These are answers to the exam questions, not complete solutions. Answers provided to questions requiring explanations do not represent complete solutions, and would not necessarily receive the full marks allocated on the exam paper. Many marks are given on the exam for ‘working’ (i.e. for showing that you understand the relevant physics), and a numerical answer alone is not always sufficient to gain full marks.

1. (a) Explanation required.
(b) The speed would be the same on the Moon as it would be on Earth. Explanation required.
(c) (i) It speeds up.
(ii) Explanation required.
(d) Explanation required.

2. (a) Graph required.
(b) Slider 1: initial velocity 12 m/s. Final velocity –4 m/s.
Slider 2: initial velocity 0 m/s. Final velocity 8 m/s.
(c) Momentum is conserved for the two sliders. Explanation required.
(d) \( \frac{m_1}{m_2} = \frac{1}{2} \).

3. (a) Diagram required.
(b) 62.2 N.
(c) 14.5 kg.

4. (a) 6.26 m/s.
(b) \( k = 2.12 \times 10^4 \) N/m. Note: if the change in gravitational potential energy while the trampoline stretches is ignored (not technically correct) then \( k = 1.88 \times 10^4 \) N/m.
(c) 36.2 cm. Note: if the change in gravitational potential energy is again ignored, the trampoline stretches 35.4 cm.
5.  
(a) 0.377 rad/s².
(b) G. Explanation required. Notes: When the turntable is rotating at 36 rev/min, the net force on the coin actually acts at an angle of 1.52° away from G in the direction of F. When the turntable starts rotating, the net force is in the direction E. The net force direction gradually moves closer to G as the turntable speeds up.
(c) 0.42 m/s.
(d) E. Explanation required.
(e) 0.160.

6.  
(a) 13 m/s.
(b) 11 m/s.
(c) No.
(d) 9.3 m.
(c) 13 J.

7.  
(a) When \( \theta \) is small enough that the restoring force on the bob is approximately linear with the angular displacement (i.e. when \( \sin \theta \) can be approximated by \( \theta \)).
(b) Graphs required.
(c) Graph required.

8.  
(a) Explanation required.
(b) Sketch required. (Note that the pulse speeds ought to be 2.0 cm/s and 1.0 cm/s.)
(c) Sketch required.

9.  
(a) (i) 3430 Hz.
(ii) Explanation required.
(b) (i) Less than 1.500 MHz. Justification required.
(ii) 375 Hz.
(iii) 500 Hz.
10. 
   (a) $10^6 \text{ W/m}^2$.
   (b) 60 dB.
   (c) You would hear an apparent frequency of 1001 Hz, beating louder and softer with a frequency of 2 Hz.
   (d) Graph required.

11. 
   (a) 1.48.
   (b) 428 nm.

12. 
   (a) $1.1 \times 10^{-9} \text{ m}$.
   (b) $20 \times 10^{-6} \text{ m}$. 