s = \frac{1}{2}kx^2$$

$$\tau = F_{\perp} d$$

$$F_g = \frac{Gm_1m_2}{d^2}$$

$$F = \frac{kq_1q_2}{d^2}$$

$$\mathcal{E} = \frac{F}{q}$$

$$\mathcal{E}_{pt.charge} = \frac{kq}{d^2}$$

$$V = \frac{W}{q} = \mathcal{E}d$$

$$C = \frac{q}{V}$$

$$V = IR$$

$$P = IV$$

$$\frac{1}{R_{T1}} = \sum \frac{1}{R_i}$$

$$F = qvB$$

$$F = BIL$$

$$V = BLv$$

$$d = v_i t + \frac{1}{2}at^2$$

$$v_f = v_i + at$$

$$v_f^2 = v_i^2 + 2ad$$

$$\bar{v} = \frac{d}{t} = \frac{v_i + v_f}{2}$$

$$v_{circular} = \frac{2\pi r}{T}$$

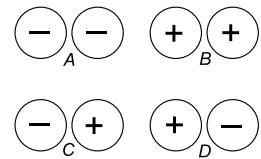
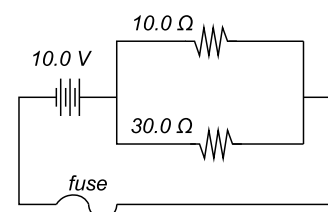
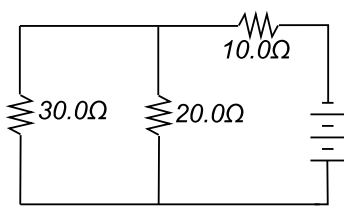
$$p = mv$$

- _____ 1. Velma Vector weighs 500 N and sits on a see-saw 1.5 m from the fulcrum. The see-saw balances when Victor Velocity sits 1.0 m from the fulcrum. How much does Victor weigh?
 a) 380 N b) 650 N c) 750 N d) 880 N

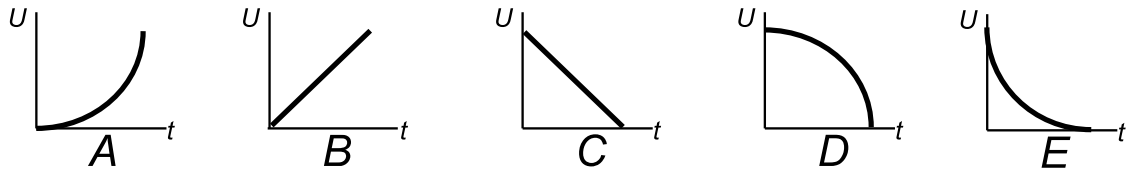
- _____ 2. A pump raises 10.0 liters of water per minute from a depth of 100 m. What is the power of the pump? (A liter of water has a mass of 1.00 kg.)
 a) 81.7 W b) 163 W c) 327 W d) 653 W

- _____ 3. Consider the single electron zipping around the single proton in a hydrogen atom at a typical distance of perhaps 5.28×10^{-11} m. What is the electrical attraction between the particles?
 a) 8.26×10^{-8} N b) 2.27×10^{39} N c) 3.64×10^{-47} N d) 5.17×10^{11} N

- _____ 4. A person prevents a 7500 N car with its brakes released from rolling down a hill by pushing on the car with a force of 250 N. How much work has the person done?
 a) 0 J b) 5.0×10^3 J c) 150,000 J d) 3.0×10^5 J

- _____ 5. If two automobile headlights are connected in parallel to a 12.0 V battery and the resistance of each bulb is $3.00\ \Omega$, how much current passes through each bulb?
 a) 2.00 A b) 4.00 A c) 8.00 A d) 36.0 A
- _____ 6. A negatively charged rod is brought near the right hand side of two neutral metal spheres that are touching one another. The spheres are then separated with charges as shown at right. Which pair of spheres shows the correct charges? (The spheres are insulated from the ground.)
- 
- _____ 7. A charge of $+2.0q$ is located 2.0 meters to the right of point P. Where would you have to place a charge of $-1.0q$ so the electric field at point P would be zero?
 a) 1.4 m right of P b) 1.4 m left of P
 c) 1.0 m left of P d) 1.0 m right of P
- _____ 8. What is the smallest possible fuse that will not blow in the circuit shown?
- 
- a) 0.250 A b) 0.500 A
 c) 0.667 A d) 1.33 A
- _____ 9. Momentum is conserved for a system only if...
 a) all internal forces are balanced.
 b) all external forces sum to zero.
 c) internal and external forces cancel each other out.
 d) any collisions are elastic.
- _____ 10. How much work must an engine do to accelerate a 500 kg car from rest to 15.0 m/s?
 a) 7,500 J b) 24,500 J c) 56,300 J d) 73,500 J
- _____ 11. In the complex circuit shown at right, what is the total effective resistance?
- 
- a) $60.0\ \Omega$ b) $40.0\ \Omega$
 c) $32.0\ \Omega$ d) $22.0\ \Omega$
- _____ 12. An electron is passing through a magnetic field of 0.0050 tesla at a right angle to the field. If the electron is accelerated at $8.9 \times 10^{16}\ \text{m/s}^2$ by the field, what was the electron's original speed?
 a) $1.0 \times 10^8\ \text{m/s}$ b) $1.5 \times 10^8\ \text{m/s}$
 c) $2.5 \times 10^8\ \text{m/s}$ d) $3.0 \times 10^8\ \text{m/s}$
- _____ 13. Which alteration would **NOT** increase a parallel-plate capacitor's capacitance?
 a) decreasing the plate separation b) inserting a polarized insulator between the plates
 c) decreasing the voltage d) increasing the plate area
- _____ 14. You are driving a car and make a sharp turn to the right. The net force on you is...
 a) unbalanced and to the left. b) unbalanced and to the right.
 c) balanced and to the left. d) balanced and to the right.
- _____ 15. If a wire carries conventional current towards the east, it will be pushed _____ by the earth's magnetic field.
 a) upward b) downward c) south d) nowhere
- _____ 16. A DC motor must have a commutator because...
 a) otherwise it would oscillate back and forth.
 b) without it the current and forces would alternate.
 c) otherwise it would only turn partway and then stop.
 d) the current must be made to flow only in one direction.
- _____ 17. Which alteration will **NOT** increase the strength of an electromagnet?
 a) increasing the number of turns in the coil
 b) increasing the current in the coil
 c) inserting a core material that can be magnetized but has a low coercivity
 d) increasing the diameter of the coil

- _____ 18. Which statement corresponds to a series circuit?
 a) The voltage drop over each element is the same.
 b) The total resistance of the circuit is less than any of the individual resistances.
 c) The current through each element is the same.
 d) Even if one element fails, all other elements will remain active.
- _____ 19. A spring with a force constant of 175 N/m is stretched 0.250 m. How much kinetic energy could this spring impart to a mass?
 a) 43.8 J b) 10.9 J c) 5.47 J d) 0.000357 J
- _____ 20. A girl swings a sling with a stone in it over her head in a horizontal circle. The centripetal acceleration of the stone is 90.0 m/s^2 . The girl was swinging it around twice every second. How long is the sling?
 a) 9.12 m b) 0.570 m c) 0.0444 m d) 0.0222 m
- _____ 21. Suppose the moon's mass were twice as large and twice as far from the earth as it is presently. Its pull on the earth would be _____ as large as it is now.
 a) half b) twice c) four times d) one-fourth
- _____ 22. A pole vaulter needs to clear a pole that is 5.00 m above his center of gravity, at a speed of 2.00 m/s. How fast must he be running when he begins the vault?
 a) 2.00 m/s b) 5.05 m/s c) 10.0 m/s d) 10.1 m/s
- _____ 23. Mr. M hooked Fluffy across a 12.0 V battery and a current of 0.0500 A flowed for 6.00 hours. How much energy did Fluffy receive?
 a) 0.600 J b) 3.60 J c) 216 J d) 13,000 J
- _____ 24. A ball is dropped from rest to the ground. If ground level is where the potential energy U is taken to be zero, which of the graphs below best represents the ball's potential energy as a function of time t ?



- _____ 25. An object is pulled at a constant speed across a surface with a coefficient of sliding friction μ_K by a force T applied at an angle θ above the horizontal. What is the size of the frictional force?
 a) $\mu_K(mg - (T \cos \theta))$ b) $\mu_K(mg - (T \sin \theta))$ c) $\mu_K mg$ d) $T \cos \theta$ e) both **b** and **d**
- _____ 26. A motorcycle of mass m accelerates as fast as possible. What is its speed after a time t in terms of the appropriate coefficient of friction?
 a) $gt\mu_K$ b) $mt\mu_K$ c) $gt\mu_S$ d) $mt\mu_S$
- _____ 27. Which statement is correct?
 a) $F_{fS} \geq \mu_S N$ b) $F_{fK} \leq \mu_K N$ c) $F_{fS} = \mu_S N$ d) $F_{fK} < \mu_S N$

1. c
 2. b
 3. a
 4. a
 5. b
 6. c
 7. a
 8. d
 9. b
 10. c
 11. d
 12. a
 13. c
 14. b
 15. a
 16. c
 17. d
 18. c
 19. c
 20. b
 21. a
 22. d
 23. d
 24. d
 25. e
 26. c
 27. d

ANSWERS