Tamil Nadu Board Class 10 Science 2017

Section-I

$15 \times 1 = 15$

Q1. In persons suffering from insulin-dependent diabetes, _____ the cells of the pancreas are degenerated.
(Alpha, Beta, Delta, Gamma)
Solution: Beta

Q2. The first vaccine injected into a newborn baby is
(Oral Polio, DPT and Oral Polio, DPT, BCG)
Solution: BCG

Q3. The endocrine gland related to the immune system is
(Thyroid, Thymus, Adrenal, Pineal)
Solution: Thymus

Q4. If the water-soaked seed is pressed, a small drop of water comes out through the
(Lenticle, Stomata, Micropyle, Radicle)
Solution: Micropyle

Q5. Mitral Valve is found between
(Right auricle and right ventricle, Left auricle and left ventricle, Left ventricle and aorta, Right ventricle and pulmonary artery)
Solution: Left auricle and left ventricle

Q6. In *Monotropa*, the special type of root, which absorbs nourishment, is
(Haustoria, Mycorrhizal root, Clinging root, Adventitious root)

Solution: Mycorrhizal root

Q7. The sedimented and floating materials are removed by this treatment process. Which one?
(Primary treatment, Secondary Treatment, Tertiary Treatment, Peripheral Treatment)
Solution: Primary treatment

Q8. The mixture of gases used by deep-sea divers is
(helium-oxygen, hydrogen-nitrogen, oxygen-nitrogen)
Solution: helium-oxygen

Q9. Vinegar is present in acetic acid. Curd contains _____ acid.
(Lactic acid, Citric acid, Tartaric acid)
Solution: Lactic acid

Q10. An element which is an essential constituent of all organic compounds belongs to _____ the group.
(14th group, 15th group, 16th group)
Solution: 14th group

Q11. _____ is used for coagulating rubber from latex.
(Ethanol, Ethanoic acid)
Solution: Ethanoic acid

Q12. Screw Gauge is an instrument used to measure the dimensions of a very small objects up to _____
(0.1 cm, 0.01 cm, 0.1 mm, 0.01 mm)
Solution: 0.01 mm

Q13. The physical quantity, which is equal to the rate of change of momentum, is (displacement, acceleration, force, impulse)

Solution: force

Q14. Kilowatt-hour is the unit of

(potential difference, electric power, electric energy, charge)

Solution: electric energy

Q15. An electric current through a metallic conductor produces around it.

(magnetic field, mechanical force, induced current)

Solution: magnetic field

Section-II

$20 \times 2 = 40$

Q16. The inheritable characters vary in different species and within the same species. Name the variations in the following cases.

(i) The eye colour among human beings varies, such as blue, black, brown, green, etc. This is called as _____ variation

(ii) The dentition in the rabbit and the elephant are different. This is called as _____ variation.

Solution:

(i) intraspecific variation

(ii) interspecific variation

Q17. What is Genetic Engineering?

Solution:

Genetic engineering involves manipulating and transferring genes from one organism to another to create a new DNA called recombinant DNA(rDNA). The term recombinant is used because DNA from two sources can be joined together.

Hence, genetic engineering is also called recombinant DNA technology.

Q18. Match the following by identifying the pairs
(medicines, fuel, microbes, metabolism, organic acids)

(i) Vaccine	
(ii) Natural gas	
(iii) Citric acid	
(iv) Vitamins	

Solution:

(i) Vaccine	Microbes
(ii) Natural gas	Fuel
(iii) Citric acid	Organic acid
(iv) Vitamins	Metabolism

Q19. Marasmus and Kwashiorkor are both protein deficiency defects. Marasmus differs from Kwashiorkor in the enlarged belly and swelling in the face. Are these symptoms of the disease correct? If not, correct it.

Solution:

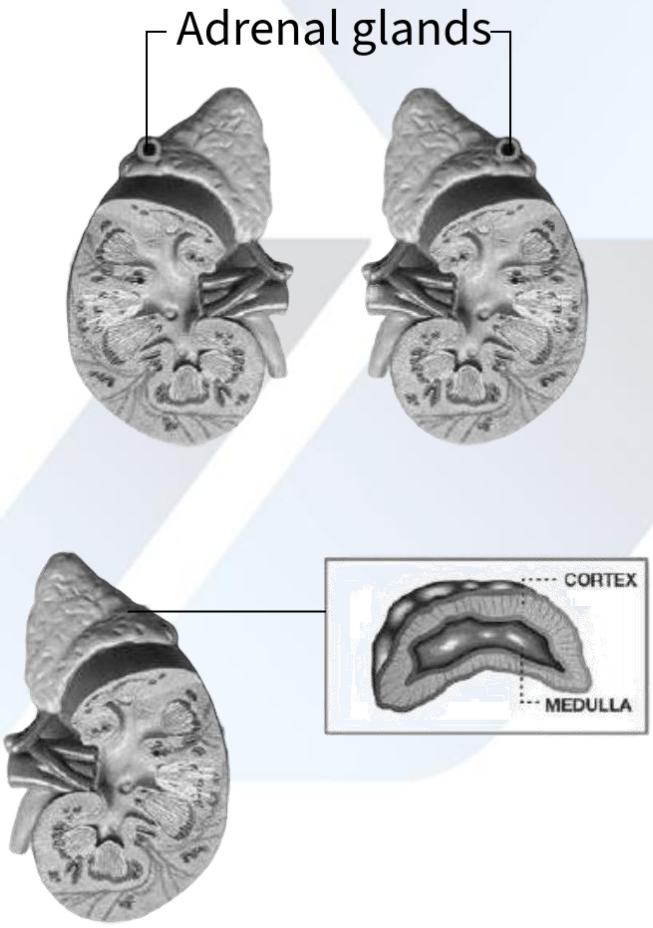
The symptoms of the disease given here are wrong. Kwashiorkor's symptoms include an enlarged belly and swelling of the ankles and feet. Marasmus's symptoms are a shrunken, wasted appearance, loss of muscle mass, and subcutaneous fat mass.

Q20. Copy the diagram and label the parts with the help of the clues given:

(i) It is otherwise called supra renal gland

(ii) It secretes two hormones, namely aldosterone and cortisone

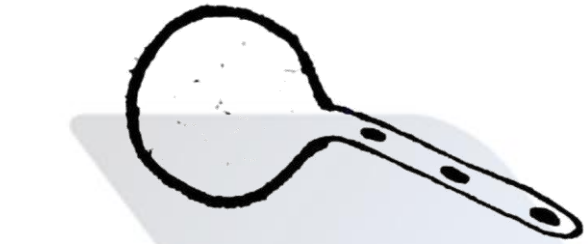
Solution:



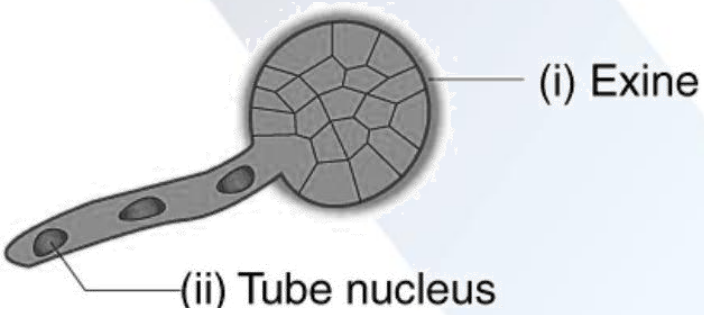
Q21. Draw the given diagram and label the following part:

(i) Exine

(ii) Tube Nucleus



Solution:



Q22. Mention any four adaptations seen in the camel to live successfully in the deserts.

Solution:

(i) The camel has strong and tough skin.

(ii) The skin has special cells that hold water, helping the camel save water.

(iii) Camels have thick eyebrows that shield their eyes from sandstorms.

(iv) They close their nostrils in sandstorms to keep sand out.

Q23. Pick the odd one out

(i) globulin, glomerulus, fibrinogen, albumin

(ii) mountain goat, big horned sheep, grizzly bear, seal

Solution:

(i) The odd one is **Glomerulus**. The other three are blood proteins found in plasma, while Glomerulus is a group of tiny blood vessels.

(ii) **Seals** are different from the other three animals because they live in the ocean,

while the others live in high mountains.

Q24. Complete the table given below:

Excretory Organ	Disposed as	Excretory Products
Kidneys	Urine	Nitrogenous waste products-Urea, Uric acid, Creatinine, etc
Lungs	Exhaled/Expired Air	_____
Skin	_____	Excess water and salts

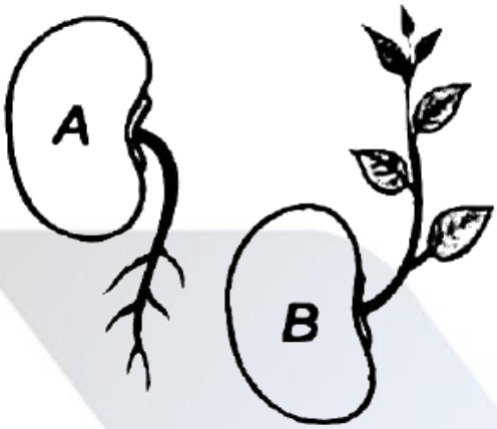
Solution:

Excretory Organ	Disposed as	Excretory Products
Kidneys	Urine	Nitrogenous waste products-Urea, Uric acid, Creatinine, etc
Lungs	Exhaled/Expired Air	Water vapour and Carbon Dioxide
Skin	Sweat	Excess water and salts

Q25. Observe the diagram

(i) Mention the type of movements shown in the figure *A* and *B*

(ii) How does this movement differ from the movement of mimosa?



Solution:

(i) Geotropism is how plants move in response to gravity. Roots grow down towards gravity, so they are positively geotropic. Stems grow away from gravity, making them negatively geotropic. Figure A shows geotropism, while Figure B shows phototropism. In phototropism, plants grow towards light. They have a chemical called auxin that helps them respond to light, causing their cells to stretch. Growing towards light is positive phototropism, and growing away from it is negative phototropism. Stems grow towards light and are positively phototropic, while roots grow away from light and are negatively geotropic.(ii) Here, the movements in geotropism and phototropism depend on growth, while in Mimosa, the movement is independent of growth.

Q26. Sugar is converted into alcohol

(i) In the above reaction, which kind of process takes place?

(li) Which micro-organism is involved in the above reaction?

Solution:

(i) When sugar turns into alcohol, fermentation happens. In this process, glucose changes into pyruvic acid, which is further converted into ethanol and carbon dioxide.

(ii) Yeast is a type of single-celled fungus that can produce alcohol without oxygen. It is commonly used to make alcohol commercially.

Q27. Match the following:

a. Ammonotelic	(i) fish
b. Ureotelic	(ii) mammals
c. Uricotelic	(iii) birds
d. Nephridia	(iv) annelids

Solution:

a. Ammonotelic	(i) fish
b. Ureotelic	(ii) mammals
c. Uricotelic	(iii) birds
d. Nephridia	(iv) annelids

Q28. Depict a food chain by placing the following organisms at the correct trophic levels.

(Snake, Grass, Eagle, Frog, Grasshopper)

Solution: The food chain for this will be as given below:

Grass → Grasshopper → Frog → Snake → Eagle

The grass is a producer, while the grasshopper is a primary consumer (herbivore). The frog is a secondary consumer (primary carnivore), and the snake is a tertiary consumer (secondary carnivore). The eagle is the top predator.

Q29. What are the various liquid bio-fuels for transportation? (Any four)

Solution:

Liquid biofuels for transportation include bioethanol, biogas, biodiesel, and vegetable oils.

Q30. Match the renewable and non-renewable sources:

Sources	A	B	C
Renewable	Coal	Wind	Petroleum
Non-Renewable	Hydrogen	Natural Gas	Solar Energy

Solution:

Sources	A	B	C
Renewable	Hydrogen	Wind	Solar Energy
Non-Renewable	Coal	Natural Gas	Petroleum

Q31. Fossil fuels are formed by the decomposition of biomass buried under the earth over millions of years ago. Name any two fossil fuels.

Solution:

The two fossil fuels are Coal, crude oil, and natural gas.

Q32. What is the Brownian Movement?

Solution:

Brownian motion, or Brownian sway, is the random movement of particles in a liquid caused due to the constant bumping into fast-moving molecules.

Q33. Find the solution concentration in terms of weight percent if 20 g of common salt is dissolved in 50 g of water.

Solution:

Given the weight of salt (NaCl) $= 20$ g

And the weight of the water (H_2O) $= 50$ g

Calculate weight percentage $= \frac{\text{weight of solute}}{(\text{weight of solute} + \text{weight of solvent})} \times 100$

Therefore, weight percentage $= \frac{20}{20+50} \times 100 = 28.57\%$

Q34. Calculate the number of moles in 12.046×10^{22} atoms of copper.

Solution:

To calculate the number of moles in an atom,

Number of moles of atoms = $\frac{\text{Number of atoms}}{\text{Avogadro's number}}$

So, by replacing the values in the formula, you get ($\frac{12.046 \times 10^{22}}{6.023 \times 10^{23}} = 2 \times \frac{1}{10} = 0.2$) moles

Q35. Two acids " A " and " B " were kept in beakers. Acid " A " undergoes partial dissociation in water, whereas acid " B " undergoes complete dissociation in water.

(i) Of the two acids "A" and "B", which is a weak acid and which is a strong acid?

(ii) Give one example for each weak and strong acid.

Solution:

(i) A weak acid does not fully break apart in solution, meaning it exists alongside both the unbroken acid and its breakdown products. Therefore, acid A is the weak acid, while acid B is a strong acid.

(ii) Acetic acid (CH_3COOH) is an example of a weak acid, whereas HCl is a strong acid.

Q36. Pick the odd one out:

(i) Inorganic acids: $HCl, HNO_3, H_2SO_4, HCOOH$

(ii) Basic nature: Blood, Baking soda, Vinegar, Household Ammonia

Solution:

(i) HCOOH is the odd man out as it is an organic acid

(ii) Odd man out is Vinegar, as it is acidic in nature

Q37. Correct the mistakes, if any, in the following statement.

(i) Second period is a short period. It contains only 2 elements

(ii) Group 18 elements are called the Halogen family

Solution:

(i) The second period has 8 elements, while the first period is the shortest with just 2 elements.

(ii) Group 18 elements are known as noble gases, and Group 17 elements are called halogens.

Q38. Assertion: A greenish layer appears on copper vessels if left uncleaned.

Reason: It is due to the formation of a layer of basic copper carbonate

a. Assertion and reason are correct and relevant to each other

b. Assertion is true, but reason is not relevant to the assertion

Solution:

(a) Assertion and reason are correct and relevant to each other

Q39. An Organic Compound (A) is widely used as a preservative in pickles and has a molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet-smelling compound (B).

(i) Identify the compounds A and B

(ii) Name the process and write the corresponding chemical equation

Solution:

(i) The Organic compound (A) used as a preservative in a pickle is Vinegar - Acetic Acid (CH_3COOH). When acetic acid (CH_3COOH) reacts with ethanol in the presence of conc. H_2SO_4, esters are formed with a sweet smell.

Compound A is Acetic Acid, also known as Ethanoic Acid, and compound B is Ethyl Ethanoate, which is an ester.

(ii) When a carboxylic acid reacts with alcohol, it creates an ester. For example, ethanoic acid reacts with pure ethanol using an acid catalyst to form an ester.

$$CH_3COOH + CH_3CH_2OH \rightarrow CH_3COOCH_2CH_3$$

Q40. Assertion (A): MRI scans the inner organs of the human body by penetrating a very intense magnetic field.

Reason(R): By use of a very intense magnetic field, very high-resolution images can be obtained.

(a) (A) is incorrect, and (R) is correct

(b) (A) is correct, (R) is incorrect

(c) Both (A) and (R) are incorrect

(d) (A) is correct, and (R) supports A

Solution:

(d) (A) is correct, and (R) supports A

Q41. An object of mass 1 kg is dropped from a height of 20 m. It hits the ground and rebounds at the same speed. Find the change in momentum.

(Take g = 10 m/s^2)

Solution:

Take the mass of the object (m) = 1 kg

Height (h) = 20 m

Now, replace values to the equation

$v_1 = \sqrt{2gh} = \sqrt{2 \times 10 \times 20} = \sqrt{400} = 20\ ms^{-1}$.

Meanwhile, the Velocity with which the object rebounds $(v_2) = -20\ ms^{-1}$

Therefore,

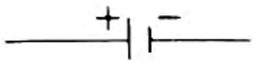
a change in momentum. = Final momentum - Initial momentum = $mv_2 - mv_1$

$mv_2 - mv_1 = [(1 \times (-20)] - (1 \times 20) = -20 - 20 = -40\ kg\ ms^{-1}$

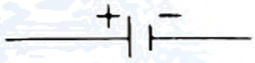
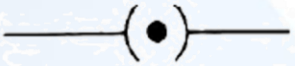
Hence, the magnitude of change in momentum is 40 kg ms^{-1}

Q42. Match the following:

	COMPONENTS		SYMBOLS
(a)	An electric cell	(i)	

(b)	Plug key (or) switch (closed)	(ii)	
(c)	A wire joint	(iii)	
(d)	A resistor of resistance R	(iv)	

Solution: (a) - (ii), (b) -(iv), (c) - (i), (d) - (iii)

	Components		Symbols
(a)	An electric cell	(ii)	
(b)	Plug key (or) switch (closed)	(iv)	
(c)	A wire joint	(i)	
(d)	A resistor of resistance R	(iii)	

Q43. Fill in the blanks:

(i) Potential Difference: Voltmeter; then Current: _____

(ii) Hydro power plant: Conventional Source of Energy; then Solar Energy: _____

Solution:

(i) Ammeter

(ii) Non-conventional source of energy

Q44. Write about ocean thermal energy.

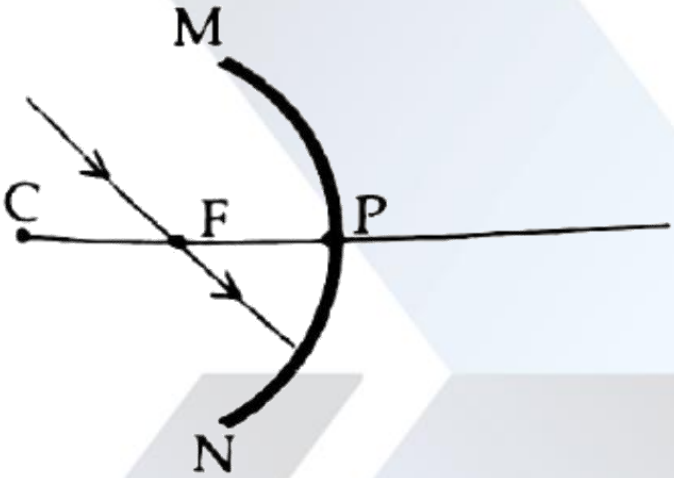
Solution:

Ocean Thermal Energy, or OTEC, is a way to use the temperature difference between cold deep ocean water and warmer shallow water to generate energy.

Q45. The ray diagram shown below is introduced to show how a concave mirror forms the image of an object:

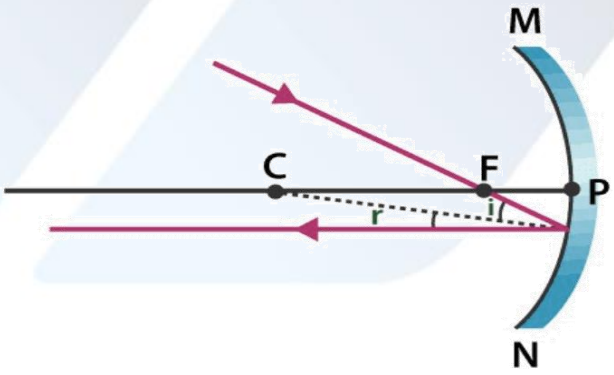
a. Identify the mistake and draw the correct ray diagram

b. Write the justifications for your corrections



Solution:

(a)



(b) When a ray passes through focus strikes concave mirrors, the reflected ray passes parallel to the principal axis.

Q46. Define Fleming's right-hand rule.

Solution:

Faraday's law of electromagnetic induction states that an electric current is generated when a conductor moves within a magnetic field. When the conductor is pushed through the magnetic field, a connection is established between the direction of the applied force, the magnetic field, and the resulting current. This relationship is depicted by Fleming's right-hand rule, which shows the relationship among the three directions.

To utilize the right-hand rule, orient your right hand so that your index finger, middle finger, and thumb form right angles with each other. The index finger indicates the direction of the magnetic field, the thumb shows the direction of motion or applied force, and the middle finger indicates the direction of the induced current. Thus, the thumb represents the direction of motion, the index finger signifies the magnetic field's direction, and the middle finger illustrates the path of the induced current.

Q47. If an object placed 25 cm in front of the converging lens forms an image 20 cm behind the lens, then what is the focal length of the lens?

Solution:

Now, given that $u = -25$ cm and $v = +20$ cm,

Consider the formula,

$$\frac{1}{f} = \left(\frac{1}{v}\right) - \left(\frac{1}{u}\right) = \left(\frac{1}{20}\right) - \left(\frac{1}{-25}\right) = \frac{1}{20} + \frac{1}{25} = \frac{5+4}{100} = \frac{9}{100}$$

Therefore, $f = \frac{100}{9} = 11.11$ cm

Section III

$4 \times 5 = 20$

Part-I

Q48. There is a widespread outbreak of malaria in your area.

a. Suggest some controlling measures to the local authorities concerned.

b. Write the symptoms of malaria.

Solution:

(a) Some strategies to mitigate the extensive spread of malaria are outlined below:

- Disinfect the areas
- Ensure that water does not accumulate and maintain coverage over the ditches and drainage systems.
- Use mosquito nets and repellents

(b) Some signs of malaria consist of experiencing chills, shivering, and a sensation of fever.

Q49. Use the words from the given list to complete the following paragraph: (Vertebral column, Piamater, Arachnoid membrane, Meninges, Duramater)

a. The central nervous system is covered by three protective coverings collectively called ___(1)___. The outermost cover lying below the skull and ___(2)___ is double thick and is called ___(3)___. The middle covering is thin and vascularized and is called ___(4)___. The innermost cover is a very thin delicate membrane and is closely stretched over the outer surface of Brain and Spinal Cord and is called ___(5)___.

(b) Name five types of nerve cells

Solution:

(a) (1) Meninges

(2) Vertebral column

(3) Diameter

(4) Arachnoid membrane

(5) Piamater

b. Below are the types of nerve cells:

(1) Myelinated or Medullated or White neurons.

(2) Non-myelinated or Non-Medullated or Grey neurons.

(3) Unipolar neurons.

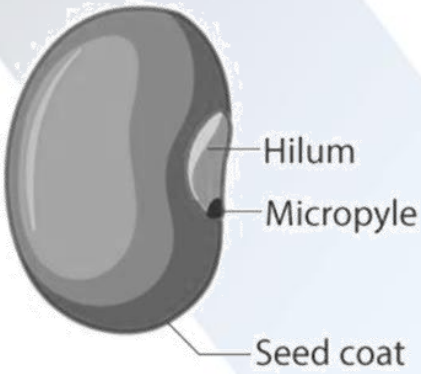
(4) Bipolar neurons.

(5) Multipolar neuron.

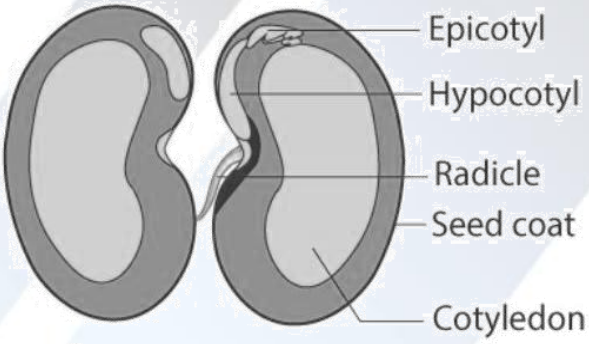
Part-II

Q50. Describe the structure of a dicot seed with a neat diagram.

Solution:



(a) Lateral view of a seed



(b) A mature embryo with its parts

Structure of a Dicotyledonous Seed

- Peas, almonds and cashews are examples of dicotyledons or dicot seeds.
- Dicotyledons, or dicots, are a type of flowering plant. They are called dicots because their seeds have two parts called cotyledons. There are about 200,000 different species of dicots known today.

- In dicotyledons, the embryo has a main part called the embryo axis and two swollen parts called cotyledons, which store food for the growing seedling. The embryo axis has two ends: the top end forms the shoot tip, known as the plumule, and the bottom end forms the root tip, called the radicle. Everything is protected by a seed coat, which has an outer layer called testa and an inner layer called tegmen. The seed connects to the fruit through a part called the hilum.
- Examples of other dicot seeds include apples, plums, and peaches.

Q51. (a) What is Green Chemistry?

(b) What are the future products of Green Chemistry?

Solution:

(a) Green Chemistry, also known as Sustainable Chemistry, is a field that focuses on creating processes and products that reduce or eliminate toxic substances. It is important to differentiate Green Chemistry from environmental chemistry. Green Chemistry mainly looks at how chemical practices affect the environment and promotes sustainable methods, like using fewer non-renewable resources and reducing pollution. On the other hand, ecological chemistry studies the effects of specific harmful chemicals on ecosystems.

(b) Future products:

- Incorporation of renewable feedstock: Renewable feedstock and raw materials must be preferred over non-renewable ones.
- Energy efficiency: The energy consumption of the process should be reduced to the greatest extent feasible.
- Prevention of waste: Preventing the formation of waste products is always preferable to cleaning up the waste once it is generated.

Part- III

Q52. Modern atomic theory takes up the wave concept, principle of uncertainty, and other latest discoveries to give a clear picture of an atom. State the findings of modern atomic theory

Solution:

Atoms are Divisible – They consist of protons, neutrons, and electrons.

Electrons Do Not Revolve in Fixed Orbits – They are found in regions called orbitals.

Wave-Particle Nature of Electrons – Electrons behave both as particles and waves.

Uncertainty Principle – The exact position and momentum of an electron cannot be determined simultaneously.

Energy Levels and Subshells – Electrons are arranged in shells (K, L, M, N) and subshells (s, p, d, f).

Electron Spin – Each electron has a unique spin (+½ or -½).

Nucleus Contains Protons and Neutrons – It is small, dense, and positively charged.

Q53. Explain the manufacturing of Ethanol from molasses.

Solution:

Molasses is a viscous, dark syrup produced after sugar extraction from concentrated sugar cane juice. It contains a substantial quantity of sucrose, which can be converted into ethanol. The following outlines the steps involved in this conversion process:

(i) The initial process is distillation, where molasses is combined with water to reduce the sugar concentration to between 8% and 10%.

(ii) Secondly, add ammonium salts. Usually, molasses has enough nitrogenous matter to act as food for yeast during fermentation. However, if the nitrogen content in molasses is low, it can be fortified by adding ammonium phosphate or ammonium sulphate. (iii). Now, add yeast. Step (ii) solution is then collected in large 'fermentation tanks', and yeast is added. The mixture is maintained at

approximately 303 K for several days. Throughout this time, the enzymes invertase and zymase found in yeast facilitate the conversion of sucrose into ethanol.

$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{invertase}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

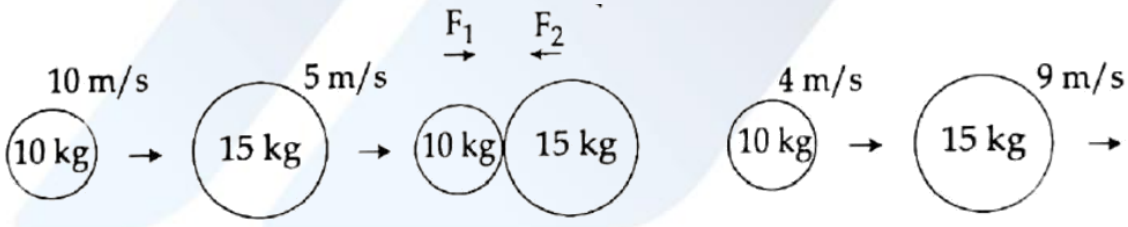
$$\underset{\text{Glucose or Fructose}}{C_6H_{12}O_6} \longrightarrow \underset{\text{Ethanol}}{2C_2H_5OH} + 2CO_2 \uparrow$$

Now, here, the fermented liquid is technically known as wash.

(iv) The final step involves the distillation of the wash. The fermented liquid, which contains 15% to 18% alcohol and the remainder water, undergoes fractional distillation. The primary fraction collected is an aqueous ethanol solution, known as rectified spirit, comprising 95.5% ethanol and 4.5% water. Following approximately five to six hours of reflux heating over quicklime, the mixture is allowed to stand for twelve hours. Distilling this mixture yields pure alcohol, referred to as absolute alcohol, at a 100% concentration.

Part-IV

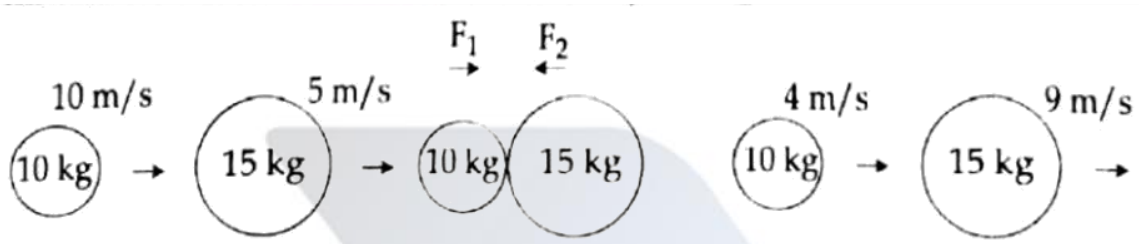
Q54.



a. Newton's 1st law of motion gives a qualitative definition of force. Justify.

b. The figure represents two bodies of masses 10 kg and 15 kg, moving with an initial velocity of 10 ms^{-1} and 5 ms^{-1} respectively. They collide with each other. After the collision, they move with velocities. 4 ms^{-1} and 9 ms^ respectively. The

time of collision is **2s**. Now, calculate F_1 and F_2.



Solution:

(a) Newton's First Law of Motion asserts that an object will remain at rest or in uniform motion along a straight path unless acted upon by an external force. This law provides a qualitative definition of force. For instance, wearing a seat belt while driving illustrates this principle. In the event of an accident or sudden braking, the body tends to maintain its inertia and move forward, which can be potentially dangerous. Seat belts are designed to counteract this forward motion, thereby preventing injury and enhancing safety during such incidents.

(b) Given here is the Mass of a body A, $(m_1) = 10$ kg

Mass of a body B, $(m_2) = 15$ kg

Initial velocity of A, $(u_1) = 10$ m/s

Initial velocity of B, $(u_2) = 5$ m/s

Final velocity of A, $(v_1) = 4$ m/s

Final velocity of B, $(v_2) = 9$ m/s and

The time of the collision, (t) $= 2$ seconds.

Applying Newton's second law of motion, the force exerted on object B can be described as the action force.

F_1 = mass of B × acceleration on B

Therefore, $F_1 = \frac{m_2(v_2-U_2)}{t} = \frac{15(9-5)}{2} = 15 \times \frac{4}{2} = 30$ N

Meanwhile, Force acting on A (reaction), F_2 = mass of A × acceleration on A

That is, $F_2 = \frac{m_1(v_1-u_1)}{t} = \frac{10(4-10)}{2} = 10 \times \frac{-6}{2} = -30$ N

Now, according to Newton's 3rd law of motions $F_1 = -F_2$

Hence, $F_1 = 30$ N

$F_2 = -30$ N

Q55. State and explain the defects of vision. How can these defects be rectified?

Solution: Some vision defects include myopia, hyperopia, hypermetropia, and presbyopia.

(a) Myopia (Short-Sightedness)

- **Explanation**: A person with myopia can see nearby objects clearly but cannot see distant objects distinctly. This occurs when the eyeball is elongated or the eye lens is too curved, causing light rays to converge in front of the retina instead of on it.
- **Rectification**: Myopia is corrected using concave (diverging) lenses, which help focus light rays directly onto the retina.

(b) Hypermetropia (Long-Sightedness)

- **Explanation**: A person with hypermetropia can see distant objects clearly but has difficulty seeing nearby objects. This occurs when the eyeball is too short or the eye lens is too flat, causing light rays to converge behind the retina instead of on it.
- **Rectification**: Hypermetropia is corrected using convex (converging) lenses, which help focus light rays correctly on the retina.

(c) Presbyopia

- **Explanation**: This age-related defect occurs when the eye lens loses its flexibility, making it difficult to focus on nearby objects. It usually happens due to the weakening of ciliary muscles.
- **Rectification**: Presbyopia is corrected using bifocal lenses, which have both concave and convex sections to aid in viewing both near and distant objects.