AS -4018 (Environmental studies)

B.Tech. (first year)(B-semester)exam -2013

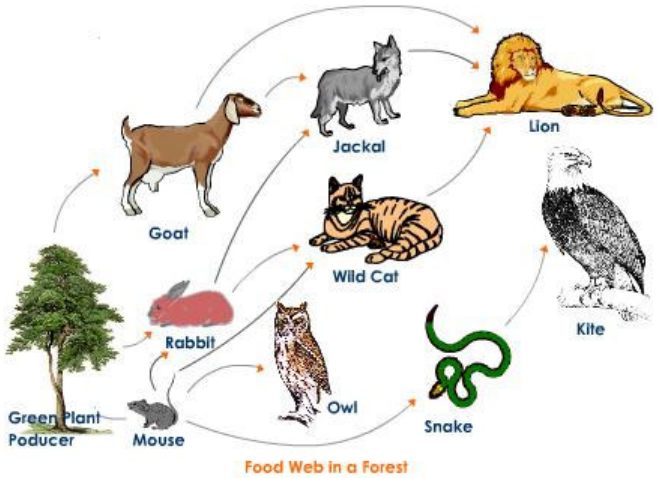
Ans 1. (i) b(ii)b (iii) a(iv) a(v) a(vi) a (vii) a (viii)a (ix) a(x) d

Ans. 2. (a) Major regions of environment:

- Lithosphere: it includes core, mantle & crust.
- Hydrosphere: The water bodies found on earth make up the hydrosphere. The earth is called the blue planet because about 71 % part of the land is covered by water. About 97% of water is in the oceans and remaining 3% is available as pure fresh water known as drinking water. About 2.4% water is trapped in giant glaciers and polar ice. Hydrosphere includes surface and ground water resources such as oceans, seas, rivers, lakes, streams and polar ice etc.
- Biosphere: It is area of the earth where life exists. it includes plants, animals and microbes.
- Atmosphere: it extends upto 500 km above the earth surface. It includes :
  i. troposphere
  ii. stratosphere
  iii. mesosphere
  iv. thermosphere

(b) In nature the food chains are perhaps never linear or rarely linear. They are interrelated and interconnected with one another. At each trophic level there is a great diversity of organisms. Thus, every organisms has ample of choice for its food. This is why several food chains operate simultaneously in an interlinked manner which is collectively known as food web and flow of energy in food web is multidirectional.

Fig of food web:



(c) The various components of forest ecosystem are being under following heads:

i. Abiotic components: the abiotic components include soil, moisture, air, sunlight, atmospheric humidity, rainfall as physical conditions. Carbohydrates, proteins etc. as organic components. Different gases, minerals are as inorganic componenets.

ii. Biotic components: it includes producers, consumers, and decomposers.

(1) Producers: the green plants with photosynthetic capacity are producers. Various types of trees are prevalent as teak, saal, palash, picea, cedrus etc.

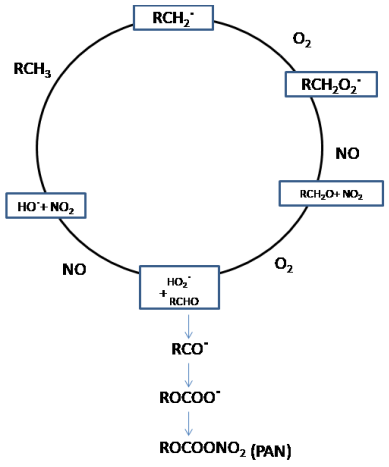
(2) Consumers: it includes: (a) primary consumers: Herbivores are popularly called as primary consumers because they obtain energy from plants by consuming them. Examples: elephant, deer, monkeys, ants, flying foxes etc.

(b) Secondary consumers: they obtain food energy from the flesh of primary consumers are said to be secondary consumers. Examples: carnivorus birds, garden lizard, foxes etc.

(c) Tertiary consumers: the highest grade of consumers are called as top consumers. Examples: tiger, lion, panther etc.

(3). Decomposers: it includes fungi and bacteria. They digest the dead parts of plants and animals and release them in the form of simple molecules. Examples: alternaria, fusarium, actinomycetes, aspergillus etc.

Ans. 3. (a) It is more common in cities with sunny, warm, dry climates and a large number of motor vehicles because it travels with the wind, it can affect sparsely populated areas as well. Photochemical smog is a type of air pollutant produced when sunlight acts upon motor vehicles exhaust gases to form harmful substances such as ozone, aldehydes and PAN. It is formed in the atmosphere through a chemical reaction of sunlight, nitrogen oxide and volatile organic compounds. Formation of photochemical smog is



(b) The wastes water treatment involves three steps

Preliminary: it involves to screen out coarse solids from waste water like sticks, rags, wood, clothes, polythenes and other floating materials etc passing through the various screen bars. generally screen bar is a device with several holes for removing large suspended floating material.

Primary treatment: it includes sedimentation sedimentation with coagulation and filtration.

i. Sedimentation: the process of subsidence and deposition of suspended matter from waste water by gravity is termed as sedimentation.

It is the process of removing suspended impurities by allowing the water to stand undisturbed in a big tank for 2-8 hrs. Most of the particles settle down at bottom of the tank due to gravitational force, and they are removed. The clear supernatant water is then drawn out from the tanks. This process removes 70-75 % of the suspended matter.

ii.Sedimentation with coagulation: To remove the finely divided silica, clay, and organic matter some coagulants (i.e. alum, sodium aluminate etc.) are needed to add to water which hydrolyses to form a gelatinous precipitate. This insoluble floccculant precipitate descent through the water absorbs and entangles very fine suspended impurities forming bigger flocs, which settle down easily. Moreover, coagulants like alum provide Al3+ which neutralizes the negatively charged colloidal particles when them come close and combine to form bigger particles. Due to force of gravity, these bigger particles settle down.

iii. Neutralization : highly acidic or highly alkaline wastes should be neutralized before being discharged. Acidic wastes are neutralized with limestone-lie slurry or NaOH. Depending upon the type and quantity of the waste. Alkaline wastes may be neutralized by treatment with H_2SO_4 or CO_2 or waste boiler flue gases.

(c) Incineration: the process of burning wastes in large furnaces in the presence of oxygen is known as incineration. It converts waste material into heat, gases, steam, and ash at very high temperature. Highly combustible wastes like plastics, cardboard, cartons, food wastes, re subjected to incineration. It results in air pollution and so proper control equipment needs to be installed to avoid contamination of environment.

Reaction:

$$\text{Solid wastes} \xrightarrow{1650^0C,\ O_2} \text{incombustible residue and gaseous products}$$

Pyrolysis: it is also called as destructive distillation. In this method, the solid wastes are heated under anerobic condition. The organic components of the solid wastes split up into gaseous, liquid, and gaseous fractions (CO, CO_2, Tar, charred carbon). It is highly endothermic process.

600-1000^{0}C, anaeroic

Solid wastes → chemical constituents and chemical energy, tar, gaseous phase, carbon Char,

Ans 4. (a) Eight basic principles: (explain in brief)

1. prevention of waste
2. maximum incorporation of reactants into the final product
3. prevention or minimization of effect of hazardous products
4. designing of safer chemicals
5. energy requirement for synthesis
6. selection of starting materials
7. use of biocatalyst
8. products designed should be biodegradable

(b) Biocatalysis: It includes the most important conversions with the help of enzymes. They are referred to as biocatalysts and the transformations are referred to as biocatalytic conversions. It has very advantages as :

i. Most of the reactions are performed in aqueous medium at ambient temperature and pressure.
ii. The biocatalytic conversions normally involve only one step.
iii. Protection and deprotection of functional groups is not necessary.
iv. The reactions are fast.
v. The conversions are steriospecific, kinetic specific and reaction specific.

There are six major classes of enzymes based reactions: oxidoreductase, transferase, hydrolases, isomerase, lyases, ligases.

Ionic liquids: The commonly used solvents like benzene, toluene, and methylene chloride etc for organic synthesis are known to cause health and environmental problems. The ionic liquids comprising entirely of ions were and mainly of interest to chemists. It replaced the volatile organic compounds. It is also called as designer solvent because this solvent can be designed with a particular aim. Its properties (i.e. viscosity, m. p., hydrophobicity etc.) can be changed by simple changes to the structure of ions. By choosing the correc ionic liquid higher product yield can be obtained and reduced amount of waste produced in the chemical reactions. it can be recycled, so it is cost effective. Reactions in ionic liquids are quicker and easier to carry out.

(c) Various approaches:

Approaches include to organize a green chemical synthesis are:

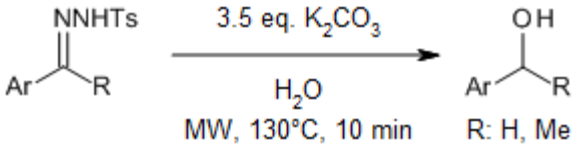
1. choice of starting material
2. choice of reagents

3. choice of catalysts
4. choice of appropriate solvents

5. (a) microwave : Normally microwaves have wavelength between 1 cm to 1 m. It is used for heating purposes in organic chemical synthesis. When molecules with a permanent dipole are submitted to an electric field, they become aligned and as the field oscillates their orientation changes, this rapid reorientation produces intense internal heating. Teflon and polystyrene containers can be used.

Applications(some chemical reactions):

1.



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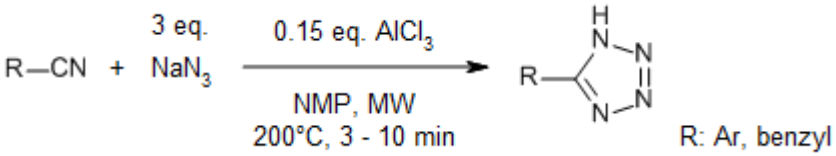

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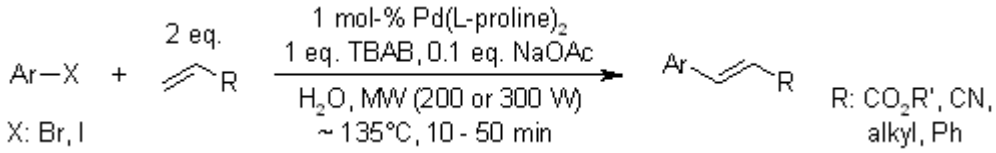


(b) Sonochemistry: Sonochemistry is used to describe the effect of ultrasound waves on chemical reactivity. It is generated with the help of an instrument having an ultrasonic transducer a device by which electrical or mechanical energy can be converted into sound energy. When a sound wave propagated by a series of compression and refraction cycles, pass through a liquid medium. It causes the molecules to oscillate around their mean position. During the compression cycle, the average distance between the molecules is reduced and during refraction, the average distance between the molecules is increased. In refraction cycle, under appropriate conditions, the attractive forces of the molecules of the

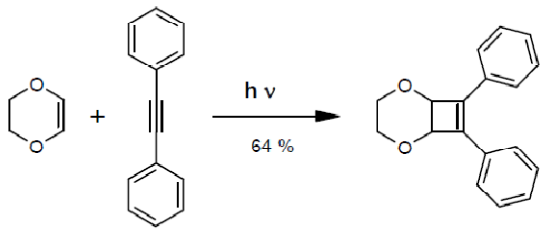
liquid may be overcome, causing formation of bubbles. In case, the internal forces are great enough to ensure collapse of these bubbles, very high local temperature and pressure may be created, which initiate the chemical reactions. it gives excellent yields compared to other reactions. It is time saving and pollution free technology.

(c) Applications of light in green chemistry reactions:

The chemistry which deals with the chemical reactions in the presence of natural light is known as photochemistry.

Examples of some chemical reactions:

1.



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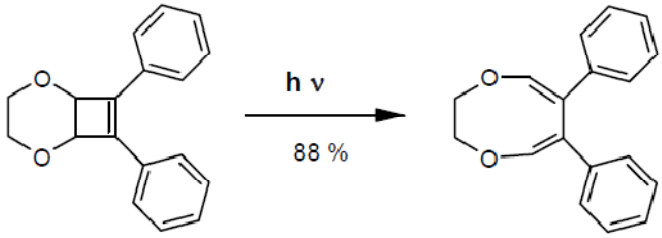

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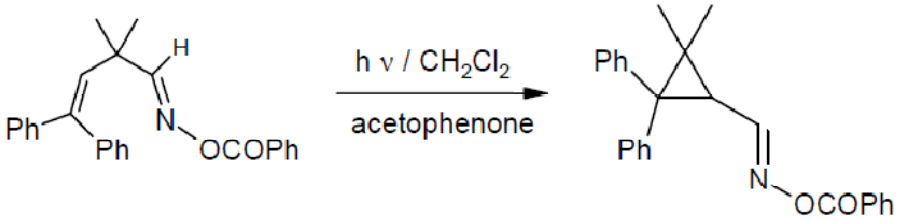

Ans. 6. (a) Geothermal energy:

The energy released by heat stored inside the earth is called as geothermal energy. At most places on the earth, the magma are many miles below the ground, but at some locations, it comes to close to the surface, creating hot spots. When ground water comes in contact with hot spots, the water turns to steam. This hot water or geothermal steam can b used to generate electricity. The steam can also be directly piped into buildings for heating.

(b) Four non conventional energy resources:

1. Wind energy

2. Ocean energy

3. Geothermal energy

4. Solar energy

(c) Significance of wind:

Moving air is called wind. As we all know that energy possessed due to the motion of anything is called its kinetic energy. Thus, when air moves from one place to another it possesses kinetic energy. The energy possesses by wind depends on its velocity. If air is stationary, it has no kinetic energy. However, when it starts moving it generate kinetic energy. This wind energy is fast emerging as most cost effective source of power it combines the abundance of natural element with modern technology. The great advantage of wind driven power stations that, it is in harmony with the environment. A wind driven power station consumes no raw materials neither does it have any waste. Being a cheap source of energy and with simple manageable technology, it is ideal for the developing countries. Advantage of wind energy:

a. It is renewable, abundant, inexpensive, and pollution free.
b. B. it is being used to generate electricity, to run pumps to draw water from the ground.
c. C. it can be supplied to remote areas where other sources of energy are not possible.