Gravitational Potential Energy: Relative to 0 at ∞.

1. E

* E is furthest from Sebaddoh

2. A

* F_g decreases as you move further from planet.

3. C

* W must be positive ($\vec{F}$ is right, $\vec{d}$ is right)

4. A

* $W_{nc} = \Delta E_k$, constant speed $\Rightarrow \Delta E_k = 0$

5. A

* $E_{pg_A} > E_{pg_B}$, but still negative

6. C

* Tough one! $E_{pg_A} < E_{pg_C} < E_{pg_E}$. But that's true for B, C and D. So ALSO, the difference in E_{pg} between A and C is GREATER than the difference in E_{pg} between C and E!

7. $W_{nc} = \Delta E_k^{\,0} + \Delta E_p$

$W_{nc} = E_{pg}^{\,0} - E_{pg_0}$

$= 0 - (-8.9\times10^{10}\text{ J})$

$\boxed{= 8.9\times10^{10}\text{ J}}$

8. $W_{nc} = \Delta E_k^{\,0} + \Delta E_p$

$W_{nc} = E_{pg}^{\,0} - E_{pg_0}$

$W_{nc} = 0 - (-8.9\times10^{10}\text{ J})$

$\boxed{= 8.9\times10^{10}\text{ J}}$

9. $W_{nc} = \Delta E_k^{\,0} + \Delta E_p$

$W_{nc} = E_{pg}^{\,0} - E_{pg_0}$

$W_{nc} = 0 - (-8.9\times10^{10}\text{ J})$

$\boxed{= 8.9\times10^{10}\text{ J}}$

10. a. $E_{pg} = \dfrac{-GMm}{r} = \dfrac{-6.67\times10^{-11}\,\text{N m}^2/\text{kg}^2\,(2.0\times10^{25}\text{ kg})(4.0\times10^{20}\text{ kg})}{5.0\times10^{9}\text{ m}} = -1.0672\times10^{26}\text{ J} \approx \boxed{-1.1\times10^{26}\text{ J}}$

b. $\sum \vec{F} = m\vec{a} \Rightarrow \dfrac{GMm}{r^2} = \dfrac{mv^2}{r} \Rightarrow v = \sqrt{\dfrac{GM}{r}}$

$v = \sqrt{\dfrac{6.67\times10^{-11}(2.0\times10^{25})}{5.0\times10^{9}}} = 516.526\ldots \approx \boxed{520\text{ m/s}}$

c. $E_k = \frac{1}{2}mv^2 = \frac{1}{2}(4.0\times10^{20})(516.52\ldots)^2 = 5.336\times10^{25}\text{ J} \approx \boxed{5.3\times10^{25}\text{ J}}$