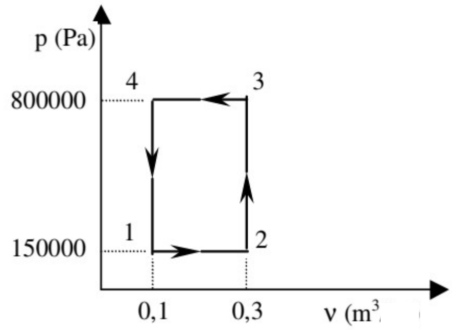
TEST for the COURSE OF PHYSICS in MEDICINE
INTEGRATED BACHELOR+MASTER in MEDICINE and SURGERY
NAPOLI, 21/03/2022

NAME____________________ MATRICOLA (Student Reg. Nr.)__________
SURNAME___________________________
SIGNATURE__________________________

RULES of the TEST: +3 pts each correct answer, -1 pts each wrong answer, 0 pts no answer

1. THERMODYNAMICS – A gas mixture at 340 K temperature is made of 225 mg of Neon, 320 mg of Methane and 175 g of Argon. If the partial pressure of Neon is 0.875 atm (mass of Neon = 20.18 unit of atomic mass), calculate the volume of the mixture.
   a) 0.31 dm^3 b) 0.36 dm^3 **c) 0.46 dm^3** d) 0.99 dm^3 e) 0.56 dm^3

2. THERMODYNAMICS – The same heat, ΔQ = 260 J, is transferred by conduction from a source at 400 K to another source at 100 K. Calculate di entropy variation of the system.
   a) 1.50 J/K b) 2.70 J/K c) -1.50 J/K d) 1.95 J/K e) 7.50 J/K



3. THERMODYNAMICS – 25 moles of carbon oxide, CO, [R = 8.314 J/(mol·K), c_p = 1013 J/(kg·K)] undergo the four trasnformations of the cycle shown in the aside figure. Calculate the maximum temperature reached by the gas in the cycle.
   a) 752 K b) 1154 K c) 613 K **d) 825 K** e) 962 K

4. LIQUIDS – An artery having a 0.80 cm diameter gets shrinked to 0.75 cm because of a stenosis. Calculate the pressure gradient to apply to both ends of the artery to keep constant the flow.
   a) 11% b) 5% **c) 37%** d) 46% e) 29%

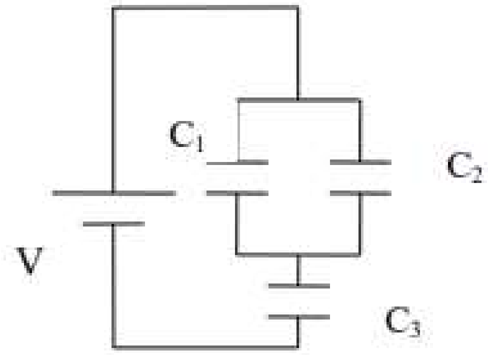
5. LIQUIDS – We have to lift a body of mass m = 120 kg by means of a balloon filled in with Helium (He, density of He = 0.179 kg/m^3). What will the minimum volume of the balloon be, by neglecting the balloon mass when it is empty? (density of air = 1.29 kg/m^3)
   a) 90 m^3 b) 108 m^3 c) 131 m^3 d) 144 m^3 e) 162 m^3

6. WAVES. A mechanical device produces a noise of 75 dB. In a laboratory there are eight devices like this, working at the same time. Calculate the overall amount of dB present in the laboratory.
   a) 97 dB b) 81 dB c) 65 dB **d) 78 dB** e) 84 dB

7. OPTICS – A converging lens is put into water. Which of these statements is correct?
   a) the focal length diminishes b) the power increases **c) the power decreases** d) the power keeps the same as it only depends on the length material e) the focal length changes its sign.

8. ELECTRICITY – A resistor dissipates 0.02 kW of power when subjected to a continuous tension of 10 V. Calculate the resistivity of the material, by knowing that the resistor length and section are 2 m and 1 mm^2, respectively.
   a) 3.6×10^{-6} Ω·m b) 2.5×10^{-6} Ω·m c) 7.2×10^{-6} Ω·m **d) 1.6×10^{-6} Ω·m** e) 5.4×10^{-6} Ω·m

9. ELECTRICITY – Three capacitors $C_1 = 12$ μF, $C_2 = 5.3$ μF and $C_3 = 4.5$ μF are connected as in the figure aside. Calculate the equivalent capacitance.
   a)5.39 μF b)8.69 μF **c) 3.57 μF** d) 7.21 μF e) 1.11 μF



10. RADIATION – Calculate the attenuation of a X-ray beam travelling for 5 cm through a material having an absorption coefficient $\mu = 1$ cm^{-1}.
    a) 4.5×10^{-5} b) 6.7×10^{-3} **c)** $\mathbf{3.4\times10^{-4}}$ d) 2.8×10^{-2} e) 1.5×10^{-1}