★

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

RR 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)

Questions	Answers	Marking scale	Question reference in the framework
	Part I		
1-1-1-	$CH_3—CH_2—C(=O)—O—CH_2—CH_3$ ethyl propanoate	**0,25** **0,25**	-Recognise in the formula of a chemical compound the organic functional groups: -OH(hydroxyl); -CO2H(carboxyl) ; -CO2R (ester); -CO-O-CO- (anhydride). -Write the esterification and the hydrolysis equation. -Name the esters containing at most five carbon atoms.
1-1-2-	Method , $m \simeq 2,47\,g$.	**0,5** **0,25**	-Know that, the reaction quotient in equilibrium Qr,eq, associated to the reaction equation of a chemical system, takes a value independent of concentrations, called equilibrium constant K. -Draw the progress table of a reaction and exploit it. -Determine the composition of reaction mixture at a given time.
1-2-1-	Equation of the reaction	**0,25**	-Write the esterification and the hydrolysis equation.
1-2-2-	Method , $r \simeq 91\%$.	**0,25** **0,25**	-Calculate the yield of a chemical transformation.
2-1-1-	Equation of the reaction	**0,25**	-Write the equation of the acid-base reaction and identify the two pairs involved.
2-1-2-	$pH = pK_A + \log\left(\frac{[C_2H_5COO^-_{(aq)}]}{[C_2H_5COOH_{(aq)}]}\right)$	**0,25**	-Write and use the expression of the acid dissociation constant KA associated with the reaction of an acid with water.
2-1-3-	Finding the expression $\tau \simeq 1\%$.	**0,75** **0,25**	-Determine the pH for an aqueous solution. -Calculate the final progress of the reaction that occurs between an acid and water taking into consideration the value of both the concentration and this acid's pH aqueous solution; then, compare it with the maximum progress. -Define the final progress rate of a reaction, and determine it using experimental data
2-2-1-	equation of titration reaction (use only one arrow).	**0,25**	-Write the equation of titration reaction (use only one arrow)
2-2-2-	Method , $\frac{[C_2H_5COO^-]}{[C_2H_5COOH]} = \frac{V_B}{V_{BE} - V_B}$	**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.. -Determine and exploit the point of equivalence.
2-2-3-	Check the value of pK_A	**0,5**	

Part II			
1-	b	**0,5**	-Interpret the functioning of a battery based on: the direction of electric current flow, the electromotive force (emf), the electrode reactions, the polarity of electrodes or the movement of charge carriers. -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).
2-1-	Method, $Q_r = \frac{1,25.10^{-2} + 0,25x}{(0,1-2x)^2}$	**0,25** **0,25**	-Give and use the expression of the reaction quotient Qr through the reaction equation. -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...).
2-2-	Method, $Q_r = 56,25$.	**0,5** **0,25**	
2-3-	Method, $\lvert\Delta m\rvert = 5,62\,g$	**0,25+0,25**	

Physics (13 points)				
Exercise1	**Questions**	**Answers**	**Marking scale**	**Question reference in the framework**
Nuclear Transformations (2,25 points)	**1 -**	c	**0,5**	-Use the dimensional analysis to determine the units of λ and τ. -Know that 1Bq is equal to one decay per second. -Use different units of mass, energy and the relationships between their units. -Exploit the binding energy per nucleon curve (Aston curve) to identify the most stable nucleus.
	2-	The definition	**0,25**	Define the radioactivity: α , β^+ & β^- and the $\gamma - radiation$.
	3-	Method , $\lvert\Delta E\rvert \approx 2,28\,MeV$.	**0,5** **0,25**	-Define and calculate the mass defect and the binding energy. - Define and calculate the binding energy per nucleon and exploit it. -Calculate the energy released (produced) by a nuclear reaction: $E_{pro} = \lvert\Delta E\rvert$.
	4-	Method , $t_1 \approx 10,63\,ans$.	**0,5** **0,25**	-Know and exploit the law of the radioactive decay, and exploit its curve.

Ex2	Questions	Answers	Marking scale	Question reference in the framework
Electricity (5,25 points)		**Part I**		
	1-1-	differential equation	**0,5**	- Find out the differential equation and verify its solution when the RC dipole is submitted to a step voltage
	1-2-	Method , $R = 400\Omega$.	**0,25** **0,25**	-Know and exploit the time-constant expression. -Exploit experimental documents in order to:…
	1-3-	Method, $U_0 = 4V$	**0,25** **0,25**	-Recognise and represent the variation curves of $u_C(t)$ between the capacitor terminals and different physical quantities associated to it, and exploit them. -Recognise that the voltage between capacitor terminals is a continuous function of time at t=0, and the current intensity is a discontinuous function at t=0.
	1-4-	$E_{el} = \frac{1}{2}C(E^2 - U_0^2)$, $E_{el} = 60\mu J$	**0,25+0,25**	-Know and exploit the expression of the electric energy stored in a capacitor.
	2-1-	Establish this relationship : $E_m = \frac{1}{2}Li^2(t)$.	**0,5**	-find out the expression of the electro-magnetic energy stored in an inductor.
	2-2-	Method , $\frac{dE_t(t)}{dt} = -(R_0 + r).i^2(t)$.	**0,25** **0,25**	-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 damping case. -Know and exploit the expression of the total energy in the circuit.
	2-3-	Finding $\lvert\Delta E\rvert = \frac{1}{2}(CE^2 - \left(\frac{u_{R_0}}{R_0}\right)^2 (L + C(R_0 + r)^2))$ $\lvert\Delta E\rvert \approx 2,58.10^{-5}$ J .	**0,25** **0,25**	
		Part II		
	1-	d	**0,5**	-Know the role of the driver and the resonating system. -Know and exploit the quality factor expression $Q = \frac{N_\circ}{\Delta N}$ - Know the power factor -Distinguish between free and forced oscillations.
	2-	Finding : * $U_m \approx 10V$, * $L_0 \approx 0,5H$, * $r_0 = 7\Omega$	**0,25** **0,25** **0,25**	-Know and exploit the impedance expression $Z = \frac{U}{I}$ of a circuit. -Recognise the electric resonance phenomenon and its characteristics. -Know and exploit the natural period expression.
	3-	Method. $P = 1,35W$.	**0,25** **0,25**	-Find out and exploit the average power expression $P = U.I.\cos\varphi$ -Recognise the electric resonance phenomenon and its characteristics.

Exercise3		Questions	Answers	Marking scale	Question reference in the framework
Mechanics (5,5 points)	Part I	1-1-	differential equation	0,25	-Apply Newton's second law to the oscillating system (solid-spring) to establish the differential equation of motion and verify its solution when the oscillating system vibrates in the following situations: horizontal, inclined or vertical..
		1-2-	Finding: $X_m = 2\,cm$, $\varphi = 0$.	0,5 0,25	-Know the meaning of the physical quantities involved in the expression of the parametric equation $x_G(t)$ of the oscillating system (solid-spring) and determine them using the initial conditions. -Exploit the curves: $x_G(t)$, $v_G(t)$ and $a_G(t)$.
		2-1-	$\Delta\ell_0 = -\frac{mg}{K}$.	0,25	-Know the characteristics of the restoring force exerted by a spring on a solid in motion..
		2-2-	Finding : $E_p = \frac{1}{2}Kz^2 + \frac{1}{2}K(\Delta\ell_0)^2$	0,5	-Know and exploit the expression of the elastic potential energy.
		2-3-1-	Finding: $\Delta\ell_0 = -4\,cm$, $K = 50\,N.m^{-1}$.	0,25 0,25	-Exploit the energy diagrams.
		2-3-2-	Finding: $W(\vec{T}) = -\Delta E_p + K.\Delta\ell_0(z_2 - z_1)$ $W(\vec{T}) = -3,3.10^{-2}\,J$.	0,25 0,25	-Know and exploit the relation between the work of a force applied by a spring and the elastic potential energy change.
	Part II	1-	The definition	0,25	-Know the heliocentric and geocentric frames of reference.
		2-	The correct answer is "d"	0,5	-Use of the dimensional analysis (dimensional equations). -Know that the gravitational force applied on the centre of mass of a satellite or of a planet is centripetal. -Apply the Newton's second law to the centre of mass of a satellite or of a planet to determine the type of motion or one of parameters that characterizes the motion.
		3-	$\vec{F} = G\frac{m.M}{R^2}\vec{n}$	0,25	-Know the universal gravitation law in its vectorial form.
		4-	Show that the motion is circular uniform.	0,5	-Apply the Newton's second law to the centre of mass of a satellite or of a planet to determine the type of motion or one of parameters that characterizes the motion. -Find Kepler's third law in the case of circular trajectory.
		5-	Finding: $\frac{T^2}{R^3} = \frac{4\pi^2}{GM} = cte$	0,5	
		6-	Finding: $r = R.\sqrt[3]{\frac{m.T'^2}{M.T^2}}$, $r \approx 3,81.10^5\,km$	0,5 0,25	