AP POLYCET Question Paper 2025 (Sample)

TEST 1

Physics

- 1. Work, Energy, and Power:
 - Question: A 10 kg object is lifted to a height of 5 meters. Calculate the work done in lifting the object. (Assume $g = 10 \text{ m/s}^2$)
 - Solution:
 - Work done (W) = force (F) × distance (d)
 - Force (F) = mass (m) × acceleration due to gravity (g) = 10 kg × 10 m/s² = 100 N
 - Work done (W) = 100 N × 5 m = 500 Joules (J)
- 2. Sound:
 - Question: What is the relationship between the speed of sound (v), frequency (f), and wavelength (λ)?
 - Solution:
 - The speed of sound is the product of its frequency and wavelength: v=fλ
- 3. Heat:
 - Question: How much heat is required to raise the temperature of 2 kg of water from 20°C to 80°C? (Specific heat capacity of water = 4200 J/kg°C)
 - Solution:
 - Heat (Q) = mass (m) × specific heat capacity (c) × change in temperature (ΔT)
 - Q = 2 kg × 4200 J/kg°C × (80°C 20°C) = 2 × 4200 × 60 = 504,000 J or 504 kJ

4. Motion: A train starts from rest and accelerates uniformly at 2 m/s². What will its velocity be after 10 seconds?

• Solution: v=u+at=0+(2×10)=20m/s

5. Light: An object is placed 20 cm in front of a convex lens of a focal length of 10 cm. Find the image distance.

• Solution: 1/f=1/v+1/u, 1/10=1/v+1/-20, 1/v=1/10+1/20=3/20, v=20/3cm

6. Electricity: A resistor of 5 ohms is connected to a 10 V battery. Calculate the current flowing through the resistor.

- Solution: V=IR, 10=I×5, I=2A
- 7. Magnetism: What is the direction of the magnetic field lines inside a solenoid?
 - Solution: Parallel to the axis of the solenoid.
- 8. Sound: What is the audible frequency range for humans?
 - Solution: 20 Hz to 20,000 Hz.

9. Work and Energy: If a 50 kg object is raised 3 meters vertically, how much potential energy does it gain? (g = 9.8 m/s^2)

- Solution: PE=mgh=50×9.8×3=1470J
- 10. Heat: What is the SI unit of specific heat capacity?
 - Solution: J/kg°C or J/(kg·K)
- 11. Waves: What is the relationship between the period (T) and frequency (f) of a wave?
 - Solution: T=1/f
- 12. Gravitation: What is the value of the acceleration due to gravity on the surface of the Earth?
 Solution: Approximately 9.8 m/s²
- 13. Modern Physics: What is the photoelectric effect?
 - Solution: The emission of electrons when light hits a material.

Chemistry

- 1. Chemical Bonding:
 - Question: What type of bond is formed between two non-metals?
 - Solution:
 - Covalent bond.
- 2. Periodic Classification of Elements:
 - Question: What are the elements in group 17 of the periodic table called?
 - Solution:
 - Halogens.
- 3. Carbon and its Compounds:
 - Question: What is the general formula for alkanes?
 - Solution:
 - CnH2n+2 ____
- 4. Chemical Reactions: What type of reaction is represented by $2H2+O2\rightarrow 2H2O?$
 - Solution: Combination reaction.
- 5. Acids and Bases: What is the product formed when an acid reacts with a metal?
 - Solution: Salt and hydrogen gas.
- 6. Periodic Table: What are the elements in group 1 of the periodic table called?
 - Solution: Alkali metals.
- 7. Carbon Compounds: What is the functional group present in alcohols?
 - Solution: -OH (hydroxyl group)
- 8. Metals: Name a metal that is a good conductor of heat and electricity.
 - Solution: Copper (Cu), Aluminum (Al), Silver (Ag)
- 9. Chemical Bonding: What is an ionic bond?
 - Solution: The electrostatic attraction between oppositely charged ions.
- 10. Solutions: What is a saturated solution?
 - Solution: A solution that cannot dissolve any more solute at a given temperature.
- 11. Chemical Kinetics: What factors affect the rate of a chemical reaction?
 - Solution: Temperature, concentration, surface area, and catalysts.
- 12. Organic Chemistry: What is the name of the simplest alkane?
 - Solution: Methane (CH4)
- 13. Environmental Chemistry: What is the chemical formula of ozone?
 - Solution: O3

Mathematics

- 1. Linear Equations:
 - \circ $\;$ Question: Solve the system of linear equations:
 - 2x+y=7
 - x-y=2
 - Solution:
 - Adding the two equations: 3x=9, so x=3.
 - Substituting x=3 into the second equation: 3-y=2, so y=1.
 - Therefore, the solution is x=3 and y=1.
- 2. Progressions:
 - Question: Find the sum of the first 10 terms of the arithmetic progression 2, 4, 6, 8, ...
 - Solution:
 - First term (a) = 2, common difference (d) = 2, number of terms (n) = 10.
 - Sum of n terms (Sn) = 2n[2a+(n-1)d]
 - Sn = 210[2(2)+(10-1)2]=5[4+18]=5×22=110
- 3. Coordinate Geometry:
 - Question: Find the midpoint of the line segment joining the points (1, 4) and (5, 8).
 - Solution:
 - Midpoint = (2x1+x2,2y1+y2)
 - Midpoint = (21+5,24+8)=(26,212)=(3,6)
- 4. Algebra: Solve for x: 3(x-2)=15
 - Solution: 3x-6=15, 3x=21, x=7
- 5. Geometry: The diameter of a circle is 14 cm. Find its area.
 - Solution: Radius = 7 cm, Area = $\pi r^2 = \pi (72) = 49\pi$ cm²
- 6. Trigonometry: If $cos(\theta)=1/2$, find θ .
 - Solution: θ=60°
- 7. Coordinate Geometry: Find the equation of a line with a slope of 2 and a y-intercept of 3.
 - Solution: y=mx+c, y=2x+3
- 8. Statistics: Find the median of the data: 5, 8, 3, 9, 12.
 - Solution: Sorted data: 3, 5, 8, 9, 12. Median = 8
- 9. Probability: What is the probability of drawing a king from a standard deck of 52 cards?
 - Solution: 4/52 = 1/13
- 10. Arithmetic Progressions: Find the 20th term of the AP: 1, 4, 7, 10, ...
 - Solution: an=a+(n-1)d, a20=1+(20-1)3=58
- 11. Quadratic Equations: Find the sum of the roots of $x^2-6x+8=0$.
 - Solution: Sum of roots = -b/a = -(-6)/1 = 6
- 12. Mensuration: Find the volume of a cube with side of 5 cm.
 - Solution: Volume = side3=53=125 cm³
- 13. Linear Equations: If 2x+3y = 13 and x = 2, what is the value of y?
 - Solution: 2(2) + 3y = 13. 4+3y = 13. 3y = 9. y = 3.

TEST 2

Physics

- 1. Question: A car moving at 20 m/s applies brakes and comes to rest in 5 seconds. Calculate the retardation and the distance traveled before it stops.
 - Explanation:
 - Retardation is negative acceleration.
 - We can use the equations of motion to solve this.
 - Solution:
 - Initial velocity (u) = 20 m/s
 - Final velocity (v) = 0 m/s
 - Time (t) = 5 s
 - Retardation (a): v=u+at => 0=20+a(5) => a=-4m/s2 (retardation is 4 m/s²)
 - Distance (s): s=ut+(1/2)at2 => s=(20)(5)+(1/2)(-4)(52) => s=100-50=50m
- 2. Question: A lens forms an image of an object placed at a distance of 30 cm. The image is formed 10 cm from the lens. Find the focal length of the lens and the magnification.
 - Explanation:
 - We'll use the lens formula and magnification formula.
 - Solution:
 - Object distance (u) = -30 cm (negative because it's on the object side)
 - Image distance (v) = 10 cm (positive, assuming a real image)
 - Lens formula: 1/f=1/v-1/u => 1/f=1/10-1/(-30) => 1/f=1/10+1/30=4/30 => f=30/4=7.5cm
 - Magnification (m): m=v/u => m=10/(-30)=-1/3
- 3. Question: Two resistors, 6 ohms and 12 ohms, are connected in parallel. If a 12 V battery is connected across them, calculate the total current flowing through the circuit.
 - Explanation:
 - We'll find the equivalent resistance and then use Ohm's law.
 - Solution:
 - Equivalent resistance (R): 1/R=1/R1+1/R2 => 1/R=1/6+1/12=3/12 => R=12/3=4ohms
 - Current (I): V=IR => 12=I(4) => I=3A

4. Question: A body of mass 2 kg is dropped from a height of 10 meters. Calculate its kinetic energy just before it hits the ground. (Assume $g = 10 \text{ m/s}^2$)

- Explanation: We'll use the conservation of energy. Potential energy at the top converts to kinetic energy at the bottom.
- Solution:
 - Potential energy (PE) at the top = mgh = 2 kg * 10 m/s² * 10 m = 200 J
 - Just before hitting the ground, all PE converts to KE.
 - Kinetic energy (KE) = 200 J

5. Question: A sound wave has a frequency of 500 Hz and a wavelength of 0.68 meters. Calculate its speed.

- Explanation: We'll use the formula: speed = frequency * wavelength.
- Solution:

- Speed (v) = frequency (f) * wavelength (λ)
- v = 500 Hz * 0.68 m = 340 m/s

6. Question: A heater resistance of 20 ohms is connected to a 220 V supply. Calculate the power dissipated by the heater.

- Explanation: We'll use the formula: Power (P) = V^2/R .
- Solution:

Chemistry

- 1. Question: Balance the following chemical equation: MnO2+HCl→MnCl2+Cl2+H2O
 - Explanation:
 - We need to ensure that the number of atoms of each element is the same on both sides.
 - Solution:
 - $\blacksquare MnO2+4HCI \rightarrow MnCl2+Cl2+2H2O$
- 2. Question: Calculate the pH of a solution with a hydrogen ion concentration of $1 \times 10-3$ M.
 - Explanation:
 - pH = -log[H+]
 - Solution:
 - pH = -log(1×10−3) = -(-3) = 3
- 3. Question: What is the IUPAC name of CH3CH2CH2OH?
 - Explanation:
 - We need to identify the longest carbon chain and the functional group.
 - Solution:
 - Propanol. (3 carbons and an OH group)

4. Question: What is the concentration of a solution prepared by dissolving 10 grams of NaOH in 250 mL of water? Express the concentration in grams per liter (g/L).

- Explanation: We need to convert mL to L and then calculate the concentration.
- Solution:
 - 250 mL = 0.25 L
 - Concentration = mass of solute / volume of solution = 10 g / 0.25 L = 40 g/L

5. Question: What is the product formed when ethanoic acid (CH3COOH) reacts with ethanol (C2H5OH) in the presence of an acid catalyst?

- Explanation: This is an esterification reaction.
- Solution:
 - $\circ \quad CH3COOH+C2H5OH \rightarrow CH3COOC2H5+H2O$
 - \circ $\;$ The product formed is ethyl ethanoate (CH3COOC2H5) and water.

Mathematics

- 1. Question: Find the roots of the quadratic equation 2x2-5x+3=0.
 - Explanation:
 - We can use the quadratic formula or factorization.
 - Solution:
 - Factorization: 2x2-2x-3x+3=0 => 2x(x-1)-3(x-1)=0 => (2x-3)(x-1)=0 => x=3/2 or x=1
- 2. Question: The sum of the first n terms of an AP is Sn=3n2+5n. Find the nth term.

- Explanation:
 - We can use the relation an=Sn-S(n-1).
- Solution:
 - Sn=3n2+5n
 - S(n-1)=3(n-1)2+5(n-1)=3(n2-2n+1)+5n-5=3n2-6n+3+5n-5=3n2-n-2
 - an=Sn-S(n-1)=(3n2+5n)-(3n2-n-2)=6n+2
- 3. Question: A point P divides the line segment joining A(1, 2) and B(4, 5) in the ratio 2:1 internally. Find the coordinates of P.
 - Explanation:
 - We can use the section formula.
 - Solution:
 - P(x,y)=[(m*x2+n*x1)/(m+n),(m*y2+n*y1)/(m+n)]
 - P(x,y)=[(2*4+1*1)/(2+1),(2*5+1*2)/(2+1)]=[(8+1)/3,(10+2)/3]=(3,4)
- 4. Question: If the points (2, 3), (4, k), and (6, -3) are collinear, find the value of k.
 - Explanation: For collinear points, the area of the triangle formed by them is zero. We can also use the concept of slope.
 - Solution:
 - Using the slope method:
 - Slope between (2, 3) and (4, k) = (k 3) / (4 2) = (k 3) / 2
 - Slope between (4, k) and (6, -3) = (-3 k) / (6 4) = (-3 k) / 2
 - Since they are collinear, the slopes are equal: (k 3) / 2 = (-3 k) / 2
 - k 3 = -3 k => 2k = 0 => k = 0
- 5. Question: Find the distance between the point (3, 4) and the line 3x + 4y 10 = 0.
 - Explanation: We'll use the formula for the distance between a point and a line.
 - Solution:
 - Distance = $|Ax1 + By1 + C| / \sqrt{(A^2 + B^2)}$
 - Distance = $|(3 * 3) + (4 * 4) 10| / \sqrt{(3^2 + 4^2)} = |9 + 16 10| / \sqrt{25} = 15 / 5 = 3$
- 6. Question: What is the probability of drawing a red card from a standard deck of 52 cards?
 - Explanation: There are 26 red cards (hearts and diamonds) in a deck.
 - Solution:
 - Probability = number of red cards / total number of cards = 26 / 52 = 1/2

TEST 3

Physics

- 1. Question: A force of 20 N acts on a body of mass 5 kg. Calculate the acceleration produced.
 - Explanation: Use Newton's second law, F = ma.
 - Solution: a = F/m = 20 N / 5 kg = 4 m/s².
- 2. Question: What is the power of a lens with a focal length of -25 cm?
 - Explanation: Power (P) = 1/f (f in meters).
 - \circ Solution: f = -0.25 m. P = 1 / -0.25 m = -4 diopters.

- 3. Question: If a wire of resistance 10 ohms is stretched to double its length, what will be its new resistance be?
 - Explanation: Resistance is proportional to length and inversely proportional to area. When length doubles, area halves.
 - Solution: New resistance = 4 * original resistance = 4 * 10 ohms = 40 ohms.
- 4. Question: What is the relationship between the angle of incidence and the angle of reflection?
 - Explanation: Law of reflection.
 - Solution: The angle of incidence is equal to the angle of reflection.
- 5. Question: What is the SI unit of momentum?
 - Explanation: Momentum = mass * velocity.
 - Solution: kg m/s.
- Question: A body is projected vertically upward with a velocity of 30 m/s. What is the maximum height reached? (g = 10 m/s²)
 - Explanation: Use $v^2 = u^2 + 2as$, where v = 0 at maximum height.
 - Solution: $0 = 30^2 2 * 10 * s. s = 900 / 20 = 45 m.$
- 7. Question: What is the function of a step-down transformer?
 - Explanation: Transformers change voltage.
 - Solution: To decrease the voltage.
- 8. Question: What is the relationship between the speed, wavelength, and frequency of a wave?
 - Explanation: $v = f\lambda$.
 - Solution: Speed = frequency * wavelength.
- 9. Question: What is the formula for calculating the heat generated in a resistor?
 - Explanation: Joule's law of heating.
 - Solution: $H = I^2 Rt$.
- 10. Question: What is the value of the gravitational constant(G)?
 - Solution: 6.674 x 10^-11 Nm²/kg²

Chemistry

- 1. Question: What is the chemical formula of calcium carbonate?
 - Solution: CaCO₃.
- Question: What are the products formed when a strong acid reacts with a strong base?
 Solution: Salt and water.
- 3. Question: What is the process of coating iron with zinc called?
 - Solution: Galvanization.
- 4. Question: What is the functional group present in aldehydes?
 - Solution: -CHO.
- 5. Question: What is the chemical formula of ammonia?
 - Solution: NH₃.
- 6. Question: What is the pH of a solution with a hydroxide ion concentration of 1×10^{-4} M?
 - Explanation: $pOH = -log[OH^-]$, pH = 14 pOH.
 - Solution: pOH = 4, pH = 10.
- 7. Question: What is the monomer of polythene?
 - Solution: Ethene (ethylene).

- 8. Question: What is the process of converting vegetable oils to fats called?
 - Solution: Hydrogenation.
- 9. Question: What is the chemical formula of rust?
 - $\circ \quad Solution: Fe_2O_3.xH_2O$
- 10. Question: Name the gas evolved when dilute acid reacts with metal carbonate.
 - Solution: Carbon dioxide.

Mathematics

- 1. Question: Find the area of a triangle with vertices (1, 2), (3, 4), and (5, 1).
 - Explanation: Use the formula for the area of a triangle with given vertices.
 - Solution: 4 square units.
- 2. Question: Find the value of $sin(30^\circ) + cos(60^\circ)$.
 - Solution: 1/2 + 1/2 = 1.
- 3. Question: Find the distance between the points (2, -3) and (5, 1).
 - Solution: 5.
- 4. Question: Find the sum of the first 15 terms of the AP: 2, 5, 8, ...
 - Solution: 345.
- Question: Find the probability of getting a sum of 7 when two dice are thrown.
 Solution: 1/6.
- 6. Question: If $tan(\theta) = 3/4$, find $sin(\theta)$.
 - Solution: 3/5.
- 7. Question: Find the midpoint of the line segment joining (1, -2) and (5, 4).
 - Solution: (3, 1).
- 8. Question: Find the equation of a line with a slope 3 and passing through (2, 1).
 - Solution: y = 3x 5.
- Question: Find the volume of a cylinder with a radius of 7 cm and a height of 10 cm.
 Solution: 1540 cubic cm.
- 10. Question: Find the value of x if $log_2 x = 4$.
 - Solution: 16.