1 The kangaroo rat is a mammal that can survive in desert environments and can tolerate much higher concentrations of sodium ions in their bloodstream than humans.

Figure 16 shows an image of the kangaroo rat.



(Source: Richard R. Hansen/Science Photo Library)

Figure 16

(a) The name of the process that controls water levels in the body is

(1)

☒ **A** diffusion

☒ **B** osmosis

☒ **C** osmoregulation

☒ **D** thermoregulation

(b) (i) Explain how the blood entering the nephron of the kangaroo rat is filtered to remove excess sodium ions and water.

(3)

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The kangaroo rat has a longer loop of Henle than most mammals.

(ii) Explain why this adaptation is beneficial to the kangaroo rat.

(2)

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The volume of ADH stored in the pituitary gland of the kangaroo rat was measured.

Figure 17 shows the average results for 500 kangaroo rats.

concentration of sodium chloride fed to kangaroo rats (mol dm^{-3})	volume of ADH stored in the pituitary gland (arbitrary units)
0.00	45
0.25	40
0.50	10
0.75	8
1.00	8

Figure 17

*(iii) Explain how ADH helps to control the levels of water and sodium ions in the bloodstream.

(6)

(Total for Question 1 = 12 marks)