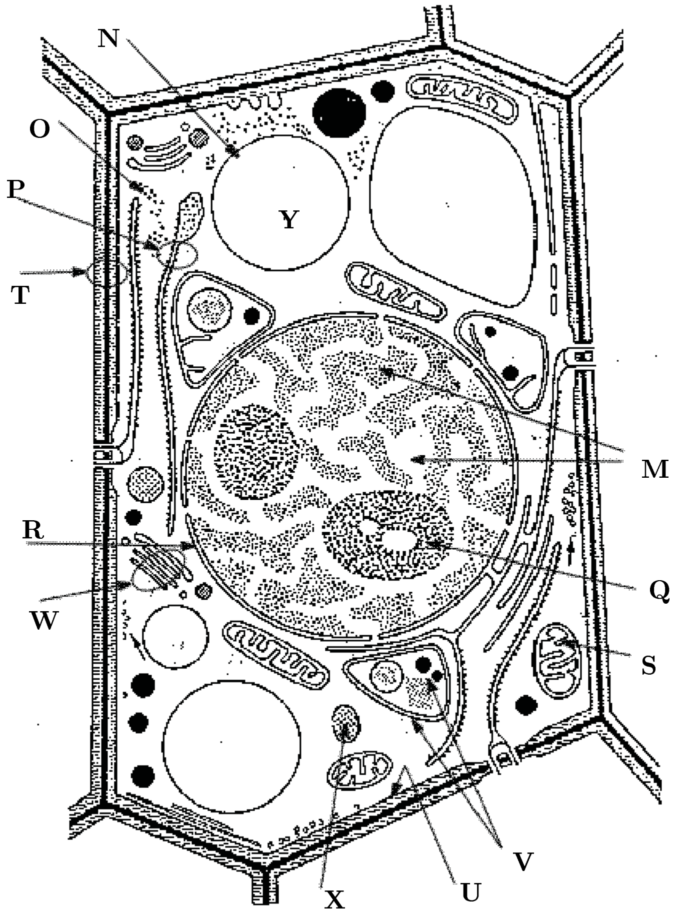
17. [3pt] Match the appropriate letter on the diagram with each organelle in the sequence in which they are listed. (Example: If the first organelle corresponds to D on the diagram and the next to C, begin your answer with DC...)



1) Nucleus
2) Ribosomes
3) Nuclear Envelope
4) Cell Wall
5) Plastid (Chloroplast, proplastid, ...
6) Nucleolus
7) Endoplasmic Reticulum
8) Golgi Body
9) Vacuole
10) Cell or Plasma Membrane
11) Peroxisome
12) Tonoplast or Vacuolar Membrane
13) Mitochondrion

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18. [1pt] Consider the reaction of nitrous oxide N_2O with oxygen O_2 to form nitrogen dioxide NO_2:

$$2N_2O_{(g)} + 3O_{2(g)} \rightarrow 4NO_{2(g)}$$

A 5.0 liter vessel contains N_2O gas at 5.0 atm pressure. A second vessel, 2.0 L in volume contains oxygen at 5.0 atm pressure. Now suppose that the two vessels are connected by a pipe of negligible volume and the two gases mix and react to produce as much nitrogen dioxide as possible. Assume that the temperature remains constant. What is the pressure in the apparatus at the end of the reaction?

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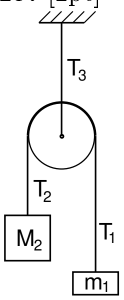
19. [2pt]



A frictionless, massless pulley is attached to the ceiling, in a gravity field of 9.81 m/s^2. Mass M_2 is greater than mass m_1. The quantities T_n and g are magnitudes. (For each statement select T-True, F-False, G-Greater than, L-Less than, or E-Equal to.)

A) m_1g + M_2g is .... T_3
B) T_2 is .... T_1
C) m_1g is ... T_1
D) The center-of-mass does not accelerate.
E) The magnitude of the acceleration of M_2 is ... the magnitude of the acceleration of m_1.
F) T_3 is .... $T_1 + T_2$

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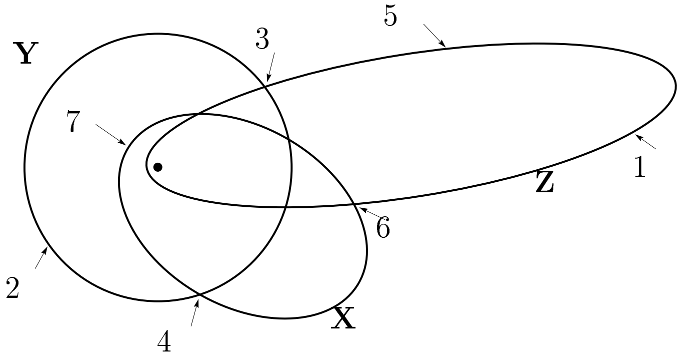
20. [2pt] Asteroids **X**, **Y**, **Z** have equal mass (6 kg each). They orbit around a planet with M=7 × 10^{24} kg. The orbits are in the plane of the paper and are drawn to scale.



TE, KE and PE represent Total, Kinetic and Potential energies. Select G-Greater than, L-Less than, or E-Equal to. (If the first is G and the rest L, enter GLLLLLL).

A) The KE of **Y** at 3 is .... its value at 2.
B) The speed of **Z** at 6 is .... it is at 5.
C) The PE of **X** at 4 is .... the PE of **Y** at 4.
D) The PE of **X** at 4 is .... the PE of **Y** at 3.
E) The TE of **Z** is .... the TE of **X**.
F) The TE of **Y** is .... the TE of **X**.
G) The PE of **X** at 7 is .... its value at 6.

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21. [5pt] Write a short essay (200 words or less) about the experiment shown in PHY183 class on Tuesday, November 24, and its interpretation. The text of the video can be found in http://capa2.nscl.msu.edu/demolibary/Links/ALNf7/freefall.html. Submit your answer via CAPA (Not by e-mail). Teams of up to five students may collaborate on a single submission.

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22. [2pt] Vector $\mathbf{C} = \mathbf{A}\times\mathbf{B}$, where

$$\mathbf{A} = 15\mathbf{i} - 17\mathbf{j} - 20\mathbf{k}$$
$$\mathbf{B} = 15\mathbf{i} + 25\mathbf{j} - 20\mathbf{k}$$

The unit vectors in the x, y and z directions are **i**, **j** and **k** respectively. **A** is a displacement and has units of m, and **B** is a force and has units of N. Calculate vector **C** and enter the numerical values of its x, y, and z components.