

VITEEE 2025 – 23 April (Shift 1) Question Paper with Solutions

Time Allowed :2 Hours 30 Minutes	Maximum Marks :125	Total Questions :125
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General Instructions

1. Candidates must carry a printed copy of their **VITEEE 2025 Admit Card** and a valid **Photo ID proof** to the examination center.
2. The examination will be conducted in **Computer-Based Test (CBT)** mode.
3. Duration of the examination is **2 hours 30 minutes**.
4. The question paper consists of **125 Multiple Choice Questions (MCQs)** divided as follows:
 - Physics – 40 questions
 - Chemistry – 35 questions
 - Mathematics / Biology – 40 questions
 - Aptitude – 10 questions
5. Each correct answer carries **1 mark**. There is **no negative marking**.
6. Candidates must report to the test center at least **60 minutes before** the examination.
7. Use of **mobile phones, calculators, smart watches, or any electronic gadgets** is strictly prohibited.
8. Rough work must be done on the **sheet provided at the test center** and returned to the invigilator after completion.
9. Any form of malpractice, impersonation, or communication with others will lead to disqualification.
10. Candidates must ensure that all personal details are correctly entered on the computer screen before beginning the test.

1. A body of mass 2 kg is moving with a velocity of 3 m/s. What is its kinetic energy?

- (A) 6 J
- (B) 9 J
- (C) 12 J
- (D) 18 J

Correct Answer: (B) 9 J

Solution:

Step 1: Understanding the Concept:

Kinetic energy is the energy an object possesses due to its motion. It depends on both the mass of the object and its velocity.

Step 2: Key Formula or Approach:

The formula to calculate kinetic energy (KE) is:

$$KE = \frac{1}{2}mv^2$$

where m is the mass of the body and v is its velocity.

Step 3: Detailed Explanation:

We are given the following values:

Mass (m) = 2 kg

Velocity (v) = 3 m/s

Substituting these values into the kinetic energy formula:

$$KE = \frac{1}{2} \times 2 \text{ kg} \times (3 \text{ m/s})^2$$

First, calculate the square of the velocity:

$$v^2 = 3^2 = 9 \text{ (m/s)}^2$$

Now, substitute this back into the equation:

$$KE = \frac{1}{2} \times 2 \times 9$$

$$KE = 1 \times 9$$

$$KE = 9 \text{ J}$$

The unit of energy is Joules (J).

Step 4: Final Answer:

The kinetic energy of the body is 9 J. Therefore, option (B) is the correct answer.

💡 Quick Tip

A common mistake in kinetic energy calculations is forgetting to square the velocity. Always remember the v^2 term in the formula. Double-check your units to ensure they are in the standard SI system (mass in kg, velocity in m/s) to get the energy in Joules.

2. A bulb rated 60 W operates for 2 hours. How much energy does it consume in this time?

- (A) 120 J
- (B) 1200 J
- (C) 720 J
- (D) 4320 J

Correct Answer: (D) 4320 J

Solution:

Step 1: Understanding the Concept:

Electrical energy consumption is the product of the power rating of an appliance and the duration for which it operates. The standard unit for energy is the Joule (J), which corresponds to a power of 1 Watt for 1 second.

Step 2: Key Formula or Approach:

The formula for energy consumed is:

$$E = P \times t$$

where E is the energy in Joules, P is the power in Watts, and t is the time in seconds.

Step 3: Detailed Explanation:

We are given:

Power (P) = 60 W (which is 60 J/s)

Time = 2 hours

First, we must convert the time from hours to seconds, as the standard unit for energy calculation in Joules requires time in seconds.

$$t = 2 \text{ hours} \times 60 \frac{\text{minutes}}{\text{hour}} \times 60 \frac{\text{seconds}}{\text{minute}} = 7200 \text{ s}$$

Now, we can calculate the energy consumed:

$$E = 60 \text{ J/s} \times 7200 \text{ s} = 432000 \text{ J}$$

The calculated energy is 432,000 J. This value is not present in the options. This indicates a likely typo in the question or the options. Let's analyze the options to find the intended answer.

Option (D) is 4320 J. This value is exactly 1/100th of our calculated answer. It would be correct if the time were 72 seconds instead of 7200 seconds (2 hours).

$$E = 60 \text{ W} \times 72 \text{ s} = 4320 \text{ J}$$

Given the provided choices, it is highly probable that the question intended to give a time that results in 4320 J, or there is a typo in the options (missing zeros). Assuming the numerical part of option (D) is correct, we select it as the intended answer.

Step 4: Final Answer:

Based on the high likelihood of a typo in the question's data, option (D) is the most plausible intended answer. The calculation leading to this value would require the time to be 72 seconds.

 Quick Tip

In physics problems, always convert all quantities to their base SI units before calculation (e.g., hours to seconds, km to meters). If your calculated answer doesn't match any option, re-read the question for potential typos or re-evaluate the units.

3. What is the focal length of a lens if its power is +2 D?

- (A) 0.5 m
- (B) 1.0 m
- (C) 2.0 m
- (D) 0.2 m

Correct Answer: (A) 0.5 m

Solution:

Step 1: Understanding the Concept:

The power of a lens is a measure of its ability to converge or diverge light rays. It is defined as the reciprocal of its focal length when the focal length is measured in meters. The unit of power is the dioptre (D). A positive power indicates a converging (convex) lens, while a negative power indicates a diverging (concave) lens.

Step 2: Key Formula or Approach:

The relationship between the power of a lens (P) and its focal length (f) is given by:

$$P = \frac{1}{f}$$

where f must be in meters.

Step 3: Detailed Explanation:

We are given:

Power of the lens (P) = +2 D

We need to find the focal length (f). We can rearrange the formula:

$$f = \frac{1}{P}$$

Now, substitute the given value of power:

$$f = \frac{1}{+2} \text{ m}$$
$$f = 0.5 \text{ m}$$

The focal length is 0.5 meters. The positive sign confirms that it is a convex lens.

Step 4: Final Answer:

The focal length of the lens is 0.5 m. Therefore, option (A) is the correct answer.

 Quick Tip

Remember that the unit Dioptre (D) is equivalent to m^{-1} . If the focal length is given in centimeters, you must convert it to meters before calculating the power, and vice versa. $P(D) = \frac{100}{f(\text{cm})}$.

4. A stone is dropped from a height of 45 m. What is the time taken for the stone to reach the ground? (Take $g = 10 \text{ m/s}^2$)

- (A) 3 s
- (B) 5 s
- (C) 6 s
- (D) 9 s

Correct Answer: (A) 3 s

Solution:

Step 1: Understanding the Concept:

This problem involves an object in free fall, which is motion under the influence of gravity alone. We can use the equations of motion to solve for the time taken. Since the stone is "dropped", its initial velocity is zero.

Step 2: Key Formula or Approach:

The second equation of motion relates distance, initial velocity, time, and acceleration:

$$s = ut + \frac{1}{2}at^2$$

For an object in free fall, the distance s is the height h , the initial velocity u is 0, and the acceleration a is the acceleration due to gravity g . The formula becomes:

$$h = \frac{1}{2}gt^2$$

Step 3: Detailed Explanation:

We are given the following values:

Height (h) = 45 m

Initial velocity (u) = 0 m/s

Acceleration due to gravity (g) = 10 m/s^2 (as assumed from other questions in the paper)

Substitute these values into the simplified equation of motion:

$$45 = \frac{1}{2} \times 10 \times t^2$$

$$45 = 5 \times t^2$$

Now, solve for t^2 :

$$t^2 = \frac{45}{5}$$

$$t^2 = 9$$

Finally, take the square root to find t :

$$t = \sqrt{9} = 3 \text{ s}$$

We consider only the positive root as time cannot be negative.

Step 4: Final Answer:

The time taken for the stone to reach the ground is 3 seconds. Therefore, option (A) is correct.

💡 Quick Tip

For any object dropped from rest from a height h , you can quickly calculate the time to fall using the formula $t = \sqrt{\frac{2h}{g}}$. This is just a rearrangement of the standard kinematic equation.

5. A current of 2 A flows through a resistor for 10 minutes. What is the total charge that flows through the resistor?

- (A) 120 C
- (B) 200 C
- (C) 240 C
- (D) 360 C

Correct Answer: (A) 120 C

Solution:

Step 1: Understanding the Concept:

Electric current is defined as the rate of flow of electric charge. Therefore, the total charge that flows through a conductor is the product of the constant current and the time interval for which it flows. The standard unit for charge is the Coulomb (C).

Step 2: Key Formula or Approach:

The relationship between charge (Q), current (I), and time (t) is given by:

$$Q = I \times t$$

where Q is in Coulombs, I is in Amperes, and t is in seconds.

Step 3: Detailed Explanation:

We are given:

Current (I) = 2 A

Time = 10 minutes

First, we must convert the time from minutes to seconds to use the formula correctly.

$$t = 10 \text{ minutes} \times 60 \frac{\text{seconds}}{\text{minute}} = 600 \text{ s}$$

Now, calculate the total charge:

$$Q = 2 \text{ A} \times 600 \text{ s} = 1200 \text{ C}$$

The calculated charge is 1200 C. However, this value is not among the options. This suggests a typo in the question's time value. Let's examine the options. Option (A) is 120 C, which is

exactly one-tenth of our calculated value. This would be the correct answer if the time was 1 minute instead of 10 minutes.

Let's assume the time was intended to be 1 minute (60 seconds):

$$Q = 2 \text{ A} \times 60 \text{ s} = 120 \text{ C}$$

This matches option (A). Given the choices, it is highly probable that "10 minutes" was a typo for "1 minute".

Step 4: Final Answer:

Assuming a typo in the question where the time should have been 1 minute, the total charge that flows is 120 C. Therefore, option (A) is the most plausible intended answer.

💡 Quick Tip

Always be careful with units. The definition of the Ampere is Coulombs per second, so time must be in seconds for the formula $Q = I \times t$ to yield Coulombs. If your answer seems off by a factor of 60 or 3600, you have likely made a unit conversion error with time.

6. A body of mass 10 kg is moving with a speed of 5 m/s. What is the momentum of the body?

- (A) 50 kg m/s
- (B) 100 kg m/s
- (C) 200 kg m/s
- (D) 25 kg m/s

Correct Answer: (A) 50 kg m/s

Solution:

Step 1: Understanding the Concept:

Linear momentum is a measure of the quantity of motion of an object. It is a vector quantity, meaning it has both magnitude and direction. It is calculated as the product of the object's mass and its velocity.

Step 2: Key Formula or Approach:

The formula for linear momentum (p) is:

$$p = m \times v$$

where m is the mass and v is the velocity of the body.

Step 3: Detailed Explanation:

We are given the following values:

Mass (m) = 10 kg

Speed (v) = 5 m/s

Since the direction is not specified, we will calculate the magnitude of the momentum.

Substitute the values into the formula:

$$p = 10 \text{ kg} \times 5 \text{ m/s}$$

$$p = 50 \text{ kg} \cdot \text{m/s}$$

The unit of momentum is kilogram-meter per second.

Step 4: Final Answer:

The momentum of the body is 50 kg m/s. Therefore, option (A) is the correct answer.

💡 Quick Tip

Don't confuse momentum ($p = mv$) with kinetic energy ($KE = \frac{1}{2}mv^2$). They are related but are different physical quantities. Momentum is a vector and is conserved in collisions, while kinetic energy is a scalar and is only conserved in elastic collisions.

7. The potential energy of a body at a height of 10 meters is 200 J. What is its mass? (Take $g = 10 \text{ m/s}^2$)

- (A) 2 kg
- (B) 5 kg
- (C) 10 kg
- (D) 20 kg

Correct Answer: (A) 2 kg

Solution:

Step 1: Understanding the Concept:

Gravitational potential energy is the energy an object possesses because of its position in a gravitational field. It depends on the mass of the object, the acceleration due to gravity, and its height relative to a reference point.

Step 2: Key Formula or Approach:

The formula for gravitational potential energy (PE) is:

$$PE = mgh$$

where m is the mass, g is the acceleration due to gravity, and h is the height.

Step 3: Detailed Explanation:

We are given the following values:

Potential Energy (PE) = 200 J

Height (h) = 10 m

Acceleration due to gravity (g) = 10 m/s^2

We need to find the mass (m). We can rearrange the formula to solve for m :

$$m = \frac{PE}{gh}$$

Now, substitute the given values into the rearranged formula:

$$m = \frac{200 \text{ J}}{(10 \text{ m/s}^2) \times (10 \text{ m})}$$

$$m = \frac{200}{100} \text{ kg}$$

$$m = 2 \text{ kg}$$

Step 4: Final Answer:

The mass of the body is 2 kg. Therefore, option (A) is the correct answer.

💡 Quick Tip

It's often easier to rearrange the formula algebraically to solve for the unknown variable before plugging in the numerical values. This can help reduce calculation errors. In this case, isolating 'm' first simplifies the process.

8. What is the resistance of a conductor if the potential difference across it is 12 V and the current flowing through it is 3 A?

- (A) 4
- (B) 6
- (C) 9
- (D) 12

Correct Answer: (A) 4

Solution:

Step 1: Understanding the Concept:

Ohm's Law describes the relationship between potential difference (voltage), current, and resistance in an electrical circuit. It states that the current through a conductor between two points is directly proportional to the voltage across the two points, provided the temperature and other physical conditions remain unchanged.

Step 2: Key Formula or Approach:

Ohm's Law is expressed as:

$$V = IR$$

where V is the potential difference in Volts (V), I is the current in Amperes (A), and R is the resistance in Ohms (Ω).

Step 3: Detailed Explanation:

We are given:

Potential Difference (V) = 12 V

Current (I) = 3 A

We need to find the resistance (R). We can rearrange Ohm's Law to solve for R :

$$R = \frac{V}{I}$$

Substitute the given values:

$$\begin{aligned} R &= \frac{12 \text{ V}}{3 \text{ A}} \\ R &= 4 \Omega \end{aligned}$$

Step 4: Final Answer:

The resistance of the conductor is 4 . Therefore, option (A) is the correct answer.

 Quick Tip

You can use the "Ohm's Law Triangle" as a mnemonic. Cover the variable you want to find: to find V, you see I beside R ($V = IR$); to find I, you see V over R ($I = V/R$); to find R, you see V over I ($R = V/I$).

9. A convex lens has a focal length of 10 cm. What is the magnification produced when the object is placed 30 cm from the lens?

- (A) 2
- (B) 3
- (C) 1.5
- (D) 4

Correct Answer: None of the options are correct.

Solution:

Step 1: Understanding the Concept:

This problem requires using the lens formula to find the image position and then the magnification formula to find the magnification produced by the lens. For a convex lens, the focal length is positive. By convention, the object distance is taken as negative.

Step 2: Key Formula or Approach:

1. **Lens Formula:** Relates the object distance (u), image distance (v), and focal length (f):

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

2. **Magnification Formula:** Relates the image distance and object distance:

$$m = \frac{v}{u}$$

Step 3: Detailed Explanation:

We are given:

Focal length (f) = +10 cm (positive for a convex lens)

Object distance (u) = -30 cm (negative by sign convention)

Part 1: Find the image distance (v)

Using the lens formula:

$$\begin{aligned}\frac{1}{10} &= \frac{1}{v} - \frac{1}{-30} \\ \frac{1}{10} &= \frac{1}{v} + \frac{1}{30}\end{aligned}$$

Rearrange to solve for $1/v$:

$$\frac{1}{v} = \frac{1}{10} - \frac{1}{30}$$

Find a common denominator (30):

$$\frac{1}{v} = \frac{3}{30} - \frac{1}{30} = \frac{2}{30} = \frac{1}{15}$$

Therefore, the image distance is $v = +15$ cm. The positive sign indicates that a real image is formed.

Part 2: Find the magnification (m)

Using the magnification formula:

$$m = \frac{v}{u} = \frac{+15}{-30} = -0.5$$

The magnification is -0.5. The negative sign indicates that the image is inverted, and the magnitude (0.5) means the image is smaller than the object (diminished).

Step 4: Final Answer:

The calculated magnification is -0.5. The question asks for the magnification produced, and the options are all positive magnitudes greater than 1. None of the given options (2, 3, 1.5, 4) match the calculated value of 0.5. Therefore, the question or the options provided are incorrect.

 Quick Tip

Always be careful with the sign conventions in optics. For lenses: object distance (u) is almost always negative; focal length (f) is positive for convex and negative for concave lenses; image distance (v) is positive for real images and negative for virtual images.

10. What is the molar mass of NaCl?

- (A) 58 g/mol
- (B) 60 g/mol
- (C) 62 g/mol
- (D) 56 g/mol

Correct Answer: (A) 58 g/mol

Solution:

Step 1: Understanding the Concept:

The molar mass of a compound is the mass of one mole of that substance. It is calculated by summing the atomic masses of all the atoms in the compound's chemical formula.

Step 2: Key Formula or Approach:

Molar Mass of NaCl = (Atomic Mass of Na) + (Atomic Mass of Cl)

Step 3: Detailed Explanation:

First, we need the atomic masses of Sodium (Na) and Chlorine (Cl) from the periodic table.

Atomic mass of Na 22.99 g/mol

Atomic mass of Cl 35.45 g/mol

Now, we sum these values to find the molar mass of sodium chloride (NaCl):

$$\text{Molar Mass of NaCl} = 22.99 + 35.45 = 58.44 \text{ g/mol}$$

This value is often rounded to 58.5 g/mol for school-level calculations.

Looking at the options, the closest value is 58 g/mol. This answer would be obtained if the atomic mass of Chlorine was rounded down to 35 g/mol and Sodium was rounded to 23 g/mol. Calculation with rounded values: $23 \text{ g/mol} + 35 \text{ g/mol} = 58 \text{ g/mol}$. Given the options, it is clear that this level of approximation is expected.

Step 4: Final Answer:

The molar mass of NaCl is approximately 58.44 g/mol. The closest option is 58 g/mol, which is the intended answer based on rounded atomic masses.

💡 Quick Tip

For competitive exams, it's useful to memorize the approximate atomic masses of common elements like H(1), C(12), N(14), O(16), Na(23), Cl(35.5), K(39), Ca(40). This will save you time in calculations.

11. Which of the following is an example of a redox reaction?

- (A) $\text{H} + \text{Cl} \rightarrow 2\text{HCl}$
- (B) $\text{NaCl} + \text{AgNO} \rightarrow \text{NaNO} + \text{AgCl}$
- (C) $\text{CHOH} + 3\text{O} \rightarrow 2\text{CO} + 3\text{HO}$
- (D) $\text{H} + \text{O} \rightarrow 2\text{HO}$

Correct Answer: (A) $\text{H} + \text{Cl} \rightarrow 2\text{HCl}$

Solution:

Step 1: Understanding the Concept:

A redox (reduction-oxidation) reaction is a type of chemical reaction that involves a change in the oxidation states of atoms. Oxidation is the loss of electrons (increase in oxidation state), and reduction is the gain of electrons (decrease in oxidation state).

Step 2: Detailed Explanation:

Let's analyze the oxidation states of the elements in each reaction:

(A) $\text{H} + \text{Cl} \rightarrow 2\text{HCl}$

- In H, the oxidation state of H is 0.
- In Cl, the oxidation state of Cl is 0.
- In HCl, the oxidation state of H is +1 and Cl is -1.

Hydrogen's oxidation state increased from 0 to +1 (oxidation). Chlorine's oxidation state decreased from 0 to -1 (reduction). Since there is a change in oxidation states, this is a redox reaction.

(B) $\text{NaCl} + \text{AgNO} \rightarrow \text{NaNO} + \text{AgCl}$

- This is a double displacement reaction. Let's check the oxidation states:
- Na remains +1, Cl remains -1, Ag remains +1, N remains +5, O remains -2 throughout the reaction.
- There is no change in oxidation states. This is not a redox reaction.

(C) $\text{CHOH} + 3\text{O} \rightarrow 2\text{CO} + 3\text{HO}$

- This is a combustion reaction.
- In O, the oxidation state of O is 0. In CO and HO, it is -2 (reduction).
- The oxidation state of Carbon changes from -2 in CHOH to +4 in CO (oxidation).
- This is also a redox reaction.

(D) $\text{H} + \text{O} \rightarrow 2\text{HO}$

- In H, the oxidation state of H is 0. In HO, it is +1 (oxidation).
- In O, the oxidation state of O is 0. In HO, it is -2 (reduction).
- This is also a redox reaction.

Step 3: Final Answer:

The question asks for an example of a redox reaction. Options (A), (C), and (D) are all correct examples of redox reactions. In a single-choice format, such a question is flawed. However, if forced to choose one, (A) is a simple and clear example of a combination redox reaction. All three are valid answers. We select (A) as a representative correct answer.

💡 Quick Tip

Remember the mnemonic OIL RIG: Oxidation Is Loss (of electrons), Reduction Is Gain (of electrons). Also, all combustion reactions, single displacement reactions, and many combination/decomposition reactions are redox reactions. Double displacement reactions are typically not redox.

12. What is the pH of a solution if the concentration of H ions is 1×10^{-5} mol/L?

- (A) 5
- (B) 6
- (C) 4
- (D) 7

Correct Answer: (A) 5

Solution:

Step 1: Understanding the Concept:

The pH scale is a logarithmic scale used to specify the acidity or basicity of an aqueous solution. It is defined as the negative of the base-10 logarithm of the hydrogen ion concentration $[\text{H}^+]$.

Step 2: Key Formula or Approach:

The formula to calculate pH is:

$$\text{pH} = -\log_{10}[\text{H}^+]$$

where $[\text{H}^+]$ is the molar concentration of hydrogen ions.

Step 3: Detailed Explanation:

We are given the hydrogen ion concentration:

$$[\text{H}^+] = 1 \times 10^{-5} \text{ mol/L}$$

Now, we substitute this value into the pH formula:

$$\text{pH} = -\log_{10}(1 \times 10^{-5})$$

Using the properties of logarithms ($\log(a \times b) = \log(a) + \log(b)$):

$$\text{pH} = -(\log_{10}(1) + \log_{10}(10^{-5}))$$

We know that $\log_{10}(1) = 0$ and $\log_{10}(10^{-x}) = -x$.

$$\text{pH} = -(0 + (-5))$$

$$\text{pH} = -(-5) = 5$$

Step 4: Final Answer:

The pH of the solution is 5. Therefore, option (A) is the correct answer.

💡 Quick Tip

For any hydrogen ion concentration given in the form 1×10^{-n} mol/L, the pH is simply the value of n . This is a useful shortcut for multiple-choice questions.

13. What is the number of moles in 18 g of water (H₂O)?

- (A) 1 mol
- (B) 0.5 mol
- (C) 2 mol
- (D) 0.25 mol

Correct Answer: (A) 1 mol

Solution:

Step 1: Understanding the Concept:

A mole is a unit of measurement for the amount of substance. The number of moles can be calculated by dividing the given mass of the substance by its molar mass.

Step 2: Key Formula or Approach:

The formula to calculate the number of moles (n) is:

$$n = \frac{\text{mass}}{\text{Molar Mass}}$$

Step 3: Detailed Explanation:

First, we need to calculate the molar mass of water (H₂O).

The atomic mass of Hydrogen (H) is approximately 1 g/mol.

The atomic mass of Oxygen (O) is approximately 16 g/mol.

Molar Mass of H₂O = (2 × Atomic Mass of H) + (1 × Atomic Mass of O)

$$\text{Molar Mass of H}_2\text{O} = (2 \times 1) + 16 = 18 \text{ g/mol}$$

Now, we can calculate the number of moles in 18 g of water.

Given mass = 18 g

$$n = \frac{18 \text{ g}}{18 \text{ g/mol}} = 1 \text{ mol}$$

Step 4: Final Answer:

There is 1 mole in 18 g of water. Therefore, option (A) is the correct answer.

 Quick Tip

The molar mass of water is 18 g/mol, a number that appears frequently in chemistry problems. Memorizing it can save time. For example, 36g of water is 2 moles, 9g is 0.5 moles, etc.

14. Which of the following gases has the highest density at STP?

- (A) O
- (B) N
- (C) CO
- (D) H

Correct Answer: (C) CO

Solution:

Step 1: Understanding the Concept:

According to Avogadro's law, equal volumes of all ideal gases, at the same temperature and pressure, have the same number of molecules. This implies that at Standard Temperature and Pressure (STP), the molar volume of any ideal gas is constant (approximately 22.4 L/mol). Density is mass per unit volume ($\rho = m/V$). For one mole of gas, density is $\rho = \text{Molar Mass}/\text{Molar Volume}$. Since the molar volume is constant for all gases at STP, the density of a gas is directly proportional to its molar mass. The gas with the highest molar mass will have the highest density.

Step 2: Key Formula or Approach:

At STP, Density $\propto$ Molar Mass. We need to compare the molar masses of the given gases.

Step 3: Detailed Explanation:

Let's calculate the molar mass of each gas:

1. **O (Oxygen):** Molar Mass = $2 \times 16 = 32$ g/mol
2. **N (Nitrogen):** Molar Mass = $2 \times 14 = 28$ g/mol
3. **CO (Carbon Dioxide):** Molar Mass = $12 + (2 \times 16) = 12 + 32 = 44$ g/mol
4. **H (Hydrogen):** Molar Mass = $2 \times 1 = 2$ g/mol

Comparing the molar masses:

CO (44 g/mol) $\succ$ O (32 g/mol) $\succ$ N (28 g/mol) $\succ$ H (2 g/mol)

Since CO has the highest molar mass, it will have the highest density at STP.

Step 4: Final Answer:

Carbon dioxide (CO) has the highest density at STP among the given options. Therefore, option (C) is correct.

 Quick Tip

To quickly compare gas densities at the same temperature and pressure, you only need to compare their molar masses. A heavier molecule means a denser gas under the same conditions.

15. Which of the following acids is a strong acid?

- (A) HSO
- (B) CHCOOH
- (C) HCO
- (D) HNO

Correct Answer: (A) HSO

Solution:

Step 1: Understanding the Concept:

A strong acid is an acid that ionizes completely in an aqueous solution. This means that nearly all the acid molecules dissociate to produce hydrogen ions (H). A weak acid, in contrast, only partially dissociates.

Step 2: Detailed Explanation:

Let's analyze each option:

(A) HSO (Sulfuric acid): This is one of the common strong acids. It dissociates completely in water in its first deprotonation step.

(B) CHCOOH (Acetic acid): This is the acid found in vinegar. It is a classic example of a weak organic acid. It only partially dissociates in water.

(C) HCO (Carbonic acid): This acid is formed when carbon dioxide dissolves in water. It is a weak acid.

(D) HNO (Nitric acid): This is another common strong acid. It also dissociates completely in water.

Step 3: Final Answer:

The question asks for a strong acid. Both HSO (Sulfuric acid) and HNO (Nitric acid) are strong acids. This indicates a flaw in the question design for a single-choice format. However, both are valid answers. In such cases, often the first correct option is accepted. We choose (A) as a correct answer, keeping in mind that (D) is also correct.

 Quick Tip

It is very helpful to memorize the list of common strong acids for chemistry exams. They are: HCl (Hydrochloric acid), HBr (Hydrobromic acid), HI (Hydroiodic acid), HNO (Nitric acid), HSO (Sulfuric acid), and HClO (Perchloric acid). Most other acids you encounter will be weak.

16. What is the pH of a solution with a H concentration of 1×10^8 mol/L?

- (A) 3
- (B) 4
- (C) 5
- (D) 6

Correct Answer: (A) 3

Solution:

Step 1: Understanding the Concept:

The pH of a solution is a measure of its acidity and is defined as the negative base-10 logarithm of the hydrogen ion $[H]$ concentration.

Step 2: Key Formula or Approach:

The formula for pH is:

$$\text{pH} = -\log_{10}[H^+]$$

Step 3: Detailed Explanation:

We are given the hydrogen ion concentration:

$$[H^+] = 1 \times 10^{-3} \text{ mol/L}$$

Substitute this value into the pH formula:

$$\text{pH} = -\log_{10}(1 \times 10^{-3})$$

$$\text{pH} = -(\log_{10}(1) + \log_{10}(10^{-3}))$$

Since $\log_{10}(1) = 0$ and $\log_{10}(10^{-3}) = -3$:

$$\text{pH} = -(0 - 3) = 3$$

Step 4: Final Answer:

The pH of the solution is 3. Therefore, option (A) is correct.

💡 Quick Tip

This question reinforces the shortcut: when the hydrogen ion concentration is expressed as 1×10^{-n} , the pH is simply n . This allows for a very quick solution without a calculator.

17. Which of the following is an example of an exothermic reaction?

- (A) $H + Cl \rightarrow 2HCl$
- (B) $N + 3H \rightarrow 2NH$
- (C) $CH + 15O \rightarrow 6CO + 3HO$
- (D) $N + 3H \rightarrow 2NH$

Correct Answer: (C) $CH + 15O \rightarrow 6CO + 3HO$

Solution:

Step 1: Understanding the Concept:

An exothermic reaction is a chemical reaction that releases energy, usually in the form of heat or light. In an exothermic reaction, the change in enthalpy (ΔH) is negative. Endothermic reactions, conversely, absorb energy from their surroundings.

Step 2: Detailed Explanation:

Let's analyze the options:

(A) $H + Cl \rightarrow 2HCl$: The formation of hydrogen chloride from its elements is an exothermic reaction.

(B) $\text{N} + 3\text{H} \rightarrow 2\text{NH}$: This is the Haber process for synthesizing ammonia. It is a well-known exothermic reaction.

(C) $\text{CH} + 15\text{O} \rightarrow 6\text{CO} + 3\text{HO}$: This represents the combustion of benzene. All combustion reactions, where a substance reacts rapidly with an oxidant (like oxygen) to produce heat and light, are classic examples of highly exothermic reactions. (Note: The stoichiometry shown is incorrect. The balanced equation is $2\text{C}_6\text{H}_6 + 15\text{O}_2 \rightarrow 12\text{CO}_2 + 6\text{H}_2\text{O}$. However, the process itself is exothermic).

(D) $\text{N} + 3\text{H} \rightarrow 2\text{NH}$: This is identical to option (B) and is also exothermic.

Step 3: Final Answer:

This question is flawed as it contains multiple correct answers (all listed reactions are exothermic) and a repeated option. However, combustion reactions like the one in option (C) are arguably the most universally recognized and potent examples of exothermic processes. Despite the stoichiometric error, it represents a valid class of exothermic reactions. Therefore, we select (C) as the most representative answer.

 Quick Tip

Remember that combustion, neutralization (acid + base), and most synthesis/combination reactions are typically exothermic. Breaking bonds requires energy (endothermic), while forming bonds releases energy (exothermic). In an exothermic reaction, more energy is released by forming new bonds than is consumed to break old ones.

18. What is the molar volume of an ideal gas at standard temperature and pressure (STP)?

- (A) 22.4 L/mol
- (B) 1 L/mol
- (C) 24 L/mol
- (D) 12 L/mol

Correct Answer: (A) 22.4 L/mol

Solution:

Step 1: Understanding the Concept:

The molar volume of a gas is the volume occupied by one mole of that gas at a specific temperature and pressure. Standard Temperature and Pressure (STP) is a set of standard conditions used for experimental measurements.

Step 2: Detailed Explanation:

Historically and in many educational contexts, STP is defined as:

- **Standard Temperature:** 0 °C or 273.15 K
- **Standard Pressure:** 1 atmosphere (atm) or 101.325 kPa

Under these specific conditions, experiments show that one mole of any ideal gas occupies a volume of approximately 22.4 liters.

The IUPAC has a slightly different definition (1 bar pressure), which gives 22.7 L/mol, but 22.4 L/mol is the value most commonly used in introductory chemistry and expected in this context.

Option (C), 24 L/mol, is closer to the molar volume at SATP (Standard Ambient Temperature and Pressure, 25 °C and 1 atm), which is about 24.5 L/mol.

Step 3: Final Answer:

The standard molar volume of an ideal gas at STP (0°C and 1 atm) is 22.4 L/mol. Therefore, option (A) is correct.

💡 Quick Tip

Be aware of the difference between STP (0°C, 1 atm) and SATP (25°C, 1 atm or 1 bar). For STP, use 22.4 L/mol. For SATP, the molar volume is higher, around 24.5 L/mol, because the temperature is higher.

19. Which of the following is a characteristic property of acids?

- (A) They turn blue litmus paper red.
- (B) They turn red litmus paper blue.
- (C) They are slippery to touch.
- (D) They have a bitter taste.

Correct Answer: (A) They turn blue litmus paper red.

Solution:

Step 1: Understanding the Concept:

Acids and bases are two classes of chemical compounds with distinct properties. These properties can be used to identify them.

Step 2: Detailed Explanation:

Let's evaluate the given properties:

(A) They turn blue litmus paper red: This is a defining characteristic of acids. Litmus is an indicator that changes color in the presence of an acid or a base.

(B) They turn red litmus paper blue: This is the property of bases, not acids.

(C) They are slippery to touch: This is a characteristic property of bases (e.g., soap, which is alkaline). Acids do not feel slippery; strong acids are corrosive.

(D) They have a bitter taste: Bases typically have a bitter taste. Acids are known for their sour taste (e.g., citric acid in lemons). (Note: Tasting chemicals in a lab is extremely dangerous and should never be done).

Step 3: Final Answer:

The characteristic property of acids among the choices is that they turn blue litmus paper red. Therefore, option (A) is correct.

💡 Quick Tip

A simple mnemonic to remember the litmus test is **BAR**: **B**lue litmus turns **R**ed in **A**cid. This helps distinguish it from the effect of bases.

20. Find the value of x in the equation $2x + 3 = 7x - 8$.

- (A) $x = 1$
- (B) $x = 2$
- (C) $x = 3$
- (D) $x = 4$

Correct Answer: None of the options are correct.

Solution:

Step 1: Understanding the Concept:

This problem requires solving a linear equation with one variable. The goal is to isolate the variable (x) on one side of the equation.

Step 2: Key Formula or Approach:

We will use algebraic manipulation to solve for x . The steps involve grouping terms with x on one side and constant terms on the other.

Step 3: Detailed Explanation:

The given equation is:

$$2x + 3 = 7x - 8$$

First, move the terms with x to one side. Let's subtract $2x$ from both sides:

$$3 = 7x - 2x - 8$$

$$3 = 5x - 8$$

Next, move the constant terms to the other side. Add 8 to both sides:

$$3 + 8 = 5x$$

$$11 = 5x$$

Finally, solve for x by dividing both sides by 5:

$$x = \frac{11}{5} = 2.2$$

The correct value of x is 2.2.

Step 4: Final Answer:

The calculated value for x is 2.2. None of the integer options provided (1, 2, 3, 4) is correct. This indicates an error in the question or the provided options.

Quick Tip

When solving an equation, you can always check your answer by substituting it back into the original equation. For our calculated $x = 2.2$: LHS = $2(2.2) + 3 = 4.4 + 3 = 7.4$. RHS = $7(2.2) - 8 = 15.4 - 8 = 7.4$. Since LHS = RHS, our solution is correct.

21. The sum of the first 10 terms of an arithmetic progression is 150. If the first term is 10, what is the common difference?

- (A) 5

- (B) 3
- (C) 4
- (D) 2

Correct Answer: None of the options are correct.

Solution:

Step 1: Understanding the Concept:

An arithmetic progression (AP) is a sequence of numbers such that the difference between consecutive terms is constant. This constant difference is called the common difference (d).

Step 2: Key Formula or Approach:

The sum (S_n) of the first n terms of an AP is given by the formula:

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

where a is the first term, n is the number of terms, and d is the common difference.

Step 3: Detailed Explanation:

We are given the following information:

The sum of the first 10 terms, $S_{10} = 150$

The number of terms, $n = 10$

The first term, $a = 10$

We need to find the common difference, d .

Substitute the given values into the formula:

$$\begin{aligned} 150 &= \frac{10}{2}[2(10) + (10 - 1)d] \\ 150 &= 5[20 + 9d] \end{aligned}$$

Divide both sides by 5:

$$\begin{aligned} \frac{150}{5} &= 20 + 9d \\ 30 &= 20 + 9d \end{aligned}$$

Subtract 20 from both sides:

$$\begin{aligned} 30 - 20 &= 9d \\ 10 &= 9d \end{aligned}$$

Solve for d :

$$d = \frac{10}{9}$$

The calculated common difference is approximately 1.11.

Step 4: Final Answer:

The calculated value for the common difference is $d = 10/9$. None of the integer options (5, 3, 4, 2) matches this result. Therefore, the numerical values in the question are inconsistent with the provided options.

 Quick Tip

If your calculation seems correct but doesn't match any option, double-check the formula and your arithmetic. If the mismatch persists, the question itself might be flawed. You can also try working backward from the options to see if any of them fit a slightly modified version of the problem, which might reveal the intended question.

22. What is the area of a triangle with base 8 cm and height 6 cm?

- (A) 24 cm²
- (B) 30 cm²
- (C) 36 cm²
- (D) 48 cm²

Correct Answer: (A) 24 cm²

Solution:

Step 1: Understanding the Concept:

The area of a triangle is the amount of two-dimensional space it occupies. It can be calculated if the lengths of its base and corresponding height are known.

Step 2: Key Formula or Approach:

The formula for the area of a triangle is:

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$$

Step 3: Detailed Explanation:

We are given the following values:

Base (b) = 8 cm

Height (h) = 6 cm

Substitute these values into the area formula:

$$\text{Area} = \frac{1}{2} \times 8 \text{ cm} \times 6 \text{ cm}$$

$$\text{Area} = 4 \text{ cm} \times 6 \text{ cm}$$

$$\text{Area} = 24 \text{ cm}^2$$

The unit for area is square centimeters (cm²).

Step 4: Final Answer:

The area of the triangle is 24 cm². Therefore, option (A) is the correct answer.

 Quick Tip

Don't confuse the area of a triangle with the area of a rectangle (base $\times$ height). The factor of $\frac{1}{2}$ is crucial because a triangle can be seen as half of a rectangle or parallelogram with the same base and height.

23. Solve for x in the equation $\frac{1}{x} + \frac{1}{2x} = \frac{1}{2}$.

- (A) $x = 1$
- (B) $x = 2$
- (C) $x = 3$
- (D) $x = 4$

Correct Answer: (C) $x = 3$

Solution:

Step 1: Understanding the Concept:

This is a rational equation, which is an equation containing at least one fraction whose numerator and denominator are polynomials. To solve it, we can find a common denominator to combine the fractions or multiply the entire equation by the least common multiple (LCM) of the denominators to eliminate them.

Step 2: Key Formula or Approach:

The approach is to combine the terms on the left side by finding a common denominator, and then solve for x .

Step 3: Detailed Explanation:

The given equation is:

$$\frac{1}{x} + \frac{1}{2x} = \frac{1}{2}$$

The least common denominator for the terms on the left side (x and $2x$) is $2x$. We rewrite the first term with this denominator:

$$\frac{1}{x} \times \frac{2}{2} = \frac{2}{2x}$$

Now substitute this back into the equation:

$$\frac{2}{2x} + \frac{1}{2x} = \frac{1}{2}$$

Combine the fractions on the left side:

$$\begin{aligned}\frac{2+1}{2x} &= \frac{1}{2} \\ \frac{3}{2x} &= \frac{1}{2}\end{aligned}$$

Now, we can solve this by cross-multiplication:

$$\begin{aligned}3 \times 2 &= 1 \times 2x \\ 6 &= 2x\end{aligned}$$

Finally, divide by 2 to solve for x :

$$\begin{aligned}x &= \frac{6}{2} \\ x &= 3\end{aligned}$$

We should check that this solution does not make any denominator in the original equation equal to zero. Since $x = 3$, the denominators are 3 and 6, which is valid.

Step 4: Final Answer:

The value of x that solves the equation is 3. Therefore, option (C) is correct.

💡 Quick Tip

An alternative method is to multiply the entire equation by the LCM of all denominators (x , $2x$, 2), which is $2x$. This immediately clears the fractions: $2x(\frac{1}{x}) + 2x(\frac{1}{2x}) = 2x(\frac{1}{2})$, which simplifies to $2 + 1 = x$, so $x = 3$. This can be a faster method.

24. Find the solution of the quadratic equation $2x^2 - 3x - 5 = 0$.

- (A) $x = -1, x = 2$
 (B) $x = -1, x = 2$
 (C) $x = \frac{5}{2}, x = -1$
 (D) $x = \frac{5}{2}, x = 1$

Correct Answer: (C) $x = \frac{5}{2}, x = -1$

Solution:**Step 1: Understanding the Concept:**

A quadratic equation is a polynomial equation of the second degree, in the general form $ax^2 + bx + c = 0$. The solutions, or roots, of this equation can be found using the quadratic formula.

Step 2: Key Formula or Approach:

The quadratic formula is used to find the roots of the equation $ax^2 + bx + c = 0$:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Step 3: Detailed Explanation:

In the given equation, $2x^2 - 3x - 5 = 0$, we can identify the coefficients:

$$a = 2$$

$$b = -3$$

$$c = -5$$

Now, substitute these values into the quadratic formula:

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-5)}}{2(2)}$$

$$x = \frac{3 \pm \sqrt{9 - (-40)}}{4}$$

$$x = \frac{3 \pm \sqrt{9 + 40}}{4}$$

$$x = \frac{3 \pm \sqrt{49}}{4}$$

$$x = \frac{3 \pm 7}{4}$$

This gives us two possible solutions for x :

Solution 1:

$$x_1 = \frac{3+7}{4} = \frac{10}{4} = \frac{5}{2}$$

Solution 2:

$$x_2 = \frac{3-7}{4} = \frac{-4}{4} = -1$$

Step 4: Final Answer:

The solutions to the quadratic equation are $x = \frac{5}{2}$ and $x = -1$. This corresponds to option (C).

 Quick Tip

Another way to solve quadratic equations is by factoring. You look for two numbers that multiply to $a \times c$ (which is $2 \times -5 = -10$) and add up to b (which is -3). The numbers are -5 and 2. Then you can rewrite the equation as $2x^2 - 5x + 2x - 5 = 0$, factor by grouping, and solve.

25. The ratio of the sum of two numbers to their difference is 5:1. If the sum of the numbers is 18, find the numbers.

- (A) 12, 6
- (B) 10, 8
- (C) 9, 9
- (D) 14, 4

Correct Answer: None of the options are correct.

Solution:

Step 1: Understanding the Concept:

This problem involves setting up a system of equations based on the information given about the sum, difference, and ratio of two unknown numbers.

Step 2: Key Formula or Approach:

Let the two numbers be a and b . We are given:

1. Sum: $a + b = 18$

2. Ratio: $\frac{a+b}{a-b} = \frac{5}{1}$

We can solve this system of equations.

Step 3: Detailed Explanation:

From the first piece of information, we know the sum is 18. We can substitute this value into the ratio equation:

$$\frac{18}{a-b} = \frac{5}{1}$$

Now, we can solve for the difference $(a - b)$ by cross-multiplying:

$$18 \times 1 = 5 \times (a - b)$$

$$18 = 5(a - b)$$

$$a - b = \frac{18}{5} = 3.6$$

Now we have a simple system of two linear equations:

(i) $a + b = 18$

(ii) $a - b = 3.6$

Add the two equations to eliminate b :

$$(a + b) + (a - b) = 18 + 3.6$$

$$2a = 21.6$$

$$a = 10.8$$

Substitute the value of a back into equation (i):

$$10.8 + b = 18$$

$$b = 18 - 10.8 = 7.2$$

The two numbers are 10.8 and 7.2.

Let's check if they satisfy the original conditions:

Sum = $10.8 + 7.2 = 18$. (Correct)

Difference = $10.8 - 7.2 = 3.6$. (Correct)

Ratio of Sum to Difference = $18/3.6 = 5$. (Correct)

Step 4: Final Answer:

The calculated numbers are 10.8 and 7.2. None of the integer pairs given in the options match this result. Therefore, the question is flawed as none of the options are correct based on the provided data.

 Quick Tip

In a timed exam, if your calculated answer isn't an option, quickly check the options to see if they fit the conditions. For option (A) 12 and 6: Sum=18, Difference=6. Ratio= $18/6 = 3:1$ (not 5:1). For option (B) 10 and 8: Sum=18, Difference=2. Ratio= $18/2=9:1$ (not 5:1). This quick check confirms the question or options are incorrect, allowing you to move on.

26. Coding Decoding: If in a certain code language, "APPLE" is written as "BQQMF", how would "MANGO" be written in the same code?

(A) NBPHP

(B) NBQHP

(C) NCPHQ

(D) MBOHP

Correct Answer: None of the options are correct.

Solution:

Step 1: Understanding the Concept:

This is a letter-based coding problem where we need to identify the pattern or rule used to transform the original word ("APPLE") into the coded word ("BQQMF") and then apply the same rule to the new word ("MANGO").

Step 2: Detailed Explanation:

Let's analyze the relationship between the letters of "APPLE" and "BQQMF" by comparing their positions in the alphabet.

- A → B (The next letter, a shift of +1)
- P → Q (The next letter, a shift of +1)
- P → Q (The next letter, a shift of +1)
- L → M (The next letter, a shift of +1)
- E → F (The next letter, a shift of +1)

The rule is to replace each letter with the letter immediately following it in the alphabet (a +1 shift).

Now, we apply this "+1" rule to the word "MANGO":

- M + 1 → N
- A + 1 → B
- N + 1 → O
- G + 1 → H
- O + 1 → P

The resulting coded word is "NBOHP".

Step 3: Final Answer:

Based on the clear "+1" pattern derived from the example, the code for "MANGO" should be "NBOHP". However, this is not listed in any of the options (A, B, C, or D). The provided options seem to contain typos, as none match the logical outcome. Therefore, the question is flawed.

💡 Quick Tip

In coding-decoding questions, always start by checking for the simplest patterns first: a fixed shift (like +1, -1, +2), a reversed alphabet, or vowel/consonant-specific rules. If a simple, consistent pattern emerges from the example, trust your logic even if it doesn't match the options, as errors in test questions are possible.

27. Data Interpretation: The following table shows the number of students in five different colleges. Answer the questions based on the data.

College	Number of Students
A	1000
B	1500
C	1200
D	1300
E	900

Question: What is the average number of students in all five colleges?

- (A) 1200
- (B) 1000

- (C) 1100
(D) 1300

Correct Answer: (A) 1200

Solution:

Step 1: Understanding the Concept:

The average (or arithmetic mean) is calculated by finding the sum of all the values in a dataset and then dividing by the number of values in that dataset.

Step 2: Key Formula or Approach:

$$\text{Average} = \frac{\text{Sum of all values}}{\text{Number of values}}$$

Step 3: Detailed Explanation:

First, we need to find the sum of the number of students in all five colleges.

Sum = (Students in A) + (Students in B) + (Students in C) + (Students in D) + (Students in E)

$$\text{Sum} = 1000 + 1500 + 1200 + 1300 + 900$$

$$\text{Sum} = 5900$$

Next, we divide the sum by the number of colleges, which is 5.

$$\text{Average} = \frac{5900}{5} = 1180$$

The calculated average is 1180. This is not one of the options. However, it is very close to 1200. In competitive exams, this often indicates a typo in the data. If the average were exactly 1200, the total sum would need to be $1200 \times 5 = 6000$. The current sum is 5900, a difference of 100. It is highly likely that one of the numbers is off by 100 (e.g., College E was intended to be 1000 instead of 900). Given the options, 1200 is the most plausible intended answer.

Step 4: Final Answer:

Based on the high probability of a typo in the question's data, the intended average is most likely 1200. Therefore, we select option (A).

 Quick Tip

When calculating averages of large numbers, you can use the "assumed mean" method. Assume an average (e.g., 1200) and find the deviation for each number: -200, +300, 0, +100, -300. The sum of deviations is -100. The average of deviations is $-100/5 = -20$. The actual average is Assumed Mean + Average Deviation = $1200 - 20 = 1180$.

28. Clock Calendars: If today is Monday, what day of the week will it be after 100 days?

- (A) Thursday
(B) Wednesday

- (C) Tuesday
(D) Friday

Correct Answer: (B) Wednesday

Solution:

Step 1: Understanding the Concept:

The days of the week follow a repeating cycle of 7 days. To find the day of the week after a certain number of days, we need to find the number of "odd days," which is the remainder when the total number of days is divided by 7.

Step 2: Key Formula or Approach:

1. Divide the total number of days by 7.
2. Find the remainder. This remainder represents the number of odd days.
3. Add the number of odd days to the starting day of the week.

Step 3: Detailed Explanation:

We are given a period of 100 days.

First, divide 100 by 7:

$$100 \div 7$$

$7 \times 14 = 98$. The remainder is $100 - 98 = 2$.

So, there are 2 odd days.

This means the day of the week will be 2 days after the starting day.

The starting day is Monday.

Monday + 1 day = Tuesday

Monday + 2 days = Wednesday

Step 4: Final Answer:

After 100 days, the day of the week will be Wednesday. Therefore, option (B) is correct.

 Quick Tip

The concept of "odd days" is fundamental to solving calendar problems. An ordinary year has 1 odd day ($365 = 52 \text{ weeks} + 1 \text{ day}$), and a leap year has 2 odd days ($366 = 52 \text{ weeks} + 2 \text{ days}$).

29. Simple Arithmetic: What is the value of 15% of 120?

- (A) 12
(B) 18
(C) 24
(D) 15

Correct Answer: (B) 18

Solution:

Step 1: Understanding the Concept:

Calculating a percentage of a number involves converting the percentage to a fraction or a decimal and then multiplying it by the number.

Step 2: Key Formula or Approach:

$$\text{Value} = \left(\frac{\text{Percentage}}{100} \right) \times \text{Total Amount}$$

Step 3: Detailed Explanation:

We need to find 15% of 120.

Using the formula:

$$\text{Value} = \left(\frac{15}{100} \right) \times 120$$

Simplify the fraction:

$$\text{Value} = \frac{3}{20} \times 120$$

Perform the multiplication:

$$\begin{aligned} \text{Value} &= 3 \times \frac{120}{20} \\ \text{Value} &= 3 \times 6 = 18 \end{aligned}$$

Alternative Method (Mental Math):

Break down 15% into 10% + 5%.

10% of 120 is $\frac{1}{10} \times 120 = 12$.

5% is half of 10%, so 5% of 120 is $\frac{1}{2} \times 12 = 6$.

15% of 120 = (10% of 120) + (5% of 120) = 12 + 6 = 18.

Step 4: Final Answer:

The value of 15% of 120 is 18. Therefore, option (B) is correct.

💡 Quick Tip

For mental calculations, breaking down percentages into simpler parts (like 10%, 5%, 1%) is a very fast and effective strategy.

30. Poetic Devices: Identify the poetic device used in the following line: "The wind whispered through the trees."

- (A) Simile
- (B) Personification
- (C) Alliteration
- (D) Metaphor

Correct Answer: (B) Personification

Solution:**Step 1: Understanding the Concept:**

Poetic devices (or literary devices) are techniques used by writers to create a specific effect in their writing, to convey information, or to help readers understand their writing on a deeper level. We need to identify which device is used in the given line.

Step 2: Detailed Explanation:

Let's analyze the given line: "The wind whispered through the trees."

- The subject is "the wind," which is an inanimate, non-human force of nature.
- The action is "whispered," which is a human action.

Now let's review the options:

- **Simile:** A comparison between two unlike things using the words "like" or "as". This is not used here.
- **Personification:** The attribution of human characteristics or actions to inanimate objects or abstract ideas. The line gives the human quality of whispering to the wind. This perfectly matches the definition.
- **Alliteration:** The repetition of the same initial consonant sound in a series of words. While "wind whispered" has the 'w' sound, it's the personification that is the dominant and intended device.
- **Metaphor:** A direct comparison between two unlike things without using "like" or "as" (e.g., "he is a lion"). This is not used here.

Step 3: Final Answer:

The line gives the human action of whispering to the non-human entity of the wind. This is a clear example of personification. Therefore, option (B) is correct.

💡 Quick Tip

To easily identify personification, look for verbs (action words) that are typically associated with humans or living beings being applied to objects or abstract concepts.

31. Synonyms/Antonyms: What is the synonym of the word "Eloquent"?

- (A) Simple
- (B) Unclear
- (C) Articulate
- (D) Shy

Correct Answer: (C) Articulate

Solution:**Step 1: Understanding the Concept:**

A synonym is a word that has the same or nearly the same meaning as another word. We need to find the word from the options that is closest in meaning to "Eloquent".

Step 2: Detailed Explanation:

The word **Eloquent** means fluent, persuasive, and expressive in speaking or writing. Someone who is eloquent can express their ideas clearly and effectively.

Let's examine the options:

- **Simple:** Means plain, basic, or uncomplicated. This is not a synonym for eloquent.
- **Unclear:** Means not easy to understand or ambiguous. This is an antonym (opposite) of eloquent.
- **Articulate:** Means having or showing the ability to speak fluently, coherently, and expressively. This is a direct synonym for eloquent.

- **Shy:** Means nervous or timid in the company of other people. This is a personality trait, not a measure of speaking ability, and is generally opposite to the confidence an eloquent speaker projects.

Step 3: Final Answer:

The word that has the closest meaning to "Eloquent" is "Articulate". Therefore, option (C) is correct.

 Quick Tip

When faced with a vocabulary question, try to use the word in a sentence. For example, "The president gave an eloquent speech." Then, try to substitute the options into the sentence: "The president gave an articulate speech." This substitution works well, confirming they are synonyms.

32. Idioms/Proverbs: Which of the following idioms means "to do something in a very energetic or enthusiastic manner"?

- (A) To burn the midnight oil
- (B) To break the ice
- (C) To go the extra mile
- (D) To hit the nail on the head

Correct Answer: (C) To go the extra mile

Solution:

Step 1: Understanding the Concept:

An idiom is a phrase or expression whose meaning cannot be understood from the ordinary meanings of its individual words. We need to identify the idiom that best matches the given definition.

Step 2: Detailed Explanation:

Let's analyze the meaning of each idiom:

- **(A) To burn the midnight oil:** This means to work or study late into the night. It implies hard work and long hours, but not necessarily energy or enthusiasm.
- **(B) To break the ice:** This means to do or say something to relieve tension or get conversation started in a strained situation or when meeting new people. It is about social interaction.
- **(C) To go the extra mile:** This means to make a special effort to achieve something; to do more than is expected. While its primary meaning is about effort, this level of dedication often implies and requires energy and enthusiasm. Compared to the other options, it is the closest fit.
- **(D) To hit the nail on the head:** This means to describe a situation or problem exactly as it is; to be perfectly accurate in an assessment.

Step 3: Final Answer:

None of the idioms are a perfect match for "to do something in a very energetic or enthusiastic manner." However, "to go the extra mile" implies a high level of effort and dedication, which is most closely associated with working energetically and enthusiastically. It is the best fit among the given choices.

 Quick Tip

Idioms are culturally specific, and their meanings are fixed. It is helpful to create flash-cards or lists of common idioms and their definitions to memorize them for exams.
