Waves

Physics

Nudger

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Tutorials

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General

1. Put dotted partial reflection rays (with direction arrows) where relevant (they only need to extend a small distance, just to show you have remembered them)

2. Put direction arrows on rays.

3. Put dotted normals (and always use angle between normal and ray NOT surface and ray in calculations).

4. Ray lines must join up exactly.

5. Check that your calculator isn't in RAD mode when calculating angles (although clearly you have two calculators, one in each mode, anyway . . . ahem). A common sense check at the end of your answer should spot this kind of error anyway, clearly.

6. Provide sufficient detail. As a general rule, if it's what you'd have written for GCSE then his won't cut it at A-level. For example, when ask for a safety precaution when using lasers, write 'polarised protective goggles with a high optical density effective against the specific wavelength of laser being used', not just 'safety goggles' (virtually all of which just offer splash protection and would be useless against lasers).

Progressive Waves

7. Waves reflect 'from' surfaces NOT 'off of' . . . you chav.

8. Watch out when dealing with reflections: remember they travel double the distance (or alternatively halve the time involved).

9. Make sure that any waveforms drawn are precise and hit all the relevant axes/ junctions and so on.

10. Draw dotted guidelines for attenuation in waveforms, checking carefully that there is a progressive reduction in amplitude (very easy without guidelines to have a waveform in which there is a draughting 'bias' for either +ve or -ve displacements, and hence amplitude increases periodically).

11. Check whether a given waveform involving displacement on the y-axis is plotted against time (from which you can obtain period) or against distance (from which you can extract wavelength): your brain intuitively sees the latter.

12. Draw the next wave position to work out if a wave is 'rising' or 'falling' (your brain will send you wrong on this very easily).

13. You MUST STATE what is constant when doing proportional analysis on equations (especially when used to explicate qualitative answers). Failure to do so will lose you marks.

14. You MUST state (and ideally re-arrange) root equation prior to substitution (particularly for 'show that' questions).

15. Do NOT use rounded values in subsequent working.

16. Do NOT use the words 'it' or 'they' (and so on) in qualitative descriptions unless very confident with your written communication; they (hah . . .) are the source of much subject/object/direct-object confusion which costs marks.

17. Write a clear note (ideally boxed) to the examiner when using a given value and so on, rather than your own in subsequent working. (Similar for writing your answer in the wrong section and so on: treat the examiner with respect by writing a polite, clear note to them explaining what's gone wrong and how you've fixed it – do not just draw arrows swapping the two parts and how they work it out, for example (similar for any '*' related extensions to work: draw an arrow directing the examiner's attention to the additional work).

18. Why do houses in valleys or next to mountains struggle to get good tv and radio reception? [86]

19. What is intensity?

20. What is black-body radiation?

Refraction

21. Refractive indices are given to TWO dp (hence air/vacuum is 1.00 NOT just 1.0). Track this in terms of sf in final answer.

22. How do absorption and dispersion degrade a digital light pulse travelling through an optical fibre? [p105-6]

23. What is the difference between axial and non-axial rays in an optical fibre? [106]

24. What is the function of repeaters in optical fibre networks? [106]

One and Two Source Interference

25. Don't confused path difference (measured in (half-)wavelengths or m) with phase difference (measured in degrees or radians).

26. Count the gaps for fringes (with double slits), not the fringes themselves, when using spread to calculate 'w'.

27. Describe the pattern seen for diffraction of white light through a single slit? [87]

28. Derive the equation for two source interference. [93]

29. A two source interference pattern comprises 12 fringes over 24 cm. What is the fringe separation?

30. Why is it important to measure across many fringes to find the separation, rather than just one? [94]

Diffraction Grating

31. Watch out for prefixes when obtaining 'd' in diffraction grating questions (and common sense check your value thereafter as a double check).

32. Put 90 degrees into the grating equation to find maximum visible order (and always round down – 4.8 is still only 4 visible, because you can't see the 5th).

33. Remember to count the zero order (central maximum) in grating/dual slit questions. For example, if a maximum 4th order grating pattern is formed (as discussed above) then there will be SEVEN orders visible in total (three orders either side and one for the central maximum).

34. Derive the diffraction grating equation.[97]

35. What is the difference between a transmission and reflection grating? [96]

36. What is the 'zero order' line? [96]

37. What does a 'courser' grating mean? [98]

Stationary Waves

38. Draw 'alternative' medium position as dotted line for standing waves, not as full line (for standing wave on a string, for example).

39. Remember that the ends of a stationary wave on a string are also nodes (often forgotten when counting/labelling them for questions).

40. Don't confuse harmonics with overtones (they lag by one, so 5th harmonic is 4th overtone). Fundamental is the 1st harmonic. All further harmonics are frequency multiples of the fundamental (so if fundamental is 40Hz then the 2nd, 3rd and 4th harmonics are 80Hz, 120Hz and 160Hz respectively).

41. $(H)(\lambda/2)$ = length (for working out wavelength, where H is the number of harmonics (loops) in stationary wave.

42. Don't confuse nodes with anti-nodes (easily done, due to the 'anti' which implies 'cancelling' in our minds).

43. You should ensure that the peak-trough positions for standing waves match up.

44. Remember also (particularly when dealing with stationary waves) that waves undergo a 180° (half-wavelength path) change upon reflection at an interface.

45. What are 'resonant' frequencies?

46. Draw the third harmonic for: closed pipe; open pipe; open at one end pipe; string.

47. What are the wavelengths of the above (see 32) and what are they going up in?

48. If the 5th harmonic for a string (fixed at both ends) is 75 Hz, what is the 7th harmonic?

49. What is the difference between the harmonic system and the fundamental-overtone system?

50. What does 'μ' mean in terms of strings?

51. What is f for the 1st harmonic (of a string) in terms of μ?

52. What is f for the 4th harmonic (of a string) in terms of μ?