NAME: ANANYA PRASAD

REG NO.: 20BCE10093

PROFF: SUCHETANA MA'AM

SLOT: F11+F12

MODEL QUESTION PAPER

1.Justify why efficiency is one of the most important parameters for any heat engine.

The efficiency of a heat engine relates how much useful work is output for a given amount of heat energy input. Efficiency can be expressed as $Eff=W/Q_h$, the ratio of work output divided by the amount of energy input. The efficiency of a heat engine relates how much useful work is output for a given amount of heat energy input. In other words, a heat engine absorbs heat energy from the high temperature heat source, converting part of it to useful work and delivering the rest to the cold temperature heat sink. The theoretical maximum efficiency of any heat engine depends only on the temperatures it operates between. The efficiency of a heat engine relates how much useful work is output for a given amount of heat energy input. In other words, a heat engine absorbs heat energy from the high temperature heat source, converting part of it to useful work and delivering the rest to the cold temperature heat sink.

2.Formulate the principle of the conservation of the mechanical energy. Give some suitable examples.

Mechanical energy is the sum of the potential and kinetic energies in a system. The principle of the conservation of mechanical energy states that the total mechanical energy in a system (i.e., the sum of the potential plus kinetic energies) remains constant as long as the only forces acting are conservative forces. We could use a circular definition and say that a conservative force as a force which doesn't change the total mechanical energy, which is true, but might shed much light on what it means.

A good way to think of conservative forces is to consider what happens on a round trip. If the kinetic energy is the same after a round trip, the force is a conservative force, or at least is acting as a conservative force. Consider gravity; you throw a ball straight up, and it leaves your hand with a certain amount of kinetic energy. At the top of its path, it has no kinetic energy, but it has a potential energy equal to the kinetic energy it had when it left your hand. When you catch it again it will have the same kinetic energy as it had when it left your hand. All along the path, the sum of the kinetic and potential energy is a constant, and the kinetic energy at the end, when the ball is back at its starting point, is the same as the kinetic energy at the start, so gravity is a conservative force.

Kinetic friction, on the other hand, is a non-conservative force, because it acts to reduce the mechanical energy in a system. Note that non-conservative forces do not always reduce the mechanical energy; a non-conservative force changes the mechanical energy, so a force that increases the total mechanical energy, like the force provided by a motor or engine, is also a non-conservative force.

An example

Consider a person on a sled sliding down a 100 m long hill on a 30° incline. The mass is 20 kg, and the person has a velocity of 2 m/s down the hill when they're at the top. How fast is the person traveling at the bottom of the hill? All we have to worry about is the kinetic energy and the gravitational potential energy; when we add these up at the top and bottom they should be the same, because mechanical energy is being conserved.

At the top: PE = mgh = (20) (9.8) (100sin30°) = 9800 J

KE = 1/2 mv2 = 1/2 (20) (2)2 = 40 J

Total mechanical energy at the top = 9800 + 40 = 9840 J

At the bottom: PE = 0 KE = 1/2 mv2

Total mechanical energy at the bottom = 1/2 mv2

If we conserve mechanical energy, then the mechanical energy at the top must equal what we have at the bottom. This gives:

1/2 mv2 = 9840, so v = 31.3 m/s.

3. What are the disadvantages of fossil fuels? Why are we looking at alternate sources of energy.

Fossil fuels are nonrenewable

Once you burn a gallon of oil, it's gone for good – and fossil fuels will run out. It's estimated we have just 100 years of coal production left, 50 years of crude oil, and 50 years of natural gas. That means this is a major problem for us, our children, and our grandchildren.

That's why we help our customers switch to the benefits of renewable energy – all Inspire employees and customers are striving to replace harmful energy sources with clean, renewable energy sources long before that happens. If you want to join our fight, learn more about our energy plans.

Dangerous to produce

Mining is a potentially dangerous industry where tragic disasters can happen. Despite developments in machinery, there's still a human element that can come at a huge cost.

Refinery and oil rig explosions

Both oil and gas are volatile and flammable, and the instances of refineries and oil rigs exploding or occasions where fire breaks out are numerous. It is not just the damage caused or the risk to the lives of employees and firefighters, but also the danger of the noxious gases that are liable to be released.

Water pollution and oil spills

Water table poisoning from fracking

Fracking is a method of extraction that is incredibly harmful to the environment, but one serious worry is the pollution of our water table. It shouldn't happen but can if proper precautions are not taken or if mistakes are made, and can poison our water supply.

Air pollution and smog

Smog is caused when sunlight reacts with nitrogen oxide and another volatile organic compound in the atmosphere. Nitrogen oxide is a key emission from vehicles, factories, and coal power plants. Volatile organic compounds are released from gasoline, paints and solvents. The resulting photochemical smog is a health hazard all over the planet but particularly so in newly industrialized countries, believed to cause respiratory diseases like asthma and lung cancer. Changing energy plans even on a personal level will help give the world's cities cleaner air.

Acid rain

Acid rain is formed by a chemical reaction between sulfur dioxide and nitrogen oxides mixing with water, oxygen and other chemicals high in the atmosphere. The pollutants are mostly produced by fossil-fuel-burning power plants. Acid rain is a serious problem and damages trees, lakes, rivers, architecture, statues, crops, and wildlife.

Mercury emissions

Mercury is highly toxic and extremely damaging to the environment. A major contributor to mercury pollution is the combustion of coal. It is reckoned that coal-burning results in approximately 475,000kg of mercury being released into the atmosphere.

Global warming

Global warming, or climate change, is still denied by some, but science almost unequivocally supports it. The major cause is the release of greenhouse gasses into the atmosphere. The burning of fossil fuels produces vast quantities of carbon dioxide and is a massive contributor to the growing problem that the world faces.

Land use and the impact on wildlife

The process of finding, extracting, producing, and transporting fossil fuels has no thought for the local wildlife. In many parts of the world, if there are fossil fuels, everything else must move out of the way so it can be extracted. Habitats are regularly destroyed, and massive scars are left upon the landscape produced by surface mines and other extraction methods.

Fossil fuels are a finite resource and need to be replaced as soon as possible to prevent further harm to the environment. Clean energy is the only way forward. Coal, oil, and gas pollute and harm the planet. If we want our children and their children to have a healthy world to live in, we have to invest in the new technologies that are clean, renewable and safe.