

Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 2 (Mechanics)

Name of the Student: _____

Max. Marks : 17 Marks

Time :17 Minutes

Q1.

Some sports place high stresses on the bones in the body, which can result in injury.

A gymnast of mass 45 kg dismounts from a beam. Her centre of mass is displaced through 1.6 m vertically before her feet touch the ground.

As she lands, the bones in the lower part of her legs experience a force from the ground. The time between hitting the ground and coming to rest is 0.90 s.

(i) Calculate the mean force from the ground on the gymnast.

(4)

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Mean force from the ground =

(ii) Explain how bending both knees when landing helps the gymnast prevent an injury.

(3)

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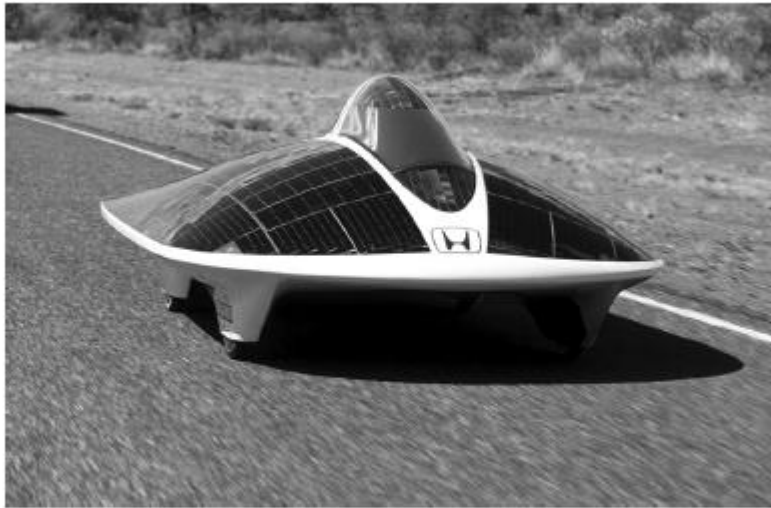
(Total for question = 7 marks)

Q2.

The world solar challenge is set every two years, in Australia. The challenge is to complete a three thousand

kilometre route with a vehicle powered only by the Sun.

Vehicles have their surfaces fitted with solar panels, as shown in the photograph.



(Source: © LAURENT DOUEK/LOOK AT SCIENCES/SCIENCE PHOTO LIBRARY)

The vehicle can reach a maximum speed of 34 m s^{-1} on flat ground. The electric motor used to move the vehicle has a power of 4.5 kW.

(i) Calculate the initial acceleration of the vehicle as it starts from rest.

mass of vehicle and driver = 420 kg

(3)

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Initial acceleration =

(ii) State one assumption made in this calculation.

(1)

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(Total for question = 4 marks)

Q3.

Two ice skaters are gliding across the horizontal ice surface at an ice rink.



(Source: © ITAR-TASS News Agency/Alamy Stock Photo)

Initially the skaters move together with a speed of 5.6 m s^{-1} .

The male skater pushes the female skater forwards. After being pushed, she has a forward speed of 7.5 m s^{-1} .

Calculate the speed of the male skater immediately after pushing the female skater forwards.

mass of male skater = 66 kg

mass of female skater = 52 kg

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Speed of male skater =

(Total for question = 3 marks)

Q4.

When food is cooked in a microwave oven, microwave radiation is absorbed by water molecules, increasing the internal energy of the food.

A student heats water in a microwave oven for 1 minute to determine the efficiency of the oven at transferring energy to the water. The current in the microwave oven is 5.0 A and the potential difference is 230 V. The increase in internal energy of the water is 29 000 J.

Calculate the efficiency of the microwave oven at heating the water.

(4)

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Efficiency =

Q5.

A website advertises an electric car with the following information.



EFFICIENCY 195 W h / km

USEABLE BATTERY CAPACITY 22 kW h

BATTERY CHARGING POWER 3.6 kW

CHARGING TIME 7 HOURS

RANGE 129 km

Calculate the efficiency of the battery.

(3)

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Efficiency =

(Total for question = 3 marks)