

## Projectile Motion Questions

1. Draw a diagram to represent the motion of a projectile. Draw vectors at five points (evenly spaced from start to finish) on the diagram representing acceleration and velocity at each point.
2. How does the downward component of the motion of a projectile compare to the motion of an object in free fall?
3. Why is it that the vertical component of a projectile's velocity accelerates but the horizontal doesn't?
4. An object thrown horizontally off a cliff takes 5.3 seconds to hit the ground.
  - a) Calculate the height of the cliff
  - b) How fast vertically was the projectile going on impact?
5.
  - a) Calculate the vertical and horizontal components of a projectile launched at  $31.0^\circ$  above the horizontal with a speed of  $11.2 \text{ ms}^{-1}$
  - b) Calculate the time the projectile takes to hit the ground if it is launched from ground level.
  - c) Calculate the range of the projectile.
  - d) Calculate the horizontal and vertical components of the velocity on impact.
  - e) Find the velocity vector on impact
  - f) Calculate the maximum height of the projectile
6. The projectile in question 5 is launched again from the ground at an angle of  $59.0^\circ$ .
  - a) Show that the range of the projectile is the same.
  - b) Discuss why the range is the same even though the time of flight is longer.
7. Draw the path of a projectile without air friction, and a possible path if there were air friction.
8. Calculate the time of flight and horizontal range of a package dropped from a plane 200m above the ocean, if the plane was moving at  $20 \text{ ms}^{-1}$  when the package was dropped.
9. A cannon fires a cannonball from ground level at  $42 \text{ ms}^{-1}$  at an angle of  $60.5^\circ$  above the horizontal.
  - a) Find the time of flight and horizontal range of the cannonball
  - b) Calculate the velocity of the cannonball on impact
10. Discuss the effect of increasing the launch height of a projectile and the reasons why.