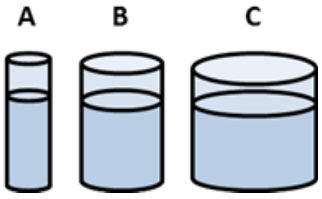
Question **1**

Consider three vessels with different diameters that are filled with same liquid to the same height. In which vessel is the surface tension of the liquid the greatest?

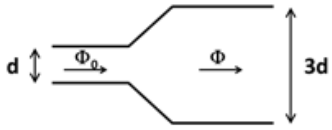


Select one:

- a. A
- b. B
- c. C
- d. in none of them

Question **2**

A pipe has input diameter d. The water flow at the input is Φ_0. Output diameter is 3d. What is the water flow Φ at the pipe output?



Select one:

- a. $1/3\ \Phi_0$
- b. Φ_0
- c. $9\ \Phi_0$
- d. $3\ \Phi_0$

Question **3**

Kinetic friction is always

Select one:

- a. lower that static friction
- b. greater than static friction
- c. zero
- d. equal to static friction

Question **4**

Sound intensity level is measured in

Select one:

- a. dynes
- b. pascals
- c. decibels
- d. pounds

Question **5**

Which of the following is a vector?

Select one:

- a. frequency
- b. distance
- c. work
- d. velocity

Question **6**

Constructive interference happens when two waves are

Select one:

- a. high amplitude
- b. in phase
- c. out of phase
- d. low amplitude

Question **7**

Name the physical quantity that determines the amount of heat needed to warm up 1 kg of a substance by 1 K

Select one:

- a. heat capacity
- b. entropy
- c. specific heat capacity
- d. molar heat capacity

Question **8**

The energy of 1 keV is equal to

Select one:

- a. 1×10^{19} J
- b. 1×10^{3} J
- c. 1.6×10^{-16} J
- d. 1 J

Question **9**

Sublimation is called a change of state

Select one:

- a. from solid to liquid
- b. from liquid to solid
- c. from solid to gas
- d. from liquid to plasma

Question **10**

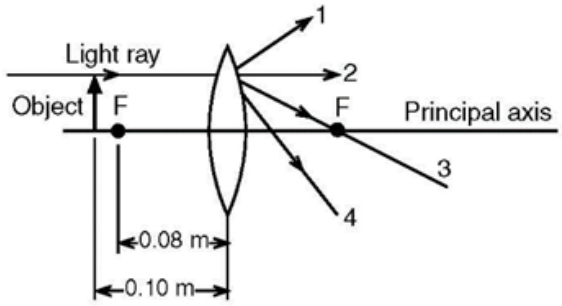
Moving a coil in and out of magnetic field indices

Select one:

- a. none of mentioned
- b. voltage
- c. force
- d. resistance

Question **11**

A converging lens has a focal length of 0.080 meter. A light ray travels from the object placed 0.1 m from the lens parallel to the principal axis. Which line best represents the path of the ray after it leaves the lens?



Select one:

- a. 1
- b. 2
- c. 3
- d. 4

Question **12**

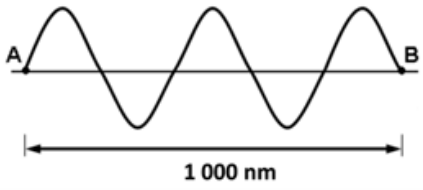
Density of air is

Select one:

- a. 1/8 of water
- b. 1/80 of water
- c. 1/800 of water
- d. 1/8000 of water

Question **13**

In the diagram below, the distance between points A and B on a wave is 1 000 nm. What is wavelength of this wave?



Select one:

- a. 100 nm
- b. 200 nm
- c. 250 nm
- d. 400 nm

Question **14**

Consider three types of the elementary particles neutron, proton and electron. Between which two particles would you expect the highest electric force when they are placed at the same mutual distances?

Select one:

- a. between two electrons
- b. between neutron and proton
- c. between neutron and electron
- d. between two neutrons

Question **15**

When two mechanical waves meet in one point, their displacements

Select one:

- a. destruct each other
- b. add up
- c. cancel out
- d. remain the same

Question **16**

Which graph best represents the motion of an object in the Earth's field that was thrown vertically upward?

Select one:

- a. 

- b. 

- c. 

- d. 

Question **17**

In the reaction $_{11}Na^{24} \rightarrow {}_{12}Mg^{24}$ + X, particle X is a

Select one:

a. neutron

b. proton

c. electron

d. positron

Question **18**

Current through each resistor when they are connected in series is

Select one:

a. same

b. gradually increasing

c. zero

d. different (according to the resistance)

Question **19**

What is the SI unit of magnetic flux?

Select one:

- a. 1 weber
- b. 1 farad
- c. 1 tesla
- d. 1 henry

Question **20**

Gravitational force acting on two point masses is directly proportional to

Select one:

- a. sum of masses
- b. distance between masses
- c. difference of masses
- d. product of masses

Question **21**

Infrasound

Select one or more:

- [ ] a. is used for diagnostic purposes in medicine
- [ ] b. can be transferred through a vacuum
- [ ] c. is a form of electromagnetic radiation
- [ ] d. has the frequency lower than 15 Hz
- [ ] e. has longer wavelength than hearable sound
- [ ] f. has the speed of propagation lower in solid materials than any other materials

Question **22**

Glasses with diverging lenses are used

Select one or more:

- [ ] a. when the location of the near point (punctum proximum) and the location of the far point (punctum remotum) are same
- [ ] b. to correct nearsightedness
- [ ] c. when the image is formed in front of the retina
- [ ] d. when the image is formed behind the retina
- [ ] e. to correct glaucoma
- [ ] f. to correct farsightedness

Question **23**

Select the correct statements

Select one or more:

- [ ] a. The volume pumped out per unit of time by the right ventricle is less than the volume pumped out by the left ventricle.
- [ ] b. The diastolic value of the blood pressure is always greater than the systolic value.
- [ ] c. The diastolic pressure is related to elastic recoil of the aorta wall.
- [ ] d. The work performed by the left ventricle is much greater than the work performed by the right ventricle because the wall of the left ventricle is thicker than the wall of the right ventricle.
- [ ] e. In all parts of the cardiovascular system two values of the blood pressure can be distinguished, namely the systolic and diastolic value.
- [ ] f. The volume of blood pumped by the heart in a minute is about 5 liters at rest.

Question **24**

Select the correct statements about human body

Select one or more:

- [ ] a. The potential energy of a 70 kg man standing on the Earth's surface is about 70 kJ.
- [ ] b. The normal blood pressure is about 120/80 Pa.
- [ ] c. The breathing frequency is 1 Hz in adults at rest.
- [ ] d. At low luminance the eye sensitivity to the blue light is higher than that to red light.
- [ ] e. The hair cells inside the organ of Corti are mechanoreceptors.
- [ ] f. The cardiac output is about 0.5 l/min.

Question **25**

What are the names of the devices that are used by ophthalmologist to determine a degree of nearsightedness?

Select one or more:

- [ ] a. pachymeter
- [ ] b. ophthalmoscope
- [ ] c. perimeter
- [ ] d. optotype
- [ ] e. tonometer
- [ ] f. refractometer

Question **26**

A stone is thrown upwards with initial velocity of 20 m/s. Gravitational acceleration g = 9.8 m/s^2.The height that stone will reach would be approximately

Select one:

- ◯ a. 20 m
- ◯ b. 60 m
- ◯ c. 40 m
- ◯ d. 10 m
- ◯ e. 30 m
- ◯ f. 50 m

Question **27**

What is the magnitude of the gravitational force between Earth and Moon? Assume their distance 3.84 $\times 10^5$ km, masses 6 $\times 10^{24}$ kg and 7.3 $\times 10^{22}$ kg, and gravitational constant 6.7 $\times 10^{-11}$ $m^3 \cdot kg^{-1} \cdot s^{-2}$.

Select one:

- a. 7.6×10^{14} N
- b. 2.0×10^{20} N
- c. 2.5×10^{4} N
- d. 1.1×10^{16} N
- e. 7.6×10^{18} N
- f. 4.4×10^{14} N

Question **28**

An ideal gas is inside of a tube at 60 °C. If the pressure remains constant, but the volume increases from 3 m^3 to 5 m^3, what will be the final temperature in the tube?

Select one:

- a. -73 °C
- b. 463 °C
- c. 36 °C
- d. 100 °C
- e. -162 °C
- f. 282 °C

Question **29**

A 800 kg car was accelerated from 20 m/s to 30 m/s. What is the increase in kinetic energy?

Select one:

- a. 12 kJ
- b. 80 kJ
- c. 200 kJ
- d. 24 kJ
- e. 400 kJ
- f. 40 kJ

Question **30**

Calculate the impedance of a capacitor (capacitive reactance) with the capacitance of 60 μF when it is connected to an AC voltage source at the frequency of 50 Hz.

Select one:

- a. 8.3×10^{5} Ω
- b. 5.3×10^{1} Ω
- c. 1.2×10^{-1} Ω
- d. 1.2×10^{-6} Ω
- e. 1.7×10^{2} Ω
- f. 3.7×10^{-4} Ω

Question **31**

If a 15 Ω resistor is connected in parallel with a 30 Ω resistor, the equivalent resistance is

Select one:

- a. 45 Ω
- b. 22.5 Ω
- c. 20 Ω
- d. 15 Ω
- e. 10 Ω
- f. 60 Ω

Question **32**

A wire carries a current of 20 A from east to west. Assume that at this location the magnetic field of the earth is horizontal and directed from south to north, and has a magnitude of 0.50×10^{-4} T. Calculate the magnetic force on a 300 m length of the wire.

Select one:

- a. 4.0×10^{5} N
- b. 0 N
- c. 3.0×10^{5} N
- d. 0.3 N
- e. 3.3 N
- f. 1.3×10^{3} N

Question **33**

What is the wavelength of a particle, if its momentum is 2.6 $\times 10^{-22}$ kg·m·s^{-1}? Consider that the Planck's constant is 6.63 $\times 10^{-34}$ m^2·kg·s^{-1} and the charge of the particle 1.6 $\times 10^{-19}$ C.

Select one:

- a. 4.14×10^{-15} m
- b. 2.55×10^{-12} m
- c. 1.08×10^{-36} m
- d. 1.62×10^{-3} m
- e. 4.08×10^{-31} m
- f. 2.76×10^{-74} m

Question **34**

Determine the optical power of the human eye if its effective focal length is 17 mm.

Select one:

- a. 34 D
- b. 17 D
- c. 8.5 D
- d. 0 D
- e. 59 D
- f. 1.7 D

Question **35**

Calculate the time required for a sample of radioactive technetium to lose 90 % of its activity. Consider that the half-life of technetium is 6 hours?

Select one:

- a. 19.9 h
- b. 10.8 h
- c. 54.0 h
- d. 23.4 h
- e. 9.3 h
- f. 13.8 h

Correct answers:

1 D	11 C	21 D, E	31 E
2 B	12 C	22 B, C	32 D
3 A	13 D	23 C, F	33 B
4 C	14 A	24 D, E	34 E
5 D	15 B	25 D, F	35 A
6 B	16 A	26 A	
7 C	17 C	27 B	
8 C	18 A	28 F	
9 C	19 A	29 C	
10 B	20 D	30 B	