1. James and John dive from an overhang into a lake. James drops straight down from the edge. John takes a running start and jumps with an initial horizontal velocity of 25 m/s. When they reach the lake below,

A)the speed of James is larger than that of John.   B) the speed of John is larger than that of James.

C) they have the same speed.   D) the speed of James will always be 9.8 m/s larger than that of John.

E) the speed of John will always be 25 m/s larger than that of John.

The vertical component of velocity is the same for both. The horizontal component of velocity is the same as what it was when they jumped (0 for James and 25 m/s for John). Thus John's speed is greater.

Correct answer is B

2. Same as question 1….Who reaches the surface of the lake first?

A) James   B) John   C) They reach the surface of the lake at the same time.

The vertical motion is the same, since they started with the same vertical velocity (0)

Correct answer is C

3. The horizontal and vertical components of the initial velocity of a ball are 16 m/s and 20 m/s respectively. How long does it take for the ball to rise to the highest point of its trajectory?   (take g=10 m/s^2)

A) 1.0 s   B) 2.0 s   C) 3.0 s   D) 4.0 s   E) 5.0 s

$V_y = V_{0y} - gt$ .... At the top $V_y = 0$ → $t = V_{0y}/g = 20/10 = 2$ sec

Correct answer is B

4. A jumper in the long-jump goes into the jump with a speed of 12 m/s at an angle of 20° above the horizontal. How long is the jumper in the air before returning to the Earth?

A) 0.21 s   B) 0.42 s   C) 0.84 s   D) 1.3 s   E) 1.6 s

As seen in 3, the time taken to get to the top is V_{0y}/g. It then takes the same amount of time to come down → $t = 2 V_{0y}/g = 2 V_0 \sin20 / g = 2*12*\sin20/9.8$

$t= 0.84$ sec   → **Correct answer is C**.

Another way of doing it: $y= V_{0y} t - \frac{1}{2} g t^2$, set y=0, solve for t, get same answer

5. Same as question 4.....How far does the jumper jump?

A) 3.4 m   B) 6.2 m   C) 9.4 m   D) 15 m   E) 18 m

$x = V_{0x} t = V_0 \cos20\, t = 12 \cos20\, 0.84$ m $= 9.4$ m   **Correct answer is C**