

Physics

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Centre Number

Section I – Part B (continued)

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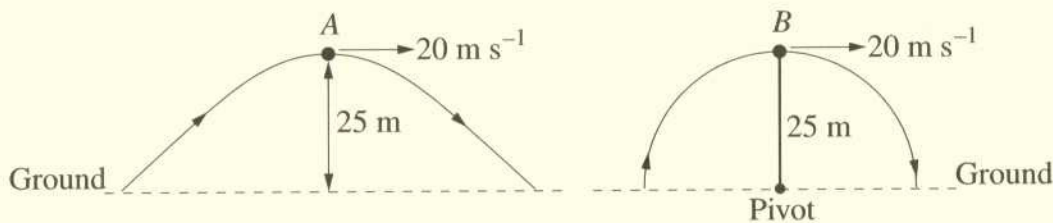
Student Number

Marks

Question 18 (6 marks)

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

Force = mass \times acceleration
 $F = 30 \times 20$
 $= 600 \text{ N}$

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

$25 = ut + \frac{1}{2}at^2$
 $20 = 20t - 9.8t$
 $t = \frac{20}{9.8}$
 $t = 2.04 \text{ sec}$

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

Both A & B would have the same gravitational potential but B would constantly be accelerating because of its centripetal action and the fact that it was the pivot not gravity that made the object fall.

Marks

Question 19 (4 marks)

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

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The initial frames of reference, is what was used by Michelson and Morley, in the Michelson-Morley experiment, to prove that ether did not exist. Relativity, in reference to Michelson & Morley's experiment, meant that if ether would travel in the same direction as Earth's frame of reference, then when the experiment is rotated 90° the ether will ~~be~~ alter the light. The light did not alter, hence light does not need ether, for it to travel, ^{therefore} ~~therefor~~ ether did not exist.

Question 20 (4 marks)

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

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

They are used to sep up and down voltages, because the higher the voltage the less the resistance is thus you lose less energy which means higher voltages are more economical for ~~being~~ distributing electricity, they sep down voltage as it comes to towns etc so as homes can use it to operate appliances