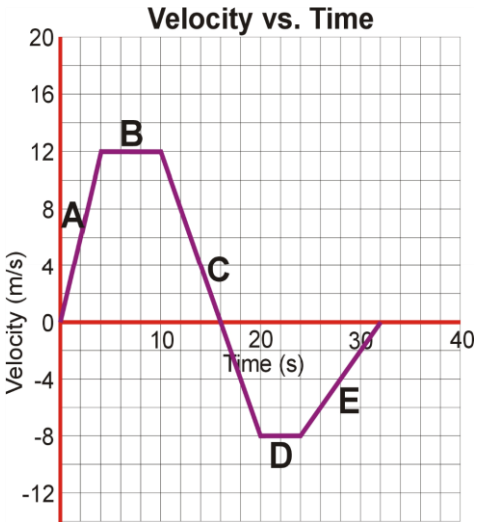
Mrs. Welter's Physics 30: Final Exam Review Suggestions

Please note that you are responsible for all material that has been discussed or assigned within this course. The final exam will consist of, but is not limited to, the material and topics listed below. Use the topics below as a place to start your studying!

Unit: Kinematics

1. (a) Distinguish between: a. distance and displacement b. speed and velocity
   (b) You run from your house to a friend's house that is 3 km [E] in 30 minutes. You then immediately walk home, taking 1 hour on your return trip. Calculate the distance and displacement experienced. [6 km; 0]
   (c) Your average speed for the entire trip was ____, while your average velocity for the entire trip was ____. [4 km/h; 0]
2. In a training for a triathlon, Oliver swam 2.9 km [E], then cycled 8.6 km [S 21◦ E], and finally ran 1.2 km [N 15◦ E]. Use the vector component method to find Oliver's displacement. [9.3 km [S 42◦ E]]



3. (a) Determine the acceleration of the object during sections A and C represented by the graph. [A = +3 m/s^2, C = -2 m/s^2]
   (b) Determine the displacement after 32 s. [+52 m]
4. If an object is moving eastward and slowing down, then the direction of its velocity vector is ____. If an object is moving eastward and slowing down, then the direction of its acceleration vector is ____.
5. A car accelerates uniformly along a straight road at 6.0 m/s^2 east to a final velocity of 16.0 m/s east in 5.0 s. What is the initial velocity of the car? [14 m/s [W]]
6. A car accelerates at 2.7 m/s^2 for 5.4 s, reaching a speed of 18 m/s. During the period of the acceleration, what distance does the car travel? [58 m]
7. A car traveling at 20.0 m/s when the driver sees a child standing in the road. He takes 0.80 s to react, then steps on the brakes and slows at 7.0 m/s^2. How far does the car go before it stops? [45 m]
8. (a) What is meant by projectile motion?
   (b) An object is dropped from a cliff 12 m high. How long before the object hits the ground below? [1.6 s]
   (c) A kid at the top of a cliff throws a ball straight up so that it just misses him on the way down. It falls to the base of the cliff striking the water at 22 m/s. The ball was thrown upward at 9.0 m/s. Assume the effect of air resistance is negligible. How high is the cliff? [21 m]

Unit: Dynamics

9. An object moves horizontally at a constant velocity. Is there a net force? Explain.
10. State Newton's 1st Law of Motion. Why is it often called the Law of Inertia?
11. State Newton's 2nd Law of Motion. If the net force on object is tripled and the mass is doubled, how is acceleration affected? [1.5 x larger]
12. A 3.5 kg mass is pulled to the right over a level surface by a 5.0 N horizontal force. The mass is found to accelerate at 1.0 m/s^2 to the right. What is the magnitude of the frictional force? [1.5 N]

13. A 15 kg block has a constant acceleration of 2.2 m/s^2 down a 30° incline. Draw the FBD and find the magnitude of the friction force on the block. [41 N]

14. A 45 kg toboggan and rider accelerate on level snow at -0.53 m/s^2. Draw the FBD and calculate the coefficient of friction between the toboggan and the snow. What type of friction does this represent? [0.054; kinetic]

15. A boy pulls his 15 kg toboggan with a force of 50.0 N along the handle. If the handle is elevated 35° above the horizon, determine the magnitude of acceleration of the wagon is the coefficient of friction is 0.10. [1.9 m/s^2]

16. (a) State Newton's 3rd Law of Motion.
(b) What is reaction to each of the following actions: your foot pushing down and backwards on the floor? a rifle firing a bullet? Which object experiences the greatest acceleration in each situation? Why?

Unit: Circular Motion

15. Explain why an object moving in a circular path has a constant speed but it said to be accelerating at the same time.

16. A 65 kg pilot in a stunt plane performs a vertical loop with a 700.0 m radius. The plane reaches a speed of 210 m/s at the bottom of the loop. What is the upward force on the pilot (F_{lift}) at the bottom of the loop? [4700 N[up]]

17. Suppose that the coefficient of friction between a typical tire and a particular highway surface is 0.75. What should the minimum radius be for curves on this highway if the speed limit is 110 kilometers per hour? Pay attention as to how to derive this formula! [130 m]

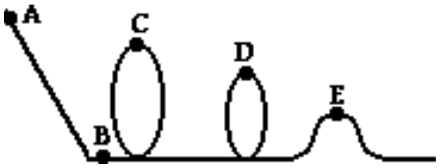
Unit: Energy & Momentum

18. What is the difference between positive, negative and zero work?

19. A child pulls a 7.4 kg toboggan 4.2 m across level ground with a 15 N force that is 34° above the horizontal. What is the work done? [52 J]

20. A 51.7-kg hiker ascends a 43.2-meter high hill at a constant speed of 1.20 m/s. If it takes 384 s to climb the hill, then determine: a. kinetic energy change of the hiker. [0 J]
b. the potential energy change of the hiker. [21900 J]
c. the power delivered by the hiker. [57.0 W]

21. A 510 kg roller coaster car starts at rest at Location A at a height of 32 m. Assuming negligible energy losses to friction and air resistance, determine the speed of the car at location C, which is at a height of 20.0 m. [15 m/s]



22. A 65.8-kg skier accelerates down an icy hill from an original height of 521 meters. Use the work-energy theorem to determine the speed at the bottom of the hill if no energy is lost or gained due to friction or air resistance. [101 m/s]

23. Distinguish between momentum and impulse.

24. A 925 kg car moving at a velocity of 18.0 m/s right collides with a stationary truck of unknown mass. The two vehicles lock together and move off at a velocity of 6.50 m/s right. What is the mass of the truck? [1640 kg]

25. A 50.0 kg object travelling at 6.0 m/s collides with a 25.0 kg object at rest. The object with the greater mass is at rest after the collision. What is the magnitude of the velocity of the 25.0 kg object after the collision? [12 m/s]

Unit: Fields

26. Determine the force of gravitational attraction between the earth and a 70.0 kg physics student if the student is in an airplane at 40000 feet (12, 192 m) above earth's surface. [683 N]

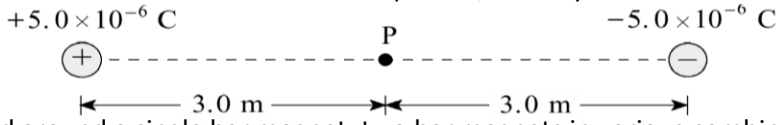
27. Ganymede, the largest natural satellite in the solar system, orbits Jupiter. It has a mass of 1.48×10^{23} kg and an average radius of 2631 km. What is the gravitational field strength on the surface of Ganymede? [$1.43 m/s^2$]

28. A 3200 kg space shuttle is placed in circular orbit at an altitude of 3.00×10^5 m above Earth's surface. What is the shuttle's orbital speed? [7.73×10^3 m/s]

29. Two charges are 0.40 meters apart. One charge is 1.0×10^{-10} C. The other is 3.0×10^{-9} C. Calculate the electric force at the midpoint between these two charges. [1.69×10^{-8} N]

30. Describe the electric field around a single positive charge, a single negative charge, two oppositely charged particles, and two similarly charged particles.

31. What is the magnitude and direction of the electric field at point P, midway between the two fixed charges shown in the diagram below?



[1.0×10^4 N/C]

32. Describe the magnetic field around a single bar magnet, two bar magnets in various combinations, in a straight conductor, in a loop, and in a solenoid.

Unit: Modern Physics

33. Distinguish between classical physics and quantum physics.

34. Describe each of the following phenomena: a. wave-particle duality b. measurement disturbance

35. a. The half-life of a certain radioactive isotope is 20 h. How much of an original 320-g sample will remain the same radioactive isotope after 5 days? [5 g]
    b. You start with 800 grams of a radioisotope. In 36 hours, there are 100 grams left. What is the half-life of this radioisotope? [12 h]

37. Complete the following table:

Type of Radiation	Symbol & Charge	Penetrating Power	Ionizing Ability	Can be Shielded By	Sample Equation

38. Distinguish between ionizing radiation and non-ionizing radiation.

39. Summarize the three ways in which scientists measure exposure to radiation.

40. Distinguish between fission and fusion. Write a sample equation for each.

41. Explain how a CANDU reactor works (consider discussing chain reaction; critical mass; moderator; coolant; fuel bundle; calandria; control rods; heat exchanger; and turbine), making sure to note its safety features.

Exam Format 50 Multiple Choice (1 mark each), 6 short answer questions (5 marks each), Total – 80 marks