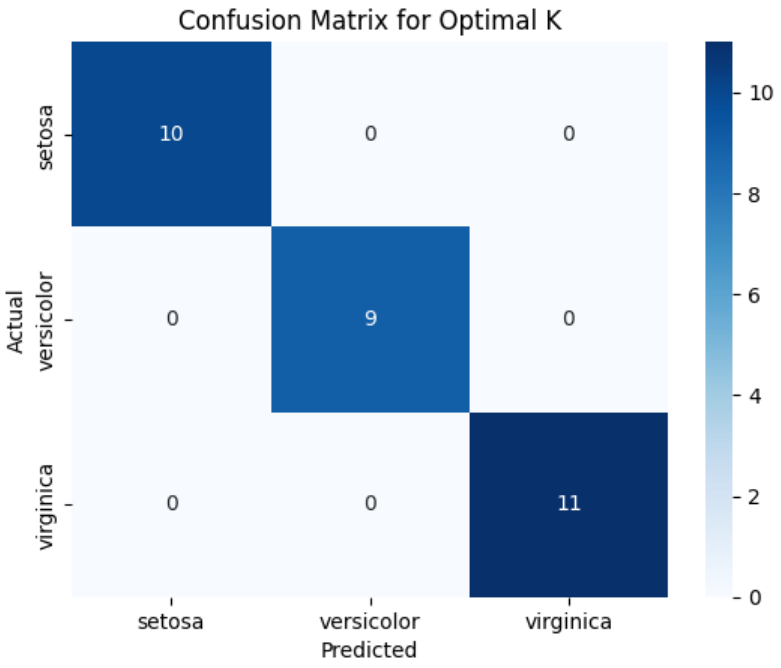
In [3]:
```
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import accuracy_score

iris = load_iris()
X, y = iris.data, iris.target

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=4

k_values = range(1, 21)
accuracies = []

for k in k_values:
    knn = KNeighborsClassifier(n_neighbors=k)
    knn.fit(X_train, y_train)
    y_pred = knn.predict(X_test)
    accuracies.append(accuracy_score(y_test, y_pred))

# Find the best K
best_k = k_values[accuracies.index(max(accuracies))]
print(f"The best K value is: {best_k}")
```

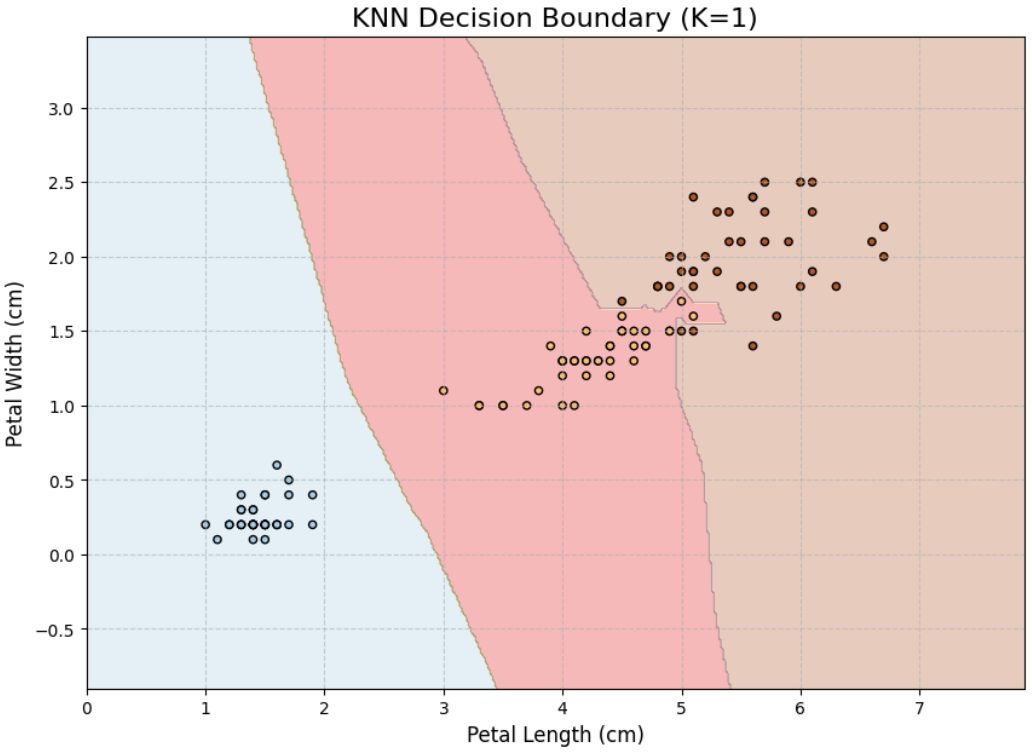
```
The best K value is: 1
```

In [4]:
```
from sklearn.metrics import confusion_matrix
import seaborn as sns
import matplotlib.pyplot as plt

# Using the best_k found earlier
knn = KNeighborsClassifier(n_neighbors=best_k)
knn.fit(X_train, y_train)
y_pred = knn.predict(X_test)

cm = confusion_matrix(y_test, y_pred)
sns.heatmap(cm, annot=True, fmt="d", cmap="Blues", xticklabels=iris.target_names, ytick
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.title('Confusion Matrix for Optimal K')
plt.show()
```



In [6]:
```
# Train the KNN model with the optimal K on the selected features
knn = KNeighborsClassifier(n_neighbors=best_k)
knn.fit(X_train, y_train)
```

```
# Create a mesh grid to plot decision boundaries
x_min, x_max = X_selected[:, 0].min() - 1, X_selected[:, 0].max() + 1
y_min, y_max = X_selected[:, 1].min() - 1, X_selected[:, 1].max() + 1
xx, yy = np.meshgrid(np.arange(x_min, x_max, 0.02),
                     np.arange(y_min, y_max, 0.02))

# Make predictions on the mesh grid
Z = knn.predict(np.c_[xx.ravel(), yy.ravel()])
Z = Z.reshape(xx.shape)

# Create the decision boundary visualization
plt.figure(figsize=(10, 7))
plt.contourf(xx, yy, Z, alpha=0.3, cmap=plt.cm.Paired)
plt.scatter(X_train[:, 0], X_train[:, 1], c=y_train, cmap=plt.cm.Paired, edgecolor='k',
plt.title(f'KNN Decision Boundary (K={best_k})', fontsize=16)
plt.xlabel('Petal Length (cm)', fontsize=12)
plt.ylabel('Petal Width (cm)', fontsize=12)
plt.xticks(fontsize=10)
plt.yticks(fontsize=10)
plt.grid(True, linestyle='--', alpha=0.6)
plt.savefig('knn_decision_boundary.png')

plt.show()
```



In [ ]: