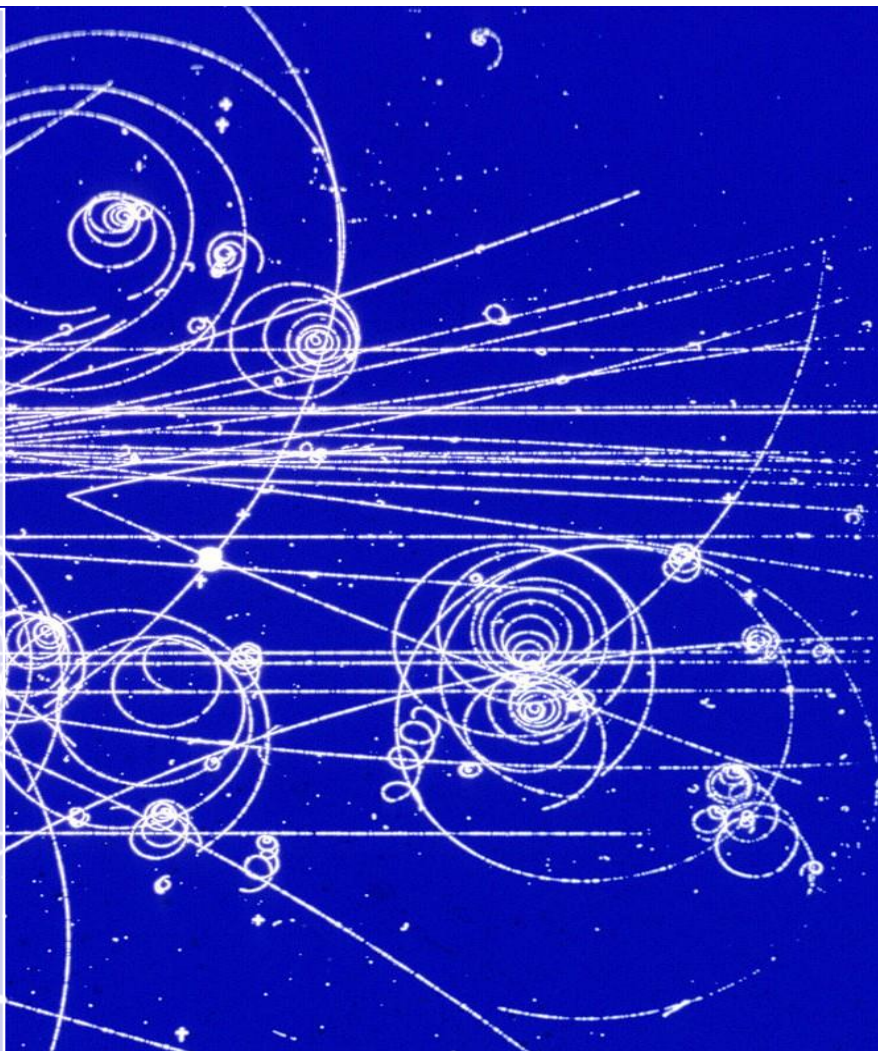


SPH3U – Review Package

Grade 11 University Preparation Physics

[2017-2018]



SPH3U – REVIEW PACKAGE

This package contains selected problems from each of the units studied this term in Grade 11 University Preparation Physics. This is just a sampling of problems; to study completely go through your notes and old evaluations for more review.

Units Covered:

- Electricity & Magnetism
- Kinematics
- Dynamics
- Work, Energy and Power
- Waves & Sounds

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Exam Preparation

Name: _____

Date: _____

Review Notes & Equations

- Make short review notes for each of the units
- Download and review the online equation sheet; to be used during the exam

Kinematics

1. An airplane travels from Calgary to Toronto in 4h 20 min. Find the average speed if the distance between the two cities is 4330 km. [$1.00 \times 10^3 \text{ km/h}$]
2. A train travelling at 100 km/h slows down with an uniform deceleration of 0.60 m/s^2 . How long does it take to stop? [46 s]
3. A bobsled has a constant acceleration of 2.0 m/s^2 , starting from rest.
a) How fast is it going after 5.0 s? b) How far has it travelled in 5.0 s? c) What is the average velocity in the first 5.0 s? d) How far has it travelled by the time its speed has reached 30 m/s? [10 m/s; 25 m; 5.0 m/s; 225 m]
4. A stone is thrown straight down from the top of a cliff with an initial velocity of 6.0 m/s. It reaches the bottom in 3.0 s. How high is the cliff? [62 m]

Dynamics

5. *State in your own words: Newton's first law, Newton's second law, Newton's third law*, the difference between **mass and weight**, what variables affect the **force of friction** on an object, what is meant by **terminal velocity** and **crumple zone**.
6. A 40 kg sprinter starts from rest and 2.0 s later is running at a speed of 8.0 m/s. What is the net force acting on her? [160 N]
7. If it takes a human cannonball 1.8 s to exit a 1.9 m long cannon and the average net force acting on the performer is 159 N, what is the performer's mass? [136 kg]
8. It takes a 50 N horizontal force to pull a 20 kg object along the ground at a constant velocity. What is the coefficient of friction? [0.26]
9. A cart with a mass of 2.0 kg is pulled across a level desk by a horizontal force of 4.0 N. If the coefficient of kinetic friction is 0.12, what is the acceleration of the cart? [0.82 m/s^2]

10. Consider the following situation. A cat on a skateboard is accelerating towards the right. The coefficient of friction is 0.40. The mass of the cat and skateboard is 90-kg. Four independent horizontal forces are acting on the cat. 100N [down], 400N [left] , 40N [up] and a larger unknown fourth force is pushing to the right. If it was found that the cat started at a slow speed of 5 m/s and covered a distance of 100m in a time of 5 seconds, determine the size of the fourth horizontal force. [be careful finding the acceleration; use one of the kinematics equations]

Work, Energy & Power

11. What is the gravitational potential energy of a 230 g bird flying 1 km off the surface of the earth? [2254 J]
12. What is the speed of a car that has a mass of 985 kg and a kinetic energy of 56 000 J? [38 km/h]
13. What initial velocity is required, at the ground, so that an object will reach a maximum height of 9 m? (use conservation of energy equations) [13.3 m/s]
14. A 1000 kg car changes its velocity from 10 m/s to 24 m/s in 8 s. Calculate the work and power of the engine. [2.4×10^5 J ; 30 kW]
15. A crate of mass 50 kg is being pulled with a force of 30 N at an angle. The work done to pull the crate 15 m was 300 J. At what angle was the crate being pulled? [48°]
16. A person carries a 50 kg object up a flight of stairs. There are ten stairs; each step is 30 cm high and 30 cm deep. How much work is done to carry the object to the top of the stairs? [1.47 kJ]
17. A roller-coaster cart (250 kg) is traveling at 5 m/s on the track that is 20 m above the ground. Calculate how fast is it traveling if it drops down a hill 6 m (it is therefore only 14 m from the ground at this point)? [12 m/s]
18. During an investigation, 300.0g of iron is heated to 78.0°C . The hot silver is then placed into 600.0g of water that has an initial temperature of 5.0°C . Determine the final temperature of the iron-water mixture.
19. A beaker of water ($c = 4200$) containing 500mL of water ($1\text{mL} = 1\text{g}$) is heated from 20°C to 89°C . Calculate the energy required to do this.
20. A 2kg unknown piece of steel is heated from 10°C to 40°C . This required 45 KJ of energy. Calculate the specific heat capacity of the metal.
21. A beaker containing 600g of methyl alcohol is heated. The initial temperature was 20°C . Calculate the final temperature if 7.5 KJ of energy are input into it.

Waves & Sound

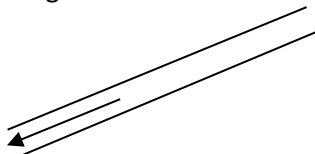
22. Calculate the speed of sound if the air temperature is 27°C .
23. A plane is flying at Mach 3 through air that has a temperature of -36°C .
24. A tuning fork is vibrating at 500 Hz in room that has a temperature of 22°C . Calculate the wavelength of the sound.
25. Standing waves are produced in a string by two waves traveling in opposite directions at 6.0 m/s. The distance between the second and sixth node is 80 cm. Determine the wavelength and frequency of the original waves. [40 cm; 15 Hz]
26. A closed tube 50.0 cm long resonates at its shortest resonant length (fundamental frequency) with a tuning fork at an air temperature of 25°C . (at one end)
a) What is the wavelength? b) What is the frequency of the tuning fork? C) What is the frequency of the third harmonic? [200 cm; 174 Hz; 520 Hz]
27. A 250 Hz tuning fork is sounded along with a note of unknown frequency. 3 beats per second are heard. What are the possible frequencies of the unknown note? [253 Hz or 247 Hz]
28. The temperature is 22°C and a car is honking its horn at a frequency of 450 Hz. You perceive a frequency of 500 Hz. Is the car moving towards you or away? How fast is the car traveling relative to you? [towards ; 124.3 km/h]
29. The second resonance length in an open air column is found to be 65 cm. A tuning fork of frequency 500 Hz was used to do the experiment. What is the air temperature? [-12°C]

Electricity & Magnetism

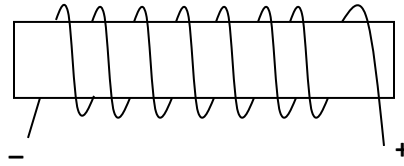
30. Describe the **domain theory of magnetism**, use diagrams to help communicate your understanding, also state the name given to materials that can be magnetized.
31. Determine current direction in each case below



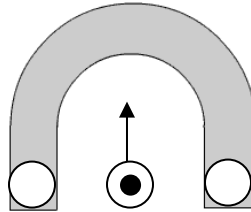
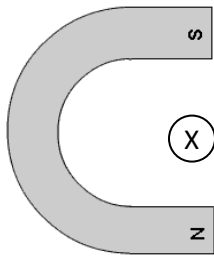
32. Use the right hand rule to sketch the direction of the magnetic field created by the current in the following conductors.



33. For each current-carrying coil, sketch the view of the magnetic field around the coil, based on the direction of current flow shown. If applicable, label the polarity (north and south) of the electromagnet.



34. Describe the **motor principle** (use diagrams if necessary)
35. Fill in the missing information for the diagrams below. (i.e. Magnetic field lines, force on the conducting wire, poles of the horseshoe magnet, direction of current in the current carrying conductor).



36. Describe the physics principles behind how **transformers** work. (You must use the term Oersted's Principle and Faraday's law in your description)
37. A transformer is required to adjust the voltage going to a microwave oven. A microwave uses 2200 W of power and draws 44 A of current. The microwave is plugged into a 120 V outlet. If the number of turns on the primary coil in the transformer is 1200, what is the number of turns in the secondary coil?