UNIVERSITY OF CAMBRIDGE

NATURAL SCIENCES TRIPOS EXAMINATIONS
LaTeX CLASS DOCUMENTATION

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This document describes the `NSTexam.cls` *LaTeX class for preparing NST examination papers.*

STATIONERY REQUIREMENTS	SPECIAL REQUIREMENTS
linear graph paper	Mathematical Formulae Handbook
Rough workpad	Approved calculator allowed

You may not start to read the questions printed on the subsequent pages of this question paper until instructed that you may do so by the Invigilator.

V8.4

SECTION A

Instructions on how to use this package. This illustrates the layout that it produces.

1 **Background.** The `NSTexam.cls` class has been written to allow the easy preparation of NST (physics) examination papers using LaTeX, to be consistent with required U of Cambridge style.

2 **Setup.** To use this package, make sure the `NSTexam.cls` file is in your LaTeX working directory, or in an appropriate LaTeX system input directory. Start your paper with the following construction.

```
\documentclass{NSTexam}
...
\begin{document}
```


(There are some font specification options available in `NSTexam.cls`, which are discussed below.)

The `NSTexam.cls` class automatically loads both the `graphicx` and `amsmath` packages, for easy inclusion of figures and additional mathematical definitions respectively (although some mathematical commands, e.g. `\vec` are specifically re-defined by `NSTexam.cls` from the `amsmath` definitions, see below). It also loads the `babel` package, for British hyphenation patterns.

Include any additional TeX or LaTeX commands — for the inclusion of other packages, or for the definition of commonly used macros for example — in the preamble before `\begin{document}`. If you are *not* using the LaTeX cross reference commands `\label{...}` and `\ref{...}` (or `\pageref{...}`), then you can include the command `\nofiles` in the preamble, which switches off the writing/reading of `.aux` files.

3 **Identification and Copyright.** For a letter or numbers at the bottom left of each page, use `\ID{A}` or you can use `\noID` for no identification. Similarly, you can add a version name and/or date to each paper, which is useful to be able to keep track of different drafts of papers, e.g.

```
\version{first draft: \today}
```

(the default is just the date the file is processed). You can switch off the version if you specify `\noversion`.

A copyright line in added to the left margin of each page. The year included in this is the current year, unless `\paperyear{...}` is used to specify a particular year.

4 **Titles.** The tripos name(s), date/time and name of the paper are specified by using

```
\tripos{NATURAL SCIENCES TRIPOS \qquad Part IB}
\date{Saturday 1st June 2001 \qquad 9.00 to 12.00}
\paper{PHYSICS (1)}
```

(note that the `\tripos` and `\paper` commands and used more than once if required, for example for papers that are taken in more than one Tripos).

5 **Part II Papers.** The same papers are set for both NST Part II Physics, and also for Half Subject Physics in NST Part II Physical Sciences, but *may* require different titles. To avoid the possible confusion of having two versions of these papers, the same paper *can* be processed to produce either the paper for Physics or for Half Subject Physics. Include in the preamble before the `\begin{document}` a line `\askifII` which will prompt you for whether to process the file for Physics (the default) or for Half Subject Physucs when the file is LaTeXed. Then use the following construction.

```
\ifII
  \tripos{NATURAL SCIENCES TRIPOS \qquad Part II}
\else
  \tripos{NATURAL SCIENCES TRIPOS \qquad
                          Part II Physical Sciences)}
\fi
\date{Saturday 1st June 2001 \qquad 9.00 to 12.00}
\ifII
  \paper{PHYSICS (1)}
\else
  \paper{HALF SUBJECT PHYSICS (1)}
\endif
```

Similarly `\ifII ... \else ... \fi` can be used elsewhere (e.g. for alternate rubrics), as required.

6 **Rubric.** The rubric of the paper is specified in a `rubric` environment.

```
\begin{rubric}
...
\end{rubric}
```

Newlines within the rubric are forced by using `\\`.

7 **Requirements and Warning.** Lists of stationery and special requirements and a warning to candidates not to start reading the paper until instructed to do so by the Invigilator can be included after the rubric.

```
...
\requirements{linear graph paper\\Rough workpad}{Mathematical
  Formulae Handbook\\Approved calculator allowed}

\warning
\clearpage
```

Newlines within the `\requirements{...}{...}` are forced by using `\\`.

8 **Questions.** After the rubric, the `questions` environment contains as many `\question` entries as required.


```
\begin{questions}

\question ...

\question ...

\end{questions}
```

The paper should end as follows.

```
...
\endofpaper

\end{document}
```

9 **Marks.** The marks for each part of a question can be specified using the `\marks{...}` command. This places the number of marks in square brackets in the right margin of the line containing the `\marks` command. The `\marks{...}` should not be both preceded and followed by a space, as this will put an unsightly double sized space in the text of the question. [5]

The number marks can be half integer, specified as a decimal '.5', which will be displayed as a fraction. The number of marks allocated to each question is written out to the screen, and the `.log` file, when a paper is processed, so that a check can be made on the total marks for each question. (But note, in a 'brief notes' question, the total will be for all the parts of the question, and therefore may not be the appropriate true total.) [5½]

10 **Answers.** You can, optionally, include answers in the `.tex` file. After a question, use `\answer`, then the text for the answer, and end with `\endanswer`. To make the answers visible, put `\showanswerstrue` in the preamble of the `.tex` file (i.e. before the `\begin{document}` line), otherwise they are not shown.

Here is an example answer. The default style is that the start and end of the answer are marked with rules, and a slightly smaller font is use.

This can be changed, if required, by redefining the `\answersbegin` and `\answersend` commands, which are commands that are used at the start and end of each answer.

---

11 **Basic answers.** You can also, again optionally, provide basic (numerical, simple alegrabic) answers. To produce these, put `\showbasicstrue` in the preamble of your main `.tex` file, and *follow* each question with a command `\basic{...}` giving the answers for that question. This will write out another `.tex` file than can be processed (e.g. if the main input file is `file.tex`, it will write out a file called `file-basics.tex`). This `...-basics.tex` file will automatically have any `\tripos{...}`, `\date{...}` and `\paper{...}` commands copied to it from the main `.tex` file, for identification.

12 **Sections.** The letter of a Section is specified by

```
\section{A}
```

before the first `\question` in that section, or in case of the first question, before the `\begin{questions}`. Whether or not the questions are labelled with these letters in addition to their numbers is controlled by `\sectiontrue` and `\sectionfalse` commands. Conventionally the compulsory 'Section A' questions in many Physics papers are numbered only, with later sections being numbered and lettered.

For Section A (or others if required), the argument to the `\section` command can also contain additional instructions, e.g.

```
\section{A \em Attempt all questions.\\
Relevant formulae can be assumed.}
```

(note that the font change does need to be specified, and that `\\` is used to force a newline).

In recent years, it has been conventional to start numbering the questions in each Section of Part II papers from 1. To do this, use the `\resetquestioncount` command at the start of the second Section.

In this document, this 'question' and the preceding ones show the layout produced after `\section{A}` and `\sectionfalse`, whereas the rest of the document shows the layout after `\sectiontrue` and `\section{B}`.

SECTION B

B13 **Particular Question Styles.** Several styles of question are provided.

(a) **Parts.** For questions consisting of several parts (such as this one), use:

```
\begin{parts}
\part ...
\part ...
\end{parts}
```

This automatically provides lettered 'parts' within a question. Some text needs to follow `\question` before `\begin{parts}`.

(i) A further level of division, a 'subpart', is also available (with lower case roman numbers).

```
\part ...
\begin{subparts}
\subpart ...
\subpart ...
\end{subparts}
```

(ii) This shows what the `\subpart` of question looks like.

(b) Also there is `\begin{allparts} ...\end{allparts}`, which can be used several times in a question, to give parts labelled with a singled '(a)', '(b)' ... sequence through the question. That is

```
\question ...
\begin{allparts}
\part ...
\part ...
\end{allparts}
...
\begin{allparts}
\part ...
\end{allparts}
```

(If you want to start a question with a part, use `\question \startpart`.)

(c) **Either/Or.** For questions requiring either one part or another part to be answered, then

```
\question \either{One part...}\or{Another part...}
```

provides the appropriate layout. The next question illustrates the layout resulting from the `\either{...}\or{...}` command.

B14 **Either** (a) Do the first part of this question.

Or (b) Do the second part of this question.

B15 **Hints.** Is has been conventional to give additional information — or 'hints' — at the end of questions, enclosed in square brackets and with a slanted font (so explicit `\rm` font changes are needed to specify upright fonts, e.g. for units). Two commands are provided for this:

(a) `\shorthint{...}` (which is best preceded by `\noindent`), for a hint that fits on one line;

(b) `\longhint{...}`, for a hints that takes several lines (for example with displayed equations).

[*This is an example hint. You may assume that* $2 + 2 = 4$*;* $l = 4$ m.]

B16 This is a dummy question in order to show a `\longhint{...}`.

[*You may find it useful to use the relation*

$$a^2 = b^2 + c^2.$$

]

B17 **Figures.** The `graphicx` package, for inclusion of figures, is loaded by `NSTexam.cls`. For example, the following easily includes a centred figure

```
\medskip
  \centerline{\includegraphics[width=10cm]{figure}}
\medskip
```

Note: no filetype is given explicitly, and this will include `.eps` file if using LaTeX, or a `.pdf` file if using pdfLaTeX.

B18 **Pagestyles.** Several LaTeX `\pagestyle`s are specified by the `NSTexam.cls` package. Automatically the first page will be in `\pagestyle{first}` (i.e. no page number), with subsequent pages in `\pagestyle{turnover}` (i.e. page numbers, with '(TURN OVER' at the bottom right of odd numbered pages), except for the last page which will be in `\pagestyle{last}` (i.e. page numbers, but no '(TURN OVER' is required if it is an odd page).

Occasionally, however, you will have to tell LaTeX an additional `\pagestyle` to use. If a question is split over odd/even-numbered pages, then start this question with

```
\thispagestyle{continue}
\question ...
```

so that the bottom of the odd numbered page has the appropriate '(TURN OVER for continuation of question . . . ' at the bottom right.

Alternatively you may wish to reorder the questions in a Section to avoid splitting a

question. You can always force a question to start on a new page.

```
\clearpage
\question ...
```

B19 **Typography.** Although the `NSTexam.cls` package makes it easy to get the layout of a paper correct, it does not help avoid all the possible traps concerned with strictly correct typography. But here are some reminders.

(a) Use single quotes. Only use double quotes if a quote is required inside single quotes. Remember that left and right quotes are different (i.e. use `‘single quote’`, or `‘single ‘‘double’’ quote’`), and to place punctuation marks inside the quote if it ends a sentence.

(b) For lists, the punctuation should be: one; two; three; last.

(c) Distinguish between hyphens (`-`), en-dashes (`--`, used for number ranges, and connections such as ‘an East–West interferometer’ or ‘the Michelson–Morley’ experiment), em-dashes (`---`) — which are punctuation dashes — and minus signs (`$...-...$` in maths mode only).

B20 **Mathematical Typography.** The typesetting of mathematics should follow the report on *Quantities, Units and Symbols* from the Royal Society.

(a) Mathematical symbols (including greek letters used as symbols, but not when uses as particle names) should be in a sloping font. In LaTeX's default maths mode, letters and the lowercase greek letters *are* automatically sloping, but uppercase greek letters are *not*. The `NSTexam.cls` file changes the uppercase greek letter definitions so that they are slanted by default (e.g. `$\Sigma=\Psi+\Phi$` gives $\Sigma = \Psi + \Phi$). Be careful to enclose all symbols in `$...$` when they appear or are defined in the text.

(b) Vectors should be in a bold sloping font. This is provided for with `NSTexam.cls` by changing some bold maths font and lowercase greek letter definitions, and then redefining the `\vec{...}` command to use the bold fonts, rather than using an arrow accent (e.g. `$\vec{a}=\vec{b}+\vec{c}$` gives $\boldsymbol{a} = \boldsymbol{b} + \boldsymbol{c}$; `$\vec{A}=\vec{B}+\vec{C}$` gives $\boldsymbol{A} = \boldsymbol{B} + \boldsymbol{C}$; `$\vec{\sigma}=\vec{\mu}+\vec{\beta}$` gives $\boldsymbol{\sigma} = \boldsymbol{\mu} + \boldsymbol{\beta}$; and `$\vec{\Gamma}=\vec{\Psi}+\vec{\Sigma}$` gives $\boldsymbol{\Gamma} = \boldsymbol{\Psi} + \boldsymbol{\Sigma}$.

(c) If a bold version of a character which is not available in the standard LaTeX fonts is require, then a ‘poor man's bold’ can be used. The command `$...\pmb{$...$}...$` is defined in `NSTexam.cls`, which simulates a bold version of any given character or symbol by printing several nearly overlapping copies of the character (e.g. `$\pmb{$\nabla$}$` gives $\pmb{\nabla}$). For convenience, `\del` is defined as `\pmb{$\nabla$}` for use in maths mode (although with some font options — see below — an appropriate character is available, and is used instead).

(d) Units should be in an upright (roman) font. For simple units in the text these can be specified outside maths mode (e.g. `$\approx 10$~m` gives ≈ 10 m), but for displayed maths, or complicated units, it is best to include them in the maths mode, with explicit font change and spaces (e.g.
`$5 \times 10^{-10} {\rm\ W\ m^{-2}}$` gives 5×10^{-10} W m^{-2}).

(e) The numbers 'e', 'i' should be upright, and `$\num{...}$` has been defined so that `$\num{e}$` and `$\num{i}$` give 'e' and 'i' in maths mode respectively.

(f) Subscripts/superscripts on symbols should usually be in roman font, unless they represent another symbol (e.g. `$C_p$` for C_p, the heat capacity at constant pressure, but `$C_{\rm B}$` for C_B, the heat capacity of substance 'B'). Also note, use `$V_0$` not `$V_o$`.

(g) The 'd' in differentials should be upright. Two commands are defined in the `NSTexam.cls` for single and double differentials.

```
\d#1by#2
\dd#1by#2#3
```

So that `\d{}by{x}` gives $\frac{\mathrm{d}}{\mathrm{d}x}$, `\d{y}by{x}` gives $\frac{\mathrm{d}y}{\mathrm{d}x}$, `\d{^2y}by{x^2}` gives $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$, and `\dd{z}by{x}{y}` gives $\frac{\mathrm{d}^2z}{\mathrm{d}x\mathrm{d}y}$. Similarly

```
\p#1by#2
\pp#1by#2#3
```

are defined for partial differentials. For vector differentials, `\vecd{...}` has been defined, so that `\vec{B} \cdot \vecd{l}` gives $\boldsymbol{B} \cdot \mathbf{d}\boldsymbol{l}$. Note the use of `\cdot` to give a centred 'dot product' operator, with appropriate spacing before and after. Also note, putting `{...}` around `\cdot` removes the space put around it (e.g. `$3{\cdot}14159$` gives 3·14159).

(h) With the `NSTexam.cls` file, `\hbar` is redefined for a better looking $\hbar$, and similarly `\dbar` and `\lambdabar` are defined for $\mathrm{đ}$ and $\lambda\!\!\!^{-}$. These commands are also available for sub-/super-scripts in maths mode.

(i) In mathematical typesetting, remember: use `\sin`, `\log` etc. for functions, so that they are typeset in an upright roman font; for integrals, a thin space helps separate the function from the differential (e.g. `$\int\sin{x} \, {\rm d}x$` for $\int \sin x \, \mathrm{d}x$); for large brackets use `$\left( ... \right)$` so that the appropriately sized symbols will automatically be used.

(j) Mathematical accents, such as `\hat` and `\tilde` (e.g. $\hat{x}$ and $\tilde{x}$) are rather small, and can be difficult to see when photocopied. Instead use the alternative TEX commands `\widehat` and `\widetidle` (e.g. $\widehat{x}$ and $\widetilde{x}$), which are more obvious. Also the default `\dot` and `\ddot` accents (e.g. $\dot{x}$ and $\ddot{x}$) may be difficult to see when photocopied, so the `NSTexam.cls` package defines a clearer alternatives `\bigdot` and `\bigddot` (e.g. $\dot{\vphantom{x}}x$ and $\ddot{\vphantom{x}}x$). If you wish, put commands like `\let\hat=\widehat` in the preamble of your document, so that all `\hat` commands actually use `\widehat`.

(k) Chemical elements and particles should be typeset as upright font, including greek letters. The latter are not available for lowercase greek letters, unless additional fonts are loaded (see the discussion on fonts below).

For convenience, the command `$\particle{...}$` is defined in `NSTexam.cls` for particles, e.g. `$\particle{e}$` for e, `$\particle{\bar W}$` for $\bar{\mathrm{W}}$. This also works for uppercase greek letters, e.g. `$\particle{\Sigma}$` for Σ, `$\particle{\Xi}$` for Ξ, etc., but not for lowercase greek letters, unless additional fonts are loaded (see below).

Similarly `$\quark{...}$` is defined for quarks, e.g. `$\quark{u} \quark{\bar u}$` for $\mathrm{u}\bar{\mathrm{u}}$, `$\quark{d} \quark{\bar d}$` for $\mathrm{d}\bar{\mathrm{d}}$, etc.

If you prefer an overline rather than a bar for anti-particles, then you can use `\overline` instead of `\bar` (or put `\let\bar=\overline` in the preamble).

(l) Greek letters when used as numbers: e.g. for 3.14159 . . . and for the prefix 10^{-6}, should be upright. These are not available unless additional fonts are loaded (see below). For convenience the commands `$\uppi$` and `$\upmu$` are defined to give these numbers in maths mode, `$\upDelta$` and `$\updelta$` are defined for increments, and `$\upOmega$` for the unit Ohm are defined, although some of these give slanted lowercase versions unless additional fonts are loaded (see below).

B21 **Additional Fonts.** A complete set of upright greek letters (as strictly required for some particle names, numbers, or symbols), are only available if an appropriate additional fonts are loaded. Several options are provided by `NSTexam.cls` for this.

(a) By starting the document with `\documentclass[euler]{NSTexam}`, an $\mathcal{AMS}$-LaTeX Euler font is loaded. However, you may think this font may not 'look right' mixed with the standard fonts.

(b) Or by using `\documentclass[cmmu]{NSTexam}` a customised 'upright' version of the standard `cmmi10` ('maths italic') font is loaded. This requires three other files — `cmmu10.mf`, `cmmu10.tfm` and `omlcmmu.fd` — either in your working directory, or somewhere in the LaTeX filesystem.

(c) Or by using `\documentclass[newtx]{NSTexam}` or `\documentclass[txfonts]{NSTexam}` then the `newtx` or `txfonts` package is loaded, each of which uses Time Roman fonts, with matching greek fonts and symbols.

The `newtx` options uses, basically, the same fonts as `txfonts`, but with revised metrics which arguably have better spacing of sub-/super-scripts in mathematics, and so it is the recommended choice. With both the `newtx` and `txfonts` fonts the `\widehat` symbol is quite wide, as is `\widetilde`, and does not work well with some narrow letters, particularly lowercase ones. In these cases you may want to define a command to correct for this for use as an operator (e.g. `\newcommand{\ophat}[1]{\kern1.6pt\widehat{#1}\kern1.6pt}` and then

use `\ophat{...}`).

Both these fonts options also define: (i) `\del` to use a bold nabla symbol which is avialable with these fonts, and (ii) `\half` for ½.

The last five pages of this document illustrate the fonts available for `NSTexam.cls` with no additional font options specified, and for each of the options `euler`, `cmmu`, `txfonts` and `newtx`.

B22 **Page Markup.** The style of the layout that is set up in the `NSTexam.cls` package is consistent with University recommendations (e.g. `\raggedright`, `\raggedbottom` and `\parskip=0pt`).

If you wish to make changes to these settings then *do not* change the `NSTexam.cls` package itself. Instead insert the appropriate LaTeX commands just before the `\begin{document}` command in each paper (or include an additional package of your own options and commands). Be warned, however, that switching off the `\raggedright` settings may lead to some poor, and possibly confusing hyphenation.

B23 **The 'big' option.** An additonal option is `big`, which uses larger fonts, and smaller margins, to produce A4 output which can then be enlarged to A3 (as has been required for some visually impaired students). The page breaks with this option may not be in exactly the same place as without this option. If different page breaks need to be forced in the source `.tex`, then constructions such as

```
\ifNSTbig\clearpage\fi
```

(for a forced page break only if the `big` option is used), or

```
\ifNSTbig\else\clearpage\fi
```

(for a forced page break only if the `big` option is not used) can be used so that the same `.tex` can be used with or without the `big` option.

B24 **Updates.** This package has been used to prepare most of the Physics papers in NST examinations since 1995 (it was converted to a LaTeX class in 2010, when the additional font options were rationalised and enhanced). So it should cover most eventualities, but please let me know if there are any additional features required. The most up-to-date release of the `NSTexam` package will be available from:

`http://www.mrao.cam.ac.uk/~dag/NSTexam/`

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END OF PAPER

V8.4

This illustrates what fonts/symbols are available for `NSTexam.cls`, with no additional font options.

(a) Mathematical symbols, as sloping font, including greek letters:

$$a^2 + b^2 = c^2, \qquad A^2 + B^2 = C^2, \qquad \alpha + \beta = \gamma, \qquad \Gamma + \Delta = \Omega.$$

(b) Vectors, as a bold sloping font (using `$\vec{...}$`):

$$\boldsymbol{a} = \boldsymbol{b} + \boldsymbol{c}, \qquad \boldsymbol{A} = \boldsymbol{B} + \boldsymbol{C}, \qquad \boldsymbol{\alpha} + \boldsymbol{\beta} = \boldsymbol{\gamma}, \qquad \boldsymbol{\Gamma} + \boldsymbol{\Delta} = \boldsymbol{\Omega}.$$

(c) Using 'poor man's bold' for `$\del$`:

$$\boldsymbol{\nabla}\Phi = 0, \qquad \mathrm{e}^{-\boldsymbol{\nabla}\cdot\boldsymbol{k}}.$$

(d) Numbers, upright (using `$\num{e}$` and `$\num{i}$`):

$$\mathrm{e}, \qquad \mathrm{i}.$$

(e) Barred symbols (using `$\hbar$`, `$\dbar$` and `$\lambdabar$`):

$$\hbar^{\bar{\hbar}}, \qquad \mathrm{d}^{\bar{\mathrm{d}}}, \qquad \lambda^{\bar{\lambda}}$$

(f) Mathematical accents (using `$\widehat{...}$`, `$\widetilde{...}$`, `$\bigdot{...}$` and `$\bigddot{...}$`), plus integral signs:

$$\widehat{x}, \qquad \widetilde{x}, \qquad \dot{x}^2 = \ddot{x}, \qquad \dot{X}^2 = \ddot{X} \qquad \int.$$

(g) Particle names, including uppercase greek letters (using `$\particle{...}$` or `$\particle{\bar ...}$`):

$$\mathrm{e}, \quad \mathrm{p}, \bar{\mathrm{p}}, \quad \mathrm{n}, \quad \mathrm{W}, \quad \mathrm{Z}, \bar{\mathrm{Z}}, \quad \Sigma, \quad \Xi, \quad \Lambda$$

but lowercase greek letters are not available, and for quarks (using `$\quark{...}$` or `$\quark{\bar ...}$`):

$$\mathrm{u}\bar{\mathrm{u}}, \qquad \mathrm{d}\bar{\mathrm{d}}.$$

(h) Upright lowercase greek letters are not available, but uppercase greek letters are available for increment (as `$\upDelta$`) and the Ohm unit (as `$\upOmega$`):

$$\Delta, \qquad \Omega.$$

This illustrates what fonts/symbols are available for `NSTexam.cls`, with the `euler` font option.

(a) Mathematical symbols, as sloping font, including greek letters:

$$a^2 + b^2 = c^2, \qquad A^2 + B^2 = C^2, \qquad \alpha + \beta = \gamma, \qquad \Gamma + \Delta = \Omega.$$

(b) Vectors, as a bold sloping font (using `$\vec{...}$`):

$$\boldsymbol{a} = \boldsymbol{b} + \boldsymbol{c}, \qquad \boldsymbol{A} = \boldsymbol{B} + \boldsymbol{C}, \qquad \boldsymbol{\alpha} + \boldsymbol{\beta} = \boldsymbol{\gamma}, \qquad \boldsymbol{\Gamma} + \boldsymbol{\Delta} = \boldsymbol{\Omega}.$$

(c) Using 'poor man's bold' for `$\del$`:

$$\boldsymbol{\nabla}\Phi = 0, \qquad \mathrm{e}^{-\boldsymbol{\nabla}\cdot\boldsymbol{k}}.$$

(d) Numbers, upright (using `$\num{e}$` and `$\num{i}$`):

$$\mathrm{e}, \qquad \mathrm{i}.$$

(e) Barred symbols (using `$\hbar$`, `$\dbar$` and `$\lambdabar$`):

$$\hbar^{\bar{\hbar}}, \qquad \mathrm{d}^{\bar{\mathrm{d}}}, \qquad \lambda^{\bar{\lambda}}$$

(f) Mathematical accents (using `$\widehat{...}$`, `$\widetilde{...}$`, `$\bigdot{...}$` and `$\bigddot{...}$`), plus integral signs:

$$\widehat{x}, \qquad \widetilde{x}, \qquad \dot{x}^2 = \ddot{x}, \qquad \dot{X}^2 = \ddot{X} \qquad \int.$$

(g) Particle names, including uppercase greek letters (using `$\particle{...}$` or `$\particle{\bar ...}$`):

$$\mathrm{e}, \quad \mathrm{p}, \bar{\mathrm{p}}, \quad \mathrm{n}, \quad W, \quad \mathrm{Z}, \bar{\mathrm{Z}}, \quad \Sigma, \quad \Xi, \quad \Lambda$$

and for lowercase greek letters (also using `$\particle{...}$` or `$\particle{\bar ...}$`):

$$\tau, \quad \rho, \quad \gamma, \quad \nu, \bar{\nu}$$

and for quarks (using `$\quark{...}$` or `$\quark{\bar ...}$`):

$$\mathrm{u}\bar{\mathrm{u}}, \qquad \mathrm{d}\bar{\mathrm{d}}.$$

(h) Upright greek letters are available (as `$\uppi$` and `$\upmu$`):

$$\pi, \qquad \mu$$

and for increments (as `$\upDelta$` and `$\updelta$`) and the Ohm unit (as `$\upOmega$`):

$$\Delta, \qquad \delta, \qquad \Omega.$$

This illustrates what fonts/symbols are available for `NSTexam.cls`, with the `cmmu` font option.

(a) Mathematical symbols, as sloping font, including greek letters:

$$a^2 + b^2 = c^2, \qquad A^2 + B^2 = C^2, \qquad \alpha + \beta = \gamma, \qquad \Gamma + \Delta = \Omega.$$

(b) Vectors, as a bold sloping font (using `$\vec{...}$`):

$$\boldsymbol{a} = \boldsymbol{b} + \boldsymbol{c}, \qquad \boldsymbol{A} = \boldsymbol{B} + \boldsymbol{C}, \qquad \boldsymbol{\alpha} + \boldsymbol{\beta} = \boldsymbol{\gamma}, \qquad \boldsymbol{\Gamma} + \boldsymbol{\Delta} = \boldsymbol{\Omega}.$$

(c) Using 'poor man's bold' for `$\del$`:

$$\boldsymbol{\nabla}\Phi = 0, \qquad \mathrm{e}^{-\boldsymbol{\nabla}\cdot\boldsymbol{k}}.$$

(d) Numbers, upright (using `$\num{e}$` and `$\num{i}$`):

$$\mathrm{e}, \qquad \mathrm{i}.$$

(e) Barred symbols (using `$\hbar$`, `$\dbar$` and `$\lambdabar$`):

$$\bar{\hbar}^{\bar{\pi}_{\bar{\pi}}}, \qquad \bar{\mathrm{d}}^{\bar{\mathrm{d}}_{\bar{\mathrm{d}}}}, \qquad \bar{\lambda}^{\bar{\lambda}_{\bar{\lambda}}}$$

(f) Mathematical accents (using `$\widehat{...}$`, `$\widetilde{...}$`, `$\bigdot{...}$` and `$\bigddot{...}$`), plus integral signs:

$$\widehat{x}, \qquad \widetilde{x}, \qquad \dot{x}^2 = \ddot{x}, \qquad \dot{X}^2 = \ddot{X} \qquad \int.$$

(g) Particle names, including uppercase greek letters (using `$\particle{...}$` or `$\particle{\bar ...}$`):

$$\mathrm{e}, \quad \mathrm{p}, \bar{\mathrm{p}}, \quad \mathrm{n}, \quad \mathrm{W}, \quad \mathrm{Z}, \bar{\mathrm{Z}}, \quad \Sigma, \quad \Xi, \quad \Lambda$$

and for lowercase greek letters (also using `$\particle{...}$` or `$\particle{\bar ...}$`):

$$\tau, \quad \rho, \quad \gamma, \quad \nu, \bar{\nu}$$

and for quarks (using `$\quark{...}$` or `$\quark{\bar ...}$`):

$$\mathrm{u}\bar{\mathrm{u}}, \qquad \mathrm{d}\bar{\mathrm{d}}.$$

(h) Upright greek letters are available (as `$\uppi$` and `$\upmu$`):

$$\pi, \qquad \mu$$

and for increments (as `$\upDelta$` and `$\updelta$`) and the Ohm unit (as `$\upOmega$`):

$$\Delta, \qquad \delta, \qquad \Omega.$$

This illustrates what fonts/symbols are available for `NSTexam.cls`, with the `txfonts` font option.

(a) Mathematical symbols, as sloping font, including greek letters:

$$a^2 + b^2 = c^2, \qquad A^2 + B^2 = C^2, \qquad \alpha + \beta = \gamma, \qquad \Gamma + \Delta = \Omega.$$

(b) Vectors, as a bold sloping font (using `$\vec{...}$`):

$$\boldsymbol{a} = \boldsymbol{b} + \boldsymbol{c}, \qquad \boldsymbol{A} = \boldsymbol{B} + \boldsymbol{C}, \qquad \boldsymbol{\alpha} + \boldsymbol{\beta} = \boldsymbol{\gamma}, \qquad \boldsymbol{\Gamma} + \boldsymbol{\Delta} = \boldsymbol{\Omega}.$$

(Note: with `txfonts` the default letter `$v$` looks very similar to the greek `$\nu$` (v compared with ν); instead you can use `$\varv$`, which looks like $\varv$.)

(c) Using bold symbol for `$\del$`:

$$\boldsymbol{\nabla}\Phi = 0, \qquad \mathrm{e}^{-\boldsymbol{\nabla}\cdot\boldsymbol{k}}.$$

(Also defines `\half` for ½.)

(d) Numbers, upright (using `$\num{e}$` and `$\num{i}$`):

$$\mathrm{e}, \qquad \mathrm{i}.$$

(e) Barred symbols (using `$\hbar$`, `$\dbar$` and `$\lambdabar$`):

$$\hbar^{\bar{\pi}_\pi}, \qquad \mathrm{d}^{\bar{\mathrm{d}}_\mathrm{d}}, \qquad \lambda\!\!\!^{-\pi_\pi}$$

(f) Mathematical accents (using `$\widehat{...}$`, `$\widetilde{...}$`, `$\bigdot{...}$` and `$\bigddot{...}$`), plus integral signs:

$$\widehat{x}, \qquad \widetilde{x}, \qquad \dot{x}^2 = \ddot{x}, \qquad \dot{X}^2 = \ddot{X} \qquad \int.$$

(g) Particle names, including uppercase greek letters (using `$\particle{...}$` or `$\particle{\bar ...}$`):

$$\mathrm{e}, \quad \mathrm{p}, \bar{\mathrm{p}}, \quad \mathrm{n}, \quad \mathrm{W}, \quad \mathrm{Z}, \bar{\mathrm{Z}}, \quad \Sigma, \quad \Xi, \quad \Lambda$$

and for lowercase greek letters (also using `$\particle{...}$` or `$\particle{\bar ...}$`):

$$\tau, \quad \rho, \quad \gamma, \quad \nu, \bar{\nu}$$

and for quarks (using `$\quark{...}$` or `$\quark{\bar ...}$`):

$$\mathrm{u}\bar{\mathrm{u}}, \qquad \mathrm{d}\bar{\mathrm{d}}.$$

(h) Upright greek letters are available (as `$\uppi$` and `$\upmu$`):

$$\pi, \qquad \mu$$

and for increments (as `$\upDelta$` and `$\updelta$`) and the Ohm unit (as `$\upOmega$`):

$$\Delta, \qquad \delta, \qquad \Omega.$$

This illustrates what fonts/symbols are available for `NSTexam.cls`, with the `newtx` font option.

(a) Mathematical symbols, as sloping font, including greek letters:

$$a^2 + b^2 = c^2, \qquad A^2 + B^2 = C^2, \qquad \alpha + \beta = \gamma, \qquad \Gamma + \Delta = \Omega.$$

(b) Vectors, as a bold sloping font (using `$\vec{...}$`):

$$\boldsymbol{a} = \boldsymbol{b} + \boldsymbol{c}, \qquad \boldsymbol{A} = \boldsymbol{B} + \boldsymbol{C}, \qquad \boldsymbol{\alpha} + \boldsymbol{\beta} = \boldsymbol{\gamma}, \qquad \boldsymbol{\Gamma} + \boldsymbol{\Delta} = \boldsymbol{\Omega}.$$

(Note: with `newtx` the default letter `$v$` looks very similar to the greek `$\nu$` (v compared with ν); instead you can use `$\varv$`, which looks like $\varv$.)

(c) Using bold symbol for `$\del$`:

$$\boldsymbol{\nabla}\Phi = 0, \qquad \mathrm{e}^{-\boldsymbol{\nabla}\cdot\boldsymbol{k}}.$$

(Also defines `\half` for ½.)

(d) Numbers, upright (using `$\num{e}$` and `$\num{i}$`):

$$\mathrm{e}, \qquad \mathrm{i}.$$

(e) Barred symbols (using `$\hbar$`, `$\dbar$` and `$\lambdabar$`):

$$\bar{\hbar}^{\bar{\hbar}}, \qquad \bar{\mathrm{d}}^{\bar{\mathrm{d}}}, \qquad \bar{\lambda}^{\bar{\lambda}}$$

(f) Mathematical accents (using `$\widehat{...}$`, `$\widetilde{...}$`, `$\bigdot{...}$` and `$\bigddot{...}$`), plus integral signs:

$$\widehat{x}, \qquad \widetilde{x}, \qquad \dot{x}^2 = \ddot{x}, \qquad \dot{X}^2 = \ddot{X} \qquad \int.$$

(g) Particle names, including uppercase greek letters (using `$\particle{...}$` or `$\particle{\bar ...}$`):

$$\mathrm{e}, \quad \mathrm{p}, \bar{\mathrm{p}}, \quad \mathrm{n}, \quad \mathrm{W}, \quad \mathrm{Z}, \bar{\mathrm{Z}}, \quad \Sigma, \quad \Xi, \quad \Lambda$$

and for lowercase greek letters (also using `$\particle{...}$` or `$\particle{\bar ...}$`):

$$\tau, \quad \rho, \quad \gamma, \quad \nu, \bar{\nu}$$

and for quarks (using `$\quark{...}$` or `$\quark{\bar ...}$`):

$$\mathrm{u}\bar{\mathrm{u}}, \qquad \mathrm{d}\bar{\mathrm{d}}.$$

(h) Upright greek letters are available (as `$\uppi$` and `$\upmu$`):

$$\pi, \qquad \mu$$

and for increments (as `$\upDelta$` and `$\updelta$`) and the Ohm unit (as `$\upOmega$`):

$$\Delta, \qquad \delta, \qquad \Omega.$$