الامتحان الوطني الموحد للبكالوريا
المسالك الدولية – خيار أنجليزية
الدورة الاستدراكية 2018
-عناصر الإجابة-

RR28E

المملكة المغربية
وزارة التربية الوطنية والتكوين المهني والتعليم العالي والبحث العلمي
المركز الوطني للتقويم والامتحانات والتوجيه

3	مدة الإنجاز	الفيزياء والكيمياء	المادة
7	المعامل	شعبة العلوم التجريبية : مسلك العلوم الفيزيائية – خيار أنجليزية	الشعبة أو المسلك

EXERCISE I (7 points)				
	Questions	**Answers**	**Marking scale**	**Question reference In the framework**
Part I	**1**	$Q_{r,i}=1$	**0,5**	-Calculate the value of the quotient of reaction Q_r of a chemical system in given state. -Determine the direction of spontaneous evolution of a chemical system. -Write the half-equation that occurred in each electrode (use double arrows) and write the overall equation of the reaction during the battery functioning (use one arrow). -Establish the relationship between the amount of substance of chemical specie produced or consumed, the current intensity and the operating duration of a battery. Use this relationship to determine other quantities (quantity of charge, progress of the reaction, change of the mass...).
	2	Direction (1)	**0,5**	
	3	At the cathode : $Cu^{2+}_{(aq)}+2e^- \rightleftarrows Cu_{(s)}$	**0,5**	
	4	$m(Cu)=\frac{I.\Delta t.M(Cu)}{2.F}$ $m(Cu)\approx 1,78$ g	**0,5** **0,25**	
Part II	**1.1**	Catalyst (it speeds up the reaction)	**0,5**	-Know that a catalyst is a chemical specie that increases the rate of a chemical reaction without changing the equilibrium state of the system.
	1.2	Slow and non-complete (limited)	**0,25x2**	-Know the characteristics of esterification and hydrolysis: non- complete and slow transformations.
	1.3	Set-up (**C**)	**0,5**	-Know the experimental set-up of an acid-base titration.
	1.4	Equation of reaction	**0,75**	- Write the esterification and the hydrolysis equation.
	1.5	-Expression of K. - $K=0,25$	**0,5** **0,25**	- Know that, the reaction quotient in equilibrium $Q_{r,eq}$, associated to the reaction equation of a chemical system, takes a value independent of concentrations, called equilibrium constant K.
	2.1	$A_{(\ell)}$: CH_3-$OH_{(\ell)}$ $B^-_{(aq)}$: CH_3-$CO^-_{2(aq)}$	**0,25** **0,25**	-Write the equation of the reaction of an anhydrous acid with an alcohol and that of the basic hydrolysis of an ester.
	2.2.1	- Method - $G_{1/2}\approx 17$ mS	**0,5** **0,25**	-Exploit the different curves of time-evolution of the following: the amount of substance of a chemical specie, its

				concentration, the progress of a reaction, conductivity, conductance, pressure and volume.
	2.2.2	Let consider any value of $t_{1/2}$ in the following interval $17\,\text{min} \le t_{1/2} \le 18\ min$	**0,5**	-Define the half-life t1/2 of a chemical reaction. -Determine the half-life $t_{1/2}$ of the chemical reaction graphically or through exploiting the

EXERCISE II (2,5 points)			
Questions	**Answers**	**Marking scale**	**Question reference In the framework**
1.	- Equation of disintegration - The radioactivity's type is β^-	**0,5** **0,25**	- Know and exploit the two laws of conservation. - Write the equation of a nuclear reaction by applying the two conservation laws. - Recognise the type of radioactivity using the equation of a nuclear reaction.
2.	- Method - $E_{pro} \simeq 2,8.10^{-2}\ MeV$	**0,5** **0,25**	- Calculate the energy released (produced) by a nuclear reaction: $E_{pro} = \lvert\Delta E\rvert$.
3.	- Method - $a_1 \simeq 7,5.10^{5}\ Bq$	**0,5** **0,5**	- Know and exploit the law of the radioactive decay, and exploit its curve. - Know that 1Bq is equal to one decay per second. - Exploit the relationships between τ , $t_{1/2}$ and λ (decay constant).

	EXERCISE III (4,5 points)			
	Questions	**Answers**	**Marking scale**	**Question reference In the framework**
Part I	**1.**	How to connect the datalogger to monitor the voltage $u_L(t)$	**0,25**	Know how to connect an oscilloscope and a datalogger to monitor different voltages.
	2.	Differential equation : $\frac{di}{dt}+\frac{R}{L}i=\frac{E}{L}$	**0,5**	- Find out the differential equation and verify its solution when the RL dipole is submitted to a step voltage.
	3.	$u_L(t)=E.e^{-\frac{R.t}{L}}$	**0,5**	- Determine the current's intensity expression $i(t)$ when the RL dipole is submitted to a step voltage, and deduce the voltage expressions between the inductor's terminals and the resistor terminals.
	4.	$u_L(\tau)=E.e^{-1}=0,37.E$ $u_L(\tau)\approx 3,3\,V$	**0,25** **0,25**	
	5.	$\tau = 1\,ms$ $L \approx 10^{-2}\,H$	**0,25** **0,5**	- Know and exploit the time-constant expression. - Exploit experimental documents in order to determine the time-constant.
	6.	- Expression of E_m - $E_m \approx 1,6.10^{-3}\,J$	**0,5** **0,25**	- Know and exploit the expression of the magnetic energy stored in a inductor.

Part II	1.	Answer : **C**	**0,5**	- Know the stages of demodulation. - Know the conditions allowing to get an amplitude modulation and a high quality detection envelope. - Know the selective role of the LC (bung circuit) for the modulated voltage. - Recognise the essential components required to assemble an AM radio, and their roles in the demodulation. - Know the role of different used filters.
	2.	Answer : **B**	**0,5**	
	3.	Answer : **C**	**0,25**	

	EXERCISE IV (6 points)			
	Questions	**Answers**	**Marking scale**	**Question reference In the framework**
Part I	1.	Path (1) : O^{2-} Path (2) : He^{2+}	**0,25** **0,25**	- Know the characteristics of Lorentz force and the rule to determine its direction. - Apply Newton's second law in the charged particle case inside a uniform magnetic field, with $\vec{B}$ perpendicular to $\vec{v}_0$ in order to determine the type of motion. - Know the components of the acceleration vector in Cartesian coordinate system and in Frenet frame.
	2.	- Newton's second law - Using Frenet frame - Uniform motion -Circular motion	**0,25** **0,25** **0,25** **0,25**	
	3.	$\frac{R_{O^{2-}}}{R_{He^{2+}}} = 4$	**0,5**	
	4.	Method	**1**	
Part II	1.	Method	**0,5**	- Use of the dimensional analysis (dimensional equations). - 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. - Know the expression of the natural period for the simple pendulum. - 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.
	2.	$T_0 \approx 2,8\ s$ $\varphi = -\frac{\pi}{2}\ rad$	**0,25** **0,5**	
	3.	Method	**0,5**	
	4.	Method	**0,75**	
	5.	- Method - $m \approx 34\ kg$	**0,25** **0,25**	