اسس التصحيح – لمادة الفيزياء – شهادة الثانوية العامة فرع علوم الحياة – دورة ٢٠٠٤ الاستثنائية

First exercise (6 pts.)

1. The kinetic energy of the system (block , bullet) **(1/4pt.)**

2. $\vec{P}_{\text{before}} = \vec{P}_{\text{after}}$ **(1/4 pt)**

m $\vec{V_0}$ = (M+m)$\vec{V_1}$ **(1/4 pt)** so : $V_1 = \frac{mV_0}{(M+m)}$ **(1/4 pt.)**

3. a. M.E = P.E$_g$ + K.E **(1/4pt.)**

M.E = 0 + K.E = $\frac{1}{2}(M+m)V_1^2$ **(1/4pt.)**

M.E = $\frac{1}{2}$ (M+m)$[\frac{mV_0}{(M+m)}]^2 = \frac{1}{2}\frac{m^2V_0^{\ 2}}{(M+m)}$ **(1/4 pt.)**

b. M.E = (M+m)gh **(1/4pt.)**

h = ℓ - ℓcosα = ℓ (1-cosα) **(1/2pt)**

⇒ M.E = (M+m)g ℓ (1-cosα) **(1/4pt.)**

c. The mechanichal energy of the system (block, bullet) is conserved because friction is neglected . **(1/2pt.)**

$\frac{1}{2}\frac{m^2V_0^{\ 2}}{(M+m)}$ = (M+m)g ℓ (1-cosα)

$V_0 = \frac{(M+m)}{m}\sqrt{2gl(1-\cos\alpha)}$ **(1pt.)**

V_0 = 101.3 m/s **(1/2 pt.)**

4. K.E$_{\text{before}}$ = ½ m V_0^2 **(1/4pt)**

K.E$_{\text{before}}$ = 102.6 J **(1/4pt)**

K.E$_{\text{after}}$ = ½ (M+m)V_1^2

= $\frac{1}{2}\frac{m^2V_0^{\ 2}}{(M+m)}$ **(1/4pt)**

K.E$_{\text{after}}$ = 2 J **(1/4pt)**

K.E$_{\text{before}}$ > K.E$_{\text{after}}$, the answer is verified. **(1/4pt)**

Second exercise (7 pts.)

A-

I. X is a capacitor because at the end of charging the current becomes zero **(3/4)**

2. Y is a resistor because the current remains constant.**(3/4 pt)**

3. Z is a coil because the current grows with a certain delay . **(3/4 pt)**

B-1.a) B = 10^{-4} A / Hz **(1 pt)**

b) Given : i = $\frac{dq}{dt} = \frac{Cdu_C}{dt}$

i = C U$\sqrt{2}$ 2π f cos2π ft

⇒ i = I$\sqrt{2}$ cos2π ft

⇒ I = 2π C U f = B f ⇒ B = 2π C U

(13/4pt.)

c) C = B / 2π U = 10^{-4} / 2π = 16 × 10^{-6} F

(1/2 pt)

2.a) Current resonance **(1/2 pt)**

b) $f_0 = \frac{1}{2\pi\sqrt{LC}}$ **(1/2 pt)**

⇒ L = 0.11 H. **(1/2 pt)**

Third exercise (7 pts)

A-1) the nuclei having the same charge number Z but different mass number A. **(1/2 pt.)**

2) $^{14}_{7}N + ^{1}_{0}n \longrightarrow ^{14}_{6}C + ^{1}_{1}p$ **(3/4 pt.)**

3 The emitted particle is a proton (or hydrogen nucleus) **(1/4pt.)**

B-1. $^{1}_{0}n \longrightarrow ^{0}_{-1}e + ^{1}_{1}p$ **(3/4 pt.)**

2. the binding energy of a nucleus of mass m is : $E_l = \Delta m.c^2$ **(1/4pt.)**

with $\Delta m = [Zm_p + (A-Z)m_n] - m_x$ **(1/4pt)**

the binding energy per nucleon is $\frac{E_l}{A}$.**(1/4pt)**

- for the nucleus $^{14}_{6}C$ we have :

$\Delta m = 6 \times 1.00728 + 8 \times 1.00866 - 14.0065$

$\Delta m = 0.10646$ u ; $E_l = 99.16749$ MeV

$\frac{E_l}{A} =$ 7.083 MeV **(1/2 pt)**

- for the nucleus $^{14}_{7}N$ we have ;

$\Delta m = 7 \times 1.00728 + 7 \times 1.00866 - 14.0031$

$\Delta m = 0.10848$ u ; $E_l = 101.04912$ MeV

$\frac{E_l}{A} =$ 7,217 MeV **(1/2 pt)**

3. We notice that the binding energy per nucleon of $^{14}_{7}N$ is greater than that of $^{14}_{6}C$; The nitrogen nucleus $^{14}_{7}N$ is more stable than the carbon $^{14}_{6}C$ nucleus . **(1/4pt)**

4.a) $\lambda = \frac{0,693}{T}$ **;** **(1/4pt)**

$\lambda = 1.244 \times 10^{-4}$ year^{-1} $= 3.94 \times 10^{-12}$ s^{-1} **(1/4pt)**

b) $n = \frac{0.05 \times 6.02 \times 10^{23}}{14} = 215 \times 10^{19}$ nuclei **(1/2pt)**

c) $A = \lambda \times n$ **(1/4 pt)** ; $A = 8471 \times 10^{10}$ Bq**.** **(1/4pt)**

C- A_0= 200 dis./mn A= 20 dis./mn

$A = A_0 e^{-\lambda t}$ **(1/4pt)** ; $t = \frac{\ln \frac{A_0}{A}}{\lambda}$ = 18509 years **(1pt)**