

Part 1 (8 marks): Indicate the answer choice that best completes the statement or answers the question

A ball of mass m is hanged vertically at the end of a spring having force constant

Q1: $k = 600 \text{ N/m}$. As a result, the spring stretches by $x = 4 \text{ cm}$. What is the mass of the ball?

A 15 g B 244.9 kg c 27 kg. d 2.45 kg

Q2: A book of mass $m = 0.2 \text{ kg}$ is moving horizontally from left to right for a distance $d = 2\text{m}$. What is the work done by gravity in this motion?

A 3.92 J B 0J c 1.96 J d -3.92 J

Q3: A car engine is applying a constant force $F = 500 \text{ N}$ to move a car of mass $m = 1500 \text{ kg}$ from rest for a distance $d = 1 \text{ km}$ without friction. The final speed of the car is:

A 25.8 m/s B 1.41 m/s c 2 m/s d $2 \times 10^3 \text{ m/s}$

Q4: Suppose that you push a book put on a flat table with a force F_{push} . If the book does not move, which of the statements is correct:

A $F_{\text{push}} = f_k$ B $f_s < F_{\text{push}} < f_k$ c $F_{\text{push}} = f_{s,\text{max}}$ d $F_{\text{push}} \leq f_{s,\text{max}}$

a man of mass $m = 80 \text{ kg}$ is standing inside an elevator. If the elevator is

Q5: accelerating upwards and the apparent weight of the man inside the lift is equal to 1000 N , what is the acceleration a of the lift?

- A 5.4 m/s^2 B 22.3 m/s^2 c 2.7 m/s^2 d 9.8 m/s^2

A bee of mass $m = 5 \text{ g}$ is flying in a circular motion of radius $r = 50 \text{ cm}$ with a

Q6: constant speed v . If the centripetal acceleration of the bee is $a_{cp} = 0.16 \text{ m/s}^2$, what is the speed of the bee?

- A 0.283 m/s B 4 m/s c 2.83 m/s d 1.6 m/s

consider two cars of masses m_1 and m_2 respectively. If the speed of car 2 is the

Q7: half of the speed of car 1 and the mass m_2 is the quadruple of mass m_1 , which of the following statements is the correct one?

- A $KE_1 = 2 KE_2$ B $KE_2 = 4 KE_1$ c $KE_1 = KE_2$ d $KE_1 = \frac{1}{2} KE_2$

Q8: How much energy is generated by a 70-Watt heater in 4 minutes?

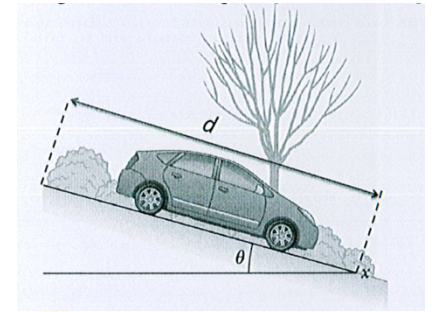
- A 280 J B 0.29 J c 16800 J d 17.5 J

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Part 2 (6 marks): Solve the following TWO problems in the provided space and show your work in detail.

Problem 1 (3 marks):

Consider a car of mass $m = 1300$ kg on an inclined plan (inclination angle $\theta = 30^\circ$).



a) (1 mark) If the car was at rest at the top of the inclined plan and about to move since friction reached its maximum, find the value of the static friction force $f_{s,max}$.

a) (1 mark) Determine the value of the coefficient of static friction μ_s

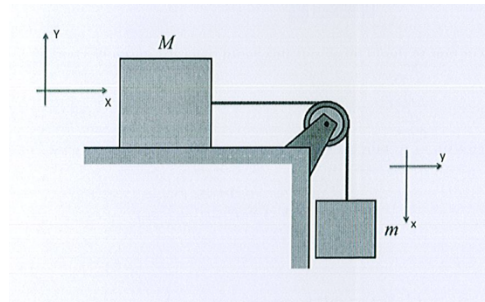
*b) (1 mark) If the car is moving down the incline **without friction**, calculate the acceleration of the car.*

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Problem2 (4 marks):

Two blocks are connected with an ideal string through, and ideal pulley as shown in the figure below.

The coefficient of kinetic friction between the table and block M is 0.3. The axes for each block are shown on the figure.



a) (1 mark) Draw the free body diagram for each block (all forces on block M and m)

b) (2 mark) Calculate the acceleration of the blocks (use $M = 10 \text{ kg}$ and $m = 20 \text{ kg}$)

c) (1 mark) Calculate the tension T in the string

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