

Short questions about the first 6 'Stellar Transients' lectures

1. What flux unit is used in spectra (multiple possibilities)?
2. What is the relationship between fluence and energy output?
3. What general physical effects underly the rising and decaying phases of a transient?
4. What is the definition of duty cycle?
5. What are the basic energy sources of stellar transients?
6. What is an easy way to estimate the size of the emission region?
7. What is the smallest region ever detected from a transient?
8. Name all thermonuclear transients discussed in the course.
9. Calculate the emission region size for a classical nova radiating at the Edington luminosity. Assume a 1 solar mass WD and a Stefan-Boltzmann constant of $5.67\text{E-}5 \text{ erg/cm}^2/\text{K}^4/\text{s}$.
10. Why is the study of transients in the radio band so underdeveloped?
11. Calculate the energy release of a nucleon dropped on a NS and WD.
12. How does one categorize the following sources:
 - (a) A NS in orbit around a B0-I star?
 - (b) A BH around a Roche-lobe filling white dwarf?
 - (c) A solar-like star in orbit around a white dwarf?
 - (d) A burster with an orbital period of 11 min?
 - (e) A transient lasting 1 min at 1 min?
13. How can one follow during a transient outburst the inner edge radius of an accretion disk in a LMXB?
14. If an accretion disk is switching from cold to hot/viscous, how can one determine whether the heating front moves inward or outward?
15. Let's say we see a HMXB transient that suddenly turns off, what may be the reason for that?
16. Usually NSs are spin up by accretion, but sometimes they are slowed down. What may be the reason?
17. What determines whether a star is tidally disrupted when falling into a supermassive black hole?

18. Let us assume that a NS has been accreting for a very long time at 10^{15} g/s, so that the atmosphere was in thermal equilibrium, and that the accretion suddenly stops. What temperature do you expect to measure immediately afterward? The Stefan-Boltzmann constant is 5.67×10^{-5} erg/cm²/s/K⁴.
19. What determines the decay time of an X-ray burst?
20. What determines the rise time of an X-ray burst?
21. What determines the peak flux of an X-ray burst?
22. Why does an X-ray burst decay faster at high photon energies than at low?
23. If matter of solar composition is accreted by a NS, with 73% hydrogen, how can a pure helium flash occur? What would be the typical duration?
24. If matter without hydrogen is accreted by a neutron star, what kind of X-ray burst do you expect and what would be the duration?
25. Why are there no X-ray bursts detected in HMXBs?
26. What does a precursor in an X-ray burst light curve imply?
27. If we would like to measure the radius of a neutron star, how should we best go about it?
28. What is the typical recurrence time of X-ray bursts in one source?
29. We measure an alpha of 2000. What does this imply?
30. What is supposed to burn in a superburst?
31. Explain why precursors in superbursts are less energetic than ordinary bursts from the same source?
32. Why is it odd that burst oscillations occur in X-ray burst tails?
33. Why do classical novae shine brightest in the UV and X-ray bursts in X-ray?
34. Why do thermonuclear flashes on WDs not have nice exponential decays like those on NSs?
35. Explain under what circumstances a WD can grow to the Chandrasekhar limit. How may such a system look like?
36. What distinguishes the prompt GRB emission from the afterglow emission?
37. What is the most important contribution that CGRO made to GRB research?

38. What is standard candle in GRBs?
39. Why does the $\log N$ - $\log P$ distribution of GRBs as measured with BATSE on CGRO flatten off at low P ?
40. What does the detection of an 18 GeV photon from a GRB imply?
41. What does an achromatic break in a GRB afterglow imply?
42. Why are so few SNe seen in conjunction with GRBs?
43. GRBs usually happen on the brightest parts of the host galaxy, 'normal' core-collapse SNe do not. Can you explain why this might be so?
44. Do you expect short GRBs to sit on the brightest parts of the host galaxy and why so?
45. What is a clear indicator that short GRBs have a different origin than long GRBs?
46. What may be the best way to measure high redshifts of GRBs?