Year 13 Science: Interference, double slits and diffraction gratings

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. Two speakers in phase emit sound of wavelength 0.40 m. At point P the path difference is 1.00 m. Is P loud or quiet?

2. Light of wavelength 600 nm passes through slits 0.300 mm apart onto a screen 1.50 m away. Find the fringe spacing.

3. Find the slit spacing d of a grating with 300 lines per mm.

4. Yellow light of 589 nm shines on that grating. Find the angle of the second-order maximum.

5. What is the highest order maximum that grating gives for 589 nm light?

Exam-style question: a grating on the lab wall

Aroha shines a red laser of wavelength 635 nm through a diffraction grating with 500 lines per mm, onto a wall 1.50 m from the grating. The wall is wide enough to catch every beam.

6. Calculate the angle of the first-order maximum.

7. Calculate the distance on the wall from the central maximum to the first-order maximum.

8. Explain why the first-order maximum is bright.

9. Aroha changes to a violet laser of wavelength 405 nm. Describe and explain how the pattern changes, including how many maxima there are.

Fix the mistake

10. Correct this statement: "For a grating, $\sin\theta = x/L$, so I used $n\lambda = dx/L$ at 40°."

11. Correct this statement: "The grating has 600 lines per mm, so d = 600 mm."

12. Correct this statement: "$d \div \lambda = 3.13$, so there are 3 maxima."

13. Correct this statement: "Dark fringes are where no light reaches the screen from the slits."