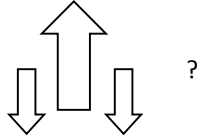## ST/STE PreTest 3.5 2015

ST PART

1.   Which twisting constraint is experienced by buildings during earthquakes?
(A)   Shearing
(B)   Torsion
(C)   Tension
(D)   Compression

2.   What constraint is symbolized by   ?

deflection

3.   a) What is the difference between compression and tension?

Compression is a squishing constraint; tension occurs when a material is
being stretched.

b) Which of the two affects a car in a head on collision?
compression

4.   List two elements with an atomic number less than 4 that have poor thermal conductivity.
He and H

5.   What third period material has decent electrical conductivity but lousy thermal conductivity?
Si

6.   a) If we refer to the power needed per meter of material to get a certain temperature difference across, is
        that specific heat? Or thermal conductivity?
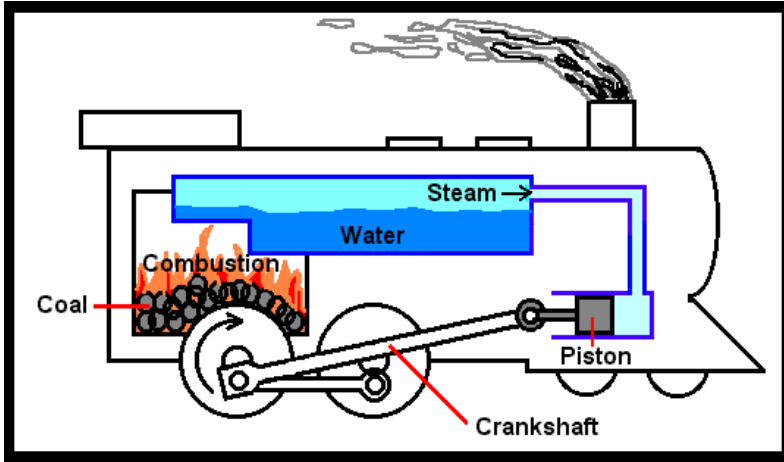   Or thermal conductivity?
b) What are the units of thermal conductivity if we do not use watts?
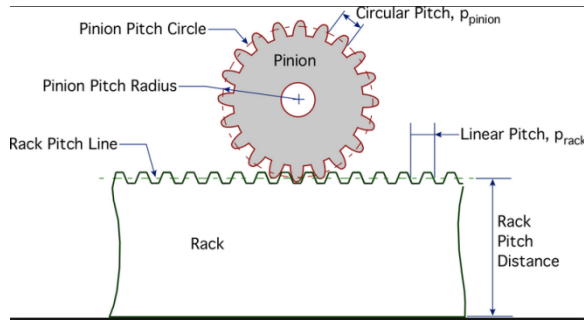
J/(s m °C)
c) What property is being referred to if we note that it takes very little heat to get copper to reach a high
        temperature?
Specific heat

7.   Draw a steam engine with a crank and slider transformation mechanism.
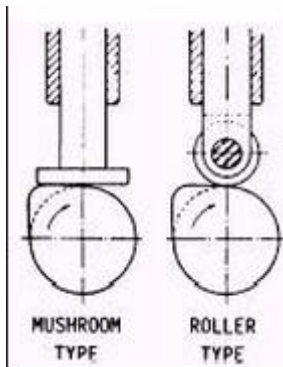
8. It is possible to slide the rack to the left or right. What transformation is involved?

Linear to rotational

9. a) What motion transformation system is being represented below?

MUSHROOM TYPE   ROLLER TYPE

cam and follower

10. a)   What's the most recyclable plastic?

==HDPE code 2==

    b)   Why are plastics called polymers?

==Each one is a sequence of a certain molecule (a monomer) repeated over and over again.==
    c)   What's the difference between polystyrene(styrofoam) and polyethylene (jugs, plastic bags) molecules?

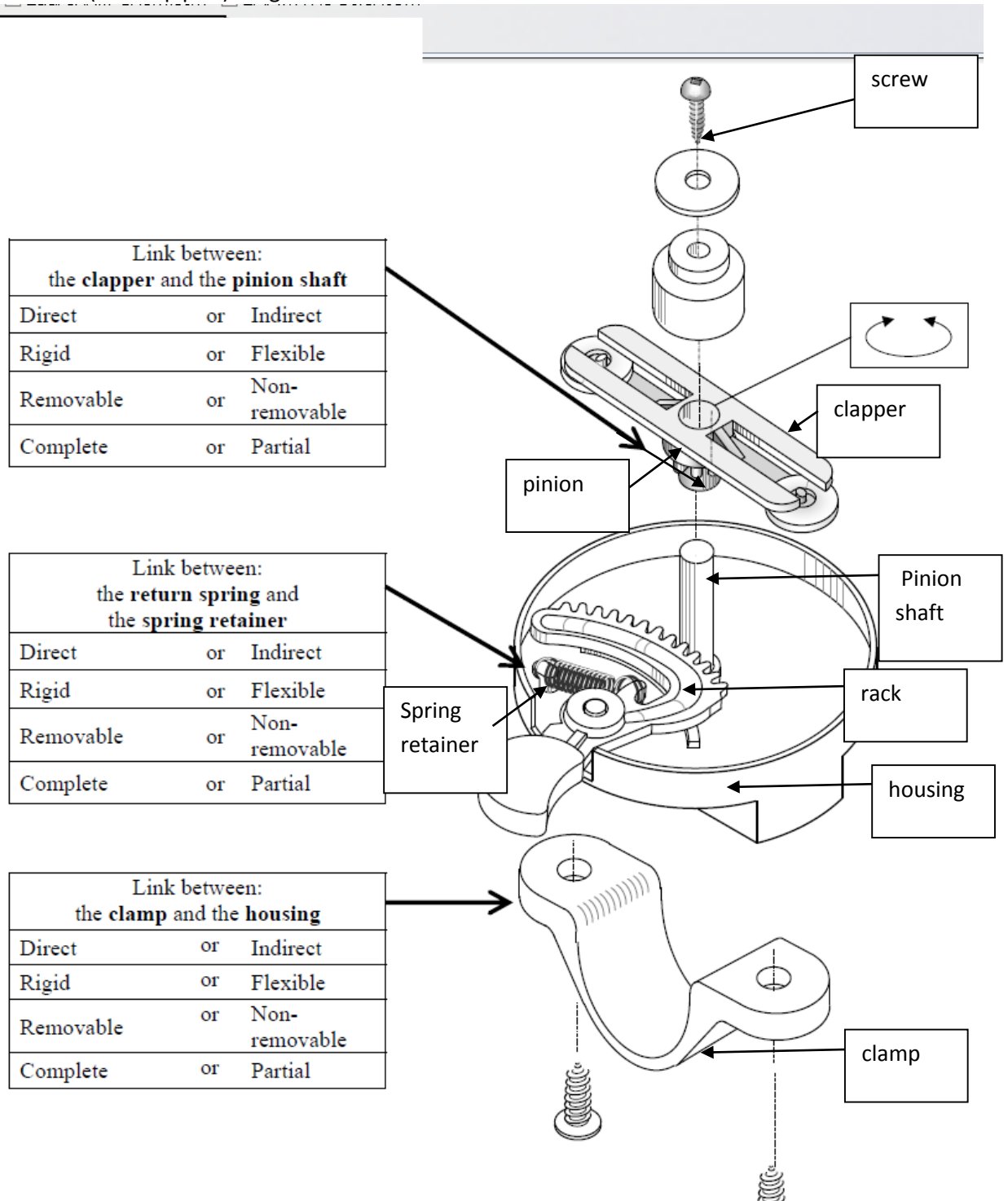==Polystyrene repeats styrene==
==Polyethylene repeats ethylene==

    d)   Instead of using petroleum or natural gas as a source of monomers for plastic, what's a more eco-friendly way of making them. Give the steps involved.

==Sugar cane-→ alcohol from fermentation→ ethylene→ polyethylene==

11. 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.

Link between: the **clapper** and the **pinion shaft**		
Direct	or	Indirect
Rigid	or	Flexible
Removable	or	Non-removable
Complete	or	Partial

screw

clapper

pinion

Pinion shaft

Link between: the **return spring** and the **spring retainer**		
Direct	or	Indirect
Rigid	or	Flexible
Removable	or	Non-removable
Complete	or	Partial

Spring retainer

rack

housing

Link between: the **clamp** and the **housing**		
Direct	or	Indirect
Rigid	or	Flexible
Removable	or	Non-removable
Complete	or	Partial

clamp

See below 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	
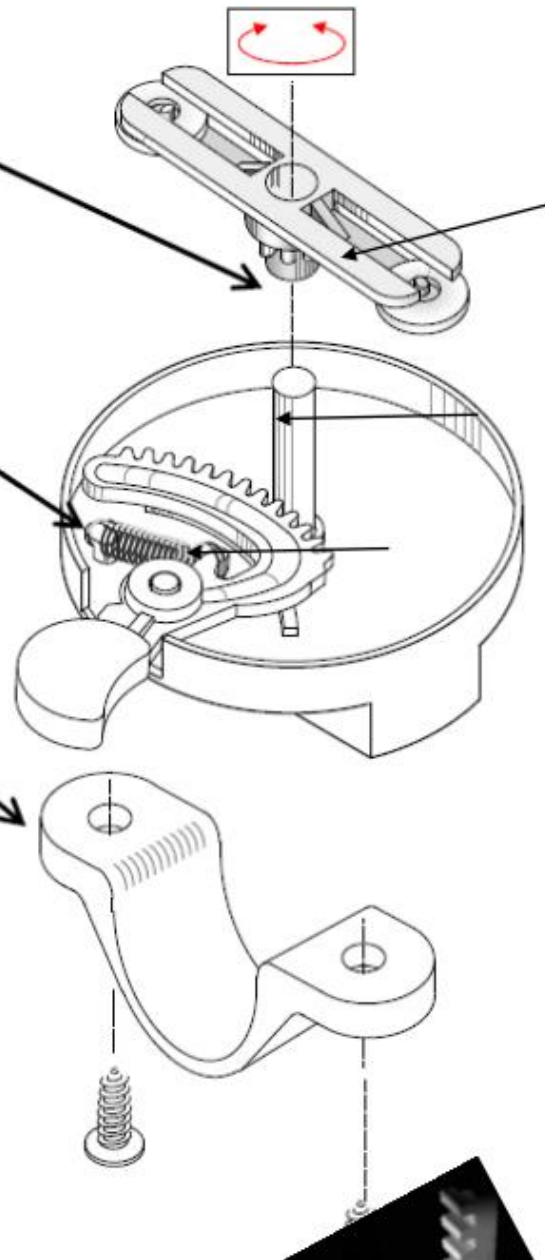
STE PART

12.   Give the number of significant figures in each case.
   a) 2.3000 kg   5
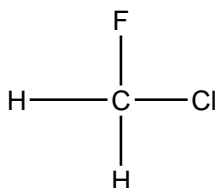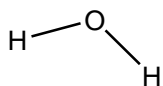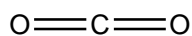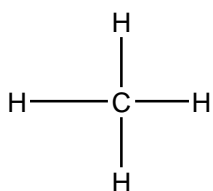
b) 0.00500 km   3
c) 5.00 X 10^2 g   3
d) 500 g   1

13.   Find the molarity and express with the correct number of significant figures. 11.50 g of NaBr are dissolved in 250.0 ml of solution. Make sure you use molar masses with the right number of sig figs.

(11.50 g / 102.894 g/mol) / 0.2500 L = 0.4471 M   4 SF

14. Draw a dot structure for 4 different greenhouse gases. (STE)

15. a)   Soil originally with a concentration of 8 ppm of Cr^{6+} was tested a month later and the concentration dropped by 75%. (STE)
If there was cabbage growing on the land and the roots' concentration of the same ion increased, what do you think happened?

It's an example of bioconcentration in which a toxin gets stuck in plant tissue and we end up with a higher concentration in the plant than in its environment.

b)Calculate the final concentration of Cr^{6+} in the soil.

8ppm – 0.75(8ppm) = 2 ppm

Plus three more STE topics selected by the class. (No ST flashback will be on this test)