

ST/ STE

Pretest 3.5

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 make contact and create sound 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 it direct and removable. The shaft does not move while the clapper can rotate and hit the sides of the bell, which is 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.

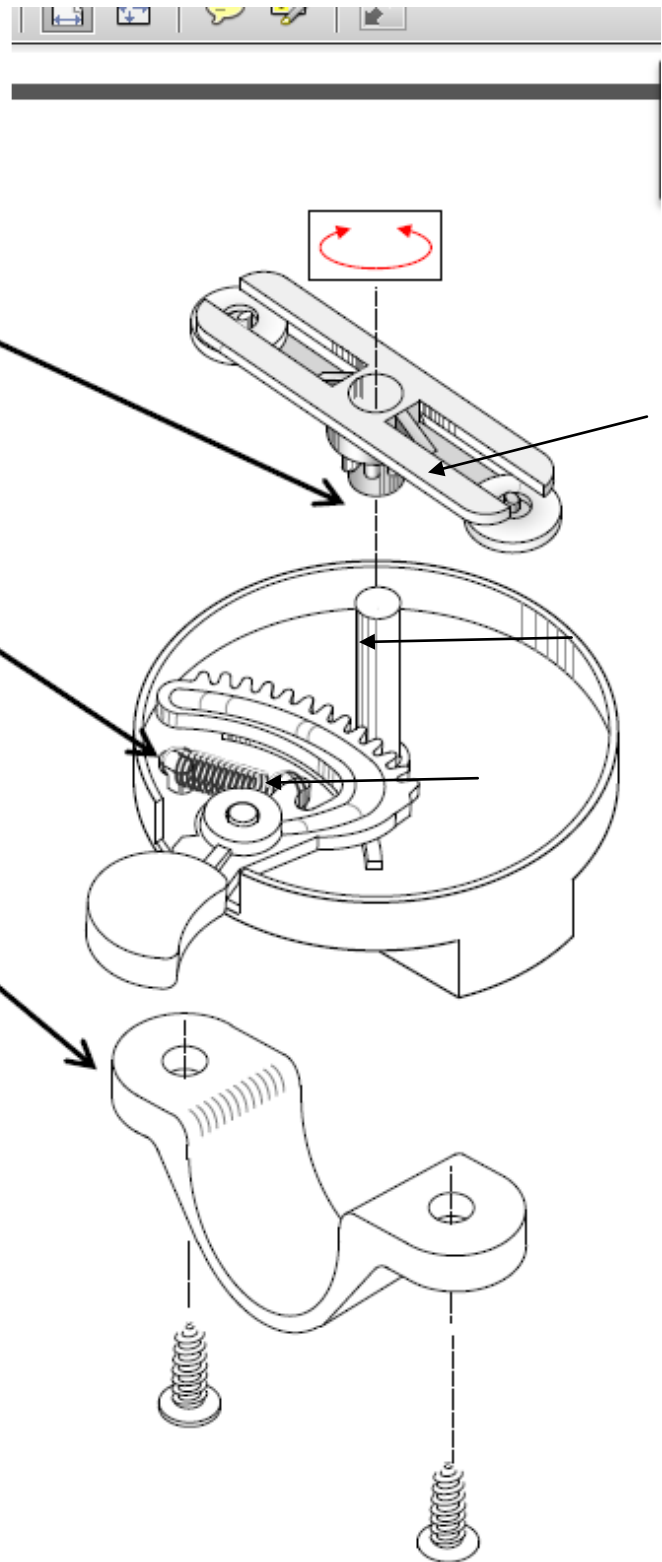
See next page for all answers and diagram.

10.

Link between: the clapper and the pinion shaft	
<i>Direct</i>	or
<i>Rigid</i>	or
<i>Removable</i>	or
	or <i>Partial</i>

Link between: the return spring and the spring retainer	
<i>Direct</i>	or
<i>Rigid</i>	or
<i>Removable</i>	or
<i>Complete</i>	or

Link between: the clamp and the housing	
	or <i>Indirect</i>
<i>Rigid</i>	or
<i>Removable</i>	or
<i>Complete</i>	or



ST Flashback

Conservation of mass and conservation of energy

STE Flashback: Periodic trends, ions versus neutral substances and isotopes

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.

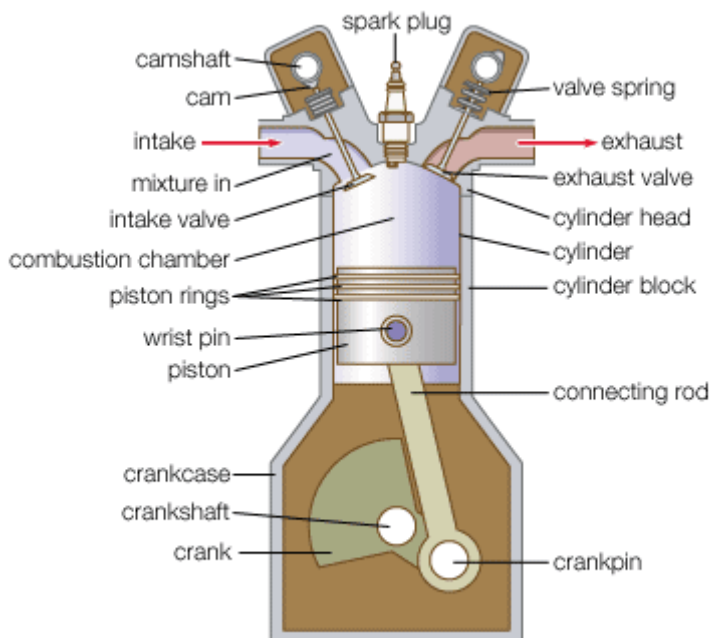
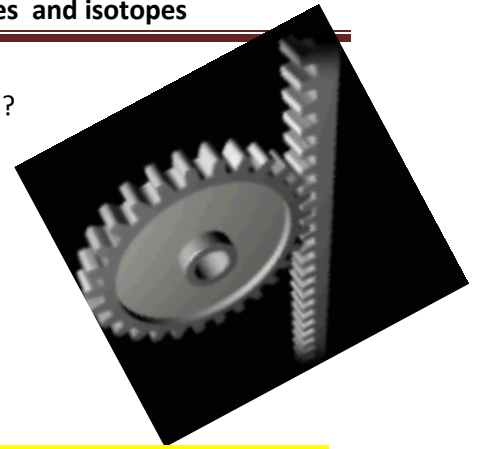
4. a) In the slider-crank system, what part of the engine is moving up and down?

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.

ST Flas

Consel

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?

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

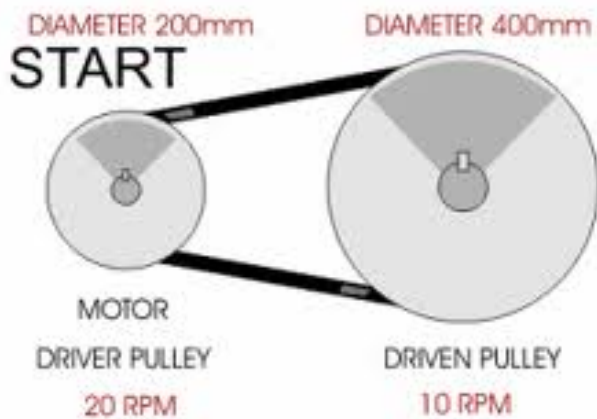
$$x/34 = 11/17$$

$$x = 22 \text{ turns}$$

- 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](#)

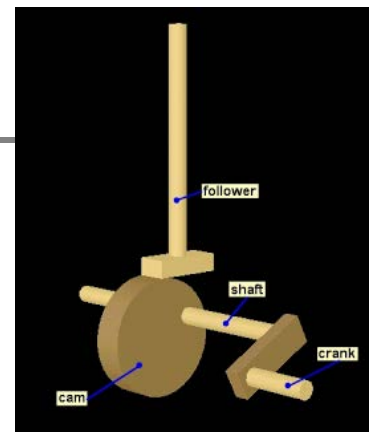
8. A machine requires no toothed gears, and you don't want any belts either. What kind of gear system can be used? [Friction gears](#)

9. Show two ways of making the same transformation system operate the up and down motion of a toy dog's head or tongue. Use a cam and follower in each case. But in design one, use a teardrop-shaped cam. In the second design, use an off-centered circular cam.

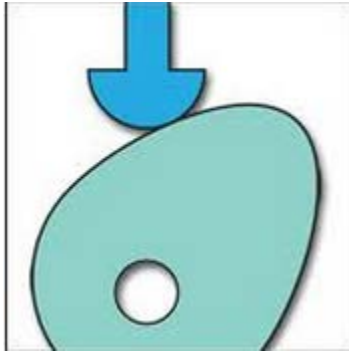


and conservation of energy

4



STE Part



1. What do common artificial modern methods of plant cloning have in with animal cloning? Differences?

Common: both produce genetically identical offspring.

Differences:

(1) In plants, eggs are not stripped of their DNA. Parts of plants are removed, subjected to nutrients and/or hormones in test tubes and then transplanted to soil.

(2) For animals, an egg cell is stripped of its nucleus and given the DNA of an animal to be cloned. A surrogate mother's uterus is then used to allow the clone egg to develop.

2. What is the purpose of a strawberry runner or potato eye?

It is used for asexual reproduction, a natural form of cloning.

- a) What name is given to a group of undifferentiated cells obtained from a young embryo, umbilical cord or some organs? **stem cells**
- b) At what stage of animal cloning is the choice made to use stem cells therapeutically instead of letting them develop into a baby?

The choice is made after the egg cell has been shocked and it starts to divide but before the cells begin to specialize.

3. a) What is used to clean sewage water in phytoremediation?
Plants
- b) How does phytoremediation resemble bioconcentration?

Phytoremediation is a form of bioconcentration because the amount of toxins entering the plants exceed those coming out, so many get filtered and stuck inside the plants' tissues. As a result, the concentration of toxins will be higher inside the tissues than in the waste water going into the river, lake or ocean.

4. In which case does being connected to a sewage treatment center better than a septic tank?

ST Flashback

Conservation of mass and conservation of energy

In areas where there is a high population density.