1. Choose the correct alternative that will continue the same pattern and fill in the blank spaces. 2, 7, 14, 23, ——, 47

(a) 34 (b) 31 (c) 38 (d) 27 (e) None of these

Answer: A

2. It is postulated that huge deposits of NaCl (rock salt) and CaCO3 (chalk and marble) are sites of erstwhile oceans, where the salts had been concentrated through weathering by rain and wind and leaching by rivers. Select the correct explanatory statement in this context.

(a) Both NaCl and CaCO3 are highly soluble in water.

(b) NaCl is soluble in water but CaCO3 is not. Hence, concentration of CaCO3 in the oceans through weathering is an untenable hypothesis.

(c) The solubility of CaCO3 in water is pH dependent and is enhanced by acidic atmospheric gases. Hence, CaCO3 may be leached into water during weathering.

(d) NaCl and CaCO3 are igneous rocks and have crystallized as such during the slow cooling process when the earth was born. Hence, the ocean postulates is baseless.

Answer: C

3. A known positive charge is located at point P as shown above, between two unknown charges, Q1 and Q2. P is closer to Q2 than Q1. If the net electric force acting on the charge at P is zero, it may correctly be concluded that:

(A) Both Q1 and Q2 are positive

(B) Both Q1 and Q2 are negative

(C) Q1 and Q2 have opposite signs

(D) Q1 and Q2 have the same sign, but magnitude of Q1 is greater than the magnitude of Q2

Answer: D

4. If log2 = 0.30103 and log3 = 0.4771, find the number of digits in (648)5.

(a) 23. (b) 15. (c) 13. (d) 14. (e) 22.

Answer: B

5. Which of the following solutions, when mixed, will not form a buffer solution?

(a) 100 mL 0.1 M NaOH + 50 mL 0.1 M CH3COOH

(b) 50 ml 0.1 M NaOH + 100 mL 0.1 M CH3COOH

(c) 50 mL 0.1 M NH4OH + 50 mL 0.1 M CH3COOH

(d) 50 ml 0.1 M HCl + 100 mL 0.1 M CH3COONa

Answer: A

6. A man can cover a distance in 1hr 24min by covering 2/3 of the distance at 4 km/h and the rest at 5km/h. The total distance is

(a) 2km (b) 5km (c) 6km (d) 10km (e) None of these

Answer: C

7. Three identical masses are at the three corners of the triangle, connected by massless identical springs (rest length l0) forming an isosceles right angle triangle. If the two sides of equal length (of length 2l0) lie along positive x-axis and positive y-axis, then the force on the mass that is not at the origin but on the x-axis is given by $ax\hat{} + by\hat{}$ with

(a) a = 1 and b = 0

(b) a = 0 and b = 1

(c) a = -√2 and b = 1

(d) a = - 2 and b = 0

(e) a = - 2 and b = 1

Answer: E

8. Asim got thrice as many sums wrong as he got right. If he attempted 60 sums in all, how many sums did he solve correctly?

(a) 25 (b) 12 (c) 20 (d) 10 (e) 15

Answer: E

9. A system consists of N particles, interacting with each other (for example, protein molecule). Which one of the following statements is FALSE.

(a) The motion of the system can be split into translational, rotational and vibrational motions

(b) Number of rotational degrees of freedom are 3

(c) Number or translational degrees of freedom are 3

(d) Number of vibrational degrees of freedom are 3

(e) The system, if isolated, will conserve both total energy and total angular momentum.

Answer: C

10. Three pipes A, B and C can fill a tank in 6 hrs . After working at it together for 2 hrs C is closed and A and B can fill the remaining part in 7 hrs . The total number of hrs taken by C alone to fill the tank is

(a) 14 (b) 12 (c) 11 (d) 10 (e) 13

Answer: A

11. A square closed loop of area A, lying in the horizontal plane, is moving horizontally with velocity v in a uniform vertical magnetic field B. Which one of the following statements is FALSE?

(a) There is current in the loop even though there is no battery (or any other voltage source)

(b) The work done in moving the coil is being converted to the current in the coil

(c) The current is being generated because the magnetic field is doing the work.

(d) the emf generated is proportional to the velocity of the coil

(e) the emf generated is proportional to the magnetic field strength

Answer: C

12. Two liquids A and B are mixed in such a proportion that they form an ideal solution whose total vapor pressure is exactly three times that of the partial pressure of A. If P_A^o and P_B^o are the vapor pressures of pure A and B respectively, then the total vapor pressure of the solution is given by

Options:

(a) $\frac{2P_A^oP_B^o}{3P_A^o+P_B^o}$ (b) $\frac{3P_A^oP_B^o}{P_B^o+2P_A^o}$ (c) $\frac{2P_A^o}{2P_A^o+P_B^o}$ (d) $\frac{2P_B^o}{P_A^o+2P_B^o}$

(e) more data needed to solve the problem

Answer: B

13. If Po and Ps are the vapour pressures of the solvent and solution respectively and X0 and Xs are mole fractions of solvent and solute respectively, then

(a) P0 = XsPS (b) PS = X0P0 (c) P0 = X0PS (d) PS = XsP0

Answer: B

14. The velocity of the nitrogen molecule in room temperature air is:

(a) zero

(b) 10 m s-1

(c) 100 m s -1

(d) 500 m s -1

(e) 5000 m s -1

Answer: D

15. Helium is two times heavier than H2. The average kinetic energy per molecule for helium at 300K is

(a) twice as H2 (b) same as H2 (c) half as H2 (d) one fourth of H2

Answer: B.