

Mathematics:

Question 1:

- If $f(x)=x^2+5x+6$, find the roots of $f(x)=0$.
- A) -2, -3
- B) 2, 3
- C) -2, 3
- D) 2, -3
- Answer: A) -2, -3
- Explanation:
 - To find the roots, we need to solve the quadratic equation $x^2+5x+6=0$.
 - Factoring the equation, we get $(x+2)(x+3)=0$.
 - Therefore, $x=-2$ or $x=-3$.

Question 2:

- What is the derivative of $\sin(2x)$?
- A) $\cos(2x)$
- B) $2\cos(2x)$
- C) $-\cos(2x)$
- D) $-2\cos(2x)$
- Answer: B) $2\cos(2x)$
- Explanation:
 - Using the chain rule, the derivative of $\sin(2x)$ is $\cos(2x) * 2 = 2\cos(2x)$.

Question 3:

- If $A=[1324]$, find the determinant of A.
- A) -2
- B) 2
- C) 10
- D) -10
- Answer: A) -2
- Explanation:
 - $\det(A) = (1 * 4) - (2 * 3) = 4 - 6 = -2$.

Question 4:

- Find the equation of the line passing through the points (1, 2) and (3, 4).
- A) $y = x + 1$
- B) $y = 2x$
- C) $y = 3x - 1$
- D) $y = 4x - 2$
- Answer: A) $y = x + 1$
- Explanation:
 - Slope (m) = $(4 - 2) / (3 - 1) = 2 / 2 = 1$.
 - Using the point-slope form: $y - 2 = 1(x - 1) \Rightarrow y = x + 1$.

Question 5:

- What is the integral of ex ?
- A) $ex+C$

- B) $x e^{x-1} + C$
- C) $e^x + 1 + C$
- D) $1/e^x + C$
- Answer: A) $e^x + C$
- Explanation:
 - The integral of e^x is simply e^x plus the constant of integration, C.

Question 6:

- Find the value of $\lim_{x \rightarrow 0} x \sin x$.
- A) 0
- B) 1
- C) ∞
- D) -1
- Answer: B) 1

Explanation:

- This is a standard limit result: $\lim_{x \rightarrow 0} x \sin x = 1$.

Question 7:

- Find the area of the circle $x^2 + y^2 = 16$.
- A) 4π
- B) 8π
- C) 16π
- D) 32π
- Answer: C) 16π

Explanation:

- The radius of the circle is $\sqrt{16} = 4$.
- Area = $\pi r^2 = \pi(4^2) = 16\pi$.

Physics:

Question 1:

- A body is thrown vertically upwards with a velocity of 10 m/s. What is the maximum height reached by the body? (Assume $g = 10 \text{ m/s}^2$)
- A) 5 m
- B) 10 m
- C) 15 m
- D) 20 m
- Answer: A) 5 m
- Explanation:
 - Using the equation $v^2 = u^2 + 2as$, where $v = 0$ (final velocity), $u = 10 \text{ m/s}$ (initial velocity), $a = -10 \text{ m/s}^2$ (acceleration due to gravity), and s is the displacement (height).
 - $0 = 100 - 20s$
 - $s = 5 \text{ m}$.

Question 2:

- What is the unit of electric charge?

- A) Ampere
- B) Volt
- C) Coulomb
- D) Ohm
- Answer: C) Coulomb

Question 3:

- What is the relationship between kinetic energy (KE) and momentum (p)?
- A) $KE = p^2/2m$
- B) $KE = 2mp^2$
- C) $KE = p/2m$
- D) $KE = 2m/p^2$
- Answer: A) $KE = p^2/2m$
- Explanation:
 - $KE = \frac{1}{2}mv^2$ and $p = mv$. Substituting $v = p/m$ into the KE equation gives $KE = p^2/2m$.

Question 4:

- What is the refractive index of a medium if the speed of light in that medium is 2×10^8 m/s? (Speed of light in vacuum = 3×10^8 m/s)
- A) 1.5
- B) 1.0
- C) 2.0
- D) 0.67
- Answer: A) 1.5
- Explanation:
 - Refractive index (n) = (speed of light in vacuum) / (speed of light in medium) = $3 \times 10^8 / 2 \times 10^8 = 1.5$.

Question 5:

- What is the SI unit of power?
- A) Joule
- B) Watt
- C) Newton
- D) Pascal
- Answer: B) Watt

Question 6:

- What is the work done in moving a charge of 2 Coulombs across a potential difference of 5 Volts?
- A) 10 Joules
- B) 2.5 Joules
- C) 7 Joules
- D) 0.4 Joules
- Answer: A) 10 Joules

Explanation:

- Work done (W) = Charge (Q) × Potential difference (V)
- $W = 2 \text{ C} \times 5 \text{ V} = 10 \text{ J}$.

Question 7:

- What is the focal length of a plane mirror?
- A) 0
- B) Infinite
- C) 1
- D) -1
- Answer: B) Infinite

Explanation:

- A plane mirror has an infinite focal length.

Question 8:

- Which electromagnetic wave has the highest frequency?
- A) Radio waves
- B) Microwaves
- C) X-rays
- D) Gamma rays
- Answer: D) Gamma rays

Chemistry:

Question 1:

- What is the pH of a solution with a hydrogen ion concentration of 10^{-3} M ?
- A) 1
- B) 3
- C) 7
- D) 10
- Answer: B) 3
- Explanation:
 - $\text{pH} = -\log[\text{H}^+] = -\log(10^{-3}) = 3$.

Question 2:

- Which of the following elements belongs to the halogen group?
- A) Sodium
- B) Calcium
- C) Chlorine
- D) Potassium
- Answer: C) Chlorine

Question 3:

- Which of the following is an example of an alkaline earth metal?
- A) Sodium
- B) Magnesium
- C) Aluminum
- D) Potassium

- Answer: B) Magnesium

Explanation:

- Magnesium is in Group 2 of the periodic table, which is the alkaline earth metals group.

Question 4:

- What is the chemical formula for sodium chloride?
- A) NaCl
- B) Na₂Cl
- C) NaCl₂
- D) Na₃Cl
- Answer: A) NaCl

Question 5:

- What type of bond is present in a water molecule (H₂O)?
- A) Ionic bond
- B) Covalent bond
- C) Metallic bond
- D) Coordinate bond
- Answer: B) Covalent bond

Explanation:

- Water molecules are formed by the sharing of electrons between oxygen and hydrogen atoms, which is a covalent bond.

Question 6:

- What is the oxidation number of sulfur in H₂SO₄?
- A) +2
- B) +4
- C) +6
- D) -2
- Answer: C) +6

Explanation:

- $2(+1) + S + 4(-2) = 0$
- $2 + S - 8 = 0$
- $S = +6.$

Question 7:

- Which gas is commonly known as laughing gas?
- A) Carbon dioxide
- B) Nitrous oxide
- C) Sulfur dioxide
- D) Methane
- Answer: B) Nitrous oxide (N₂O)

Question 8:

- What is the process of converting a solid directly into a gas called?

- A) Melting
- B) Boiling
- C) Sublimation
- D) Condensation
- Answer: C) Sublimation

