Question 1

$$T = (14.7 \pm 0.4)\,s \qquad\qquad \frac{\delta T}{T} = \frac{0.4}{14.7} = 0.027$$

a)
$$5T = 5(14.7 \pm 0.4)\,s$$
$$= (73.5 \pm 2.0)\,s$$

Ans $\quad (74 \pm 2)\,s$

b) T^4
$$\frac{\delta T^4}{T^4} = \frac{4\delta T}{T} = 0.109$$

$$\therefore T^4 = (46695 \pm 46695 \times 0.109)\,s^4$$

$$= (46695 \pm 5090)\,s^4$$

Ans $\quad (4.7 \pm 0.5) \times 10^4\ s^4$

c)
$$\frac{\delta \frac{1}{T}}{\frac{1}{T}} = \frac{\delta T}{T} = 0.027$$

$$\frac{1}{T} = (0.0680 \pm 0.0680 \times 0.027)\,s^{-1}$$

$$= (0.0680 \pm 0.0018)\,s^{-1}$$

Ans $\quad (6.8 \pm 0.2) \times 10^{-2}\ s^{-1}$

d)
$$\frac{\delta \frac{1}{\sqrt{T}}}{1/\sqrt{T}} = \frac{1}{2}\frac{\delta T}{T} = 0.014$$

$$\frac{1}{\sqrt{T}} = (0.261 \pm 0.261 \times 0.014)\,s^{-\frac{1}{2}}$$

$$= (0.261 \pm 0.0036)\,s^{-\frac{1}{2}}$$

Ans $\quad (0.261 \pm 0.004)\,s^{-\frac{1}{2}}$

<u>Question 2</u> $x = (5.2 \pm 0.1)\,cm$ $y = (7.6 \pm 0.1)\,cm$

a) $P = 3x + 2y$ $= (15.6 \pm 0.3)\,cm + (15.2 \pm 0.2)\,cm$

        Ans $= \underline{(30.8 \pm 0.5)\,cm}$

b) $P = \frac{1}{2}x - y$ $= (2.60 \pm 0.05)\,cm - (7.6 \pm 0.1)\,cm$

                $= -(5.0 \pm 0.\ )\,cm$

        Ans $\underline{-(5.0 \pm 0.2)\,cm}$

c) $\frac{\delta P}{P} = \frac{\delta x}{x} + \frac{\delta y}{y}$ $= \frac{0.1}{5.2} + \frac{0.1}{7.6} = 0.032$

   $P = 2xy$ $= (79.04 \pm 79.04 \times 0.032)\,cm^2$

          $= (79.0 \pm 2.5)\,cm^2$

        Ans $\underline{(79 \pm 3)\,cm^2}$

d) $\frac{\delta P}{P} = 2\frac{\delta x}{x} + \frac{\delta y}{y}$ $= 2 \times \frac{0.1}{5.2} + \frac{0.1}{7.6} = 0.052$

   $P = x^2 y$ $= (206 \pm 206 \times 0.052)\,cm^3$

           $= (206 \pm 11)\,cm^3$

        Ans $\underline{(2.1 \pm 0.1) \times 10^2\,cm^3}$

e) $\frac{\delta P}{P} = \frac{\delta x}{x} + \frac{1}{2}\frac{\delta y}{y}$ $= \frac{0.1}{5.2} + \frac{1}{2}\frac{0.1}{7.6} = 0.026$

   $P = \frac{x}{\sqrt{y}}$ $= (1.886 \pm 1.886 \times 0.026)\,cm^{\frac{1}{2}}$

     Ans $= \underline{(1.89 \pm 0.05)\,cm^{\frac{1}{2}}}$