Question block created by wizard

This exam contains 52 questions.

$$cg = \frac{h}{3}$$

$$cg = \frac{4r}{3\pi}$$

$$M = F \cdot d$$

$$M_+ = M_-$$

$$F = \sigma \cdot A$$

$$F = m \cdot A$$

$$F_B \cdot b = F_A \cdot a$$

$$MA = \frac{r_B}{r_A}$$

$$F = k \cdot \Delta l$$

$$F \cdot \Delta t = m \cdot \Delta v$$

$$imp = F \cdot \Delta t$$

$$p = m \cdot \Delta v$$

$$F_s = \frac{m \cdot v^2}{r}$$

$$W = m \cdot g \cdot \Delta h$$

$$W = Q - \Delta U$$

$$E_{kin} = \frac{1}{2} \cdot m \cdot v^2$$

$$E_{pot} = m \cdot g \cdot h$$

$$Q = m \cdot c \cdot \Delta T$$

$$\eta = \frac{W}{Q_H} (\times 100\%)$$

$$f_s^{max} = \mu_s \cdot F_N$$

$$f_k = \mu_k \cdot F_N$$

$$\rho = \frac{m}{V}$$

$$\text{sg} = \frac{\rho_{substance}}{\rho_{water\ (277K)}}$$

$$\text{mfr} = \rho \cdot A \cdot v$$

$$F = \frac{9}{5}\,^{o}C + 32$$

$$v_f = v_0 + \Delta v$$

$$p = \rho \cdot g \cdot h$$

$$p = p_{atm} + p_{liquid}$$

$$s = v \cdot t$$

$$s_f = v_0 \cdot t + \frac{1}{2} \cdot a \cdot t^2$$

$$v = a \cdot t$$

$$v_f = v_0 + a \cdot t$$

$$v = f \cdot \lambda = \frac{\lambda}{T}$$

$$v = \frac{2 \cdot \pi \cdot r}{T}$$

$$v = \sqrt{a_c \cdot r}$$

$$T = 2\pi \cdot \sqrt{\frac{l}{g}}$$

$$\theta = \omega \cdot t = \frac{2\pi}{T} \cdot t$$

$$\Delta V = \beta \cdot V_0 \cdot \Delta T$$

$$R = \frac{p \cdot V}{T} = \frac{2 \cdot c_p}{5} = \frac{2 \cdot c_V}{3} = R_s \cdot m$$

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$$

$$m = \frac{h_i}{h_o}$$

$$T = \frac{1}{f}$$

$$I = \frac{P}{A}$$

$$4{,}186\ kJ = 1kcal$$

1. Name three elements of group 18 of the Periodic Table of Elements.

a. Li, N, K.
b. F, Cl, Br.
c. He, Ne, Ar.

2. An atom consists of 58 neutrons and its mass number is 103.

Determine the atoms atomic number.

a. 161
b. 22
c. 45

3. Is it possible to break down a compound in a physical way?

a. Yes, both chemically and physically is it possible.
b. No, it is not possible.
c. Yes, it is possible.

4. Which of the following expressions is a property of a liquid?

a. Liquids have greater density than solids or gases.
b. A liquids shape is confined to the container it fills.
c. A liquid has a fixed shape.

5. Which of the following expressions is a property of a gas?

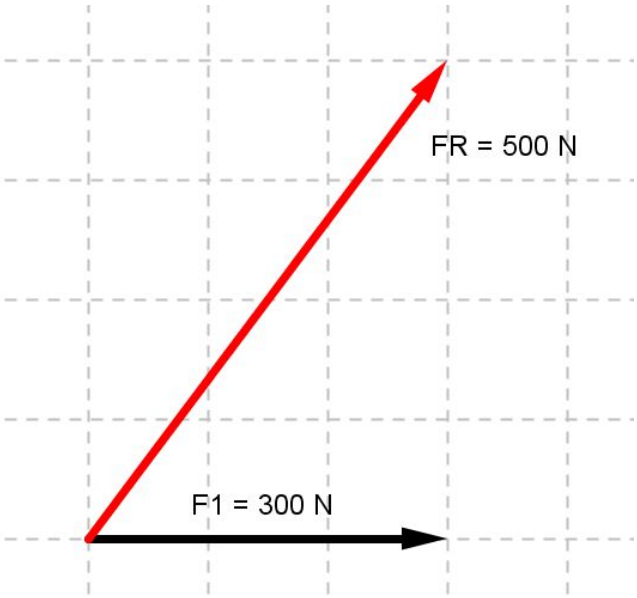
a. With decrease in temperature, the particles move faster.
b. The particles are moving very close to each other.
c. There are almost no forces of attraction between the particles of a gas.

6. If a liquid is evaporating, the new state is ...

a. solid, the temperature decreases.
b. liquid, the temperature keeps the same.
c. gas, the temperature increases.

7. Two forces are acting upon an object; F1 and F2. They create a resulting force FR.

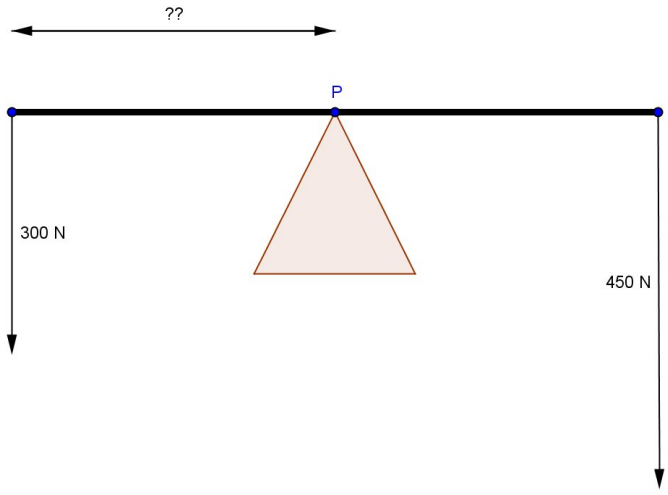
Determine the magnitude of the unknown force F2.



a. 400 N
b. 200 N
c. 583 N

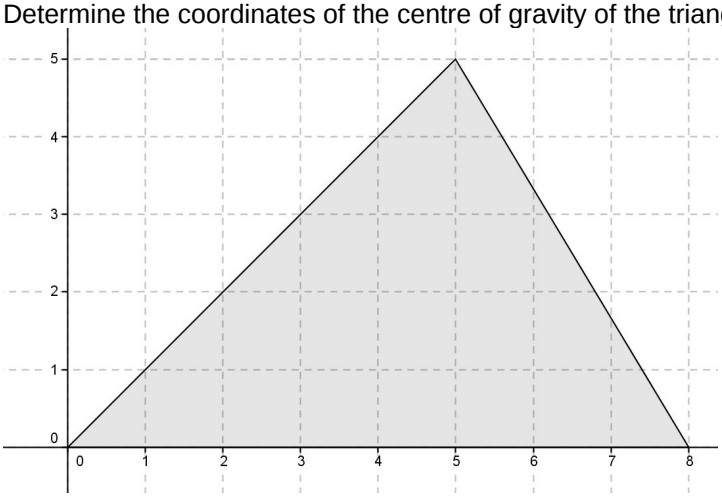
8. An 8 meter long beam is supported in a movable pivot point. The beam must be balanced. At the left end of the beam works a force of 300 N, at the right end and force of 450 N.

Determine the pivot point measured from the left side of the bar.



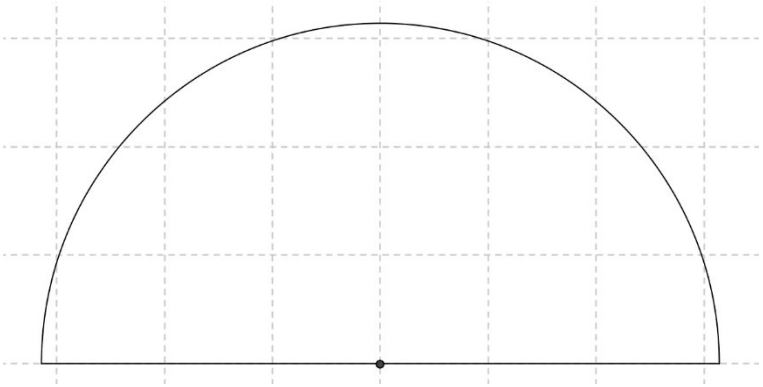
a. 4,80 m
b. 4 m
c. 3,2 m

9. Determine the coordinates of the centre of gravity of the triangle in the figure.



a. (4,3;1,7)
b. (5,3)
c. (3,5)

10. Calculate the centre of gravity of a semicircle with a radius of π m.



a. 0,75 m
b. 1,33 m
c. 1,04 m

11. What kind of external forces cause stress?

a. Body forces.
b. Both, surface- and body forces.
c. Surface forces.

12. An atom consists of 58 neutrons and its mass number is 103.

Determine the atoms atomic number.

a. 45
b. 0,22
c. 161

13. The law of Pascal and the law of hydrostatics are applicable to....

a. liquids.
b. gases.
c. gases and liquids.

14. An airplane is taxiing on the runway with a speed of 72 km/h. The time from start till end is about 3,75 min.

Calculate the length of the runway.

a. 19200 m
b. 270 m
c. 4500 m

15. Both, acceleration and velocity are vector quantities.

If they point in the same direction, the object is....

a. accelerates.
b. keeps the same velocity.
c. slows down.

16. A stone is falling of a tower.

Calculate the height of the tower when the time to fall is 4 seconds.

a. 400 m
b. 80 m
c. 20 m

17. The centripetal acceleration is caused by a force.

What force?

a. The force in the same direction as the acceleration.
b. The centrifugal force.
c. The centripetal reaction force.

18. The period of a pendulum is depending on the acceleration due to gravity.

What can you say about the speed of the pendulum on the moon relative to the speed on earth, with the same pendulum?

a. On the moon the pendulum is slower.
b. On the moon the pendulum speed is the same as on earth.
c. On the moon the pendulum is faster.

19. The elongation or stretching of a spring is depending on....

a. stiffness.
b. initial length.
c. length after stretching.

20. The equation: $MA = r_B / r_A$ belongs to....

a. gear trains and chain and belt drives.
b. gear trains and lever.
c. gear trains and block and tackle.

21. 1,5 kg = ... hg

a. 150
b. 15
c. 0,15

22. Which of the next units are SI units?

a. Meter per second (m/s) and kilogram (kg).
b. Meter (m) and kilogram (kg).
c. Second (s) and meter per second (m/s).

23. What is the first step toward ensuring accuracy and reproducible units in which measurements are made?

a. Defining the units.
b. An international agreement.
c. Making the measurements reproducible as possible.

24. A car is accelerating with 3 m/s^2 and it has a mass of 1200kg.

Calculate the force that the engine must provide minimal.

a. 400 N
b. $2{,}5 \cdot 10^{-3}$ N
c. 3600 N

25. Which statement in the answers is the second law of Newton?

An object under influence of a force....

a. will stay at rest or in motion along a straight line.
b. will accelerate.
c. gives a positive reaction force.

26. If an object is propelled at a constant speed,it is often more convenient to count on the ability of work.

Which rule can be used to determine the work capacity?

a. Second law of Newton.
b. Work-power rule.
c. Kinetic energy rule.

27. When is the efficiency of a gearbox higher?

a. With much fraction between the gears.
b. With less friction between the gears.
c. If a lot of heat is developed.

28. Which theory plays a central role in describing collisions?

a. The impulse-momentum theorem.
b. The second theorem of Newton.
c. The first theorem of Newton.

29. An isolated system is one....

a. for which the vector sum of the internal forces acting on the system is zero.
b. for which the vector sum of the external forces acting on the system is zero.
c. for which the vector sum of the external forces acting on the system is more than zero.

30. What two kind of not mechanical gyroscopes do we know?

a. Optical and piezo electric.
b. Piezo electric and air driven.
c. Motor driven and optical.

31. The coefficient of kinetic friction between a wooden sled and snow is 0,2.

Calculate the kinetic force between the sled and the snow if the sled including child has a mass of 45 kg. ($g = 10\ m/s^2$)

a. 2250 N
b. 90 N
c. $2{,}25 \cdot 10^{-4}$ N

32. What concept do we use to compare densities?

a. Mass density.
b. Specific gravity.
c. Density.

33. Give the equation of mass density.

a. $\rho = m / V$
b. $\rho = m \cdot V$
c. $\rho = m + V$

34. Give another name for streamline flow.

a. Steady flow.
b. Turbulent flow.
c. Unsteady flow.

35. Which is Bernoulli's equation?

a. $p_1 + \frac{1}{2} \cdot \rho \cdot v_1^2 + \rho \cdot g \cdot y_1 = p_2 + \frac{1}{2} \cdot \rho \cdot v_2^2 + \rho \cdot g \cdot y_2$

b. $$\frac{p_1 + \frac{1}{2} \cdot \rho \cdot v_1^2}{\rho \cdot g \cdot y_1} = \frac{p_2 + \frac{1}{2} \cdot \rho \cdot v_2^2}{\rho \cdot g \cdot y_2}$$

c. $$\frac{p_1 + \rho \cdot g \cdot y_1}{\frac{1}{2} \cdot \rho \cdot v_1^2} = \frac{p_2 + \rho \cdot g \cdot y_2}{+\frac{1}{2} \cdot \rho \cdot v_2^2}$$

36. There are several kind of thermometers.

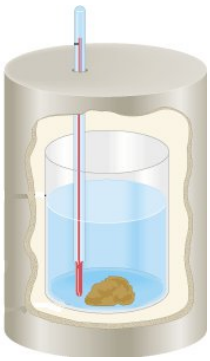
Name two kind of thermometers.

a. Thermocouple and ethanol thermometers.
b. Ethanol and electric voltage thermometers.
c. Mercury and Constant volume thermometers.

37. Heat is a kind of energy thus has the unit:

a. W/s
b. W/^{o}C
c. Joule

38. What is the name of the apparatus shown in the picture?



a. Calorimetry.
b. Calorimeter.
c. Joulemeter.

39. If the coefficient of linear expansion is given.

What is than the coefficient of volumetric expansion?

a. 3β =α
b. β =α/3
c. β =3α

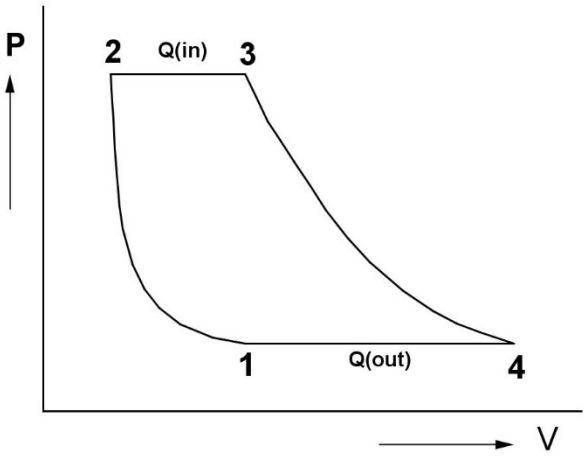
40. According to the first law of thermodynamic, when is Q positive?

a. Q is positive when the system loses heat and negative when it gains heat.
b. Q is positive when the system gains heat and negative when it loses heat.
c. Q is positive when the system gains heat and/or when it loses heat.

41. Give Boyle's law.

a. At a constant temperature, the pressure of a fixed mass (fixed number of molecules) of a low-density gas is directly proportional to its volume.
b. At a constant temperature, the absolute pressure of a fixed mass (fixed number of molecules) of a low-density gas is direct proportional to its volume.
c. At a constant temperature, the absolute pressure of a fixed mass (fixed number of molecules) of a low-density gas is inversely proportional to its volume.

42. The figure represents the process of a gas turbine motor.



What happens during the step 4 to1?

a. The combustion of fuel under constant pressure.
b. The exhaust, removal of heat and the combustion gases under a constant pressure.
c. The exhaust, removal of heat and the combustion gases under a constant volume.

43. The speed of an electromagnetic wave is $2{,}5 \cdot 10^8$ m/s, the frequency of this wave is $5 \cdot 10^6$ Hz.

Calculate the wavelength of this wave.

a. 50 m
b. 1,25 Mm
c. 2 cm

44. The angle of incidence of a light beam on a plane mirror is 50^o with respect to the mirror.

Determine the angle of reflection with respect to the normal.

a. 50^o
b. 90^o
c. 40^o

45. The focal length of a concave mirror is 2 m, an object is at 3 m in front of the mirror.

Determine the distance of the image.

a. -6 m
b. 6 m
c. $^1/_6$ m

46. When light passes from a medium of larger refractive index into one of smaller refractive index, the refractive ray bends....

a. towards the normal.
b. away from the normal.
c. along the surface.

47. The number of modes in multimode fibres depends on...

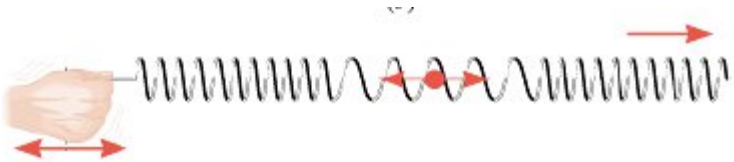
a. only the numerical aperture.
b. only the core size.
c. core size and numerical aperture.

48. The frequency of a wave is 20 Hz.

Calculate the period of this wave.

a. 0,5 s
b. 20 s
c. 0,05 s

49. What kind of wave is depicted in the picture?



a. Longitudinal standing wave.
b. Longitudinal wave.
c. Transverse standing wave.

50. When two waves meet in phase, we call this....

a. destructive interference.
b. neutral interference.
c. constructive interference.

51. The speed of sound in the air is depending on a number of variables. Which variable?

a. Air density and volume of the air.
b. Density and temperature of the air.
c. Temperature and volume of the air.

52. When an ambulance with siren comes to you, the frequency of the siren seems to be higher / lower or constant?

a. higher
b. lower
c. constant