

SCIENCE AND TECHNOLOGY (212)

SECTION – A

Q.No. 1 to 17 are the Multiple Choice Questions of 1 mark each. An internal choice has been provided in some of these questions. You have to attempt only one of the given choices in such questions.

1. In ancient times people used to make measurements by using their :

- (A) thumb
- (B) hand-span
- (C) first finger
- (D) all of the above

Answer: (D) all of the above

2. Someone has written the mass of a body as given below in different ways. Which of these is written correctly as per rules ?

- (A) 100 mg
- (B) 100 mg
- (C) 100/mg
- (D) 100 mgs

Answer: (A) 100 mg

3. (i) In respect of ionic compounds, which one of the following properties is incorrect ?

- (A) they are solid and hard.
- (B) their melting and boiling points are high.
- (C) they are soluble in organic solvents.
- (D) they are good conductor of electricity in molten state.

Answer: (C) They are soluble in organic solvents.

4. (i) Identify which of the following is formed by transfer of electrons :

- (A) Oxygen
- (B) Nitrogen
- (C) Hydrogen
- (D) Sodium chloride

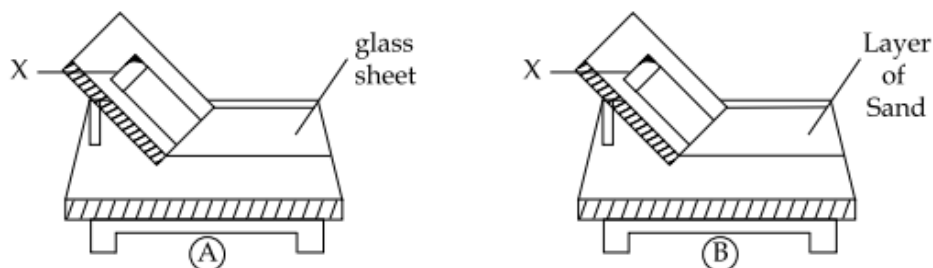
Answer: (D) Sodium chloride

5. Which of the following atoms has the largest atomic radius ?

- (A) C
- (B) N
- (C) O
- (D) F

Answer: (A) C

6. In the following set ups A and B of an inclined plane on a table.



If a pencil cell 'X' is released from equal heights on the inclined plane in both the set up A and B one by one, the correct observation would be :

- (A) the distance moved by the cell on the table is more in set up A because this surface offers more friction as compared to the surface in set up B
- (B) the distance moved by the cell on the table is more in set up A because this surface offers less friction as compared to set up B .
- (C) the distance moved by the cell on the table is less in set up A because this surface offers more friction as compared to set up B .
- (D) the distance moved by the cell on the table is less in set up A because this surface offers less friction as compared to the surface in set up B.

Answer: (A) the distance moved by the cell on the table is more in set up A because this surface offers more friction as compared to the surface in set up B

19. Complete the following sentence by given options below.

[Attempt any 2 Parts from the following (i to iv)]

(loss, chemical bonding, bad conductor, good conductor, gain)

(i) Atoms of elements in a molecule are held together by _____ .

(ii) Metals form cations by _____ of electrons.

Answer:

(i) Atoms of elements in a molecule are held together by chemical bonding.

(ii) Metals form cations by loss of electrons.

20. Write TRUE (T) for correct statement and FALSE (F) for incorrect statements.

[Attempt any two parts from following questions (i to iv)]

(i) The electronic configuration of Argon is 2, 8, 8

(ii) In the formation of sodium chloride, sodium atom gains one electron and chlorine atom loses one electron.

Answer:

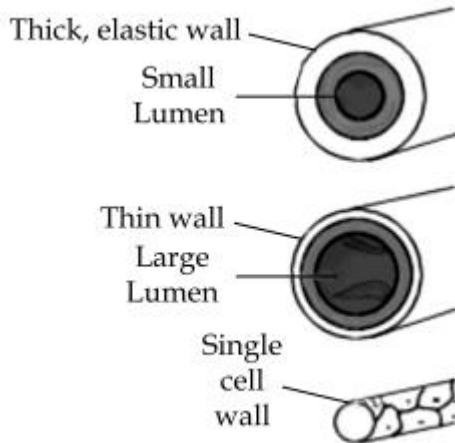
(i) The electronic configuration of Argon is 2, 8, 8 — True (T)

(ii) In the formation of sodium chloride, sodium atom gains one electron and chlorine atom loses one electron — False (F)

21. Read the passage and answer the questions that follow it. (i) to (ii)

Human circulatory system consists of :

- Centrally located muscular pump called heart and
- Blood vessels which are tube-like structures connected to the heart, these are Arteries, Veins and Capillaries.



- (i) The blood vessels that carry blood from heart are termed as _____ and those that bring blood from various parts of the body to the heart is termed as _____.
- (ii) Name the thin structures that allows the exchange of materials between blood and tissues.

Answer:

(i) The blood vessels that carry blood from the heart are termed as arteries, and those that bring blood from various parts of the body to the heart are termed as veins.

(ii) The thin structures that allow the exchange of materials between blood and tissues are called capillaries.

22. Read the Passage and answer the Questions (i) and (ii) that follow it.

RTIs refer to infections of reproductive organs. These illnesses may occur due to poor genital hygiene. For example, Poor menstrual hygiene among girls. Importantly, RTIs include the illness that are transmitted from one Person to another Person during sexual contact and are known as STDs.

(i) Which one of the following is not STDs ?

- (A) Syphilis
- (B) Gonorrhoea
- (C) AIDS
- (D) Goitre

(ii) HIV/AIDS is not transmitted by :

- (A) Unprotected sexual intercourse
- (B) Infected blood
- (C) Infected mother to her baby
- (D) Kissing and hugging

Answer:

(i) The correct answer is (D) Goitre. Goitre is not a sexually transmitted disease (STD).

(ii) The correct answer is (D) Kissing and hugging. HIV/AIDS is not transmitted by kissing and hugging.

23. Write TRUE (T) for correct statement and FALSE (F) for incorrect statement.

[Attempt any two Parts from the following questions (i to v)]

- (i) HENRY MOSELEY, an English Physicist discovered that the 'atomic mass' and not the 'atomic number' is the most fundamental property of elements.
- (ii) F, Cl, Br, I and At are the non-metallic elements called halogens.

Answer:

(i) HENRY MOSELEY, an English Physicist, discovered that the 'atomic number' and not the 'atomic mass' is the most fundamental property of elements — True (T)

(ii) F, Cl, Br, I, and At are the non-metallic elements called halogens — True (T)

24. Match Column - I formula with the right option of Column – II

Column - I	Column – II
(i) H ₂ SO ₄	(P) Base
(ii) NaOH	(Q) Aqua Regia
	(R) King of Chemicals
	(S) Neutral salt

Answer:

Column - I	Column - II
(i) H ₂ SO ₄	(R) King of Chemicals
(ii) NaOH	(P) Base

25. Fill in the blanks.

Attempt any two parts from the following questions (i to iv).

- (i) A close interaction between two or more different organisms of different species living in close physical association is termed as _____.
- (ii) The _____ rate of a population is the number of individuals dying per thousand per unit time.

Answer:

(i) A close interaction between two or more different organisms of different species living in close physical association is termed as symbiosis.

(ii) The death rate of a population is the number of individuals dying per thousand per unit time.

26. Write TRUE (T) for correct statement and FALSE (F) for incorrect statements.

[Attempt any two parts from the following questions (i to iv)]

- (i) Fish and aquatic invertebrates like prawns have gills for respiration.
- (ii) Penguins have a hump to store fat.

Answer:

(i) Fish and aquatic invertebrates like prawns have gills for respiration — True (T)

(ii) Penguins have a hump to store fat — False (F)

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(ii) The formula for gravitational force is:

$$F = \frac{Gm_1m_2}{r^2}$$

Given:

- $F = 65 \text{ N}$
- $G = 6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$
- $m_1 = 3.1 \times 10^5 \text{ kg}$
- $m_2 = 6.5 \times 10^3 \text{ kg}$

Solving for r , we get:

$$r = \sqrt{\frac{Gm_1m_2}{F}}$$

Substituting values:

$$r = \sqrt{\frac{6.67 \times 10^{-11} \times 3.1 \times 10^5 \times 6.5 \times 10^3}{65}}$$

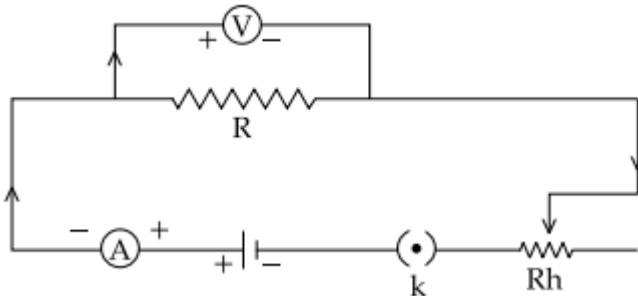
After calculation, the answer is approximately $4.5 \times 10^{-1} \text{ m}$.

The correct answer is

- (B) $45.0 \times 10^{-1} \text{ m}$

28. Read the passage and answer the questions that follow it (i to vii).

Given below is the circuit diagram to study relationship between Voltage and Current.



Attempt any five parts from following questions (i) to (vii) :

(i) In the circuit diagram the voltmeter is connected :

- (A) in series
- (B) in parallel
- (C) in mixed combination
- (D) in no particular combination

(ii) Which one of the following sets includes devices that are used in electrical circuits for their safety ?

- (A) Switch, tester and fuse
- (B) Tester, fuse and MCB
- (C) Switch, fuse and MCB
- (D) MCB, switch and tester

(iii) The following symbol in the above circuit diagram represents :

- (A) Resistance
- (B) Rheostat
- (C) Electromagnet
- (D) Transformer

(iv) Which law, the above circuit diagram represents ?

- (A) Joule's Law of heating effect
- (B) Kirchhoff's Law
- (C) Ohm's Law
- (D) Coulomb's Law

(v) Which one of the following is the SI unit of electrical energy ?

- (A) Volt ampere
- (B) Kilowatt hour
- (C) Watt second
- (D) Joule

Answer:

- (i) In the circuit diagram, the voltmeter is connected: (B) in parallel.
- (ii) The set of devices used in electrical circuits for their safety includes: (C) Switch, fuse and MCB.
- (iii) The symbol in the above circuit diagram represents: (A) Resistance.
- (iv) The law represented by the above circuit diagram is: (C) Ohm's Law.
- (v) The SI unit of electrical energy is: (D) Joule.

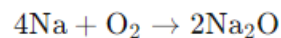
SECTION – B

29. (i) Write the balanced chemical equation for the following statements.

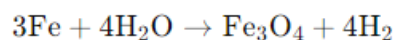
- (a) Sodium element reacts with oxygen to form sodium oxide.
- (b) Iron reacts with steam to form iron oxide and hydrogen gas.

Answer:

(a) The balanced chemical equation for the reaction of sodium with oxygen to form sodium oxide is:



(b) The balanced chemical equation for the reaction of iron with steam to form iron oxide and hydrogen gas is:



34. Define the terms :

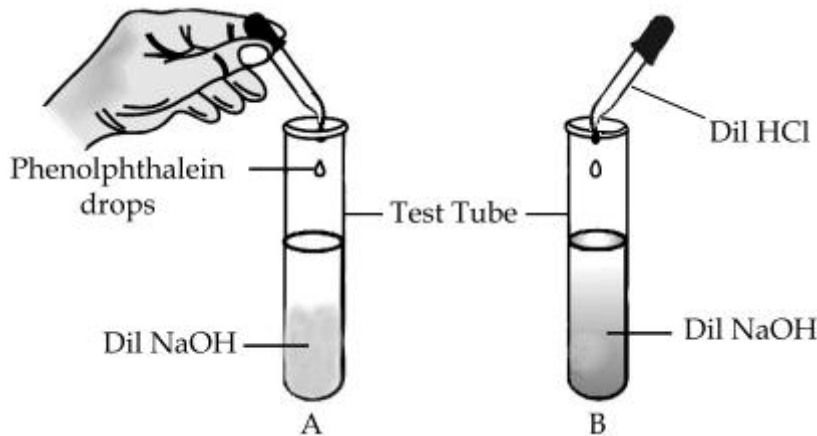
- (i) Osmoregulation
- (ii) Dialysis

Answer:

(i) Osmoregulation: Osmoregulation is the process by which living organisms regulate the balance of water and electrolytes in their bodies to maintain homeostasis.

(ii) Dialysis: Dialysis is a medical process that removes waste products and excess fluids from the blood when the kidneys are unable to perform these functions naturally. It is often used in patients with kidney failure.

35. (i) Look at the activity given below and answer the questions that follow it :



- (a) What colour change will you observe in test tube A ?
- (b) What would happen in test tube B ?
- (c) What the process occurring in test tube B called as ?

Answer:

(a) In test tube A, the solution will turn pink due to the presence of phenolphthalein in the basic solution of NaOH.

(b) In test tube B, after adding dilute HCl, the solution will become colourless as the acid neutralizes the base.

(c) The process occurring in test tube B is called neutralization.

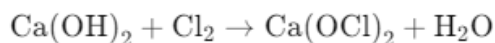
36. (a) Write the molecular formula and chemical name of Bleaching Powder.
(b) Name the two materials used in the manufacture of Bleaching Powder.
(c) Write the chemical equation that takes place in the manufacture of Bleaching powder in Hasen-Clever Plant.

Answer:

(a) The molecular formula of bleaching powder is $\text{Ca}(\text{OCl})_2$, and its chemical name is Calcium Oxychloride.

(b) The two materials used in the manufacture of bleaching powder are chlorine gas (Cl_2) and dry slaked lime [$\text{Ca}(\text{OH})_2$].

(c) The chemical equation for the manufacture of bleaching powder in the Hasen-Clever Plant is:



37. (i) Calculate the value of acceleration due to gravity of the earth i.e. 'g'.
Given : mass of earth = 6×10^{24} kg and radius of earth = 6.4×10^6 kg.

Answer:

The formula to calculate the acceleration due to gravity (g) is:

$$g = \frac{G \cdot M}{R^2}$$

Where:

- G is the gravitational constant = $6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$
- M is the mass of the earth = 6×10^{24} kg
- R is the radius of the earth = 6.4×10^6 m

Substitute the values into the formula:

$$g = \frac{6.67 \times 10^{-11} \times 6 \times 10^{24}}{(6.4 \times 10^6)^2}$$

Now calculate:

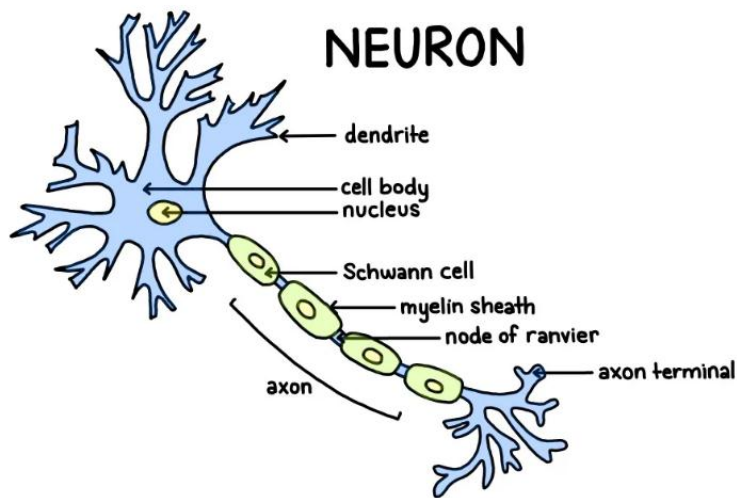
$$g = \frac{4.002 \times 10^{14}}{4.096 \times 10^{13}} \approx 9.78 \text{ m/s}^2$$

Thus, the value of acceleration due to gravity g is approximately 9.8 m/s^2 .

38. (i) Draw the generalized structure of a neuron (nerve cell) and label the following parts on it.

- (a) Dendrites
- (b) Cell body
- (c) Axon
- (d) Nucleus

Answer:



39. With the help of a line diagram show the chromosomal basis of sex determination in humans.

Answer:

To explain the chromosomal basis of sex determination in humans, the following line diagram can be illustrated:

- Males have XY chromosomes (heterogametic).
- Females have XX chromosomes (homogametic).

When a male and female reproduce:

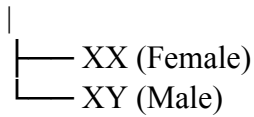
- Male gametes (sperms) carry either an X or a Y chromosome.
- Female gametes (eggs) always carry an X chromosome.

Thus, the combination of chromosomes during fertilization determines the sex:

- X from the female and X from the male result in an XX combination, leading to a female offspring.
- X from the female and Y from the male result in an XY combination, leading to a male offspring.

This is the basic line diagram:

Male (XY) + Female (XX)



This shows the chromosomal basis of sex determination in humans, where the male determines the sex of the offspring.

40. What is meant by Population dispersal ? Explain in brief about the two types of Population dispersal.

Answer:

Population dispersal refers to the movement of individuals or species from their place of origin to new locations. It is the way populations spread out over a given area and establish themselves in different regions.

The two types of population dispersal are:

1. **Emigration:** This is when individuals move out of a population's area to another location. It reduces the population size in the original area. For example, animals moving from a crowded area to a less populated region.
2. **Immigration:** This is when individuals move into a new population's area. It increases the population size in the new area. For example, birds migrating to a new habitat for better resources.

These movements help maintain ecological balance by distributing individuals across different regions.

41. (i) State the term bio-magnification.

(ii) DDT is widely used for crop protection. How is it responsible for the decreased population of pelican birds ?

Answer:

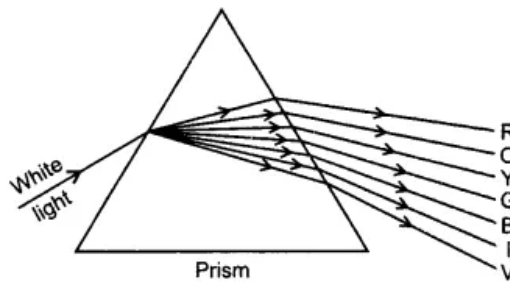
(i) Bio-magnification is the process by which the concentration of toxic substances increases at each successive trophic level in a food chain. As organisms at lower levels are consumed by predators, the toxins accumulate in higher concentrations in the bodies of organisms at higher levels.

(ii) DDT, a pesticide used for crop protection, enters the food chain and bio-magnifies. In pelican birds, DDT affects the calcium metabolism, leading to thinner eggshells. These thin eggshells break easily, causing a decline in the population of pelican birds as fewer eggs successfully hatch.

42. (i) (a) Define dispersion of white light through a glass prism. Draw a diagram to illustrate it.
(b) Which of the colours bends least and which one bends the most ?
(c) Why does prism show dispersion of white light ?

Answer:

(i) Dispersion of white light through a glass prism is the phenomenon where white light splits into its constituent colors (Violet, Indigo, Blue, Green, Yellow, Orange, Red) when it passes through a prism. This happens because different colors of light bend by different amounts when they pass through the prism.



(ii) Red light bends the least because it has the longest wavelength, while Violet light bends the most because it has the shortest wavelength.

(iii) A prism shows the dispersion of white light because each color of light has a different refractive index for the prism's material. The different colors travel at different speeds when passing through the prism, causing them to refract (bend) by different amounts, leading to the separation of white light into a spectrum of colors.

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