# Matplotlib 快速绘图　课后测验

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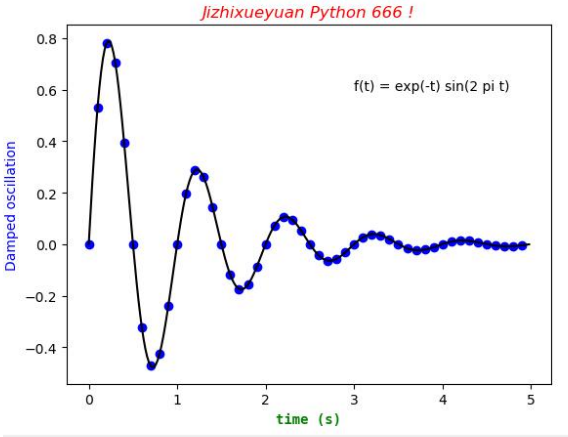
**作业：使用 Python 编程，补全下列程序，然后在 Pycharm 中运行程序，如果运行得到的图形和题目所给图片一模一样，说明程序完全正确，否则错误。**

1. 正确结果为：



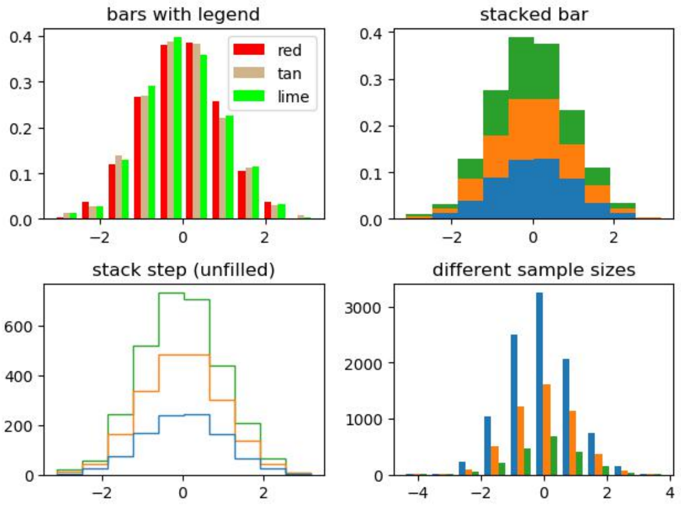
部分程序如下：

```
______________________                        # 提示：导入必需的 python 库
______________________                        # 提示：导入必需的 python 库

def f(t):
    s1 = ______________________               # 提示：s1 = sin(2πt)
    e1 = ______________________               # 提示：e1 = e^(-t)
    return np.multiply(s1, e1)

t1 = ______________________             # 提示：t1 从 0.0 到 5.0，每隔 0.1 取一个数
t2 = ______________________             # 提示：t2 从 0.0 到 5.0，每隔 0.02 取一个数
fig, ax = plt.subplots()
plt.plot(___________, t2, f(t2), 'k')   # 提示：作图，t1, f(t1)，蓝色线，以 o 表示点
plt.text(3.0, 0.6, 'f(t) = exp(-t) sin(2 pi t)')
ttext = plt.title('______________________')   # 提示：标题
ytext = plt.ylabel('______________________')     # 提示：纵坐标
xtext = plt.xlabel('___________')                # 提示：横坐标
plt.setp(ttext, size='large', color='r', style='italic')
plt.setp(xtext, size='medium', name=['Courier', 'DejaVu Sans Mono'],
weight='bold', color='____')                     # 提示：绿色
plt.setp(ytext, size='medium', name=['Helvetica', 'DejaVu Sans'],
weight='light', color='____')                    # 提示：蓝色
_____________                                     # 提示：显示图片
```

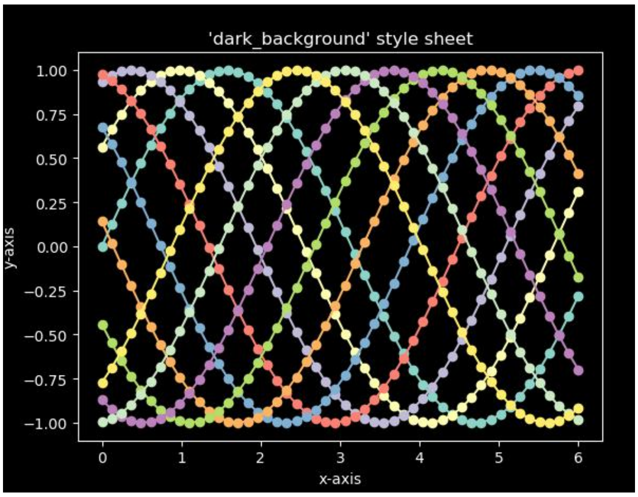
2. 正确结果为：



部分程序如下：

```
______________________                          # 提示：导入必需的 python 库
______________________                          # 提示：导入必需的 python 库
np.random.seed(0)
n_bins = 10
x = np.random.randn(1000, 3)
fig, axes = plt.subplots(nrows=2, ncols=2)
ax0, ax1, ax2, ax3 = axes.flatten()
colors = [______________________]               # 提示：图例
ax0.hist(x, n_bins, normed=1, histtype='bar', color=colors, label=colors)
ax0.legend(prop={'size': 10})
ax0.set_title('______________________')         # 提示：标题
ax1.hist(x, n_bins, normed=1, histtype='bar', stacked=True)
ax1.set_title('______________________')              # 提示：标题
ax2.hist(x, n_bins, histtype='step', stacked=True, fill=False)
ax2.set_title('______________________')         # 提示：标题
# Make a multiple-histogram of data-sets with different length.
x_multi = [np.random.randn(n) for n in [______________________]]
# 提示：包含 10000, 5000, 2000
ax3.hist(x_multi, n_bins, histtype='____')      # 提示：直方图的类型为 bar
ax3.set_title('______________________')         # 提示：标题
fig.tight_layout()
______________________                          # 提示：显示图片
```

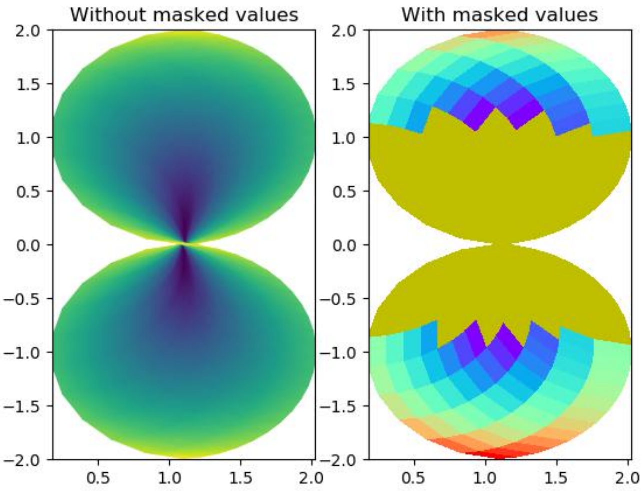
3. 正确结果为：



部分程序如下：

```
____________________                              # 提示：导入必需的 python 库
____________________                              # 提示：导入必需的 python 库
plt.style.use('dark_background')
fig, ax = plt.subplots()
L = 6
____________________                              # 提示：x 从 0 到 L 等间距取点
ncolors = len(plt.rcParams['axes.prop_cycle'])
shift = np.linspace(0, L, ncolors, endpoint=False)
for s in ______:                                  # 提示：循环
    ax.plot(____________________)                 # 提示：作图，x, sin(x + s), “o-”
ax.set_xlabel('______')                           # 提示：横坐标
ax.set_ylabel('______')                           # 提示：纵坐标
ax.set_title("____________________")              # 提示：标题
____________________                              # 提示：显示图片
```

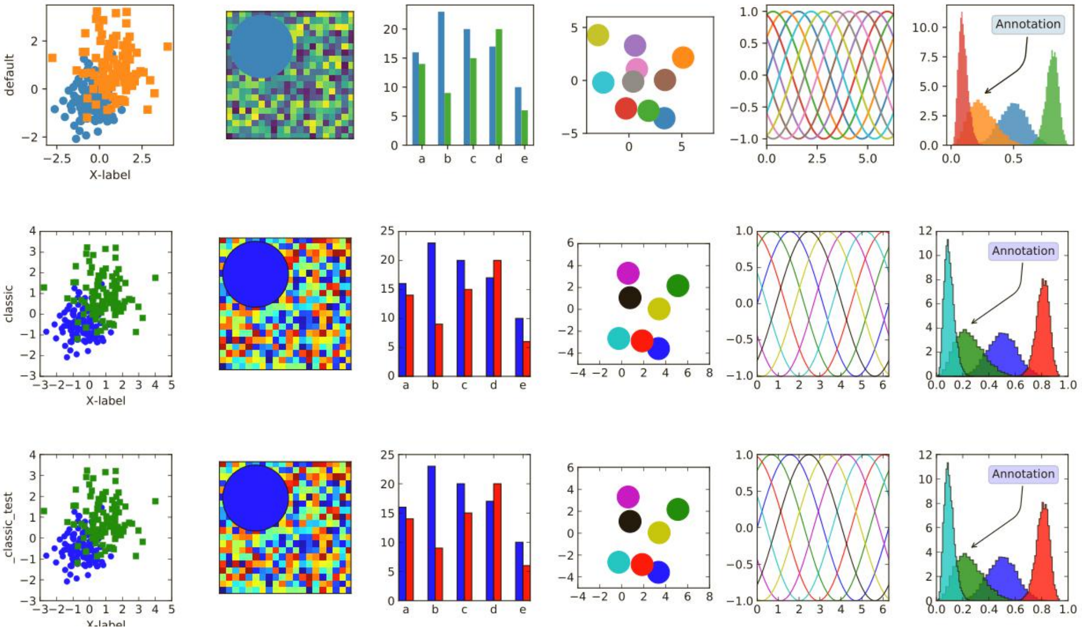
4. 正确结果为：

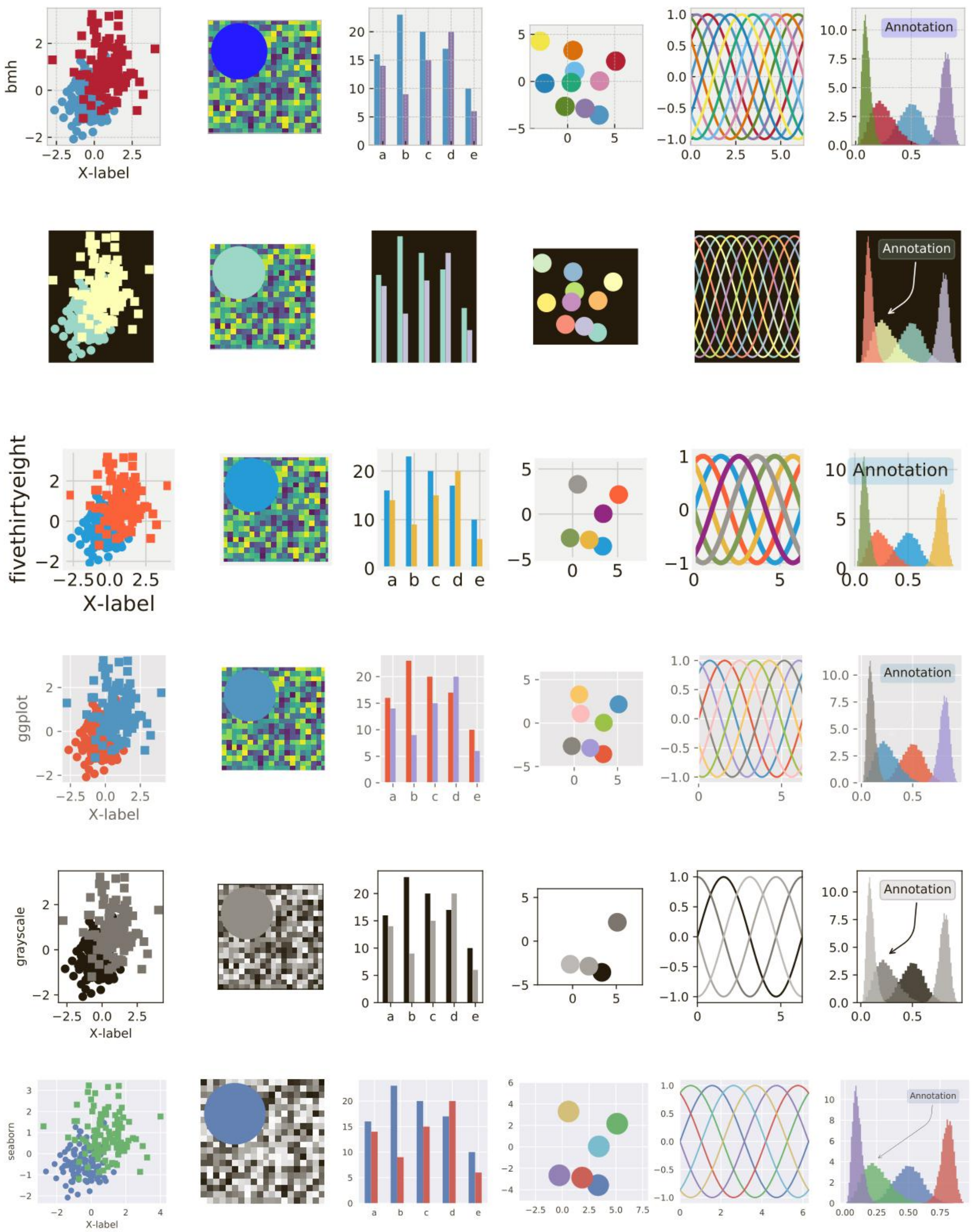


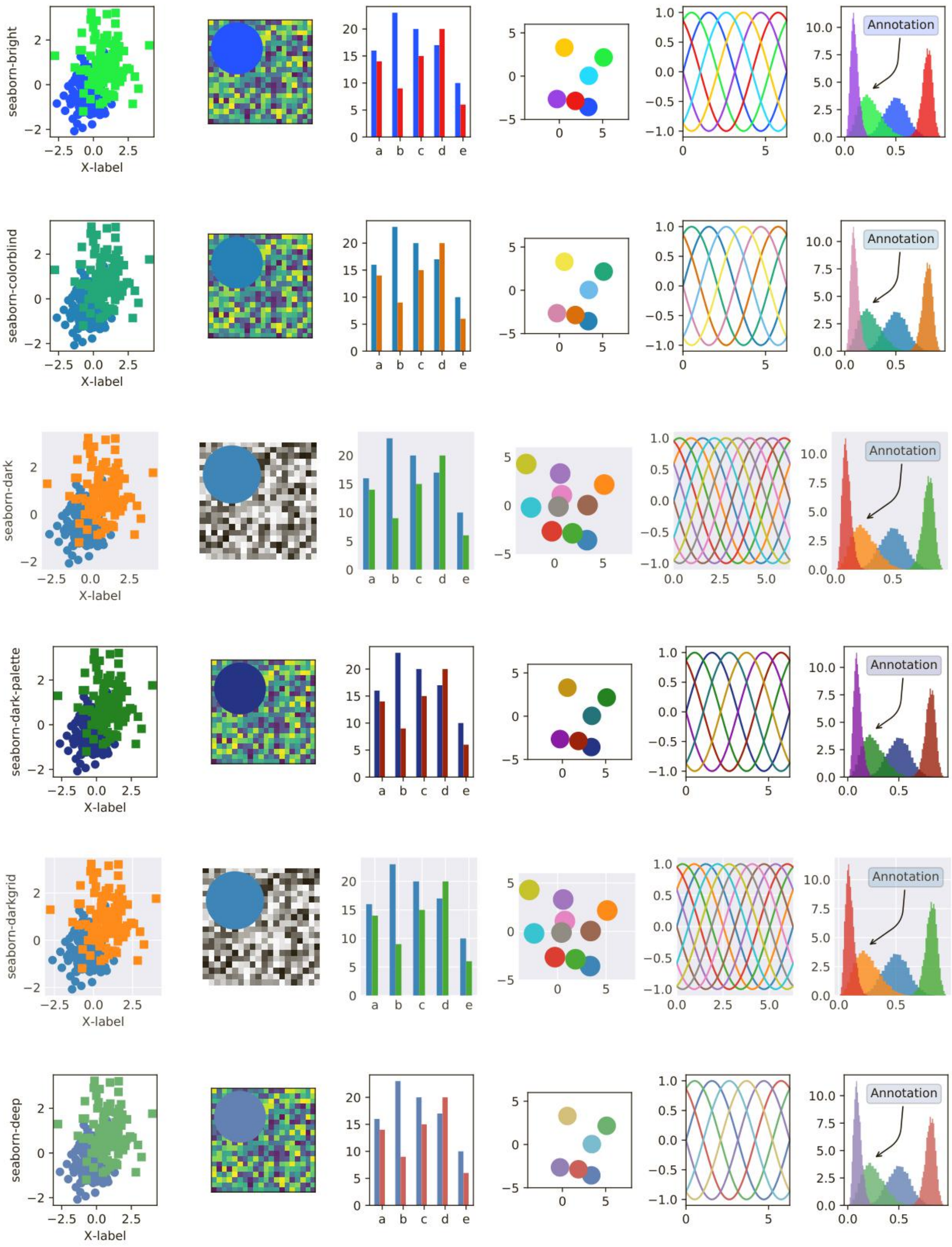
部分程序如下：

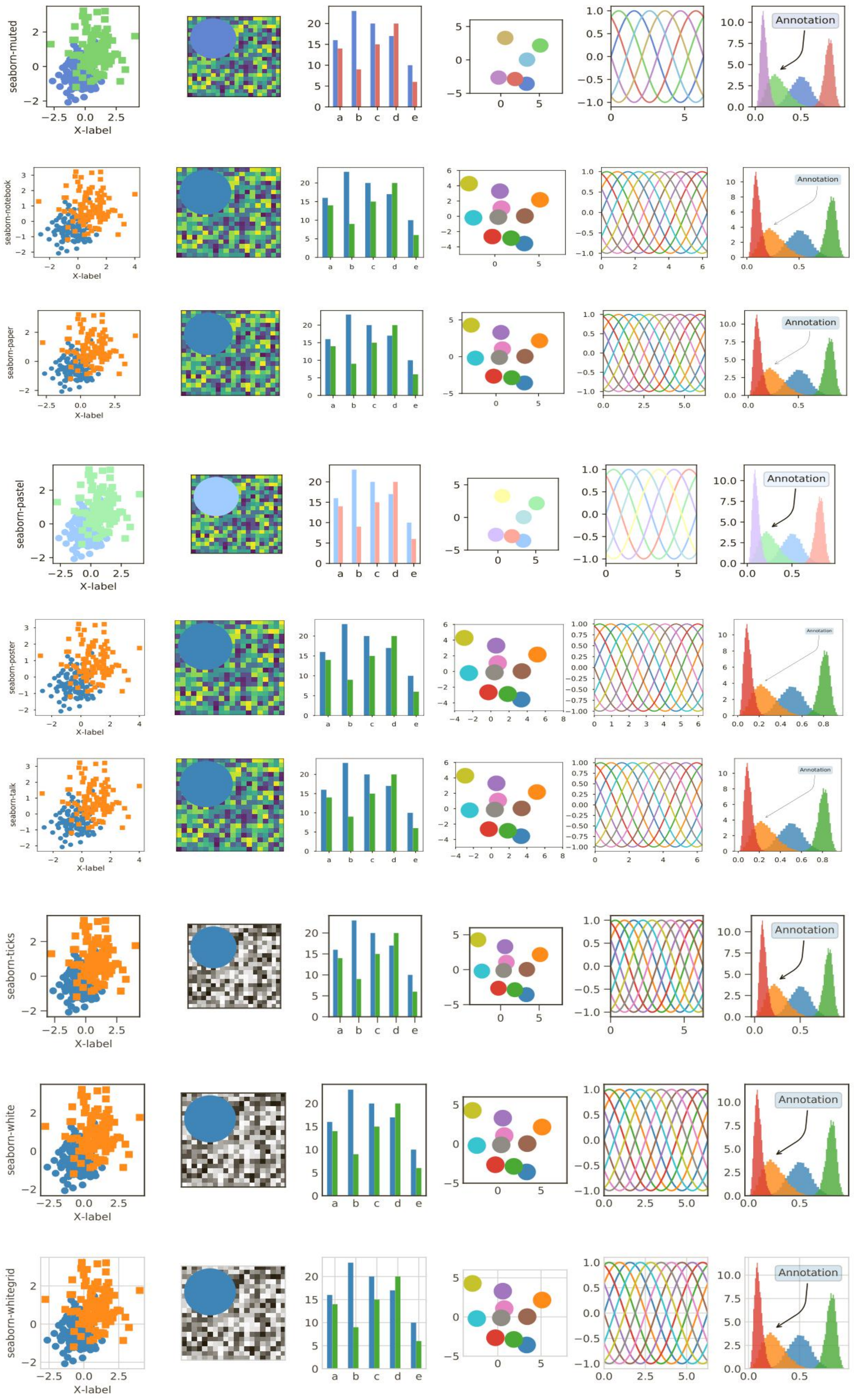
```
____________________                    # 提示：导入必需的 python 库
from matplotlib.pyplot import figure, show, savefig
from matplotlib import cm, colors
from numpy import ma
n = 12
x = np.linspace(-1.5, 1.5, n)
y = np.linspace(-1.5, 1.5, n*2)
____________________                # 提示：网格化
Qx = ____________________             # 提示：Qx = cosY- cosX
Qz = ____________________             # 提示：Qx = sinY + sinX
Qx = (Qx + 1.1)
Z = ____________________              # 提示：Z=sqrt(X^2 + Y^2)/5
Z = ____________________              # 提示：对 Z 标准化，（Z-最小值）/（极差）
# The color array can include masked values:
Zm = ma.masked_where(np.fabs(Qz) < 0.5*np.amax(Qz), Z)
____________________                          # 提示：创建一幅图片
ax = fig.add_subplot(121)
ax.pcolormesh(Qx, Qz, Z, shading='gouraud')
ax.set_title('Without masked values')
ax = fig.add_subplot(122)
# You can control the color of the masked region:
cmap = ____________________                # 提示：创建彩虹图
cmap.set_bad('y', 1.0)
ax.pcolormesh(Qx, Qz, Zm, cmap=cmap)
ax.set_title('____________________')       # 提示：标题
____________________                          # 提示：显示图片
```

5. 正确结果为：




bmh
X-label
−2.5 0.0 2.5
2 0 −2
20 15 10 5 0
a b c d e
5 0 −5
0 5
1.0 0.5 0.0 −0.5 −1.0
0.0 2.5 5.0
10.0 7.5 5.0 2.5 0.0
0.0 0.5
Annotation
Annotation
fivethirtyeight
X-label
−2.50.0 2.5
2 0 −2
20 10 0
a b c d e
5 0 −5
0 5
1 0 −1
0 5
10 Annotation
5 0
0.0 0.5
ggplot
X-label
−2.5 0.0 2.5
2 0 −2
20 15 10 5 0
a b c d e
5 0 −5
0 5
1.0 0.5 0.0 −0.5 −1.0
0 5
10.0 7.5 5.0 2.5 0.0
0.0 0.5
Annotation
grayscale
X-label
−2.5 0.0 2.5
2 0 −2
20 15 10 5 0
a b c d e
5 0 −5
0 5
1.0 0.5 0.0 −0.5 −1.0
0 5
10.0 7.5 5.0 2.5 0.0
0.0 0.5
Annotation
seaborn
X-label
−2 0 2 4
3 2 1 0 −1 −2
20 15 10 5 0
a b c d e
6 4 2 0 −2 −4
−2.5 0.0 2.5 5.0 7.5
1.0 0.5 0.0 −0.5 −1.0
0 2 4 6
10 8 6 4 2 0
0.00 0.25 0.50 0.75
Annotation


seaborn-bright
seaborn-colorblind
seaborn-dark
seaborn-dark-palette
seaborn-darkgrid
seaborn-deep
X-label
−2.5
0.0
2.5
−2
0
2
a
b
c
d
e
0
5
10
15
20
−5
−1.0
−0.5
0.0
0.5
1.0
5.0
Annotation
2.5
7.5
10.0


seaborn-muted
X-label
Annotation
a
b
c
d
e
seaborn-notebook
X-label
Annotation
seaborn-paper
X-label
Annotation
seaborn-pastel
X-label
Annotation
seaborn-poster
X-label
Annotation
seaborn-talk
X-label
Annotation
seaborn-ticks
X-label
Annotation
seaborn-white
X-label
Annotation
seaborn-whitegrid
X-label
Annotation

部分程序如下：

```
    ____________________                                    # 提示：导入必需的 python 库
    ____________________                                    # 提示：导入必需的 python 库

    def plot_scatter(ax, prng, nb_samples=100):
        """Scatter plot.
        """
        for mu, sigma, marker in [(-.5, 0.75, 'o'), (0.75, 1., 's')]:
            x, y = prng.normal(loc=mu, scale=sigma, size=(2, nb_samples))
            ax.plot(x, y, ls='none', marker=marker)
        ax.set_xlabel('________')                           # 提示：横坐标
        return ax

    def plot_colored_sinusoidal_lines(ax):
        """Plot sinusoidal lines with colors following the style color cycle.
        """
        ____________________                                # 提示：L=2π
        ____________________                                # 提示：x 从 0 到 L 等间距取点
        nb_colors = ____(plt.rcParams['axes.prop_cycle'])
        #提示：plt.rcParams['axes.prop_cycle']的长度
        shift = np.linspace(0, L, nb_colors, endpoint=False)
        for s in shift:
            ax.plot(x, np.sin(x + s), '-')                  # 提示：作图，x, sin(x + s)
        ax.set____________________                          # 提示：限定 x 的取值范围为 x[0]到 x[-1]
        return ax

    def plot_bar_graphs(ax, prng, min_value=5, max_value=25, nb_samples=5):
        """Plot two bar graphs side by side, with letters as x-tick labels.
        """
        x = ____________________
      # 提示：x 为从 0 开始，步长为 1，取 nb_samples 个数组成的 numpy.ndarray 类型
        ya, yb = prng.randint(min_value, max_value, size=(2, nb_samples))
        width = 0.25
        ax.bar(x, ya, width)
        ax.bar(x + width, yb, width, color='C2')
        ax.set_xticks(x + width)
        ax.set_xticklabels(['a', 'b', 'c', 'd', 'e'])
        return ax

    def plot_colored_circles(ax, prng, nb_samples=15):
        """Plot circle patches.
        NB: draws a fixed amount of samples, rather than using the length of
        the color cycle, because different styles may have different numbers
        of colors.
        """
        for sty_dict, j in zip(plt.rcParams['axes.prop_cycle'], range(nb_samples)):
            ax.add_patch(plt.Circle(prng.normal(scale=3, size=2),
            radius=1.0, color=sty_dict['color']))
        # Force the limits to be the same across the styles (because different
        # styles may have different numbers of available colors).
        ax.set_______________                    # 提示：设置x的显示范围为-4到8
        ax.set_______________                    # 提示：设置x的显示范围为-5到6
        ax.set_aspect('equal', adjustable='box') # to plot circles as circles
        return ax

    def plot_image_and_patch(ax, prng, size=(20, 20)):
        """Plot an image with random values and superimpose a circular patch.
        """
        values = prng.random_sample(size=size)
        ax.imshow(values, interpolation='none')
        c = plt.Circle((5, 5), radius=5, label='patch')
        ax.add_patch(c)
        # Remove ticks
        ax.set_xticks([])
        ax.set_yticks([])

    def plot_histograms(ax, prng, nb_samples=10000):
        """Plot 4 histograms and a text annotation.
        """
        params = ((10, 10), (4, 12), (50, 12), (6, 55))
        for a, b in params:
            values = prng.beta(a, b, size=nb_samples)
            ax.hist(values, histtype="stepfilled", bins=30, alpha=0.8, normed=True)
        # Add a small annotation.
        ax.annotate('Annotation', xy=(0.25, 4.25), xycoords='data',
        xytext=(0.9, 0.9), textcoords='axes fraction',
        va="top", ha="right",
        bbox=dict(boxstyle="round", alpha=0.2),
        arrowprops=dict(
        arrowstyle="->",
        connectionstyle="angle,angleA=-95,angleB=35,rad=10"),
        )
        return ax

    def plot_figure(style_label=""):
        """Setup and plot the demonstration figure with a given style.
        """
        # Use a dedicated RandomState instance to draw the same "random" values
        # across the different figures.
        prng = np.random.RandomState(96917002)
        # Tweak the figure size to be better suited for a row of numerous plots:
        # double the width and halve the height. NB: use relative changes because
        # some styles may have a figure size different from the default one.
        (fig_width, fig_height) = plt.rcParams['figure.figsize']
        fig_size = [fig_width * 2, fig_height / 2]
        fig, axes = plt.subplots(ncols=6, nrows=1, num=style_label,
        figsize=fig_size, squeeze=True)
        axes[0].set_ylabel(style_label)
        plot_scatter(axes[0], prng)
        plot_image_and_patch(axes[1], prng)
        plot_bar_graphs(axes[2], prng)
        plot_colored_circles(axes[3], prng)
        plot_colored_sinusoidal_lines(axes[4])
        plot_histograms(axes[5], prng)
        fig.tight_layout()
        return fig

    if __name__ == "__main__":
        # Setup a list of all available styles, in alphabetical order but
        # the `default` and `classic` ones, which will be forced resp. in
        # first and second position.
        style_list = list(plt.style.available)    # *new* list: avoids side effects.
        style_list.remove('classic')    # `classic` is in the list: first remove it.
        style_list.sort()
        style_list.insert(0, u'default')
        style_list.insert(1, u'classic')
        # Plot a demonstration figure for every available style sheet.
        for style_label in style_list:
            with plt.style.context(style_label):
                fig = plot_figure(style_label=style_label)
        ____________________                                  # 提示：显示图片
```