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**Time taken** 18 mins 11 secs

**Grade** 18.00 out of 22.00 (82%)

Question **1**

Correct

Mark 2.00 out of  
2.00

In the single slit diffraction experiment setup used in our lab, the intensity of the fringe pattern was measured by using a photosensitive device which was connected to a multimeter. The typical readings on the multimeter were in

- ☐ micro volts.
- ☐ milli amperes.
- ☐ milli volts.
- ☒ micro amperes.



The correct answer is: micro amperes.

Question **2**

Correct

Mark 2.00 out of  
2.00

In the single slit experiment, initially the data collected contained photocell measurements taken every 0.1 cm along the diffraction pattern. Instead if you decide to take readings for every 0.01 cm, which of the following are true.

- ☐ The accuracy in predicting the position of all the minima will be lower.
- ☒ The accuracy in predicting the position of all the minima will be higher.
- ☐ The accuracy in predicting the position of the central maxima will be lower.
- ☐ The accuracies will not change.



The correct answer is:

The accuracy in predicting the position of all the minima will be higher.

Question **3**

Incorrect

Mark 0.00 out of  
2.00

Recall the single slit diffraction experiment setup that was used during the demonstration. Choose the correct property of the light source.

- ☐ Wavelength is 630.8 nm. Light source is incoherent.
- ☒ Wavelength is 632.8 nm. Light source is incoherent.
- ☐ Wavelength is 630.8 nm. Light source is coherent.
- ☐ Wavelength is 632.8 nm. Light source is coherent.



The correct answer is: Wavelength is 632.8 nm. Light source is coherent.

Question **4**

Correct

Mark 2.00 out of  
2.00

In the single slit diffraction experiment, due to a faulty multimeter, the reading for the value of the current is  $kI$  (i.e.  $k$  times  $I$ ), where  $I$  is the true value of current generated by the photosensitive device and  $k$  is a constant. How much error does this introduce in the measurement of the slit width. If  $d$  is the true value of slit width, the measured value would be

- ☐  $d/k$
- ☐  $kd$
- ☒  $d$
- ☐  $2kd$



The correct answer is:

$d$

Question **5**

Correct

Mark 2.00 out of  
2.00

What happens to the ratio of the Intensity at the primary maxima to that at the secondary maxima if the width of the single slit as well as the distance between the slit and the photocell are doubled.

- ☒ Remains same
- ☐ Doubles
- ☐ Cannot be computed
- ☐ Quadruple



The correct answer is: Remains same

Question **6**

Correct

Mark 4.00 out of 4.00

Consider the following setups for the single slit diffraction experiments using a coherent point source. Also, assume that no lenses are being used.

(I) Light source is far from the slit and the slit is far from the observation screen.

(II) Light source is close to the slit and the slit is far from the observation screen.

(III) Light source is close to the slit and the observation screen is also close to the slit.

(IV) Light source is far from the screen and the slit is close to the observation screen.

[Multiple answers correct. Partial marks will be awarded if all the correct answers are not selected. Selection of a wrong answer carries negative marks.]

☐ (II) is the Fraunhofer diffraction setup.

☒ (IV) is the Fresnel diffraction setup.



☐ (I) is the Fresnel diffraction setup.

☒ (I) is the Fraunhofer diffraction setup.



The correct answers are: (I) is the Fraunhofer diffraction setup., (IV) is the Fresnel diffraction setup.

Question **7**

Correct

Mark 2.00 out of  
2.00

If you wish to observe single-slit diffraction pattern using a window ( $\sim 50\text{ cm} \times 50\text{ cm}$ ) on a wall as a slit, you would choose a source which emits a coherent electromagnetic radiation in the:

- ☐ Ultraviolet region
- ☒ Radio wave region
- ☐ X-ray
- ☐ Infrared region



The correct answer is:  
Radio wave region

## Question 8

Incorrect

Mark 0.00 out of 2.00

Recall the single slit diffraction experiment setup that we used for the purpose of demonstration. A broadened and parallel laser beam can be obtained by mounting two lenses between the laser and the slit. If  $f$  denotes the focal length, choose the correct answer.

- ☒ Lenses used in the experiment during the demonstration had  $f=1$  cm and  $f=10$  cm. ✗
- ☐ No lenses were used during the demonstration.
- ☐ Lenses used in the experiment during the demonstration had  $f=2$  cm and  $f=10$  cm.
- ☐ Lenses used in the experiment during the demonstration had  $f=2$  cm and  $f=20$  cm.

The correct answer is: No lenses were used during the demonstration.

## Question 9

Correct

Mark 2.00 out of 2.00

In a single slit diffraction experiment with monochromatic light the width of the central bright maximum is \_\_\_\_\_ the first secondary maximum.

- ☐ one fourth
- ☐ half
- ☒ twice ✓
- ☐ same as

The correct answer is: twice




Question **10**

Correct

Mark 2.00 out of 2.00

Red light is used in a single slit diffraction experiment with a slit width  $0.01 \text{ mm}$ . If the source is replaced with X-Rays, it will lead to

- ☐ an observable diffraction pattern with increased fringe numbers per unit length on the screen.
- ☒ no observable diffraction pattern. 
- ☐ an observable diffraction pattern with broadened central maxima.
- ☐ an observable diffraction pattern with reduced fringe numbers per unit length on the screen.

The correct answer is: no observable diffraction pattern.

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