Barème du test blanc 2023

note: 1 + (number of points * 5/70)

- **Question Vrai/faux**
  4 points pour chacune des 9 questions (ensemble de 4 questions individuelles)

4x correct: 4 pts
3 x correct: 2 pts
2, 1, 0 x correct: 0 pt

- **Barème de la question 10**

10 a : 6 pts

Identification of each remaining species (1pt), correct value of the concentration of each remaining species 1 pt

- H^+ ($H3O^+$) 0.07 mol/L 2pts
- Cl^- 0.15 mol/L 2pts
- NH_4^+ 0.08 mol/L 2pts

If OH- and NH3 are given with a large value (> 0.01 mol/L) we remove 1 point per additional species

Partial points:

Acid/base reaction:	$HCl(aq)$ +	$NH_3(aq)$	→ $NH_4^+(aq)$	+ $Cl^-(aq)$	1pt
With initial values:	0.15	0.08	0	0	+1 pt (consideration of the doubling of the volume)
HCl fully dissociated					1pts

10 b : 4 points
Correct pH: 4point

Partial points
Strong acid + weak acid approximated as a strong acid
Strong acid only (OK) 3pts
Value of pH 1pt
(if the value is consistent with concentration of H+ (H3O+) found in part a, we give all the points)

- **Barème de la question 11**

11 a 4pts

Choice of cathode /anode	2pts
Justification	1pt
Sense of electron flow :	1pt

Partial points/ Comments

If they get the polarity of electrodes right but they just don't know what anode/cathode means only 1 pt i(nstead of 2)

Two justifications accepted for the identification of cathode:

- the concentration of Pb^{2+} decreases when the galvanic cell discharges
- E0 (Pb^{2+}/Pb) > E0 (Sn^{2+}/Sn) (not totally correct but nevertheless fully accepted here)

Sense of electron flow should be from the negative pole to the positive pole of the cell. This should be consistent with their prior identification of the electrode polarity (even if it was wrong)

11b (4 points)

Concentration of Sn^{2+} at equilibrium :	3 points
Initial concentration of Sn^{2+} :	1 point

Partial points for the calculation of Sn2+ at equilibrium

Method A

The equilibrium constant is the ratio of Sn2+/Pb2+

$\frac{[Sn^{2+}]}{[Pb^{2+}]} = K$	1pt
Calculation of K (K = 2.55)	1pt
Calculation of Sn^{2+} (0.51 mol/L)	1pt

Method B

At equilibrium ΔE = 0	1pt
Correct use of Nernst	1pt
Concentration of Sn2+	1pt

Comment for the calculation of the initial concentration of Sn^{2+}

if they write [Sn^{2+}] initial = [Sn^{2+}] equilibrium – 0.4 mol/L we give the point even if their value of [Sn^{2+}] equilibrium is wrong

11c

Correct value of E	4pt

Partial points

Nernst correct (without values or with wrong values)	1 pt
Nernst correct (+ correct or consistent values of E0, R, T (in K), [Pb2+],[Sn2+]	+2 pts
Correct numerical value	1pt

WARNING
The Nernst equation can be written in slightly different ways

RT/F: 0.257 V
RT/F + conversion ln to $\log_{10.}$: 0.059 V when T is 298 K

$\Delta E = \Delta E^0 + (RT/2F)\ \ln (0.6/0.11)$
$\Delta E = \Delta E^0 + 0.257/2\ \ln (0.6/0.11)$

if they use the global equation
$\Delta E = \Delta E^0 - (RT/zF)\ln Q$
$Pb^{2+}(aq) + Sn(s) \rightleftharpoons Pb(s) + Sn^{2+}(aq)$
$Q = [Sn^{2+}]/[Pb^{2+}]$
$\Delta E = \Delta E^0 - RT/zF\ \ln (0.11/0.6)$

- **Barème de la question 12**

12a

$k = 4.69\ 10^{-3}\ s^{-1}$ (right unit) 6pts

Partial points

- Use of the advancement of the reaction to express P_A 1pt
- Correct expression of P_A as a function of P_{tot} : 1pt

$P_{tot} = P_0 - x + 2x + 0.5x = P_0 + 1.5$ or

$P_{tot} = P_A + 2.5\ x$

$P_A = 1/3\ P_0$ when $P_{tot} = 2\ P_0$ 1pt

- 1^{st} order kinetics $\ln(P_A/P_0) = -kt$ 1pt
- With values $\ln(1/3) = -234\ k$ +1pt
- Numerical value of k +1pt

(-0.5 pt if the unit is wrong or not given)

12b

T =332.7 K 6 pts

Partial points

- Equation of 1^{st} order kinetics $k2 = -\ln(0.25)/100$ 1pt
- Value of k2 at the unknown temperature 1pt

- Arrhenius (literal only or with wrong values) 1pt
- With correct (or consistent) values +2pts
- Numerical value of T +1pt