ST/ STE
Pretest 3.3

1. In the tables below, choose the right characteristic for each link. This is a bicycle bell. (the top part of the bell that the little washers hit is not shown)
   a) **The 1st link is the cylindrical slide-on base of the pinion gear**. Since it just slides on, there's no 3rd part making direct and removable. The shaft does not move while the clapper can rotate and hit the sides of the bell, which why the link is partial.

      The 2nd link is the loop part of the spring, it can be removed with the spring and they stretch together.(complete). The spring is flexible, but **the link itself(the loop part) is rigid.**

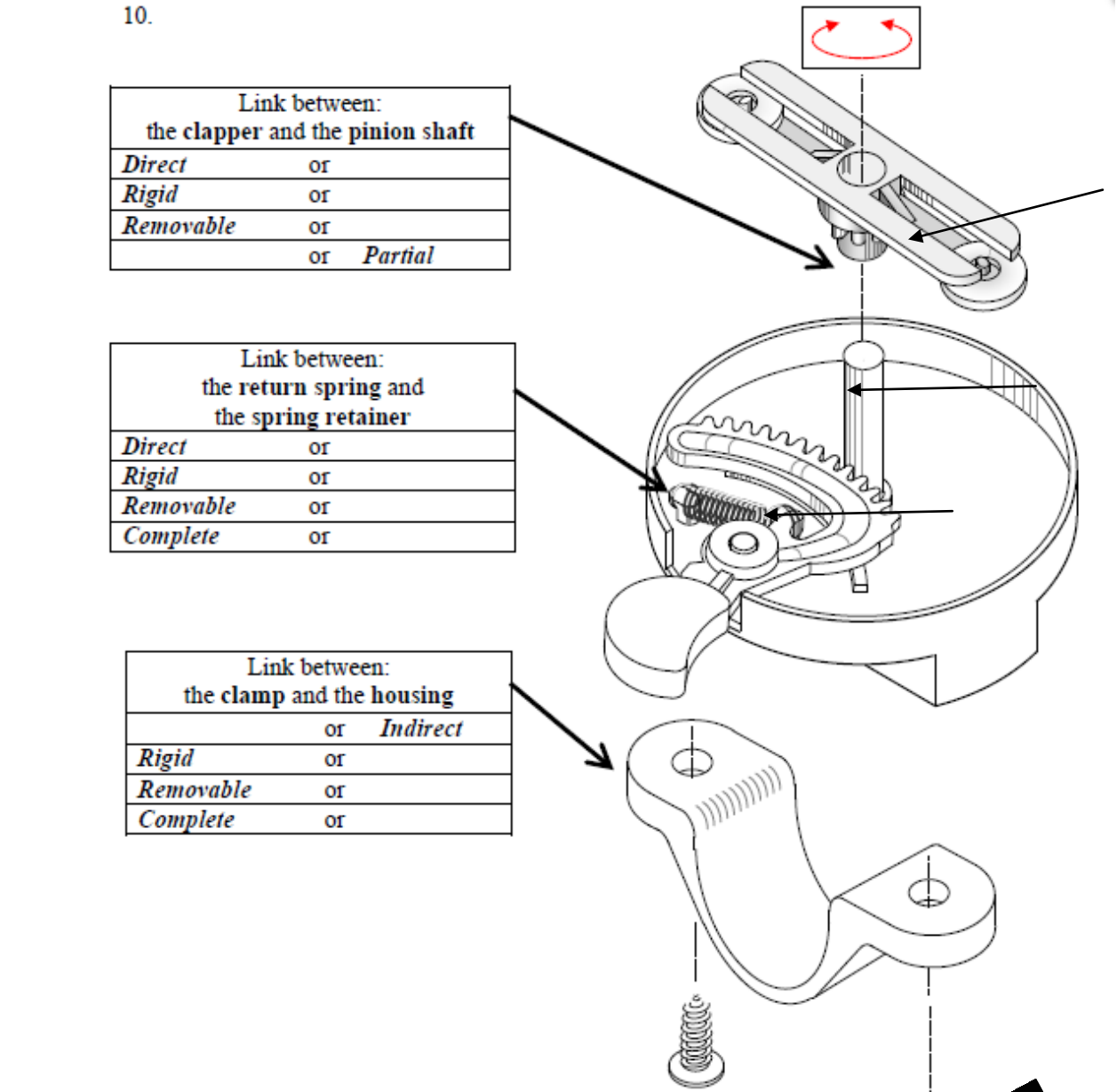
      3rd link is the screws
      See next page for all answers and diagram.

10.

Link between: the **clapper** and the **pinion shaft**	
Direct	or
Rigid	or
Removable	or
	or *Partial*

Link between: the **return spring** and the **spring retainer**	
Direct	or
Rigid	or
Removable	or
Complete	or

Link between: the **clamp** and the **housing**	
	or *Indirect*
Rigid	or
Removable	or
Complete	or



2. a) In the rack and pinion, what transformation of motion is involved?

Circular(pinion) to linear (rack)

b) Although this system is often used in steering, how could you use this system to lift a weight? Hint: you would need to add a part that would support a weight.

If you fix the pinion(circular gear) to an axle and attach a base to the rack, by turning the pinion the rack will move up and lift the base and whatever weight is placed on it.

c) Where would you add the lubricant?

The lubricant (oil or grease) should be applied where the rack and pinion's teeth mesh.

3. a) In this screw-gear system, which part is in a fixed position?

The circular nut.

b) Why is it practical to have the other part moving?

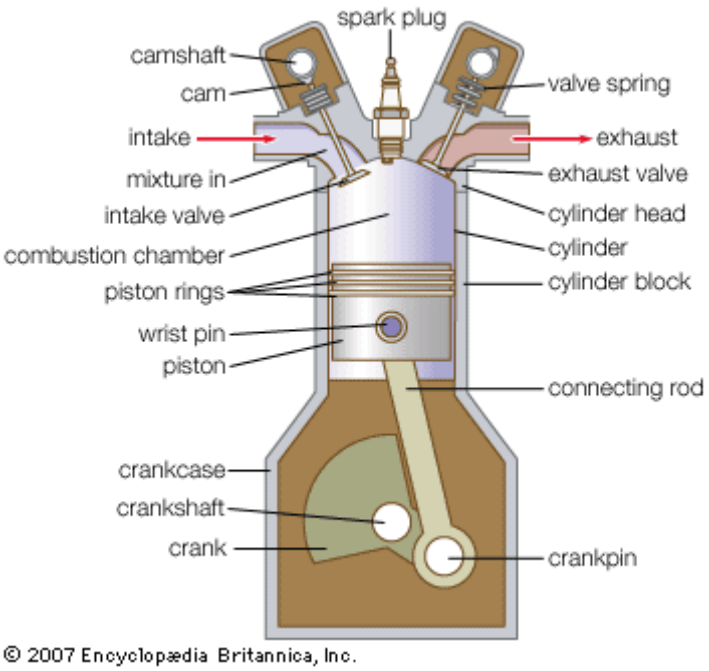
As the long part moves up and down it allows one to unscrew different nut-sizes.

4. a) In the slider-crank system, what part of the engine is moving up and down? See diagram
the piston

b) What's powering the up and down motion?

The hot gases produced by the combustion of gasoline.

c) What kind of motion is experienced by the crank?
circular



d) Is the link between the crank and piston direct? No. there is a connecting rod between them.

5. a) If we turn the small gear(11 teeth) so that it

make 34 turns, how many turns will the large gear(17 teeth) complete?

$V_{out}/V_{in} = n_{in}/n_{out}$

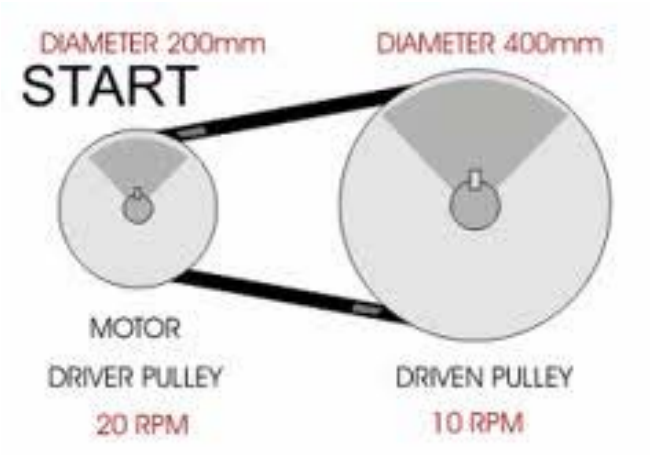
$x/34 = 11/17$

$x = 22$ turns

b) How much more turning force (find the mechanical advantage) does the large gear have?
17/11

6. a)What makes this system different from a chain-sprocket system? Give two differences
Belt instead of chain
Groove instead of teeth on gears

b) Calculate the speed(velocity ratio)of this system. V = I/O = 200/400 = 0.5



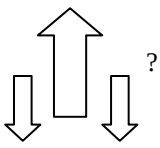
7. You want the motor to spin a certain gear very quickly, but you want the other gear that's attached to the 1st one to move very slowly.

What kind of gear system will work best? Worm-worm-gear

8. A machine requires no toothed gears, and you don't want any belts either. What kind of gear system can be used? Friction gears

9. Which twisting constraint (stress) is experienced by buildings during earthquakes?

(A) Shearing
(B) Torsion
(C) Tension
(D) Compression

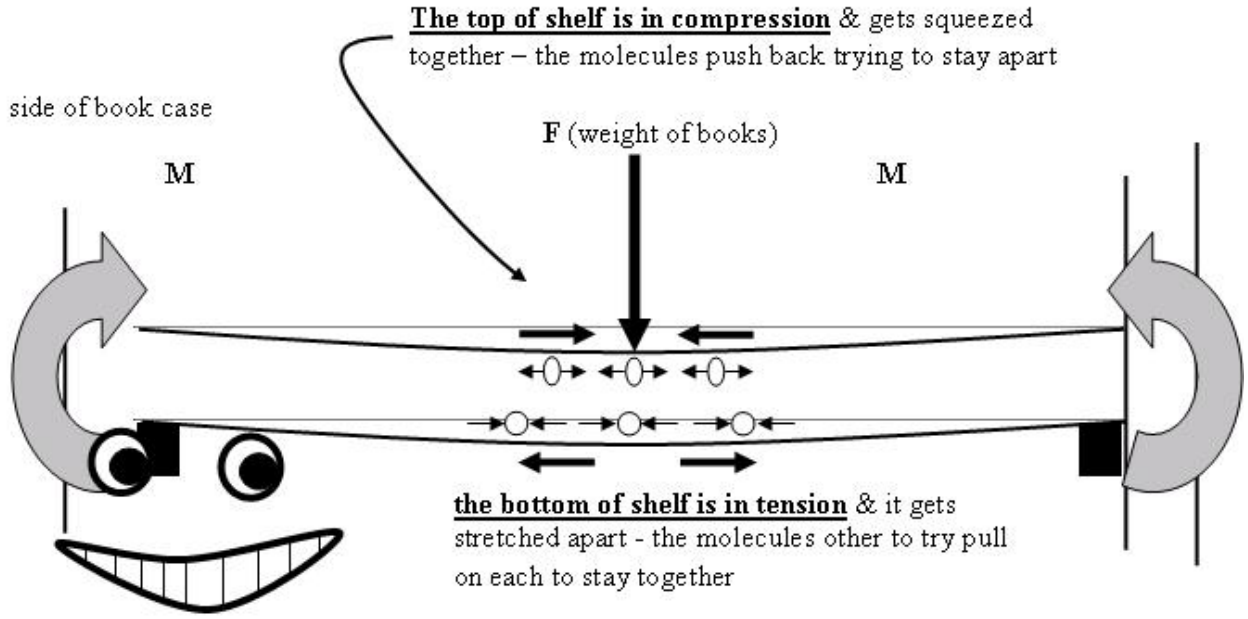
10. What constraint (stress) is symbolized by  ?

deflection

11. What property of materials has the units W/(mK)?

Thermal conductivity

12. Many weights are placed on a shelf. After a few months we find it bent out of shape. Identify the stresses involved.



a beam is said to "smile" in bending: the top is in compression & bottom is in tension

Compression, tension and deflection

FLASHBACK

13. a) The second most common gas in the atmosphere is ___OXYGEN___
b) The gas in the air with the most variable composition is __WATER VAPOUR__
c) Atmospheric pressure is caused by the __WEIGHT___of the air acting on a certain unit of area.

14. Use the following terms to answer the following: troposphere, stratosphere, mesosphere, thermosphere, exosphere

a) The layer closest to the surface troposphere
b) The layer closest to outer space exosphere
c) The layer that has the important protective gas ozone__stratosphere__
d) Where Northern lights form___thermosphere
e) Found at an altitude of 50 to 80 km, it 's where unusual noctilucent clouds form mesosphere

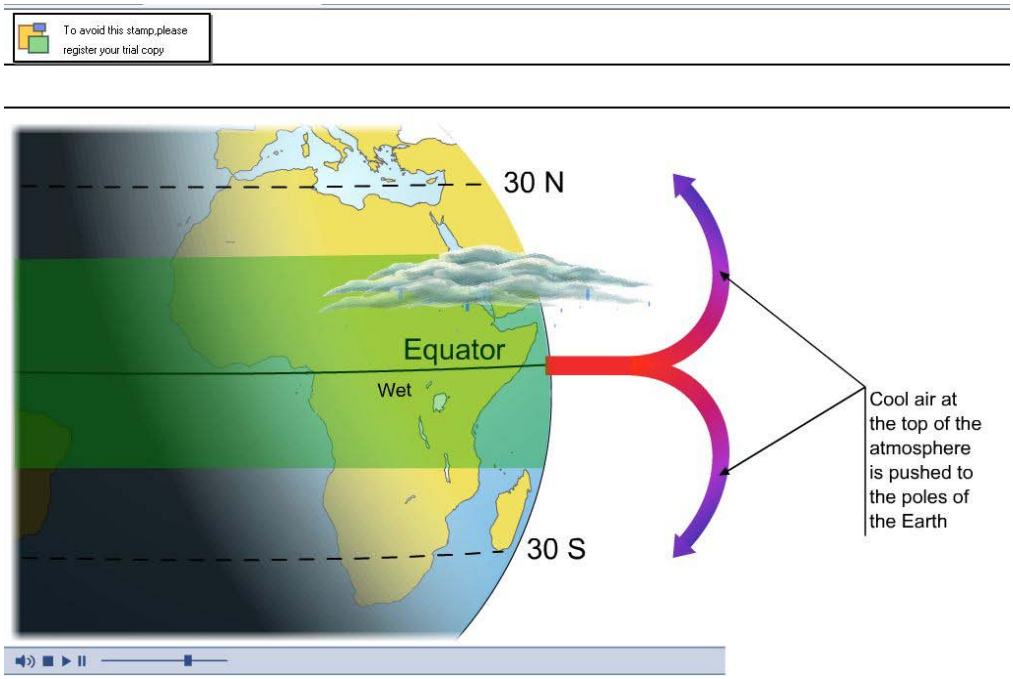
15. In which hemisphere do cyclone (tropical storm) winds move ***clockwise*** towards the low pressure area?

In the southern hemisphere

16. What two forces combine to create the curving effect of the Coriolis effect?

The rotation of the earth and differences in atmospheric pressure(casue wind).

17. a) Use the diagram to explain why the Hadley cell exists.

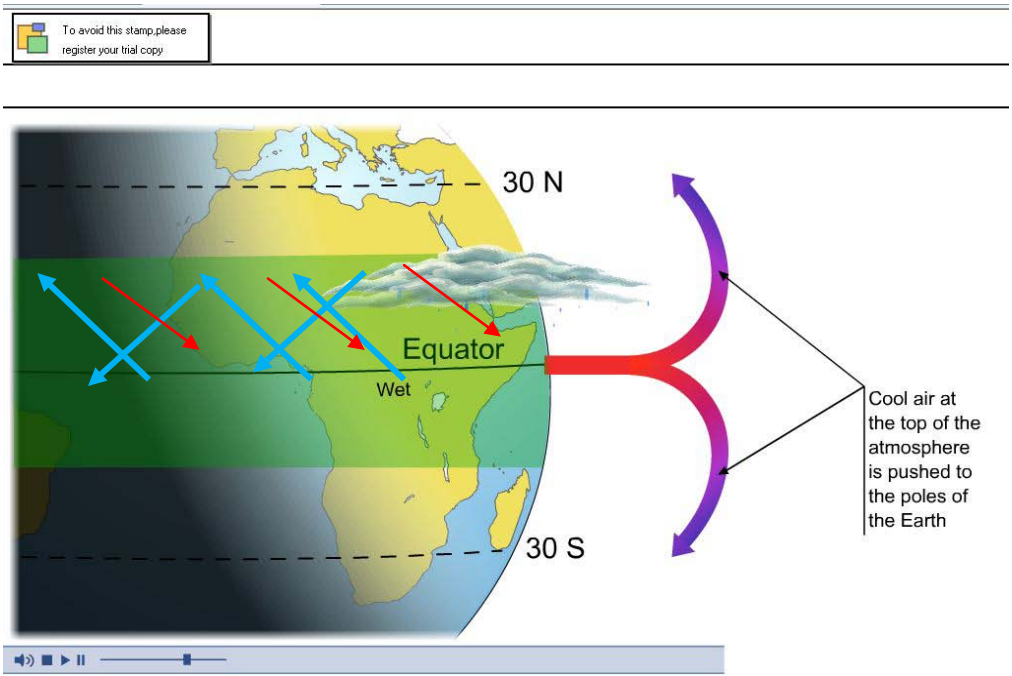


Areas closer to the equator receive more direct sunlight. This warms the air. As its density decreases it rises. Cooling causes condensation and then close to the 30^{o} latitude, drier air sinks .

b) How does it help explain the location of some desert and tropical biomes?

Below the condensation zones we find tropical forests. Where the drier air sinks at the higher latitudes we get deserts.

18. On the map show the westerlies and trade winds with the correct direction.



19. What are two important properties of CH_4 , CO_2 and H_2O?

They let visible light through but absorb heat (infrared)

20. Where does most of the excess CO_2 that we inject into the atmosphere come from?

Most (about half) comes from burning oil, gas and coal to generate electricity. The rest comes from fossil fuel combustion for heating and transportation.