Solutions for DNA Nanoscience From Prebiotic Origins to Emerging Nanotechnology 1st Edition by Douglas

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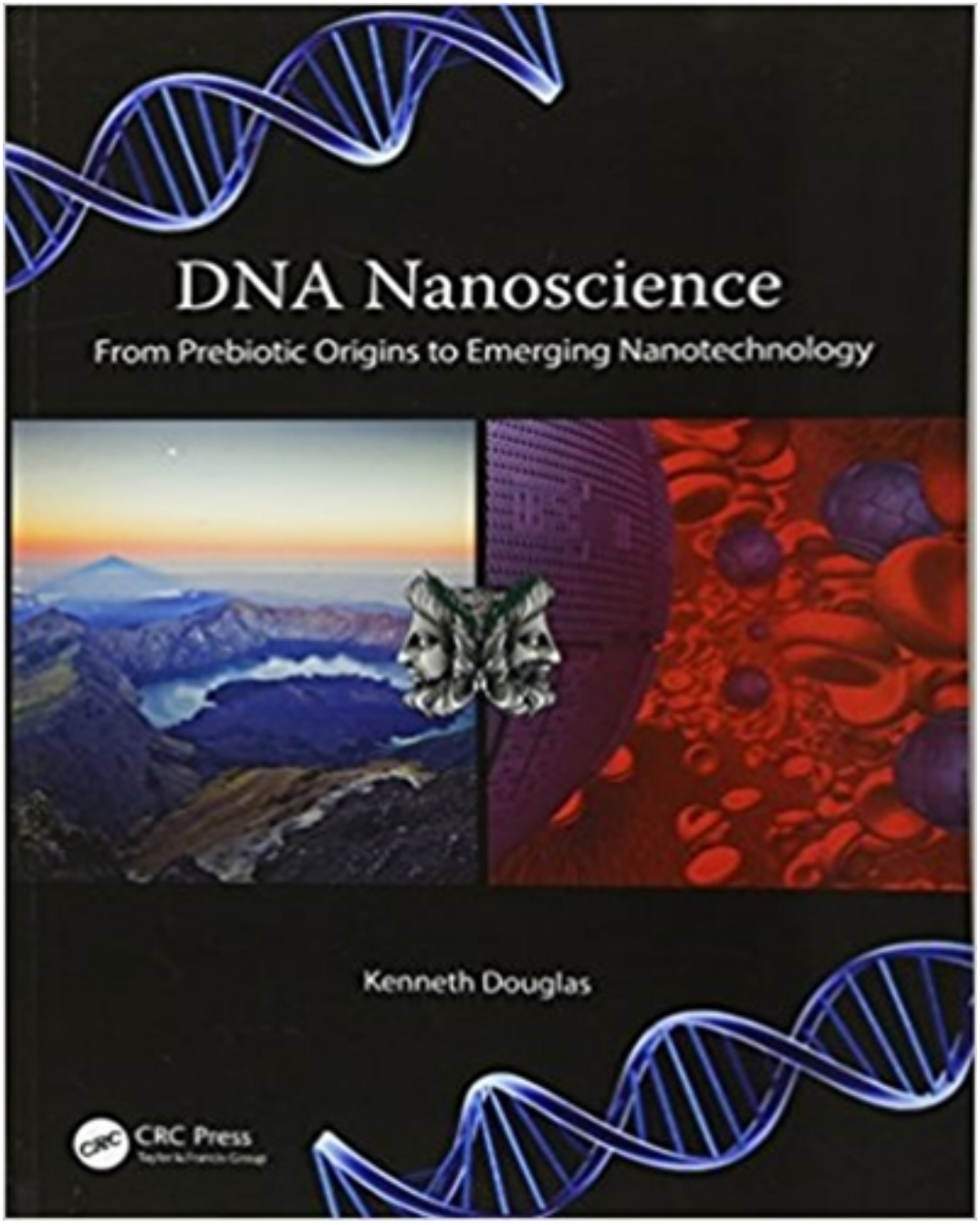

Solutions

Solutions to Exercises

Exercise 2.1

The bead would rotate clockwise from the perspective of the magnet as shown in Figure 2.16. The motion of the helix relative to a *fixed* RNA polymerase causes the helix to rotate. The RNA polymerase rotates DNA by tracking its *right-handed* helix.

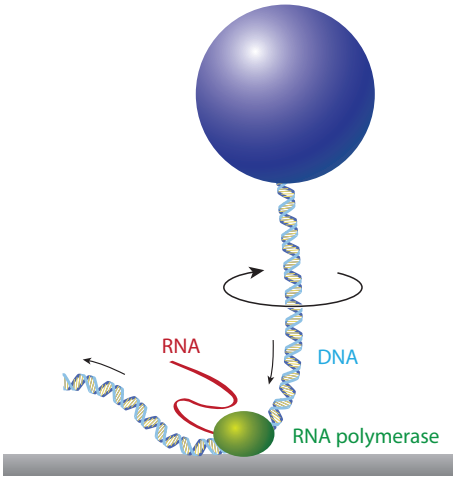

Figure 2.16

Exercise 2.2

The correct answer is "D" – the suspect is excluded as a source of DNA in the evidence. The top band in lane 5 (the male fraction from vaginal swab) does not match any bands in lane 2 (the defendant's known sample), excluding him as a contributor of that DNA.

Exercise 3.1

We can express the de Broglie wavelength of the flea immediately after takeoff as

$$\lambda = \frac{h}{p} = \frac{h}{mv_0}.$$

Using a constant acceleration equation, we express the height the flea can jump as a function of its takeoff speed: $v_0^2 + 2a\Delta y$ or, since $v = 0$ and $a = -g$, then

$$v_0 = \sqrt{2g\Delta y}\,.$$

Substitute to obtain

$$\lambda = \frac{h}{m\sqrt{2g\Delta y}}.$$