Set A

Presidency University
Department of Geology
Undergraduate Admission Test – 2012

Full Marks : 100

Time : 2 hrs

1. The dimension $ML^{-1}T^{-2}$ may correspond to :
(A) Work done by a force; (B) Linear momentum; (C) Pressure; (D) Energy per unit volume per unit time

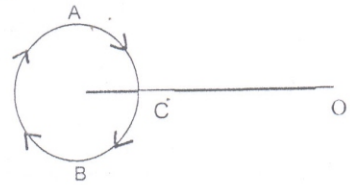
2. The efficiency of a Carnot engine is given by $\eta = 1 - T_1/T_2$; will it run if T_1 = 0 K and T_2 = 50 K ?
(A) Yes, with higher efficiency, (B) No it will violate 2nd Law of Thermodynamics, (C) Yes with lower efficiency, (D) Can not be predicted.

3. The value of $\int_{-1}^{1} \max\{2-x, 2, 1+x\}dx$ is : (A) $\frac{1}{2}$, (B) 2, (C) 4, (D) $\frac{9}{2}$.

4. If x, y, z , a are positive real numbers and x, y, z are in G.P., then $\log_a x + (\log_z a)^{-1}$ equals
(A) $\log_a y$, (B) $2\log_a y$, (C) $\log_y a$, (D) $2 \log_y a$

5. The four quantum numbers of the valence shell electron of Sodium atom are
(A) 3,1, 1, ½, (B) 3,0,0, ½, (C) 3, 1, 0, ½, (D) 3, 3, 0, ½

6. A small source of sound moves on a circle as shown in the adjacent figure and an observer is sitting at O. Let ν_1, ν_2 and ν_3 be the frequencies heard when the source is at A, B and C respectively. Then,



(A) $\nu_1 > \nu_2 > \nu_3$, (B) $\nu_1 = \nu_2 > \nu_3$, (C) $\nu_2 > \nu_3 > \nu_1$, (D) $\nu_1 > \nu_3 > \nu_2$.

7. Consider the following two equations : (A) $\vec{R} = \frac{1}{M}\sum_i m_i \vec{r}_i$ and (B) $\vec{G}_{CM} = \frac{\vec{F}}{M}$ in a non-inertial frame, Then
(A) Both are correct, (B) Both are wrong, (C) A is correct but B is wrong, (D) A is wrong but B is correct.

8. The co-ordinates of the foci of an ellipse are (3, 1) and (1, 1). If the ellipse passes through the point (1, 3), then its eccentricity is :
(A) $\sqrt{2}-1$, (B) $\sqrt{3}-1$, (C) $\frac{1}{2}(\sqrt{2}-1)$, (D) $\frac{1}{2}(\sqrt{3}-1)$.

9. Which of the following element will have the greatest difference between first and second ionization energy?
(A) P, (B) Si, (C) Mg. (D) Na.

10. If two angles of a triangle are $\tan^{-1}2$ and $\tan^{-1}3$, then the third angle is (A) $\frac{\pi}{3}$, (B) $\frac{\pi}{4}$, (C) $\frac{\pi}{5}$, (D) $\frac{\pi}{6}$.

11. The range of a projectile fired at an angle of 15° is 50 m. If it is fired with same speed at angle of 45°, its range will be
(A) 25 m, (B) 37 m, (C) 50 m, (D) 100 m.

12. Let the angle between two nonzero vectors $\vec{A}$ and $\vec{B}$ be 120° and its resultant be $\vec{C}$, then
(A) $|\vec{C}|$ must be = $|\vec{A}-\vec{B}|$, (B) $|\vec{C}|$ must be < $|\vec{A}-\vec{B}|$, (C) $|\vec{C}|$ must be > than $|\vec{A}-\vec{B}|$ (D) $|\vec{C}|$ may be = $|\vec{A}-\vec{B}|$

13. If A is a skew-symmetric matrix of order 3 and P is a 3 x 1 matrix, then $P^T AP$ is a
(A) null matrix, (B) non-null symmetric matrix, (C) non-null skew-symmetric matrix, (D) none of these.

14. Which one has the highest second ionization energy? (A) C, (B) N, (C) O, (D) F.

15. The value of x for which $f(x) = \int_0^x (1-t^2)e^{-t^2/2}dt$ is maximum is : (A) 1/3, (B) ½, (C) 2/3, (D) 1

16. If the solubility of $Pb_3(PO_4)_2$ is S moles/L, then solubility product (K_{sp}) will be
(A) S^5, (B) $27S^3$, (C) $108S^4$, (D) $108S^5$.

17. The attraction that an atom exerts on a pair of electrons that is being shared with another atom for forming covalent bond is referred to as its :
(A) electron affinity, (B) electronegativity, (C) ionization energy, (D) valency

18. If the sum of the coefficients in the expansion of $(1 - 4x + 11x^2)^{2012}$ is p, and the sum of the coefficients in the expansion of $(1 + x^2)^{2012}$ is q ; then
(A) p = 3q, (B) 3p = q, (C) $p = q^3$, (D) $p^3 = q$.

19. A particle moves in a circular path with a uniform speed. Its motion is
(A) Periodic, (B) Oscillatory, (C) Simple Harmonic, (D) Angular Simple Harmonic.

20. Two charges (+Ve) Q_1 and Q_2 are separated by a distance R. Q_1+Q_2 = 10 Coulomb. The electrostatic repulsion is maximum if
(A) Q_1 = 4 C, Q_2 = 6 C, (B) Q_1 = 7 C, Q_2 = 3 C, (C) Q_1 = 8 C, Q_2 = 2 C, (D) Q_1 = 5 C, Q_2 = 5 C

21. If z = x + iy (x, y ∈ R) and $\arg\left(\frac{z-1}{z+1}\right) = \frac{\Pi}{4}$ then the point (x, y) lies on
(A) a straight line, (B) a circle, (C) a parabola, (D) an ellipse .

22. The number of different reflexive relations on a set with 3 elements is (A) 16, (B) 32, (C) 64, (D) 128.

23. Which of the following oxides dissolves in water to give a mixture of two acids?
(A) N_2O_5, (B) P_2O_5, (C) SO_3, (D) CO_2.

24. The energy (ev) associated with Bohr's Orbit (n) in H-atom is given by $E_n = (-13.6)/n^2$. The energy of the electron at third level is given by :
(A) -13.6, (B) -6.8, (C) -1.51, (D) 0

25. The parametric equation of a parabola is $x = t^2 + 1$, $y = 2t + 1$. The equation of its directrix is
(A) x = 0, (B) y = 0, (C) x = 1, (D) y = 1.

26. Which of the series of elements listed below would have nearly the same atomic radius?
(A) F, Cl, Br, I, (B) Na, K, Rb, Cs, (C) Li, Be, B, C, (D) N, P , O, S.

27. A particle is moving in a straight line under the law x = ½ vt (symbols have their usual meanings). The acceleration of the particle
(A) is constant, (B) varies as v, (C) varies as x, (D) varies as x^2.

28. The coefficient of x^{99} in the polynomial (x-1)(x-2)...(x-100) is
(A) -5500, (B) -5050, (C) -5005, (D) -5000.

29. $\lim_{x \to 0} \frac{\sin|x|}{x} = ?$ (A) – 1, (B) 0, (C) ½, (D) none of these.

30. Two elements X and Y are isotonic having atomic weight 54 and 56 respectively. If the atomic number of X is 26, then atomic numbers of Y is :
(A) 26, (B) 27, (C) 28, (D) 30.

31. The amount of C-14 ($t_{0.5}$ = 5770 years) in a piece of wood is found to be one sixth of the amount present in a fresh piece of wood. What is the age (years) of the wood ?
(A) 1421, (B) 11540, (C) 5770, (D) 17310.

32. A polygon has 44 diagonals. The number of its sides is
(A) 7, (B) 8, (C) 11, (D) 12.

33. The coefficient of x^7 in the expansion of $(1- x^2 + x^3)(1+x)^{10}$ is
(A) 78, (B) 132, (C) 340, (D) 582.

34. A student says that he had applied a force $F = -K\sqrt{x}$ on a particle which executes simple harmonic motion. He refuses to tell whether K is a constant or not. Assume that he had worked only with positive x and no other force acted on the particle,
(A) as x increases K increases, (B) as x increases K decreases, (C) as x increases K remains constant, (D) none of these.

35. The component of a vector is :
(A) Always < its magnitude, (B) Always > than its magnitude, (C) Always = its magnitude, (D) None of these

36. *For an electro-magnetic wave which one is true ?*
(A) $\vec{E} \times \vec{B} = 0$, (B) $\vec{E}.\vec{B} = 0$, (C) $\left(\vec{E} \times \vec{B}\right) \times \vec{B} = 0$, (D) $\vec{E} + \vec{B} = 0$

37. Somebody is measuring the time of free fall of a particle from a height 'h' by a simple pendulum. The same experiment is done in moon and earth:
(A) The recorded time will be different, (B) The recorded time will be same, (C) Time can not be recorded in moon, (D) None of these

38. If f(x) = sin π [x] , x ϵ R , then f '(1 – 0) is : (A) -1, (B) 0, (C) 1, (D) non-existent.

39. The value of $\lim_{n \to \infty} \left(\frac{n!}{n^n}\right)^{\frac{1}{n}}$ is : (A) e, (B) e^{-1}, (C) -1, (D) 1 .

40. The phenomenon of beats can take place
(A) for longitudinal waves only, (B) for transverse waves only; (C) for both longitudinal and transverse waves, (D) for sound waves only.

41. A piece of charcoal is completely burnt. The change in entropy of the universe is
(A) Zero, (B) Negative, (C) Positive, (D) None of these.

42. Certain amount of ideal gas expands freely. The work done in this process is
(A) RT, (B) 1/3RT, (C) 0, (D) 1/√3 RT.

43. If $\int_0^x f(t)dt = x + \int_x^1 tf(t)dt$, then the value of f(1) is : (A) 0, (B) 1/3, (C) ½, (D) 1.

44. The area (in square unit) of the region bounded by the curves y = sin x, y = cos x between two consecutive points of their intersection is (A) √2–1, (B) √2, (C) √2+1, (D) 2√2,

45. Which of the following cations will have the highest polarizing power? (A) Na^+, (B) Ca^{2+}, (C) Mg^{2+}, (D) Al^{3+}

46. The differential equation $\frac{d^2x}{d^2y} = 2$ represents a family of (A) Straight lines, (B) Circles, (C) Parabolas, (D) Ellipses.

47. Chalcocite is the chief mineral of (A) Cu, (B) Pb, (C) Zn, (D) Fe

48. In flame test, concentrated HCl is added to :
(A) dissolve the solid sample, (B) form easily volatile chloride, (C) oxidize the anionic component present in solid, (D) reduce the anionic component present in the sample.

49. Deep blue precipitate can be obtained when M^{n+} -salt solution in acid medium is treated with potassium ferrocyanide. The M^{n+} is : (A) Cu^{2+}, (B) Fe^{3+}, (C) Fe^{2+}, (D) Zn^{2+}

50. Flux is a material that is added to the furnace charge during metal extraction for separating :
(A) Volatile gases, (B) Gangue, (C) Slag, (D) Metal.