Further Mechanics

Physics

Nudger

Circular Motion

1. Derive $a = v^2/r$ from first principles. [23-24]

2. What is the difference between centrifugal and centripetal force?

3. Why do fallen leaves concentrate near the centre of a playground roundabout over the course of a day?

4. Why does dust concentrate near the centre of a vinyl record over the course of many plays?

5. Where do you feel heaviest when doing a loop-the-loop in a roller coaster?

6. Where is the string on a twirled pendulum (in a vertical circle) most likely to snap?

7. Why does washing stay against the side of a spin-dryer?

8. Which track feels the most force when a train goes round a corner: the inner or outer?

9. Explain what is happening to an orbiting satellite in terms of energy.

10. Draw and explain the free body diagram for a car travelling on a circular banked track: slowly; fast; at optimum speed.

11. Draw and explain the free body diagram for a plane banking in a circle.

12. What happens to the speed of the satellite as its orbit decays?

Simple Harmonic Motion

13. What is phase difference? [27]

14. For two cycles sketch graphs for: E_k-x, E_p-x, E_k-t, E_p-t, a-t, x-t, v-t, a-x and v-x. [28-31]

15. Derive $x = A\cos(wt)$. [30]

16. What is 'w' called in SHM? [31]

17. Give three examples of SHO. [33-39]

18. Under what conditions is $T = 2\pi(l/g)^{0.5}$ [36-7]

19. Under what conditions is $T = 2\pi(m/k)^{0.5}$ [33-35]

20. Draw the Amplitude-Driving Frequency curves for: light damping; heavy damping. [41-42]

21. Draw the x-t curves for: light damping; heavy damping; critical damping;

overdamping. [41-42]

22. Why does a rear-view mirror in a car sometimes vibrate?

23. Why do soldiers break stride when marching over bridges?

24. What would happen to the period of a swing if a you replaced a swinging thin child with a fatty?

25. What would happen to the period of a swing if you released it from a greater amplitude?

26. What is the Σk for three springs with stiffness k: in series; in parallel.