**PHYSICS UNIT 3 SKILLS TEST 2 *(Projectile Motion)* NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*(22 Marks, 22 Minutes)*

Oleg kicks a ball from ground level at an angle of 25º to horizontal. Its initial velocity is 20 m/s, find

a) the maximum height it can reach

0=

*(3 Marks)*

b) the total time required for the ball to reach the ground again

Twice time to reach top

1.72 s

*(2 Marks)*

c) the horizontal displacement when the ball hits the ground

*(2 Marks)*

d) The soccer goals are 2.44m high and 6m away. Presuming Oleg kicks straight and the goalie is poorly positioned, does Oleg score a goal? Show working.

Time to goal:

Height at this time =

= 20sin25-

which is under the 2.44m bar

Oleg scores!

*(3 Marks)*

2. A cannonball is fired off a cliff 60m high at a speed of 35ms-1 in a direction 53º above the horizontal. Where will the cannonball land? (Horizontal distance from firing point)

In vertical:

In horizontal:

*(6 Marks)*

3. An arrow is to be fired at 61ms-1 at an angle to the horizontal, hitting the centre of a target 25m away at the same height as the arrow was released.

a) Derive an expression for (time in flight) based on the horizontal displacement.

*(1 Mark)*

b) Derive an expression for based on the vertical displacement?

(Vertical Speed at start = vertical speed at end but in opposite direction)

*(1 Mark)*

c) By equating your two expressions, calculate the angle to the horizontal that the arrow must be fired at? (*Hint*: )

*above horizontal*

*(4 Marks)*