

**Figure 2 | Predetermined optical generation and switching of the toron structures.** **a**, Polarizing optical microscopy texture showing T3-1 (the smallest), two T3-2s of opposite winding (intermediate size) and T3-3 (the largest structure) generated next to each other. The inset shows the letters 'CU' obtained by optical generation of four T3-2s per letter at the letters' vertices and T3-1 elsewhere within the characters. The orientations of the crossed polarizer (P) and analyser (A) are shown by the white bars. **b**

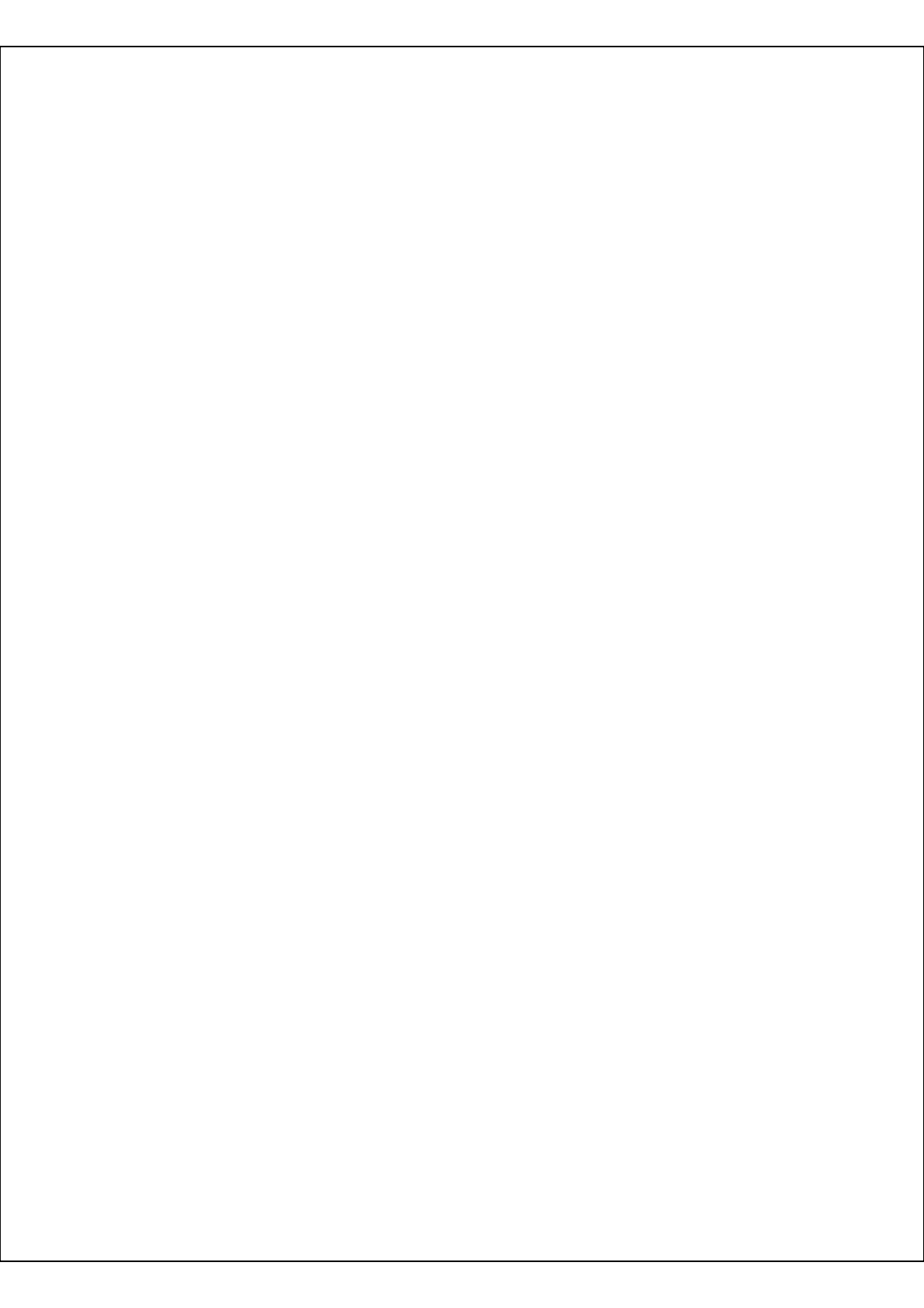
**Table 1 | Material parameters of the used nematic hosts and chiral additives.**

| Material/property | $K_{11}$ (pN) | $K_{22}$ (pN) | $K_{33}$ (pN) | $\Delta\epsilon_{IF}$ | $\Delta n$ | $H_{HTP}$ of CB-15 ( $\mu\text{m}^{-1}$ ) | $H_{HTP}$ of S-811 ( $\mu\text{m}^{-1}$ ) |
|-------------------|---------------|---------------|---------------|-----------------------|------------|---|---|
| MLC-6609          | 17.2          | 7.51          | 17.9          | -3.7                  | 0.078      | -   | -10.5                                     |
| ZLI-3412          | 14.1          | 6.7           | 15.5          | +3.4                  | 0.078      | +6.3                                      | -8.8                                      |
| MLC-6815          | -             | -             | -             | +8.1                  | 0.052      | +6.5                                      | -10.7                                     |

example, the letters 'CU' in the inset of Fig. 2a are composed of T3-2s at the corners and T3-1s elsewhere within the characters. Generation of different T3s depends on the initial laser-induced director tilt from the vertical alignment, which, in turn, depends on the intensity distributions shown in Fig. 1g-j. Beams having large  $|l|$  with high-intensity lobes in the axial plane pointing outward from the low-intensity centre generate T3-2s or T3-3s, whereas the beams with small  $|l|$  generate T3-1s. For example, in a cell with  $p = d = 5 \mu\text{m}$ , the T3-1 structure is induced by the Laguerre-Gaussian beams of  $l = \pm(0 - 4)$ , the T3-2 is observed for  $l = \pm(4 - 8)$  and T3-3 is observed for  $|l| > 8$ . Therefore, T3s can be reversibly transformed between each other as shown in the top right corner of Fig. 2c-g. The threshold generating laser powers are comparable for all T3s and vary from 60 mW for  $l =$









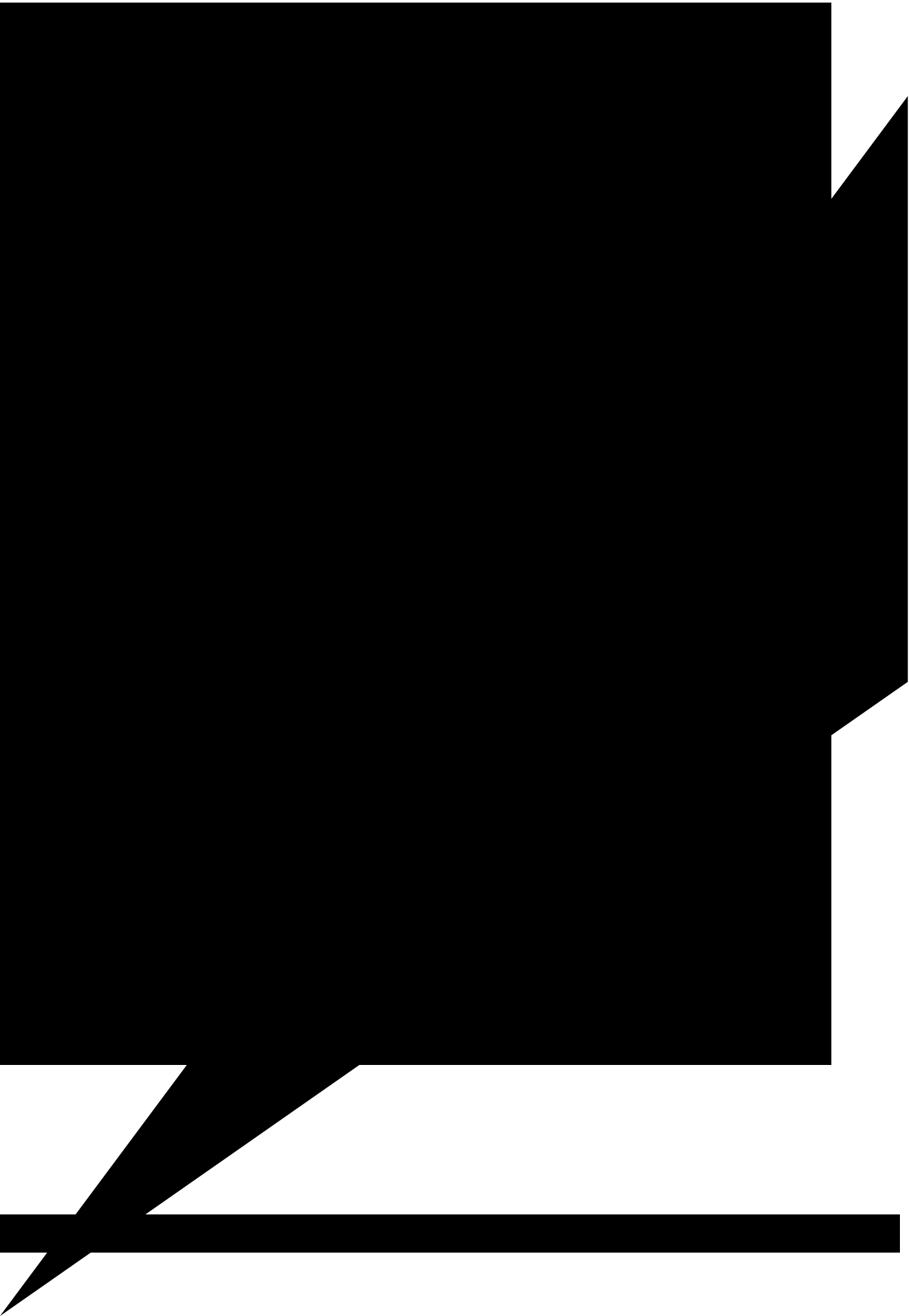


# SUPPLEMENTARY INFORMATION

$$\begin{aligned}
 & \text{\$-}\$+/\text{\$}^*+!1^*\text{\$-}7\&!0!:\text{\$}, 2\%\$))\text{\$}>A, \%&&^*, '\text{\$}!4\$, (\ \&!/5, /!5, ?\text{\$}/0)\%&>^*F\text{\$}!' /'\ \&^*/3!7^*\&/\text{\$}^*4\%/\text{\$}^*0'\ \&!G\text{\$}^*2;!'2>0! \\
 & , '\text{\$}7! /5, /!\text{\$}^* 7\%+\text{\$}! /0)0^*7>\&5, =\text{\$}7! \text{\$}^* \text{\$}^* /, -! 7\text{\$}10) (\ , /'0'\ \&! 0! /5\text{\$}! 7^*)\text{\$}+ /0)! 1^*\text{\$-}7! 7\text{\$}=\text{\$}^* 7^* 2! 0' ! /5\text{\$}! \\
 & +5, )2\text{\$}! /!, '\text{\$}7!), 7^*\%&! )!0! /5\text{\$}! ?0)/\text{\$}C!4\$, (\ !'\text{\$}! \text{\$}^* \&!-, /\$), -! =-, '\text{\$};!7'!, 2)\text{\$}\text{\$} (\ '\text{\$} /!B^* /5! \text{\$}C=\text{\$})^* (\ '\text{\$} /&D \\
 & /5\text{\$}! \text{\$}^* \text{\$}^* /, -! -0+, /'0' !0! /5\text{\$}! 4\$, (\ ]&! 10+, -! =-, '\text{\$}!, +)0&&! /5\text{\$}! \&, (\ =-\text{\$}]&! /5^*+F'\ \&&! 70\text{\$}\&! ' 0! /5, ?\text{\$}!, ! \\
 & \&^*2' \text{\$}^*1^+, '\text{\$}! /!\text{\$}11\text{\$}+ /! 0' ! /5\text{\$}! \&=, /', -! -0+, /'0' ! 0! /5\text{\$}! 2\text{\$}' \$), /\$7! <0)0' ;! T-/50%25! (\ 0&! 0! /5\text{\$}! \\
 & '\text{\$} (\ \$)^+, -!)\text{\$}\&\%-\&! /5, /!B\text{\$}! =)\text{\$}\&\text{\$}' /!\text{\$}^* /5^*\&!B0)F!5, ?\text{\$}!4\text{\$}\text{\$}' !04/, \text{\$}^* \$7!10) \quad / p=1
 \end{aligned}$$









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084=12,!N/,I ; J ?=:21M&J =6:27,Q21:896@91; <M-29:8; 3<, ; K,:L2,(NM ,<:1=9:=12/, ,6!<5\$!&/)%+/%)\$!  
 +0' &\*&/&!01!/5\$!), 7\*, -!/B\*&!01!  $\hat{n}(\vec{r})$  \*\* !/5\$!+\$' /), -!=-, ' \$!01!/5\$!+\$--!, &!B\$-!, &!/B0!=0\*' !/7\$1\$+/&!  
 +0&\$!/0!/5\$!&%4&/), /\$&j!/5\$!\* &\$&!&50B!&\* ( %-, /\$7! ^(\nu)

