Answers for SJPO 2011 Special Round

1   (a) 12.1 ms^{-1}

(b) 12 ms^{-1} upwards

(c) 6.1 m

2   (a) $\emptyset = 48.2°$

(b) $\cos\emptyset = \dfrac{2gR+v_o^2}{3gR}$

(c) 7.4m

3   (a) 0.136m

(b) 0, 3.7ms^{-1}

4   (a) 365K

(b) 1.33

(c) V_c=0.523m^3

(d) 846 J

(e) No. In this case, $\Delta E_{int} < 0$; $W_{by\ system}$<0; $\Delta Q_{CA} < 0$; Process CA cannot be adiabatic.

6   (a) 5C

(b) 50 000A

(c) 73800s

7   (b) 0.20A

8   (b)$\dfrac{4\pi m}{qB_1}$, Yes

9 1.35×10^{-43} s

10   (a) 1.33×10^5 s, longer time

       (b) $\frac{1}{2}\beta^2 T_o$

       (c) 5×10^{-13}

       (d) gravity of Earth causes space-time distortions

11   Half-life of A: 0.309 hr

       Half-life of B: 1.64 hr