Question 1: Answer (D)

Options (A) through (C) are incorrect as prokaryotic cells have no membrane bound organelles. Ribosomes, however, are found in all types of cells. Therefore, **option (D)** is the correct option.

Question 2: Answer (D)

Binomial nomenclature is typically underlined. Therefore, **option (D)** is the correct option.

Question 3: Answer (C)

Albumin is a protein, which means that it is made up of **option (C), amino acids.**

Question 4: Answer (A)

DNA is known for having thymine and RNA replaces thymine with uracil. Options (B) through (D) all have either of these. **Option (A)** has neither of those, so it can be found in BOTH DNA and RNA.

Question 5: Answer (D)

Option (A) is incorrect as the trachea is lined with pseudostratified epithelium. Option (B) is incorrect because blood vessels are lined with simple squamous epithelium. Option (C) is incorrect, the inner wall of the Bowman's capsule is lined with podocytes, not simple columnar epithelium. **Option (D)** is correct - the wall of the PCT is lined with simple cuboidal epithelium, increasing its surface area to allow maximum reabsorption of water and electrolytes.

Question 6: Answer (B)

Cellulose and pectin are typically found in plants and chitin is found in fungi. Glycogen is the "animal starch" it is what we use as our energy source. Humans cannot digest cellulose.

Question 7: Answer (D)

Endemic organisms are those that are only found in and native to one place in the world, in this case Sri Lanka. Indigenous species are those that naturally occur in an environment and did not get introduced from another environment. Exotic species were introduced from another environment; the opposite of indigenous species. **Option (D)** is correct - the hora is endemic to Sri Lanka, the snakehead fish is indigenous to Sri Lanka, and the tilapia is an exotic (introduced from Africa). The other options are either in the wrong order or don't match the correct organisms to their correct classification.

Question 8: Answer (D)

Petri Dishes are typically sterilized using dry heat (often done in a hot air oven). Controlling microbes in water is done by filtration. Culture media is sterilized with moist heat. Milk is sterilized with pasteurization (low heat to kill pathogens). Therefore, the correct answer is **option (D)**.

Question 9: Answer (D)

Calcium oxalate is commonly found in kidney stones; as the calcium in urine reacts with oxalate to form a mineralized product.

Question 10: Answer (B)

Trypsin, **option (B)**, is the enzyme that breaks down proteins. Lipase breaks down fats, amylase breaks down carbohydrates, and cellulase breaks down cellulose.

Question 11: Answer (C)

Option (A) is correct because platyhelminthes (also called flatworms - can be free-living or parasites) have functional flame cells. Option (B) is also correct because chordates (including humans, fish - kingdom animalia) have a ventrally (anteriorly) placed heart relative to nerve cord, meaning the heart is in-front of the nerve cord. **Option (C)** is incorrect - annelids have a closed circulatory system. Option (D) is correct, molluscs (snails, clams, ect) have a muscular foot.

Question 12: Answer (A)

Simple goiter is an illness caused by an iodine deficiency **option (A).**

Question 13: Answer (C)

Color blindness is known to be an X-linked recessive trait. If the mother is color blind, it must mean that she is homozygous recessive for this trait. As it is X-linked, the daughters will be carriers as they only inherit one recessive allele from their mother and a dominant allele from their father. The sons, however, with be color blind, because they inherit everything on the one X chromosome from the mother. The Y chromosome does not affect this trait. Therefore, **option (C)** is correct.

Question 14: Answer (B)

Nitrogen fixation, converting nitrogen gas into ammonium, is accomplished by anabaena bacteria. Nitrification, the process of converting ammonium to nitrites and nitrates is performed by Nitrosomonas (nitrite → nitrate) and Nitrobacter (nitrite → nitrate). Denitrification, the process of converting nitrate to nitrogen gas is accomplished by pseudomonas. Therefore, **option (B)** is the correct answer. As for the other bacteria, clostridium is found in the

intestinal tract of animals and humans. Theobacillus oxidizes sulfur - producing sulfates for plants, not helping with the nitrogen cycle.

Question 15: Answer (C)

This question is testing knowledge of innate, acquired, active, and passive immunity. A is incorrect because infants receive antibodies from the mother's breast milk passively. For this to be active, the infant would have to fall sick and develop the antibodies first-hand. B is also incorrect because having the infection first-hand (having chicken pox) is an active immune process, not a passive one. D is correct because having Polio it is artificially acquired in the form of a vaccine. It represents active immunity because the individual actually fights off the infection first-hand. D is unfortunately technically flawed as receiving the infection in the form of a vaccine is artificially acquired **active** immunity (as the body has to fight it first-hand).**C** seems to be the best option.

Question 16 (Subatomic Particles)

(A)- False. An atom has an equal number of protons and electrons. But negative ions have gained electrons. So, they have more electrons than protons. On the other hand, positive ions have lost electrons. So, they have less electrons than protons. So, clearly the statement is wrong for Na ion and Mg ion.

(B)- False. The number of protons and neutrons do not change when an atom becomes an ion. Oxygen has 8 protons and 8 neutrons. So, that statement is clearly wrong.

(C)- True. O2- ions have 8+2=10 electrons. F- ion has 9+1=10 electrons. Ne atoms have 10 electrons. Na+ ions have 11-1=10 electrons. Mg2+ ions have 12-2=10 electrons.

(D)- False. O2- has 8 neutrons but F- has 10.

Correct Answer :- C

Question 17 (Potassium)

1 - True. Potassium is a metal. Metals have free electrons in the solid state. So, they conduct electricity in the solid state. In molten state, metals have freely moving electrons and ions, which also conduct electricity. So, Potassium conducts electricity in both states.

2 - Yes. Potassium is a very reactive metal and it reacts explosively with water.

3- No. Potassium reacts with water to form potassium hydroxide and hydrogen. Potassium hydroxide is an alkaline. So, the pH > 7.

(Ask abt ltr)

Correct Answer :- A

Question 18 (Moles)

$$Moles \; = \; \frac{m}{M} \; = \; \frac{9g}{18g/mol} = 0.5 \, mol$$

Then, the no. of moles should be 0.5 mol.

For option A, $n \; = \; \frac{m}{M} \; = \; \frac{4g}{2g/mol} \; = \; 2 \, mol$

For option B, $n \; = \; \frac{m}{M} \; = \; \frac{28g}{28g/mol} \; = \; 1 \, mol$

For option C, $n \; = \; \frac{m}{M} \; = \; \frac{16g}{32g/mol} \; = \; 0.5 \, mol$

For option D, $n \; = \; \frac{m}{M} = \; \frac{44g}{44g/mol} \; = \; 1 \, mol$

Correct Answer :- C

Question 19 (Covalent bond)

A covalent bond is formed when electrons are shared between two nonmetals.

Correct Answer :- B

Question 20 (Stoichiometry)

Since the number of Cu atoms should be the same, p = r.
Since the number of N atoms should be the same, q = 2r + s.
Since the number of H atoms should be the same, q = 2t
Since the number of O atoms should be the same, 3q = 6r + s + t

The only choice that fits the above conditions is choice D.

Correct Answer :- D

Question 21 (Separating techniques)

To separate copper(II) sulfate crystals from sand, the correct sequence of processes is:
Dissolving – Copper(II) sulfate dissolves in water, while sand does not.
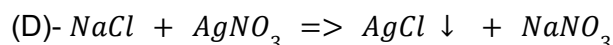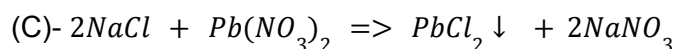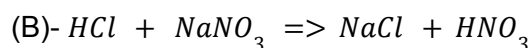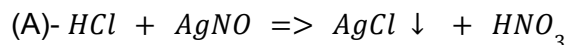
Filtering – The sand is separated from the copper(II) sulfate solution via filtration.
Evaporating – The water is partially evaporated to concentrate the solution.
Crystallising – Upon cooling, copper(II) sulfate crystals form.

(Which option ?)

Question 22 (Precipitates)

(A)- $HCl + AgNO => AgCl \downarrow + HNO_3$

(B)- $HCl + NaNO_3 => NaCl + HNO_3$

(C)- $2NaCl + Pb(NO_3)_2 => PbCl_2 \downarrow + 2NaNO_3$

(D)- $NaCl + AgNO_3 => AgCl \downarrow + NaNO_3$

Option B is the answer since every other option gives a precipitate.

Correct Answer :- B

Question 23 (Redox)

(A) - The oxidation state of O atoms in Oxygen changes from 0 to -2.
(B) - The oxidation state of Cu and Zn changes.
(C) - The oxidation state of any atom does not change.
(D) - The oxidation state of Zn and H changes.

Correct Answer :- C

Question 24 (Energy diagrams)

When 1 mol of HCl reacts with 1 mol of NaOH, 54 kJ of energy is released.
So, when 0.1 mol of HCl reacts with 0.1 mol NaOH, 5.4 kJ of energy is released.

Correct Answer :- C

Question 25 (Electrochemical cell)

Magnesium is the strongest reducing agent (most negative voltage), meaning it readily loses electrons and acts as the anode. Silver is the strongest oxidizing agent (most positive voltage), meaning it readily gains electrons and acts as the cathode. The large potential difference between Mg and Ag results in the highest possible voltage for this setup.

Question 26 (Rates of Reactions)

(A) - When you increase the concentration of the acid, the rate of collisions increases. So, the rate of the reaction increases.

(B) - When you increase the particle size of the zinc, the total surface area decreases, And the rate of collisions decreases. So, the rate of the reaction decreases.

(C) - Increasing the pressure has no effect on the system because it does not affect the rate of the reaction. (However, if one of the reactions was a gas, then increasing the pressure would have increased the rate of collisions. But in this case, it has no effect.)

(D) - Increasing the temperature would increase the kinetic energy of the particles. This will increase the percentage of collisions having more than the activation energy to react. Increasing the temperature will also increase the rate of collisions as the particles now move faster. So, the rate of the reaction increases due to both reasons.

Correct Answer :- B

Question 27 (Acid Base Reactions)

$Moles\ of\ KOH\ =\ C\ *\ V\ =\ 1M\ *\ \frac{15}{1000}L\ =\ 0.015\ mol$

$Moles\ of\ HCl\ =\ Moles\ of\ KOH\ =\ 0.015\ mol$

$C\ =\ \frac{Moles}{V}\ =\ \frac{0.015\ mol}{(20/1000)\ L}\ =\ 0.75M$

Correct Answer :- A

Question 28 (Boyle's law)

$P_1 V_1\ =\ P_2 V_2$

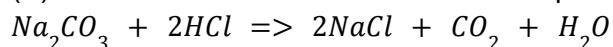Substituting $P_1\ =\ 6\ atm,\ V_1\ =\ 45\ ml,\ P_2\ =\ 8\ atm$, we get

$V_2\ =\ 33.75\ ml$

Correct Answer :- B

Question 29 (Sodium Salts)

(A) - Ammonia is a weak base and does not significantly react with either Na_2CO_3 or $NaCl$ in a way that helps distinguish them.

(B) - HCl reacts with sodium carbonate to produce carbon dioxide gas:

$$Na_2CO_3 \ + \ 2HCl \ => \ 2NaCl \ + \ CO_2 \ + \ H_2O$$

However, HCl does not react with Nacl. So, we can use this option to distinguish the two chemicals.

(C) - Lead(II) Nitrate reacts with both compounds to form white precipitates (Lead(II) Carbonate, Lead(II) chloride). So, using Lead(II) Nitrate isn't useful to distinguish the two chemicals.

(D) - All reactions have sodium ions. So, neither will react in a way useful for us.

Correct Answer :- B

Q30:

We can use Newtons second law to find the acceleration of an object:

$$F \ = \ m{\times}a$$

$$a \ = \ \frac{F}{m}$$

Since F and m are constants, that would mean that a must be a constant too.

Since the acceleration is constant, that means that the velocity, and with it, the momentum and kinetic energy are all increasing.

ANS. CHOICE D

Q31:

Since this question uses mirrors, we can use the following formula:

$$\frac{1}{f} \ = \ \frac{1}{p} + \frac{1}{l}$$

Where the f is the focal length of the mirror, p is the distance from the object to the mirror, and l is the distance between the mirror and the image.

Since the mirror is convex, that means that the focal length and the image are both behind the mirror, because of which, we need to make these negative in the formula, giving us the following:

$$-\frac{1}{f} = \frac{1}{p} - \frac{1}{l}$$

$$\frac{1}{p} = \frac{1}{l} - \frac{1}{f}$$

Substituting l and f with the information given in the problem, we get

$$\frac{1}{p} = \frac{1}{10cm} - \frac{1}{15cm}$$

$$\frac{1}{p} = \frac{3}{30cm} - \frac{2}{30cm}$$

$$\frac{1}{p} = \frac{1}{30cm}$$

$$p = 30cm$$

ANS. CHOICE A

Q32:

Since the object gets all given energy, we know that:

$$E = \frac{m \times \left(10\frac{m}{s}\right)^2}{2} - \frac{m \times \left(0\frac{m}{s}\right)^2}{2}$$

$$E = \frac{m}{2} \times (100\frac{m^2}{s^2})$$

We can similarly find the energy needed to accelerate the object from the velocity of $10\frac{m}{s}$ to the velocity of $20\frac{m}{s}$:

$$E_1 = \frac{m \times \left(20\frac{m}{s}\right)^2}{2} - \frac{m \times \left(10\frac{m}{s}\right)^2}{2}$$

$$E_1 = \frac{m}{2} \times \left(\left(20\frac{m}{s}\right)^2 - \left(10\frac{m}{s}\right)^2\right)$$

$$E_1 = \frac{m}{2} \times \left(400\frac{m^2}{s^2} - 100\frac{m^2}{s^2}\right)$$

$$E_1 = \frac{m}{2} \times \left(300\frac{m^2}{s^2}\right)$$

Dividing E_1 by E we get:

$$\frac{E_1}{E} = \frac{\frac{m}{2} \times \left(300\frac{m^2}{s^2}\right)}{\frac{m}{2} \times \left(100\frac{m^2}{s^2}\right)}$$

$$\frac{E_1}{E} = 3$$

$$E_1 = 3E$$

ANS. CHOICE C

Q33:

The problem involves using energy to increase temperature, for which it is obvious that we need to use the next formula to solve it:

$$Q = mc\Delta t$$

Q is the energy we need to calculate.

Substituting $m = 2kg$, $c = 4200\frac{J}{kg \times °C}$ and $\Delta t = 10°C$ we get:

$$Q = 2kg \times 4200\frac{J}{kg \times °C} \times 10°C$$

$$Q = 84000J$$

ANS. CHOICE A

Q34:

Condensers are used to transform steam into liquid. Ethanol easily evaporates so the condenser would stop the ethanol gas from escaping by turning it back into liquid form, so it is used to stop it from escaping.

ANS. CHOICE B

Q35:

Lets say the mass of both liquids is m, then:

$$m = \rho_1 V_1 = \rho_2 V_2$$

Where index 1 is used for water and index 2 is used for the liquid

$$1\frac{g}{cm^3}V_1 = 2\frac{g}{cm^3}V_2$$

$$V_1 = 2V_2$$

The overall volume of the mixture is

$$V = V_1 + V_2 = 2V_2 + V_2 = 3V_2$$

And the overall mass of the mixture is

$$M = 2m = 2\rho_2 V_2 = 4\frac{g}{cm^3}V_2$$

The overall density of the mixture will be

$$\rho = \frac{M}{V} = \frac{4\frac{g}{cm^3}V_2}{3V_2} = \frac{4}{3}\frac{g}{cm^3}$$

ANS. CHOICE B

Q36:

Since the lamp is working with the switch not being connected, once the switch is turned on, it is obvious that it will behave differently. Since there is no resistance in

the part of the circuit with the switch, we can find the equivalent resistance fori t using the next formula which is used to find the equivalent resistance when resistors are connected parallel to eachother:

$$\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{R_2}$$

So, since there is no resistance in the circuit in the part where the switch is, $R_2 = 0\Omega$

$$\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{0\Omega}$$

$$\frac{1}{R_e} = \infty \Rightarrow R_e = 0$$

Since there is no resistance, turning the switch on will increase the current, resulting in the lamp glowing brighter.

ANS. CHOICE A

Q37:

The only forces acting upon the object with the mass of $m = 3kg$ is the gravitational force and the tension, so we can find the acceleration of both objects (they are moving the same way because the string is tightened and has tension) using Newtons second law:

$$F = ma$$

$$F_t - F_g = ma$$

$$a = \frac{F_t - F_g}{m}$$

$$a = \frac{F_t - mg}{m}$$

Substituting $F_t = 39N, m = 3kg$ and $g = 10\frac{m}{s^2}$ we get
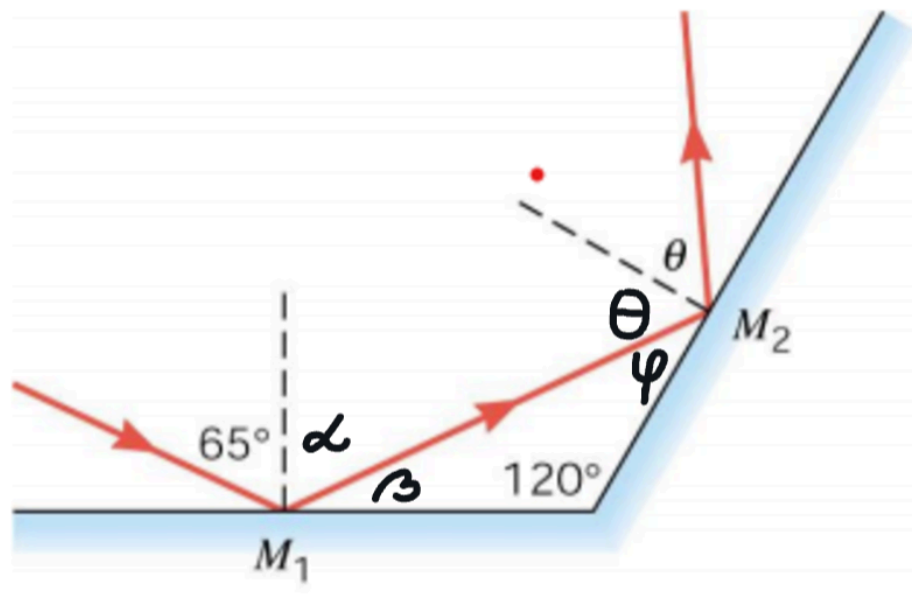
$$a = \frac{39N - 30N}{3kg}$$

$$a = \frac{9N}{3kg}$$

$$a = 3\frac{m}{s^2}$$

ANS. CHOICE B

Q38:

Since the light is hitting a plane mirror, the angle at which the beam hits the mirror is equal to the angle at which it is leaving.

Because of this, we know that α = 65°. Since angles α and β are complementary, we get

$$\alpha + \beta = 90°$$

$$\beta = 90° - \alpha$$

$$\beta = 90° - 65°$$

$$\beta = 25°$$

Since the triangle on the picture has the angles β, φ and 120°, the sum of them is 180°

$$\beta + \varphi + 120° = 180°$$

Substituting β = 25° we get

$$\varphi = 180° - 120° - 25°$$

$$\varphi = 35°$$

Since angles φ and θ are complementary, we get

$$\varphi + \theta = 90°$$

$$\theta = 90° - \varphi$$

$$\theta = 90° - 35°$$

$$\theta = 55°$$

ANS. CHOICE D

Q39:

Looking at the graph we see that the object travelled to a point $16m$ to the right from the starting point, and then travelling back to the point that is $8m$ to the right from the starting point, so the body travelled $16m - 8m = 8m$ to get back to that point. The overall distance travelled is

$$s = 16m + (16m - 8m) = 16m + 8m = 24m$$

ANS. CHOICE C

Q40:

Since the rod is negatively charged, it will distribute its negative charge to the electroscope, leaving it negatively charged after we remove the rod

ANS. CHOICE B

Question 41

We should write both sides using powers of 2.

$right\ hand\ side = 2^{3x-1} * 4 = 2^{3x-1} * 2^2 = 2^{3x+1}$ $(X^a * X^b = X^{a+b})$

$left\ hand\ side = 2^{2x+2}$

Since the left hand side and the right hand side are the same, $2^{3x+1} = 2^{2x+2}$,

3x + 1 = 2x + 2. X = 1.

Correct Answer :- C

Question 42

We have to rearrange the equation

$$v^2 = u^2 + 2as$$

$$v^2 - 2as = u^2$$

$$(v^2 - 2as)^{\frac{1}{2}} = u$$

Correct Answer :- B

Q43:

A transverse wave, by its definition, has its particles moving perpendicular to their motionless state, which, in this case, falls on the line CI.

ANS. CHOICE C

Q44:

Pressure, for a solid object, is defined as the overall force acting on a certain area, divided by that same area.

$$p = \frac{F}{A}$$

The force in the formula, is the weight of the liquid

$$F = mg$$

The mass of the liquid is found by multiplying its density with the volume it takes up

$$m = \rho V$$

So, by substituting everything in the formula for pressure, we get

$$p = \frac{\rho V g}{A}$$

And this is the value of the starting pressure.

Lets calculate the pressure for every of the given answers:

$$p_a = \frac{2\rho V g}{\frac{A}{2}} = 4\frac{\rho V g}{A}$$

$$p_b = \frac{\frac{\rho}{2} 2 V g}{\frac{A}{2}} = 2\frac{\rho V g}{A}$$

$$p_c = \frac{2\rho V g}{2A} = \frac{\rho V g}{A}$$

$$p_d = \frac{\frac{\rho}{2} 2 V g}{2A} = \frac{1}{2}\frac{\rho V g}{A}$$

Out of these 4, only answer choice C matches with the starting pressure

ANS. CHOICE C

Q45:

Since the light ray comes back at the same trajectory it came from, we can rewrite this as a problem where we need to find the focal length of the mirror, where, if we place an image at the distance d from the mirror, its image is formed at the same distance. Using the mirror formula we get

$$\frac{1}{f} = \frac{1}{d} + \frac{1}{d}$$

$$\frac{1}{f} = \frac{2}{d}$$

$$2f = d$$

$$f = \frac{d}{2}$$

ANS. CHOICE C

Question 46

When two lines are parallel, their gradient is similar. The gradient of the first line is 6. The gradient of the second line should also be 6. The y-intercept is said to be 8. So, the equation of the line should follow the following set of equations where n is any integer

n(y = 6x + 8)

The only equation that follows the above condition is choice D.

Correct Answer :- D

Q47:

Since the rod is metal, it will conduct heat, it is not clear enough what would be the stronglest source of heat, conduction or convection, because convection is dependent on the size of the fire and the distance at which we are observing it, while the conduction is dependent on the exact type of metal the rod is made from and the length of the rod. Since we are sure there is both conduction and convection, ans. choice c is wrong. Depending on the circumstance, either of the statements a or d could be correct, but ans choice b is always correct, because the conduction will always heat up the other end of the rod, no matter the before discussed circumstances.

ANS. CHOICE B

Q48:

Using the right hand rule, we see that if we change the currents direction, the force will also change its direction accordingly, so ans choice A is incorrect.

If we interchanged the magnet poles, that would swap the direction of the magnetic field which would also, according to the right hand rule, change the direction of the force, so ans choice B is incorrect

Using the right hand rule, we see that the force would not change direction if both the currents and the magnetic fields direction got swapped, answer choice c is incorrect.

We already saw from the past answers that, changing the direction of only one of the magnetic field or the current the direction of the force will also change, but now if we changed the directions of both the magnetic field and current, so this is the correct answer

ANS. CHOICE D

Question 49

This is a simple trigonometry equation

$$tan\ 30\ =\ \frac{opposite\ side}{adjacent\ side}\ =\ \frac{Height\ of\ the\ tree}{Length\ of\ the\ shadow}\ =\ \frac{Height\ of\ the\ tree}{50m}$$

Height of the tree = 50m * tan 30.

Correct Answer :- C

Question 50

To solve this problem, we will calculate the area of each shape.

$$Area\ of\ the\ Semicircle\ =\ \tfrac{1}{2}\pi r^2\ =\ \tfrac{1}{2}\pi\left(\tfrac{14}{2}\right)^2\ =\ 77cm^2$$

$$Area\ of\ the\ quadrilateral\ =\ Width\ *\ Height\ =\ 14cm\ *\ 12cm\ =\ 168cm^2$$

$$Area\ of\ the\ the\ triangle\ =\ \tfrac{1}{2}*\ base\ *\ height\ =\ \tfrac{1}{2}*\ 14cm\ *\ 12cm\ =\ 84cm^2$$

$$Total\ Area\ =\ 77cm^2\ +\ 168cm^2\ +\ 84cm^2\ =\ 329\ cm^2$$

Correct Answer :- B