الامتحان الوطني الموحد للبكالوريا
المسالك الدولية- خيار أنجليزية
الدورة العادية 2017
- عناصر الإجابة -

NR 30E

المملكة المغربية
وزارة التربية الوطنية والتكوين المهني والتعليم العالي والبحث العلمي

المركز الوطني للتقويم والامتحانات والتوجيه

المادة	الفيزياء والكيمياء	مدة الإنجاز	4
الشعبة أو المسلك	شعبة العلوم الرياضية (أ) و(ب) – خيار أنجليزية	المعامل	7

Chemistry (7 points)			
Question	**Answers**	**Marking scale**	**Question reference in the framework**
	Part I		
1-1-	equation of titration reaction (use only one arrow).	**0,5**	-Write the equation of titration reaction (use only one arrow)
1-2-	$V_{BE}=20\,mL$, $C=\frac{C_B.V_{BE}}{V_A}$; $C=4.10^{-2}\ mol.L^{-1}$	**0,25+0,25** **0,25**	-Exploit the curve or the results of the titration.
1-3-	Check the value of p	**0,5**	
1-4-	Using the progress table , $HCOO^-$ is the predominant chemical specie ; Method , $pK_A \simeq 3,8$.	**0,25** **0,25** **0,25+0,25**	-Draw the progress table of a reaction and exploit it. -Write and use the expression of the acid dissociation constant KA associated with the reaction of an acid with water. -Know the relationship pKA= -logKA.
2-1-	Equation of the reaction	**0,5**	-Write the equation of the acid-base reaction and identify the two pairs involved.
2-2-	Finding $x_f=\frac{\sigma.V_1}{\lambda_{HCOO^-}+\lambda_{H_3O^+}}$.	**0,5**	-Draw the progress table of a reaction and exploit it.. -Use the relationship linking the conductance G of a solution part to the effective molar concentrations [Xi] of Xi ions in the solution.
2-3-	Finding the value of τ .	**0,5**	-Define the final progress rate of a reaction, and determine it using experimental data
2-4-	$pK_A=-\log\left(\frac{C.\tau^2}{1-\tau}\right)$, $pK_A \simeq 3,8$.	**0,5** **0,25**	-Write and use the expression of the acid dissociation constant KA associated with the reaction of an acid with water. -Know the relationship pKA= -logKA.

Part II			
1	b	**0,5**	-Give and use the expression of the reaction quotient Qr through the reaction equation. -Know that the abundance of one reactant or the removing of one product displaces the equilibrium state of the system in the forward direction. -Know that a catalyst is a chemical specie that increases the rate of a chemical reaction without changing the equilibrium state of the system. -Define the half-life t1/2 of a chemical reaction. -Know the expression of the volume rate of reaction. -Explain qualitatively the reaction rate change using the plotted evolution's curves,.
2	Write the equation of the reaction using structural formulae propyl methanoate	**0,5** **0,25**	-Name the esters containing at most five carbon atoms. -Write the esterification and the hydrolysis equation.
3	In this instant, the reaction has not reached yet the equilibrium state.	**0,75**	-Calculate the yield of a chemical transformation. -Determine the composition of reaction mixture at a given time. -Give and use the expression of the reaction quotient Qr through the reaction equation.

Physics (13 points)				
Exercice 1	**Question**	**Answers**	**Marking scale**	**Question reference in the framework**
Waves(2,75 points)	**1-1-**	c	**0,5**	-Know (Recall) and exploit the relationship: $n = \frac{c}{v}$ -Know (Recall) and exploit the relationship $\theta = \lambda/a$; - Know the boundaries of wavelengths and their colours for the visible spectrum in the vacuum.. -Know (Recall) and exploit the relationship: $\lambda = \frac{c}{v}$. -Exploit experimental measurements to verify the relationship $\theta = \lambda/a$
	1-2-	Establish this relationship : $a = \frac{2\lambda D}{\ell}$, $a \simeq 55,8\,\mu m$	**0,5** **0,25**	
	1-3-	$\theta \simeq 1,13.10^{-2}$ rad $\ell' \approx 6,8\,cm$.	**0,25** **0,25**	
	2-1-	$E = \frac{hc}{\lambda}$, $E = 1,96\,eV$	**0,25+0,25**	-Know and exploit the relation $\Delta E = h.\nu$. - Use different units of mass, energy and the relationships between their units.
	2-2-	$E_n = 20,66\,eV$; $E_p = 18,70\,eV$.	**0,25** **0,25**	

Exercice 2	Question	Answers	Marking scale	Question reference in the framework
Electricity(5 points)	1-1-	Finding $C=20\,nF$	0,25	- Know and exploit the relationship q = C.u. - Know the capacitance of a capacitor, its unit F and their submultiples $\mu F, nF$ and pF. - Determine the capacitance of a capacitor graphically or by calculation. - Know and exploit the relationship $i=\frac{dq}{dt}$ for a capacitor in receiver convention.
	1-2-	Method , $\Delta t=1,2\,s$	0,25+0,25	
	1-3-1-	differential equation	0,25	- Find out the differential equation and verify its solution when the RC dipole is submitted to a step voltage.
	1-3-2-	Method , $U_0 \simeq 12,2\,V$. Method , $R=1k\Omega$	0,25+0,25 0,25+0,25	-Determine the voltage expression $u_C(t)$ between capacitor terminals when the RC dipole is submitted to a step voltage, and deduce both the expression of the intensity current in the circuit and the capacitor charge. - Know and exploit the time-constant expression. - Exploit experimental documents in order to: determine the time-constant and charge duration.
	1-3-3-	Method , $t_1=10\,\mu s$.	0,25+0,25	- Know and exploit the expression of the electric energy stored in a capacitor.
	2-1-	differential equation	0,5	-Know and exploit the relationship $i=\frac{dq}{dt}$ for a capacitor in receiver convention. Know and exploit the relationship q = C.u. - Know and exploit the voltage expression $u = r.i + L.\frac{di}{dt}$ between the inductor (coil) terminals using the receiver convention. -Find out the differential equation for the voltage between the capacitor terminals or for its charge $q(t)$ in the RLC circuit that is maintained by using a generator delivering a voltage which is proportional to the current intensity: $u_G(t)=k.i(t)$ -Determine the two characteristics of the inductor (the inductance L, the resistance r) exploiting experimental results.
	2-2-1-	Finding $r=8\Omega$.	0,25	
	2-2-2-	$L=312,5\,mH$. $U_{c_{max}}=10\,V$.	0,25 0,25	-Know and exploit the natural period . - Know and exploit the expression of the electric energy stored in a capacitor - Know and exploit the expression of the total energy in the circuit.
	3-1-	d	0,25	-Know that in the receiving antenna, the electromagnetic wave generates an electric signal that has the same frequency.- -Recognise the different stages of amplitude modulation and amplitude demodulation through their corresponding assembly schemes. - Know the conditions allowing to get an amplitude modulation and a high quality detection envelope.
	3-2-	yes , justification	0,5	- Know the selective role of the LC (bung circuit) for the modulated voltage. -Know and exploit the natural period expression.
	3-3-	Method , $5\,nF << C_x < 230\,nF$.	0,25 0,25	- Know the conditions allowing to get an amplitude modulation and a high quality detection envelope.

Exercice 3		Question	Answers	Marking scale	Question reference in the framework
Mechanics (5,25 points)	Part I	1-1-	Method to find out the differential equation	0,5	- Apply Newton's second law to find out the differential equation of a solid's centre of inertia motion in frictional vertical fall..
		1-2-	$\tau = 0,1s$, $k = 5kg.s^{-1}$	0,25+0,25	-Exploit the curve $v_G = f(t)$ to determine: - Apply Newton's second law to determine the kinetic quantities $\overrightarrow{v_G}$ and $\overrightarrow{a_G}$ and dynamic quantities and exploit them
		1-3-	Method, $v_i \approx -0,632\,m.s^{-1}$	0,25 0,25	-Know and apply the Euler's method to solve approximately differential equation.
		2-1-	$x_B(t) = 20\cos\alpha.t$ $y_B(t) = -5t^2 + 20\sin\alpha.t + 1,8$	0,25 0,25	- Apply Newton's second law in the case of a projectile to: * deduce the parametric equations of motion and exploit them; * establish the equation of the path (trajectory), find out the expressions of the range and the maximum height of the path and exploit them;
		2-2-	$x_S = 20\sin 2\alpha$, $y_S = 20\sin^2\alpha + 1,8$	0,25 0,25	
		3	Méthod , $\alpha \simeq 60^\circ$	0,25+0,25	
	Part II	1	Finding $E_p = \frac{mgL}{4}\theta^2$	0,5	-Exploit the expression of the gravitational potential energy and the expression of the kinetic energy to determine the mechanical energy of the physical pendulum in the small oscillations case. -Exploit the conservation of the mechanical energy of a physical pendulum in the small oscillations case. -Determine the nature of the motion for a physical pendulum in the small oscillation amplitude case; then, write and exploit the equations of the motion $\theta(t)$, $\dot{\theta}(t)$ and $\ddot{\theta}(t)$. -Know the meaning of the physical quantities involved in the expression of the time-equation $\theta(t)$ for the physical pendulum and determine them using the initial conditions. -Establish the expression of the natural period for the physical pendulum. -Know and exploit the expression of the natural period and the natural frequency for the physical pendulum in the small oscillation amplitude case. -Exploit the diagrams $\theta(t)$, $\dot{\theta}(t)$ and $\ddot{\theta}(t)$ to determine the characterizing quantities of the physical pendulum motion in the small oscillation amplitude.
		2	Method	0,5	
		3-1-	Method, $g \simeq 9,81\,m.s^{-2}$	0,25+0,25	
		3-2-	Method, $\theta_m \simeq 0,26\,rad \simeq 15^\circ$	0,25 0,25	
		3-3-	$\varphi \simeq 0,84\,rad \simeq 48^\circ$	0,25	