

**1. Which group of units involves only base SI units?**

- a) K, cd, kg      b) s, N, T      c) kg, V, W      d) K, W, dB  
e) no answer is correct

**2. Which quantity has units  $[\text{kg}\cdot\text{m}^{-3}]$ ?**

- a) force      b) velocity      c) acceleration      d) angular velocity  
e) no answer is correct

**3. Which quantity has units  $[\text{N}\cdot\text{m}]$ ?**

- a) liquid surface tension      b) power      c) acceleration      d) pressure  
e) no answer is correct

**4. 1 tonne (metric ton) is the same as:**

- a) 100 kg      b)  $10^{12}$   $\mu\text{g}$       c)  $10^9$  ng      d)  $10^{12}$  pg      e) no answer is correct

**5. A rocket accelerates constantly from rest for 10 s. During this time it travels 10 000 m. What is its final velocity?**

- a)  $2000 \text{ m}\cdot\text{s}^{-1}$       b)  $750 \text{ m}\cdot\text{s}^{-1}$       c)  $500 \text{ m}\cdot\text{s}^{-1}$       d)  $250 \text{ m}\cdot\text{s}^{-1}$       e) no answer is correct

**6. A car accelerates from rest with a constant acceleration of  $8 \text{ m}\cdot\text{s}^{-2}$  for 10 s. What distance will it travel during this time?**

- a) 200 m      b) 20 m      c) 1000 m      d) 400 m      e) no answer is correct

**7. What work is done when slowly letting down a 20 kg object into a hole 5 m deep? Assume a free-fall acceleration of  $10 \text{ m}\cdot\text{s}^{-2}$ .**

- a) 2000 J      b) 2000 W      c) 1000 J      d) 1000 W      e) no answer is correct

**8. A man of mass 100 kg goes upstairs to the 3<sup>rd</sup> floor which is 12 m above ground level. If he takes 12 s what is his minimum mean power? (Assume a free-fall acceleration of  $10 \text{ m}\cdot\text{s}^{-2}$ )**

- a) 120 W      b) 12000 W      c) 1000 W      d) 100 J      e) no answer is correct

**9. A piston is driven by an engine of power 10 W. The piston exerts a force of 1 kN for 10 s. What is the displacement of the piston during this time?**

- a) 100 m      b) 10 m      c) 1 m      d) 0.1 m      e) no answer is correct

**10. What is the angular velocity of a particle doing uniform circular motion, when it does the whole circle in 0.1 s?**

- a) 0.1 Hz      b) 10 Hz      c)  $20\pi \text{ rad}\cdot\text{s}^{-1}$       d)  $10\pi \text{ rad}\cdot\text{s}^{-1}$       e) no answer is correct

**11. The positions of two particles initially at a distance  $r$  from one another were changed so that the gravitational force between them increased 100-times. What is the new distance between them?**

- a)  $r/100$       b)  $r/10$       c)  $100r$       d)  $10r$       e) no answer is correct

**12. Archimedes' principle is the basic principle of:**

- a) the hydraulic lever      b) ballooning      c) the mercury barometer  
d) surface tension      e) no answer is correct

**13. The force buoying up an object in a liquid (buoyant force acting upward) depends on:**

- a) the mass of the immersed object
- b) the free-fall acceleration
- c) the density of the immersed object
- d) the total volume of the liquid
- e) no answer is correct

**14. An aluminum cube is put into a water-filled vessel. It may float if:**

- a) the water is heated to 99 °C.
- b) the water is magnetized.
- c) the water is replaced by mercury.
- d) the water surface tension is increased.
- e) no answer is correct

**15. The force due to liquid pressure acting on the bottom of a water-filled vessel is proportional to only:**

- a) the bottom area and depth.
- b) the depth of water and liquid density.
- c) the liquid density and free-fall acceleration.
- d) the depth of water, liquid density and free-fall acceleration.
- e) no answer is correct

**16. Water flows through a pipe at speed of 10 m.s<sup>-1</sup>. What is the new flow speed in a section of the pipe where the radius is half the original radius? Consider water an ideal liquid with density of 1000 kg.m<sup>-3</sup>.**

- a) 5 m.s<sup>-1</sup>
- b) 2.5 m.s<sup>-1</sup>
- c) 20 m.s<sup>-1</sup>
- d) 40 m.s<sup>-1</sup>
- e) no answer is correct

**17. The magnitude of the velocity of a body doing simple harmonic oscillations is:**

- a) maximum when reaching maximum displacement
- b) minimum when reaching zero displacement
- c) maximum when reaching zero displacement
- d) constant
- e) no answer is correct

**18. A simple harmonic oscillator reaches minimum kinetic energy:**

- a) at maximum displacement
- b) at zero displacement
- c) kinetic energy of this oscillator is constant
- d) the oscillator has only potential energy
- e) no answer is correct

**19. Which statement is false?**

- a) We can hear sound waves of frequency 16 - 20 000 Hz.
- b) Sound (intensity) level is given in decibels.
- c) Airborne sound waves are longitudinal mechanical oscillations.
- d) Sound can travel in vacuum.
- e) no answer is correct

**20. What is the main difference between sound and ultrasound?**

- a) the speed of ultrasound is higher than the speed of sound
- b) sound waves are of mechanical character while the ultrasound ones are of electromagnetic character
- c) sound waves are transverse whilst the ultrasound ones are longitudinal
- d) the frequency of sound is higher than the frequency of ultrasound
- e) no answer is correct

**21. The First law of thermodynamics represents:**

- a) a rule describing spontaneous increase of disorder in an isolated system
- b) a rule describing transformation of heat in free energy
- c) a rule describing spontaneous decrease of disorder in an isolated system
- d) a special application of the law of conservation of energy
- e) no answer is correct

**22. Which equation expresses the ideal gas law?**

- a)  $p.V.n = \text{const.}$       b)  $p.V.T = \text{const.}$       c)  $p.V = R.T$       d)  $p.V = n.R.T$   
e) no answer is correct

**23. Which of the following gases or gaseous mixtures has the highest density (under constant temperature and pressure)?**

- a) helium      b) oxygen      c) air      d) carbon dioxide  
e) no answer is correct

**24. The units of heat capacity are:**

- a) J      b)  $\text{J.m}^{-3}$       c)  $\text{J.mol}^{-1}$       d) none, it has no units      e) no answer is correct

**25. Find the false statement. During a reversible adiabatic compression of ideal gas:**

- a) the internal energy is not constant.      b) the volume of the gas decreases.  
c) the product of pressure and volume of the gas is constant.  
d) the pressure of the gas increases      e) no answer is correct

**26. An isothermal reversible process in constant amount of an ideal gas can be described by the equation:**

- a)  $pV = \text{const.}$       b)  $VT = \text{const.}$       c)  $V/(nT) = \text{const.}$       d)  $nRT = \text{const.}$   
e) no answer is correct

**27. Which of the following statements is true?**

- a) Evaporating water releases heat.  
b) Ice absorbs heat during sublimation (evaporation).  
c) Water absorbs heat during condensation  
d) Water vapour absorbs heat during condensation.      e) no answer is correct

**28. The pressure inside a bubble:**

- a) increases as the bubble radius increases      b) does not depend on bubble radius  
c) decreases as the bubble radius increases  
d) reaches its maximum when the bubble bursts      e) no answer is correct

**29. The surface tension of a liquid is measured in**

- a) volts      b) volts per metre      c) volts per metre squared      d) newtons per metre  
e) no answer is correct

**30. The force acting between two electric charges at rest is described by:**

- a) Kirchhoff's laws      b) Faraday's law      c) Ohm's law  
d) Coulomb's law      e) no answer is correct

**31. The capacitance of a capacitor (electric condenser) is:**

- a) inversely proportional to the area of its plates  
b) directly proportional to the distance between its plates  
c) inversely proportional to the permittivity of the medium between the plates  
d) directly proportional to the permittivity of the medium between its plates  
e) no answer is correct

**32. A constant direct electric current of 100  $\mu\text{A}$  passes through a conductor. What is the time necessary for the passage of an electric charge of 5 C?**

- a) 20 s      b) 500 s      c)  $5.10^{-8}$  s      d) more than 10 hours  
e) no answer is correct

**33. When the temperature of an electric conductor increases, then:**

- a) its resistance decreases
- b) its conductance increases
- c) the same value of electric current produces more heat in 1 s
- d) the same value of electric current produces less heat in 1 s
- e) no answer is correct

**34. An electrically charged particle moves in a magnetic field perpendicular to the direction of the magnetic induction vector  $B$ . How does it influence its trajectory?**

- a) It is deflected in the direction of vector  $B$ .
- b) It is deflected in the direction opposite to that of vector  $B$ .
- c) Its movement will be slowed down.
- d) Its speed increases
- e) no answer is correct

**35. The image seen on a TV-screen can be locally deformed by a magnet because:**

- a) the magnet influences trajectory of the electron beam which “draws” on the screen.
- b) the magnetic field deflects photons of visible light.
- c) the luminescent layer of the screen is magnetic.
- d) the magnet attached to the screen influences the orientation of the deflecting coils.
- e) no answer is correct

**36. A converging lens has focal distance of +20 cm. What is its optical power?**

- a) +5 N
- b) +5 W
- c) +5 D
- d) +0,05 D
- e) no answer is correct

**37. Which sentence about the reflection and the refraction of light is *true*?**

- a) the angle of incidence is always greater than the angle of refraction.
- b) the angle of incidence is always equal to the angle of refraction.
- c) the angle of incidence can be smaller or greater than the angle of refraction.
- d) the sum of the angle of incidence and angle of refraction equals to the angle of reflection.
- e) no answer is correct

**38. If a light ray passes from air into water:**

- a) refraction towards the normal occurs.
- b) refraction away from the normal occurs.
- c) no refraction occurs.
- d) total internal reflection occurs.
- e) no answer is correct

**39. Electromagnetic radiation with wavelength longer than infrared radiation is called:**

- a) red light
- b) visible light
- c) ultraviolet light
- d) microwaves
- e) no answer is correct

**40. The photoelectric effect is the:**

- a) transformation of electric energy into light
- b) liberation of electrons from surfaces by incident photons
- c) capture of a photon by a nuclear proton
- d) production of light by an electric discharge (arc)
- e) no answer is correct