**FT – Physics II – Example test for examination - Problems**
J.Erhart, Winter semester 2017/2018

Problem topics:
1x Oscillations and waves
1x Heat, gas laws, phase transitions
1x Electricity
1x Magnetisms
1x Optics

1. **What is the phase difference for two points oscillating in wave propagated in one-dimensional waveguide with wavelength 0.5m if their mutual distance is 2m?**

2. **What is minimum speed of lead sphere colliding the steel plate in order to melt by impact? Initial sphere temperature is $27^{o}C$, melting point for lead is $328^{o}C$. Specific heat for lead is 129 $Jkg^{-1}K^{-1}$ and specific latent heat for melting is 23 $kJkg^{-1}$. Assume that all heat generated at impact accounts only for sphere heating without any losses.**

3. **Four charges of ±1nC are placed in the corners of square with 6cm edges. Calculate magnitudes and find directions for the electric field and electric potential in the center of square generated by these charges in vacuum. Solve the problem for following charge polarity arrangements:**
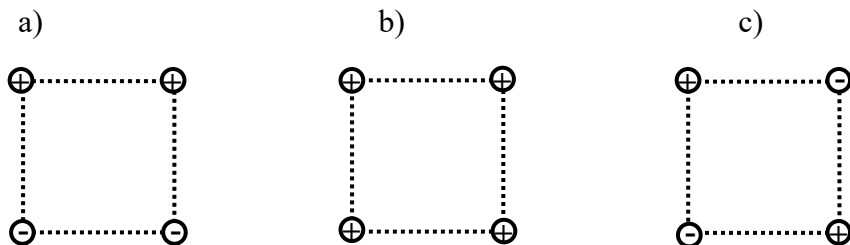
4. **Two long direct conductors are parallel and find themselves at mutual distance of 16cm. Current 4A flows in each conductor. Draw a picture and calculate magnitude of magnetic field induction generated in the center between these two conductors for following current orientations:**
   a) Currents are parallel
   b) Currents are antiparallel.

5. **Thin lens made from glass with refractive index 1.5 has optical power of 5 Diopters in air. What is optical power of this lens if submerged into water with refractive index 4/3?**

FT – Physics II – Example test for examination – Theory
J.Erhart, Winter semester 2017/2018

10 questions from topics:
1x oscillations, 1x waves, 1x heat, 1x gas laws, thermodynamics, 2x electricity, 2x magnetism, 1x optics, 1x nuclear physics.

1. **Write formula for the oscillation period of body on spring, explain used quantities and state their units.**

2. **Specify relationship between wavelength, phase velocity and wave frequency, explain used quantities and state their units.**

3. **Define specific latent heat for boiling phase transition, state its unit.**

4. **Write ideal gas law, explain used quantities and state their units.**

5. **Specify relationship of conductor resistance on its length and crossection, explain used quantities and state their units.**

6. **Write Kirchhoff laws for electrical circuit. Explain what is branch and node in circuit.**

7. **Write formula for Lorentz magnetic force, draw a picture with its orientation, explain used quantities and state their units.**

8. **Define magnetic flux, specify Faraday's law of electromagnetic induction, explain used quantities and state their units.**

9. **Specify lens equation for convergent lens, draw picture of ray tracing for object imaging by such lens, explain used quantities.**

10. **Specify radioactive decay law, explain used quantities and state their units.**