

Name of the Student: _____

Max. Marks : 18 Marks

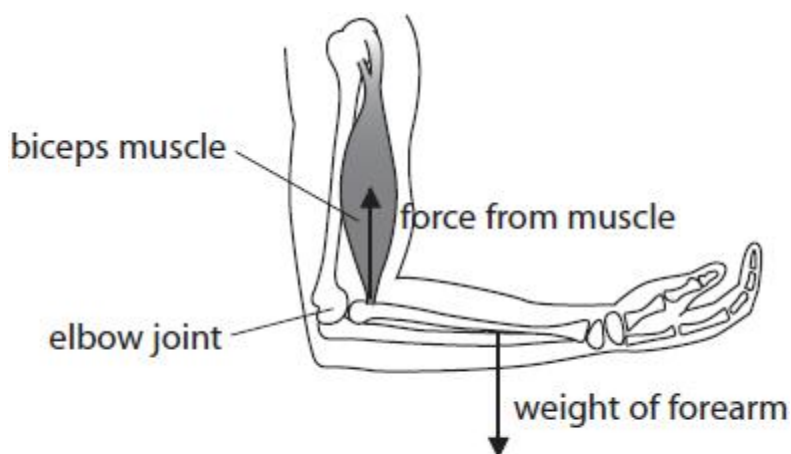
Time : 18 Minutes

Q1.

Figure 12 shows some of the bones and muscles in an arm.

The arrows show the forces on the forearm when the arm is bent.

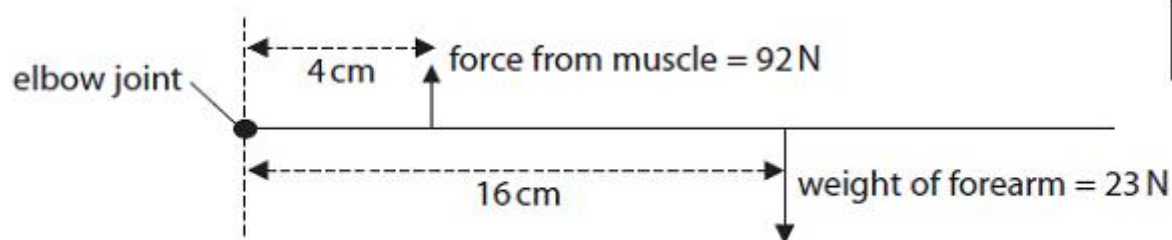
The hand is empty.

**Figure 12**

The biceps muscle provides a force to balance the weight of the forearm.

The weight of the forearm can be represented as a single force.

Figure 13 shows a diagram representing the forces and distances involved.

**Figure 13**

(i) Use the principle of moments to show that the system shown in Figure 13 is in equilibrium.

(2)

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(ii) The person then holds a ball weighing 15 N in their hand.

Figure 14 shows the forces on the forearm and their distances from the elbow joint.

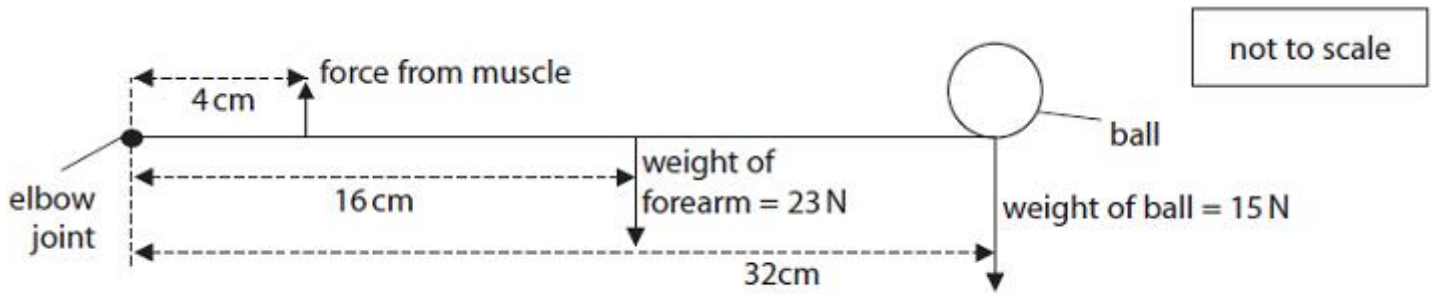


Figure 14

Calculate the force from the muscle that is needed to keep the system in Figure 14 in equilibrium.

(3)

force = N

(Total for question = 5 marks)

Q2.

*Figure 24 shows a wooden block connected to a weight by a string.
The string goes over a pulley.
The surfaces of the table and the wooden block are both rough.

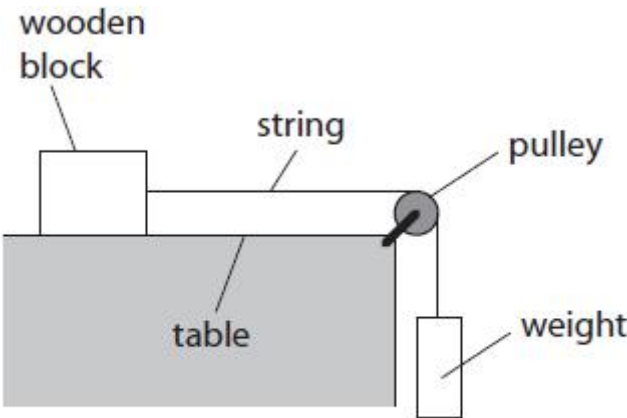


Figure 24

The wooden block moves across the table at a constant horizontal velocity.
Several vertical and horizontal forces act on the wooden block as it moves.
Explain how the forces keep the wooden block moving across the table at a constant horizontal velocity.
Your answer should refer to all forces acting on the wooden block.
You may add to the diagram to help with your answer.

(6)

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(Total for question = 6 marks)

Q3.

Figure 2 shows an open door.

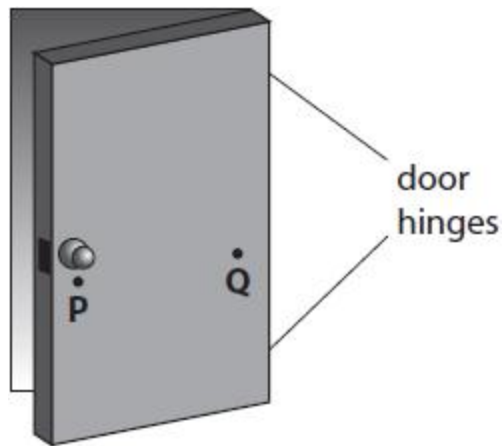


Figure 2

Explain why it is easier to close the door by pushing at point **P** rather than pushing at point **Q**.

(2)

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(Total for question = 2 marks)

Q4.

Figure 7 shows a person trying to lift a large rock using a metal bar.

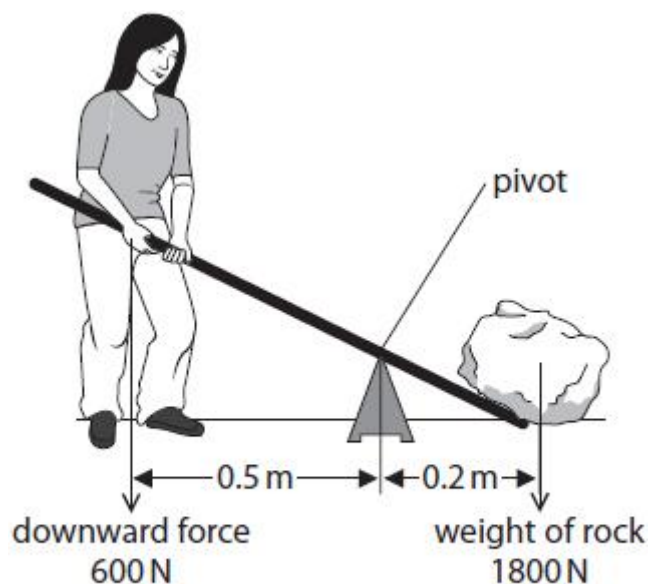


Figure 7

The rock weighs 1800 N.

The person can only produce a downwards force of 600 N.

The person cannot lift the rock.

(i) Explain, using calculations, why the person cannot lift the rock.

(3)

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(ii) Explain **one** change to the arrangement that will make it possible for this person to lift the rock.

(2)

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(Total for question = 5 marks)