# IB thermodynamics: Midway feedback

## Decile samples from 136 total

| | Your opinion of teaching through discussions? | Your opinion of learning approximation and applications to the physics of the everyday world | Any other comments and suggestions? |
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| **100%** | I think it's brilliant. It keeps us awake and interested and helps us learn a lot more. It was discussions like this during physics lessons at school that made me choose physics as my degree course. | I think it's a lot more relevant to the real world than abstract equations. I think your course teaches us to apply physics to everyday life and that's brilliant. | I think this course is the best one we've had this year. Thank you for not letting my interest in physics die! |
| **90%** | I have not fallen asleep in one of these lectures. That must be good. | This is something we would not otherwise learn. A lot of physics we are taught we know only as maths and never find out what is actually going on. | "I care because you do." (Aphex Twin) |
| **80%** | Different method of learning. I like it as it helps me hear about different opinions, but different people learn differently and that's why some people are opposed to your style. Personally I like it. | It's interesting and can be useful but it seems to require a lot of facts and numbers that are considered common knowledge but I don't seem to have. | I hope more lecturers will adopt your style and make physics "fun" and not just equations. Get some sleep... |
| **70%** | Enjoyable and a great deal more interactive. I can read and learn the equations in no time but applying them is a different matter, so that is why I find this course more gratifying and worthwhile. | Certainly more applicable and relevant to real problems. | |
| **60%** | Works fairly nicely and tends to stop me turning off during lecture. Unfortunate that the group is so large maybe. | Very important skill to have, especially as (as far as I can see) almost all but the simplest problems are not solvable directly. | Not really, you're the expert. I'll trust you know what you're doing. |
| **50%** | But we do need the classical thermo too. | Fun physics. | This is a really good [constructive?] course but should be lectured as an extra course possibly in IA. Please don't |

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| | | | spend too much time talking about the structure next year...we enjoy the physics. It was frustrating initially but has improved. |
| **40%** | The advantage is you develop a way of thinking more independently and there's some opportunity to get alternative methods of approaching problems. However, the time−consuming nature of it does restrict the volume of material which can be covered −− not necessary a serious disadvantage if that's not the objective of the course. | It's a useful skill which is more likely than most other things we learn in Physics which we will be able to apply in the future, and does give you a better feel for what thing mean. However, it's something which is hard to teach and possibly more acquired by experience. | Please could you write a little larger on the blackboard? |
| **30%** | **Some** discussion is a breath of fresh air, but if it takes too long or digresses too much, the lecturer should guide things back on track. No complaints about this course so far...**only not worth discussing too much in class about the style of teaching itself.** | It's very useful. But need to see in each case **how** the estimate was made. If the lecturer says "Okay...here's a factor of roughly 700 here," it doesn't help. | Someone should make sure our DoS's do give us photocopies of the book...and it would be helpful to know roughly the structure of what we will cover and the relevant pages.<br><br>P.S. Don't worry too much. The course is good! |
| **20%** | I think it is better for supervisions than lectures as people in discussions can then ask more specific questions about what they do not understand. | Application of physics to the outside world is great; it makes everything more enjoyable and interesting. I believe approximation is a useful tool but once you have learnt it, I do not see the point of applying it to everything. Actually I don't think approximation making is a big issue or concern, either for or against it. | You are a good lecturer because you are interesting and enthusiastic. However, I think it would be better to do more classical thermodynamics, just try not to make it boring!! |
| **10%** | Much more engaging and definitely gives a greater understanding of principles. There has to be some loss | Definitely a vital skill. Very important however to distinguish between approximating, | Questions were variable. Some were hugely interesting, |

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| | of actual material which is a shame possibly. I think a balance has to be achieved. | estimating, and guessing −− which is of NO use I think. | others I frankly found just silly. |
| **0%** | Great, but a discussion with 150 other people is ridiculous. It is not a discussion. I think little of value is said by the students in lectures and the rest have to sit and listen. Leave discussions to supervisions.<br><br>I'd like to do a proper thermodynamics course in lectures. I would then have something to discuss. | Anyone can approximate. You just do a proper calculation badly. These types of approximations turn out only useful when the answer is already known. The opposite, I feel, of what is intended.<br><br>You indicate in your question that in this course the physics is somehow more related to the "outside world." When is any physics course not related to the world, outside or otherwise? | |

# All 136 feedback forms

| | **Your opinion of teaching through discussions?** | **Your opinion of learning approximation and applications to the physics of the everyday world** | **Any other comments and suggestions?** |
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| **1** | I think it's brilliant. It keeps us awake and interested and helps us learn a lot more. It was discussions like this during physics lessons at school that made me choose physics as my degree course. | I think it's a lot more relevant to the real world than abstract equations. I think your course teaches us to apply physics to everyday life and that's brilliant. | I think this course is the best one we've had this year. Thank you for not letting my interest in physics die! |
| **2** | The most interesting course I have had at Cambridge (both years), and most likely beforehand also. The only class I haven't slept or clock watched. The beauty of Maxwell's equations gets taught enough (done it two different courses so far this year and about to do it in maths also). | Very useful. Your explanation of random walks was the most clear and intuitive I have seen. Always found 'standard' explanation of cross terms canceling a little obscure. | This is the only class that I invited students from other subjects to attend (English and History) and they asked to come back to the next one. Last year statistical physics/thermodynamics struggled to get attendance above 1/4. And that was Malcolm Longair, who everyone agreed is a phenomenal lecturer, and professor of natural |

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| | | | philosophy etc. but people just found it a little dull despite his very considerable effort. |
| **3** | Far more interesting than the normal format (i.e. a lecturer reading out lecture notes word−for−word) which makes the lectures worth going to. Get to talk to other people from other colleges; normally doesn't happen. | Love it! The fact that my A−level teacher taught us in a similar fashion to you is what made me want to do physics in the first place. Physics should be taught as an exciting subject relevant to the real world which is about more than just derivations of formulae. | I was really losing motivation at the beginning of this term but you (along with a couple of other things, e.g. good feedback from lab report, helping teach in schools with STIMULUS project) have restored my interest in physics (sorry if that sounds melodramatic!).<br><br>You are also helping teach us to work independently and read the book for ourselves. This happens in subjects like philosophy but hardly ever in physics; we never get time to pursue our own interests or have any real independence.<br><br>I think you've got totally the right idea and if you could convince anyone else to do something similar I'd be very grateful....(though I understand this might not go down too well since reading out pre−prepared lecture notes saves them from having to put the effort of thinking in...) </cynicism> |
| **4** | It makes the lectures more enjoyable. For the first time in Cambridge I look forward to lectures. I feel at last that I am learning for the sake of interest rather than to pass another stupid exam. | I think I am learning better how to use my mind, the solution of so much work in Cambridge is to follow a formula but in life and probably in physics most of the real work is in working out what to do rather than the number crunching | Thank you for making physics more rewarding and enjoyable. It is hard to do something different but please stick by your beliefs. There is more to physics than stress and exams. A glimpse of the future? People are scared |

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| | | manipulation. There is time to look up formulae later. The real skill is in thinking not in the experience of sums, and the improvement of the former is a breath of fresh air. | of change but it needs brave people to move things forward. Fantastic! |
| **5** | Good. High. It rocks! RIP THE SYSTEM. | This course has made me a better physicist. Approximation methods and useful tricks are great to know. It's nice to have a departure from learning by rote, and it's fun. | Always want to come to these lectures because I enjoy them and know that I will learn something and not go into zombie−mode. Best lectures ever?! |
| **6** | Makes it much easier to learn the material covered. Maybe less material is covered? | Very useful for understanding physics. Perhaps a separate course on orders of magnitude/approximation should be run if people are worrying about it taking over the thermodynamics course. | Definitely the most interesting course we've had so far. |
| **7** | By far the most interesting physics lectures I have had since I came to Cambridge. More of an emphasis on really thinking and also seeing more than one way round a problem. | Challenging, but ultimately far more useful than just learning equations that will be forgotten after the exams; a skill that will last a **lifetime**. | I did not come to a single physics lecture last term, but I have been to every lecture so far this term. In my opinion last term was a waste of time and now I am finally learning something. Anyone can just read through a handout at hoe. |
| **8** | It is a good thing. I think it helps pool the ideas of a lot of people and improve our ability in all areas of physics, not just classical thermodynamics. | Far more interesting than learning endless equations, for example learning about $K$ [thermal conductivity] showed us why we feel colder in cold water than air at the same temperature. Much more interesting than the master equations. | Don't listen to the **minority** who might complain about lack of "mathematical rigour". Someone needs to tell them that physics is not just learning equations! Some people like to complain too much. |
| **9** | Much more effective than lectures! I have a minor tendency to sleep through lectures but discussion | I find it more interesting and I'm sure it will be more useful. Thermodynamics | I remember nothing from A−level physics apart from how to approach an |

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| | actually keeps me awake! Its also very reassuring to know that as a group we do know the answers we just need to ask the right questions! I never learn anything in lectures. I tend to read the book afterwards, usually in the holidays. | equations can be looked up in a book when/if they are needed. Whereas learning how to apply it to the outside world is a skill which needs practice. We don't get enough of it. If we spent the time learning the equations we would forget them the day after the exam, which is more than a little pointless. | A−level physics question. I don't want to finish my degree having learnt how to approach a Cambridge tripos question and nothing else. It's unlikely to be at all useful to my career! |
| **10** | Much more engaging than listening to someone droning on and writing bogs of equations. Puts the fun back into physics as well as making you **think** rather than passively learning. | Very useful. I wholly appreciate the need to approximate and to make educated, deductive "guesses" since the real physics going on in research requires you to look for answers that no one yet knows −− need to approximate to make progress. Good groundwork. | This is the most entertaining and thought−provoking set of lectures I've had for a long time. DON'T change the format to please the conservatives! |
| **11** | Good. You (well, we) learn things from everyone in the room. Board notes that you write need to be more ordered and more readable so discussions flow more easily. | This is what my supervisor said: [sketch of physics knowledge versus time showing step function at "this course"] | Keep it up. It's top stuff. |
| **12** | **Fun!** Learning to think about physics in this way is very useful since it is a good place to start with most problems. | Much more useful and generally applicable than learning lots of equations. | I **LIKE** it. It's **GOOD**. **Don't stop.** |
| **13** | If the discussion is well chaired (and you do a fairly good job) this is the best way to learn since you must pay attention. You feel included and maintains interest in the material. | [I] feel this is vital, maintains a significance to equation pushing, also makes you realize how to make the physics you know already "work a lot harder." Only a shame that it isn't done so much earlier in the course. | I am really enjoying this now and think it is a course that should run through 1st and 2nd year. Possibly not 1st term [of the] 1st year since people may take it too easy but definitely in 1st year so that you can think in the right manner. Actually makes us think like physicists rather than equation librarians! |

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| **14** | I have not fallen asleep in one of these lectures. That must be good. | This is something we would not otherwise learn. A lot of physics we are taught we know only as maths and never find out what is actually going on. | "I care because you do." (Aphex Twin) |
| **15** | Very good. I am not bored out of my skull in a lecture (I listen) so I feel I am learning more than when someone reads a handout full of derivations. | I guess these are important physics skills, so it's good we're learning them. Surely those are more important than knowing four master equations. After all we've done thermodynamics the boring way three times already (i.e. last year). | Keep it as you're doing now. |
| **16** | **GREAT!!** Learn much more because you learn why one reasoning is accurate and another flawed. | **DON'T STOP So** much more applicable to the real world; to me physics is about the real world, not maths ... (spot the heretic) | |
| **17** | Much easier to remain focused/awake! Generally good way to learn: easier to see problems, etc. However, can be slower, though not necessarily bad! | Certainly useful to learn a bit more about approximation etc., to be forced/encouraged to do it. Perhaps more useful for general life than knowing how to calculate exactly? | Certainly one of the most interesting/enjoyable courses I've been to in Cambridge. Shame that this isn't specifically an order−of−magnitude physics course. At the moment it's not *really* either a Thermodynamics course or a OoM physics course.<br><br>Much more enjoyable than a "standard" course, although perhaps a little more mathematical rigor would be comforting −− concern over future need to know Thermodynamics.<br><br>But −− Thank you! At least someone has the courage to try something different. |
| **18** | Good. Very enjoyable, and it's nice to be able to think during a lecture rather | It's nice to be able to gain some experience at doing | By far the best course this year. I hope it's continued |

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| | than spending an hour making notes/reading the handout and preventing the onslaught of sleep. | this. It's not really encouraged on other courses, and it's nice to be able to do some physics without a lengthy differential equation. | onto further years. It's kind of fun to feel like a big research project. |
| **19** | I think it's awesome. | This is the best part of the course! Good for my general passion for physics! | Maybe each lecture on this course not covering as much material as a typical Cambridge lecture? |
| **20** | It's the best way to learn, one won't fall behind during lectures because of one little algebra line or reasoning. I believe I've not had such a good intake of physics during lessons/lectures since A−level. | Love it. It's not easy but its' a lot of fun. In my UCAS application I mentioned that my desire for physics and my enthusiasm comes from how physics could related and explain everyday life and interesting phenomena. So I totally agree with what you've said about how it's better to learn this early than later. | Whatever other staff in the department say, you should continue to lecture in the same way, please ... And thank you. |
| **21** | Much better. We've probably done a lot of the formal stuff in maths/chemistry etc. and it's a waste of time (and deeply boring) doing it again. I'd rather learn the physics than the maths. | Much more useful in life/for jobs since even if we do a physics−related job we probably won't need most of our degree anyway. This stuff is relevant to any job. | I don't care about the exam anyway so long as we're learning useful things. Course is amazing.<br><br>Is this teaching style more common in the US since I'm thinking of applying to MIT and would be interested to know the style of teaching? |
| **22** | I feel that this more interactive way of teaching helps to keep you alert during lectures. You don't just sit there not really thinking about the lecture material. It is also much more interesting. | I think this is a very important skill in physics and helps to give you a feel for physics too. It is also one of the things that attracted me to physics in the first place. | This is the most interesting course I have had so far this year. My only slight concern is that when it comes to exams we might not have enough past material to cover. |
| **23** | I think it's very good because it makes the subject more interesting. Conventional lectures can get quite tedious. This way breaks it up a bit | I like it because it makes the physics seem much more relevant and useful. It's good to have a rough idea of | I think this is a really good course. |

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| | and keeps people's attention. | numbers and the way to work them out in real life. | |
| **24** | It takes a lot of courage for many people to speak out as we are not used to it, so you tend to start getting comments from the more arrogant people in the class. However, you are extremely good at asking for new people to make comments so that builds people's confidence more. This is also good for life as many people at Cambridge lack people skills, which they are learning from these discussions. | It is much better and leads to a greater understanding of what is happening in the real world rather than learning abstract equations that you plug into constructed situations. | There are too many people in this university that are scared of change and teaching us to cope with real world situations rather than mathematics. |
| **25** | It's a good laugh. | Useful. Reveals how little I actually know! | Keep it up. Down with the system! |
| **26** | It's good fun but as I'm a Nat Sci I shun all enjoyment; it is after all why I'm taking physics.<br><br>I feel I'm missing out on the gut−wrenchingly dull partial derivatives and I'm not wasting so much paper on messing them up. I think that W.H. Smith are missing my money. | Applying physics? I've never heard of that before, isn't that engineering? | Write something really confusing on the board for the next class to puzzle over. |
| **27** | Keeps people interested in lectures. Engages people's minds to the subjects before reading lecture notes at home. We're actually being taught stuff as a basis for our own learning rather than just having a whole load of notes to teach ourselves. | It's interesting, fun and I think gives us a better overall understanding of what's going on. Just learning a whole load of equations and proofs feels more like learning maths than physics. | Definitely worth all of the hassle! |
| **28** | Different method of learning. I like it as it helps me hear about different opinions, but different people learn differently and that's why some people are opposed to your style. Personally I like it. | It's interesting and can be useful but it seems to require a lot of facts and numbers that are considered common knowledge but I don't seem to have. | I hope more lecturers will adopt your style and make physics "fun" and not just equations. Get some sleep... |
| **29** | Good −− keeps me awake and engaged in the lecture. | Fun! This is something one can do while walking to the lecture. | I hope this style of teaching would eventually spread −− should be done in |

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| | | | school education as well (while keeping balance with 'exact' stuff). I think approximation is a good way to apply this knowledge to real world, given enough background theory from learning exact theories. |
| **30** | Perhaps little too long discussing in lectures −− can leave that to supervisions. Good to work things through in lectures though as often many steps are assumed by lecturers. | Very useful, actually applicable to problem solving. Often lose sight of physics in the real world −− this course related it back to what we can see/hear etc. | Question sheets make you think rather than just finding the formula in your notes and plugging in the numbers. **Most enjoyable course at uni −− the reason I did physics was for parts like this.**<br><br>p.s. Most lecturers hand out these things and no one fills them in. |
| **31** | I like this style. [I] know it might not work for all subjects but it certainly does in this one. Keep it up and don't give in just yet! | Very useful. I am now much more aware of how physics relates to life. They should do this much more and I should have known this even before I came to university! (And to think people are wondering why no one wants to study physics!) If physics was much more approachable, more people would study it and they wouldn't have to pay people to study physics!! | |
| **32** | This is very stimulating. A very welcome change from being lectured at. It has changed the atmosphere of the lectures and helped me to start thinking about and engaging with the course. | This is something that causes me to see physics in perspective. It makes all the little areas of physics we are taught link in. | So far this has been an inspiring course and certainly the best this year. I would appreciate it if slightly greater care would be taken with clarity of presentation on the blackboard. |
| **33** | Good, but would like some actual printed notes. I find it hard to copy | Very, very good. | |

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| | down all the useful stuff you say. | | |
| **34** | It's the best way. Some people have different learning styles. It's VERY good you cater for that. | It's the reason I study physics. There's beauty in the world and even more beauty behind the surface. I want to learn to appreciate that. You are really good at helping me. | PLEASE make a handout for next year. I know there are textbooks but they waffle. I want to know specifically some clear derivations AT THE RIGHT LEVEL without buying a million textbooks. |
| **35** | Makes learning much easier −− remember things without trying. Easy to listen, slow though. | Useful, interesting, suddenly understood what some of the other courses have actually meant. Hard to take knowledge away though; relies on being able to reproduce approximations. | Much more interesting than other courses. Makes it easy to love physics. Even if we ended up having to learn from notes on our own I would prefer to have lectures like this which explained concepts rather than had notes read at me that I could read in my own time. |
| **36** | Much more interesting than the other lecturers' styles of teaching. My attendance at other lecture courses is minimal because they are so dull. All you need is the handout so there is little to gain in understanding from sitting there listening. | The reason people to physics is to solve/approximate real problems so learning in this way is good. Just learning equations and formulae is dry and seems pointless as one will always be able to find them in books. | |
| **37** | It keeps you engaged with the lecture so that you actually learn more in the lecture rather than frantically having to read the notes as you do examples questions. It also means you are more confident to think about problems for the actual physics rather than just churning out maths. | Again, increases confidence in applying physics to everyday things and not just the set examples. Makes physics interesting again. | The website is looking very good. A discussion forum there would be brilliant. I like the summaries of lectures that are being posted. |
| **38** | Found it useful and very enjoyable. | I think, since it has been taught well so far, it is worthwhile and very useful. The last two lectures I have found especially useful. i also feel it is something that it is very important for us to learn | All the lectures have been good fun and added some interest to an otherwise mundane subject. Well done; brilliantly taught (certainly better than thermo last year). Many of |

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| | | and I'm glad that we are doing it. | the students who complain would do better by trying to actually learn physics and worry less about "rigorous mathematics." |
| **39** | It is a very active process, forcing (in a good way) interest and thought. These lectures are much harder work than others, even though I'd say I try to think and pay attention in others. | It feels more like we're doing physics, rather than learning/memorizing relations. I'm glad it's being done through thermodynamics. I may not be so keen if it was a part of the course that I'm more interested in. | The paper on 1920's arithmetic teaching in [New Hampshire] on Sanjoy's website is interesting. Why does no one pay attention to this? |
| **40** | Good! As long as we read extra in books. | Extremely helpful. The example sheets for instance have made me realize that I have no clue about things which should be really obvious and are helpful in life (such as energies/lengths of various physical phenomena).<br><br>The very first thing physics students at the [...], where I spent some time, learnt in their 1st year (1st term) thermodynamics course was approximations/applications. Really important. | Good that we are advised on what to read in the books (formulae etc.) |
| **41** | Enjoyable and a great deal more interactive. I can read and learn the equations in no time but applying them is a different matter, so that is why I find this course more gratifying and worthwhile. | Certainly more applicable and relevant to real problems. | |
| **42** | More useful than being talked at −− makes us think during the lecture −− good! | Really good −− that's why I do physics −− because I like to apply it to things that I observe. | What we learn about physics problems in general from this course is very important and helpful. |
| **43** | Good thing −− you don't just get fed information; you learn how to think | I find it very important to apply physics to the outside | |

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| | for yourself. | world −− this lecture course emphasizes this; it's always more insightful when you can actually see how all the physics actually applies in the real world. I also think that we do need approximations when we are describing the outside world. | |
| **44** | Keeps us awake in lectures and allows everyone to use the lecture as they desire and at their own level. | Vital! | |
| **45** | More interesting, causes you to think more about situation behind theory. Summary of key ideas would be useful as note taking [is] difficult. | Useful and interesting. Can solve real−life problems. Physics often gets somewhat detached from reality, which is a shame. | Lecture style interesting, encourages people to actually come and learn stuff as opposed to just read book/notes. |
| **46** | I find it keeps everyone generally more awake and aware but I'm slightly worried about what I need to write down and which are the key facts. | I think it's a very valuable skill to learn to allow people to get a physical grasp of what is going on. | I do chemistry A also, in which I get taught the "classical" type of subject so I don't feel at any disadvantage. However, those not doing chemistry may feel differently. |
| **47** | Lecture far more interesting, actually listen. | Useful. We need to be able to approximate to solve problems anyway, gives understanding of world. | Some equations (e.g. a sheet) would be useful. Not much point in detailed equation derivation −− do those next term anyway. |
| **48** | Allows questions to be answered by someone who really knows their subject (although does mean less material can be presented in a lecture). Also keeps up interest throughout lecture. | Important aspect to learn. Obviously entire course cannot be taught that way but having one unit which focuses on it seems like a good idea. | Having one unit taught in a divergent style helps to break up the rigorous structure of the physics course and so makes it more interesting. Pretty much the only lectures I enjoy going to. |
| **49** | The style is very engaging and the lectures are fun. | This is a skill that is required in the "outside world" and as such it is useful. | The course requires a good lecturer and I would be concerned that if taught the same way in later years the lecturer would have to be |

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| | | | chosen carefully. More fun demonstrations!! |
| **50** | It's more involved, which is a good thing as lectures can be a bad use of time if you are not picking up on things at the same spot as the lecturer wants you to. Helps you to take in the content. | It is helpful to have a good grasp of this to know when you are going wrong when tackling a problem so it's good that it's included in the course. | Are there any other good ways of deducing formulae apart from using the units to see what quantities fit? |
| **51** | Better at keeping us awake than mechanically copying down stuff like a zombie and only understanding days/weeks later when reading notes. Provided the discussions are controlled and led properly (and you do well in this) it is a good method of teaching. | I haven't read the lecture summaries on your website yet but with used equations and values highlighted, something non−standard like this heavily (but approximately) applying to the real world (at this stage of education) is a nice variation and a good skill to learn. | The course is popular with the students but often we have little clue what is good for us! One mustn't rely solely on our opinion for guidance (on the other hand, your own education experience is guiding you).<br><br>By the way, we keep getting delayed for "Physics and War". |
| **52** | Far more effective and important to learn through discussions as this teaches more than just fundamental physical concepts but develops a style of thinking as well as lots of little ways to speed up calculations and spot errors. | I can't really be sure but I would expect the most important thing with the outside world is not really knowing, calculating, or learning exact values but having an order−of−magnitude, otherwise the accuracy of a number can detract from its significance if undue emphasis is placed on getting it exact. | I think it is a shame the physics department (at least some elements in it) refuse to evolve [beyond] a style of teaching that in some ways is outdated (assuming it was ever of utility). |
| **53** | Useful. I think it helps us keep interest through the lecture and perhaps understand more than the traditional method. I think it makes examples easier to approach. | I think this is also very useful. | |
| **54** | Teaching through discussion is useful. It encourages me to take an active part in lectures and to think during the lectures. However, it does mean that less material is covered. | This is probably the most useful sort of physics to learn. Perhaps it would be better to have a separate course (at IA) to "teach" this. | The course website is very useful. I particularly like the lecture synopses. |

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| **55** | Works fairly nicely and tends to stop me turning off during lecture. Unfortunate that the group is so large maybe. | Very important skill to have, especially as (as far as I can see) almost all but the simplest problems are not solvable directly. | Not really, you're the expert. I'll trust you know what you're doing. |
| **56** | It is a good thing. Far better than other lectures, more stimulating. | It is an important skill, not always brought out in other courses. | Just the textbook issue...still don't have it as our DoS didn't want to infringe copyright so has asked CUP for explicit permission to copy it. Any other books you recommend in the meantime? |
| **57** | Interesting and easier to focus. | Useful in real life, instead of just "exam−based" techniques. | The course is good but a bit radical and might require more getting used to. There are advantages to the different forms of lectures but I do enjoy yours. However, a balance between traditional lectures and your current type might be more useful. In fact, I think this is happening as lectures progress.<br><br>I like the way you use everyday physics to relate formulas to us rather than just giving them, as other lecturers do. |
| **58** | It's good −− just as long as the discussion doesn't take over the lecture. Sometimes it's hard to figure out what students are saying. | Interesting. Very different from the usual physics here. Would prefer (brief!) notes on theory then its application as lots of examples. | Overall I think it's good, shows a totally different approach which is quite refreshing. |
| **59** | Great! Hope there will be "optional" trial exam questions so we can see exact style of Tripos questions and can also practice them. | Great. Less pressure to cram head full of equations that we could easily look at in a textbook...and that's what you do when working for a company anyway! | |

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| **60** | Good −− however, I learn by discussion in supervision since they are 1−1 or 2−1 so I get feedback on my ideas and led in the right direction. But I do find the lectures useful. It makes you think about the physics rather than the maths and gives a better understanding of what goes on. | Useful. It gives a feel for numbers and sizes of things and makes physics seem like something that can be used outside of a classroom. | I like the course. It's different but refreshing. You communicate your enthusiasm and interest in physics and that's the best thing to teach. It would be nice to have some other book suggestions though! |
| **61** | Useful. Can take up a lot of the lecture though, so you sometimes rush towards the end a little. Good that [you] ask questions while going through calculations, i.e. typical values or estimates, etc. | Still a little strange because not used to thermo being approximate after last year's Chem IA. Useful though. | |
| **62** | More interesting than normal. Makes us think. Not appropriate for every course, but it is good that we have one lecture course like it. | Useful −− better understanding of numbers (J, W, etc.) for checking calculations. | It'll be interesting to see what's left for the supervisions −− probably more discussion and ideas to bring back to the lectures. |
| **63** | I do like it.<br><br>How about experimenting [with an] idea? Like the random walk thing can be shown lovely in computer simulation, especially to illustrate the difference of dimension involved (i.e. [factor of] one−third when in 3D). | Perfect! | Keep up the effort.<br><br>It is possible to integrate both sides of teaching style? i.e. after using estimation to calculate the thermal conductivity of ice, then use the traditional way to work that out as well (just for a few examples as there is definitely the time constraint). |
| **64** | Just wonder? Why don't you teach in the US? As it would be more liberal and less constrained when compared to the UK, especially Cambridge which always cares about tradition. I guess many of us would like to know as well. (Just ignore it if that is personal reason.) | | |
| **65** | Much more interesting than most lectures, and I pay more attention. | Useful and actually think in lectures rather than just | Some lecture notes would be good. |

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| | However, don't get through as much material | sitting look at calculations. | |
| **66** | It's more engaging and interesting. The lecture is more lively but I do feel that more substantial materials should be taught in lecture instead of relying on the students to read up (sorry, this would be due to self−discipline but may be true for most people). | Approximation and applications are totally relevant in physics. In fact, the more theorems we learn, the more approximation we need. Always hard to get exact analytic solutions. | A compilation of necessary materials that we need to know for the course will be good. It can allay the fear that students have for the examination. |
| **67** | Helpful, as long as some way to have guide to look back on (i.e. as now on website). | Very useful but possibly more honest to have this reflected in course title. | |
| **68** | But we do need the classical thermo too. | Fun physics. | This is a really good [constructive?] course but should be lectured as an extra course possibly in IA. Please don't spend too much time talking about the structure next year...we enjoy the physics. It was frustrating initially but has improved. |
| **69** | Teaching through discussions is far more engaging style of lecturing and stimulates thought in the lecture attendees. Far more interesting than just having formal derivations thrown at you. | Approximation is clearly a very valuable skill to have, and one that is (I suspect) not often taught. Physics is, after all, a study of the real world, and exact answers aren't always possible to obtain. | Recommending an out−of−print textbook is slightly obtuse. |
| **70** | Useful. | Several previous courses have used same principles so [I] feel confident about approximation. | Highly looking forward to "Physics and War." Don't feel massive need to attend the lectures as the synopses are good. |
| **71** | Really good. By far the most enjoyable course. I take in more like this than when being lectured at. | It's really important in my opinion. I've become more aware of the things I used to not look at in so much detail, like orders of magnitude. | Keep it up! But please don't write all over the place on the blackboard as it gets lost sometimes. If you stick to same order (e.g. going from left to right) that would help! |

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| **72** | I enjoy it. It keeps me awake and allows me to learn to use concepts I already know in a wider context. | Useful. Puts things we learn in a real life context, makes ideas easier to manipulate. | I enjoy the lecture course, but although useful for [reviewing?] old ideas, I would quite enjoy it if a similar technique was used to introduce new concepts. I presume this will happen more as the course continues.<br><br>Although it's good to generate feedback so you know how to better your own methods, you've got to watch the process doesn't encroach too much into lecture time. I don't expect you are going to change your teaching philosophy radically and start giving out full printed lecture notes or going through tedious derivations even if the masses clamor for it. If this is the case, you should probably use less time generating feedback and more teaching the course in a style you feel appropriate. |
| **73** | Depends on who you are sitting near in lectures. I have to use my mind to do the questions so they are difficult but I think that must be a good thing. | Very interesting because I feel like I am learning physics rather than equations. | Are there any "vital" numbers we need to know that are plucked out of the air by many people but I don't know them. I can never remember numbers but which do I need to know? e.g. ratio of volumes of gas/solid; speed of sound in air/water. |
| **74** | One of the best ways of learning. Hearing several explanations of a problem or idea or explaining one yourself, is a very powerful way of pinning down a concept. | This is very useful and I think we subconsciously use approximation all the time to make decisions. However I think combining it with some more theoretical physics would be good. | I really enjoy your lecture course, thank you very much. Also, could you give the rest of the department some teaching lessons! |

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| **75** | Definitely a change for the better. **All** lecturers should allow a portion of their lecture for questions and discussion. However, would be better if we were guided more by telling us which chapters we will rely on in the lectures. | Important. Too often the worry over details obscures the understanding of the underlying processes. | To give students a better sense of structure, perhaps a list of topics to be read about could be put upon the board at the end of each lecture. These do not have to match the topics covered in the lectures but help by giving a (artificial) feeling of progress. |
| **76** | OK −− less likely to fall asleep during lectures. | Quite useful in lots of situations. | Maybe a textbook that hasn't gone out of print! |
| **77** | It's good fun but less efficient. | It's useful but should be done in all courses, not just thermo, and not the whole thermo course should be devoted to it (I think). | Concerns:<br>• that they are not going to let you get away with your exam questions in the department.<br>• We should spend the lectures discussing physics rather than the course structure etc.<br>• Makes it harder for us if we don't have handouts, book is out of print etc.<br>• Lots of changes to the IB course. I feel like a guinea pig, not sure what to expect in exams. |
| **78** | Useful and interesting. May not cover as broad a topic as usual but understand discussed topics to greater extent. | Very important approach. Don't think it should be applied into exam conditions. | |
| **79** | It's a good way of learning. The lectures are more fun. | It's a good idea in theory, but you need to know a lot of general stuff to be able to do it (like how the atmosphere is!). | I won't be able to come up with all the estimates in the exam to work out answers. I don't know random numbers! At least with equations there are only so many to learn. |

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| **80** | It makes the lectures a lot more interesting. | I think it is a useful skill but as we've never had any practice at it, I feel it will take longer than one lecture course to become any good at it. | I am scared by the exam. The methods we are learning depend on knowing random values (or being able to approximate them) and I am rubbish at this and can't pick numbers out of the air. |
| **81** | Great way to remember simple ideas. | Very useful. But where do the magical constants come from e.g. pi−squared/60? Some formal derivations would be useful in this case (how do you remember pi−squared/60?). | |
| **82** | The advantage is you develop a way of thinking more independently and there's some opportunity to get alternative methods of approaching problems. However, the time−consuming nature of it does restrict the volume of material which can be covered −− not necessary a serious disadvantage if that's not the objective of the course. | It's a useful skill which is more likely than most other things we learn in Physics which we will be able to apply in the future, and does give you a better feel for what thing mean. However, it's something which is hard to teach and possibly more acquired by experience. | Please could you write a little larger on the blackboard? |
| **83** | It's alright, can be slow. Better than the alternative. | Could be helpful later I guess. Worried that questions on the exam may assume knowledge of random trivia, e.g. how long a 9V battery lasts. | |
| **84** | Means that we understand better but don't get through as much as in a "classical" Cambridge course. However, that's not a bad thing! Time to genuinely understand. | Makes it seem like a science and not just maths, but not sure if it's okay to hijack thermodynamics to teach us this useful stuff. | Good idea but still have reservations. Maybe I've been brainwashed by the Cambridge system! |
| **85** | Great, but it's too big a class and I don't know enough to want to join in. But I listen! | I enjoy it but don't know what I've learnt. Like I couldn't write it in a list! | Can you work across the board from one side to the other? If I get lost it's not always easy to pick up again. Maybe the Cambridge people are of the opinion that this |

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| | | | teaching style should be reserved for a physics club rather than a physics lecture. Thanks! |
| **86** | Interesting and refreshing way of learning. I do feel that maybe we should be given some more "start" material before we discuss. | Useful skill to have, would help to have more concrete structure. Some kind of notes to accompany the lectures would help us remember the methods we learn. | Give out a question sheet. Cover a few central thermodynamic topics. Very good lecturer, makes physics fun! |
| **87** | I think it leaves some students at a disadvantage as it provides less concrete material to go over outside the lectures. However, I appreciate the fresh approach. | It's good that we get to do it sometime! | Some notes on the web (not just summaries) to go in conjunction with the course might be nice. |
| **88** | I learn lots from others. I think it's different but interesting. | I like it. However, I am afraid that if these kind of questions are asked in the exam I won't know what to do. | It would be quite nice if you can put up the main theme or topic learnt in a lesson on the web since I often lose the track following all the numbers and units on the board. Many thanks. |
| **89** | I like listening to the discussions but don't like participating in such a large lecture theater when those who do have ideas seem to magically know a lot more random facts. It is quite intimidating. | Very useful −− opportunity to think "outside the box." Good for communicating what we do to non−physicists. Unsure about how helpful doing entire lecture course by this method is −− time will tell! | After vote on concurrent answers for question sheets, second solution sheet did not appear... |
| **90** | Much more interesting than having lecture notes read to you although I feel a lot less is covered in less depth. However, most lectures you might as well read a book, while [in] yours you are made to engage and think a lot more, which is good. | Very useful and interesting to get an order of magnitude feeling for things. Very important skill but not really thermodynamics. | Very interesting course which I definitely enjoy but don't feel I'm extending thermodynamics knowledge much from IA. Much better at approximation than before. |
| **91** | It's generally a good thing as it keeps you more involved and gets better understanding. | This is also important as it's not always covered in other lecture courses. | I think the course is good but I would like to have done some more "normal" thermodynamics. However, |

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| | | | it has given me a good insight on Physics which I wouldn't otherwise have. |
| **92** | It's interesting and when it leads to a wider discussion it's helpful, but there's sometimes a bit too much. | This is really useful and helps me to look at physics in a more flexible way. | I'm enjoying the course and think it will be helpful in its applications to other subjects, but I might feel differently if I were going to continue with physics next year, or if I didn't feel fairly happy with thermodynamics from learning it in several subjects last year. |
| **93** | Really glad that we are talking a lot in this course. But if there was a side [?] line, so that we know what will be on the next lecture, then discussions will be even better with some preparation. | Great again. But as someone who is studying physics for the first time, I think we need too much background, especially for application. I would be scared if I am expected to have that much background for the exam. | Sorry, I really can't stand the fact that the textbook is out of print and I still haven't been able to take a look at it (my DoS doesn't know where it is!). I think you could've just set some alternatives such as Kittel and Kromer or Reif. |
| **94** | I usually sleep through lectures without discussions, so it is a significant improvement. | An underrated skill that I am only just beginning to appreciate. But I don't think it needs to be stressed as much as it is in lectures. This is perhaps something we should learn in our own time. But thanks for bringing it to attention. | As much as I hate lectures in which the lecturer gives out a handout and reads through it word for word, the handout itself is usually useful to have. It would be a great help if formulas and useful numbers mentioned in lectures were put on the web, so we have something to refer to.<br><br>And I think we should talk more about the ethical issues in physics (Physics and War). It's an important issue that concerns us all. |
| **95** | **Some** discussion is a breath of fresh air, but if it takes too long or digresses too much, the lecturer should guide things back on track. No complaints about this course so | It's very useful. But need to see in each case **how** the estimate was made. If the lecturer says "Okay...here's a factor of roughly 700 here," | Someone should make sure our DoS's do give us photocopies of the book...and it would be helpful to know roughly |

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| | far...**only not worth discussing too much in class about the style of teaching itself.** | it doesn't help. | the structure of what we will cover and the relevant pages.<br><br>P.S. Don't worry too much. The course is good! |
| **96** | The method is okay in principle, but as I am deaf I struggle to follow discussions −− personal preference would be for more formal lecturing so I only have to concentrate on one person. That's only me (1 person in 150) though! | While this is something most people have encountered before, it's almost never incorporated into formal teaching −− **very** helpful to get some practice with it. But maybe a balance should be struck between this and precise "theoretical" calculations? | |
| **97** | Good −− maintains interest and involvement. | Good −− is a skill little taught in other courses, but which gives a more intuitive approach to physics that relates the subject to what we see around us. | Perhaps course should be independent −− like the experimental methods course −− i.e. in addition to thermo course. As a single physics student, this is the last time being taught thermo. |
| **98** | A nice idea −− but it is easier and less intimidating discussing in supervisions. | Again, useful. Maybe this should be a different course purely for approximations. I would prefer to be learning all those partial differential equations you keep hinting at. | I am enjoying this course. I am less likely to fall asleep in your lectures! There does need to be more structure to the course however. |
| **99** | It's an interesting way to learn things but sometimes we get bogged down with questions and answer sessions at the start of lectures. | It's a really useful skill to have especially for job interviews and things. It might be better to have an entirely separate course for it though and then still learn some thermodynamics. | Impossible to find a coy of the book so suggesting other places to look for info would be useful. |
| **100** | Isn't that why we have supervisions? On the other hand, it does at least keep me awake in lectures. Probably a good thing, but not a reason to exclude formal mathematics; you can | Necessary; but it's a theoretical course. Or at least, it's supposed to be. I think there's a balance to be struck and it still ought to be | I do actually like the course. |

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| | discuss standard derivations, can't you? | possible to do formal derivation as well. | |
| **101** | Hmmm!?! Sigh. In some ways it is REALLY GOOD because I am lacking in the ability to estimate (calculators!) but I am having withdrawal symptoms from advanced derivations. | Very good for interviews for internships etc...My friend was asked about the number of petrol stations in the UK!! | Give us a book!!! Using a chemistry textbook and IA notes at the moment. |
| **102** | Some discussion is useful but it seems that too much leads to covering very little material. I'd prefer to see a more structured course, as at the moment we have spent large amounts of time working out approximate values for different constants. | Very useful and aids intuitive grasp of physical situations, although overplayed? Some quick approximations to check about whether a value is sensible or not would be useful, but crudely approximating everything is maybe not so useful. | |
| **103** | Much more useful than continuous reams of equations. But in large groups some can be unwilling to contribute. | Applications to outside world very useful, and helps in visualization and understanding. Continuous approximation seems to waste a lot of time, when you could just use a data book. | |
| **104** | Probably a good idea but I do also think this should be more in the supervisions. Also I think one should exclude discussions about, say, general topics from a physics lecture, e.g. copyright issues related to the textbook. | Certainly a good idea as that is often needed −− but I think one should also do the more rigorous treatment (i.e. maths) behind it. | It is a good idea to learn how to estimate but I personally think one should do it **after** knowing the exact equations. |
| **105** | An interesting technique. I think it means that less is learnt than in the "usual" lecture style but that perhaps more goes in? My only worry is that we will miss some of classical thermodynamics, i.e. run out of time / not cover everything. | I would have hoped at least some of us had learnt to approximate at an earlier age. Applications of physics is interesting but again I wonder if perhaps this will again mean we won't learn everything we need to know about thermodynamics. | Good luck. It is nice to have some variety. I would like more reassurance about the course being entirely covered. |
| **106** | All good fun. | Useful but I feel that there will come a time when I have | Some demonstrations would be good. Also, it |

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| | | to be precise. | would save time if students were asked for their opinions on the course less regularly. |
| **107** | It is fun! But hard to follow without any comprehensible structure, [our own] lecture notes are very disordered and heard to sort out in my head after. No order makes it harder to take in and very hard to recall. It makes me much better and thinking though −− I just feel I don't have enough of a knowledge base to think about! | Very useful indeed. Except I don't know if we have time to teach ourselves the other stuff as well. I wish we had lecture notes/handouts or something direct from the lecturer to tell us what we need to know. Even just a list of concepts we should know by the end would help. | It's really hard to learn the mathematics direct from a book without going through it in lectures. |
| **108** | Not suitable for such large groups (better in supervisions). | Useful and worthwhile. | ...but should be a separate course if we really need to know it. |
| **109** | I think it is better for supervisions than lectures as people in discussions can then ask more specific questions about what they do not understand. | Application of physics to the outside world is great; it makes everything more enjoyable and interesting. I believe approximation is a useful tool but once you have learnt it, I do not see the point of applying it to everything. Actually I don't think approximation making is a big issue or concern, either for or against it. | You are a good lecturer because you are interesting and enthusiastic. However, I think it would be better to do more classical thermodynamics, just try not to make it boring!! |
| **110** | I like it: keeps me awake, clarify points on the spot, BUT some people just deliberately give dumb answers, which is a waste of time. | Very important. Never been taught. But: I have problems of how to link the "traditional" physics with what you are teaching now, e.g. Example sheet 2, question C2 [frozen lakes]. Didn't quite know how to set up the PDE and resolve to formal derivation of diffusion equation. | In the notations of K=rho*cp*kappa, K and kappa are too confusing. I was lost in lectures. |
| **111** | Can be useful and is certainly more interesting. However, would be more fun as part of an overall view of | Same as above. | I enjoy these lectures as they do show how a physicist thinks −− |

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| | physics rather than being restricted to thermodynamics. | | something we don't get in a normal physics course. However, the last couple of lectures have been slightly over my head as I have forgotten a lot of thermo from last year AND HAVE NEVER HAD THERMO TAUGHT WELL to me. A lot is still a complete mystery to me.<br><br>Having a thorough discussion of Maxwell's derivations would be helpful, as well as what entropy, enthalpy, and ENERGY really are. Even if the textbook you recommended was in print (a major flaw in your course!!!), a book is no substitute for a **good** teacher, which you **obviously are**. Perhaps a half and half approach would be better received by students and supervisors −− some lectures run through formal derivations, and do the estimations in the next lecture? |
| **112** | I think that it is difficult to learn through discussion with a big group like we have in lectures. I would rather you told us what we could discuss before the lecture and then that we heard from you more during the course. | I think that it is useful that we are learning how to apply our knowledge to the real world but sometimes I feel that other people in the lecture appear to "just know things" like constants and approximate values. I am worried that there is no way I can guess what to learn for the exam. | I do not have access to a copy of Adkins and don't know how to find one! |
| **113** | It's interesting but I'm not sure how much I actually learn (although I'm pretty doubtful about the effectiveness of lectures in general). | I'm a bit of a mathematician. I care about the structure of the theory rather than how to apply it to the "real world." | What is temperature? What is heat? I asked my supervisor this last year. He didn't know. |

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| | Things always seem to make more sense if I can read over them. | But that's just me. | |
| **114** | Perfectly viable method, but I think less gets achieved this way. | Fair enough, but I'm sure I could manage this without a lecture course on it as I think we all do this type of thinking every day. | Maybe better to split a lecture: teach some classical thermodynamics in first half, then do approximation using equations learnt in second half.<br><br>I'm impressed by the amount of time and effort you are putting into this course. |
| **115** | It's one of the strengths of the Cambridge system. That's why we do it in supervisions. But we need to learn the stuff too and it feels like everything is either being plucked out of thin air in the lectures or bodged together on the spot. If the textbook recommended were actually available, this would be less of a problem. We have been given no alternative recommendations and I fear coming out having learned nothing. | Good idea. Useful. But a little more quantitative stuff would be useful too seeing as we will eventually have to do that too. | This questionnaire is loaded...<br><br>We are used to learning, and have trained ourselves to learn best in the traditional way. If we do not do this, we fail the other courses. Teaching one course one way and all the others in another way is just confusing (however interesting the course!). |
| **116** | A good idea −− but probably not in lectures as the group is too big to have useful discussions. | We've been learning to do this kind of estimate to check plausibility of answers in supervisions since we started IA, although maybe not to the same extent. | The idea of the course is fine but I think it should be non−examined and run concurrently with a standard thermodynamics course. |
| **117** | A bit slow especially if people are feeling sleepy or lazy (this means lectures can sometimes get a bit boring). | Of course we should be able to do this. Maybe need a lot more theory behind it. | I agreed with the person in one of the earlier lectures who said some of us needed to relax a bit more. It's hard to get used to such a different style of course when you're used to having information thrown at you as fast as possible.<br><br>BUT I think this course needs some structure. I |

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| | | | think it's best to be taught a bit of theory first, then maybe do some discussion. We seem to have spent a lot of time recapping stuff we did last year in a disordered way. It's hard for me to retain information when there isn't a clear structure in the way it's taught.<br><br>We did some formal thermo in chemistry last year and you're right it is dull but I think you are such an energetic lecturer you could actually get away with teaching it without people being totally bored.<br><br>I'm sorry this isn't very coherent but I didn't have time to order my thoughts properly. |
| **118** | Useful at making quick calculations/estimates of properties/ways in which things will behave when planning experiments but physics generally needs to be precise to be of any scientific worth. | Handout of formulae, definitions etc. to learn in own time if we are not going to get taught these in lectures. | |
| **119** | Although useful to see other methods of working on problems, severely restricts teaching time and amount of material covered. | Doesn't allow us to fully appreciate relationships between formulae/develop proper understanding from symmetry relationships with other areas of the course. | Without course syllabus, leaves doubts to what is and isn't examinable. |
| **120** | Good, although it confused the true reasoning behind some physics with approximate answers. | Approximation has it's place but to use approximation throughout is possibly a flawed idea. Concrete ideas need to be defined better with more time given to proper derivations. Although we won't be disadvantaged for | Considering that this is labelled as a thermodynamics course, it is currently difficult to extract any thermo from much of the questions on the examples sheet. |

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| | | the exam, the course does put us at a disadvantage compared to other physicists. | |
| **121** | It is a good idea but over−used. Math Tripos lecturers seem to be able to take comments and questions whilst retaining a more conventional approach. | I feel this is a skill that you sort of arrive at by yourself. I find the endless working out of numbers and orders of magnitude very boring. It obscures the elegance of the mathematical physical theory.<br><br>P.S. I hate numbers...they make me switch off! | You are a good lecturer (much better than most) and I like the style, but I find the lectures unbalanced. What would be ideal is the engaging style used to make a more conventional exposition really exciting. |
| **122** | Much more engaging and definitely gives a greater understanding of principles. There has to be some loss of actual material which is a shame possibly. I think a balance has to be achieved. | Definitely a vital skill. Very important however to distinguish between approximating, estimating, and guessing −− which is of NO use I think. | Questions were variable. Some were hugely interesting, others I frankly found just silly. |
| **123** | Would prefer a handout or OHP slide containing key points to be gained from the lecture/course as a guide on which the discussion−based teaching could then build upon. | Maybe could be incorporated into a small set of lectures/examples classes to provide more time in the main thermodynamics lecture course. | Further to above, a course synopsis/schedule would be helpful. |
| **124** | Certainly innovative but wastes a lot of time. Questions should be restricted to 5 minutes at the end. Also, it would be much nicer if we spend most of the time on thermo, with a few anecdotes, than vice versa. | It's very useful. I do it a lot in spare time and abhor the use of calculators myself. Approximating is a great way of understanding the world.<br><br>However, it should be taught as a separate assessed course as is done in the 3rd year. I'd like **classical thermo** taught in these lectures. | Printed notes/textbook in print would be great. |
| **125** | Is a good idea. Discussing with my friends doing physics is how we learn. | Also good. | The basic ideas of your course are good. It **is** a good way to learn. But I do object to your "hijacking" our thermo course for this. I actually do want to learn |

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| | | | both thermo and approximations. So I think it would be better if your course were an extra course in its own right, perhaps for IA, and non−examined and then we could learn thermo too. You have put us in a position where we have our supervisors teaching us thermo instead, so supervision−sized lectures and lecture−sized supervisions.<br><br>Also, better now that we have stopped spending the first 20 minutes discussing your lecture style rather than doing physics. That was just dull. |
| **126** | I think this should be done in supervisions rather than lectures. Occasional discussion during lectures can be useful but if done too often, tends to take up a lot of time. | I think that while this is useful, students do learn to pick this up naturally during the study of physics; and a course dedicated to approximations is not really appropriate at this time since students have the option of doing this in the third year. | Perhaps a compromise between more "traditional" methods of lecturing and the lecturer's own style of teaching through discussion would be more useful, e.g. maybe derive some fundamental laws/equations (entropy, heat engines, etc.) and then discussion the implications of the equations and what they really mean in the real world.<br><br>Dimensional analysis is undoubtedly useful for making sure that equations that we derive are consistent with their units, but I think that we **do** also need to be able to derive them "properly" since this process often highlights the real mechanisms that explain the phenomena described by the equations. |

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| | | | I do **strongly believe** that we need a more **rigorous course** in thermodynamics, although appreciate the lecturer's attempts at giving us an understanding behind equations. |
| **127** | It's a good idea and it works. But with this [illegible] worry people? | Important to learn and needs to be taught, but is classical thermodynamics the best vehicle for it? | |
| **128** | It's an important part of learning but that is the point of supervision. We're at this Uni because we can cope with the normal [illegible] speed of lectures. That way we learn more in a shorter space of time (and get better jobs later?!). | G.C.S.E.<br><br>It's important but we are doing it all the time in our questions. | |
| **129** | I like the style of the course but worry about my notes. Also, I find it hard to sort out enough time to do all the background reading that would be really necessary to actually pass an exam. If the exam has these type of questions, then I worry that I would not have the time to think my way to an answer. There wouldn't be enough time to try a bunch of different solutions. To be honest, I think if I learn anything from this course then it's going to be because of my supervisor or because I found a book (that actually ISN'T OUT OF **PRINT**) and taught it to myself. | Very useful stuff to be able to approximate and useful for practicals. | |
| **130** | Discussion is useful say for the introduction of a lecture but until the basic theory has been presented, it is difficult to discuss it! Discussion leads to a mass of ideas, numbers, formulae on the board that isn't in a logical order. The ideas discussed then don't get taken in to be learnt. | This is a useful skill but gets tedious in every lecture. Again, until the ideas have been **presented** (not briefly read in "the book") I don't think we have enough tools to approach the problems. Symbols with important meanings get lost when attempting approximations in all the lectures. | The physics of estimation is a useful and important skill that would be better in its own course with that title. Then the worry of not learning thermodynamics would not exist! |

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| **131** | Time wasted because discussions are mostly not about physics, i.e. too tempting to chat about other things. Could get through material much more quickly without discussions. So generally a bad thing. It is nice to discover things for yourself even through discussions. | I don't think it's desirable to be deliberately vague and approximate. We could do things more accurately and precisely and I don't see why we don't. I have no problem with supplementary applications and approximations to help understanding. | Difficult to take cohesive notes from lectures. |
| **132** | More appropriate for smaller groups, i.e. supervisions. Makes lectures pointless to attend if you're not fully awake, i.e. if there were lots of notes it would be worth coming to get info to revise later. At the moment, no info to learn later. | Very useful to real−world physics. BUT we don't need to learn it at this point −− shouldn't we be covering the classical thermo material that the department wants us to learn? | In other lecture courses −− really rush to fit in huge amount of info each lecture. Here you're happy to spend half the lecture discussion what we think and other non−course material. This is why people are concerned!! |
| **133** | Nothing to do in supervision except go over what the lecturer before (about 3 years ago) did with my supervisor when she did the course. Lack of material will need to catch up if going to cope with Part II thermo course. | Did at A−level. Teacher was obsessed with it and would have approximation classes occasionally. Therefore very few skills actually being learnt here, as already covered at school. | Course syllabus published on net to aid reading (as it looks like it will be required). Did lots of them last year in Chemistry, Physics, and Material Science so this all seems trivial in comparison. Would be brilliant if formal definition accompanied all approximate stuff. |
| **134** | Okay, but not too many discussion; it is confusing to hear everyone's opinion. | Approximation and applications are good but they should be taught against proper thermodynamics. I think approximations and applications are skills that we anyway end up having by the end of our physics degree. If you really think that we won't, make a separate course on it. | Teach us proper thermodynamics, because we anyway try to read it from books, so that we know what you are talking about and for the exams, because I'm not sure what the questions will be like. |
| **135** | Good idea −− but should be reserved for supervision. Lectures, in my view, are for "sponging" information. It also keeps the physics at a very low level | Again a nice idea but it doesn't have its place in a IB thermodynamics course. I think it would be a very | We will get "steam−rollered" as you put it by Part II courses and beyond as we don't have |

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| | (in my view, too low). So we are avoiding more sophisticated mathematical ideas. | beneficial course if it was specifically about approximation and given in IA. Nearly every derivation follows with discussion until the end where the actual value is some multiple of it. | the necessary knowledge. You may write the exam, but you don't mark it. What will the markers think? (I've already emailed you a few times with my opinions!) |
| **136** | Great, but a discussion with 150 other people is ridiculous. It is not a discussion. I think little of value is said by the students in lectures and the rest have to sit and listen. Leave discussions to supervisions.<br><br>I'd like to do a proper thermodynamics course in lectures. I would then have something to discuss. | Anyone can approximate. You just do a proper calculation badly. These types of approximations turn out only useful when the answer is already known. The opposite, I feel, of what is intended.<br><br>You indicate in your question that in this course the physics is somehow more related to the "outside world." When is any physics course not related to the world, outside or otherwise? | |

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