



**MATURITNÍ TÉMATA**

Školní rok:	2024/2025		
Ředitel školy:	PhDr. Karel Goš		
Předmětová komise:	Fyzika		
Předseda předmětové komise:	RNDr. Iva Stránská		
Předmět:	Physics		
	VI. A <sub>6</sub>	RNDr. Iva Stránská	
	VI. B <sub>6</sub>	RNDr. Iva Stránská	
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**1. Kinematics**

- *relativity of motion*
- *types of motion according to trajectory and speed*
- *kinematics of linear motion and steady circular motion*
- *adding velocities*
- *basic postulates of STR, kinematics in special theory of relativity*

**2. Dynamics**

- *momentum, momentum conservation*
- *friction*
- *Newton's laws*
- *force of inertia, rotating systems*
- *dynamics in special theory of relativity*

**3. Work and power**

- *mechanical work, average and instantaneous mechanical power*
- *work done in stretching elastic materials*
- *work done by(on) a gas*
- *work and power in direct and alternating current circuits*

#### **4. Energy and efficiency**

- *mechanical energy*
- *energy conservation, conservation of mechanical energy*
- *internal energy of a body*
- *energy is special theory of relativity*
- *efficiency*

#### **5. Gravitational field**

- *Newton's law of Universal gravitation*
- *gravitational potential, gravitational field strength*
- *central and uniform gravitational field*
- *motion in central and uniform gravitational field*
- *Solar System, Kepler's laws*

#### **6. Mechanics of solids**

- *moment of a force*
- *a couple of forces*
- *equilibrium conditions*
- *kinetic energy of rotating objects, inertia*

#### **7. Mechanics of fluids**

- *ideal and real fluids*
- *pressure in a fluid, upthrust*
- *moving fluids*
- *real fluids, viscous drag*

#### **8. Kinetic theory and thermodynamics**

- *basic ideas of the kinetic theory*
- *temperature measurement*
- *internal energy and its changes*
- *heat exchange, calorimetric equation*
- *1<sup>st</sup> and 2<sup>nd</sup> Law of Thermodynamics*

#### **9. Structure and properties of gases**

- *ideal gas, root-mean-square speed of its molecules*
- *equation of state*
- *isothermal, isovolumetric, isobaric and adiabatic process*
- *2<sup>nd</sup> Law of thermodynamics and the processes*
- *heat engines*

#### **10. Structure and properties of liquids**

- *surface tension as a phenomenon and physical quantity*
- *capillarity, bubbles and drops*
- *thermal expansion of liquids*

### **11. Structure and properties of solids**

- *crystalline and amorphous solids*
- *dislocations*
- *Hooke's law*
- *thermal expansion of solids*

### **12. Changes in states of matter**

- *difference between the process of melting in amorphous and crystalline substances*
- *melting, vaporization and sublimation and outer pressure*
- *evaporation and boiling, saturated vapour*
- *specific latent heat*
- *phase diagram*

### **13. Simple harmonic motion**

- *basic quantities, links with steady circular motion*
- *displacement, speed and acceleration of s.h.m.*
- *free and forced oscillations*
- *resonance and its uses*

### **14. Mechanical waves and sound**

- *mechanical and electromagnetic waves*
- *types of mechanical waves, examples*
- *sound properties*
- *sound recording, infrasound and ultrasound*

### **15. Electric field**

- *electric charge*
- *Coulomb's law and Newton's law*
- *electric potential, electric field strength*
- *work in uniform electric field*
- *capacitance, capacitors – types*

### **16. Electric current in metals**

- *conduction in metals and temperature changes*
- *Ohm's law*
- *Kirchhoff's laws*
- *measurement of current and voltage*
- *electromotive force and internal resistance*

### **17. Electric current in semiconductors**

- *types of semiconductors*
- *resistance of semiconductors and temperature change*
- *PN junction*
- *semiconductor components*

## **18. Electric current in gases and liquids**

- *conduction in gases and liquids – comparison with metals and semiconductors*
- *AV characteristic of a discharge in the air*
- *discharge at standard pressure, lower pressure and discharge in gases*
- *conduction in liquids – Faraday's laws*
- *uses of conduction in liquids and gases*

## **19. Matter and field interactions**

- *force between a magnet and current carrying conductor*
- *force between two current carrying conductors*
- *force on a charged particle moving in a magnetic field*
- *types of magnetic materials, permeability*
- *conductor and insulator in electric field, permittivity*

## **20. Electromagnetic induction**

- *electromagnetic induction, Faraday's and Lenz's law*
- *eddy currents*
- *self-induction*
- *uses of elmag. induction – generators, transformers*

## **21. Alternating current**

- *alternating current – production, uses*
- *root-mean-square values of a.c.*
- *RLC in series*
- *rectification and smoothing of a.c.*

## **22. Electromagnetic waves and oscillations**

- *LC oscillatory circuit, natural frequency*
- *electrical oscillations and tuning circuits*
- *types of waves, comparison of mechanical and electromagnetic wave*
- *production of electromagnetic wave*
- *types of electromagnetic radiation, sources, uses*

## **23. Geometrical optics**

- *reflection, mirrors, mirror equation, ray diagrams*
- *refraction, absolute refractive index, lenses, thin lens equation, ray diagrams*
- *dispersion, conditions*
- *the eye, subjective and objective optical instruments*

## **24. Wave optics**

- *interference, Young's double slit experiment*
- *importance of interference experiments as proof of wave nature of light*
- *diffraction, diffraction grating*
- *polarization – making polarized light, uses*

## **25. Atomic physics**

- *cathode rays, their properties and behaviour in electric and magnetic field*
- *photoelectric effect*
- *X-rays*
- *wave-particle duality*
- *models of atom, line spectra*

## **26. Nuclear physics**

- *nucleus*
- *mass defect and bonding energy*
- *nuclear reactions*
- *radioactivity – types, detectors*
- *nuclear decay and fission*
- *nuclear reactors, construction, safety*