الامتحان الوطني الموحد للبكالوريا
المسالك الدولية
الدورة الاستدراكية 2020
- عناصر الإجابة –

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

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

Exercice1 : Chimie(6,5 points)

Question	Eléments de réponse	Barème	Référence de la question dans le cadre de référence
Part I- 1	Direction (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 occurredin 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 specieproduced or consumed, the current intensity andthe operating durationof a battery. Use this relationship to determine other quantities (quantity of charge, progressof the reaction, changeof the mass...). -Determine and exploit the point of equivalence. -Draw the progress table ofa reaction and exploit it.
2	$I_{2(aq)} + 2e^- \rightleftarrows 2I^-_{(aq)}$	0,25	
3	$n_c(I_2) = C_1 V - \frac{C_r V_E}{2}$; $n_c(I_2) = 7,0\,mmol$.	0,5 0,25	
4	$\Delta t = \frac{2F.n_c(I_2)}{I_0}$ ، $\Delta t = 1,93.10^4\,s$	0,5 0,25	
5	$\left[Zn^{2+}_{(aq)}\right] = C_0 + \frac{n_c(I_2)}{V}$; $\left[Zn^{2+}_{(aq)}\right] = 0,17\,mol.L^{-1}$	2x0,25	

II-1	Equation of the reaction ,	0,5	-Know that the ionic product of water K_W, is the equilibrium constant associated with the equation of the reaction of water autoprotolysis (self-ionization of water). -Know the relationship $pK_W = -\log K_W$ -Write the equation of titration reaction (useonly one arrow) -Determine the equilibrium constant associated to the equation of acid-base reaction using the acid dissociation constants of existing pairs.
2	$C_A = 0,10\,mol.L^{-1}$; Deduction.	0,25 0,5	
3-1	$\tau = \frac{10^{-pH}}{C_A}$; $\tau \simeq 4,2\%$; Reaction is non complete.	0,25 0,25	
3-2	$\frac{\left[HCOO^-\right]_{éq}}{\left[HCOOH\right]_{éq}} = \frac{1}{C_A.10^{pH} - 1}$ $\frac{\left[HCOO^-\right]_{éq}}{\left[HCOOH\right]_{éq}} \simeq 4,35.10^{-2}$	0,5 0,25	
3-3	Verification.	0,5	
4	$pH = \frac{1}{2}(pK_{A1} + pK_{A2})$; $pK_{A2} = 4,76$	0,5 0,25	

Exercice 2 : Ondes (2.5 points) – Transformations nucléaires(2,25 points)

Quest.	Eléments de réponse	Barème	Référence de la question dans le cadre de référence
I-1	1	**0,5**	-Define a mechanical wave and its wave speed. -Define a transverse wave and a longitudinal wave. - Know (Recall) and use the relationship $\lambda = v.T$ -Know(Recall) the characteristics of the diffracted wave. -Define a dispersive medium. - Know(Recall) and exploit the relationship: $\lambda = \frac{c}{v}$. - Know the boundaries of wavelengths and their colours for the visible spectrum in the vacuum. - Know the frequency of a monochromatic radiation does not change as it passes from one transparent medium to another. - Suggest the scheme of an experimental set-up allowing us to highlight the diffraction phenomenon in the case of light waves. -Know (Recall) and exploitthe relationship $\theta = \lambda/a$; and know the units and the meaningof θ and λ .
2/2-1	During the diffraction of periodic progressive mechanical, its frequency does not vary.	**0,25**	
2-2	Mechanical, longitudinal wave.	**0,25**	
3-1	The schematic mounting and the figure	**2x0,25**	
3-2	$a = \frac{2.c.D}{f_1.\ell_1}$; $a \simeq 25\mu m$.	**2x0,25**	
3-3	The width of the central spot decreases + justification.	**2x0,25**	
II-1	$^{210}_{84}P_0 \rightarrow {}^{206}_{82}Pb + {}^{4}_{2}He$	**0,25**	- Write the equation of a nuclear reaction by applying the two conservation laws. - Establish the energy balance ΔE of a nuclear reaction using: mass energies and/or binding energies and/or the energy diagram. - Calculate the energy released (produced) by a nuclear reaction: $E_{pro} = \lvert\Delta E\rvert$. - Know and exploit the law of the radioactive decay, and exploit its curve. - Know that 1Bq is equalto one decay per second. - Define the time constant τ and the half-life $t_{1/2}$. - Exploit the relationships between τ , $t_{1/2}$ and λ (decay constant).
2-1	$\lvert E_1\rvert = 5,4865\,MeV$	**0,5**	
2-2	$\lvert E_2\rvert = \frac{m}{m(^{210}_{84}P_0)}.\lvert E_1\rvert \approx 2,518.10^{10}\,J$	**0,25**	
3	$t_{1/2} \simeq 138\,jours$	**0,5**	
4	Steps of the solution $m_{max} \simeq 4,4.10^{-12}g$	**0,5** **0,25**	

Exercice 3 : Electricité (5,5 points)

Question	Eléments de réponse	Barème	Référence de la question dans le cadre de référence
I/1-1-1	Differential equation	**0,25**	- Know and exploit the relationship $i=\frac{dq}{dt}$ for a capacitor in receiver convention. - Know and exploit the relationship q = C.u. - Find out the differential equation and verify its solution when the RC dipole is submitted to a step voltage. - Recognise and represent the variation curves of $u_C(t)$ between the capacitorterminals and different physical quantities associated to it, and exploit them. - Know and exploit the time-constant expression. - Know the capacitance of the equivalent capacitor in series orin parallelassemblies**;** and recallthe interest of each one. - Represent the voltages (Electric Potential Difference) u_R and u_L using the receiver convention. - Know and exploit the voltage expression $u=r.i+L.\frac{di}{dt}$ between the inductor(coil) terminals using the receiver convention. - Recognise and represent the variation curves of the voltage between capacitor terminals in terms of time for the three states mentioned above; and exploit them. - Know and exploit the expression of thecharge $q(t)$ and deduce the current intensity expression $i(t)$ flowing in the circuit and exploit it. - Find out the differential equation for the voltage between the capacitor terminals or for its charge $q(t)$ in the damping case. - Exploit experimental documents in order to.....
1-1-2	$i(t)=\frac{E}{R}e^{-\frac{t}{RC}}$.	**0,5**	
1-2-1	Curve (b).	**0,25**	
1-2-2	Demonstration.	**0,25**	
1-2-3	Demonstration.	**0,75**	
1-2-4	$R=1k\Omega$, $E=6V$.	**2x0,25**	
2-1	Differential equation	**0,5**	
2-2	Method ; $R_1=-\frac{L}{E}.\left(\frac{du_{R_1}}{dt}\right)_{t=0}\simeq 6,7\Omega$	**0,5+0,25**	
II-1	$N_1=99kHz$; $N_2=101kHz$.	**0,25** **0,25**	- Know the mathematical expression of the sinusoidal voltage. - Know that the amplitude modulation process is to transform the modulated amplitude voltage to affine function of the modulating voltage. Recognise the stages of the amplitude modulation. - Exploit the different experimental obtained curves. -Recognise the different stages of amplitude modulation and amplitude demodulation through their corresponding assembly schemes - Know and exploit the frequency spectrum.
2	$m=\frac{S_m}{U_0}$.	**0,25**	
3-1	$m=\frac{2}{3}\simeq 0,67$.	**0,5**	
3-2	$U_0=3V$; $U_m=4V$.	**2x0,25**	

Exercice 4 : Mécanique(3,25 points)

Question	Eléments de réponse	Barème	Référence de la question dans le cadre de référence
I-1	Demonstration.	**0,5**	- Know and exploit the two models of frictional fluids(viscous forces): $\vec{F}=-k.v.\vec{i}$ and $\vec{F}=-k.v^2.\vec{i}$ - Exploit the curve $v_G = f(t)$ to determine: - Apply Newton's second law to find outthe differential equation of a solid's centre of inertia motion in frictional vertical fall. * theterminal speed; * the characteristic time τ ; * the initial state and the steady state.
2	$\eta=\frac{2r^2g}{9v_{lim}}(\rho_S-\rho_\ell)$; $\eta\simeq 0,314$ S.I.	**0,25+0,25**	
3	$z(7\tau)\simeq 75,6\,cm$. It's suitable: the permanent state is registered before that the ball reachs the end of the tube.	**0,5**	
II-1	$x(t)=100.\cos(\alpha).t$; $y(t)=-5t^2+100\sin(\alpha).t$.	**0,25** **0,25**	- Apply Newton's second law in the case of a projectile to: * find out differential equation of motion; * 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	$y(x)=\frac{-5.10^{-4}}{\cos^2\alpha}x^2+x\tan\alpha$.	**0,5**	
3-1	$\alpha_1\simeq 77,5^\circ$; $\alpha_2\simeq 26,6^\circ$.	**0,25+0,25**	
3-2	Demonstration.	**0,25**	

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