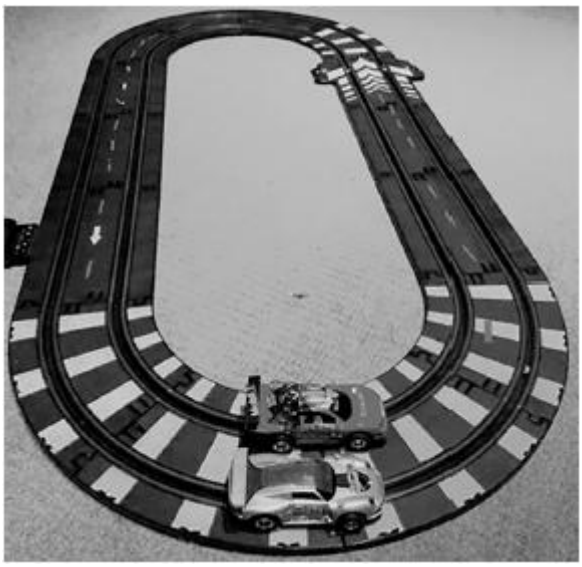
Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 6_ Further Mechanics

Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Q1.

The photograph shows a model racing car set. The curved parts of the track are semicircular. The car makes electrical contact with the track using metal brushes underneath the car.



There is a maximum speed for the car to stay on the curved part of the track. Explain why the car will slip off the curved part of the track if the car exceeds the maximum speed.

(3)

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

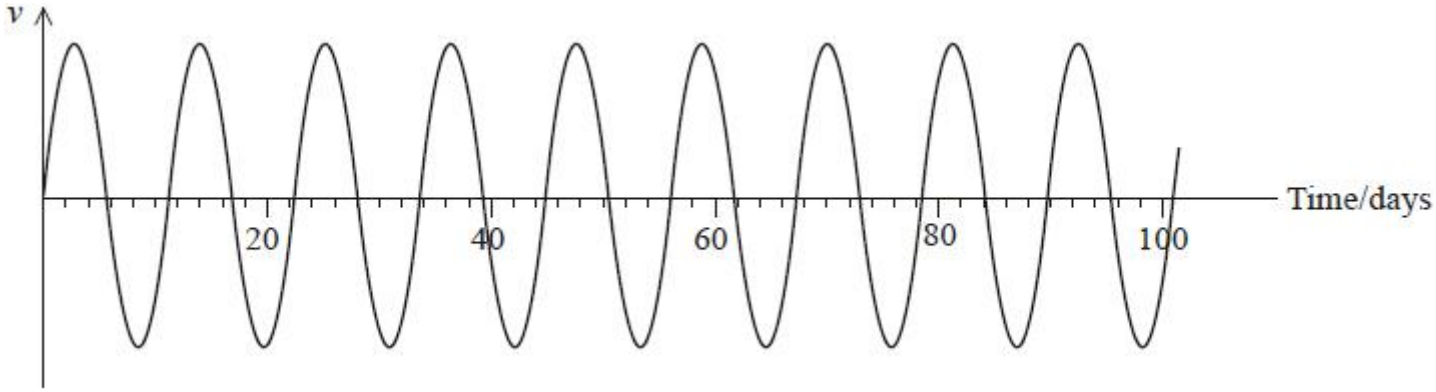
Q2.

In 2016 astronomers announced the discovery of an Earth-like planet orbiting Proxima Centauri, the closest star to the Sun.

The planet was detected because of the small movement of the star as the planet orbited. The movement was

detected using the Doppler shift in the frequency of light travelling to the Earth.

The graph shows how the component of the star's velocity *v* towards the Earth varied over time.



(i) Use the graph to show that the angular velocity of the planet is about 6×10^{-6} radian s^{-1}.

(3)

.....

.....

.....

.....

.....

.....

(ii) The mass of Proxima Centauri is 0.12 times the mass of the Sun.

Determine the distance of the planet from Proxima Centauri.
mass of Sun = 1.99×10^{30} kg

(3)

.....

.....

.....

.....

.....

.....

.....

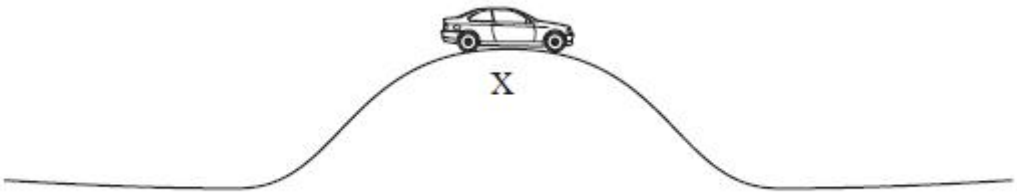
Distance = ...

(Total for question = 6 marks)

Q3.

The photograph shows a bridge.

The diagram shows a car of mass 950 kg at the highest point X of the bridge.



The bridge forms part of a vertical circle of radius 20.0 m.

(a) Calculate the total upward force *R* of the road on the car:

(i) when the car is stationary at X,

(1)

.....

.....

R = ...

(ii) when the car is passing point X at a speed of 12.0 m s^{-1}

(3)

.....

.....

.....

.....

.....

.....

R = ...

(b) The car is repeatedly driven over the bridge at gradually increasing speeds. Above a certain speed the car loses contact with the road at X.
State why this happens.

(1)

.....

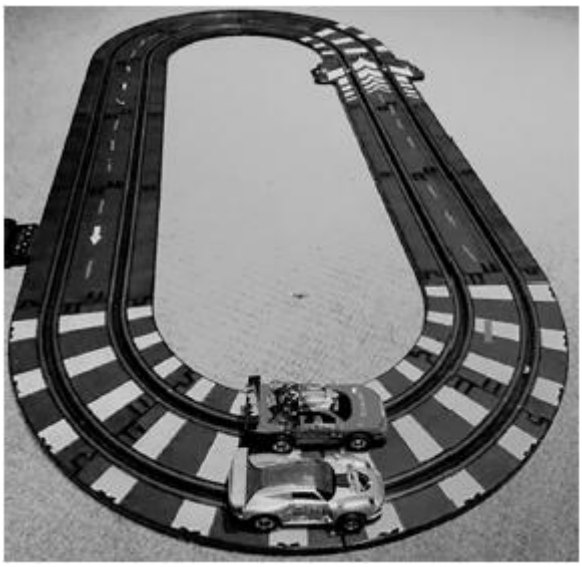
.....

.....

(Total for question = 5 marks)

Q4.

The photograph shows a model racing car set. The curved parts of the track are semicircular. The car makes electrical contact with the track using metal brushes underneath the car.



The cars are controlled separately and so can be raced, with one car on the inner lane and the other on the outer lane. The cars are identical. Each car is raced at its highest speed for that lane.

Explain why the outcome of the race is difficult to predict.

(3)

.....

.....

.....

.....

.....

(Total for question = 3 marks)