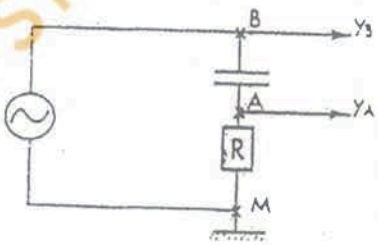
الجامعة اللبنانية
كلية الصحة العامة

مباراة الدخول ٢٠١٤ – ٢٠١٥
مسابقة في الفيزياء - Série A
المدة : ساعة واحدة

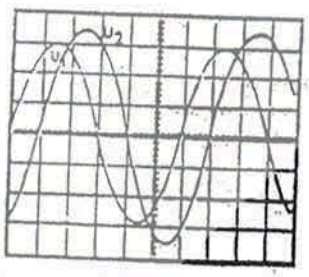
I- The rest length of a rifle spring is $l_0$ = 10cm. When introducing an arrow of mass m = 50g, the spring is compressed and its length becomes $l_1$ = 4cm. **(6 pts)**


a. Calculate the speed of the arrow when it leaves the rifle given that the stiffness of the spring is k = 500 N/m.
b. After a traveled distance of 3m, the arrow speed is 5m/s. Calculate the variation of the mechanical energy of the arrow along this displacement given that the trajectory remains horizontal.
c. Calculate the air resistance assimilated to a constant force that is opposite to the displacement of the arrow.

II- Consider the circuit represented by the following figure :
Take: R = 100Ω; $S_V$ = 2V/div for $y_A$ and $y_B$ ; $S_h$ = 1ms/div **(7 pts)**




a. $u_1$ represents the voltage across the resistor, Why?
b. Calculate the maximum intensity of the current in the circuit.
c. Calculate the phase difference between $u_1$ and $u_2$ and the pulsation of the signals.
d. Determine the instantaneous expression of the current intensity given that the voltage across the generator is given by: $u = U_m \cos\omega t$.




I- Carbone 14 is a radioactive element. It decays according to the following equation : **(7 pts)**

$$^{14}_{6}C \longrightarrow {}^{14}_{7}N + {}^{A}_{Z}X$$

a. Identify the particle X. Precise the used laws.
b. The period of $^{14}C$ is 5730 years.
   i. Define the period of a radioactive sample.
   ii. At the initial instant, a sample contains 1g of $^{14}_{6}C$. Calculate the time taken by the $^{14}C$ to become 0.125g.
c. After the death of a plant, $^{12}C$ remains stable but $^{14}C$ is not renewed.
In order to date a wood piece, we measure the activity at the moment of its discovering and we make the ratio with the initial activity, this ratio is 0.125. Determine the age of this wood piece.



Good Luck