In [1]:
```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report
import seaborn as sns
import matplotlib.pyplot as plt
```

In [2]:
```
data = pd.read_csv("glass.csv")
print(data.head())
print(data.info())
```

```
        RI     Na    Mg    Al     Si     K    Ca   Ba   Fe  Type
0  1.52101  13.64  4.49  1.10  71.78  0.06  8.75  0.0  0.0     1
1  1.51761  13.89  3.60  1.36  72.73  0.48  7.83  0.0  0.0     1
2  1.51618  13.53  3.55  1.54  72.99  0.39  7.78  0.0  0.0     1
3  1.51766  13.21  3.69  1.29  72.61  0.57  8.22  0.0  0.0     1
4  1.51742  13.27  3.62  1.24  73.08  0.55  8.07  0.0  0.0     1
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 214 entries, 0 to 213
Data columns (total 10 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   RI      214 non-null    float64
 1   Na      214 non-null    float64
 2   Mg      214 non-null    float64
 3   Al      214 non-null    float64
 4   Si      214 non-null    float64
 5   K       214 non-null    float64
 6   Ca      214 non-null    float64
 7   Ba      214 non-null    float64
 8   Fe      214 non-null    float64
 9   Type    214 non-null    int64
dtypes: float64(9), int64(1)
memory usage: 16.8 KB
None
```

In [3]:
```
print(data.isnull().sum())
```

```
RI      0
Na      0
Mg      0
Al      0
Si      0
K       0
Ca      0
Ba      0
Fe      0
Type    0
dtype: int64
```

In [6]:
```
X = data.drop("Type", axis=1)
y = data["Type"]
```

In [7]:
```
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)
```

In [8]:
```
X_train, X_test, y_train, y_test = train_test_split(X_scaled, y, test_size=0.2, random_state=42)
```

In [9]:
```
clf = DecisionTreeClassifier(random_state=42)
clf.fit(X_train, y_train)
```

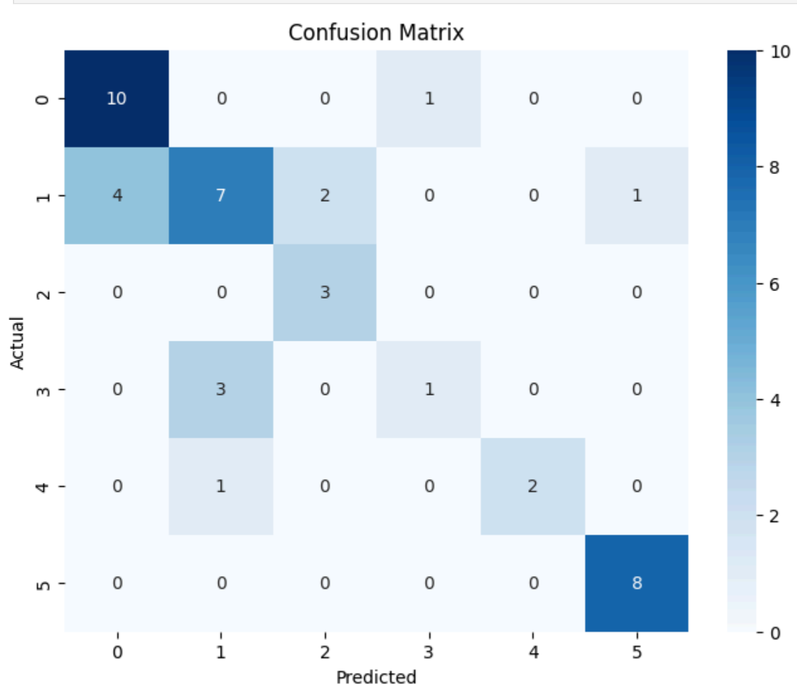
Out[9]:
```
▼ DecisionTreeClassifier
▶ Parameters
```

In [10]:
```
y_pred = clf.predict(X_test)
```

In [11]:
```
acc = accuracy_score(y_test, y_pred)
print(f"Accuracy: {acc:.2f}")
```

```
Accuracy: 0.72
```

In [12]:
```
cm = confusion_matrix(y_test, y_pred)
plt.figure(figsize=(8,6))
sns.heatmap(cm, annot=True, fmt="d", cmap="Blues")
plt.title("Confusion Matrix")
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.show()
```



In [13]:
```
print("\nClassification Report:")
print(classification_report(y_test, y_pred))
```

```
Classification Report:
              precision    recall  f1-score   support

           0       0.71      0.91      0.80        11
           1       0.64      0.50      0.56        14
           2       0.60      1.00      0.75         3
           3       0.50      0.25      0.33         4
           5       1.00      0.67      0.80         3
           6       0.89      1.00      0.94         8

    accuracy                           0.72        43
   macro avg       0.72      0.72      0.70        43
```

weighted avg	0.71	0.72	0.70	43

In [ ]: