Q1:

Considering the forces acting on each block (gravitational attraction and tension), we have:

$$\begin{cases} 5g - T = 5a \\ T - 2g = 2a \end{cases}.$$

Solving, we have $a = \frac{3g}{7} = \boxed{4.2}\ m/s^2$ and $T = 2 \cdot 4.2 + 2g = \boxed{28}\ N$.

Q2:

(1): Set the GPE as 0 at the initial height, by the conservation of energy, we have: KE+GPE=KE+GPE

$$0 + 0 = KE + mg(-l)$$

$$KE = \boxed{mgl}$$

(2): $\frac{1}{2}mv^2 = mgl$, i.e. $v = \boxed{\sqrt{2gl}}$.

(3): Similarly,

$$0 + 0 = \frac{1}{2}mv^2 - mg(-l\cos 60^\circ)$$

$$v = \boxed{\sqrt{gl}}$$

(4): The centripetal force is provided by the tension subtracting the component of the weight. We have:

$$\frac{mv^2}{r} = T - mg\cos 60^\circ$$
$$\frac{mgl}{l} = T - \frac{1}{2}mg$$
$$T = \boxed{\frac{3}{2}mg}$$

Q3:

(1): We use the 16.7 cm to cancel the open-end correction: $\frac{\lambda}{2} = 50.7 - 16.7$, i.e. $\lambda = \boxed{68}\ cm$.

(2): $16.7 + x = \frac{\lambda}{4}$, i.e. $x = \boxed{0.3}\ cm$.

(3): By $v = f\lambda$, $f = \frac{v}{\lambda} = \boxed{500}\ Hz$.

Q4:

(1): The electric fields due to both charges are $\frac{kQ}{r^2} = 200\ N/C$ and making angle of 60° to the horizon.

Consider the vector sum, the magnitude of the electric field at A

$=2 \cdot 200\sin 60^\circ \approx \boxed{350}\ N/C$.

(2): The electric potential at A$=\frac{2kQ}{0.3}$ and that at B$=\frac{2kQ}{0.15}$.

Therefore, the difference$=\frac{2kQ}{0.3} = \boxed{120}\ V$.

(3): By the conservation of energy, the kinetic energy is equal to the change in potential energy$=-120q = \boxed{3.6 \times 10^{-6}}\ J$.

Q5:

(1): $C_2 - C_3$ and $C_4 - C_5$ have the same voltage 60 V and C_2, C_3 and C_4, C_5 have the same number of charges respectively.

By $C = \frac{Q}{V}$, $V \propto \frac{1}{C}$. Therefore, the voltages consumed by C_2 and C_4 are the same, which is $\frac{C_3}{C_2+C_3} \cdot 60 = \frac{C_5}{C_4+C_5} \cdot 60$.

Therefore, the potential difference across C_1 is $\boxed{0.0}$ V.

(2): As deduced in (1), voltage across $C_2 = 40\ V$. Then, $Q = CV = \boxed{40}\ \mu C$.

(3): As deduced in (1), voltage across $C_5 = \boxed{20}\ V$.

(4): The capacitances of $C_2 - C_3$ and $C_4 - C_5$ are $\frac{1}{\frac{1}{1}+\frac{1}{2}} = \frac{2}{3}\ \mu F$.

As C_1 is not working, the equivalent capacitance is $2 \cdot \frac{2}{3} \approx \boxed{1.3}\ \mu F$.

Q6:

(1): By the first law of thermodynamics, $\Delta U = Q - W_{gas} = 100 - 60 = \boxed{40}\ J$.

(2): By the first law of thermodynamics, $Q = \Delta U + W_{gas} = 40 + 90 = \boxed{130}\ J$.

(3): As the process $A \to C$ has 0 work done, the work done by the gas is 90 J in $C \to B$.

By the first law of thermodynamics, $Q = \Delta U + W_{gas} = 20 + 90 = \boxed{110}\ J$.

(4): If $P_C = 2.0P_A$, the work done by gas in $C \to B$ will be twice that in $A \to D$.

Then, $W_{A\to D} = 45\ J$ and by the first law of thermodynamics,

$Q = \Delta U + W = \boxed{85}\ J$.