

Name of the Student: _____

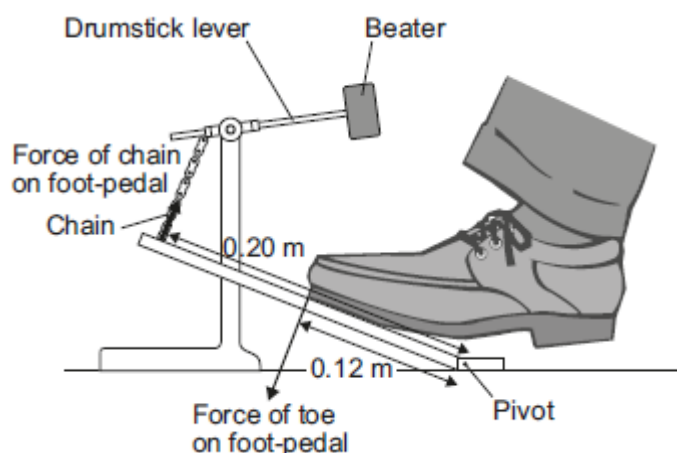
Max. Marks : 26 Marks

Time : 26 Minutes

Q1.

A drum is hit by a beater attached to a drumstick lever. The drumstick lever is attached to a foot-pedal by a chain, as shown in the **Figure 1**.

Figure 1



(a) When the toe is pushed down the force creates a moment on the foot-pedal.

(i) State what is meant by the moment of a force.

(1)

(ii) The foot-pedal is pushed halfway down and held stationary. The toe and the chain both exert a force on the foot-pedal.

Compare the sizes and directions of the moments caused by the force of the toe and the force of the chain on the foot-pedal.

(1)

(iii) The drummer's toe pushes with a 1.5 N force on the foot-pedal. The perpendicular distance from the pivot to the force is 0.12 m. The perpendicular distance from the pivot to the chain is 0.20 m.

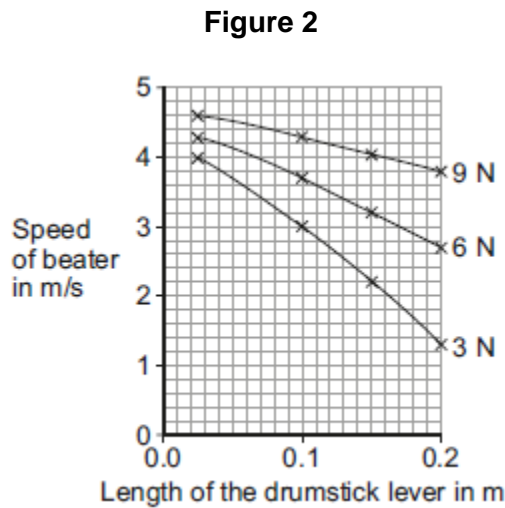
Calculate the force of the chain acting on the foot-pedal.

Force = _____ N

(3)

- (b) The foot-pedal is pushed with different forces to make the beater move at different speeds. The higher the speed at which the beater hits the drum, the louder the sound the drum makes.

Figure 2 shows how the length of the drumstick lever affects the speed of the beater for three different forces.



The drummer needs to be able to sometimes play the drum quietly and sometimes loudly.

How does the **length** of the drumstick lever affect the variation in loudness of the sound from the drum when applying:

a force of 3 N? _____

a range of forces from 3 N to 9 N? _____

(2)

(Total 7 marks)

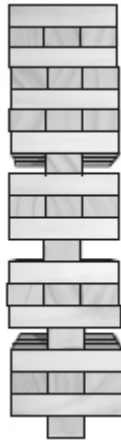
Q2.

In a balancing game, wooden blocks are used to build a tower. The shape of the tower at the start of the game is shown in **Figure 1**. During the game, some of the blocks are taken out and put on top of the tower as shown in **Figure 2**. This causes the centre of mass of the tower to change.

Figure 1



Figure 2



- (a) (i) State what is meant by the term 'centre of mass'.

(1)

- (ii) Give **two** reasons why the tower in **Figure 2** is less stable than the tower in **Figure 1**.

1. _____

2. _____

(2)

- (b) **Figure 3** shows a different arrangement for the wooden blocks.

Figure 3

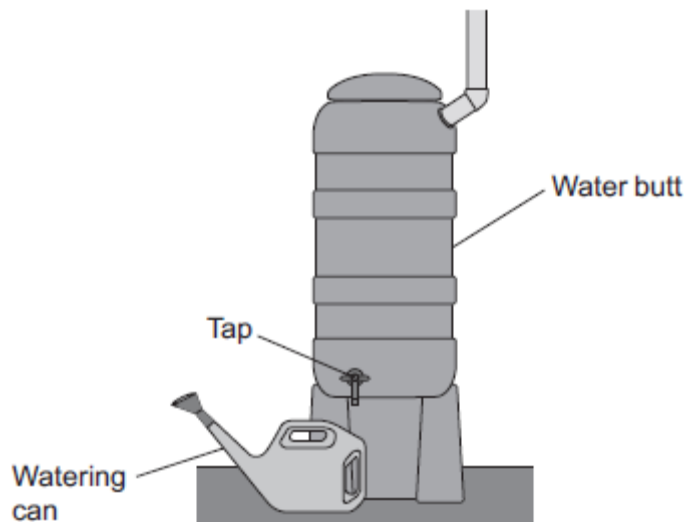


A block was placed in position **A** and an identical block was placed in position **B** at the same time.

Explain why the tower did not fall over. You should include reference to moments in your answer.

Q3.

The diagram shows a water butt used to collect rainwater.



A tap allows water to be collected from the water butt in a watering can.

- (a) If the tap was placed higher up on the water butt, what difference would it make to the rate of flow of water from the tap?

Explain your answer.

(2)

- (b) A hosepipe is now attached to the tap. The hosepipe takes water to where it is needed.

A gardener did an investigation to see how the rate of flow of water through a hosepipe, from a water butt, varies with the length of the hosepipe.

His results are shown in below table.

Length of hosepipe in metres	Water collected in 10 seconds in cm^3
2.0	500
3.0	500

4.0	500
5.0	500
10.0	250
15.0	170

(i) What conclusions can you make based on the results in the table above?

(2)

(ii) Suggest further readings that should be taken to improve the investigation.

Give reasons for your answers.

(4)

(c) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

You are provided with a water butt and lengths of hosepipe of different diameter.

Describe how you would investigate how the rate of flow of water through a hosepipe varies with the diameter of the hosepipe.

In your description you should include:

- any additional equipment that you would use
- any measurements you would make using the equipmentz
- any variables that need to be controlled and how this would be achieved.

(6)
(Total 14 marks)