Oblique Projectile Motion

21. (b)

22. (d) Acceleration through out the projectile motion remains constant and equal to *g.*

23. (c)

24. (c) Time of flight= $\frac{2u\sin\theta}{g}$=$\frac{2\times 50\times \sin 30}{10} = 5s$

25. (b) Change in momentum = $2mu\sin\theta$

$=2\times 0.5\times 98\times \sin 30=45N-s$

26. (d) $R = 4H\cot\theta$, if R=3Hthen $\cot\theta = \frac{3}{4} \Rightarrow \theta = 53°8'$

27. (c) Became vertical downward displacement of both (barrel and bullet) will be equal.

28. (b) As $H = \frac{u^2\sin^2\theta}{2g} \therefore \frac{H_1}{H_2} = \frac{\sin^2\theta_1}{\sin\theta_2} = \rightleftarrows \frac{\sin^2 30°}{\sin^2 60} = \frac{1/4}{3/4} = \frac{1}{3}$

29. (d) $R = \frac{v^2\sin 2\theta}{g} \Rightarrow \theta = \frac{1}{2}\sin^{-1}\left(\frac{gR}{v^2}\right)$

30. (a) $T = \frac{2u\sin\theta}{g} = 10\ sec \Rightarrow u\sin\theta = 50\ m/s$

$\therefore\ H = \frac{u^2\sin^2\theta}{2g} = \frac{(u\sin\theta)^2}{2g} = \frac{50\times 50}{2\times 10} = 125m$

31. (b) For complementary angles range will be equal.

32. (b) $R = \frac{u^2\sin 2\theta}{g} = \frac{(500)^2\times \sin 30°}{10} = 12.5\times 10^3 m$

33. (a) $T = \frac{2u\sin\theta}{g} \Rightarrow u = \frac{T\times g}{2\sin\theta} = \frac{2\times 9.8}{2\times\sin 30} = 19.6m/s$

34. (c) $R = \frac{u^2\sin 2\theta}{g} = R \propto u^2$. So if the speed of projection doubled, the range will becomes four times,

i.e., $4\times 50 = 200m$

35. (c) Range will be equal for complementary angles.

36. (a) When the angle of projection is very far from 45° then range will be minimum.

37. (a) $H = \frac{u^2\sin^2\theta}{2g}$ and $T = \frac{2u\sin\theta}{g}$

So $\frac{H}{T^2} = \frac{u^2\sin^2\theta/2g}{4u^2\sin^2\theta/g^2} = \frac{g}{8} = \frac{5}{4}$

38. (a) $H_1 = \frac{u^2\sin^2\theta}{2g}$ and $H_2 = \frac{u^2\sin^2(90-\theta)}{2g} = \frac{u^2\cos^2\theta}{2g}$

$H_1H_2 = \frac{u^2\sin^2\theta}{2g}\times\frac{u^2\cos^2\theta}{2g} = \frac{(u^2\sin 2\theta)^2}{16g^2} = \frac{R^2}{16}$

$\therefore R = 4\sqrt{H_1H_2}$

39. (d) Standard equation of projectile motion

$y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$

Comparing with given equation

$A = \tan\theta$ and $B = \frac{g}{2u^2\cos^2\theta}$

So $\frac{A}{B} = \frac{\tan\theta\times 2u^2\cos^2\theta}{g} = 40$

(As $\theta = 45°,\ u = 20m/s,\ g = 10m/s^2$)

40. (b) Range$=\frac{u^2 \sin 2\theta}{g}$. It is clear that range is proportional to the direction (angle) and the initial speed.