الجامعة اللبنانية

كلية الصحة العامة

مباراة الدخول 2021 – 2022

مسابقة في الفيزياء (Série A)

المدة : ٤٥ دقيقة عدد الصفحات: ٢

Choose the correct answer:

Exercise 1: The gravitational potential energy of an object of mass m is null:

a. At the sea level.
b. At an arbitrary reference level.
c. Obligatory at the lowest point of a trajectory.

Exercise 2: The variation of the mechanical energy of a ball falling from the highest floor of a building, of height 80 m, is $\Delta E_m = -904$ J.

a. The intensity of the friction force is f = 113 N.
b. The variation of the gravitational potential energy is the opposite of the variation of the kinetic energy: $\Delta E_P = -\Delta E_C$.
c. The intensity of the friction force is f = 11.3 N.

Exercise 3: A couple of skaters is initially at rest on the ice. By pushing with hands, the women gives her partner a speed of 10 km/h. If the mass of the women is m = 52 kg and that of the men is m′ = 68 kg:

a. The speed of the women becomes $V_f = -10$ km/h.
b. The speed of the center of mass of the couple is $V_G = 0$ km/h.
c. The speed of the women becomes $V_f = 15$ km/h.

Exercise 4: A car of mass 1 ton, moves along a horizontal and rectilinear road without any friction and with a speed of 54 km/h. It brakes during 15 s in order to stop. By applying the theorem of linear momentum, the intensity of the braking force is:

a. f = 50 N
b. f = 100 N
c. f = 1000 N

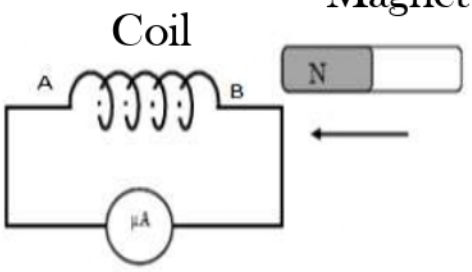
Exercise 5: A horizontal elastic pendulum is formed of a light spring of stiffness **k** and a solid of mass **m**. The center of mass of the solid is oscillating with an amplitude $X_m = 20$ cm. Given that the mechanical energy is equal to 0.8 J, the value of k:

a. k = 40 N/m
b. k = 4 N/m
c. k = 400 N/m

Exercise 6: A simple harmonic oscillator has the following characteristics:
m = 256 g; stiffness k = 78 N/m; initial abscissa $x_0 = +2$ cm (elongated spring) ; the initial speed is zero. The time equation has the form: $x(t) = A\cos(\omega t + \varphi)$.

a. x(t) = 0.02cos (17.5 t)
b. x(t) = 0.02cos (1.8 t + $\pi/2$)
c. x(t) = 0.02cos (78 t - $\pi/2$)

Exercise 7: A coil connected to an ammeter obeys to the influence of a magnet moving to the left, as shown in the adjacent figure. The induced current ***i*** and the e.m.f. **e** are:

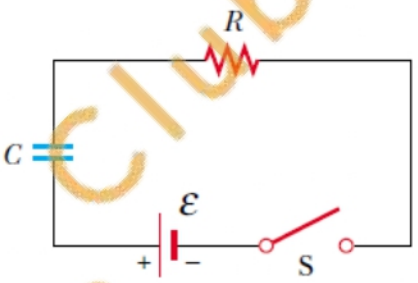


- **a.** ***i*** is from A to B with e = 0V
- **b.** ***i*** is from A to B with e ≠ 0V
- **c.** ***i*** is from B to A with e ≠ 0V

Exercise 8: A coil is formed of ten loops, each having a surface of 50 cm^2. The coil is placed in a magnetic field of 0.02 Tesla, perpendicular to the plane of the loops. In 0.1 second, the coil is totally removed from the magnetic field, the induced electromotive force across the coil is:

- **a.** $e = 10^{-3}$ V
- **b.** $e = 10^{-2}$ V
- **c.** $e = 10^{-1}$ V

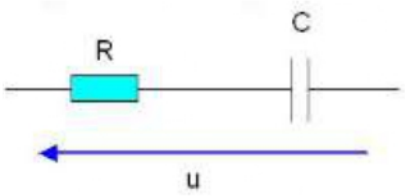
Exercise 9: Consider a (RC) circuit formed of a resistor with R = 1 MΩ and a capacitor with C = 5 μF and of a generator having a voltage E = 30 V. The instantaneous expression of the charge of the capacitor is given by $q(t) = Q(1 - e^{-t/RC})$ where Q = CE.



At t = 0, the switch is closed, the charge of the capacitor at t = 10 s:

- **a.** q = 63 μC
- **b.** q = 37 μC
- **c.** q = 129.7 μC

Exercise 10: We apply a sinusoidal alternating voltage $u = U_m \sin(\omega t + \varphi)$ on a portion of a RC circuit as shown in the adjacent figure. Take $u_R = 3\sin(\omega t)$ and $u_C = 4\sin(\omega t - \frac{\pi}{2})$. By applying the law of addition of voltages and by giving two particular values to t, the value of φ is:



- **a.** φ = -1.04 rd
- **b.** φ = -1.57 rd
- **c.** φ = -0.93 rd

Good work!