

# Introduction to Microbiology

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## Exercise

**Q. 1. Rewrite the following statements using correct of the options and explain the completed statements.**

(gluconic acid, coagulation, amino acid, acetic acid, clostridium, lactobacilli)

- a. Process of -- -- -- of milk proteins occurs due to lactic acid.
- b. Harmful bacteria in like -- -- -- in the intestine are destroyed due to probiotics.
- c. Chemically, vinegar is -- -- --.
- d. Salts which can be used as supplement of calcium and iron are obtained from - ----- acid.

**Answer :** a. Process of coagulation of milk proteins occurs due to lactic acid.

b. Harmful bacteria in like clostridium in the intestine are destroyed due to probiotics.

c. Chemically, vinegar is acetic acid.

d. Salts which can be used as supplement of calcium and iron are obtained from gluconic acid.

**Q. 2. Match the pairs**

'A' group

a. Xylitol

b. Citric acid

c. Lycopene

d. Nycin

'B' group

1. Pigment

2. To impart sweetness

3. Microbial restrictor

4. Protein binding emulsifier

5. To impart acidity

**Answer :**

| <b>A</b>       | <b>Answer</b>        | <b>Explanation</b>  |
|----------------|----------------------|---|
| a. Xylitol     | To impart sweetness  | It is a low calorie artificial sweetener                    |
| b. Citric acid | To impart acidity    | It is used to impart acidity to substances while processing |
| c. Lycopene    | Pigment              | It is an edible colour used to add colour to foods          |
| d. Nycin       | Microbial restrictor | It acts as a restrictor in microbiological reactions        |

**Q. 3. A. Answer the following.**

**Which fuels can be obtained by microbial processes? Why is it necessary to increase the use of such fuels?**

**Answer :** i. Gaseous fuel- methane can be obtained by microbial anaerobic decomposition of urban agricultural and industrial waste.

ii. Ethanol, an alcohol is a clean (smokeless) fuel obtained during fermentation of molasses by the yeast- *Saccharomyces*.

iii. Hydrogen gas is considered to be the fuel of future. Hydrogen gas is released during bio-photolysis of water in which bacteria perform the photo-reduction.

It is necessary to increase the use of these fuels so that the fuels that are obtained from the non-renewable energy sources can be conserved. Also, air pollution can be reduced.

**Q. 3. B. Answer the following.**

**How can the oil spills of rivers and oceans be cleaned?**

**Answer :** i. Spilling of petroleum oil occurs in ocean due to various reasons.

ii. This oil may prove fatal and toxic to aquatic organisms.

iii. It is not easy to remove the oil layer from surface of water by mechanical method. However, bacteria like *Pseudomonas* spp. and *Alcanovorax borkumensis* have the ability to destroy the pyridines and other chemicals.

iv. Hence, these bacteria are used to clear the oil spills. These are called as hydrocarbon clastic bacteria (HCB). HCB decompose the hydrocarbons and bring about the reaction of carbon with oxygen. CO<sub>2</sub> and water is formed in this process.

**Q. 3. C. Answer the following.**

**How can the soil polluted by acid rain be made fertile again?**

**Answer : i.** Sulphuric acid is present in the acid rain and materials coming out of mines. The erosion of metals present in statues, bridges and buildings occurs due to it.

**ii.** Sulphuric acid is source of energy for some species of bacteria like Acidophillum spp. and Acidobacillus ferrooxidans. Hence, these bacteria can control the soil pollution occurring due to acid rain.

**Q. 3. D. Answer the following.**

**Explain the importance of biopesticides in organic farming.**

**Answer : i.** Some microbes-containing inoculants are produced by process of fermentation. These inoculants are sprayed on seeds before sowing and some of the inoculants are released into plants.

**ii.** Solution containing Azotobacter and artificial nitrogenase is used in organic farming.

**iii.** Soil pollution occurring due to chemical fertilizers is prevented due to use of these solutions.

**iv.** Pesticides in the soil can be destroyed with the help of microbes.

**v.** Bacterial and fungal toxins which can destroy pests and pathogens can be directly integrated into plants with the help of biotechnology. Similar to bacteria, some species of fungi and viruses are useful as pesticides. Spinosad, a byproduct of fermentation is a biopesticide.

**Q. 3. E. Answer the following.**

**Which are the reasons for increasing the popularity of probiotic products?**

**Answer : i.** Probiotics are milk products that contain active bacteria like Lactobacillus. These microbes maintain the balance of intestinal microorganisms i.e. increase the population of microbes helping the digestion and decrease the population of harmful microbes (ex. Clostridium).

**ii.** These products form the colonies of useful microbes in alimentary canal and control other microbes and their metabolic activities, improve resistance and lower the ill-effects of harmful substances formed during metabolic activities.

iii. Useful microbes become inactive due to antibiotics; probiotics make them active again. Nowadays, probiotics are used for treatment of diarrhoea and treatment of poultry too.

**Q. 3. F. Answer the following.**

**How the bread and other products produced using baker's yeast are nutritious?**

**Answer :** i. Different types of breads are produced from flour of cereals. Dough is formed by mixing of baker's yeast – *Saccharomyces cerevisiae*, water, salt and other necessary materials with flour.

ii. Due to fermentation of carbohydrates by yeast, sugar is converted into carbon dioxide (CO<sub>2</sub>) and ethanol.

iii. Dough rises up due to CO<sub>2</sub> and the bread becomes spongy.

iv. Compressed yeast is used in commercial bakery industry. It is available in dry, granular form for domestic use.

v. Yeast produced for commercial use contains various useful contents like carbohydrates, fats, proteins, various vitamins, and minerals.

vi. Due to this, bread and other products produced with the help of yeast become nutritive.

**Q. 3. G. Answer the following.**

**Which precautions are necessary for proper decomposition of domestic waste?**

**Answer :** i. In villages, domestic sewage is disposed off either in nearby soil or in biogas plant. However, in cities, sewage needs to be carried to processing unit and acted upon by microbial processes.

ii. Segregation of dry and wet waste should be done at household level itself.

iii. Dry waste can be dumped in garbage bins which can further be used in the landfill processes.

iv. Wet waste can be used for the preparation of compost.

**Q. 3. H. Answer the following.**

**Why is it necessary to ban the use of plastic bags?**

**Answer : i.** Plastic bags pollute water as well as land. Littering of these bags gets clogged at the water sources.

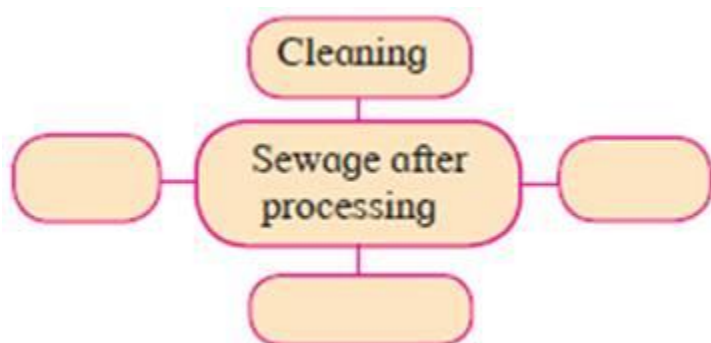
**ii.** They are manufactured from polypropylene which is a material manufactured from non-renewable sources like mineral oil and petroleum.

**iii.** Plastic bags are undegradable and are not recycled easily.

**iv.** They are harmful for marine animals and wild life creatures.

**v.** Hence, its necessary to ban plastic bags.

**Q. 4. Complete the following conceptual picture.**



**Answer :**



**Q. 5. A. Give scientific reasons.**

**Use of mutant strains has been increased in industrial microbiology.**

**Answer :** During industrial production of milk products, strict cleanliness and sterilization is essential as bacteria can be attacked by viruses. Hence, virus-resistant

varieties of bacteria are developed. Recently, use of mutant varieties of bacteria has been increased. Artificially, some strains are developed that will help to avoid unnecessary steps or materials.

**Q. 5. B. Give scientific reasons.**

**Enzymes obtained by microbial process are mixed with detergents.**

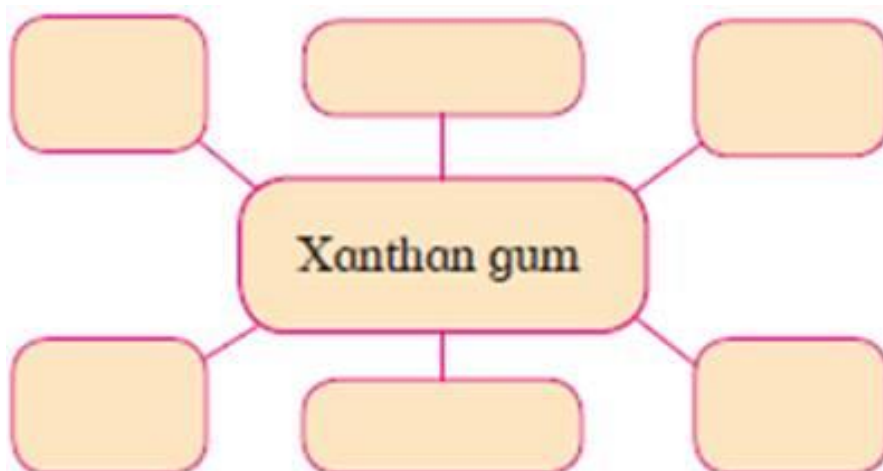
**Answer :** Instead of chemical catalysts, nowadays microbial enzymes are used in chemical industry. These enzymes are active at low temperature, pH and pressure due to which energy is saved and erosion-proof instruments are also not necessary. Process of dirt / muck removal occurs at low temperature too due to mixing of enzymes with detergents. Hence the enzymes obtained by microbial process are mixed with detergents.

**Q. 5. C. Give scientific reasons.**

**Microbial enzymes are used instead of chemical catalysts in chemical industry.**

**Answer :** Microbial enzymes are active at low temperature, pH and pressure due to which energy is saved and erosion-proof instruments are also not necessary. Enzymes carry out specific processes, hence unnecessary byproducts are not formed due to which expenses on purification are minimised. In case of microbial enzymatic reactions, elimination and decomposition of waste material is avoided and enzymes can be reused. Hence, such enzymes are eco-friendly. Hence, microbial enzymes are used instead of chemical catalysts in chemical industry.

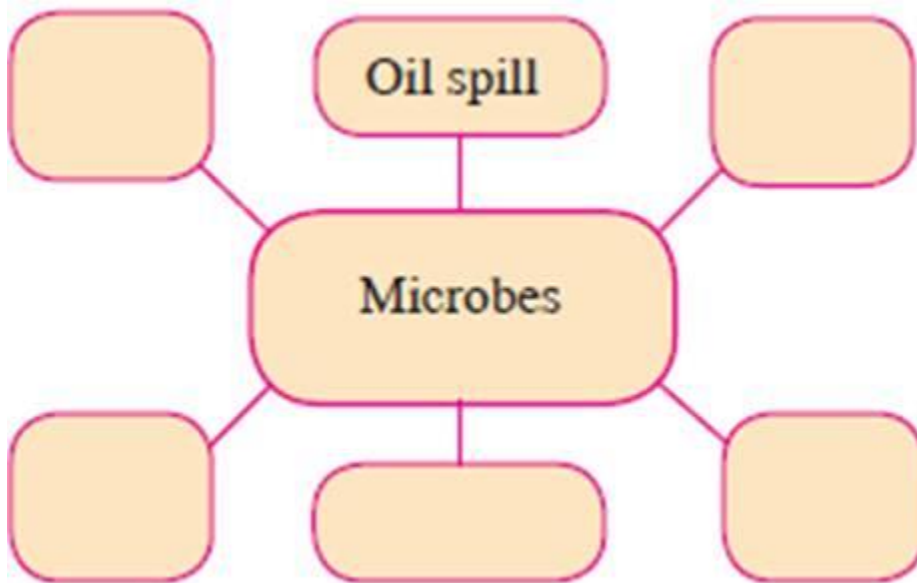
**Q. 6. Complete the following conceptual picture with respect to uses.**



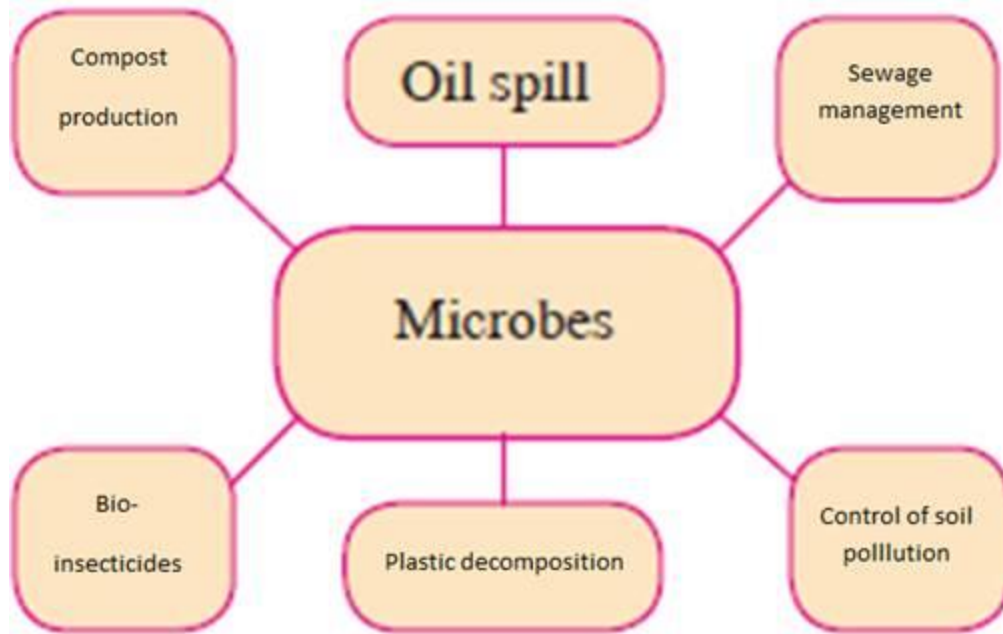
**Answer :**



**Q. 7. Complete the following conceptual picture related to environmental management.**



**Answer :**



**Q. 8. A. Answer the following.**

**What is role of microbes in compost production?**

**Answer :** Compressed waste is dumped in the large pits that are dug in open spaces far away from the residential area. It is covered with layers of soil, saw dust, leafy waste and specific biochemicals. Bioreactors are mixed at some places. Microbes present in soil and other top layers decompose the waste. Completely filled pit is sealed with soil slurry. Best quality compost is formed after few days. Such land filling sites can be reused after removal of compost.

**Q. 8 B. Answer the following.**

**What are the benefits of mixing ethanol with petrol and diesel?**

**Answer :** The energy content of ethanol is about 33% less than pure gasoline. Ethanol fuel is ethyl alcohol, the same type of alcohol found in alcoholic beverages, used as fuel. It is most often used as a motor fuel, mainly as a bio fuel additive for gasoline. For environmental purposes, ethanol is less harmful than unblended gasoline as carbon monoxide production from ethanol fuel is significantly lower than that of gasoline engines. Also, ethanol is easier to source since it comes from processed corn, which means it also helps local farm and manufacturing economies.

**Q. 8. C. Answer the following.**

**Which plants are cultivated to obtain the fuel?**



**Answer :** Plants that are cultivated to obtain fuel are known as the bio fuel crops. The most popularly used biofuel plants are corn, sugarcane, palm oil, jatropha, soyabean, canola, cottonseed, sunflower and wheat.

**Q. 8. D. Answer the following.**

**Which fuels are obtained from biomass?**

**Answer :** Burning biomass releases carbon dioxide. However, plants also take carbon dioxide out of the atmosphere and use it to grow their leaves, flowers, branches, and stems. That same carbon dioxide is returned to the air when the plants are burned. Many different kinds of biomass, such as wood chips, corn, and some types of garbage, are used to produce electricity. Some types of biomass can be converted into liquid fuels called biofuels that can power cars, trucks, and tractors. Leftover food products like vegetable oils and animal fats can create biodiesel, while corn, sugarcane, and other plants can be fermented to produce ethanol.

**Q. 8. E. Answer the following.**

**How does the bread become spongy?**

**Answer :** Different types of breads are produced from flour of cereals. Dough is formed by mixing of baker's yeast – *Saccharomyces cerevisiae*, water, salt and other necessary materials with flour. Due to fermentation of carbohydrates by yeast, sugar is converted into carbon dioxide (CO<sub>2</sub>) and ethanol. Dough rises up due to CO<sub>2</sub> and the bread becomes spongy.

**Q. 1. A. Fill in the blanks with appropriate word.**

**Laughter club is a remedy to drive away -- -- -- --.**

**Answer :** Laughter club is a remedy to drive away mental stress.

**Explanation:** Laughter club is a popularized concept in which people relieve their mental stress by laughing out loudly. It is a perfect remedy to remove all the tension going in your mind.

**Q. 1. B. Fill in the blanks with appropriate word.**

**Alcohol consumption mainly affects -- -- -- -- system.**

**Answer :** Alcohol consumption mainly affects nervous system.

**Explanation:** Alcohol consumption directly affects the nervous system (especially brain) and liver. The ability of memorization and learning becomes slow. Due to excess consumption of alcohol, lifespan of a person also decreases.

**Q. 1. C. Fill in the blanks with appropriate word.**

**The act -- -- -- is to curb the cyber crimes.**

**Answer :** The act IT Act-2000 is to curb the cyber-crimes.

**Explanation:** This act has been started since 17th October 2000 and had been amended in 2008. If someone commits cyber-crime, this act imposes a punishment like imprisonment for 3 years or fine upto 5 lakh.

**Note:** Maharashtra was the only first state who took an initiative to control the cyber-crimes. It was the first state to start a separate cyber-crime unit.

**Q. 2. A. Answer the following.**

**Which factors affect the social health?**

**Answer :** The factors which affect the social health are:

⇒ Mental stress – In this competitive environment, everyone is facing stress. Children are facing the problem of loneliness and mental stress due to excessive bindings on them. Girls are facing stress due to increased gender inequality.

⇒ Addiction – Now days, children try tobacco, cigarette, alcohol, drugs etc. due to either bad company or as an imitation of elders. This lead to addiction of such unhealthy substances.

⇒ Incurable disease – Factors like ignorance towards the people with incurable diseases like AIDS, T. B., leprosy and mental disorders as well as old persons leads to increase in old age homes and such factors also may cause harm to social health.

**Q. 2. B. Answer the following.**

**Which changes occur in persons continuously using internet and mobile phones?**

**Answer :** The changes occur in persons continuously using internet and mobile phones are:

⇒ Due to increase in technology, number of gadgets are coming in the market.

⇒ Among the gadgets, mobile phones win the competition.

⇒ Persons spending the time with mobile phones for several hours are usually unaware of the surroundings.

- ⇒ Continuous use of mobile phones causing various problems.
- ⇒ The problems include tiredness, headache, insomnia, vision problem.
- ⇒ These all problems may arise due to the radiation of mobile phones.
- ⇒ Persons continuously using the computers and internet become lonely.
- ⇒ They become less caring towards others, self-centered which may develop autism and selfishness.

**Q. 2. C. Answer the following.**

**Which problems do the common man faces due to incidences of cyber crime?**

**Answer :** The problems which common man faces due to incidences of cyber-crime are:

- ⇒ Some websites cheat the customers by showing superiors items but actually they sell the items of inferior quality or defected ones.
- ⇒ Sometimes without the knowledge of customers, bank transactions are done by using their PIN.
- ⇒ Crimes like opening a fake account on Facebook and displaying false information and thereby teasing the girls or exploiting them financially.
- ⇒ Personal information and phone numbers are automatically spread through WhatsApp.

**Q. 2. D. Answer the following.**

**Explain the importance of good communication with others.**

**Answer :** The importance of good communication with others are:

- ⇒ Having good communication involve a wide range of skills.
- ⇒ Good communication benefits individual to clearly deliver his/her messages.
- ⇒ It keeps everyone involved towards you.
- ⇒ Good communication can develop a quality of good listener. Listening shows respect.

**Q. 3. A. Solve the following cross-word**

**Continuous consumption of alcoholic and tobacco-materials.**

**Answer :** Continuous consumption of alcoholic and tobacco-materials – Addiction

**Explanation:** Continuous consumption of alcohol and tobacco materials can make a person addict. Some children start to consume all these in their early age due to bad friend circle or they want to imitate(copy) as elders. However, it may lead to addiction.

**Q. 3. B. Solve the following cross-word**

**This app may cause the cybercrimes.**

**Answer :** This app may cause the cybercrimes — Facebook

**Explanation:** Most of the cyber-crime has increased only through this app, i.e., Facebook.

⇒ Personal information and numbers are spread and thereby reaches the unknown person which leads to unnecessary calls, messages, stalking etc.

⇒ Some may make fake account on Facebook to tease the girls or to exploit them.

**Q. 3. C. Solve the following cross-word**

**A remedy to resolve stress.**

**Answer :** A remedy to resolve stress – reading

**Explanation:** There are various ways by which we can reduce stress:

i. Some of the ways include reading, drawing, cooking, sculpturing and many more.

ii. These all ways keep us busy and utilize our free hours.

iii. By diverting the energy and mind towards these things, negative thoughts go on decreasing.



**Q. 3. D. Solve the following cross-word**

**Requirement for stress free life.**

**Answer :** Requirement for stress free life – students

**Explanation:** Students require a complete stress free life. As some students are facing over strictness from their parents. There are many bindings on them due to which they face the stress. So they badly require a stress free life.

**Q. 3. E. Solve the following cross-word**

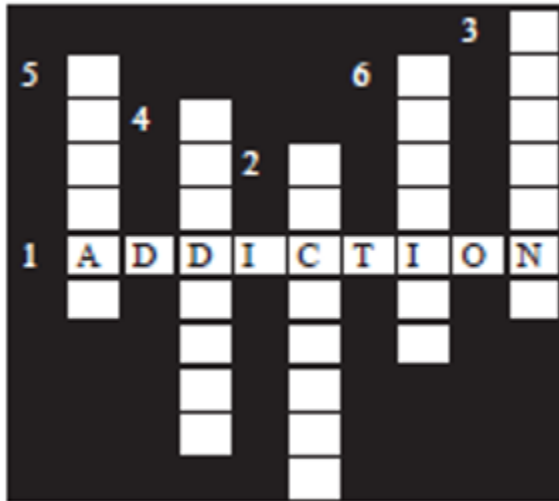
**Various factors affect -- -- -- health.**

**Answer :** Various factors affect social health.

**Explanation:** There are many factors which effect social health which include mental stress, loneliness, addiction of drugs, tobacco, alcohol, cigarette, ignorance towards suffering people with AIDS, T.B as well as old people.

**Q. 3. F. Solve the following cross-word**

**Art of preparing food items.**



**Answer :** Art of preparing food items – cooking

**Explanation:** Art of preparing food items is called cooking. Cooking is one of the way by which we can reduce mental stress. It keeps your mind fresh and free from negative thoughts.

**Q. 4. Which are various ways to minimize stress?**

**Answer :** The number of ways to minimize stress are:

- i. Newly popularized concept 'laughter club' due to which people relieve stress by laughing loudly.
- ii. By adopting hobbies like cooking, singing, drawing, reading, photographs collection, playing outdoor games, walking, dancing etc. can reduce mental stress within a few days.
- iii. By expressing your feelings to someone like parents, friends, cousins, close friends help to relieve the stress.
- iv. Regular exercising, massaging, yoga too help to relieve the stress.
- v. Meditation plays a very important role in reducing the stress. It helps to improve the ability of concentration.

**Q. 5. A. Give three examples of each.**

**Hobbies to reduce stress.**

**Answer :** Three hobbies to reduce stress are:

i. Listening Music – Singing keeps us happy and drives away the stress. Music has the power of changing the mindset.

ii. Meditation – Meditation plays a vital role in reducing stress. It helps the students to improve concentration in their studies.

iii. Dancing – Dancing is one of the important hobby to reduce stress. It keeps you away from negative thoughts.

**Q. 5. B. Give three examples of each.**

**Diseases endangering the social health.**

**Answer :** Three diseases endangering the social health are:

i. AIDS– Ignorance towards AIDS can affect social health badly.

ii. Mental disorders– People who suffer from mental disorder are ignored by the society. Some people make fun of them too.

iii. Leprosy– it is one of the incurable diseases which endanger the social health very much.

**Q. 5. C. Give three examples of each.**

**Physical problems arising due to excessive use of mobile phones.**

**Answer :** Physical problems arising due to excessive use of mobile phones are:

i. Insomnia– Due to excessive use of mobile phones, person becomes insomniac. He/she is not able to sleep properly.

ii. Effect bones– The radiations released by the mobile phones are so strong that they can even penetrate the bones of children more effectively than the bones of adults.

iii. Headache- t is one of the common physical problem due to excessive use of mobile phones.

**Q. 5. D. Give three examples of each.**

**Activities under the jurisdiction of cyber-crime laws.**

**Answer :** The activities under the jurisdiction of cyber-crime laws are:

i. Launched a cyber-crime unit – The government took a great initiative to start a cyber-crime unit to control all the cybercrimes.

ii. IT Act-2000 – This act has been amended on 2008. Person who is committing cyber-crime has to face the imprisonment.

iii. Cyber-crime experts – Collect the details, investigate the cyber-crime and thereby find the criminal with the help of internet.

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**Q. 6. B. What will you do? Why?**

**Child of your neighbor is addicted to tobacco chewing.**

**Answer :** I will go and stop the child because:

⇒ Chewing tobacco directly damage the nervous system, muscle system, heart etc.

⇒ Due to these, the person has to face the social, mental and familial illness along with physical illness.

**Q. 6. C. What will you do? Why?**

**Your sister has become incommunicative. She prefers to remain alone.**

**Answer :** If my sister has become incommunicative and wants to live alone, this means she is suffering from mental stress. I will help her to join a 'laughter club' and insist her to listen music because:

⇒ Laughter club is club where people laugh loudly which relieves mental stress and mind keeps fresh.

⇒ Music has power of changing the mindset. Listening music keeps us happy and drives away the stress.



⇒ Loneliness has driven away and person becomes more social.



**Q. 6. D. What will you do? Why?**

**You have to use free space around your home for good purpose.**

**Answer :** I will use that free space for playing outdoor games because:

⇒ Playing outdoor games has many benefits.

⇒ It reduces stress, negative thoughts, keeps us busy in our free hours and imparts positivity.

**Q. 6. E. What will you do? Why?**

**Your friend has developed the hobby of snapping selfies.**

**Answer :** I will stop him and tell him that there so many other features in the phone which you can use and enjoy because:

⇒ Taking too many selfies can make you self-centered. Once we become addicted to it, we don't care and aware about the world around and the risks.

**Q. 6. F. What will you do? Why?**

**Your brother studying in XII has developed the stress.**

**Answer :** I will insist him to do meditation regularly because:

i. Meditation helps to improve and increase the ability of concentration.

ii. t is one of the best way to reduce stress.

