

This is the document for LiteSolution template, which provides a lite design of the solution of test paper.

Some designs of this template currently only support **Simplified Chinese (Mainland)**. If necessary, you can change some Chinese characters to the language you want in the *.cls file.

1. Introduction

1.1 The purpose of this template

This template provides a lite and fresh template, and mainly used for typesetting solutions of final, textbooks' and other exercises. This template is developed based on ElegantBook, ported and improved the chapter design module code of The Legrand Orange Book. I'd like to express my gratitude to the two template authors for their previous work.

If you meet bugs when using this template, or you have better suggestions or ideas, or you want to participate in the development of the template or other templates by me, welcome to contact via email xiamyphys@gmail.com.

Also, you can join my ETEX Template Discussion QQ Group: 760570712 to communicate with me and get the insider preview edition of the template.

2. Modes of LiteSolution

2.1 The answer mode

These two modes ans and noans can show and hide answers respectively. After you choose the noans, the contents in the environment solution, the command ans and the answers in the multiple choice questions will all become the same color as the pagecolor. So the area that originally contained the answer will be replaced by an area of the same blank size. You can generate exams without answers and solutions by enabling noans.

2.2 The mtpro2 mode

If you've installed the <u>Mathtime Pro 2 Lite</u> font in your computer, then you can use this mode to change the formula font in the test paper.

2.3 The separate and continuous modes

You can insert multiple test questions into one document. The page numbers between each test question will be continuous when you use the continuous mode or the page number of each test question will start from 1 when you use the separate.

3. Commands of LiteSolution

3.1 The chapterimage command

\chapterimage{cover1.png}

This command can assign the title background image for each subsequent chapter.

3.2 The chapterfont command

This command can assign the title font for each subsequent chapter, if you do not use this command, the title font will be songti in Chinese and Libertinus in English.

3.3 The ans command

This command can underlines the answer and changes the color of the answer to Blue Sapphire.

If mode noans is enabled, the answer will disappear, leaving only a horizontal line the same width as the answer.

3.4 The watermark command

\watermark{ctanlion.pdf}

This command can add watermark to the document.

3.5 Other customer commands

In order to facilitate input, the following commands are scheduled. You can add others in the *.cls file as you like.

Command	Output	Command	Output	Command	Output
\titlelogo{#1}{#2}	Add emoji with link in text	\point{#1}	Add score	\i	i
\sokka{#1}	故本题选择 #1 项	\d	d	\e	e

4. Environments of LiteSolution

4.1 The choice environment

There're two variables in this environment. The first one is the answer of the choice problem, the second one is the keywords of this choice problem and it's optional.

\begin{choice}{D}[Keywords] If you want to add choice and keywords. ▶ 题目 1 **Keywords \begin**{tasks}(2) % 2 choices per line If you want to add choice and keywords. \task This is choice A \task This is choice B \task This is choice C \task This is choice D B. This is choice B A. This is choice A \end{tasks} C. This is choice C D. This is choice D \end{choice} \begin{choice}{D} ▶ 题目 2 If you want to add choice only. If you want to add choice only. **\begin**{tasks}(4) % 4 choices per line \task Chc A \task Chc B \task Chc C \task Chc D A. Chc A B. Chc B C. Chc C D. Chc D **end**{tasks} \end{choice}

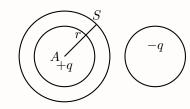
☑ 题目 3

Gaussian theory



A和 B 为两个均匀带电球体,A 带电荷 +q,B 带电荷 -q,作一与 A...

- A. 通过 S 面的电场强度...
- B. 通过 S 面的电场强度...
- C. 通过 S 面的电场强度...
- D. 通过 S 面的电场强度...



\begin{paracol}{2}

\begin{choice}{D}[Gaussian theory]

\$A\$和\$B\$为两个均匀带电球体,\$A\$带电荷\$+q\$,\$B\$带电荷\$-q\$,作一与\$A\$...

\begin{tasks}(2)

\task 通过\$S\$面的电场强度... \task 通过\$S\$面的电场强度...

\task 通过\$S\$面的电场强度... \task 通过\$S\$面的电场强度...

\end{tasks}

\end{choice}

\switchcolumn\centering\vfill\tikz{...}\vfill

\end{paracol}

4.2 The **problem** environment

Sightly different from the cmdchoice environment: the two variables are points and keywords, and the question number counter is shared with the multiple-choice question number counter.

\begin{problem}[Keywords][5]
 If you want to add keywords and points.
\end{problem}
 If you want to add none.
\end{problem}
\begin{problem}[Keywords]
 If you want to add keywords only.
\end{problem}
\begin{problem}*[][5]
 If you want to add points only.
\end{problem}

☑ 题目 4 (本题 5 分)

Keywords

If you want to add keywords and points.

☑ 题目 5

If you want to add none.

☑题目6

Keywords

If you want to add keywords only.

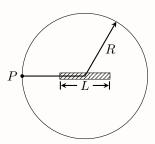
☑ 题目 7 (本题 5 分)

If you want to add points only.

☑ 题目 8 (本题 6 分)

Gaussian theory & Field strength

一均匀带电直导线长为 d,电荷线密度为 $+\lambda$. 过导线中点 O 作一半径为 R $(R>\frac{d}{2})$ 的球面 S, P 为带电直导线的延长线与球面 S 的交点. 则通过该球面的电场强度通量 $\Phi_e=\frac{\lambda d}{\varepsilon_0}$,带电直线的延长线与球面交点 P 处的电场强度的大小为 $\frac{\lambda d}{4\pi\varepsilon_0(R^2-d^2/4)}$,方向 沿矢径 OP.



\begin{paracol}{2}

\begin{problem}[Gaussian theory \& Field strength][6]

一均匀带电直导线长为\$d\$,电荷线密度为\$+\lambda\$,过导线中点\$0\$...

场强大小\ans{\$\frac{\lambda d}{4\pi\varepsilon_0(R^2-d^2/4)}\$}...

\end{problem}

\switchcolumn\centering\vfill\tikz{...}\vfill

\end{paracol}

4.3 The **note** environment

\begin{note}
 Please note that...
\end{note}

*注意

Please note that...

4.4 The solution environment

\begin{solution}

This is the answer for the problem.

\end{solution}

This is the answer for the problem.

If a star (*) is added after the \begin{solution}, then the content will follow the

\begin{solution}*

This is the answer for the problem.

\end{solution}

\delta 分析与解 This is the answer for the problem.

If mode noans is enabled, the solution will disappear, leaving only a blank box with the same height as the solution, and the name of the box will change to \ointo 答案隐藏.

5. Version History

Version 0.1a was finished developing on 29 June, 2023.

Version 0.1b was finished developing on 6 July, 2023 and released on LaTeX Studio (Xiaoshan, Hangzhou) and Xiaohongshu, where won the favor of many people and even some people.

06/07/2023 Update: Version 0.1b

- Support page number remaking between chapters.
- Added watermark command.

15/11/2023 Update: Version 1.0a

- Redesigned the chapterimage part, include the layout and the code.
- Redesigned the choice environment, supports not adding keywords.
- Deleted the exercise environment, replaced with the problem environment, supports adding only keywords or points.
- Redesigned the solution environment, supports star (*) key.
- Added the note environment and some customer commands.

1. 选填题 (共15分)



▶波的能量

- 一平面简谐波在弹性媒介中传播,在媒质质元从最大位移处回到平衡位置的过程中
 - A. 它的势能转换成动能

- B. 它的动能转换成势能
- C. 它从相邻的一段质元获得能量,其能量逐渐增加 D. 它把能量传给相邻的一段质元,其能量逐渐减小
- ☑ 分析与解 波在传播过程中介质质元振动的动能和势能同时变化. 故本题选择 C 项.

▶ 题目 2

▶ 双缝干涉

在双缝干涉实验中,两缝间距离为 d,双缝与屏幕之间的距离为 D ($D \gg d$). 波长为 λ 的平行单色光垂直照射到 双缝上, 屏幕上干涉条纹中相邻暗纹之间的距离是

A.
$$\frac{2\lambda L}{d}$$

B.
$$\frac{\lambda d}{D}$$

C.
$$\frac{dD}{\lambda}$$

D.
$$\frac{\lambda D}{d}$$

- ☑ 分析与解 由明纹公式 $x = k\lambda D/d$ 得暗纹间距 $\Delta x = \lambda D/d$. 故本题选择 D 项.
- ☑ 题目 3 (本题 3 分)

● 简谐振动的合成

- 一个质点同时参与两个在同一直线上的简谐振动: $x_1=4\cos\left(2t+rac{\pi}{6}
 ight),\,x_2=2\cos\left(2t-rac{\pi}{6}
 ight)$. 该质点合振动的振幅 大小为 $2\sqrt{7}$.
- ightharpoonup分析与解 $A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos\Delta\varphi} = 2\sqrt{7}$.
- ☑ 题目 4 (本题 6 分)

多普勒效应

- 一辆运动的警车发出警铃声音频率为 $f_s = 1400$ Hz, 从左向右移动, 速度大小为 70m/s. 一个观察者从右向左移动, 速 度大小为 10m/s, 空气中的声速 u=340m/s. 观察者与警车相遇前后, 听到警铃的频率分别为 1814.8Hz, 1126.8Hz.
- ☑ 分析与解 $f_1 = \frac{340 + 10}{340 70} \times 1400$ Hz ≈ 1814.8 Hz, $f_2 = \frac{340 10}{340 + 70} \times 1400$ Hz ≈ 1126.8 Hz.

2. 计算题 (共 20 分)

☑ 题目 5 (本题 10 分)

简谐振动

一个质量为 1kg 的物块沿 x 轴做简谐振动,振幅为 10cm,最大速度 2×10^{-2} m/s. 在时间 t=4s 时,物块位于 5 cm.

- 1. 简谐运动的周期和最大加速度.
- 2. 简谐运动的位移方程.

☑ 分析与解

$$x = 0.1\cos\left[0.2(t-4)\right] + \frac{\pi}{3} = 0.1\cos\left(0.2t + 0.079\pi\right) \tag{4pt}$$

☑ 题目 6 (本题 10 分)

牛顿环

空气中,使用波长为 480nm 平行单色光观察牛顿环. 在反射光中测得某一明环的直径为 4.74mm,在它外面第 10 个 明环的直径为 7.24mm. 求

- 1. 平凸透镜的曲率半径.
- 2. 直径为 4.74mm 明环的条纹级数 k.
- 3. 假设把整个装置放入水中 (n = 1.33), 原直径为 4.74mm 明环的新直径.

✓ 分析与解

1.
$$R = (r_{k+10}^2 - r_k^2)/10\lambda = 1.56$$
m. (4pt)

1.
$$R = (r_{k+10}^2 - r_k^2)/10\lambda = 1.56\text{m}.$$
 (4pt)
2. $\text{th} \ r_k = \sqrt{\frac{2k-1}{2}\lambda R} \not \approx k = \frac{r_k^2}{\lambda R} + \frac{1}{2} = 8.$ (3pt)

3. 由于光在介质中的波长与折射率成反比,所以此时
$$d_k' = \frac{d_k}{\sqrt{n}} = 4.11$$
mm. · · · · · · · · · · · · · · (3pt)

3. 计算题[†] (共 15 分)

☑ 题目 7 (本题 15 分)

弹簧振子

一个质量为m=1kg的盘子刚性连接竖直悬挂的轻弹簧下端,弹簧的劲度系数为k=90N/m.盘子在竖直方向做简 谐运动,振幅 A=10.0cm. 现有一个质量 $m_2=1$ kg 的物体自由落下掉在盘上,没有反弹. 当**盘子位于向上最大位移** 处,盘子与物体发生碰撞,物体从开始自由自由落体发生处,距离为h=20cm,假设碰撞瞬间完成。求碰撞后盘子 和物体组成的系统,它的振动周期、振幅和振动能量.

☑ 分析与解 Answer omitted.