

--	--	--	--	--

Centre Number

Section I – Part B (continued)

--	--	--	--	--	--	--	--	--

Student Number

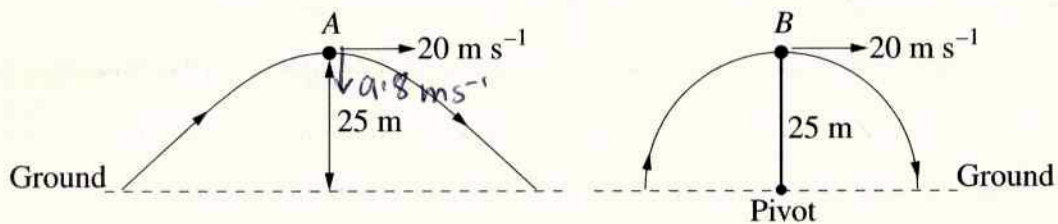
Marks

Question 18 (6 marks)

$v = 47 \text{ at}$
 $22.3 = 9.8 t$
 $t =$

A 30 kg object, A, was fired from a cannon in projectile motion. When the projectile was at its maximum height of 25 m, its speed was 20 m s^{-1} .

An identical object, B, was attached to a mechanical arm and moved at a constant speed of 20 m s^{-1} in a vertical half-circle. The length of the arm was 25 m.



Ignore air resistance.

- (a) Calculate the force acting on object A at its maximum height. 1

$F = mg$
 $= 30 \times 9.8$
 $= 294 \text{ N}$

- (b) Calculate the time it would take object A to reach the ground from its position of maximum height. 2

$v^2 = u^2 + 2as$
 $22.3^2 = 20^2 + 2(9.8)s$
 $22.3 = 9.8t$
 $t = 2.28 \text{ s}$

- (c) Describe and compare the vertical forces acting on objects A and B at their maximum heights. 3

The force acting on A is gravitational force, the force acting on B is centripetal force. Centripetal force is dependant on the radius, while gravitational force is constant. The force on B is greater than on A.

$F_c = \frac{mv^2}{r}$
 $= 480 \text{ N}$
 $F_g = mg$
 $= 294 \text{ N}$

Question 19 (4 marks)

How does Einstein's Theory of Special Relativity explain the result of the Michelson-Morley experiment?

4

The purpose of Michelson-Morley experiment was to find if the velocity of light varies with its direction and if possible use the variation to work out the direction and velocity of "ether wind" relative to the earth. There should be change in their interference pattern as they rotate apparatus. But, there is not that change. So the result is "There is no such thing called ether" and ether model is discarded. Einstein's Theory of Special Relativity explain the result that: the speed of light is constant value at all directions.

Question 20 (4 marks)

The electrical supply network uses a.c. and a variety of transformers between the generating stations and the final consumer.

4

Explain why transformers are used at various points in the network.

when the power ~~leaves~~ leaves the station it goes through a step up transformer where the current is decreased and voltage increased so it can travel through the wires with little resistance therefore using less power. When it reaches the consumer the power goes through step down transformers to supply them with enough current to run the household.