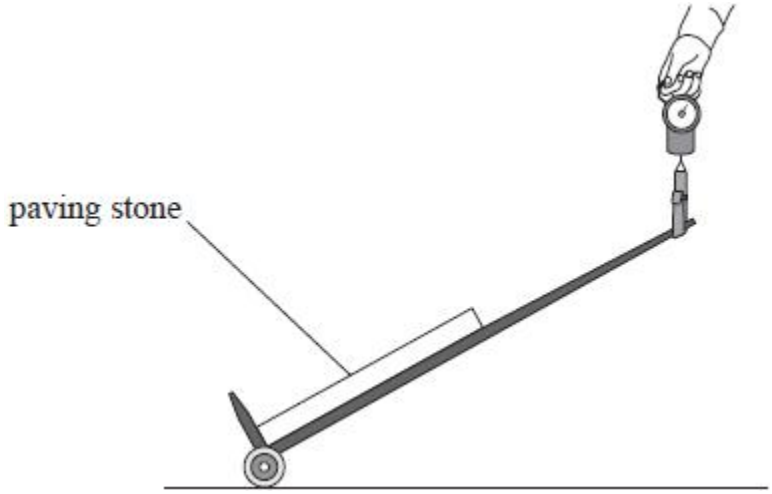
Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 2 (Mechanics)

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

Q1.

A gardener used a trolley to move a paving stone.



A force meter was attached to the handle of the trolley.

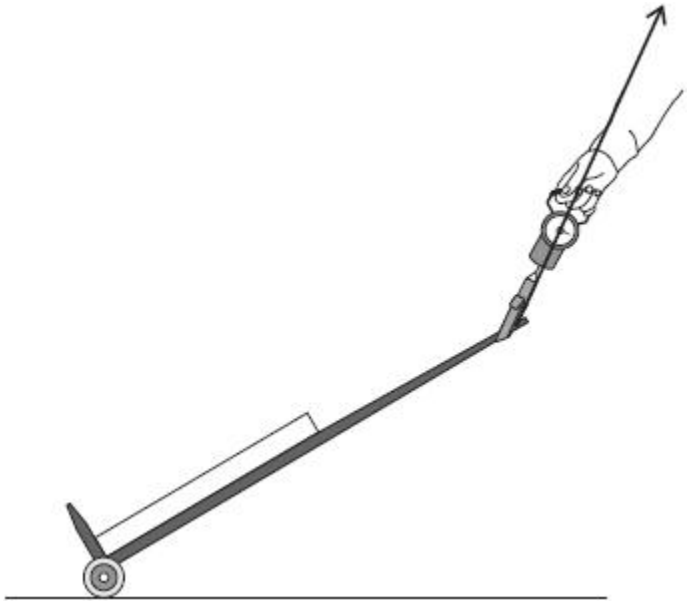
The gardener recorded the following measurements when the trolley was at rest in the position shown in the diagram.

mass of trolley and paving stone = 18.5 kg

length of trolley = 97 cm

force on handle = 50 N

The gardener then pulled the trolley and measured the applied force while the trolley was moving.



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The direction of the applied force is 25° to the vertical, as shown by the arrow.

(i) Calculate the magnitude of the applied force.

Assume the magnitude of the vertical component of the force remains at 50 N.

(2)

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Magnitude of applied force = ...

(ii) The gardener continues to walk and pulls the trolley a distance of 15 m in a time of 4.2 s.

Calculate the power developed while pulling the trolley.

(3)

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Power = ...

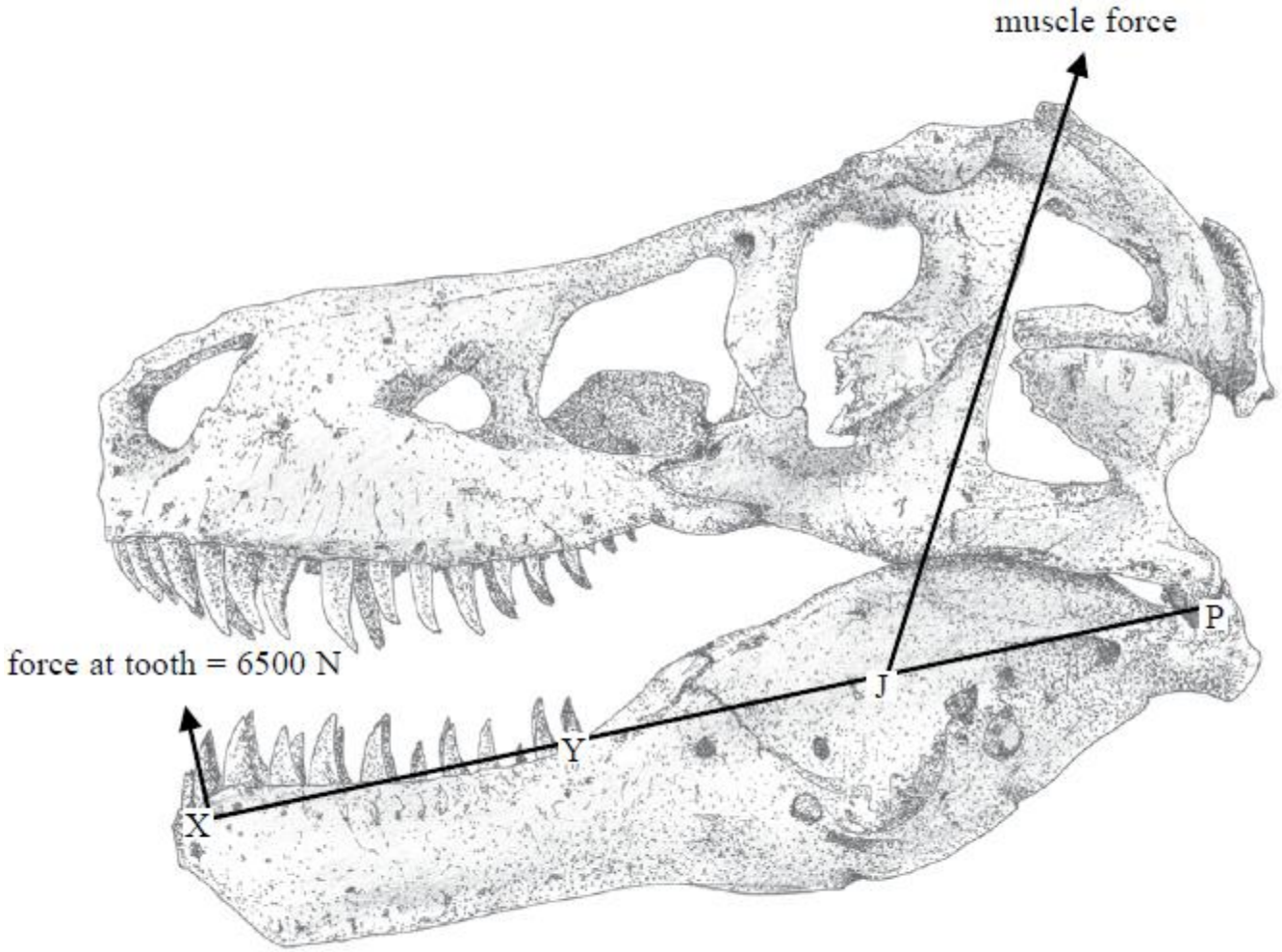
(Total for question = 5 marks)

Q2.

Extinct animals can be studied by using their fossils. 70-million-year-old fossils from the *Tyrannosaurus rex* and *Triceratops* dinosaurs show that a *Triceratops* was sometimes eaten by a *Tyrannosaurus rex*.

The diagram shows a *Tyrannosaurus rex* skull.

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On the diagram, the position of the main biting muscle is indicated by the line labelled 'muscle force'. The muscle is connected to the jaw at point J. This produces a moment about point P where the jaw is hinged. Teeth marks found in fossilised *Triceratops* bones show that the force exerted by a tooth at the front of the jaw X could reach 6500 N.

The skull is drawn to a scale of 1 to 10. The force arrows are **not** drawn to scale.

Take measurements from the diagram to determine the size of the muscle force when the force exerted by the tooth at X is 6500 N.

(5)

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Muscle force = ...

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(Total for question = 5 marks)

Q3.

An electric motor takes 45.0 s to lift a mass of 800 kg through a vertical height of 14.0 m.
The potential difference across the motor is 230 V and the current is 13.0 A.

Calculate the efficiency of the motor.

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Efficiency = ...

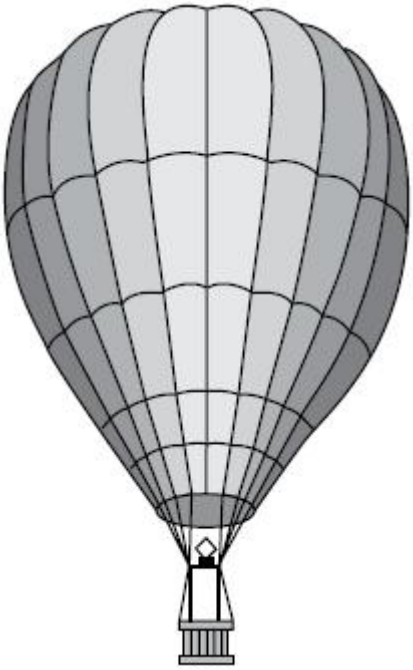
(Total for question = 3 marks)

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Q4.

Newton's laws relate the changes in motion of an object to the forces acting on the object.

A hot-air balloon is made of an envelope, containing hot air, with a wicker basket suspended from it. The balloon rises upwards because the heated air in the envelope is less dense than the surrounding air.



The total volume of the hot-air balloon is 2880 m^3. The total mass of the hot-air balloon, including the envelope, is 3400 kg. The density of the surrounding air is 1.20 kg m^{-3}.

Calculate the initial upward acceleration of the balloon.

(4)

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Initial acceleration = ...

(Total for question = 4 marks)

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