

Name of applicant:

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

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

4. 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

5. What work is done when slowly letting down a 20 kg object into a hole 10 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

6. A man of mass 100 kg goes upstairs to the 3rd floor which is 10.5 m above ground level. If he takes 15 s what is his minimum mean power? (Assume a free-fall acceleration of $10 \text{ m}\cdot\text{s}^{-2}$)

- a) 70 W b) 700 W c) 157 500 W d) 700 J
e) no answer is correct

7. 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

8. 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

9. 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

10. 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

11. Water flows through a pipe. In its narrow part, its speed increases to twice that in the wider part of the pipe. What is the ratio of the radii of the wide to narrow parts of the pipe?

- a) 1:4
- b) 4:1
- c) 1:2
- d) 2:1
- e) no answer is correct

12. A simple harmonic oscillator reaches maximum 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

13. 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

14. 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

15. 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

16. An isothermal reversible process in 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

17. Which of the following processes can be considered to be melting?

- a) evaporation of olive oil
- b) setting (hardening) of concrete
- c) drying of frozen laundry
- d) action of bile acids on fats
- e) no answer is correct

18. 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

19. 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

20. Alternating electric current of very low frequency passes through a capacitor, but

- a) poorly
- b) only its positive half-waves
- c) only its negative half-waves
- d) we must use high-quality dielectric in the space between the plates
- e) no answer is correct

21. 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) $5 \cdot 10^{-8} \text{ s}$
- d) more than 10 hours
- e) no answer is correct

22. 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

23. 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

24. 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

25. A converging lens has focal distance of $+20 \text{ cm}$. What is its optical power?

- a) $+5 \text{ N}$
- b) $+5 \text{ W}$
- c) $+5 \text{ D}$
- d) $+0,05 \text{ D}$
- e) no answer is correct

26. 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 is always smaller 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

27. 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

28. Which of the following particles does *not* change their trajectory when it passes through an electric field?

- a) electron, proton, alpha-particle
- b) proton, neutron, photon
- c) electron, photon, meson
- d) neutron, neutrino, photon
- e) no answer is correct

29. The number of neutrons in an atomic nucleus increased by one, without changing the total number of nucleons. It was caused by the:

- a) capture of a neutron
- b) emission of an electron
- c) emission of a positron
- d) emission of an alpha-particle
- e) no answer is correct

30. The photoelectric effect is the:

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