In [1]:
```
import numpy as np
import pandas as pd
from sklearn.cluster import KMeans
import matplotlib.pyplot as plt
import seaborn as sns
```

In [4]:
```
df = pd.read_csv(r'C:\Users\hp\Desktop\CodSoft\IRIS.csv')
```

In [5]:
```
df.head()
```

Out[5]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

In [6]:
```
df['species'],categories =pd.factorize(df['species'])
df.head()
```

Out[6]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	0
1	4.9	3.0	1.4	0.2	0
2	4.7	3.2	1.3	0.2	0
3	4.6	3.1	1.5	0.2	0
4	5.0	3.6	1.4	0.2	0

In [7]:
```
df.describe
```

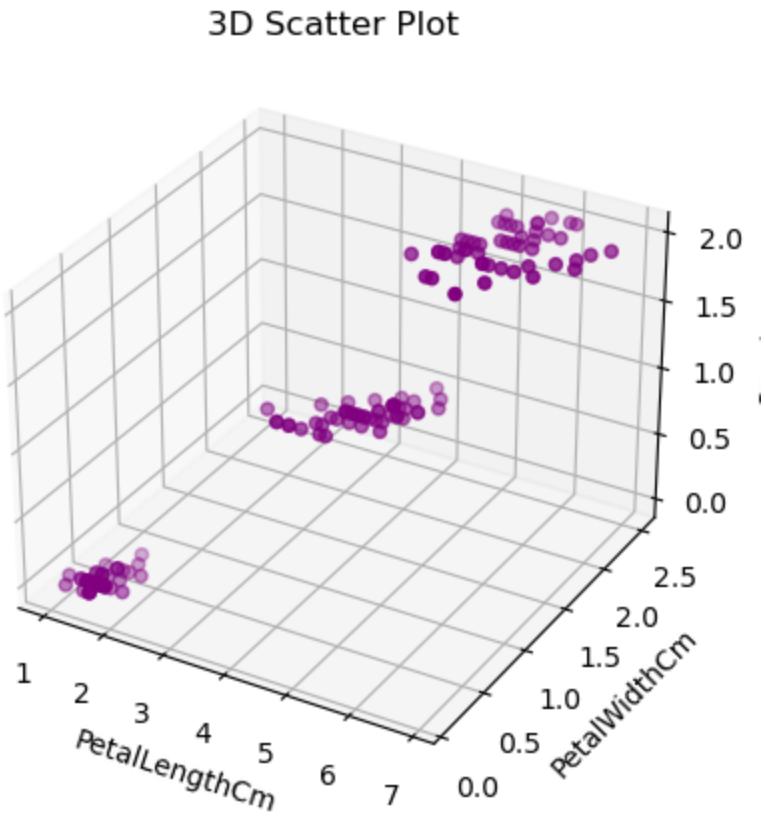
Out[7]:
```
<bound method NDFrame.describe of      sepal_length  sepal_width  petal_length  petal
_width  species
0             5.1          3.5           1.4          0.2        0
1             4.9          3.0           1.4          0.2        0
2             4.7          3.2           1.3          0.2        0
3             4.6          3.1           1.5          0.2        0
4             5.0          3.6           1.4          0.2        0
..            ...          ...           ...          ...      ...
145           6.7          3.0           5.2          2.3        2
146           6.3          2.5           5.0          1.9        2
147           6.5          3.0           5.2          2.0        2
148           6.2          3.4           5.4          2.3        2
149           5.9          3.0           5.1          1.8        2

[150 rows x 5 columns]>
```

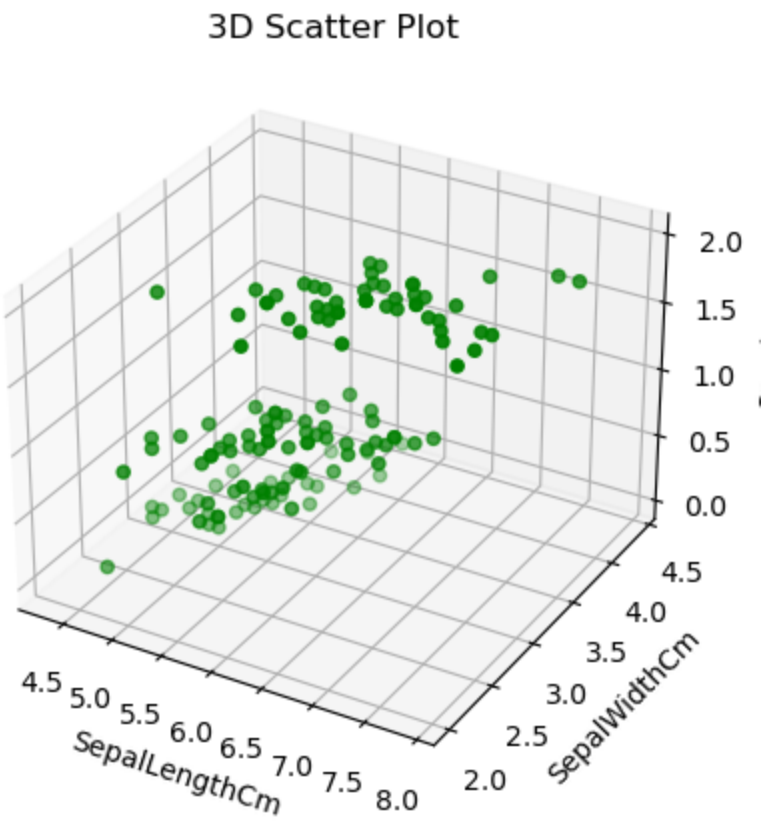
In [8]:
```
df.isna().sum()
```

Out[8]:
```
sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
species         0
dtype: int64
```

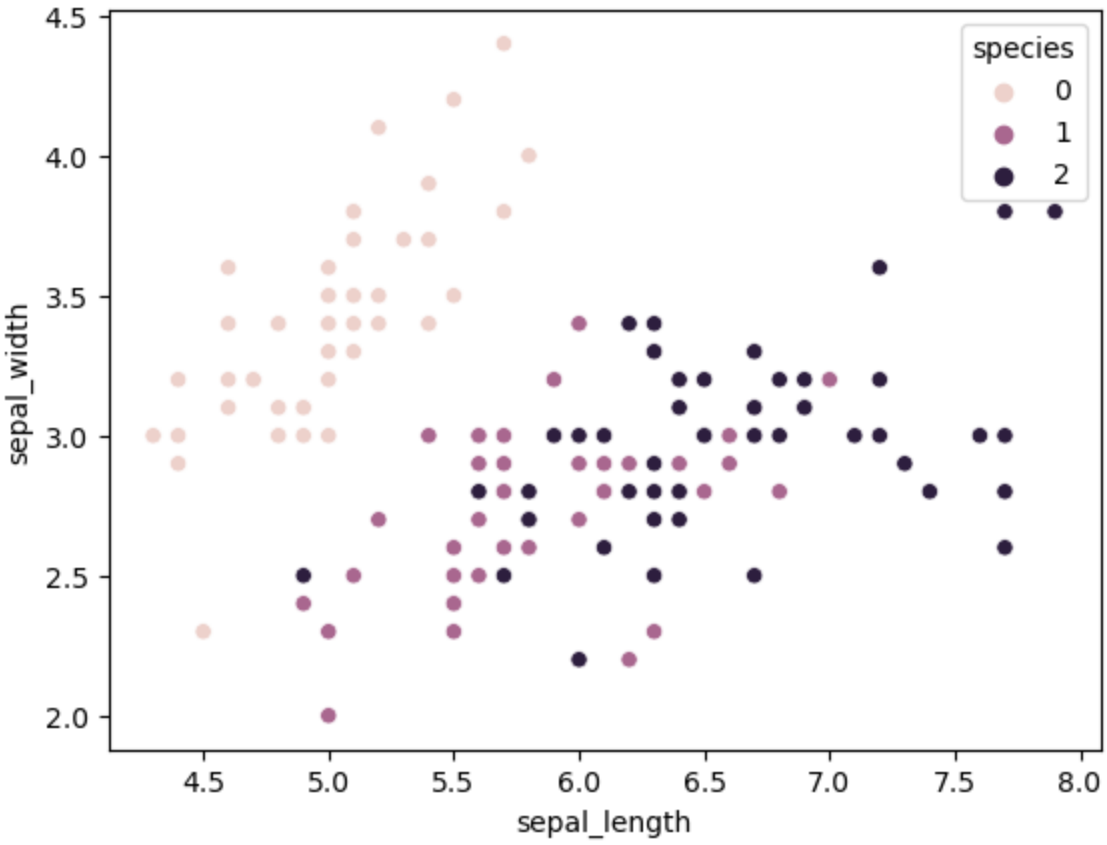
In [25]:
```
from mpl_toolkits.mplot3d import Axes3D
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
ax.scatter(df.petal_length, df.petal_width, df.species,color='purple')
ax.set_xlabel('PetalLengthCm')
ax.set_ylabel('PetalWidthCm')
ax.set_zlabel('Species')
plt.title('3D Scatter Plot')
plt.show()
```



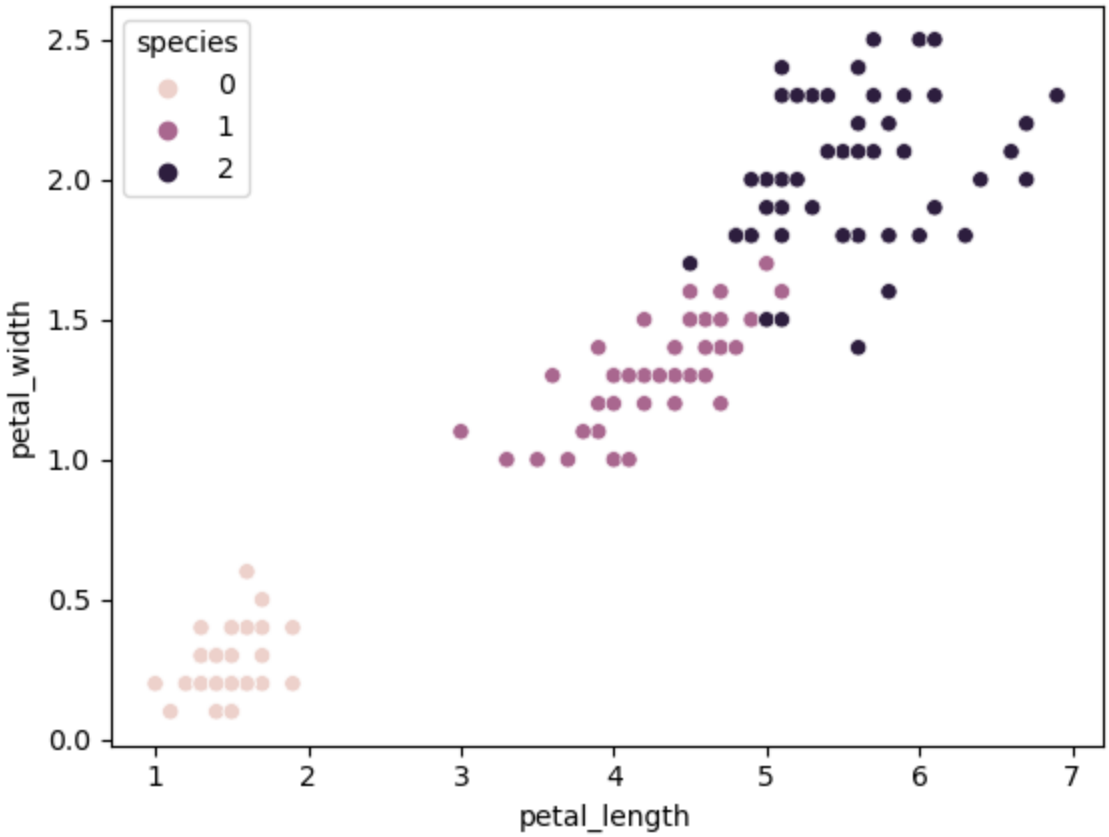
In [27]:
```
from mpl_toolkits.mplot3d import Axes3D
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
ax.scatter(df.sepal_length, df.sepal_width, df.species,color='green')
ax.set_xlabel('SepalLengthCm')
ax.set_ylabel('SepalWidthCm')
ax.set_zlabel('Species')
plt.title('3D Scatter Plot')
plt.show()
```



In [43]:
```
sns.scatterplot(data=df, x="sepal_length", y="sepal_width",hue="species");
```



In [12]:
```
sns.scatterplot(data=df, x="petal_length", y="petal_width",hue="species");
```



In [66]:
```
iris = range(1,10)
yash=[]

for k in iris:
  km = KMeans(n_clusters=k)
  km.fit(df[[ 'petal_length', 'petal_width']])
  yash.append(km.inertia_)
```

```
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarnin
g: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value
of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning:
KMeans is known to have a memory leak on Windows with MKL, when there are less chunks
than available threads. You can avoid it by setting the environment variable OMP_NUM_
THREADS=1.
  warnings.warn(
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarnin
g: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value
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C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning:
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C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarnin
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  super()._check_params_vs_input(X, default_n_init=10)
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C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning:
KMeans is known to have a memory leak on Windows with MKL, when there are less chunks
than available threads. You can avoid it by setting the environment variable OMP_NUM_
THREADS=1.
  warnings.warn(
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarnin
g: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value
of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning:
KMeans is known to have a memory leak on Windows with MKL, when there are less chunks
than available threads. You can avoid it by setting the environment variable OMP_NUM_
THREADS=1.
  warnings.warn(
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarnin
g: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value
of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning:
KMeans is known to have a memory leak on Windows with MKL, when there are less chunks
than available threads. You can avoid it by setting the environment variable OMP_NUM_
THREADS=1.
  warnings.warn(
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarnin
g: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value
of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning:
KMeans is known to have a memory leak on Windows with MKL, when there are less chunks
```

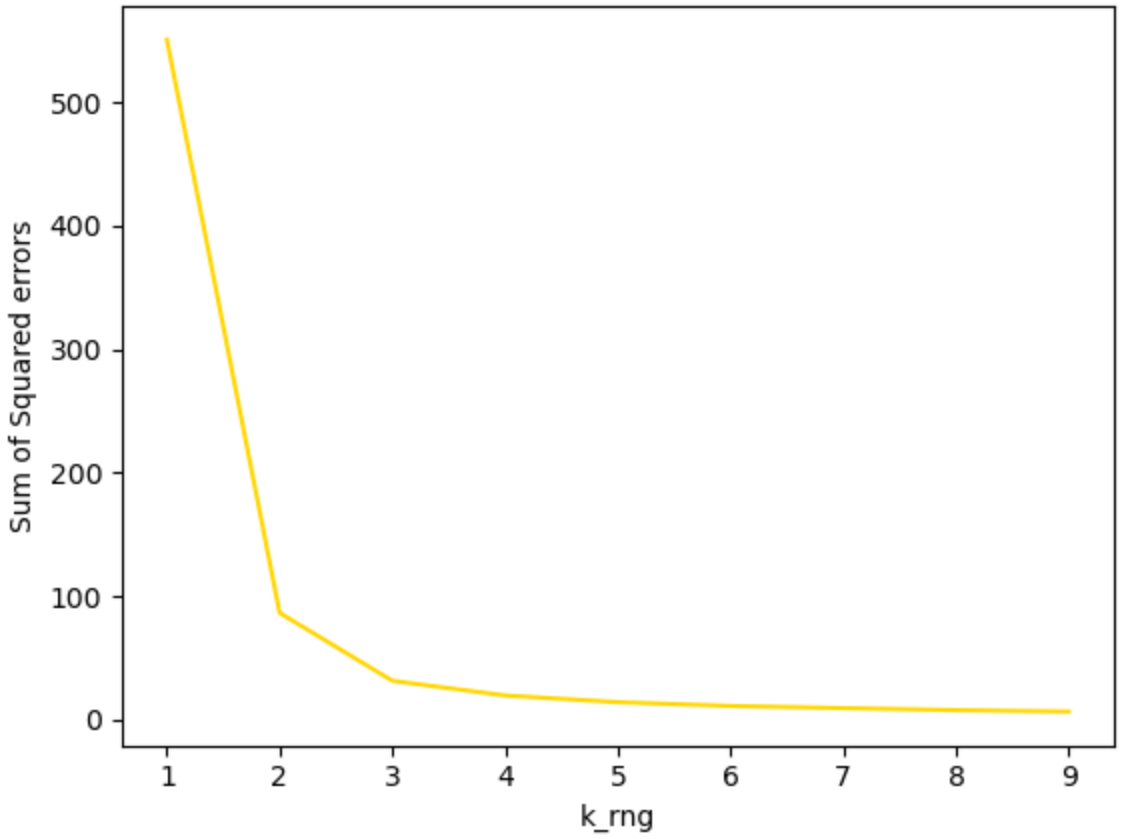
```
than available threads. You can avoid it by setting the environment variable OMP_NUM_
THREADS=1.
  warnings.warn(
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarnin
g: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value
of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning:
KMeans is known to have a memory leak on Windows with MKL, when there are less chunks
than available threads. You can avoid it by setting the environment variable OMP_NUM_
THREADS=1.
  warnings.warn(
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarnin
g: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value
of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning:
KMeans is known to have a memory leak on Windows with MKL, when there are less chunks
than available threads. You can avoid it by setting the environment variable OMP_NUM_
THREADS=1.
  warnings.warn(
```

In [67]:
```
yash
```

Out[67]:
```
[550.6434666666669,
 86.40394533571003,
 31.38775897435897,
 19.499400899685114,
 13.933308757908755,
 11.090603568447506,
 9.219714009661839,
 7.631802244955954,
 6.5929383963862245]
```

In [45]:
```
plt.xlabel('k_rng')
plt.ylabel("Sum of Squared errors")
plt.plot(k_rng, sse,color='gold')
```

Out[45]:
```
[<matplotlib.lines.Line2D at 0x27c758cd810>]
```



In [16]:
```
km = KMeans(n_clusters=3,random_state=0,)
y_predicted = km.fit_predict(df[['petal_length','petal_width']])
y_predicted
```

```
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: The default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Users\hp\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning: KMeans is known to have a memory leak on Windows with MKL, when there are less chunks than available threads. You can avoid it by setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
```

Out[16]:
```
array([1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 2, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 2, 2, 2, 2, 2, 0, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 0, 2, 2, 2, 2, 2, 2, 0, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 0, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2])
```

In [17]:
```
df['cluster']=y_predicted
df.head(150)
```

Out[17]:

	sepal_length	sepal_width	petal_length	petal_width	species	cluster
0	5.1	3.5	1.4	0.2	0	1
1	4.9	3.0	1.4	0.2	0	1
2	4.7	3.2	1.3	0.2	0	1
3	4.6	3.1	1.5	0.2	0	1
4	5.0	3.6	1.4	0.2	0	1
...	...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	2	2
146	6.3	2.5	5.0	1.9	2	2
147	6.5	3.0	5.2	2.0	2	2
148	6.2	3.4	5.4	2.3	2	2
149	5.9	3.0	5.1	1.8	2	2

150 rows × 6 columns

In [18]:
```
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(df.species, df.cluster)
cm
```

Out[18]:
```
array([[ 0, 50,  0],
       [48,  0,  2],
       [ 4,  0, 46]], dtype=int64)
```

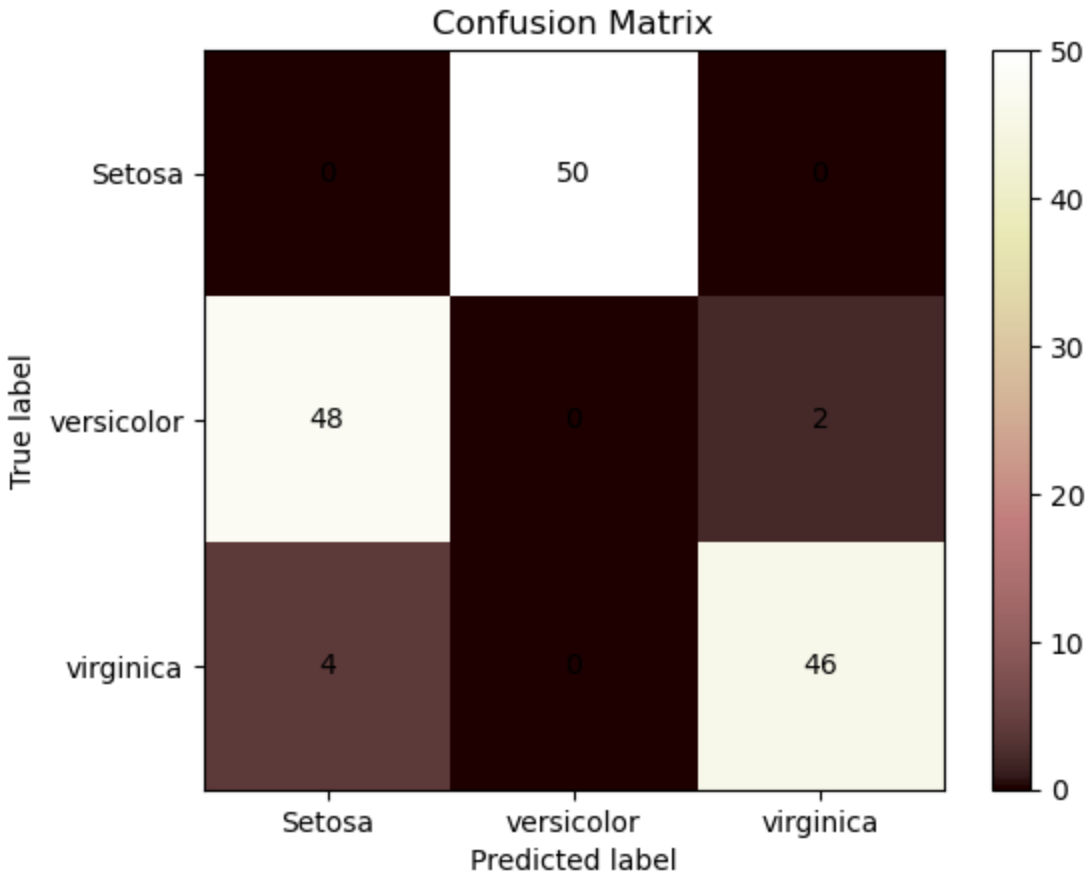
In [63]:
```
true_labels = df.species
predicted_labels= df.cluster

cm = confusion_matrix(true_labels, predicted_labels)
class_labels = ['Setosa', 'versicolor', 'virginica']

# Plot confusion matrix
plt.imshow(cm, interpolation='nearest', cmap=plt.cm.pink)
plt.title('Confusion Matrix')
plt.colorbar()
tick_marks = np.arange(len(class_labels))
plt.xticks(tick_marks, class_labels)
plt.yticks(tick_marks, class_labels)

# Fill matrix with values
for i in range(len(class_labels)):
    for j in range(len(class_labels)):
        plt.text(j, i, str(cm[i][j]), ha='center', va='center', color='black')

plt.xlabel('Predicted label')
plt.ylabel('True label')
plt.show()
```


Confusion Matrix
Setosa
versicolor
virginica
True label
0
50
0
48
0
2
4
0
46
Setosa
versicolor
virginica
Predicted label
50
40
30
20
10
0

In [ ]: