1 A person's heart beats approximately 10^5 times each day.
   A person lives for approximately 81 years.

   (a) Work out an estimate for the number of times a person's heart beats in their lifetime.
       Give your answer in standard form correct to 2 significant figures.

1 yr = 365 days

heart beat /day × 365 days ×
　　　　　　　　　　　　　　y

Person's heart beat : 10^5 × 365 × 81 ①
    in a lifetime

    = 2956500000

3.0 = 2sf　　　　　= 3.0 × 10^9 (2 s.f.)

3 = 1sf

　　　　　　　　　　　　① 3.0 ×10^9
　　　　　　　　　　　　............................

   (2)

2×10^{12} red blood cells have a total mass of 90 grams.

   (b) Work out the average mass of 1 red blood cell.
       Give your answer in standard form.

Average mass of : $\dfrac{90\ g}{2 \times 10^{12}}$ ①
  1 red blood cell

　　　　　　= 4.5 × 10^{-11} g ①

　　　　　　　　　　　　　　　　4.5 × 10^{-11}
　　　　　　　　　　　　.......................... grams

   (2)

(Total for Question 1 is 4 marks)

2 (a) Write 1.63×10^{-3} as an ordinary number.

$.\underset{\smile\smile\smile}{1}63$

✓ ①

0.00163
....
(1)

(b) Write 438 000 in standard form.

$4.38\underset{\smile\smile\smile\smile\smile}{000}$ 5 jumps to get 4.38

✓ ①

4.38×10^5
....
(1)

(c) Work out $(4 \times 10^3) \times (6 \times 10^{-5})$
Give your answer in standard form.

collect like terms

$4 \times 6 \times 10^3 \times 10^{-5}$ ✓ ①

24×10^{-2} ↓ add powers

2.4×10^{-1} ✓ ①

2.4×10^{-1}
....
(2)

(Total for Question 2 is 4 marks)

3 (a) Write 6.75×10^{-4} as an ordinary number.

$10^{-4} \Rightarrow$ move decimal place 4 places to the left

0̲.̲0̲0̲0̲6.75

$6.75 \times 10^{-4} = 0.000675$ ⓵

(1)

(b) Work out $\dfrac{2.56 \times 10^6 \times 4.12 \times 10^{-3}}{1.6 \times 10^{-2}}$

Give your answer in standard form.

consider $2.56 \times 10^6 \times 4.12 \times 10^{-3}$

multiply front numbers, add powers of 10:

$(2.56 \times 4.12) \times 10^{6-3}$

10.5472×10^3 ⓵

now consider $\dfrac{10.5472 \times 10^3}{1.6 \times 10^{-2}}$

divide front numbers, subtract powers of 10

$\left(\dfrac{10.5472}{1.6}\right) \times 10^{3-(-2)} = 6.592 \times 10^5$

6.592×10^5 ⓵

(2)

(Total for Question 3 is 3 marks)