

الصفحة 1 4	<p>الامتحان الوطني الموحد للبكالوريا المسالك الدولية – خيار إنجليزية الدورة الاستدراكية 2019 - عناصر الإجابة -</p>		<p>المركز الوطني للتقويم والامتحانات والتوجيه</p>
	*****		RR30E
4	مدة الانجاز	الفيزياء والكيمياء	المادة
7	المعامل	شعبة العلوم الرياضية : (أ) و (ب) خيار إنجليزية	الشعبة أو المسلك

Exercise1 : Chemistry (7 points)

Question	Answer elements	Marking scheme	Reference of the answer in the reference framework
I- 1	$V_E = 10 \text{ mL}$; $\text{pH}_E \approx 6,3$	0,25+0,25	-Exploit the curve or the results of the titration. -Determine and exploit the point of equivalence. -Write the equation of titration reaction (use only one arrow)
2	$C = \frac{C_A \cdot V_E}{V}$; $C = 2 \cdot 10^{-2} \text{ mol.L}^{-1}$	0,25 0,25	-Justify the choice of a suitable indicator to determine the equivalence
3	Bromthymol blue, justification	0,25 0,25	
4	Equation of the reaction	0,5	
5	Demonstration	0,5	-Draw the progress table of a reaction and exploit it. -Write and use the expression of the acid dissociation constant K_A associated with the reaction of an acid with water. -Know the relationship $\text{pK}_A = -\log K_A$.
6	Method; $y = 0,5$; $\text{pK}_{Al} \approx 10,6$.	0,25+0,25 0,25	
7-1	Equation of the reaction ,	0,25	-Write the equation of the acid-base reaction and identify the two pairs involved. -Define the final progress rate of a reaction, and determine it using experimental data.
7-2	$\tau = 12,5\%$; non-completion reaction.	0,25+0,25	

الصفحة 2 4	RR30E	الامتحان الوطني الموحد للبكالوريا (المسالك الدولية) - الدورة الاستدراكية 2019 - عناصر الإجابة - مادة: الفيزياء والكيمياء - شعبة العلوم الرياضية : (أ) و (ب) - خيار إنجليزية
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Question	Answer elements	Marking scheme	Reference of the answer in the reference framework
II-1	Structural formula of E	0,25	-Name the esters containing at most five carbon atoms.
2-1	Method ; $t_{1/2} = 4,8 \text{ min}$	2x0,25	-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. -Define the half-life $t_{1/2}$ of a chemical reaction.
2-2	Curve \mathcal{C}' + justification.	0,25+0,25	-Determine the half-life $t_{1/2}$ of the chemical reaction graphically or through exploiting the experimental results. -Know the effect of reactant concentration and the temperature on the volumetric rate of reaction. -Know the expression of the volume rate of reaction. -Determine graphically the value of the volumetric rate of reaction.
2-3	Method ; $v = 0,6 \text{ mmol.L}^{-1} \cdot \text{min}^{-1}$	0,25 0,25	
2-4	Method , $Q_r = 0,44$	0,5+0,25	-Draw the progress table of a reaction and exploit it. -Give and use the expression of the reaction quotient Q_r through the reaction equation. -Determine the composition of reaction mixture at a given time.
2-5	$r = 80\%$	0,5	-Calculate the yield of a chemical transformation.

Exercise2 : Wave propagation along a rope (3 points)

Question	Answer elements	Marking scheme	Reference of the answer in the reference framework
1	Curve (2) + justification	0,25	- Define a mechanical wave and its wave speed. -Recognise a periodic progressive wave and its period.
2	2	0,5	- Define sinusoidal progressive wave, period, frequency and wavelength. - Know (Recall) and use the relationship $\lambda = v \cdot T$
3-1	$\lambda = 40 \text{ cm}$, $T = 80 \text{ ms}$, $v = 5 \text{ m.s}^{-1}$	3x0,25	- Define a transverse wave and a longitudinal wave.
3-2	$\tau = 80 \text{ ms}$, $d = 40 \text{ cm}$.	2x0,25	-Exploit the relationship between time delay, distance and wave speed. -Exploit experimental documents and data in order to determine: distance; time delay; wave speed.
4-1	Verification of the homogeneity.	0,25	-Define a dispersive medium . Use the dimensional analysis (dimensional equations).
4-2	Non dispersive medium, v does not depend on N (depends on F and μ).	0,25	
4-3	$\lambda' \approx 56,6 \text{ cm}$.	0,5	

Exercise 3 : Electricity (5 points)

Question	Answer elements	Marking scheme	Reference of the answer in the reference framework
I/1-1	Differential equation	0,5	
1-2	$U_0 = E ; \alpha = -\frac{1}{R_1 C_e}$	0,25+0,25	- Know and exploit the relationship $i = \frac{dq}{dt}$ for a capacitor in receiver convention.
1-3-1	$E = 24 V$	0,25	- Know and exploit the relationship $q = C.u$.
1-3-2	$C_1 \approx 2 \mu F$	0,25	- Find out the differential equation and verify its solution when the RC dipole is submitted to a step voltage.
1-4	$q_1(t) = 3,2 \cdot 10^{-5} (1 - e^{-5t})$	0,5	-Recognise and represent the variation curves of $u_c(t)$ between the capacitor terminals 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 or in parallel assemblies; and recall the interest of each one
2-1	Differential equation	0,5	-Find out the differential equation for the voltage between the capacitor terminals or for its charge
2-2	Verification.	0,5	$q(t)$ in the damping case.
2-3	Method; $k = 42 \Omega$	0,25+0,25	-Know and exploit the natural period expression -Know the role of the oscillation maintenance device which compensates the energy dissipated by Joule effect in the circuit. -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: $u_G(t) = k.i(t)$
II-1	Mounting with connections.	0,5	-Recognise the electric resonance phenomenon and its characteristics. -Suggest the scheme of the experimental assembly that allows...
2	Verification.	0,5	-Know how to connect an oscilloscope and a datalogger to monitor different voltages.
3	Method; $P_0 = 0,25 W$	0,25 0,25	-Know and exploit the impedance expression $Z = \frac{U}{I}$ of a circuit. -Know and exploit the natural period expression. -- Find out and exploit the average power expression $P = U.I \cos \varphi$ -Exploiter les différentes courbes obtenues expérimentalement.

Exercise 4 : Mechanics (5 points)

Question	Answer elements	Marking scheme	Reference of the answer in the reference framework
A-1	Demonstration.	0,25	-Apply Newton's second law to determine the kinetic quantities \vec{v}_G and \vec{a}_G and dynamic quantities and exploit them.
2-1	Demonstration.	0,5	-Know and exploit the expression of the elastic potential energy.
2-2	Method ; $\frac{d^2x}{dt^2} + \frac{K}{m}x = 0$	0,25+0,25	-Know and exploit the expression of the mechanical energy of a solid-spring system. -Know and exploit both the expression of the natural period and that of the natural frequency of the oscillating system (solid-spring).
2-3	Method ; $V_0 \approx 0,63 m.s^{-1}$	0,25+0,25	-Determine the type of motion of the oscillating system (solid-spring); write the equations: $x_G(t), v_G(t) = \frac{dx}{dt}$ and $\ddot{x}_G(t)$ and exploit them. -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.
B-1	$x_1(t) = 1,73.t ;$ $y_1(t) = -5t^2 + t$	0,25+0,25	-Apply Newton's second law in the case of a projectile to:
2	$y_1 = -1,67.x_1^2 + 0,58.x_1$	0,5	* find out differential equation of motion; * deduce the parametric equations of motion and exploit them;
3	Yes, justification ($x_1 \approx 34,6 cm$).	0,5	* establish the equation of the path (trajectory), find out the expressions of the range and the maximum height of the path and exploit them;
1/1-1	Method ; $g_0 = \frac{G.M_T}{R_T^2}$	0,25+0,25	- Know Kepler's three laws. -Apply Kepler's three laws in the case of a circular trajectory.
1-2	$M_T \approx 6,02.10^{24} kg$	0,25	-Know the universal gravitation law in its vectorial form.
2/2-1	Method ; $\frac{T^2}{r^3} = \frac{4\pi^2}{G.M_T} = cte$	0,25+0,25	-Find Kepler's third law in the case of circular trajectory.
2-2	$M_T \approx 6,07.10^{24} kg$	0,25	
	Both values are close.	0,25	