Marks

Question 8 (12 marks) Use a SEPARATE writing booklet.

(a) In November 1923, 18 koalas were introduced on Kangaroo Island. By November 1993, the number of koalas had increased to 5000. **5**

Assume that the number N of koalas is increasing exponentially and satisfies an equation of the form $N = N_0 e^{kt}$, where N_0 and k are constants and t is measured in years from November 1923.

Find the values of N_0 and k, and predict the number of koalas that will be present on Kangaroo Island in November 2001.

(b) Five candidates, A, B, C, D and E, are standing for an election. Their names are written on pieces of cardboard that are placed in a barrel and are drawn out randomly to determine their positions on the ballot paper.

(i) What is the probability that A is drawn first? **1**

(ii) What is the probability that the order of the names on the ballot paper is that shown below? **2**

$\boxed{A}$

$\boxed{B}$

$\boxed{C}$

$\boxed{D}$

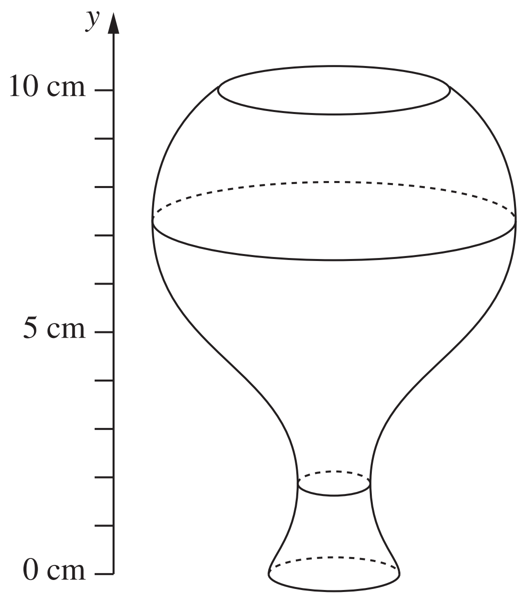
$\boxed{E}$

Question 8 continues on page 11

Marks

Question 8 (continued)

(c)



The diagram shows a ten-centimetre high glass that is being filled with water at a constant rate (by volume). Let $y = f(t)$ be the depth of water in the glass as a function of time t.

(i) Find the approximate depth y_1 at which $\dfrac{dy}{dt}$ is a maximum. **2**

Find the approximate depth y_2 at which $\dfrac{dy}{dt}$ is a minimum.

(ii) Assume that the glass takes 5 seconds to fill. **2**

Graph $y = f(t)$ and identify any points on your graph where the concavity changes.

End of Question 8