

METÓDY RIEŠENIA FYZIKÁLNYCH ÚLOH zima18 – Príklady 1

Cvičenie 4.10.2018

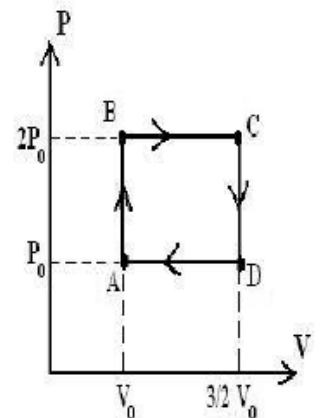
Príklad 1

Príklad 1. Zoberieme si dva pol-litrové poháre kofoly, rožok a tresku a vydáme sa na túru. Zastavíme sa pri horskej bystrinke a jeden z pohárov kofoly do nej vlejeme. Počkáme dostatočne dlho, aby sa všetka voda na planéte dostatočne premiešala a toto čakanie si skrátime výdatným obedom z rožka, tresky a druhého pohára kofoly. Keď teraz naberieme vodu z potoka do pohára, koľko atómov z pôvodnej kofoly sa v ňom bude nachádzať?

Návod. Jeden mol látky je definovaný ako zoskupenie, ktoré obsahuje počet častíc rovný Avogadrovej konštante N_A . Jej hodnota, rovnako ako aj molové hmotnosti prvkov periodickej tabuľky sa dajú ľahko nájsť v literatúre. Potom už len stačí vedieť, že voda = 2 krát vodík + 1 krát kyslík.

Príklad 2

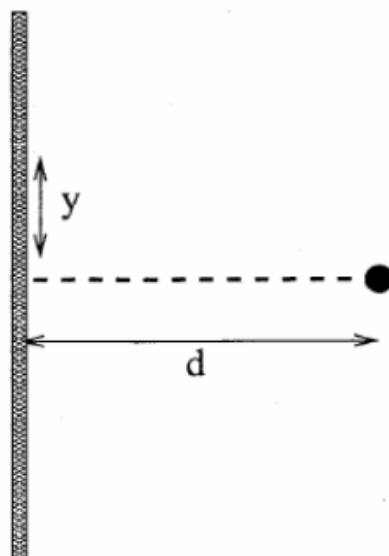
- A monatomic ideal gas is the working substance for an engine that undergoes the cyclic process (ABCD) shown in the PV diagram. The processes are all isochoric or isobaric with pressures between P_0 and $2P_0$ and volumes between V_0 and $\frac{3}{2}V_0$. What is the efficiency of this engine?



Príklad 3

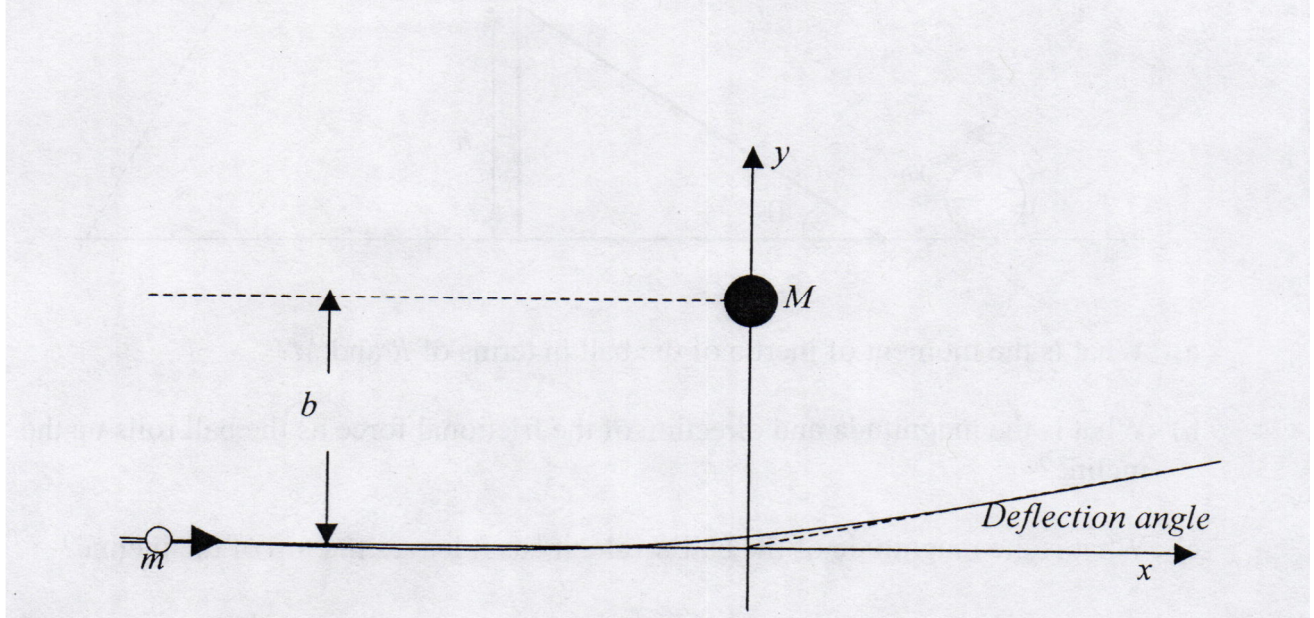
A very long wire of radius a is suspended a distance d above an infinite conducting plane. In the case that $d \gg a$, find approximate expressions for

- The capacitance per unit length of the wire, conducting plane system.
- The surface charge density on the conducting plane as a function of y , the distance along the plane lateral to the wire.



Příklad 4

2. This is a problem where gravity is the only force present, and the particle motion is non-relativistic. Calculate the deflection angle of a test mass m which approaches a big mass M ($m \ll M$), with an impact parameter of b and a velocity of v_0 in the far past. In other words, the test mass will move in a direction in the far future that is different from the incoming direction in the far past. Compute the difference in angle between these two directions. The impact parameter b is defined as follows: think of the test mass as moving more or less along the x -axis, the big mass M is located at $x = 0, y = b$. Assume that the impact parameter b is large, i.e. the deflection angle is small.



Příklad 5

2. Four identical coherent monochromatic wave sources A, B, C, D as shown below produce waves of the same wavelength λ . Two receivers R_1 and R_2 are at great (but equal) distances from B .
- What is the approximate relative signal size picked up by the two receivers?
 - What is the approximate relative signal size picked up by the two receivers if source B is turned off?
 - What is the approximate relative signal size picked up by the two receivers if source D is turned off?
 - Which receiver can tell which source, B or D , has been turned off? Explain.

