

# Exp and Log equations [28 marks]

1a. Given that  $2^m = 8$  and  $2^n = 16$ , write down the value of  $m$  and of  $n$ . [2 marks]

1b. Hence or otherwise solve  $8^{2x+1} = 16^{2x-3}$ . [4 marks]

2a. The number of bacteria,  $n$ , in a dish, after  $t$  minutes is given by  $n = 800e^{0.13t}$ . [2 marks]

Find the value of  $n$  when  $t = 0$ .

2b. Find the rate at which  $n$  is increasing when  $t = 15$ . [2 marks]

2c. After  $k$  minutes, the rate of increase in  $n$  is greater than 10000 bacteria per minute. Find the least value of  $k$ , where  $k \in \mathbb{Z}$ . [4 marks]

3a. Find the value of  $\log_2 40 - \log_2 5$ . [3 marks]

3b. Find the value of  $8^{\log_2 5}$ . [4 marks]

4a. Let  $f(x) = e^{x+3}$ . [3 marks]

(i) Show that  $f^{-1}(x) = \ln x - 3$ .

(ii) Write down the domain of  $f^{-1}$ .

4b. Solve the equation  $f^{-1}(x) = \ln \frac{1}{x}$ . [4 marks]