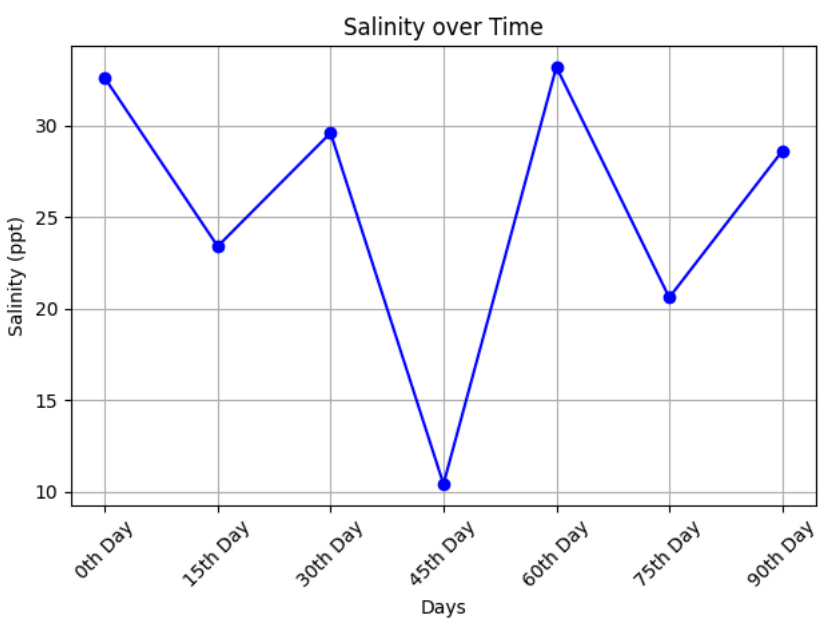
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

plt.style.use('default')


from google.colab import files
uploaded = files.upload()

import pandas as pd

df = pd.read_excel('/content/Clean-water.xlsx')
print(df.head())
```

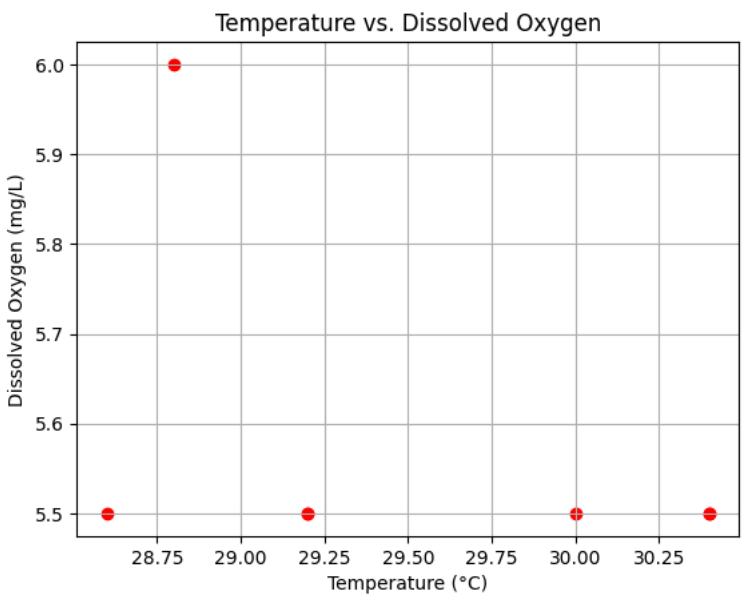
```
Choose Files No file chosen  Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
Saving Clean-water.xlsx to Clean-water (1).xlsx
       Days  Temp. (°C)   pH  DO (mg/L)  Salinity (ppt)  NH₃ (mg/L)  \
0   0th Day        29.2  7.4        5.5            32.6        0.02
1  15th Day        30.0  7.2        5.5            23.4        0.02
2  30th Day        30.4  7.2        5.5            29.6        0.02
3  45th Day        28.6  7.4        5.5            10.4        0.03
4  60th Day        28.8  7.2        6.0            33.2        0.02

   NO₂ (mg/L)  NO₃ (mg/L)  Ca  Alkanity
0       0.025       0.015 NaN       NaN
1       0.015       0.015 NaN       NaN
2       0.015       0.015 NaN       NaN
3       0.020       0.020 NaN       NaN
4       0.015       0.030 NaN       NaN
```

```
import pandas as pd
import matplotlib.pyplot as plt

days = ['0th Day', '15th Day', '30th Day', '45th Day', '60th Day', '75th Day', '90th Day']
salinity = [32.6, 23.4, 29.6, 10.4, 33.2, 20.6, 28.6]

df = pd.DataFrame({'Days': days, 'Salinity': salinity})

df['Day_num'] = df['Days'].str.extract('(\d+)').astype(int)

plt.plot(df['Day_num'], df['Salinity'], marker='o', color='blue')
plt.title('Salinity over Time')
plt.xlabel('Days')
plt.ylabel('Salinity (ppt)')
plt.xticks(df['Day_num'], df['Days'], rotation=45)
plt.grid(True)
plt.tight_layout()
plt.show()
```

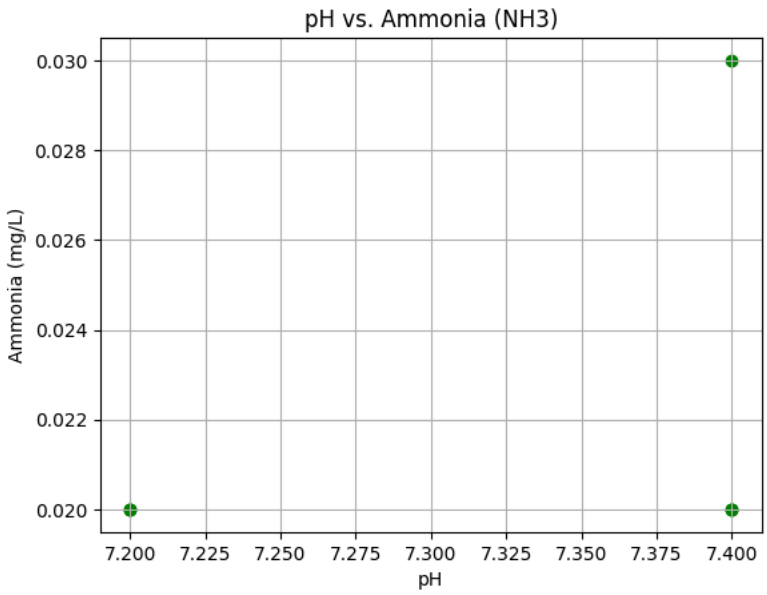



```
import matplotlib.pyplot as plt

temperature = [29.2, 30.0, 30.4, 28.6, 28.8, 30.4, 29.2]
```

```
dissolved_oxygen = [5.5, 5.5, 5.5, 5.5, 6.0, 5.5, 5.5]

plt.scatter(temperature, dissolved_oxygen, color='red')
plt.title('Temperature vs. Dissolved Oxygen')
plt.xlabel('Temperature (°C)')
plt.ylabel('Dissolved Oxygen (mg/L)')
plt.grid(True)
plt.show()
```

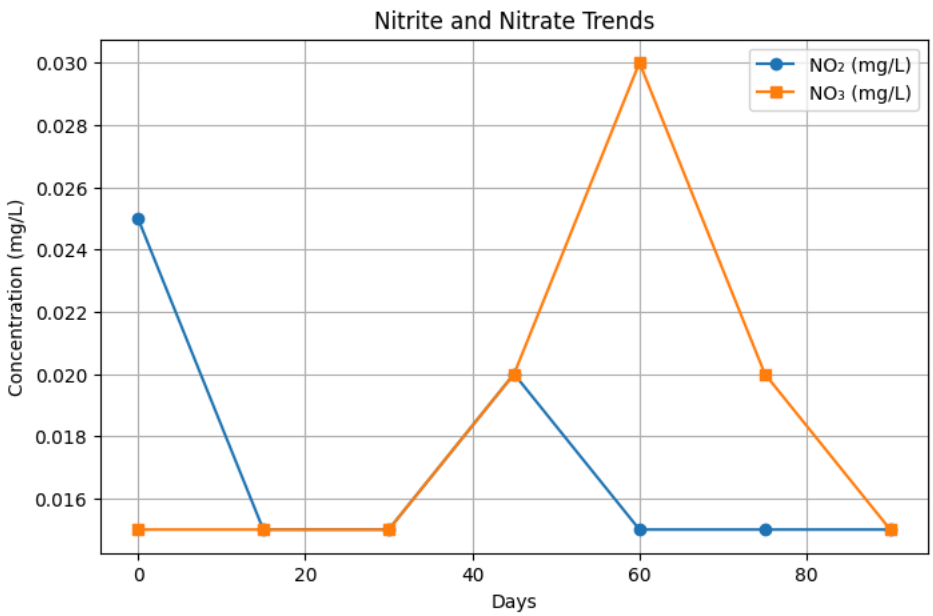



```
import matplotlib.pyplot as plt

pH = [7.4, 7.2, 7.2, 7.4, 7.2, 7.4, 7.4]
NH3 = [0.02, 0.02, 0.02, 0.03, 0.02, 0.02, 0.02]

plt.scatter(pH, NH3, color='green')
plt.title('pH vs. Ammonia (NH3)')
plt.xlabel('pH')
plt.ylabel('Ammonia (mg/L)')
plt.grid(True)
plt.show()
```

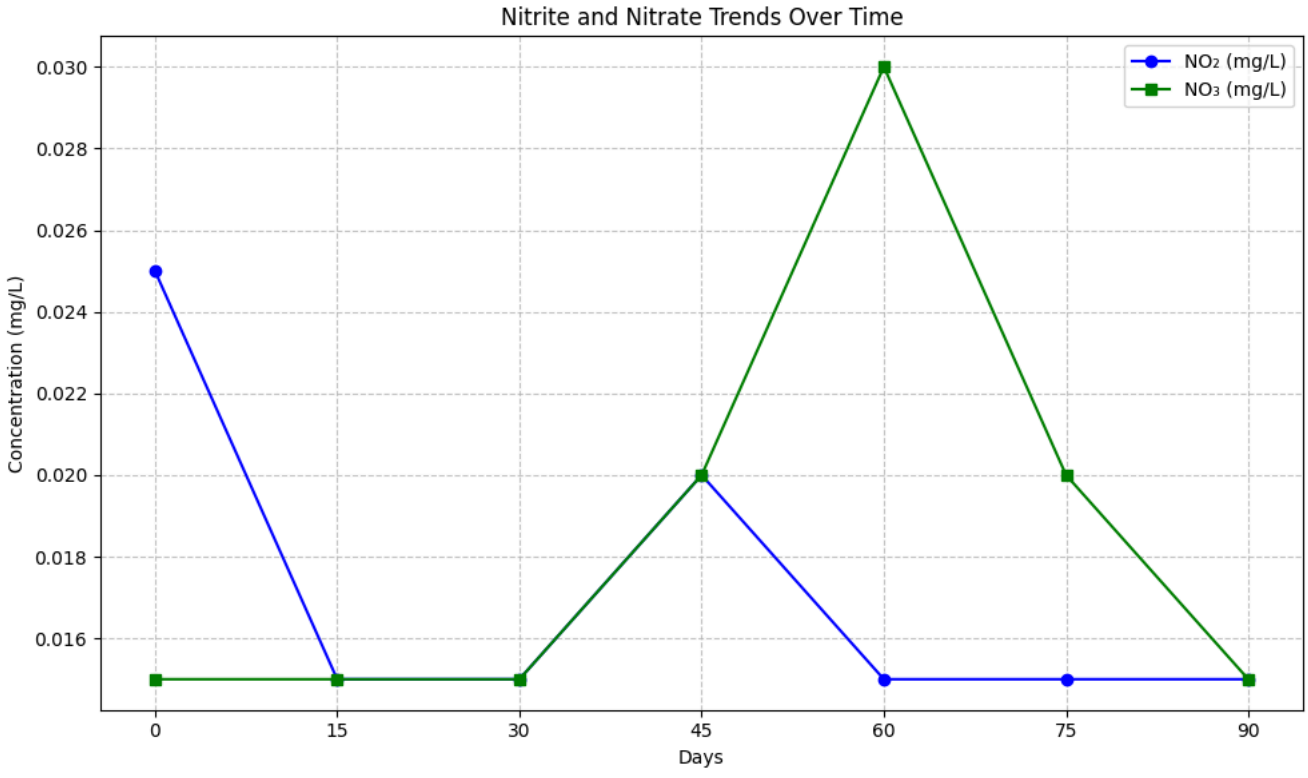



```
days = [0, 15, 30, 45, 60, 75, 90]
no2 = [0.025, 0.015, 0.015, 0.02, 0.015, 0.015, 0.015]
no3 = [0.015, 0.015, 0.015, 0.02, 0.03, 0.02, 0.015]

plt.figure(figsize=(8,5))
plt.plot(days, no2, 'o-', label='NO₂ (mg/L)')
plt.plot(days, no3, 's-', label='NO₃ (mg/L)')
plt.title('Nitrite and Nitrate Trends')
plt.xlabel('Days')
plt.ylabel('Concentration (mg/L)')
```

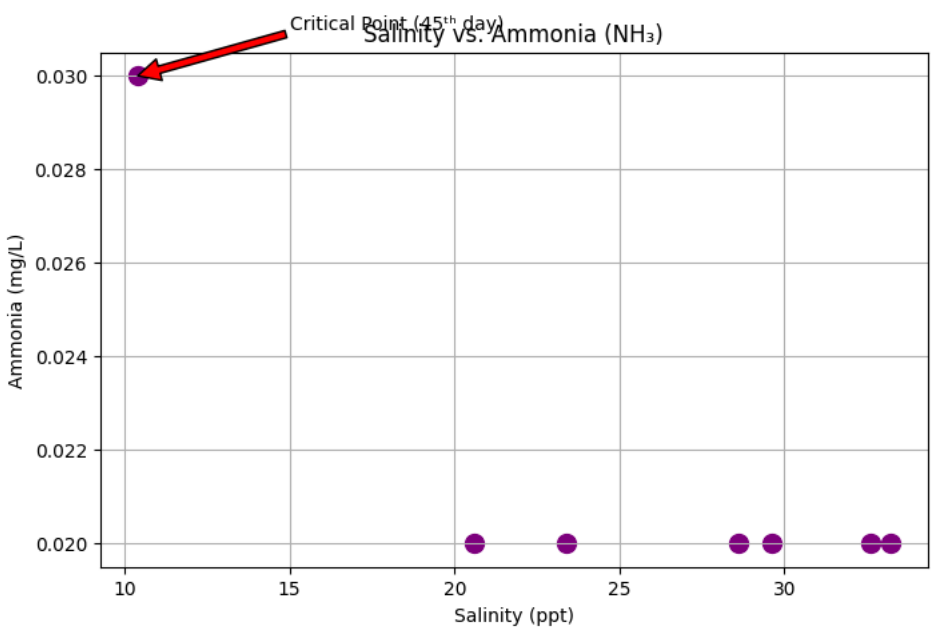
```
plt.legend()
plt.grid(True)
plt.show()
```



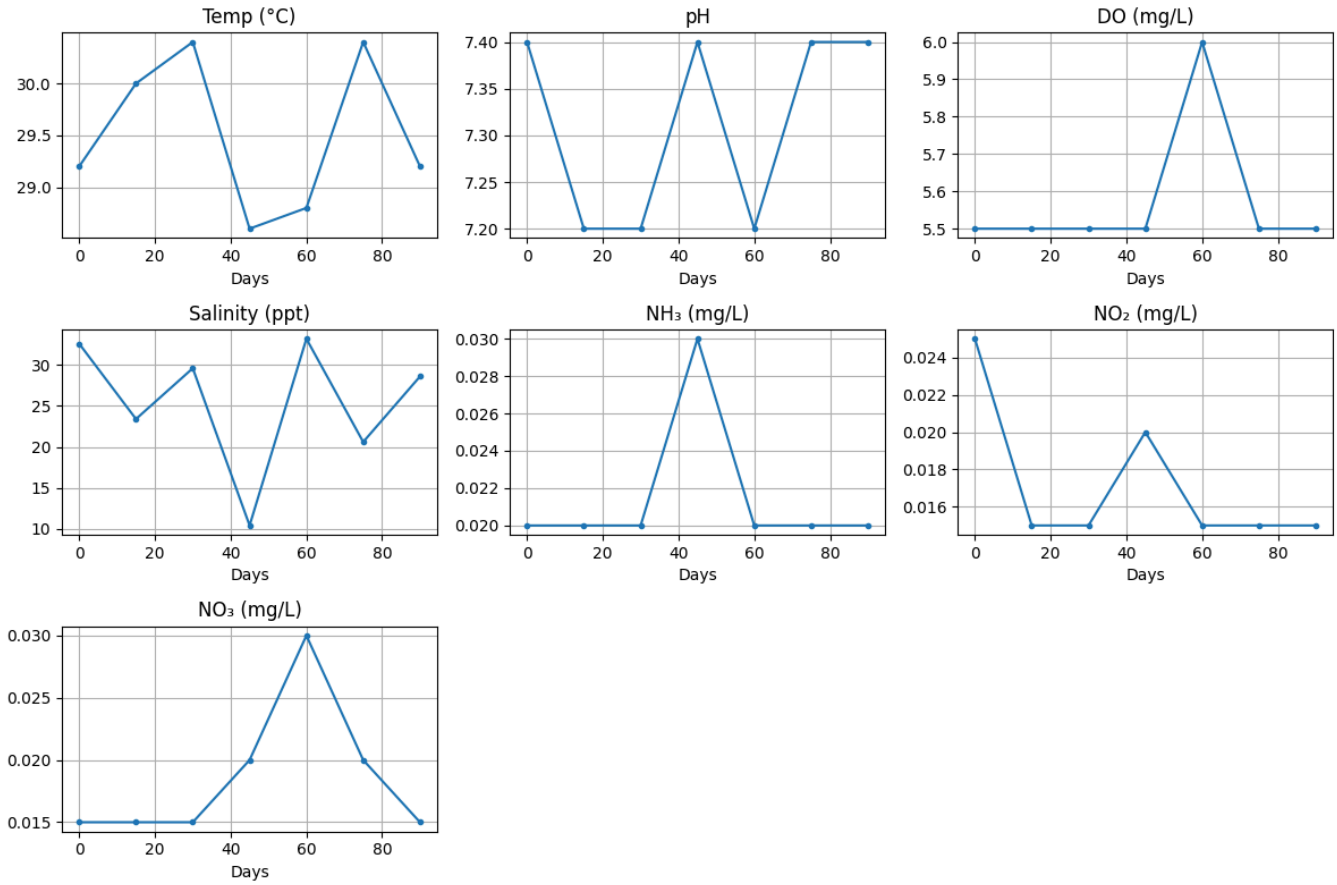

```
import matplotlib.pyplot as plt
import pandas as pd

days = [0, 15, 30, 45, 60, 75, 90]
no2 = [0.025, 0.015, 0.015, 0.02, 0.015, 0.015, 0.015]
no3 = [0.015, 0.015, 0.015, 0.02, 0.03, 0.02, 0.015]

plt.figure(figsize=(10, 6))
plt.plot(days, no2, 'o-', color='blue', label='NO₂ (mg/L)')
plt.plot(days, no3, 's-', color='green', label='NO₃ (mg/L)')
plt.title('Nitrite and Nitrate Trends Over Time')
plt.xlabel('Days')
plt.ylabel('Concentration (mg/L)')
plt.xticks(days)
plt.grid(True, linestyle='--', alpha=0.7)
plt.legend()
plt.tight_layout()
plt.show()
```



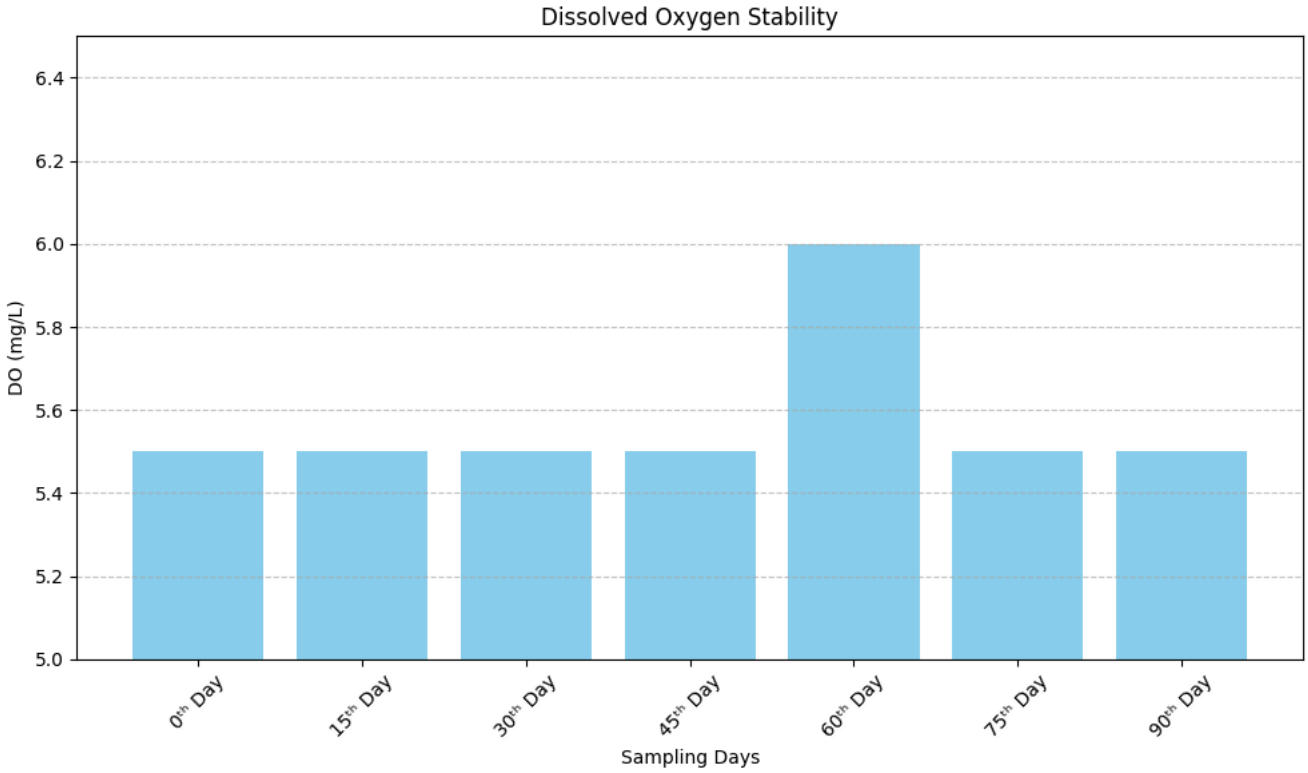
```
salinity = [32.6, 23.4, 29.6, 10.4, 33.2, 20.6, 28.6]
nh3 = [0.02, 0.02, 0.02, 0.03, 0.02, 0.02, 0.02]

plt.figure(figsize=(8,5))
plt.scatter(salinity, nh3, s=100, c='purple')
plt.title('Salinity vs. Ammonia (NH₃)')
plt.xlabel('Salinity (ppt)')
plt.ylabel('Ammonia (mg/L)')
plt.grid(True)

plt.annotate('Critical Point (45ᵗʰ day)',
             xy=(10.4, 0.03),
             xytext=(15, 0.031),
             arrowprops=dict(facecolor='red'))
plt.show()
```



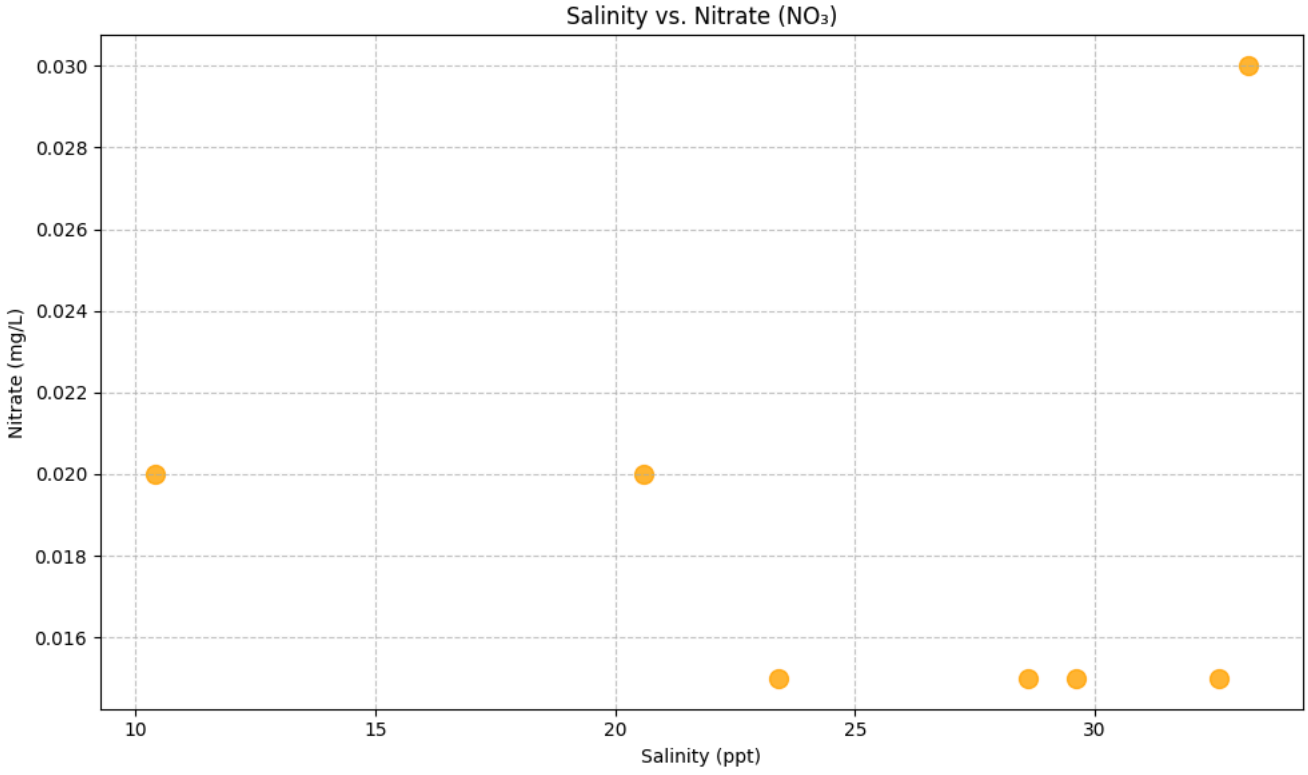

```
params = {
    'Temp (°C)': [29.2, 30.0, 30.4, 28.6, 28.8, 30.4, 29.2],
    'pH': [7.4, 7.2, 7.2, 7.4, 7.2, 7.4, 7.4],
    'DO (mg/L)': [5.5, 5.5, 5.5, 5.5, 6.0, 5.5, 5.5],
    'Salinity (ppt)': [32.6, 23.4, 29.6, 10.4, 33.2, 20.6, 28.6],
    'NH₃ (mg/L)': [0.02, 0.02, 0.02, 0.03, 0.02, 0.02, 0.02],
    'NO₂ (mg/L)': [0.025, 0.015, 0.015, 0.02, 0.015, 0.015, 0.015],
    'NO₃ (mg/L)': [0.015, 0.015, 0.015, 0.02, 0.03, 0.02, 0.015]
}

plt.figure(figsize=(12,8))
for i, (param, values) in enumerate(params.items(), 1):
    plt.subplot(3, 3, i)
    plt.plot(days, values, '.-')
    plt.title(param)
    plt.xlabel('Days')
    plt.grid(True)

plt.tight_layout()
plt.show()
```




```
import matplotlib.pyplot as plt

days = ['0th Day', '15th Day', '30th Day', '45th Day', '60th Day', '75th Day', '90th Day']
do = [5.5, 5.5, 5.5, 5.5, 6.0, 5.5, 5.5]

plt.figure(figsize=(10, 6))
plt.bar(days, do, color='skyblue')
plt.title('Dissolved Oxygen Stability')
plt.xlabel('Sampling Days')
plt.ylabel('DO (mg/L)')
plt.ylim(5.0, 6.5)
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

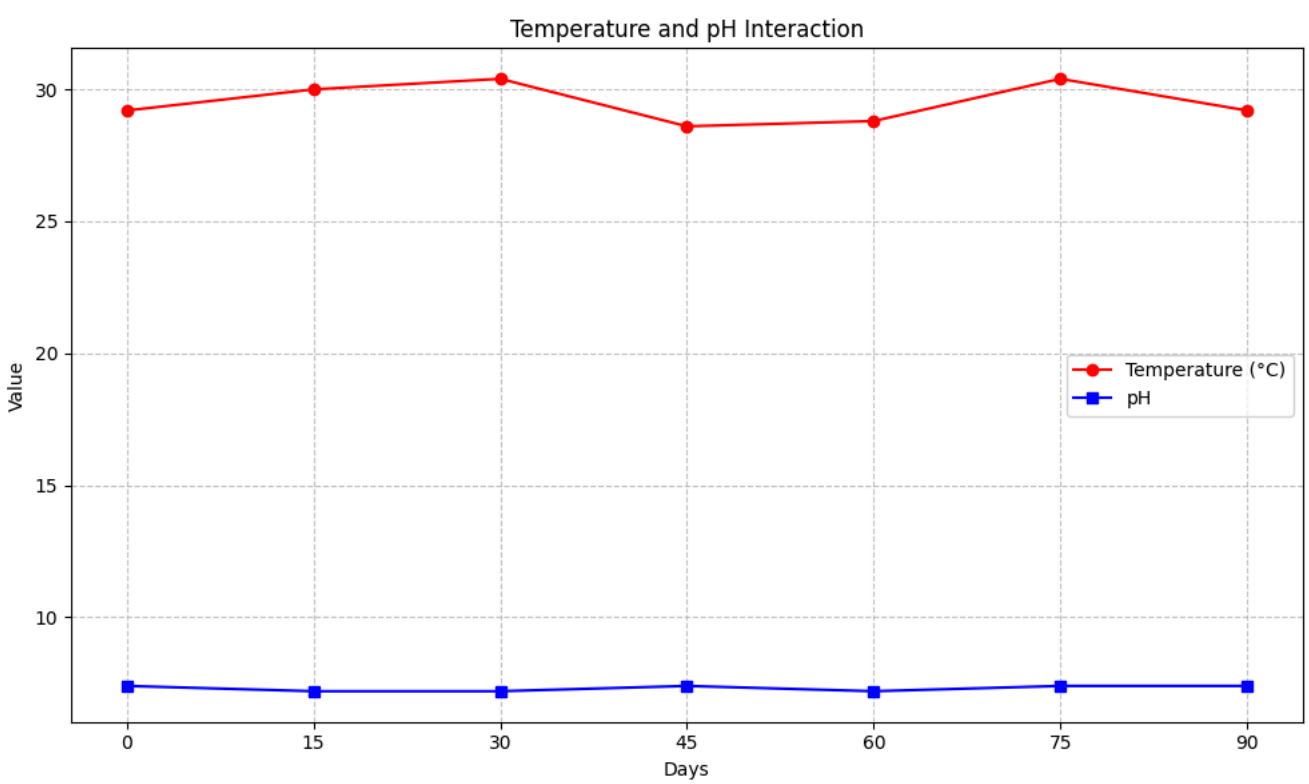



```
salinity = [32.6, 23.4, 29.6, 10.4, 33.2, 20.6, 28.6]
nitrate = [0.015, 0.015, 0.015, 0.02, 0.03, 0.02, 0.015]

plt.figure(figsize=(10, 6))
plt.scatter(salinity, nitrate, s=100, color='orange', alpha=0.8)
plt.title('Salinity vs. Nitrate (NO₃)')
plt.xlabel('Salinity (ppt)')
plt.ylabel('Nitrate (mg/L)')
plt.grid(True, linestyle='--', alpha=0.7)
plt.tight_layout()
plt.show()
```

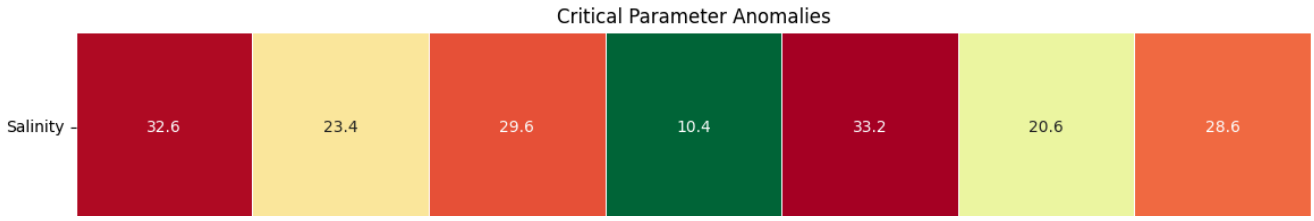



```
days_num = [0, 15, 30, 45, 60, 75, 90]
temp = [29.2, 30.0, 30.4, 28.6, 28.8, 30.4, 29.2]
ph = [7.4, 7.2, 7.2, 7.4, 7.2, 7.4, 7.4]
```

```
plt.figure(figsize=(10, 6))
plt.plot(days_num, temp, 'o-', color='red', label='Temperature (°C)')
plt.plot(days_num, ph, 's-', color='blue', label='pH')
plt.title('Temperature and pH Interaction')
plt.xlabel('Days')
plt.ylabel('Value')
plt.xticks(days_num)
plt.grid(True, linestyle='--', alpha=0.7)
plt.legend()
plt.tight_layout()
plt.show()
```




```
import seaborn as sns
import pandas as pd
import numpy as np

days = ['0ᵗʰ', '15ᵗʰ', '30ᵗʰ', '45ᵗʰ', '60ᵗʰ', '75ᵗʰ', '90ᵗʰ']
params = ['Salinity', 'NH₃', 'DO']

salinity_norm = (np.array([32.6, 23.4, 29.6, 10.4, 33.2, 20.6, 28.6]) - 10) / 30
nh3_norm = (np.array([0.02, 0.02, 0.02, 0.03, 0.02, 0.02, 0.02]) - 0.01) / 0.03
do_norm = (np.array([5.5, 5.5, 5.5, 5.5, 6.0, 5.5, 5.5]) - 5) / 2

data = np.vstack([salinity_norm, nh3_norm, do_norm])

plt.figure(figsize=(12, 6))
sns.heatmap(data,
            annot=np.array([
                ["32.6", "23.4", "29.6", "10.4", "33.2", "20.6", "28.6"],
                ["0.02", "0.02", "0.02", "0.03", "0.02", "0.02", "0.02"],
                ["5.5", "5.5", "5.5", "5.5", "6.0", "5.5", "5.5"]
            ]),
            fmt='',
            cmap='RdYlGn_r',
            cbar=False,
            linewidths=0.5)
plt.title('Critical Parameter Anomalies')
plt.xlabel('Days')
plt.ylabel('Parameters')
plt.yticks(ticks=[0.5, 1.5, 2.5], labels=params, rotation=0)
plt.xticks(ticks=np.arange(len(days)) + 0.5, labels=days)
plt.tight_layout()
plt.show()
```


Critical Parameter Anomalies
Salinity
32.6
23.4
29.6
10.4
33.2
20.6
28.6