Grade 10- Maharastra-Science-2023

Note: -

I. All questions are compulsory

II. Use of calculators is not allowed.

III. The number to the right of the questions indicates full marks.

IV. In case of MCQs (Q. No. 1(A)) only the first attempt will be evaluated and will be given credit.

V. For every MCQs the correct alternatives (A), (B), (C) or (D) with sub question number is to be written as an answer. For Eg. : (i) (A), (i) (B), (i) (C)

VI. Scientifically correct, labelled diagrams should be drawn wherever necessary.

Q1. (A) Choose the correct alternative:

(i) The device used for producing current is called.

(A) A voltmeter

(B) An ammeter

(C)A galvanometer

(D)A generator

Solution: Option D

The device used for producing electric current is called generator. An electric generator which converts mechanical energy into electricity.

(ii) If a ray of light passes from a denser medium to rarer medium in a straight line, the angle of incidence must be.

(A) 0^0

(B) 30°

(C) 60°

(D) 90°

Solution: Option A

If a ray of light passes from a denser medium to a rarer medium in a straight line, the angle of incidence must be 0^0

(iii) The power of convex lens of focal length 20 cm is.
(A) +5.0 D
(B) 0.20 D
(C) -5.0 D
(D) 0.5 D
Solution: Option A

f=20 cm (convert cm into m)

We know that,

$$P = \frac{1}{f} = \frac{1}{20 \times 10^{-2}} = \frac{100}{20} = 5D$$

(iv) Good conductor of electricity -----
(A) Bromine
(B) lodine
(C) Graphite
(D) Sulphur

Solution: Option C
Among the given options, graphite is a good conductor of electricity due to the presence of delocalized electrons.

(v)The height of medium earth orbit above the surface of the earth is:
(A) 1500 km
(B) 250 km
(C) 45000 km
(D) 25000 km
Solution: Option D
The height of medium earth orbit above the surface of the earth is 25,000 km

Q1. (B) Answer the following questions:

(i) Find the odd man out
Loudspeaker, Microphone, Electric motor, Magnet.

Solution: Magnet

The odd one out is magnet. Loud speaker, microphone and electric motor are based on the phenomenon of electromagnetism.

(ii) Complete the Co-relation:

CuI_2 : Brown: : Agcl :

Solution: White

The colour of AgCl is white

(iii) Match the pair

Group A (Substance)	Group B (Refractive Index)
Air	(a) 1.33
	(b) 1.46
	(c) 1.0003

Solution:

Group A Substance	Group B Refractive Index
Air	(c) 1.0003

(iv) State true or false

"Wavelength of red light is close to 700 nm "

Solution: True

The statement is true because red light has a wavelength between 620 nm and 750 nm, and 700 nm is within this range.

(v) Write the name of small satellite made by a group of students from COEP (College of engineering, Pune) sent to space through ISRO in 2016

Solution: SWAYAM is the small satellite made by a group of students from COEP.

Q2. (A) Give scientific reasons (Any Two):

(i) For electric power transmission, copper (or) aluminium wire is used.

Solution:

Copper and aluminium are good conductors of electricity because they contain many free electrons that can move easily through the material. This gives them low

resistivity and low resistance to current flow, making them ideal for electric power transmission.

(ii) Lemon or tamarind is used for cleaning copper vessels that turned greenish.

Solution:

Tarnished copper vessels turn green due to the formation of a copper carbonate layer. The citric acid in lemon or tamarind reacts with the copper carbonate, neutralizing it and dissolving the layer. This restores the shiny surface of the copper vessel.

(iii) Elements Belonging to the same group have the same valency.

Solution:

The valency of an element depends on the number of electrons in its outermost shell. Elements in the same group have the same outer electronic configuration, so they have the same number of valence electrons. Therefore, all elements in a group have the same valency.

Q3. (B) Answer the following questions (Any Three)

(i) How do we feel about air in each of the following conditions?

a) Relative humidity is more than 60%.

b) Relative humidity is less than 60%.

Solution:

a) When the relative humidity is more than 60% then the air is humid.

b) when the relative humidity is less than 60% then the air is dry.

(ii) Complete the following reaction

$$C_{12}H_{22}O_{11} \xrightarrow{Heat} \_\_\_\_\_ + \_\_\_\_\_$$

Solution: $C_{12}H_{22}O_{11} \xrightarrow{Heat} 12C + 11\ H_2O$

(iii) Distinguish between mass and weight.

Solution:

Mass	Weight
Mass is simply the measure of the amount of matter in a body.	Weight is the measure of the amount of force acting on a mass due to acceleration due to gravity.
Mass is denoted by "M".	Weight is denoted by "W".
Mass is always constant for a body and there are several formulas to calculate mass. One way to calculate mass is: Mass = volume × density	Weight is the measure of the gravitational force acting on a body. Weight can be calculated from the following formula: Weight = mass × acceleration due to gravity
Mass is a base quantity. Mass only has magnitude and so, it is a scalar quantity.	Weight is a derived quantity. Weight has both magnitude and direction (towards the centre of gravity) and so, it is a vector quantity.
The SI unit of mass is Kilogram (Kg).	The SI unit of weight is Newton (N).
Mass does not depend upon gravity and is constant everywhere. Mass can never be zero.	Weight is dependent on gravity and so, it varies from place to place. Weight can be zero where there is no gravity (like space).
Mass can be easily measured using any ordinary balance like beam balance, lever balance, pan balance, etc.	Weight can be measured by a spring balance or by using its formula.

(iv) Complete the following table:

Type of Satellite	The names of indian satellite and and launcher
1. Navigational Satellite	Satellite – Launcher –
2. Earth Observation satellite	Satellite – Launcher –

Solution:

Type of Satellite	The names of indian satellite and and launcher
1. Navigational Satellite	Satellite – IRNSS Launcher - PSLV
2. Earth Observation satellite	Satellite – IRS Launcher - PSLV

(v) Define periods and groups of modern periodic table.

Solution:

Periods: The horizontal rows in the modern periodic table are called periods. There are 7 periods in the modern periodic table.

Groups: The vertical columns in the modern periodic table are called groups. There are 18 groups in the modern periodic table.

3. Answer the following questions (any five)

(i) Calculate the escape velocity on the surface of the moon given the mass and radius of the moon to be 7.34×10^{22} kg and 1.74×10^{6} m respectively. (Given $G = 6.67 \times 10^{-11}\text{Nm}^2/\text{kg}^2$)

Solution:

Mass (m) $= 7.34 \times 10^{22}$ kg

Radius (R) $= 1.74 \times 10^{6}$ m

escape velocity $= (V_e) = \sqrt{\frac{2GM}{R}}$

$$(V_e) = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2 \times 6.67 \times 10^{-11} \times 7.34 \times 10^{22}}{1.74 \times 10^{6}}}$$

$$(V_e) = 2.37 \text{ km/s}$$

(ii) An element has its electron configuration as 2,8,1. Now answer the following questions:

(a) What is the atomic number of the element?

(b) What is the group of this element?

(c) To which period does the element belong?

Solution:

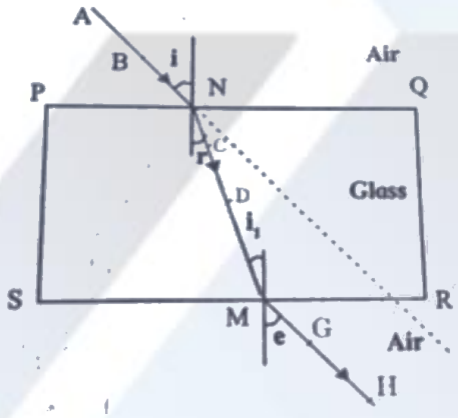
Name of the element is Sodium

(a) Atomic number is 11.

(b) This element belongs to the 1st group, i.e. alkali metals.

(c) This element belongs to the 3rd period.

(iii) Observe the figure and name the ray AB , ray CD , ray GH :



Solution:

Ray *AB* is the incident ray.

Ray CD is the refracted ray

Ray GH is the emergent ray

(iv) Read the following sentence and answer the questions:

" NaCl is an ionic compound"

(a) Why is NaCl is an ionic compound?

(b) State any two properties of ionic compound.

Solution:

(a) Sodium has 2, 8, 1 electron, and chlorine has 2, 8, 7 electrons. To become stable, sodium gives away its one electron to chlorine. Chlorine gains that electron. This forms sodium chloride (NaCl). Since the electrons are transferred from one atom to

another, sodium chloride is an ionic compound.

(b) The properties of ionic compounds are as follows:

1. They are crystalline solids and are brittle in nature.
2. They have high melting and boiling points.
3. They are soluble in water.
4. They conduct electricity in their aqueous solutions and molten states.

(v) Identify the physical and chemical changes from the following phenomena:

(a) Transformation of ice into water.

(b) Ripening of fruit

(c) Milk turned into curd

(d) Evaporation of water

(e) Digestion of food in the stomach.

(f) Iron filling get attracted towards the magnet.

Solution:

(a) Physical change

(b) Chemical change

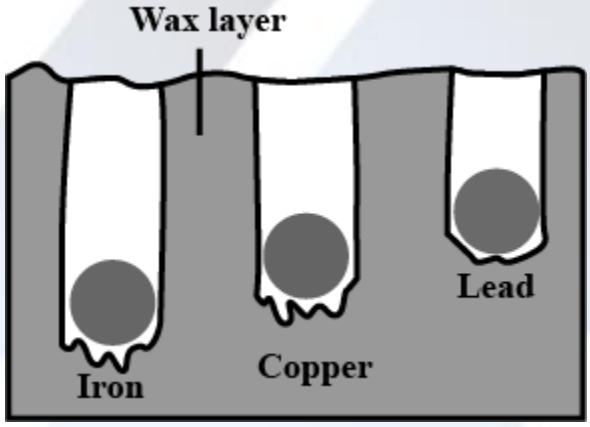
(c) Chemical change

(d) Physical Change

(e) Chemical change

(f) Physical change

(vi) Observe the following figure and answer the questions:



Specific heat capacity of metals

(a) Which element has maximum specific heat capacity? Justify.

(b) Which element has minimum specific heat capacity? Justify.

(c) Define specific heat of object.

Solution:

(a) The ball that absorbs more heat from the water will transfer more heat to the wax, causing more wax to melt and the ball to sink deeper into the wax. The iron ball will sink the most, meaning iron has the highest heat capacity.

(b) On the other hand, the lead ball will sink the least, meaning lead has the lowest heat capacity.

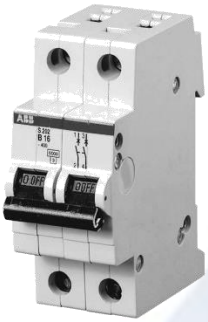
(c) Specific heat capacity of a body is the amount of heat energy required to raise the temperature of unit mass of that body through 1°C (or 1 K). It is given as

$$s = \frac{\Delta Q}{\Delta T \times M}$$

(vii) Identify figure A, B, C and give their uses:

(A)

(B)

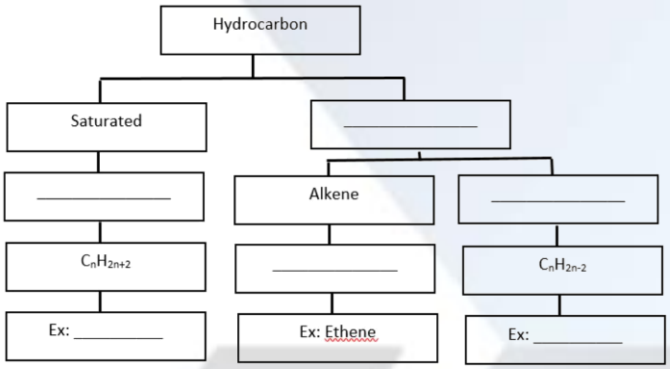


(C)

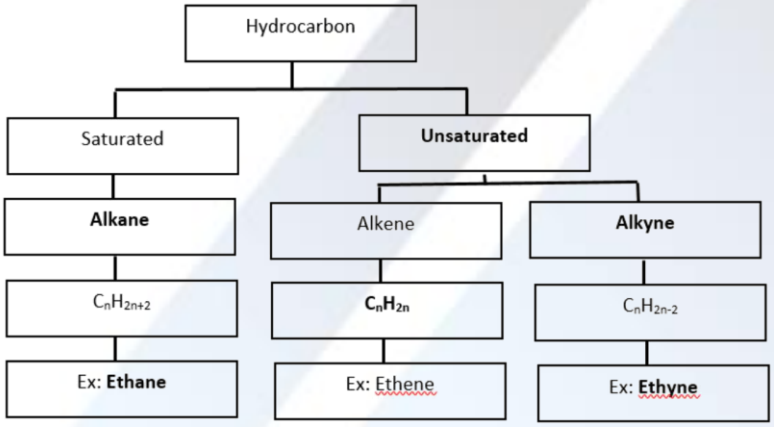
Solution:

Figure (A) represents a fuse. An electric fuse is a safety device that protects wires from overheating due to too much current. It melts when there is too much current, which breaks the circuit and stops the flow of electricity.
Figure (B) represents an MCB. An MCB is a safety device that works like a fuse but doesn't need to be replaced. It automatically turns off the circuit when there is too much current. After fixing the problem, you can simply reset the MCB to use it again.
Figure (C) represents a galvanometer. It is used in electrical circuits to measure the intensity (amount) and direction of the electrical current

(viii) Complete the following flow chart:

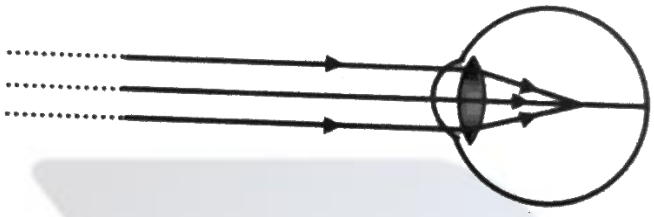


Solution:



Q4. Answer any of the following questions:

i. Observe the figure and answer the following questions:



(a) Name the defect of vision represented in the above figure.
(b) State the reasons for this defect.
(c) How is it corrected?
(d) Draw the diagram to show the correction of defect.

Solution:

(a)The defect of vision which is represented in the given figure is known as Myopia (or) nearsightedness. It is a defect of vision in which a person clearly sees all the nearby objects, but is unable to see the distant objects comfortably and his eye is known as a myopic eye. A myopic eye has its far point nearer than infinity. It forms the image of a distant object in front of its retina as shown in the given figure.

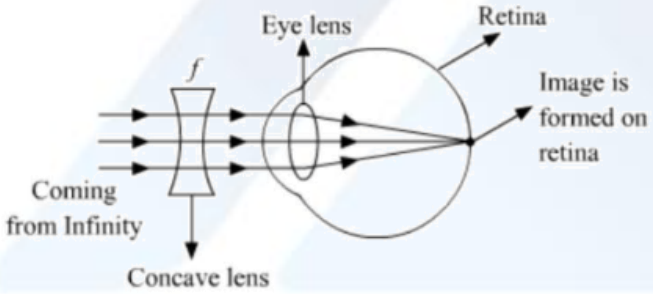
(b) Myopia is caused by

(i) Increase in curvature of the lens

(ii) increase in length of the eyeball

(c)Concave lens is used to correct this defect of vision, because concave lens has an ability to diverge incoming rays. The image is allowed to form at the retina by using a concave lens of suitable power as shown in the given figure.

(d)



ii. Complete the following table:

S.N.	Common Name	Structural Formula	IUPAC Name
1.	Ethylene	$CH_2 = CH_2$	

2.	Acetylene		
3.	Acetic acid	$CH_3 - COOH$	Ethyne
4.	Methyl alcohol		
5.		$CH_3 - CO - CH_3$	Propane-2-one

Solution:

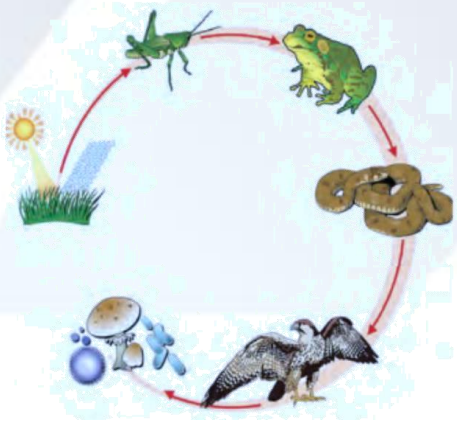
S.N.	Common Name	Structural Formula	IUPAC Name
1.	Ethylene	$CH_2 = CH_2$	**Ethene**
2.	Acetylene	**HC=CH**	Ethyne
3.	Acetic acid	$CH_3 - COOH$	**Ethanoic acid**
4.	Methyl alcohol	**$CH_3 - OH$**	Methanol
5.	**Acetone**	$CH_3 - CO - CH_3$	Propane-2-one

2023 III 20 1100-N947 - SCIENCE AND TECHNOLOGY(72) - PART II (E) (REVISED COURSE)

Time: 2 Hours
Max. Marks: 40
Note:-
I. All questions are compulsory
II. Use of calculators is not allowed.
III. The number to the right of the questions indicates full marks.
IV. In case of MCQs (Q. No. 1(A)) only the first attempt will be evaluated and will be given credit.
V. For every MCQs the correct alternatives (A), (B), (C) or (D) with sub question number is to be written as an answer.
For Eg.: (i) (A), (i) (B), (i) (C)
VI. Scientifically correct, labelled diagrams should be drawn wherever necessary.

Q1. (A) Write the correct alternative:

(i) Vestigial organ present in the human body is proof of evolution.
(A) Human hand
(B) Appendix
(C) Ear muscles
(D) Tail-bone
Solution: Option (B)
The appendix, which is not very useful in humans, is a functional organ in ruminants. In ruminants like cows and sheep, the appendix helps in digesting tough plant material by housing bacteria that aid in breaking down food.
(ii) Type of sexual reproduction is.
(A) Fragmentation
(B) Regeneration
(C) Gamete formation
(D) Budding
Solution: Option (C)
Sexual reproduction always occurs with the help of two germ cells. Female gamete and male gametes are those two germ cells. Gametes are formed by the meiosis. In meiosis, chromosome number is reduced to half; hence haploid gametes are formed.
(iii) The apex consumer is .
(A) Eagle
(B) Frog
(C) Snake
(D) Grasshopper
Solution: Option (A):
The eagle is the apex consumer as it is at the top of the food chain.

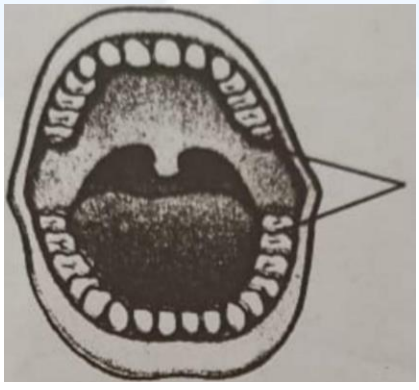


(iv) The Hydroelectric capacity of Koyna dam is.
(A) 2400 MW
(B) 1960 MW

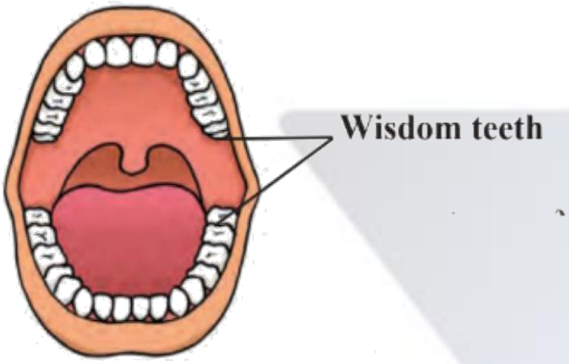
(C) 1900 MW
(D) 1961 MW
Solution: Option (B)
The Hydroelectric capacity of Koyna dam is 1960 MW
(v) Animal with bilateral symmetry in.
(A) Star fish
(B) Human
(C) Paramoecium
(D) Amoeba
Solution: Option (B):
Bilateral symmetry means the body can be divided into two equal halves along a single plane. Humans exhibit bilateral symmetry, as their body has a symmetrical structure when divided down the middle.
(B) Answer the following questions as per the given instructions:
(i) State whether the following statement is true or false:
To take a selfie on the road is an invitation for an accident.
Solution: True
(ii) Write the correct co-relation:
Insulin: diabetes:: Interferon :
Solution: Viral infection
(iii) To which class does bat belong?
Solution: Mammalia
(iv) Match the correct pair:

Column 'A'	Column 'B'
(1) Forest Conservation Act	(a) 1986
	(b) 1980
	(c) 1970

Solution: 1980
(v) Write the name of indicated part in diagram:
Human jaw



Solution: Wisdom Teeth



Q2. (A) Give scientific reasons (any two):

(i) Sometimes higher plants and animals too perform anaerobic respiration.

Solution:

Seeds undergo anaerobic respiration when the soil is submerged in water during germination. Similarly, our muscle cells carry out anaerobic respiration during exercise. As a result, less energy is produced in the body, and lactic acid builds up, causing fatigue.

(ii) It is absolutely necessary to control the fission reaction in nuclear power plants.

Solution:

Uncontrolled fission reactions can release harmful radiation and may cause a nuclear power plant to melt down. Therefore, it is crucial to regulate fission reactions in nuclear power plants.

(iii) Flower is the structural unit of sexual reproduction in plants.

Solution:

The flower is the reproductive structure of plants. It contains four floral whorls: calyx, corolla, androecium, and gynoecium, arranged from the outermost to the innermost. The androecium and gynoecium are referred to as the 'essential whorls' because they are responsible for reproduction

(B) Answer the following questions (Any three)

(i) Write a short note on Environmental Conservation.

Solution:

The purpose of this act is to control pollution and penalize individuals or organizations that harm the environment. It prohibits any person or factory from releasing pollutants into the atmosphere beyond a set permissible limit. Those who violate this rule may face up to five years of imprisonment or a fine of up to Rs. 1

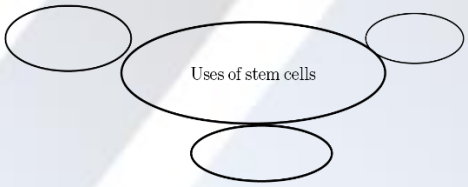
lakh. The National Green Tribunal was established in 2010 to ensure the effective implementation of environmental laws.

(ii) Distinguish between Chordates and Non-chordates.

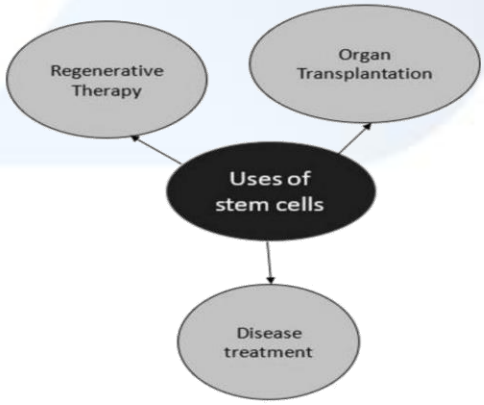
Solution:

Non-Chordates	Chordates
1. Body is not supported by a rod-like notochord.	1. Body is supported by a notochord.
2. Pharyngeal gill-slits are absent.	2. Pharyngeal gill-slits or lungs are present for respiration.
3. Nerve cord; if present, it is on the ventral side. It is solid & paired.	3. Nerve cord is present on the dorsal side of the body. It is hollow.
4. Heart, if present, it is on the dorsal side.	4. Heart is present on the ventral side of the body

(iii) Write the correct answer in blank circles.



Solution:



(iv) Write down any two objectives of disaster management.

Solution: The objectives of disaster management are:

1. Supply of essential commodities.
2. Rehabilitation of disaster victims.
3. Protective measures to reduce the intensity of future disasters.
4. Rescue of victims by the event and disposal of losses suffered.
5. Restoration of human life in the region.

(v) What are the benefits of mixing ethanol with petrol and diesel?

Solution:

Whenever ethanol is mixed with petrol and diesel, CO_2 emission from automobiles reduces by 30%. As a result, pollution decreases. Ethanol, when mixed with petrol and diesel, serves as a great cleaning agent for car engines over a long run. It also helps to increase and improve the quantity of fuel.

Q3. Answer the following questions (any five):

(i) Darwin's theory of natural selection.

Solution:

Darwin says that all organisms reproduce prolifically. All the organisms compete with each other in a life- -threatening manner. In this competition, only those organisms which show the modifications are essential for winning the competition. However, besides this, natural selection also plays an important role because nature selects only those organisms which are fit to live and the rest perish. Sustaining and selected organisms can perform reproduction and thereby give rise to the new species with their own specific characters. Darwin's theory of natural selection was widely accepted for a long duration.

However, some objections were raised against the theory. Some of the main objections are-

1. Natural selection is not the only factor responsible for evolution.
2. Darwin did not mention any explanation about useful and useless modifications.
3. There is no explanation about slow changes and abrupt changes.

(ii) Complete the following chart:

Sr. No.	Proteins	Name of the Organs
1.	Melanin, Keratin	
2.		Pancreas
3.	Haemoglobin, antibodies	

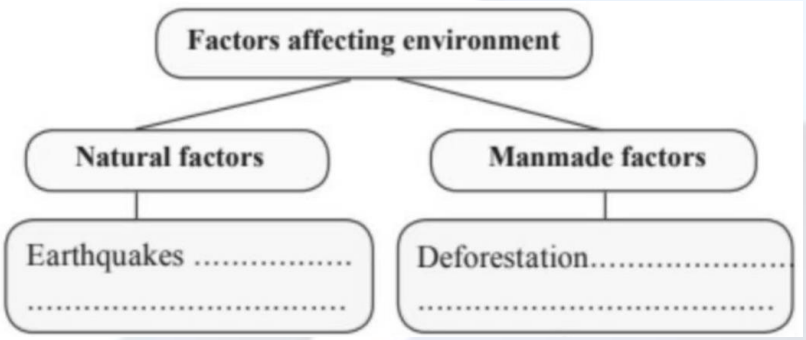
Solution:

Sr. No.	Proteins	Name of the Organs
1.	Melanin, Keratin	Skin
2.	Enzymes (trypsinogen, chymotrypsinogen,procarboxypeptidase etc) Hormones (Insulin, Glucagon etc.)	Pancreas
3.	Haemoglobin, antibodies	Bone Marrow

(iii) Write the factors affecting the environment.

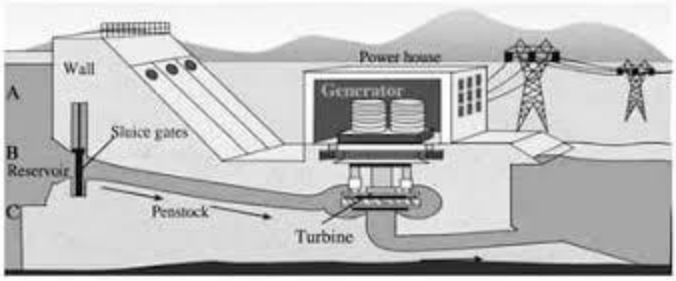
Solution:

When some natural factors of environment and artificial polluted factors harm the environment, it creates imbalance between various factors of the environment and ultimately affects the existence of biotic factors.



Environmental pollution is one of those main factors. Generally, contamination of any material is its pollution. Unnecessary and unacceptable change in the surrounding environment due to natural events or human activities is called environmental pollution. i.e. Direct or indirect changes in physical, chemical and biological properties of air, water and soil which will be harmful to human and other living beings is environmental pollution. Various reasons like population explosion, fast industrialization, and indiscriminate use of natural resources, deforestation, and unplanned urbanization are responsible for environmental pollution.

(iv) Answer the following questions from figure:



(a) With reference to point B, potential energy of how much water reservoir in the dam will be converted into kinetic energy?

Solution: When the sluice gate at point B. is opened, potential energy of the stored water level ' *A* ' and ' *B* ' in the dam will be converted into kinetic energy.

(b) What will be the effect on electricity generation, if the channel taking water to the turbine starts at point *A* ?

Solution: As height increases, potential energy increases. Thus at point A, potential energy of water will be maximum. If a canal/penstock carrying water from the dam starts at point *A*, this maximum potential energy will be converted into kinetic energy due to which turbines will rotate with more speed. Thus more electrical energy will be generated.

(c) What will be the effect on electricity generation, if the channel taking water to the turbine starts at point C?

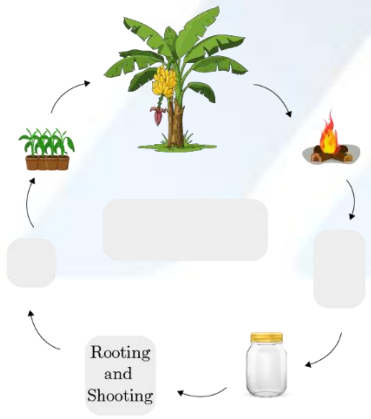
Solution: As height decreases potential energy decreases. Thus at point C, potential energy of water will be minimum. If a canal/penstock carrying water from the dam starts at point C , this minimum potential energy will be converted into kinetic energy due to which turbines will rotate with less speed. Thus less electrical energy will be generated.

(v) Cockroach, Frog, Sparrow, Star fish, from these animals which can regenerate its broken body part?

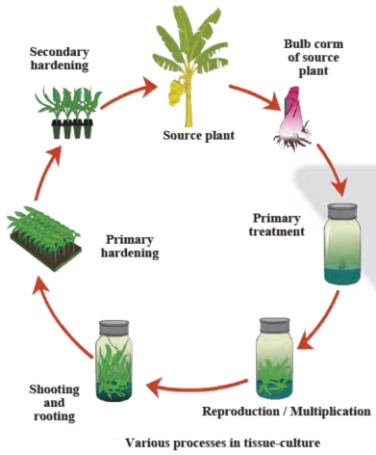
Solution:

Cockroach, Frog, Sparrow, Star fish, from these animals starfish can regenerate its broken body part because In certain situations, star fish can break apart its body parts and regenerate those later on.

(vi) Complete the diagram showing various processes in tissue culture.



Solution:



Various processes in tissue-culture

(vii) Which fuels are obtained from biomass?

Solution: Fuels that are obtained from biomass are called biofuels and they are an important and renewable source of energy. Biofuels can be in the form of either solid, liquids, or gases.

Solid biofuels: coal, dung, crop residue

Liquid biofuels : vegetable oils, alcohol

Gaseous biofuels: Gober gas, coal gas

(viii) Complete the following passage by using appropriate words given in brackets:

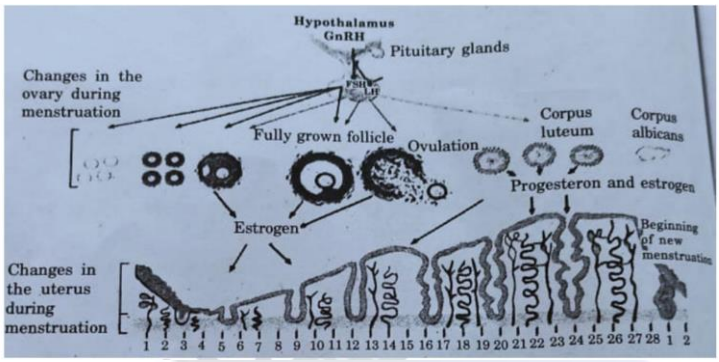
(Delhi, 12, 2005, army, National Disaster, rescue work, State Reserve Police, 2015)

National Disaster Response Force has been established as per the Disaster Management Act, Divisions of this force are working in the army. Overall, divisions are working in the country. Its headquarter is in and it is in action all over the country with the help of . In Maharashtra, Response Force is in action through State Reserve Police Force. Personnel of this force have substantial contribution in in disasters like cyclones, cliff-sliding, building collapse, etc.

Solution: National Disaster Response Force has been established as per the Disaster Management Act, 2005. Divisions of this force are working in the army. Overall, 12 divisions are working in the country. Its headquarters are in Delhi and it is in action all over the country with the help of the army. In Maharashtra, National disaster Response Force is in action through the State Reserve Police Force. Personnel of this force have substantial contribution in rescue work in disasters like cyclones, cliff-sliding, building collapse, etc.

Q4. Answer any one of the following questions:

(i) Answer the following questions by observing the diagram of menstrual cycle :



(a) What is the period of menstruation?

Solution: The period of menstruation is from the 1st to 4th day of the menstrual cycle.

(b) On which day does ovulation occur during the menstrual cycle?

Solution: The ovulation occurs during the 14th & 15th day of menstrual cycle.

(c) In the menstrual cycle which reproductive organs undergo changes?

Solution: In the menstrual cycle Ovary & Uterus lining undergo changes.

(d) Which period is said to be the period of regeneration of endometrium?

Solution: 5th to 13th day of menstrual cycle is the period of regeneration of endometrium.

(e) Which period is said to be the period of secretions of glands in endometrium ?

Solution: 16th to 28th day are said to be the period of secretions of glands in endometrium

(ii) Solve the following crossword:

(1) Continuous consumption of alcoholic and tobacco materials.

(2) This app may cause cyber-crimes.

(3) A remedy to resolve stress.

(4) Requirement for stress free life.

(5) Various factors affect health.
(6) Art of preparing food items.

Solution:

(2) Facebook
(3) singing
(4) Good food
(5) Social
(6) Cooking