ISP209 Spring 2001 **Homework 5** Name: _____
Due: Thurs., Feb. 15, 2001, 2:40 pm, in Rm 118PA. ID:_____

1. Which force(s), electromagnetic(**E**), gravitational(**G**), weak nuclear(**WN**) or strong nuclear(**SN**), is(are) primarily responsible for the following (100% correct for credit):

photosynthesis. **E** .; friction. **E** ; emission of neutrons **SN** ; lubrication with oil. **E** ; orbiting. **G** ; lightning . **E** ; decay n –> proton+e+ν. **WN** ; thunder. **E** ; decay of tooth. **E** ; pain. **E** ; shape of a snowflake. **E** ; formation of diamonds **G & E**

2. Which of the following forces acts on only one object? (a) the gravitational force, (b) the force of a spring, (c) the electric force ,(d) the force of friction, (e) none of the above

3. An object will compress when two inward forces of magnitude, F, act on it.
4. F_G on a 1 kg mass is 10N. The 1 kg mass applies a force 10N on the Earth.
5. F_G is 100N on a mass on the earth. The mass is 10 kg and its weight is 100 N .

6. The gravitational force (use m in your answers) is: mg in the hand of the thrower, mg when moving upward, : mg at the highest point, : mg on the way down, and : mg when it hits the ground. The weight (*does* or *does not*) change in the motion.

7. M contains 10 masses, m_1. F_G acting on the large mass is $10m_1g$, and on the earth is also $10m_1g$.

8. The weight vectors are drawn. T is a) mg, and b) mg. (use m in your answers)

9. Rope spring constant k. $T = kx$; $T = mg$, $kx = mg$ therefore $x = \frac{mg}{k}$

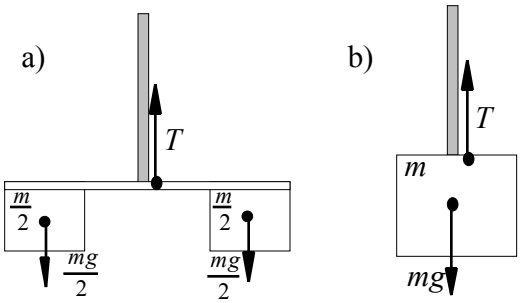

Fig. for 8 and 9.

10. The compression in each leg is 175 N. (see Fig. 5.12 for a similar situation)

11. $\rho = 8\text{gm}/\text{cm}^3$. The **weight** is 800 N.

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A rope, pulleys on a pole, and a spring (all massless) attached to the ground, support a mass m as shown. The spring is stretched, x, by the weight of the mass.

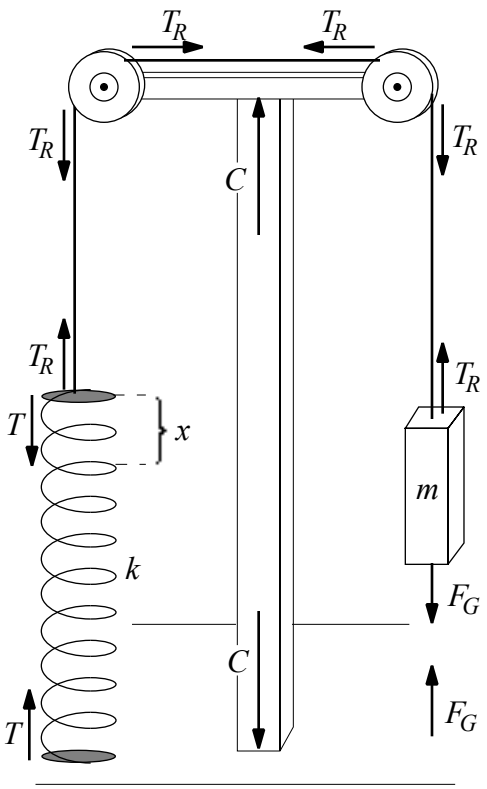

Fig. for problems 12 to 17

12. The gravitational force vectors are drawn on fig.

F_G = <u>mg</u> .

13. Tension force vectors are drawn on the fig.

T_R , = <u>mg</u>.

The relationship is <u>$F_G = T_R$</u>

The relationship between T_R and m is <u>$T_R = mg$</u>

14. Tension force vectors in spring are drawn on fig

The relationship between T_R and T is <u>$T_R = T$</u>

The relationship between T and m is <u>$T = mg$</u>

15. Compression forces vectors in the pole are drawn on the fig.

The relationship between C and T is <u>$C = 2T$</u>

The relationship between C and m is <u>$C = 2mg$</u>

16. The spring stretch is $x = mg/k$.

17. The force **vectors** are , **T** = $+T$, **C** = <u>$-C$</u> , and $\mathbf{F}_G$ = <u>mg</u> , acting **on** the earth (+ is up)

The vector sum is **T** + **C** + $\mathbf{F}_G$ = +T + (–C) + F_G = <u>$mg + (-2mg) + mg = 0$</u> .

The forces acting on the earth (<u>*are*</u> or *are not*) balanced.

18. The force vectors (F_G) are drawn on the fig.

19. Weight is a) *m;* b) 2*m*; c) *mg;* d) 2 *mg*; e) *mg*/2

20. Tension vectors, T_B , in bar are drawn on fig.
T_B = a) *m* b) 2*m* c) *mg* d) 2 *mg* e) *mg*/2

21. Tension vectors, T_R , are drawn on fig.
T_R = a) *mg* b) *mg*/2 c) 2 *mg* d) 3 *mg* e) *mg*/3

22. Force, *F*, pulling down on the roof is
F = a) *mg* b) *mg*/2 c) 2*mg*/3 d) 3*mg*/2 e) *mg*/3

23. Forces, *C*, in walls are drawn on fig. The value
C = a) *mg* b) *mg*/4 c) 4*mg*/3 d) 3*mg*/4 e) *mg*/2

24. True or false questions (all correct for credit) refer to the previous problems 18-23.

T F: The forces acting on the earth (from problems 19, 21 and 23) are in balance.
T F: The forces acting on the roof (from problems 22 and 23) are in balance.
T F: The forces acting on the mass (from problems 19 and 20) are in balance.
T F: The forces acting on pulley (#1) (from problems 20 and 21) are in balance.
T F: A rope tension (from problem 21) half the weight of the mass keeps it at rest.

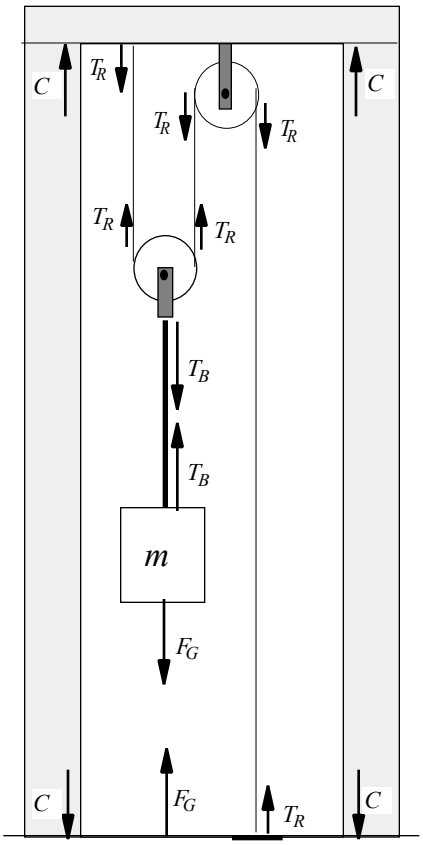

Fig. for Problems 18-24