

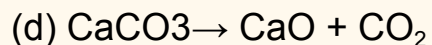
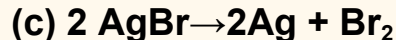
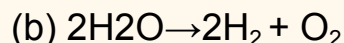
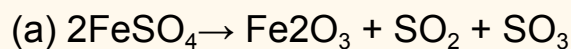
CBSE Class 10 Science Solution

(Set 3 - 31/1/3)

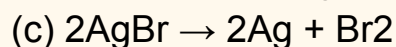
SECTION-A

Select and write the most appropriate option out of the four options given for each of the questions 1-20. There is no negative mark for the incorrect response.

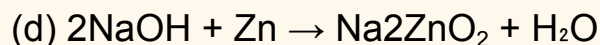
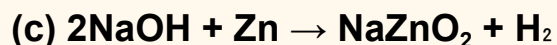
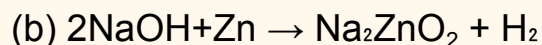
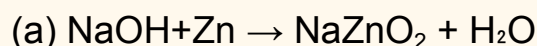
Ques 1. Select from the following a decomposition reaction in which source of energy for decomposition is light:



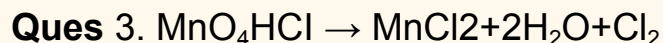
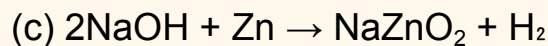
Solution The decomposition reaction in which the source of energy for decomposition is light is:



Ques 2. When 2 mL of sodium hydroxide solution is added to few pieces of granulated zinc in a test tube and then warmed, the reaction that occurs can be written in the form of a balanced chemical equation as:



Solution The balanced chemical equation for the reaction between sodium hydroxide solution and granulated zinc, when warmed, is:



The reaction given above is a redox reaction because in this case:

(a) MnO_2 , is oxidised and HCl is reduced.

(b) HCl is oxidised.

(c) MnO_2 , is reduced.

(d) MnO_2 , is reduced and HCl is oxidised.

Solution The given reaction is a redox reaction because:

(c) $\text{MnO}_4 + \text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$ (MnO_4 is reduced.)

Ques 4. Consider the following compounds:

FeSO_4 , CuSO_4 , CaSO_4 , Na_2CO_3 ,

The compound having maximum number of water of crystallization in its crystalline form in one molecule is:

(a) FeSO_4

(b) CuSO_4

(c) CaSO_4

(d) Na_2CO_3

Solution The compound with the maximum number of water of crystallization in its crystalline form in one molecule is:

(a) FeSO_4

Ques 5. In a nerve cell, the site where the electrical impulse is converted into a chemical signal is known as:

(a) Axon

(b) Dendrites

(c) Neuromuscular junction

(d) Cell body

Solution

In a nerve cell, the site where the electrical impulse is converted into a chemical signal is known as:

(c) Neuromuscular junction

Ques 6. A metal and a non-metal that exists in liquid state at the room temperature are respectively:

(a) Bromine and Mercury

(b) Mercury and Iodine

(c) Mercury and Bromine

(d) Iodine and Mercury

Solution The metal and non-metal that exist in a liquid state at room temperature respectively are:

(a) Bromine and Mercury

Ques 7. At what distance from a convex lens should an object be placed to get an image of the same size as that of the object on a screen?

(a) Beyond twice the focal length of the lens.

(b) At the principal focus of the lens.

(c) At twice the focal length of the lens.

(d) Between the optical centre of the lens and its principal focus.

Solution To get an image of the same size as that of the object on a screen, the object should be placed:

(c) At twice the focal length of the lens.

Ques 8. Carbon compounds:

(1) are good conductors of electricity.

(ii) are bad conductors of electricity.

(in) have strong forces of attraction between their molecules.

(iv) have weak forces of attraction between their molecules.

The correct statements are:

(a) (1) and (ii)

- (b) (ii) and (in)
- (c) (ii) and (iv)
- (d) (1) and (iii)

Solution Carbon compounds:

- (ii) are bad conductors of electricity.
- (iv) have weak forces of attraction between their molecules.

Ques 9. Oxides of aluminium and zinc are:

- (a) acidic
- (b) basic
- (c) amphoteric
- (d) neutral

Solution Oxides of aluminium and zinc are:

- (c) amphoteric

Ques 10. Chromosomes:

- (i) carry hereditary information from parents to the next generation.
- (ii) are thread like structures located inside the nucleus of an animal cell.
- (iii) always exist in pairs in human reproductive cells.
- (iv) are involved in the process of cell division.

The correct statements are:

- (a) (i) and (ii)
- (b) (i) and (iv)**
- (c) (1), (ii) and (iv)
- (d) (i) and (iv)

Solution (i) carry hereditary information from parents to the next generation.

(iv) are involved in the process of cell division.

The correct statements are:

(b) (i) and (iv)

Ques 11. Consider the following statements:

(1) The sex of a child is determined by what it inherits from the mother. (ii)

The sex of a child is determined by what it inherits from the father.

(iii) The probability of having a male child is more than that of a female child.

(iv) The sex of a child is determined at the time of fertilisation when male and female gametes fuse to form a zygote.

The correct statements are:

(a) (i) and (iii)

(b) (ii) and (iv)

(c) (iii) and (iv)

(d) (i), (iii) and (iv)

Solution (ii) The sex of a child is determined by what it inherits from the father.

(iv) The sex of a child is determined at the time of fertilisation when male and female gametes fuse to form a zygote. The correct statements are:

(b) (ii) and (iv)

Ques 12. Which one of the following organ is NOT a part of human female reproductive system

(a) Ovary

(b) Uterus

(c) Vas deferens

(d) Fallopian tube

Solution organs is NOT a part of the human female reproductive system

(c) Vas deferens

Ques 13. In which of the following organisms, multiple fission is a means of asexual reproduction?

(a) Yeast

(b) Leishmania

- (c) Paramoecium
- (d) plasmodium

Solution In which of the following organisms, multiple fission is a means of asexual reproduction

- (c) Paramoecium

Ques 14. In bifocal lenses used for the correction of presbyopia:

- (a) the upper portion is of convex lens for the near vision and lower part is of concave lens for the distant vision.
- (b) the upper portion is of convex lens for distant vision and lower part is of concave lens for near vision.
- (c) the upper portion of the concave lens is for the near vision and the lower part is of the convex lens for the distant vision.
- (d) the upper portion is of concave lens for distant vision and lower part is of convex lens for near vision.

Solution In bifocal lenses used for the correction of presbyopia:

- (b) the upper portion is of convex lens for distant vision and lower part is of concave lens for near vision.

Ques 16. Identify the food chain in which the organisms of the second trophic level are missing:

- (a) Grass, goat, lion
- (b) Zooplankton, Phytoplankton, small fish, large fish
- (c) Tiger, grass, snake, frog
- (d) Grasshopper, grass, snake, frog, eagle

Solution Identify the food chain in which the organisms of the second trophic level are missing:

- (b) Zooplankton, Phytoplankton, small fish, large fish

For Q. Nos. 17 to 20, two statements are given - One labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
- (b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
- (c) Assertion (A) is true, but Reason (R) is false.
- (d) Assertion (A) is false, but Reason (R) is true.

Ques 17. Assertion (A): The rainbow is a natural spectrum of sunlight in the sky.

Reason (R): Rainbow is formed in the sky when the sun is overhead and water droplets are also present in air.

Solution Assertion (A): The rainbow is a natural spectrum of sunlight in the sky.

This assertion is true. A rainbow is indeed a natural optical phenomenon that forms when sunlight is refracted, dispersed, and reflected by water droplets in the atmosphere, resulting in a spectrum of light appearing in the sky.

Reason (R): Rainbow is formed in the sky when the sun is overhead and water droplets are also present in the air.

This reason is also true and provides an accurate explanation for why rainbows form. Rainbows typically occur when sunlight shines into airborne water droplets, such as after rain showers or during mist or fog. The

Ques 18. Assertion (A): Hydrogen gas is not evolved when zinc reacts with nitric acid.

Reason (R): Nitric acid oxidises the hydrogen gas produced to water and itself gets reduced.

Solution Assertion (A) states that hydrogen gas is not evolved when zinc reacts with nitric acid. This is because nitric acid is a strong oxidizing agent and can oxidize the hydrogen gas produced by the reaction to water, thus preventing its evolution. Reason (R) provides the explanation for why hydrogen gas is not evolved. It states that nitric acid oxidizes the hydrogen gas produced to water and itself gets reduced. This is a correct explanation because nitric acid indeed acts as an oxidizing agent, oxidizing the hydrogen gas to water while itself undergoing reduction. Therefore, both the assertion and the reason are true, and the reason explains the assertion.

Ques 19. Assertion (A): Accumulation of harmful chemicals is maximum in the organisms at the highest trophic level of a food chain.

Reason (R): Harmful chemicals are sprayed on the crops to protect them from diseases and pests.

Solution Assertion (A) states that accumulation of harmful chemicals is maximum in the organisms at the highest trophic level of a food chain. This is generally true because of a process known as biomagnification, where harmful chemicals (like pesticides) accumulate as they move up the food chain, resulting in higher concentrations in organisms at higher trophic levels. However, Reason (R) states that harmful chemicals are sprayed on crops to protect them from diseases and pests. While this may contribute to the presence of harmful chemicals in the environment, it is not directly related to why accumulation is maximum in organisms at the highest trophic level. Therefore, Assertion (A) is true, but Reason (R) is false.

Ques 20. Assertion (A): The rate of breathing in aquatic organisms is much faster than in terrestrial organisms.

Reason (R): The amount of oxygen dissolved in water is very high as compared to the amount of oxygen in air.

Solution Assertion (A) states that the rate of breathing in aquatic organisms is much faster than in terrestrial organisms. This is generally

true because aquatic organisms need to extract oxygen from water, which has a lower concentration of oxygen compared to air. Therefore, they need to breathe faster to obtain enough oxygen for survival. However, Reason (R) states that the amount of oxygen dissolved in water is very high compared to the amount of oxygen in air. This statement is false because oxygen dissolves more readily in air than in water. Therefore, Assertion (A) is true, but Reason (R) is false.

SECTION-B

Ques 21. (A) (1) Write the significance of the peripheral nervous system in human beings.

(2) How is the human brain protected from mechanical injuries and shocks?

Solution (1) The significance of the peripheral nervous system in human beings lies in its role in connecting the central nervous system (brain and spinal cord) to the limbs and organs. It facilitates the transmission of sensory information from the body to the central nervous system and motor commands from the central nervous system to the muscles and glands.

(2) Regarding protection of the human brain from mechanical injuries and shocks, the skull acts as a physical barrier against external mechanical forces, while cerebrospinal fluid provides cushioning and shock absorption to further protect the brain.

OR

(B) Name one directional growth movement each in response to chemicals and water in plants. Write an example for each of them.

Solution Plants exhibit different types of directional growth movements in response to various stimuli. Two examples include:

Chemotropism: This is when plants grow towards or away from certain chemicals in their environment. For example, the roots of plants may grow

towards sources of nutrients in the soil, such as nitrogen or phosphorus, which are essential for their growth.

Hydrotropism: This is the directional growth of plants in response to water. For instance, plant roots tend to grow towards areas of higher moisture or water concentration in the soil. This allows them to access water more effectively, which is crucial for their survival and nutrient uptake.

Ques 22. (i) Give reason why herbivorous animals have longer, small intestine than carnivorous animals?

(ii) Although 'Pepsin' and 'Trypsin' are both protein digesting enzymes yet they differ from each other. Justify this statement by giving one difference between them.

Solution. Herbivorous animals have longer small intestines than carnivorous animals because plant matter takes longer to digest and requires more surface area for absorption of nutrients. Pepsin and Trypsin are both protein-digesting enzymes, but they differ in their optimal pH for activity. Pepsin works best in acidic environments like the stomach, while Trypsin is most active in alkaline environments like the small intestine.

Ques 23. Translate the following statement into a balanced chemical equation. "When barium chloride reacts with aluminium sulphate, aluminium chloride and barium sulphate are formed."

State the type of this reaction giving reason to justify your answer.

Ques 24. (1) Two magnetic field lines do not intersect each other. Why?

(ii) How is a uniform magnetic field in a given region represented ? Draw a diagram in support of your answer.

Solution. Two magnetic field lines do not intersect each other because if they did, it would imply that at the point of intersection, there are two directions for the magnetic field, which is not possible. Magnetic field lines always represent the direction of the magnetic field at any given point, and they never cross each other.

(ii) A uniform magnetic field in a given region is represented by parallel and evenly spaced magnetic field lines. These lines are drawn from north to south outside the magnet and from south to north inside the magnet.

Ques 25. Draw the pattern of the magnetic field lines due to a straight current carrying conductor indicating the direction of current in the conductor and the direction of the corresponding magnetic field lines.

Solution pattern of magnetic field lines due to a straight current-carrying conductor and the corresponding direction of current and magnetic field lines.

Ques 26. An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position of the image formed by the mirror.

Solution $v = -30$ cm

SECTION-C

Ques 27. (A) Plants → Deer → Lion In the given food chain, what will be the impact of removing all the organisms of second trophic level on the first and third trophic level? Will the impact be the same for the organisms of the third trophic level in the above food chain if they were present in a food web? Justify.

Solution If all the organisms of the second trophic level (deer) are removed from the given food chain "Plants → Deer → Lion", it would have a significant impact on both the first and third trophic levels. Without the deer, the lion's primary source of food would be eliminated, leading to a decline in the lion population due to starvation. On the other hand, the removal of deer could result in an increase in the population of plants since there would be fewer herbivores to consume them.

However, if the organisms of the third trophic level (lion) were present in a food web rather than a linear food chain, their impact might vary. In a food web, the lion may have alternative prey species besides deer. Therefore, the impact on the lion population might not be as severe compared to when it relies solely on deer as its prey.

OR

(B) A gas 'X' which is a deadly poison is found at the higher levels of atmosphere and performs an essential function.

Name the gas and write the function performed by this gas in the atmosphere. Which chemical is linked to the decrease in the level of this gas? What measures have been taken by an international organization to check the depletion of the layer containing this gas?

Solution The gas 'X' mentioned in the question is ozone (O_3). Ozone performs the essential function of absorbing ultraviolet (UV) radiation from the sun in the Earth's atmosphere, thus protecting living organisms from harmful UV rays. The decrease in the level of ozone in the atmosphere is linked to the use of chlorofluorocarbons (CFCs) in various industrial and consumer products.

To address the depletion of the ozone layer, an international organization known as the Montreal Protocol was established. The Montreal Protocol aims to phase out the production and use of ozone-depleting substances, including CFCs. Several measures have been implemented under this protocol to reduce the emission of harmful substances and protect the ozone layer from further depletion.

Ques 28. Name and state the rule to determine the direction of a:

- (1) magnetic field produced around a current carrying straight conductor.
- (ii) force experienced by a current carrying straight conductor placed in a magnetic field which is perpendicular to it.

Solution To determine the direction of:

- (1) The magnetic field produced around a current-carrying straight conductor, you can use the right-hand thumb rule. Point your thumb in the direction of the current flow, and the direction in which your fingers curl around the conductor will indicate the direction of the magnetic field.

(ii) The force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it, you can use Fleming's left-hand rule. Point your forefinger in the direction of the magnetic field, point your thumb in the direction of the current, and your middle finger will point in the direction of the force experienced by the conductor.

Ques 30. Define reflex action. With the help of a flow chart show the path of a reflex action such as sneezing.

Solution Reflex action is an involuntary and nearly instantaneous movement or response to a stimulus. It occurs without conscious thought as a protective mechanism to prevent injury or maintain homeostasis.

The path of a reflex action, such as sneezing, can be represented in a flow chart as follows:

Stimulus (irritation in nasal passage) → Sensory neuron (carries impulse to spinal cord) → Relay neuron in spinal cord (integrates signal) → Motor neuron (carries impulse to muscles involved in sneezing) → Response (sneezing)

Ques 31. Which organisms have a three-chambered heart ? Why do they have three-chambered hearts?

Solution Organisms with a three-chambered heart include amphibians and reptiles. They have three-chambered hearts because they typically lead a semi-aquatic lifestyle and have lower metabolic rates compared to warm-blooded mammals and birds. The three-chambered heart allows for separate circulation of oxygenated and deoxygenated blood, but it is less efficient than the four-chambered hearts found in mammals and birds

(1) List two functions of lymph.

Solution The two functions of lymph include:

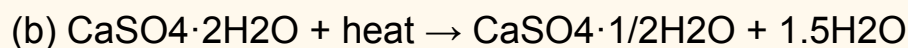
Transporting white blood cells, proteins, and fats throughout the body.

Removing toxins, waste products, and pathogens from tissues through lymphatic vessels and lymph nodes.

Ques 32. A compound which is prepared from gypsum has the property of hardening when water is mixed in right quantity with it:

- (a) Write common name and the chemical name of this compound
- (b) Give chemical equation for its preparation.
- (c) List its two uses .

Solution (a) The compound prepared from gypsum that hardens when water is mixed in the right quantity with it is called plaster of Paris. The chemical name of plaster of Paris is calcium sulfate hemihydrate ($\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$).



(c) (c) Two uses of plaster of Paris include:

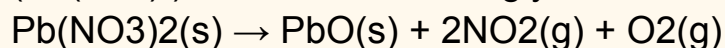
Making casts for broken bones in medical applications.

Creating molds for sculptures, decorative items, and architectural elements.

Ques 33. (1) Define a decomposition reaction. Write chemical equation for the reaction that occurs when lead nitrate is heated strongly in a boiling tube.

(2) In electrolytic decomposition of water two gases are liberated at the electrodes. Give the mass ratio of the gas liberated at the cathode and at the anode.

Solution (1) A decomposition reaction is a type of chemical reaction in which a single compound breaks down into two or more simpler substances. The chemical equation for the decomposition of lead nitrate ($\text{Pb}(\text{NO}_3)_2$) when heated strongly is:



(2) In the electrolytic decomposition of water, two gases are liberated at the electrodes: hydrogen gas (H_2) is liberated at the cathode, and oxygen gas (O_2) is liberated at the anode. The mass ratio of the gases liberated at the cathode and anode is 2:1, corresponding to the chemical formula of water (H_2O), where two hydrogen atoms combine with one oxygen atom. Therefore, for every molecule of water decomposed, two molecules of hydrogen gas are liberated at the cathode and one molecule of oxygen gas is liberated at the anode.

SECTION-D

Ques 34. (A) (1) State whether the currents and potential difference in all the bulbs will be same or different when in a circuit three bulbs of:

- (a) same wattage are connected in series.
- (b) same wattage are connected in parallel.
- (c) different wattage are connected in series.
- (d) different wattage are connected in parallel.

Solution

(a) In a circuit where three bulbs of the same wattage are connected in series, the currents through each bulb will be the same, but the potential difference across each bulb will be different. This is because the same current flows through all the bulbs in a series circuit, but the voltage is divided among them.

(b) In a circuit where three bulbs of the same wattage are connected in parallel, the potential difference across each bulb will be the same, but the currents through each bulb will be different. In parallel circuits, each bulb receives the full voltage of the battery, leading to different currents based on the resistance of each bulb.

(c) When different wattage bulbs are connected in series, the currents through each bulb will be the same, but the potential difference across each bulb will be different. This is similar to the case of same wattage bulbs connected in series.

(d) When different wattage bulbs are connected in parallel, the potential difference across each bulb will be the same, but the currents through each bulb will be different. This is similar to the case of same wattage bulbs connected in parallel.

(ii) Two identical resistors of 24Ω each are connected to a battery of 6 V . Calculate the ratio of the power consumed by the resulting combinations with (a) minimum resistance and (b) maximum resistance.

Solution

(a) For the combination with minimum resistance (when both resistors are in parallel): $P_{\min} = 3 \text{ W}$

(b) For the combination with maximum resistance (when both resistors are in series): $P_{\min} = 0.75 \text{ W}$

OR

(B) Draw a schematic diagram of a circuit consisting of a battery of six 2 V cells, a 6Ω resistor, a 12Ω resistor and a 18Ω resistor and a plug key all connected in series. Calculate the following (when key is closed):

- (1) Electric current flowing in the circuit.
- (ii) Potential difference across 18Ω resistor.
- (iii) Electric power consumed in 18Ω resistor.

Solution

$$I = 1/7 \text{ A}$$

$$V_{18} = 18/7 \text{ V}$$

$$P_{18} = 18/49 \text{ W}$$