EJERCICIO FQ1BE2678:

$M_p = 3{,}9 \cdot 10^{24}\ kg$

$R_p = 6000\ km = 6 \cdot 10^6\ m$

$G = 6{,}67 \cdot 10^{-11}\ u.S.I.$

$g_{o\,TIERRA} = 9{,}8\ m/s^2$

a) $g_{SUPERFICIE} = ?$

$$g_{SUP} = G \frac{M_p}{R_p^2} = 6{,}67 \cdot 10^{-11} \frac{3{,}9 \cdot 10^{24}}{(6 \cdot 10^6)^2}$$

$$\boxed{g_{SUP} = 7{,}23 \frac{m}{s^2}}$$

b) $T = ? \Rightarrow h = 23000\ km = 23 \cdot 10^6\ m$

3ª Ley Kepler (Sttucci Breve)

$F = m \cdot a$

$$G \frac{M m}{R^2} = m \cdot \frac{V^2}{R} \Rightarrow V_{ORB}^2 = \frac{GM}{R}$$

$$\left(\frac{2\pi R}{T}\right)^2 = \frac{GM}{R} \rightarrow \frac{4\pi^2 R^2}{T^2} = \frac{GM}{R}$$

$$R^3 = \frac{GM}{4\pi^2} \cdot T^2 \Rightarrow \boxed{T^2 = \frac{4\pi^2}{GM} R^3}$$

$R = R_p + h = 6 \cdot 10^6 + 23 \cdot 10^6$

$$T^2 = \frac{4\pi^2}{6{,}67 \cdot 10^{-11} \cdot 3{,}9 \cdot 10^{24}} \cdot (6 \cdot 10^6 + 23 \cdot 10^6)^3$$

$$T^2 = 3701376723$$

$$\boxed{T = 6083{,}94\ s} \quad \approx 16{,}9 \text{ horas}$$

c) $V_{orbital} = ?$ ¡DOS MANERAS!

$$V_{orb} = \sqrt{\frac{GM}{R}} = \sqrt{\frac{6{,}67 \cdot 10^{-11} \cdot 3{,}9 \cdot 10^{24}}{6 \cdot 10^6 + 23 \cdot 10^6}}$$

$$\boxed{V_{orb} \approx 2995\ m/s}$$

$$V_{orb} = \frac{s}{t} = \frac{2\pi R}{T} = \frac{2\pi \cdot (6 \cdot 10^6 + 23 \cdot 10^6)}{6083{,}94}$$

$$\boxed{V_{orb} \approx 2995\ m/s}$$

d) ¿aceleración de órbita?: ¡DOS MANERAS!

$$a_N = \frac{v^2}{R} \; ; \quad a = g_{órbita}$$

$$a_N = \frac{v^2}{R} = \frac{(2995)^2}{6 \cdot 10^6 + 23 \cdot 10^6} = \boxed{0{,}31\ \frac{m}{s^2}}$$

$$g_{ORB} = G\frac{M_P}{R^2} = 6{,}67 \cdot 10^{-11}\frac{3{,}9 \cdot 10^{24}}{(6 \cdot 10^6 + 23 \cdot 10^6)^2}$$

$$\boxed{g_{ORB} = 0{,}31\ m/s^2}$$

e) ¿V_{SUELO}? $h = 20\ m$, $V_0 = 0\ m/s$

PLANETA: $g_{SUP} = 7{,}23\ m/s^2$

MRUA: $V = V_0 - gt$

$S = S_0 + V_0 t - \frac{1}{2} g t^2$

$V = -7{,}23t$

$0 = 20 - \frac{1}{2} 7{,}23 t^2$

$3{,}615 t^2 = 20 \Rightarrow t^2 = 5{,}53$

$t = 2{,}35\ s$

es hacia abajo

$$V = -7{,}23 \cdot 2{,}35 = -16{,}99\ m/s$$

TIERRA: $g_0 = 9{,}8\ m/s^2$

$V = -9{,}8 \cdot t$

$0 = 20 - \frac{1}{2} 9{,}8 t^2$

$4{,}9 t^2 = 20 \Rightarrow t^2 = 4{,}08$

$t = 2{,}02$

$$V = -9{,}8 \cdot 2{,}02 = -19{,}8\ m/s$$

Normal que la velocidad en la Tierra sea mayor, ya que hay mayor aceleración de la gravedad

$g_T > g_{SUP_P} \Rightarrow 9{,}8 > 7{,}23$