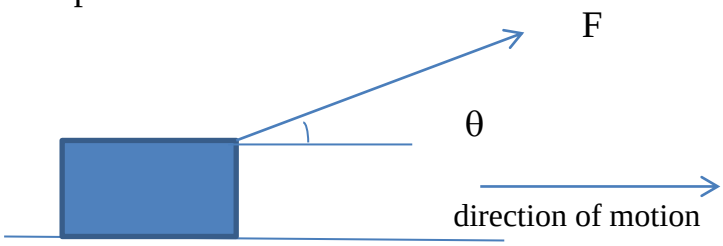
Practice I

(Unit 1)

Q1. What of the base unit for the following

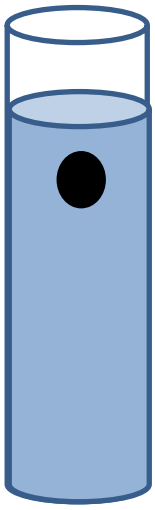
a. velocity _____ , b. acceleration _____ , c. moment _____ , d. potential energy _____ , e. work _____ , f. density _____ , g. viscosity _____ , h. strain _____ , i. young modulus _____ .

Q2. A rope is used to pull a box a fixed distance s along a horizontal surface. The rope is at an angle θ to the horizontal and a constant force F is applied to the rope as shown.



Explain how the work done on the box by F varies as θ varies.

Q3. A student carried out an experiment to determine the viscosity of washing up liquid using the apparatus shown.



(a) The student released the sphere at the top of cylinder and made measurements, using a stopwatch and metre rule, so the terminal velocity of the sphere could be determined.

i. Describe a method that the student could use to determine an accurate value for the terminal velocity of the sphere. You may add to the diagram above.

ii. Explain why the use of large sphere would increase the percentage of uncertainty in the calculated value of the terminal velocity.

(b) i. complete the free-body force diagram for the sphere when travelling at terminal velocity.

ii. The student obtained a value of 0.16 ms^{-1} for the terminal velocity of the sphere. Calculate the viscosity η of the washing up liquid in Pa s.

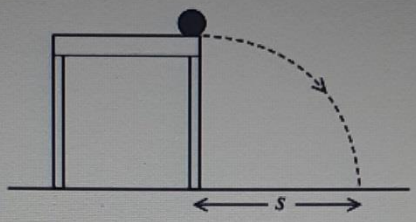
where, radius of sphere = 4.8×10^{-3} m , weight of sphere = 3.5×10^{-2} N, density of washing up liquid = 1.1×10^{3} kgm^{-3}

Q4. A sphere of weight 2.5 N floats in water with 1/2 of its volume beneath the surface. A force F is applied to the sphere, completely immersing in the water as shown.

What is the minimum value of F?

Q5.

A ball rolls off a table with a horizontal velocity of $1.2\,m\,s^{-1}$. The ball takes 0.9 s to reach the ground and lands a distance s from the table as shown.

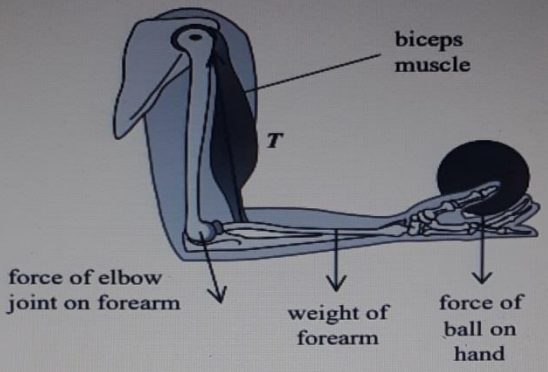


Which of the following expressions could be used to determine the value of s in metres?

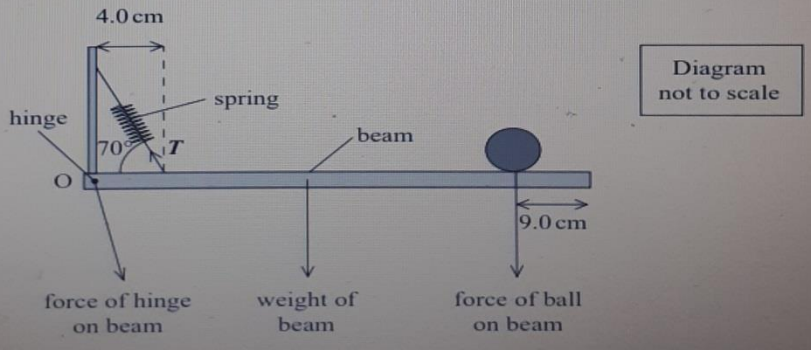
- ☒ **A** $\dfrac{1.2^2}{2 \times 9.81}$
- ☒ **B** 1.2×0.9
- ☒ **C** $\frac{1}{2} \times 9.81 \times 0.9^2$
- ☒ **D** $(1.2 \times 0.9) + (\frac{1}{2} \times 9.81 \times 0.9^2)$

Q6.

Muscles move body parts by contracting and relaxing. For the forearm to hold a ball in the position shown, the biceps muscle contracts, creating a tension T in the muscle as shown.



A student modelled the forces on the forearm using a uniform beam and spring arrangement as shown below. The length and weight of the beam were the same as the length and weight of the forearm.



7 A water pump causes 200 g of water to be ejected from the nozzle of a garden hose each second at a velocity of $3\,m\,s^{-1}$.

Which of the following expressions could be used to determine the minimum output power in watts required from the pump?

☒ **A** $\frac{200 \times 3^2}{2}$

☒ **B** $\frac{0.2 \times 3^2}{2}$

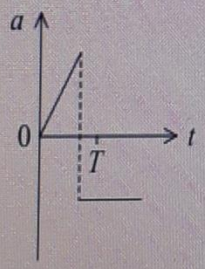
☒ **C** $\frac{200 \times 3}{2}$

☒ **D** $\frac{0.2 \times 3}{2}$

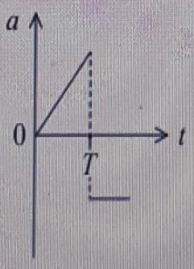
(Total for Question 7 = 1 mark)

8 A model rocket is launched and moves vertically upwards while still burning fuel to give a constant upwards thrust. The fuel runs out, and the rocket reaches the maximum height at time T before falling back to the ground.

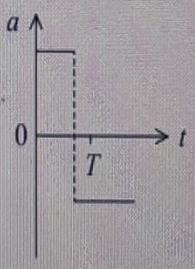
Which of the following graphs could show how the acceleration a of the rocket varies with time t, if the decrease in mass as the fuel burns is neglected?



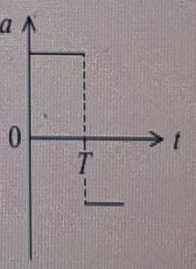
☐ **A**



☐ **B**



☐ **C**



☐ **D**

(Total for Question 8 = 1 mark)

Good Luck