

Physics

You can use the following formulae.

$$\rho = \frac{m}{V}, Q = cm\Delta t, Q = \lambda m, Q = Lm, Q = qm,$$
$$I = \frac{q}{t}, I = \frac{U}{R}, R = \rho \frac{l}{S}, I = I_1 = I_2, U = U_1 + U_2, R = R_1 + R_2, I = I_1 + I_2, U = U_1 = U_2,$$
$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}, A = IUt, P = \frac{A}{t}, K = \frac{N_1}{N_2} = \frac{U_1}{U_2},$$
$$v = \lambda f, \Delta l = k\lambda, \Delta l = (2k + 1)\frac{\lambda}{2}, d\sin\varphi = k\lambda, \frac{n_2}{n_1} = \frac{\sin\alpha}{\sin\beta}, D = \frac{1}{F} = \frac{1}{d} + \frac{1}{F}.$$
$$hf = A_{i\bar{s}}, hf = A_{i\bar{s}} + \frac{mv^2}{2}, A = Z + N$$

1. The first bottle filled with water at 0°C was immersed in crushed ice at 0°C , the second one – in water at 0°C . In which of the bottles if any water will change its state into ice? Prove your answer.

(2 points)

2. Two identical metal balls - one with 11 excess electrons, the second with 15 excess electrons - were put in contact and then separated again. How many excess electrons will the second ball have?

(2 points)

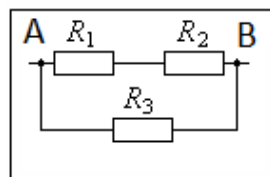
3. A stone of mass of 10 kg has its temperature decreased by 2°C when 16,8 kJ of thermal energy is transferred to cold water. Calculate specific heat capacity of the stone.

(2 points)

4. Explain why the temperature of boiling water does not increase while *it keeps getting thermal energy*.

(2 points)

5. In the diagram resistors are of $12\ \Omega$ each.



a) Calculate the resistance of the circuit.

(2 points)

b) State Ohm's Law for the part of the circuit.

(1 point)

c) A 24 V battery is connected between points A and B. How much current is drawn from the battery?

(2 points)

d) An ammeter is used to measure current, and a voltmeter measures voltage. Which of them is of low resistance? Explain.

(2 points)

6. An object is placed at 15 cm from a converging lens of 10 cm focal-length.

a) Determine the position of the image.

(2 points)

b) How many times the size of the image is greater than that of the object?

(2 points)

c) Name the type of defect on an eye which can be corrected by using a converging lens.

(1 point)