

INTERNATIONAL KANGAROO SCIENCE CONTEST

1. The law of motion of a body weighing $m=100\text{g}$ is given by the following formula:
 $x(t) = 1 + 3t + t^2$, where x represents in meters the distance travelled in t seconds. The momentum, after a time interval of 1 second is:?
- A) $p = -2Ns$ B) $p = 0Ns$ C) $p = 0.5Ns$
D) $p = 2Ns$ E) $p = 0.2Ns$
2. By reducing the common surface area of the conductor plates of a parallel-plate capacitor, its electric capacitance:
- A) increases B) decreases C) stays the same
D) depends on the voltage of the voltage source
E) depends on the electric charge of the conductor plates
3. At what distance from a convergent lens with the focal length f , should an object be placed so that its real image is formed at the minimum distance from the object?
- A) f B) $4f$ C) 0
D) $2f$ E) $3f/2$
4. The enthalpy of combustion of naphthalene is -5141.4 kJ/mol and the enthalpy of formation of $\text{CO}_2(g)$ and H_2O is -94 kcal/mol and -284.2 kJ/mol , respectively. Then the enthalpy of formation of naphthalene is:
- A) 75.25 cal/mol B) -75.24 kcal/mol C) 18 J/mol
D) 75.24 kJ/mol E) -18 J/mol
5. A volume of 40 ml solution of $2 \times 10^{-2} \text{ mol/L HCl}$ is mixed with 20 ml solution of 0.1 M NaCl and 30 mL solution of 0.02 M KOH in a volumetric flask with a capacity of 200 ml . The prepared solution is filled up to the mark of 200ml . The pH of the final solution will be:
- A) 7 B) 4 C) 3
D) 2 E) 5
6. An amount of hydrogen chloride gas is bubbled in water in order to prepare 1000 ml solution of 1g/mL HCl at $\text{pH} = 1$ and the temperature of 27°C . What is the volume of the gas that should be bubbled at the pressure $p = 1\text{atm}$ to obtain the desired quantity of HCl solution?
- A) 2.46 L B) 2.24 L C) 2240 mL
D) 3.65 L E) 3.65 mL
7. In a simple electrical circuit, formed by a voltage source with the voltage E and the internal resistance r and a consumer of resistance $= 2r$, an identical consumer is added to it, in parallel with the existing one. Then the voltage at the terminals:
- A) increases by 75% B) decreases by 75% C) decreases by 25%
D) increases by 25% E) decreases by 50%

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8. Two objects which move along the X-axis pass through the origin 0 at the same time. Their motion is described by the following equations:

$$x_1(t) = 5t \text{ and } x_2(t) = 10t - t^2$$

where x_i is the position (measured in meters m) of the object i with respect to time t (measured in seconds s) along the X-axis, for $i = 1, 2$. What is the relative speed of the first object with respect to the second one, when they meet?

- A) 5 m/s B) 0 m/s C) 10 m/s
D) 7 m/s E) 3 m/s
9. Octanitrocubane is a high explosive which does not contain hydrogen. This substance is also used in rocket propellant mixtures. The decomposition of octanitrocubane produces a mixture of CO_2 and N_2 . The volume of gas released by 1450 kg of octanitrocubane under standard conditions of temperature and pressure is:
- A) 1221.8 L B) 1221.8 m^3 C) 122.18 m^3
D) 1120 m^3 E) 1120 L
10. An iron bar contains 20% rust $FeO(OH)$ of its mass and weighs 187.8 g. The initial weight of the iron bar was:
- A) 168 g B) 118.2 g C) 44.8 g
D) 213.6 g E) 226 g

ANSWER KEY					
1	C	2	B	3	D
4	D	5	C	6	A
7	C	8	A	9	B
10	A				