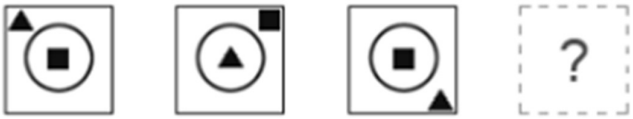
Section : I - Aptitude and Logical Reasoning

1.



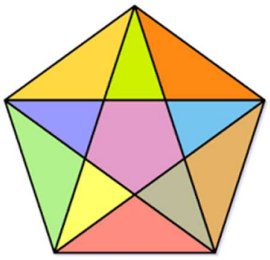
(a) 

(b) 

(c) 

(d) 

2. Determine whether the stated conclusion is valid.
Given: If an animal is a dog, then they like biscuits.
Sammy is a dog.
Conclusion: Sammy likes biscuits.
(a) Invalid (b) Valid
(c) Sammy is a Great Dane (d) Sammy is really a cat

3. 

How many triangles are in this picture?
(a) 27 (b) 35 (c) 14 (d) 10

4. Fill in the blank:
3, 8, 15, 24, 35, ?
(a) 46 (b) 48 (c) 50 (d) 54

ROUGH SPACE

5. A, B, C, D, E, and F are sitting in a row.
   - A is not at the ends.
   - C is to the immediate left of E.
   - D is at one of the ends.
   - F is not next to A.
   - B is sitting between A and C.

   Who is sitting at the other end (not D)?

   (a) A (b) E (c) F (d) B

Section : II - Mathematics

6. What type of a number is $\left(6+\sqrt{2}\right)\left(6-\sqrt{2}\right)$

   (a) Rational number (b) Irrational number (c) Prime number (d) Negative integer

7. Which is an irrational number between $\sqrt{2}$ and $\sqrt{3}$?

   (a) $2^{\frac{1}{2}}$ (b) $3^{\frac{1}{4}}$ (c) $6^{\frac{1}{4}}$ (d) $6^{\frac{1}{8}}$

8. If α and β are roots of $x^2-3x+2=0$, then find the value of $\alpha^2+\beta^2$.

   (a) 3 (b) 4 (c) 5 (d) 6

9. Find the value of $\left(\sqrt[6]{27}-\sqrt{6\frac{3}{4}}\right)^2$

   (a) $\frac{\sqrt{3}}{2}$ (b) $\frac{3}{2}$ (c) $\frac{\sqrt{3}}{4}$ (d) $\frac{3}{4}$

10. If $\sqrt{5}=2.236$ and $\sqrt{3}=1.732$, find the value of $\frac{1}{\sqrt{5}-\sqrt{3}}$

    (a) 3.968 (b) $\frac{1}{3.968}$ (c) 1.984 (d) $\sqrt{0.504}$

ROUGH SPACE

11. What is the simplified form of $\left[\sqrt[3]{x^4y} \times \frac{1}{\sqrt[4]{x^2y^8}}\right]^{-6}$?

(a) $x^5 \cdot y^{10}$ (b) $\frac{y^{10}}{x^5}$ (c) $\frac{y^2}{x}$ (d) $\frac{x^5}{y^5}$

12. Which is greater of 2^{12} and 3^8 ?

(a) 3^8 (b) 2^{12} (c) Both are equal (d) Cannot be compared

13. Find the value of $\frac{1}{1+x^{-m}} + \frac{1}{1+x^m}$

(a) 0 (b) x^m (c) 1 (d) x^{-m}

14. Find the remainder when $2x^3 + x + 1$ is divided by $1 - 2x$.

(a) $\frac{7}{4}$ (b) $-\frac{7}{4}$ (c) $\frac{7}{2}$ (d) $-\frac{7}{2}$

15. $\frac{7\sqrt{3}}{\left(\sqrt{10}+\sqrt{3}\right)} - \frac{2\sqrt{5}}{\left(\sqrt{6}+\sqrt{5}\right)} - \frac{3\sqrt{2}}{\left(\sqrt{15}+3\sqrt{2}\right)} =$ _____.

(a) 1 (b) 2 (c) $\frac{1}{2}$ (d) 3

Section : III - Science

16. A student records the following readings using a vernier caliper: main scale reading : 2.5 cm, vernier scale division coinciding : 6th division (least count 0.01 cm). What is the correct total reading?

(a) 2.56 cm (b) 2.60 cm (c) 2.06 cm (d) 3.10 cm

17. The length of a rod is measured as 25.4 cm using a metre scale having least count 0.1 cm. Write the measurement correctly including the least count.

(a) 25.4 ± 0.5 cm (b) 25.4 ± 0.1 cm (c) 25.40 ± 0.01 cm (d) 25.40 ± 0.5 cm

18. A student measures the diameter of a sphere with a vernier caliper as 2.40 cm (least count 0.01 cm). Calculate the percentage error in finding its volume.

(a) 0.42% (b) 0.84% (c) 1.25% (d) 2.00%

ROUGH SPACE

19. A particle moves with uniform acceleration. Its velocity at t = 0 is 10 m/s and at t = 5 s is 20 m/s. Find the distance travelled in 5 seconds.
(a) 60 m (b) 70 m (c) 75 m (d) 80 m

20. A motorcyclist covers the first half of a distance at 30 km/h and the second half at 60 km/h. Find his average speed.
(a) 35 km/h (b) 36 km/h (c) 45 km/h (d) 40 km/h

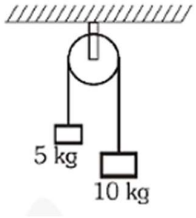
21. A ball is thrown vertically upward with a speed of 50 m/s on a planet where the acceleration due to gravity is $g = 5\ m/s^2$. Calculate the maximum height it reaches.
(a) 125 m (b) 250 m (c) 375 m (d) 500 m

22. A train is moving with velocity 72 km/h. Express this speed in m/s.
(a) 18 m/s (b) 19 m/s (c) 20 m/s (d) 22 m/s

23. Which one of the following statements for second law of motion is NOT correct ?
(a) The net force on a body is proportional to that body's acceleration
(b) The net force on a body is in the same direction as the acceleration
(c) The time rate of change of momentum is equal to force
(d) The net force on a body is proportional to that body's momentum

24. 100 balls each of mass m moving with speed v simultaneously strike a wall normally and reflected back with same speed, in time t s. The total force exerted by the balls on the wall is
(a) $\frac{100\,mv}{t}$ (b) $\frac{200\,mv}{t}$
(c) 200 mvt (d) More than one of the above

25. Two masses of 5 kg and 10 kg are connected to a pulley as shown. What will be the acceleration if the pulley is set free : (g = acceleration due to gravity)



(a) g (b) g/2 (c) g/3 (d) g/4

ROUGH SPACE

26. Calculate the wavelength (in nanometer) associated with a proton moving at 1.0×10^{3} m/s.
(mass of proton = 1.67×10^{-27} kg)
(n = 6.63×10^{-34} Js)
(a) 2.5 nm (b) 14.0 nm (c) 0.033 nm (d) 0.40 nm

27. The radius of the second Bohr orbit for hydrogen atom is:
H = 6.626×10^{-34} Js
mass of e=9.1×10^{-31} kg
charge of e^{-} = 1.6×10^{-19} C
(a) 1.65 $\mathring{A}$ (b) 4.76 $\mathring{A}$ (c) 0.529 $\mathring{A}$ (d) 2.12 $\mathring{A}$

28. The bond formed by the complete transfer of one or more electrons from one atom to another is:
(a) Covalent Bond (b) Ionic Bond (c) Metallic Bond (d) Coordinate Bond

29. Which of the following molecules contains a double covalent bond?
(a) H_2 (b) O_2 (c) N_2 (d) CH_4

30. Ionic compounds generally have:
(a) Low melting points (b) Low boiling points
(c) High melting points (d) Non-polar nature

31. C^{12}, C^{13}, C^{14} are
(a) isotones (b) isotopes (c) isobar (d) none

32. For a reaction
$CuO + CO \longrightarrow Cu + CO_2$
Which of the following statement is correct?
(a) CuO is oxidized to Cu (b) CO is reduced to CO_2
(c) CO is oxidized to CO_2 (d) Cu is oxidized CO_2

33. Number of unpaired electrons in Cr^{+1}
(Atomic number of Cr = 24)
(a) 5 (b) 4 (c) 6 (d) 3

ROUGH SPACE

34. Ground state configuration of Boron
(a) $1s^2 2s^2 2p^0$ (b) $1s^2 2s^1 2p^2$ (c) $1s^2 2s^2 2p^1$ (d) $1s^0 2s^2 2p^2$

35. Number of electrons in s-subshell of sodium is
(a) 4 (b) 6 (c) 3 (d) 5

36. The cell theory was modified by _____.
(a) Rudolf Virchow (b) Matthias Schleiden (c) Theodor Schwann (d) All of these

37. Which of the following set of organelles contain membranes?
(a) Mitochondria, Ribosome and Chloroplasts (b) Mitochondria, ER and Chloroplasts
(c) Nucleus, Ribosome and Chloroplasts (d) Mitochondria, Centrioles and Nucleus

38. Prokaryotes contain a primitive nucleus called _____.
(a) Nucleolus (b) Nucleoplasm (c) Protein (d) Nucleoid

39. Which organelle is not covered by a single membrane?
(a) Mitochondria (b) endoplasmic reticulum
(c) Lysosome (d) vacuole

40. Which type of muscle are involuntary?
(a) Skeletal muscle (b) Smooth muscle (c) Cardiac muscle (d) Both b and c

41. Type of connective tissue present around blood vessel and nerves.
(a) Adipose (b) Areolar (c) Dense (d) Epithelium

42. Which type of simple permanent plant tissue gives mechanical support?
(a) Parenchyma (b) Xylem (c) Collenchyma (d) Sclerenchyma

43. Preventive and control measures adopted for the storage of grains include
(a) strict cleaning (b) proper disjoining (c) fumigation (d) all of the above

44. Xanthium and Parthenium are
(a) Vegetables (b) Cereals (c) Weeds (d) Cash crops

45. The Principal cereal crop of India is
(a) Wheat (b) Maize (c) Rice (d) Sorghum

ROUGH SPACE