

## TD hydrochimie :

**Table 1**

Water level and physico-chemical analyses of groundwater samples of study area collected during 2015 year.

Well no	pH	Na (mg/L)	Mg (mg/L)	Ca (mg/L)	Cl (mg/L)	CO <sub>3</sub> (mg/L)	HCO <sub>3</sub> (mg/L)	SO <sub>4</sub> (mg/L)	TDS (mg/l)	EC (µmhos/cm)	T.H (mg/l)
P1	7.33	5.75	21.78	90	17.75	0	335.5	25.44	430	672	315
P2	7.47	4.6	20.57	78	14.2	0	311.1	13.44	376	587	280
P3	7.48	4.6	16.94	76	10.65	0	292.8	13.44	354	553	260
P4	8.07	5.75	12.1	64	10.65	0	189.1	49.44	292	457	210
P5	7.19	25.07	18.15	90	28.4	0	335.5	36.96	465	715	300
P6	7.38	20.01	14.52	80	24.85	0	305	16.8	395	617	260
P7	8.03	4.6	20.57	58	14.2	0	244	18.24	316	493	230
P8	8.15	6.44	29.04	58	17.75	0	262.3	36.48	365	570	265
P9	7.7	7.36	18.15	90	17.75	0	305	38.4	412	644	300
P10	7.71	2.76	16.94	56	10.65	0	225.7	14.4	272	425	210
P11	7.55	8.97	33.88	92	17.75	0	408.7	27.36	519	798	370
P12	8.28	3.68	16.94	62	10.65	0	244	16.32	306	478	225
P13	7.62	2.76	18.15	54	10.65	0	225.7	14.4	283	442	210
P14	7.81	4.6	16.94	76	10.65	0	280.6	23.04	351	548	260
P15	8.04	3.68	19.36	54	10.65	0	231.8	16.32	295	461	215
P16	8.06	6.44	12.1	58	10.65	0	219.6	12.48	274	428	195
P17	7.71	1.38	15.73	52	7.1	0	213.5	11.52	265	414	195
P18	7.45	5.75	21.78	80	14.2	0	305	30.24	393	614	290
P19	7.68	4.6	16.94	72	10.65	0	280.6	13.44	342	534	250
P20	7.65	4.6	16.94	80	14.2	0	298.9	13.44	367	573	270
P21	7.97	5.75	25.41	76	14.2	0	305	35.04	401	626	295
P22	7.71	4.6	19.36	70	10.65	0	262.3	32.64	346	540	255
P23	7.35	11.73	33.88	100	24.85	0	408.7	42.72	550	846	390
P24	7.46	3.68	16.94	60	10.65	0	244	11.52	302	472	220
P25	7.66	2.76	18.15	50	7.1	0	225.7	9.6	269	420	200
P26	7.28	9.89	25.41	84	21.3	0	347.7	19.68	438	685	315
P27	8.18	2.07	10.89	66	10.65	0	225.7	12.96	284	444	210
P28	7.73	4.6	13.31	90	14.2	0	305	18.24	381	596	280
P29	7.51	3.68	15.73	68	7.1	0	268.4	11.52	319	499	235
P30	8	5.06	26.62	70	14.2	0	317.2	14.4	384	600	285
<b>Min</b>	7.2	1.4	10.9	50.0	7.1	0.0	189.1	9.6	265.0	414.0	195.0
<b>Max</b>	8.3	25.1	33.9	100.0	28.4	0.0	408.7	49.4	550.0	846.0	390.0
<b>Ave</b>	7.7	6.2	19.4	71.8	14.0	0.0	280.8	21.7	358.2	558.4	259.8
<b>SD</b>	0.30	5.00	5.77	13.95	5.35	0.00	54.12	11.02	73.08	111.47	49.30

**Table 2**

Water level and physico-chemical analyses of groundwater samples of study area collected during 2016 year.

Well no	pH	Na (mg/L)	Mg (mg/L)	Ca (mg/L)	Cl (mg/L)	CO <sub>3</sub> (mg/L)	HCO <sub>3</sub> (mg/L)	SO <sub>4</sub> (mg/L)	TDS (mg/l)	EC (μ mhos/cm)	T.H (mg)
P1	7.3	14.95	42.35	104	31.95	0	378.2	107.04	614	944	435
P2	7.58	3.68	24.2	60	10.65	0	274.5	16.32	336	525	250
P3	7.63	5.75	12.1	60	10.65	0	219.6	15.84	281	439	200
P4	7.74	2.76	16.94	54	10.65	0	219.6	14.4	276	432	205
P5	7.27	25.07	22.99	80	24.85	0	359.9	17.76	463	712	295
P6	7.54	3.68	24.2	56	10.65	0	262.3	16.32	323	505	240
P7	7.54	4.6	25.41	74	10.65	0	323.3	18.24	388	607	290
P8	7.56	7.36	25.41	74	14.2	0	329.4	14.4	401	627	290
P9	7.83	2.76	15.73	54	10.65	0	213.5	14.4	268	418	200
P10	7.29	7.36	24.2	82	17.75	0	341.6	14.4	420	656	305
P11	7.84	7.36	10.89	60	10.65	0	219.6	14.4	275	430	195
P12	7.74	8.97	20.57	76	10.65	0	305	27.36	383	598	275
P13	7.42	5.75	25.41	74	17.75	0	317.2	15.84	392	612	290
P14	7.63	4.6	22.99	70	10.65	0	298.9	18.24	364	569	270
P15	7.46	5.75	24.2	68	17.75	0	292.8	15.84	372	581	270
P16	7.58	4.6	22.99	80	10.65	0	329.4	18.24	397	620	295
P17	7.56	7.36	24.2	78	14.2	0	335.5	14.4	405	633	295
<b>PI</b>	> 50				Unsuitable				Nil		Nil
	> 75				Class-I				Nil		Nil
	25-75				Class-II				100		100
<b>MH</b>	< 25				Class-III				Nil		Nil
	< 50				Suitable				100		100
<b>Na%</b>	> 50				Harmful & Unsuitable				Nil		Nil
	< 20				Excellent				100		100
	20-40				Good				Nil		Nil
	40-60				Permissible				Nil		Nil
<b>T.H</b>	60-80				Doubtful				Nil		Nil
	> 80				Unsuitable				Nil		Nil
	< 75				Soft				Nil		Nil
	75-150				Moderately hard				Nil		Nil
	150-300				Hard				86.7		76.7
					> 300				13.3		23.3

**Table 6**

Summary of water quality indices in present study.

Indices	Formula
Residual sodium carbonate (RSC)	$RSC = (CO_3^{2-} + HCO_3^-) + (Ca^{2+} + Mg^{2+})$
Permeability index (PI)	$PI = \frac{Na+K+\sqrt{HCO_3}}{Ca+Mg+Na+K} \tilde{n}100$
Kelly's ratio (KR)	$KR = \frac{Na}{Ca+Mg} \tilde{n}100$
Magnesium hazard (MH)	$MH = \frac{Mg}{Ca+Mg} \tilde{n}100$
Sodium percentage (Na %)	$Na\% = \frac{Na+K}{Ca+Mg+Na+K} \tilde{n}100$
Sodium adsorption ratio (SAR)	$SAR = \frac{Na}{\sqrt{(Ca+Mg)/2}} \tilde{n}100$
Soluble sodium percentage (SSP)	$SSP = \frac{Na}{Ca+Mg+Na} \tilde{n}100$

**Question :**

1. Calculer les indices .
2. Interpréter les résultats obtenues. 3. Justifier votre réponse.