

SECTION A

1. (A) (a) Rewrite the following statements with suitable words in the blanks: [2]

i. The device used for producing electric current is called a _____.

Answer: i. Generator

An electric generator produces electric current. It converts mechanical energy into electricity.

ii. _____, the second layer of the atmosphere reaches 48 km above the earth's surface.

Answer: ii. Stratosphere

(b) Rewrite the following table to match the second column with the first column: [2]

Column A	Column B
eosin	losing hydrogen
oxidation	synthetic indicator
	losing oxygen
	neutral indicator

Answer:

Column A	Column B
eosin	synthetic indicator
oxidation	Losing hydrogen

(c) Give the molecular formula of bleaching powder. [1]

Answer: The molecular formula of bleaching powder is CaOCl_2 .

(B) Rewrite the following statements by selecting the correct options: [5]

i. When phenolphthalein is added to NaOH, the colour of the solution will become:

(A) colourless

- (B) red
- (C) pink
- (D) yellow

Answer: (C) Pink

In alkaline solution, phenolphthalein gives pink color as it works as an indicator which shows its endpoint when it reacts with hydroxide ions of the base. In an acidic solution, it becomes colourless.

ii. If the potential difference across the ends of a conductor is 220 V and the resistance of the conductor is 44 Ω (ohm), then the current flowing through is:

- (A) 0.2 A
- (B) 0.5 A
- (C) 2 A
- (D) 5 A

Answer: (D) 5 A

Current flowing through the conductor is measured by applying the formula,
 $I = V/R$.

Here, supposedly $V = 220$ volts and $R = 44 \Omega$

Hence, $I = 220 / 44 = 5A$

iii. 1 A = _____ mA

- (A) 10^2
- (B) 10^3
- (C) 10^{-3}
- (D) 10^{-6}

Answer: (B) 10^3 mA

Given that $1 A = 1C / 1s$

$1 A = 10^3$ mA

iv. The distance between principal focus and optical centre of the lens is:

- (A) diameter
- (B) focal length
- (C) principal axis
- (D) optical centre

Answer: (B) focal length

Focal length is the distance between principal focus and optical centre of the lens.

v. When rays of light are incident on a glass slab, then the incident ray and emergent ray are _____ to each other.

- (A) perpendicular
- (B) parallel

- (C) opposite
(D) concurrent

Answer: (B) parallel

2. Answer any five of the following:

[10]

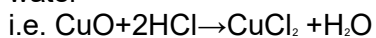
i. Give scientific reason: Danger signals are red in colour.

Answer: Red colour scatters the least by air molecules and so is used in danger signals. Meanwhile, the effect of scattering is also said to be inversely related to the fourth power of the wavelength of a color. For the reason that the color red has the highest wavelength amongst all the colors, it also scatters the least. Hence, red light is used as a danger signal because it is able to travel the longest distance through the fog, rain and so on.

ii. Complete the following reaction, balance it and write the name of the products:



Answer: The copper oxide when it reacts with hydrochloric acid produces cupric or copper chloride and water



iii. State Newlands' Law of Octaves.

Answer: The law of octaves states that every eighth element has similar properties when the elements are arranged in the increasing order of their atomic masses.

iv. The velocity of light in a medium is 1.5×10^8 m/s. What is the refractive index of the medium with respect to air, if the velocity in air is 3×10^8 m/s?

Answer: See, here the velocity of light (v_2) in a medium is 1.5×10^8 m/s, whereas the velocity in air (v_1) is 3×10^8 m/s. So, let's calculate the refractive index with respect to air.

Hence, $n = (v_1) / (v_2)$

That is $n = (3 \times 10^8) / (1.5 \times 10^8) = 3 / 1.5$

So, $n = 2$

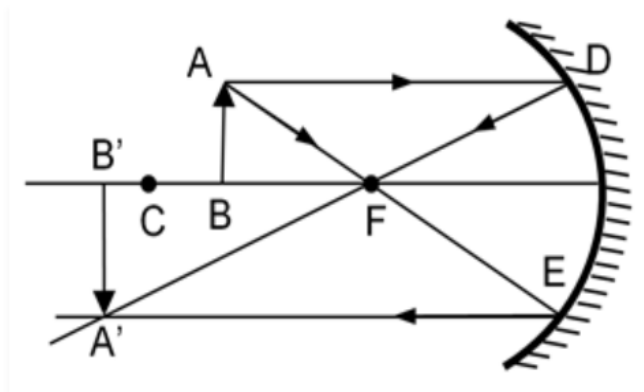
Therefore, the refractive index of the medium with respect to air is 2.

v. Differentiate between resistances in series and parallel.

Answer: For [differences between resistances in series and parallel connection](#), do check out this link mentioned or learn more here about [series and parallel connections](#).

vi. Draw a ray diagram for a concave mirror when the object is between the centre of curvature and focus.

Answer: When the object is placed between C and F, the two rays considered are one parallel to the principal axis and other passing through the principal focus of the concave mirror. A large image compared to size of the object is formed beyond C. The image is also real and inverted. To know more about [concave convex mirror image formations](#), check out the link.



3. Answer any five of the following:

[15]

i. Explain the role of citizens in pollution control.

Answer: Citizens can easily control pollution. Given here are some tips for pollution control:

- Citizens can work together to reduce sources of pollution
- Seeing as how industrial emissions are one of the main reasons that cause pollution, the pollutants can be controlled or treated at the source itself to reduce its effects. Raw materials can be substituted with less polluting substance
- Fuel replacement is one of the ways to control air pollution. Diesel and petroleum are replaced with CNG
- Make sure that your vehicle is tested for vehicle emission
- Go on to dilute the air pollutants
- Plant lots of trees and reduce the amount of pollutants in the air
- Also, planting trees in areas of high population level helps to decrease pollution

ii. What is a spectrum? Why do we get a spectrum of seven colours when white light is dispersed by a prism?

Answer: On passing a white light through a prism, a spectrum of seven colors is formed which shows that white light is a mixture of seven different colors. Also learn more about [dispersion in prism](#) with [diagram showing dispersion of light](#) and [refraction and dispersion of light through a prism](#).

iii. State four most common electrical appliances based on the heating effect of electric current. Why do we use finely heated platinum wire in surgery?

Answer: Four most common electrical appliances based on the heating effect of electric current are mentioned below. They are electric iron, electric heater, electric oven and electric toaster. Meanwhile, it is seen that finely heated platinum wire was used for the surgery instead of a knife because the melting point of platinum is 1768°C (very high) so it does not get melted that easily when they are heated for the purpose of cutting the tissues, during the process of surgery.

iv. Name the product obtained when Plaster of Paris is mixed with water. State the use of the product. Give two uses of POP.

Answer: The chemical formula for Plaster of Paris (POP) is $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$. Meanwhile, the Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) when it is mixed with water gives:

$\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O} + 1\frac{1}{2} \text{H}_2\text{O} \rightarrow \text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. Meanwhile, given here also some uses of Plaster of Paris (POP):



- In hospitals, POP is used as a plaster to support the fractured bones in the right position
- Used to make decorative materials and make wall surfaces smooth
- POP is used as a fire-proofing material

v. Classify the following elements into metals, nonmetals and metalloids: C, Mg, Si, S, Hg, As.

Answer: The following elements are classified into metals, nonmetals and metalloids.

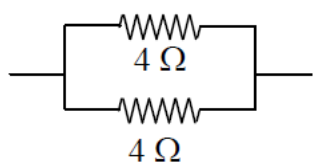
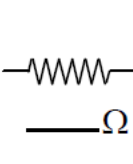
Metals are Mg and Hg, while non-metals include C and S. Metalloids, in the meanwhile are Si, As.

vi. Complete the following:

a.  = 
 $12 \Omega + 2.5 \Omega + 2.5 \Omega$ $\underline{\hspace{1cm}} \Omega$

Answer: 17 Ohm

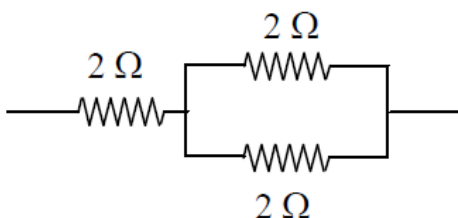
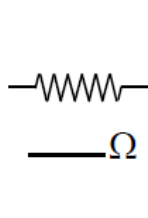
Here, $R = R_1 + R_2 + R_3 = 12 + 2.5 + 2.5 = 12 + 5 = 17 \Omega$

b.  = 
 4Ω $\underline{\hspace{1cm}} \Omega$

Answer: $1/R = 1/R_1 + 1/R_2$

Now, on applying values you will get $1/R = 1/4 + 1/4 = 1/2$

Therefore, $R/1 (R) = 2/1 = 2 \text{ Ohms}$

c.  = 
 2Ω $\underline{\hspace{1cm}} \Omega$

Answer: First, let us consider the total resistance for the parallel connectors = $1/R_2 =$

$1/r_1 + 1/r_2$

So, $1/R_2 = 1/2 + 1/2 = 1$

Therefore, $1/R_2 = 1$

With $R_2 = 1/1 = 1 \text{ ohm}$

Now, R_1 was already given as 2 ohm and you have seen that R_1 and R_2 are connected in series

So, $R = R_1 + R_2 = 2 + 1 = 3$ Ohms

4. Attempt any one of the following:

[5]

(A) Often when electricity is used we come across electrical fires. Answer the following questions related to the following terms:

a. When does short circuiting take place?

b. What happens to the resistance of the circuit during a short circuit?

c. What happens to the flow of electric current during a short circuit?

d. What is overloading?

e. How can the effects of overloading be avoided?

Answer: (A) a. When the insulation of a wire is faulty or if the appliance used is not working properly then the neutral and live may come in contact, thus increasing the quantity of current flowing through the circuit, thus leading to a short circuit. Thus, we can say that a short circuit occurs when live wire comes in contact with the neutral wire.

(A) b. During the short circuit, the resistance is reduced as the flow of current is deviated from the normal path of flow and as a result a large amount of current is passed via the wire.

(A) c. When the short circuit occurs the flow of electric current is increased

(A) d. When any equipment draws excessive current from the supply, then it is called overloading. It normally takes place when the number of devices joined in a single socket is more. During overload, the current is comparatively low.

(A) e. Given here are some precautions to avoid the effect of overloading:

(a) Never use more power than the capacity of the fuse

(b) Make sure to use good material such as Fuse, MCB, Electric Wire, Plugs and so on

(c) Connect a fuse in series with the circuit

(B) In a Std X class, out of 40 students, 10 students use spectacles, 2 students have positive power and 8 students have negative power of lenses in their spectacles.

Answer the following questions:

a. What does the negative power indicate?

b. What does the positive power indicate?

c. Generally which type of spectacles do most of the students use?

d. What defect of eyesight do most of the students suffer from?

e. Give two possible reasons for the above defect.

Answer: (B) a. Negative power indicates that the students are using a concave lens for their spectacles as they are suffering from myopia.

(B) b. Meanwhile, positive indicates that the students are using a convex lens for their spectacles and they have hypermetropia.

(B) c. Most of the students generally use diverging or concave lens spectacles.

(B) d. Most of the students suffer from an eye disease known as myopia / near-sightedness.

(B) e. Two reasons for myopia are given below:

- Because the ciliary muscles do not relax sufficiently, converging power of the eye lens is high
- As the distance between the eye lens and retina increase so do the length of the eyeball

SECTION B

5. (A) (a) Find the correlation in the given pair and rewrite the answer: [2]

i. Tinning : Tin :: Galvanizing : _____.

Answer: i. Zinc

Galvanizing is the process of covering iron or steel, with a thin coat of ZINC to prevent it from rusting, while the process of coating steel with a thin coat of TIN to prevent it from corrosion is known as Tinning.

ii. Mammals : _____ :: Amphibia : Fishes.

Answer: ii. Reptiles

(b) State True or False: [3]

i. Solar water-heater work on renewable energy systems.

Answer: i. True.

Solar energy is unlimited and is a renewable source of energy.

ii. In human beings, the blood goes to the heart in one cycle once.

Answer: False.

In human beings, double circulation of the blood known as pulmonic and systemic occur. Systemic is when blood passes from heart to body parts and back to heart, while, in pulmonic circulation, blood passes from heart to lungs and back to heart.

iii. In frogs, thyroid secretion stimulates the metamorphosis from tadpole to adult frog.

Answer: True

(B) Rewrite the following statements by selecting the correct options: [5]

i. The molecular formula of acetic acid is _____.

- (A) CH_3COOH
- (B) $\text{CH}_3 - \text{CH}_3$
- (C) C_6H_6
- (D) C_2H_4

Answer: (A) CH_3COOH

ii. Carbon dioxide enters into the leaves through tiny pores present on the surface of the leaf called _____.

- (A) chlorophyll
- (B) chloroplast
- (C) stomata
- (D) epidermis

Answer: (C) stomata

iii. _____ solution is blue in colour.

- (A) CuSO_4
- (B) FeSO_4
- (C) ZnSO_4
- (D) $\text{Al}_2(\text{SO}_4)_3$

Answer: (A) CuSO_4

iv. Yeast reproduces by _____.

- (A) spore formation
- (B) multiple fission
- (C) fragmentation
- (D) budding

Answer: (D) budding

v. Raisins put in water absorb water by the process of _____.

- (A) diffusion
- (B) osmosis
- (C) transpiration
- (D) excretion

Answer: (B) osmosis

6. Solve any five of the following:

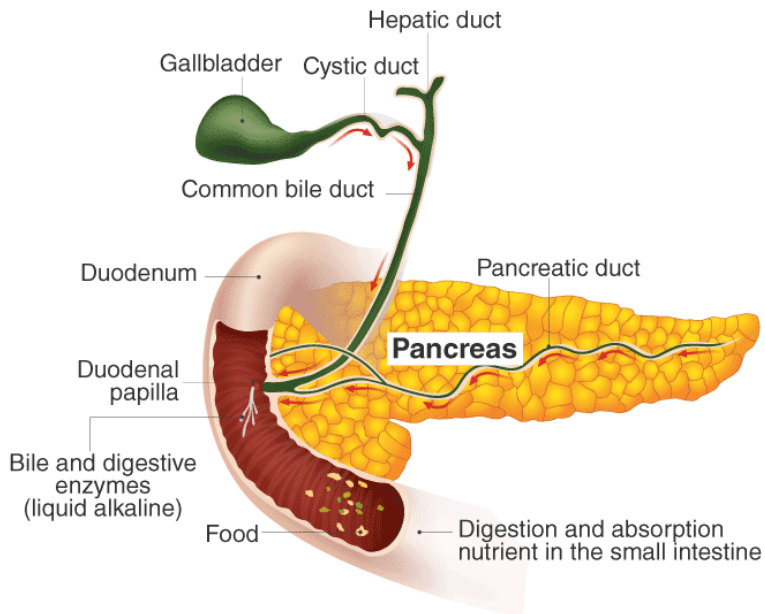
[10]

i. Give scientific reason: Common salt has a high melting point and boiling point.

Answer: Common salt has a high melting and boiling point because there is a strong electrostatic force of attraction between the ions that are oppositely charged. So, a large amount of energy is required to break the bonding force between these ions.

ii. Draw a neat labelled diagram of the Pancreas with their associated structures.

Answer:



iii. State the connecting links between Peripatus with Annelida and Arthropoda.

Answer: The connecting links between Peripatus and Annelida are Segmental nephridia, Thin cuticle and Parapodia-like appendages. Meanwhile, the connecting links between Peripatus and Arthropoda include Trachea and Open circulation.

iv. Name the two plant hormones and state their functions.

Answer: Plant hormones control all the growth and development activities like cell division, enlargement, flowering, seed formation, dormancy and abscission. Plant Hormones are categorised into two categories, based on their actions. They are Plant growth promoters and Plant growth inhibitors. Meanwhile, learn more about [Plant hormones and their functions](#) here.

v. Differentiate between Toilet soap and Laundry soap.

Answer: Raw materials used in the toilet are of high quality fats and oils along with expensive perfumes and colours. Care is taken to ensure that there is no free alkali content to prevent injuries to skin. Also, it does not use any fillers. In the meantime, cheaper quality oils and fats are used for laundry soap. Also, the perfumes or colours used are also cheap. They also make use of fillers such as sodium rosinate, sodium silicate, borax and sodium carbonate.

vi. State any four objectives of sustainable development.

Answer: The objectives of sustainable development are as follows:

- Cut down on pollution by using eco-friendly techniques
- Curtail the use of natural resources to ensure their availability for future generations

- Protect the environment
- Promote continuous economic growth

Check [Sustainable development](#) for more information.

7. Answer any five of the following:

[15]

i. What is an alloy? Give two examples with their chemical composition.

Answer: A homogeneous mixture of two or metals or a metal and a nonmetal are all known as alloys. The metals in the molten state are mixed in fixed proportions by weight to form an alloy. Over 90% of the metals used are in the form of alloys. Meanwhile, two examples of alloys with their chemical composition are as follows: There is Magnalium, an alloy of aluminium and magnesium (*Al, Mg*). The percentage composition of magnalium is: 95% Aluminium (*Al*) and 5% Zinc (*Zn*). Then, there is Brass, an alloy of copper and zinc (*Cu, Zn*) with 80% Copper (*Cu*) and 20% Zinc (*Zn*).

ii. Name the following:

- a. Cells that assist the neuron in their function.**
- b. The small gap between the consecutive neurons.**
- c. Part of the brain that coordinates the voluntary functions.**

Answer: ii. a. Schwann cells
ii. b. Synapse or synaptic cleft
ii. c. Cerebellum

iii. Explain the process of fertilization, development and birth in human beings.

Answer: Fertilization is a biological process where the fusion of the male and the female gamete take place. Sperms released from the male reproductive organ called the penis enters the female body via one of the parts of her reproductive organ called the vagina. The sperm then passes through the fallopian tubes and meets the egg that is produced by the female organs. The process of fertilization takes place in fallopian tubes. Learn more about [Fertilization, development and birth in human beings](#).

iv. What are vestigial organs? Give two examples each in human beings and plants

Answer: The organs, tissues or cells in a body that are not functional any more in the way they were in their ancestral form of the trait is known as Vestigial organs. It is an authentication of evolution and hence was helpful in explaining adaptation. Learn more about [vestigial organs](#) here.

v. What is recycling of waste? Explain with one example. State two advantages of recycling.

Answer: The process of converting the waste material into new products so that it will prevent the waste of potentially used material is known as Recycling of waste. This process helps to cut down on the usage of raw materials and also reduce energy consumption. Recycling the waste also helps to reduce air pollution caused by incineration as well as water pollution resulting from landfilling by cutting down on the need for 'conventional' waste disposal and lower greenhouse gas emissions as compared to plastic production. Learn more about [recycling and its benefits](#) from here.

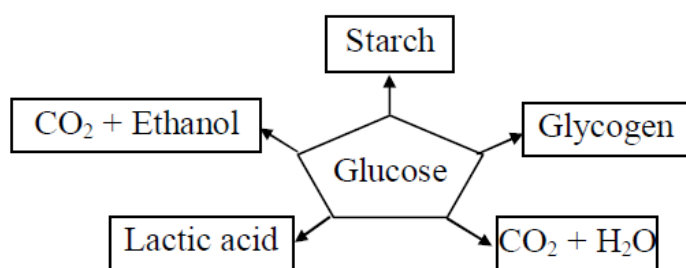
vi. Which mode of reproduction gives rise to variation? Give the importance of variation in survival of species.

Answer: Variation results from sexual reproduction. Variation is also important for the survival of the species, as it results in variety and diversity. Because of adaptive variations, the organisms could survive in altered environmental conditions. This also prevents the complete extinction of any species. It is seen that these variations and adaptations also give rise to evolution.

8. Attempt any one of the following:

[5]

(A) Given below are the end products of different reactions involving glucose. Write the appropriate end product in front of the following:



1

- i. Anaerobic reaction =
- ii. Reaction in human muscles =
- iii. Aerobic respiration =
- iv. Reaction in plant cells =
- v. Reaction in liver =

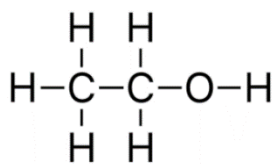
Answer: (A) (i) Anaerobic reaction is $\text{CO}_2 + \text{Ethanol}$
 (ii) Reaction in human muscles = Lactic acid
 (iii) Aerobic respiration = $\text{CO}_2 + \text{H}_2\text{O}$
 (iv) Reaction in plant cells = Starch
 (v) Reaction in liver = Glycogen

(B) Answer the following questions:

- i. Give other two names of ethanol. 1
- ii. Give the structural formula of ethanol. 1
- iii. Give two properties of ethanol. 1
- iv. Explain the action of phosphorus trichloride with ethanol. Write the balanced chemical equation of the above reaction. 2

Answer: (B) i. Other two names of Ethanol are Ethyl alcohol / Alcohol or Grain Alcohol and Cologne Spirit

(B) ii. The structural formula of ethanol is as follows:



(B) iii. (a) This monohydric primary alcohol is a inflammable volatile liquid

(b) Ethanol dissolves easily in water and other organic solvents

iv. (iv) PCl_5 reacts with ethanol and produces orthophosphorous acid and ethyl chloride. The balanced chemical equation for this would be as follows:

