17. In the last part of this lesson, energy transformations, as well as advantages and disadvantages and disadvantages associated with hydroelectricity, were discussed. Using this discussion as an example, choose one other form of electrical generation and

* In point form, outline the process through which electricity is generated, highlighting the energy transformations that occur.

Coal power plants:

* + Coal is burned inside a cauldron, thermal energy is generated
  + The burning heats up fluid placed on top of the cauldron, turning it into steam. Thermal energy is transferred and partially transformed to kinetic energy
  + The moving steam rotates rotors of the steam turbine. Thermal energy is transformed into kinetic energy
  + The rotating turbine in turn rotates the motor that is attached. Kinetic energy is transferred and partially transformed to thermal energy due to friction.
  + The motor generates electricity by changing magnetic field. Kinetic energy is transformed into electrical energy, which is eventually transformed into other forms of energy.
* State and advantage and disadvantage for this type of electricity production that have not already been discussed in the lesson.

Advantage: High stability and controllability. Unlike the speed of wind which is need by wind turbines, the amount of heat produced can be controlled as needed.

Disadvantage: Causes environmental pollutions. The particles that remained after burning is released into the atmosphere and Is harmful for health

* State the source from which you attained your information.

Parents, both of whom are electrical engineers

18. a. A child on a sled (having a combined mass of 47.0kg) is pulled by a force directed along a rope that makes a 45° angle with the horizontal axis. The force exerted on the rope is 100.0N. The force of friction acting on the sled is30.0N. If the child is pulled a distance of 10.0m along a level field, determine the total work done on the child and on the sled.

b. Determine the child’s final speed at the end of 10.0m.

19. A child on a sled (m=47.0kg) slides down a long hill starting from a rest position at a point 10.0m higher in elevation than his finishing point.

a. What is the total mechanical energy present?

The total mechanical energy present is 4600J

b. Assuming that there is no friction and no external pushed, determine the child’s speed at the bottom of the hill.

c. The child’s speed at the bottom of the hill is actually 5.0m/s. Explain whether or not this defies the law of conservation of energy.

It does not. The previous calculation did not take into account the possibilities of friction, which produces thermal energy. Realistically, With at the bottom of the hill, the total mechanical energy becomes the sum of kinetic and thermal energy. Since there is most likely thermal energy that has been converted, the final kinetic energy must be less that the amount of total energy. the speed of 5m/s is the result of the remaining kinetic energy.

20. A spring with a force constant of 225N/m is resting on a frictionless surface and mounted horizontally on a wall. A 1.5kg box is pushed against the spring, compressing it 12.0 cm from equilibrium. When release, the spring pushes the box across the floor.

a. How much force must be exerted on the spring to compress it 12.0 cm?

b. How much work is done on the spring to compress it 12.0 cm?

c. How much elastic potential energy is stored in the spring while it is compressed?

d. Once released, what maximum speed will the box attain?

21. a. Describe the energy conversions in a spring undergoing simple harmonic motion as it moves from the point of maximum compression to maximum stretch in a frictionless environment. Be sure to point out the points at which there will be

i. maximum speed

ii. minimum speed.

iii. minimum acceleration.

|  |  |  |  |
| --- | --- | --- | --- |
| Position | Elastic energy | Kinetic energy |  |
| Max. compression | Maximum | 0 | Min.speed, max. acceleration |
| Rest | 0 | Maximum | Max.speed, min acceleration |
| Max. stretch | Maximum | 0 | Min.speed, max.acceleration |

b. Explain what is meant by damping. Choose a specific technology that requires a damping mechanism and describe how the damping takes place.

1. To help reduce the severity of accidents, an engineering company designs large plastic barrels filled with antifreeze that can be placed in front of bridge supports. In a simple test, a 1200 kg car moving at 20 m/s [W] crashes into several barrels. The car slows down to 8.0 m/s [W] in 0.40 s. (5 marks)
   * 1. Find the average net force acting on the car during the collision.
     2. What would happen to the average net force if the car in the test hit a bridge support directly, instead of the barrels? Explain your reasoning. You may assume that the bridge supports are not severely damaged during the collision.

The average net force will increase. Since the bridge support is likely to be made out of more rigid material, the time it takes for the force to be applied would decease. Yet the change in momentum would not change. Since the net force is inversely proportional to time in p=Ft, the average net force will increase

* + 1. Why is it important to use antifreeze in the barrels, instead of just water, if the barrels will be used in Canada? Explain by discussing the effect this would have on the net force.

The purpose of having liquid inside the barrels is to absorb the energy during the collision. Canada has a relatively colder climate, and water will most likely freeze in colder seasons. When frozen into ice, water’s ability to absorb energy will be significantly reduced, and the net force will increase. By using anti-freeze liquids, the barrels ability to absorb energy will stay the same, regardless of change in temperature.

1. A stationary 2000 kg cannon fires a 25 kg cannon ball horizontally at 250 m/s. Find the velocity of the cannon after firing the cannon ball. You may assume that there is no friction acting on the cannon. (3 marks)
2. In an elastic head-on collision, a 0.60 kg cart moving at 5.0 m/s [W] collides with a  
   0.80 kg cart moving at 2.0 m/s [E]. The collision is cushioned by a spring (*k*= 1200 N/m). (8 marks)
   1. a)  Find the velocity of each cart after the collision.
   2. b)  Find the maximum compression of the spring.
3. In a movie stunt, a 65 kg skier starts from a rest position at the top of a hill 30 m high. She slides down the hill to the bottom, where she collides with a 45 kg stationary skier. The collision is completely inelastic. Find the final velocity of the skiers. (4 marks)
4. A baseball with a mass of 0.152 kg is moving horizontally at 32.0m/s [E], when it is struck by a bat for 0.00200 seconds. The velocity of the ball just after the collision is 52.0m/s [W 20° N]
   * 1. Find the impulse experienced by the ball.

Let east and north be postive

Find the average net force of the ball.

1. A 0.800 kg target slides along the ice at 3.0m/s [W], when it is hit by a 20.0g arrow moving at 260 m/s [N], as part of a show. Find the final velocity of the target after the inelastic collision.
2. In a physics lab, 0.30 kg puck A, moving at 5.0 m/s [W], undergoes a collision with 0.40 kg puck B, which is initially at rest. Puck A moves off at 4.2 m/s [W 30° N]. Find the final velocity of puck B.