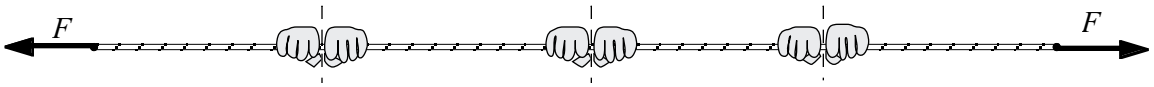
ISP209 30min_Exam-1**B** **Calculator and Pencil only.** Name:_____
September 18, 2003 **No books or notes.** ID:_____

Hooke's law: $F=kx$; Vectors: magnitude cannot be negative; sign (+/–) is the direction.

1. Of the following phenomena, the one due primarily to the electromagnetic force is:

a) beta decay of a radioactive isotope.
b) fusion of protons and neutrons in the sun.
c) orbits of the planet Saturn's rings.
d) emission of neutrinos from the sun.
e) temperature of a warm bath.



2. A long bungie cord stretched by forces, F, is grabbed by the close hands of three people, as shown above. The cord is cut between each pair of hands into 4 equal pieces. To keep the cord stretched as before, each hand must apply what force to the cord?

a) F b) $2F$ c) $F/6$ d) $F/4$ e) $F/3$

Consider the following statements:

I. Any chemical reaction is due to action of the electromagnetic force.
II. All phase changes in matter are due to the action of the electromagnetic force.
III. Every emission or absorption of light is due to the electromagnetic force.

3. Are the statements above true or false?

a) I, II, and III are false.
b) I is false, II and III are true.
c) I and II are false, III is true.
d) I and III are false, II is true.
e) I, II and III are true.

4. Which property of an object can change if brought to another planet

a) number of atoms in the object
b) number of protons in the object
c) the weight of an object
d) the mass of an object
e) none of the above

5. What is the spring constant, k , of a spring with normal length, 0.50 m, that is stretched to a final length, 0.90 m, by a force of 50 N?

a) 100 N/m b) 1000 N/m c) 55 N/m d) 2.5 N/m e) 125 N/m

$$x = (0.90 - 0.50)\ \text{m} = 0.40\ \text{m}; \quad F = 50\ \text{N}$$

$$k = \frac{F}{x} = \frac{50\ \text{N}}{0.40\ \text{m}} = \underline{125\ \text{N/m}}$$

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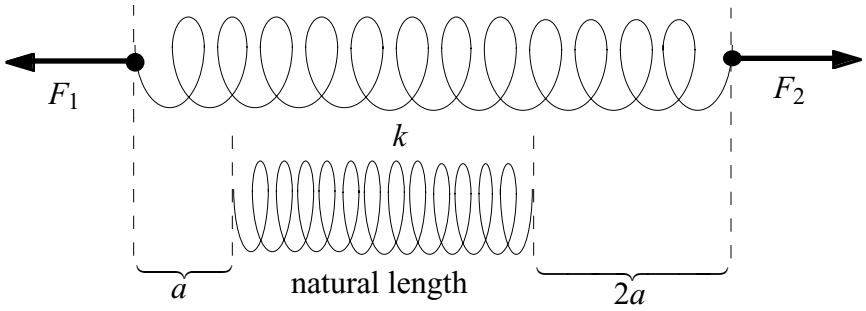

6. As shown above, forces applied to an ideal spring stretch it a distance, a, from one end and, $2a$, from the other end. What force **magnitudes** act on the spring ends?

a) $F_1 = ka$, $F_2 = 2ka$ b) $F_1 = -ka$, $F_2 = 2ka$ c) $F_1 = ka$, $F_2 = -2ka$ d) $F_1 = 3ka$, $F_2 = 3ka$ e) $F_1 = 3ka$, $F_2 = -3ka$

7. What is the magnitude of a 200 newton (N) force expressed in pound (lb) units? (choose the closest answer)

a) 440 lb b) 4000 lb c) 200 lb d) 22 lb e) 44 lb

$200\ \text{N} = 200\ \text{N}\left(0.22\ \text{lb}/1\ \text{N}\right) = \underline{44\ \text{N}}$ or $= 200\ \text{N}\left(\frac{1}{4}\ \text{lb}/1\ \text{N}\right) = \underline{50\ \text{lb}}$

8. The nucleus of a neutral atom contains 23 protons. This atom must contain what number of electrons?

a) 22 b) 23 c) 24 d) 46 e) the number varies with the isotope.

9. The nucleus of an atom has 35 protons. How many neutrons must be in this nucleus?

a) 34 b) 35 c) 36 d) 70 e) the number varies with the isotope.

10. A 10 cm long object has 1×10^{8} atoms along one edge. If the same object is stretched to a full length of 20 cm, what is the spacing of the atoms along the edge?

a) 2×10^{-7} cm
b) 1×10^{-7} cm
c) 2×10^{-8} cm
d) 5×10^{-8} cm
e) 1×10^{-8} cm

$$d = \frac{l}{n} = \frac{20\ \text{cm}}{1\times10^{8}} = \underline{2\times10^{-7}\ \text{cm}}$$