1. Which of the following is an empty set ?

(A) $\{x|x \text{ is a real number and } x^2 - 1 = 0\}$

(B) $\{x|x \text{ is a real number and } x^2 + 1 = 0\}$

(C) $\{x|x \text{ is a real number and } x^2 - 9 = 0\}$

(D) $\{x|x \text{ is a real number and } x^2 = x + 2\}$

2. Find the sum to n terms of the series given below.

$$\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \ldots\ldots\ldots$$

(A) $\frac{n(n+1)^3(n+2)}{24}$ (B) $\frac{n(2n^2+9n+13)}{24}$

(C) $\frac{4n^2+1}{5}$ (D) $\frac{1}{8}n\ 2n^2+15$

3. Which of the following is true about the graph of the inequations $x \geq 0$, $y \geq 0$, $3x + 4y \leq 12$?

(A) Exterior of a triangle.

(B) Interior of a triangle including the points on the sides.

(C) In the second quadrant.

(D) Does not exist.

4. A person appears for an examination in which there are four papers with a maximum of m marks from each paper. Find the number of ways in which one can get 2m marks.

(A) ${}^{2m+3}C_3$ (B) $\frac{1}{3}(m+1)(2m^2+4m+1)$

(C) $\frac{1}{3}(m+1)(2m^2+4m+3)$ (D) $2m + 3$

5. **Let "Z" denote a complex number and define** $S = \frac{1}{1-Z} : |Z| = 1 \text{ and } Z \neq 1$ **. Which of the following best describes the set "S", when "S" is interpreted geometrically as a set of points in the complex plane ?**

(A) S is a straight line parallel to the imaginary axis

(B) S is a parabola

(C) S is a circle

(D) S is a hyperbola

6. An iron ball is dropped into a long jar containing castor oil. How will it move ?

(A) It will fall with a constant acceleration equal to that of gravity.

(B) It will fall with an acceleration slightly less than that due to gravity.

(C) It will ultimately acquire a constant velocity.

(D) It will float in the oil.

7. A soap bubble assumes a spherical shape. Which of the following statements is wrong ?

(A) The soap film tends to shrink to as small surface area as possible.

(B) The soap film consists of two surface layers.

(C) Pressure of air enclosed by the soap film is same as that of the atmosphere outside.

(D) Pressure of air enclosed by the soap film is more than the atmospheric pressure.

8. A ball hits the floor and rebounds after an inelastic collision. What happens in this case ?

(A) The momentum of the ball just after the collision is the same as that just before the collision.

(B) The mechanical energy of the ball remains the same in the collision.

(C) The total momentum of the ball and the earth is conserved.

(D) The total energy of the ball and the earth is conserved.

9. Viscous force is somewhat like friction as it opposes the motion and is non-conservative but not exactly so, Why ?

(A) It is velocity dependent while friction is not.

(B) It's velocity decreases and becomes zero.

(C) It is temperature independent while friction is not.

(D) It is independent of area like surface tension while friction depends on the area of contact.

10. If for a liquid in a vessel force of cohesion is twice of adhesion, then which of the following is not true ?

(A) The meniscus will be convex.

(B) The liquid will wet the solid.

(C) The angle of contact will be obtuse.

(D) There will be capillary descent.

11. Which of the following can be used to prepare a buffer solution ?

(I) From a mixture of sodium acetate and acetic acid in water.
(II) From a mixture of sodium acetate and hydrochloric acid in water.
(III) From a mixture of ammonia and ammonium chloride in water.

(A) (I) and (II) only (B) (II) and (III) only

(C) (I) and (III) only (D) (I), (II) and (III)

12. For the reaction. $2Cl^-(g) \rightarrow Cl_2(g) + 2e^-$. What are the signs of ΔH and ΔS ?

(A) ΔH - Negative; ΔS - Positive

(B) ΔH - Negative; ΔS - Negative

(C) ΔH - Positive; ΔS - Negative

(D) ΔH - Positive; ΔS - Positive

13. What is the purpose of exhaust system in limekilns where the decomposition of limestone takes place ?

(A) To drive away, CO_2 gas and make the reaction proceed for completion.

(B) To reduce the temperature of the reaction.

(C) To make the reaction attain equilibrium in less time.

(D) All of the above

14. Why can H_2S in presence of dilute HCl precipitate out only second group radicals but not fourth group radicals ?

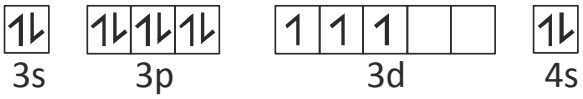
(A) HCl activates H_2S.

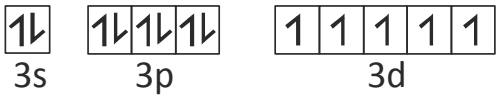
(B) HCl decreases concentration of sulphide ions.

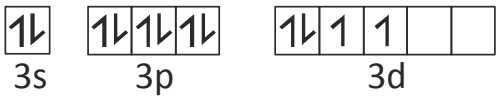
(C) HCl increases concentration of sulphide ions.

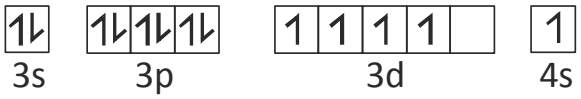
(D) Sulphides of IV group are unstable in HCl.

15. Which of the following electronic configurations represents the violation of both Aufbau principle and Hund's rule ?

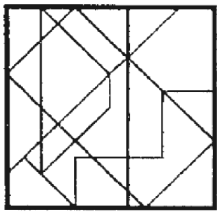
(A) 

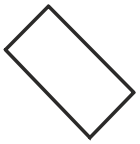
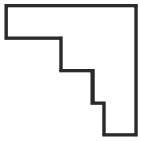
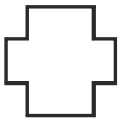
(B) 

(C) 

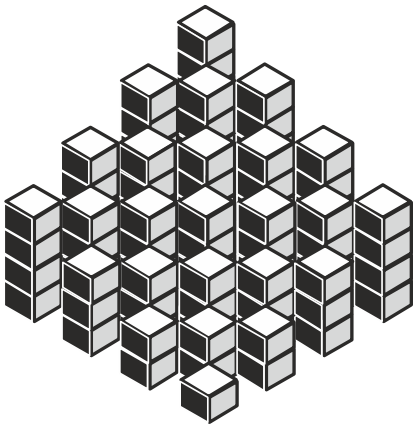
(D) 

16. The hidden figure in block 10 is _____.



(A)  (B)  (C)  (D) 

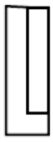
17. Count the number of blocks in the given figure.



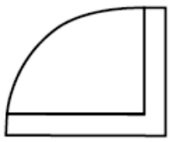
(A) 105 (B) 98 (C) 102 (D) 100

18. Identify the 3-dimensional object from the given three views.

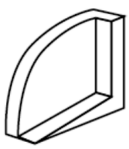
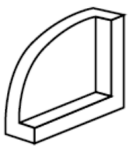
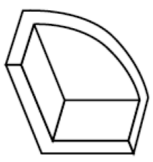
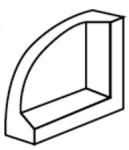
Top



Front



Side

(A)  (B)  (C)  (D) 

19. **Arrange the following words in a logical sequence.**

(1) Never **(2) Sometimes**

(3) Generally **(4) Seldom**

(5) Always

(A) 3, 5, 1, 4, 2 (B) 3, 5, 4, 2, 1

(C) 5, 3, 1, 2, 4 (D) 5, 3, 4, 1, 2

20. **Pick the TWO answer choices that will come together to make the figure shown. Pieces may be reflected and/or rotated.**