الامتحان الوطني الموحد للبكالوريا
المسالك الدولية – خيار أنجليزية
الدورة الاستدراكية 2019
- عناصر الإجابة -

RR28E

المملكة المغربية
وزارة التربية الوطنية والتكوين المهني والتعليم العالي والبحث العلمي

المركز الوطني للتقويم والامتحانات والتوجيه

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

Exercise I (7 points)

		Question	Answers	Marking scale	Question reference in the framework
Part 1		1.	$Q_{r,i} = \frac{[Cd^{2+}]_0}{[Ni^{2+}]_0}$; $Q_{r,i} = 1$ Forward direction (1)	0,25x2	- 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. - Draw a cell diagram / diagram of an electrochemical cell (battery) - 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.
		2.	Cell diagram (cell notation)	0,5	
		3.	Half-equations	2 x 0,25	
		4.	$\Delta m = \frac{I.M(Ni).\Delta t}{2.F}$ $\Delta m = 1,64\,g$	0,25 0,25	
Part 2	I	1.	Equation of titration with one arrow	0,5	- Write the equation of titration reaction (use only one arrow) - Determine and exploit the point of equivalence. - Justify the choice of a suitable indicator to determine the equivalence.
		2.1.	Method $C_A = 10^{-2}\ mol.L^{-1}$	0,25 0,25	
		2.2.	Method	0,5	
		3.	Red cresol + justification	2 x 0,25	
	II	1.	- Method	2 x 0,25	- Draw the progress table of a reaction and exploit it. - Define the final progress rate of a reaction, and determine it using experimental data.
		2.	-Progress table	0,5	
		3.	- Method $x_{max} = 2,8\,mmol$	0,25 0,25	
		4.	- Method $v \approx 10^{-3}\,mol.L^{-1}.s^{-1}$	0,5 0,25	- Determine graphically the value of the volumetric rate of reaction.
		5.	The value of $t_{1/2}$ belong to $[65\,s;\ 70\,s]$ is accepted.	0,75	- Determine the half-life $t_{1/2}$ of the chemical reaction graphically or through exploiting the experimental results.

Exercise II (2,5 points)			
Question	**Answers**	**Marking scale**	**Question reference in the framework**
1.	$\lambda = \frac{a.L}{2.D}$	**0,5**	-Exploit a document or a diffraction pattern in the case of light waves. -Know the influence of the size of the slit (opening) or of the obstacle on the diffraction phenomenon. -Know (Recall) and exploit the relationship $\theta = \lambda/a$; and know the units and the meaning of θ and λ.
2.1.	True	**0,5**	
2.2.	False	**0,5**	
3.	Method $\lambda_R = 637,5\,nm$	**0,25** **0,25**	
4.	$L_B < L_R$ + justification	**0,25x2**	

Exercise III (5 points)				
	Question	**Answers**	**Marking scale**	**Question reference in the framework**
Part 1	**I-1.**	Curve (2) + justification	**0,25x2**	-Find out the differential equation and verify its solution when the RL dipole is submitted to a step voltage. -Determine the two characteristics of the inductor (the inductance L, the resistance r) exploiting experimental results. -Recognize and represent the variation curves of current intensity $i(t)$ in terms of time across the inductor and different physical quantities associated to it, and exploit them.
	I-2.	Method	**0,5**	
	I-3.	Deducing the relationship	**0,25**	
	I-4	$r = R\left(\frac{E}{U_R} - 1\right)$ $r = 10\,\Omega$	**0,25** **0,25**	
	I-5.	$\tau = 0,01\,s$	**0,25**	
	I-6.	Method	**0,25**	
	II-1.	Underdamped state (pseudo-periodic)	**0,25**	-Exploit experimental documents in order to: * recognize the damping states; * determine the values of the period and the natural period. -Know and exploit the natural period expression.
	II-2.	$C = \frac{T_0^2}{4\pi^2.L}$ $C = 5\,\mu F$	**0,25** **0,25**	
	II-3.	$E_e = \frac{1}{2}C.u_{C1}^2 = 5,76.10^{-5}\,J$ $E_m = \frac{1}{2}L.i_1^{\,2} = 3,60.10^{-5}\,J$ $E_t = E_e + E_m$; $E_t = 9,36.10^{-5}\,J$	**0,25** **0,25** **0,25**	-Know and exploit the expression of the total energy in the circuit.
Part 2	**1.**	$F_p = 3.10^5\,Hz$ $f_m = 10^4\,Hz$	**0,25** **0,25**	-Know that the amplitude modulation process is to transform the modulated amplitude voltage to affine function of the modulating voltage. -know the required conditions to avoid over modulation. -Recognize the stages of the amplitude modulation. -Exploit the different experimental obtained curves. -Know the conditions allowing to get an amplitude modulation and a high quality detection envelope.
	2.	$m = \frac{0,6}{0,8} = 0,75$	**0,25**	
	3.	The modulation is good + Justification	**0,25** **0,25**	

Exercise IV (5,5 points)				
Question		**Answers**	**Marking scale**	**Question reference in the framework**
Part 1	**1.**	Definition of the free fall	**0,5**	-Define the vertical free fall. -Apply Newton's second law to find out the differential equation of a solid's centre of inertia motion in vertical free fall and solve it. -Know and exploit the characteristics of the uniformly accelerated straight-line motion and its parametric equations (t is the parameter). -Exploit the velocity-time graph: $v_G = f(t)$.
	2.	Method $\frac{dV_Z}{dt} = -g$	**0,25** **0,25**	
	3.	Method	**0,5**	
	4.	Method $V_Z(t) = -10t + 10$	**0,5** **0,25**	
	5.	Method	**0,5**	
	6.	The ball does not reach point B Justification	**0,25** **0,5**	
Part 2	**1.**	$E_{pt\,max} = 0,05\,J$ $C = \frac{2.E_{pt\,max}}{\theta_m^2}$; $C = 0,4\,N.m.rad^{-1}$	**0,25** **2x0,25**	-Know and exploit the expression of the torsional potential energy. -Know and exploit the expression of the mechanical energy of a torsional pendulum. -Exploit the conservation and the non-conservation of the mechanical energy of the torsional pendulum. -Exploit the energy diagrams.
	2.1	Method	**0,5**	
	2.2	Method $E_{k1} = 0,025\,J$	**0,5** **0,25**	