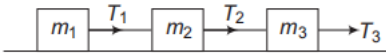


MET 2017 Memory Based Question Paper PDF

Physics

- In Young's experiment, using red light ($\lambda = 6600 \text{ \AA}$), 50 fringes are seen in the field of view. How many fringes will be seen by using violet light ($\lambda = 4400 \text{ \AA}$)?
(a) 10 (b) 20
(c) 45 (d) 90
- Two identical air core capacitors are connected in series to a voltage source of 15 V. If one of the capacitors is filled with a medium of dielectric constant 4, the new potential across this capacitor is
(a) 5 V (b) 8 V
(c) 10 V (d) 12 V
- A string of density 7.5 g cm^{-3} and area of cross-section 0.2 mm^2 is stretched under a tension of 20 N. When it is plucked at the mid-point, the speed of the transverse wave on the wire is
(a) 116 ms^{-1} (b) 40 ms^{-1}
(c) 200 ms^{-1} (d) 80 ms^{-1}
- Three blocks of masses m_1 , m_2 and m_3 are connected by massless string as shown kept on a frictionless table.


They are pulled with a force $T_3 = 40 \text{ N}$. If $m_1 = 10 \text{ kg}$, $m_2 = 6 \text{ kg}$ and $m_3 = 4 \text{ kg}$, the tension T_2 will be
(a) 20 N (b) 40 N (c) 10 N (d) 32 N
- Two identical cells whether connected in parallel or in series gives the same current when connected to an external resistance 1.5Ω . Find the value of internal resistance of each cell.
(a) 1Ω (b) 0.5Ω
(c) zero (d) 1.5Ω
- Force between two identical charges placed at a distance of r in vacuum is F . Now a slab of dielectric of dielectric constant 4 is inserted between these two charges. If the thickness of the slab is $r/2$, then the force between the charges will become
(a) F (b) $\frac{3}{5}F$ (c) $\frac{4}{9}F$ (d) $\frac{F}{4}$
- Water rises in a capillary tube to a height h . Choose false statement regarding capillary rise from the following.
(a) On the surface of Jupiter, height will be less than h
(b) In a lift moving up with constant acceleration height is less than h
(c) On the surface of moon the height is more than h
(d) In a lift moving down with constant acceleration height is less than h
- The surface area of a black body is $5 \times 10^{-4} \text{ m}^2$ and its temperature is 727°C . The energy radiated by it per minute is ($\sigma = 5.67 \times 10^{-8} \text{ J/m}^2 \cdot \text{s} \cdot \text{K}^4$)
(a) $1.7 \times 10^3 \text{ J}$ (b) $2.5 \times 10^2 \text{ J}$
(c) $8 \times 10^3 \text{ J}$ (d) $3 \times 10^4 \text{ J}$

9. The inputs and outputs for different time intervals are given below the NAND gate

Time	Inputs A	Inputs B	Outputs Y
t_1 to t_2	0	1	P
t_2 to t_3	0	0	Q
t_3 to t_4	1	0	R
t_4 to t_5	1	1	S

The values taken by P, Q, R, S are respectively

- (a) 1, 1, 1, 0 (b) 0, 1, 0, 1
(c) 0, 1, 0, 0 (d) 1, 0, 1, 1
10. An electric dipole is placed at an angle of 30° with an electric field of intensity $2 \times 10^5 \text{ NC}^{-1}$. It experiences a torque equal to 4 Nm. Calculate the charge on the dipole if the dipole length is 2 cm.
(a) 8 mC (b) 4 mC
(c) $8 \mu\text{C}$ (d) 2 mC
11. In a gas, two waves of wavelengths 1 m and 1.01 m are superposed and produce 10 beats in 3 s. The velocity of sound in the medium is
(a) 300 m/s (b) 336.7 m/s
(c) 360.2 m/s (d) 270 m/s
12. If α and β are the current gain in the CB and CE configurations respectively of the transistor circuit, then $\frac{\beta - \alpha}{\alpha\beta} =$
(a) infinite (b) 1
(c) 2 (d) 0.5
13. The apparent frequency of the whistle of an engine changes in the ratio 9 : 8 as the engine passes a stationary observer. If the velocity of the sound is 340 ms^{-1} , then the velocity of the engine is
(a) 40 ms^{-1} (b) 20 ms^{-1}
(c) 340 ms^{-1} (d) 180 ms^{-1}
14. The width of a single slit if the first minimum is observed at an angle 2° with a light of wavelength $6980 \text{ \AA}$
(a) 0.2 mm (b) $2 \times 10^{-5} \text{ mm}$
(c) $2 \times 10^5 \text{ mm}$ (d) 2 mm

15. The ratio of the resistance of conductor at temperature 15°C to its resistance at temperature 37.5°C is 4 : 5. The temperature coefficient of resistance of the conductor is

(a) $\frac{1}{25} ^\circ\text{C}^{-1}$ (b) $\frac{1}{50} ^\circ\text{C}^{-1}$
(c) $\frac{1}{80} ^\circ\text{C}^{-1}$ (d) $\frac{1}{75} ^\circ\text{C}^{-1}$

16. The momentum of a body is increased by 25%. The kinetic energy is increased by about

(a) 25% (b) 5% (c) 56% (d) 38%

17. The plane faces of two identical plano-convex lenses each having a focal length of 50 cm are placed against each other to form a usual biconvex lens. The distance from this lens combination at which an object must be placed to obtain a real, inverted image which has the same size as the object is

(a) 50 cm (b) 25 cm (c) 100 cm (d) 40 cm

18. A short solenoid of length 4 cm, radius 2 cm and 100 turns is placed inside and on the axis of a long solenoid of length 80 cm and 1500 turns. A current of 3 A flows through the short solenoid. The mutual inductance of two solenoids is

(a) $2.96 \times 10^{-4} \text{ H}$ (b) $5.3 \times 10^{-5} \text{ H}$
(c) $3.52 \times 10^{-3} \text{ H}$ (d) $8.3 \times 10^{-5} \text{ H}$

19. The angle of a prism is 60° and its refractive index is $\sqrt{2}$. The angle of minimum deviation suffered by a ray of light in passing through it is

(a) about 20° (b) 30°
(c) 60° (d) 45°

20. A voltmeter has resistance of G ohms and range V volts. The value of resistance used in series to convert it into a voltmeter of range nV volts is

(a) nG (b) $(n - 1)G$ (c) $\frac{G}{n}$ (d) $\frac{G}{(n - 1)}$

21. The half-life period of radium is 1600 yr. The fraction of a sample of radium that would remain after 6400 yr is

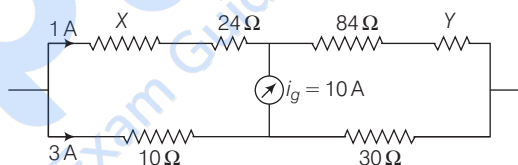
(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $\frac{1}{8}$ (d) $\frac{1}{16}$

- 22.** The temperatures of two bodies A and B are respectively 727°C and 327°C . The ratio $H_A : H_B$ of the rates of heat radiated by them is
 (a) $727 : 327$ (b) $5 : 3$
 (c) $25 : 9$ (d) $625 : 81$
- 23.** A 2 kg copper block is heated to 500°C and then it is placed on a large block of ice at 0°C . If the specific heat capacity of copper is $400 \text{ J} \cdot \text{kg}^{-1} \cdot ^{\circ}\text{C}^{-1}$ and latent heat of fusion of water is $3.5 \times 10^5 \text{ J} \cdot \text{kg}^{-1}$, the amount of ice that can melt is
 (a) $\frac{7}{8} \text{ kg}$ (b) $\frac{7}{5} \text{ kg}$ (c) $\frac{8}{7} \text{ kg}$ (d) $\frac{5}{7} \text{ kg}$
- 24.** A man weighing 100 kg slides down a light rope with an acceleration of 1.8 ms^{-2} . If $g = 9.8 \text{ ms}^{-2}$, the tension of the rope is
 (a) 180 N (b) 1160 N
 (c) 800 N (d) weightlessness
- 25.** A force of 20 N acts on a body of mass 2 kg initially at rest. Find the work done in 2 s.
 (a) 400 J (b) 20 J (c) 10 J (d) 5 J
- 26.** A charged particle of mass m and charge q is released from rest in a electric field of magnitude E . The kinetic energy of the particle after t second is
 (a) $\frac{qEt}{2m}$ (b) $\frac{q^2E^2t}{2m}$
 (c) $\frac{q^2E^2t^2}{m}$ (d) $\frac{q^2E^2t^2}{2m}$
- 27.** The electric potential is +100 V at a distance of 10 cm from a point charge q . Then, q is equal to
 (a) $+1.1 \times 10^{-9} \text{ C}$ (b) $+1.1 \times 10^{-3} \text{ C}$
 (c) 3 C (d) $3 \times 10^{-5} \text{ C}$
- 28.** A cell of emf E is connected across a resistance R . The potential difference between the terminals of the cell is found to be V . The internal resistance of the cell must be
 (a) $R \left[\frac{E}{V} - 1 \right]$ (b) $R \left[\frac{E}{V} + 1 \right]$
 (c) ER (d) $(E - V)R$
- 29.** Three 2Ω resistors are connected to form a triangle. The resistance between any two corners is
 (a) $\frac{4}{3} \Omega$ (b) $\frac{3}{4} \Omega$
 (c) 6Ω (d) $\frac{2}{3} \Omega$
- 30.** A thin rod of length $\frac{f}{3}$ is placed along the optic axis of a concave mirror of focal length f , such that its image which is real and elongated just touches the rod, the magnification is
 (a) 1.5 (b) 2.5 (c) 3.5 (d) 4.5
- 31.** Two coherent sources of intensity ratio 9 : 4 produce interference. What is the ratio between maxima and minima in the interference pattern produced ?
 (a) 3 : 2 (b) 25 : 1
 (c) 13 : 5 (d) 5 : 1
- 32.** The angle of minimum deviation for a prism of angle A is $180 - 2A$. The refractive index is
 (a) $\sin \frac{A}{2}$ (b) $\cos \frac{A}{2}$
 (c) $\tan \frac{A}{2}$ (d) $\cot \frac{A}{2}$
- 33.** An electron at rest is accelerated through a potential difference of 200 V. If the electron acquires a velocity of $8.4 \times 10^8 \text{ cm/s}$, its $\frac{e}{m}$ ratio is
 (a) $1.76 \times 10^{11} \text{ C / kg}$ (b) $2.5 \times 10^9 \text{ C / kg}$
 (c) $1.5 \times 10^5 \text{ C / kg}$ (d) $9.8 \times 10^3 \text{ C / kg}$
- 34.** The ratio of the wavelength of first line of Balmer series to the first line of Lyman series is
 (a) 3 : 1 (b) 17 : 5
 (c) 27 : 5 (d) 27 : 3
- 35.** A p - n junction is designed to withstand current up to a maximum in 10 mA. A resistor $R = 200 \Omega$ is connected in series with it. When forward biased the diode has a potential drop of 0.5 V. The maximum voltage of the battery required to forward bias the diode is
 (a) 2.5 V (b) 1.5 V (c) 2 V (d) 10 V

36. What is the Boolean equation for the figure ?



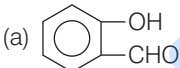
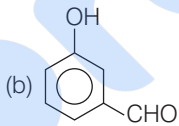
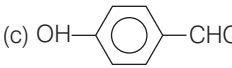
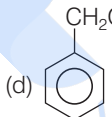
- (a) $Y = A + B$ (b) $Y = \overline{A + B}$
(c) $Y = \overline{A} + \overline{B}$ (d) $Y = \overline{A \cdot B}$
37. A geo-stationary satellite is orbiting the earth at height of $6R$ above the surface of the earth, R being the radius of earth. The time period of another satellite at a height of $2.5R$ from the surface of the earth is
(a) 10 h (b) $6\sqrt{2}$ h
(c) 6 h (d) $6\sqrt{2}$ h
38. For a colour of light the wavelength for air is $6000 \text{ \AA}$ and in water the wavelength is $4500 \text{ \AA}$. Then the speed of light in water will be
(a) $5 \times 10^{14} \text{ m/s}$ (b) $2.25 \times 10^8 \text{ m/s}$
(c) $4.0 \times 10^8 \text{ m/s}$ (d) zero
39. When an equilateral prism of refractive index $\sqrt{2}$ produces minimum deviation the angle of incidence at the first face must be
(a) 30° (b) 42°
(c) 60° (d) 75°
40. Two equal charges q are kept fixed at a and $+a$ along the x -axis. A particle of mass m and charge $\frac{q}{2}$ is brought to the origin and given a small displacement along the x -axis, then
(a) the particle executes oscillatory motion
(b) the particle remains stationary
(c) the particle executes, SHM along x -axis
(d) the particle executes SHM along y -axis
41. Two equal point charges, $Q = +\sqrt{2} \mu\text{C}$ are placed at each of the two opposite corners of a square and equal point charges q at each of the other two corners. The value of q , so that the resultant force on Q is zero is
(a) $+0.5 \mu\text{C}$ (b) $-0.5 \mu\text{C}$
(c) $1 \mu\text{C}$ (d) $-1 \mu\text{C}$
42. The linear momentum is increased by 50%, the kinetic energy will increase by
(a) 50% (b) 100%
(c) 125% (d) 25%
43. Two capacitors, one 4 pF and the other 6 pF , connected in parallel, are charged by a 100 V battery. The energy stored in the capacitors is
(a) $12 \times 10^{-8} \text{ J}$ (b) $2.4 \times 10^{-8} \text{ J}$
(c) $5.0 \times 10^{-8} \text{ J}$ (d) $1.2 \times 10^{-6} \text{ J}$
44. A voltmeter of resistance 998Ω is connected across a cell of emf 2 V and internal resistance 2Ω . The potential difference across the voltmeter is
(a) 1.99 V (b) 3.5 V (c) 5 V (d) 6 V
45. In the adjoining circuit, the resistances are given in ohm, X and Y are unknown resistances. The current through the 10Ω resistance is 3 A while that through the resistance X is 1 A . No current passes through the galvanometer. The values of the unknown resistances X and Y are respectively



- (a) 12Ω and 12Ω (b) 12Ω and 6Ω
(c) 6Ω and 12Ω (d) 6Ω and 6Ω
46. A sinusoidal voltage of peak value 300 V and an angular frequency $\omega = 400 \text{ rad/s}$ is applied to a series L - C - R circuit, in which $R = 3 \Omega$, $L = 20 \text{ mH}$ and $C = 625 \mu\text{F}$. The peak current in the circuit is
(a) $30\sqrt{2} \text{ A}$ (b) 60 A
(c) 100 A (d) $60\sqrt{2} \text{ A}$
47. The photoelectric cut-off voltage in an experiment was found to be 1.5 V . The work function for the material used in the experiment was 4.2 eV . The maximum kinetic energy of the photoelectrons that emitted was
(a) 1.5 eV (b) 2.7 eV (c) 4.2 eV (d) 5.7 eV
48. First diffraction minima due to a single slit of width 10^{-4} cm is at $\theta = 30^\circ$. Then wavelength of the light used is
(a) $4000 \text{ \AA}$ (b) $5000 \text{ \AA}$
(c) $6000 \text{ \AA}$ (d) $6250 \text{ \AA}$

49. When the inputs of a two input logic gate are 0 and 0, the output is 1. When the inputs are 1 and 0 the output is 0. The logic gate is of the type
 (a) AND
 (b) NAND
 (c) NOR
 (d) OR
50. A stationary police car sounds a siren with a frequency of 990 Hz. If the speed of sound is 330 m/s, an observer, driving towards the car with a speed of 33 m/s, will hear a frequency of
 (a) 891 Hz
 (b) 900 Hz
 (c) 1089 Hz
 (d) 1100 Hz

Chemistry

1. For f -orbital the values of m are
 (a) $-2, -1, 0, +1, +2$
 (b) $-3, -2, -1, 0, +1, +2, +3$
 (c) $-1, 0, +1$
 (d) $0, +1, +2, +3$
2. The mass of oxygen that would be required to produce enough CO which completely reduces 1.6 kg Fe_2O_3 (at. mass Fe = 56), is
 (a) 240 g (b) 480 g (c) 720 g (d) 960 g
3. Which of the following is most acidic ?
 (a)  (b) 
 (c)  (d) 
4. Purification of NaCl by passage of hydrogen chloride through brine is based on
 (a) Common ion effect
 (b) Distribution coefficient
 (c) Le-Chatelier's principle
 (d) Distribution law
5. Wurtz reaction involves the reduction of alkyl halide with
 (a) Zn/HCl (b) HI
 (c) Zn/Cu Couple (d) Na in ether
6. Dry distillation of calcium benzoate gives
 (a) benzaldehyde (b) acetophenone
 (c) benzoic acid (d) benzophenone
7. Which one of the following reacts with Grignard reagent to form an addition product which can be hydrolysed to a carboxylic acid ?
 (a) O_2 (b) CO_2
 (c) SO_2 (d) None of these
8. Vinegar is dilute aqueous solution of
 (a) ethanoic acid (b) benzoic acid
 (c) citric acid (d) oxalic acid
9. If ionic radius of Cs^+ and Cl^- are 1.69 Å and 1.81 Å respectively, the edge length of unit cell is
 (a) 4.04 Å (b) 3.50 Å
 (c) 7.00 Å (d) None of these
10. What mass of calcium chloride in grams would be enough to produce 14.35 g of AgCl ? (Atomic mass Ca = 40, Ag = 108)
 (a) 5.55 g (b) 8.295 g
 (c) 11.19 g (d) 16.59 g
11. In hydrogen spectrum, the series of lines appearing in ultra violet region of electromagnetic spectrum are called
 (a) Balmer lines (b) Lyman lines
 (c) Pfund lines (d) Brackett lines
12. The set representing the correct order of first ionisation potential is
 (a) $\text{K} > \text{Na} > \text{Li}$ (b) $\text{Be} > \text{Mg} > \text{Ca}$
 (c) $\text{B} > \text{C} > \text{N}$ (d) $\text{Ge} > \text{Si} > \text{C}$
13. Fog is a colloidal solution of
 (a) gas in gas (b) solid in gas
 (c) liquid in gas (d) None of these

- 14.** The oxidation number of N and Cl in NOClO_4 respectively are
 (a) + 2 and + 7 (b) + 3 and + 7
 (c) - 3 and + 5 (d) + 2 and - 7
- 15.** Which of the following statements is correct regarding the slag obtained during the extraction of iron ?
 (a) The slag is lighter and has lower melting point than the metal.
 (b) The slag is lighter and has higher melting point than the metal.
 (c) The slag is heavier and has lower melting point than metal.
 (d) The slag is heavier and has higher melting point than the metal.
- 16.** Which one of the following complexes is an outer orbital complex ?
 (a) $[\text{Fe}(\text{CN})_6]^{4-}$ (b) $[\text{Mn}(\text{CN})_6]^{4-}$
 (c) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (d) $[\text{Ni}(\text{NH}_3)_6]^{2+}$
- 17.** Which of the following is the most sweetest sugar ?
 (a) Sucrose (b) Fructose
 (c) Glucose (d) Lactose
- 18.** What is the kinetic energy of 1 g of O_2 at 47°C ?
 (a) $2.17 \times 10^2 \text{ J}$ (b) $2.24 \times 10^2 \text{ J}$
 (c) $1.24 \times 10^2 \text{ J}$ (d) None of these
- 19.** The osmotic pressure of 0.2 molar solution of urea at 300 K is
 ($R = 0.082 \text{ L atm mol}^{-1}\text{K}^{-1}$)
 (a) 4.92 atm (b) 1 atm
 (c) 0.25 atm (d) 27 atm
- 20.** Reduction of glucose with NaBH_4 gives
 (a) sorbitol (b) mannitol
 (c) Both (a) and (b) (d) *n*-hexane
- 21.** Decarboxylation of sodium propionate leads to the formation of
 (a) methane (b) ethene
 (c) propanone (d) ethane
- 22.** Formic acid reacts with PCl_5 to form
 (a) methyl chloride
 (b) acetyl chloride
 (c) formyl chloride
 (d) carbon monoxide and hydrogen chloride
- 23.** Which of the following conditions regarding the chemical process ensures its spontaneity at all temperatures ?
 (a) $\Delta H < 0$; $\Delta S < 0$
 (b) $\Delta H > 0$; $\Delta S < 0$
 (c) $\Delta H < 0$; $\Delta S > 0$
 (d) $\Delta H > 0$; $\Delta S > 0$
- 24.** The equilibrium constant for a reaction is 10. ΔG° will be ($R = 8 \text{ JK}^{-1} \text{ mol}^{-1}$, $T = 300 \text{ K}$)
 (a) - 5527 kJ mol^{-1} (b) - 5.527 kJ mol^{-1}
 (c) - 55.27 kJ mol^{-1} (d) + 5.527 kJ mol^{-1}
- 25.** Which of the following is most basic ?
 (a) $\text{CH}_3\text{CH}_2\text{NH}_2$ (b) CH_3CONH_2
 (c) $\text{C}_6\text{H}_5\text{CONCH}_3$ (d) NH_2NH_2
- 26.** The mass of CaCO_3 required to react with 25 mL of 0.75 M HCl is
 (a) 0.94 g (b) 9.4 g
 (c) 0.094 g (d) 0.49 g
- 27.** For azimuthal quantum number $l = 3$, m can have
 (a) only one value (b) 3 values
 (c) 5 values (d) 7 values
- 28.** The ionisation energy of nitrogen is larger than that of oxygen because
 (a) the size of nitrogen atom is smaller
 (b) there is greater attraction of electrons towards the nucleus
 (c) half-filled *p*-orbitals of nitrogen have extra stability
 (d) None of the above
- 29.** The two-third life ($t_{2/3}$) of a first order reaction in which $k = 5.48 \times 10^{-14}$ per sec, is
 (a) $\frac{2.303}{5.48 \times 10^{-14}} \log 3$ (b) $\frac{2.303}{5.48 \times 10^{-14}} \log 2$
 (c) $\frac{2.303}{5.48 \times 10^{-14}} \log \frac{1}{3}$ (d) $\frac{2.303}{5.48 \times 10^{-14}} \log \frac{2}{3}$
- 30.** The molecule (ion) having one unpaired electron is
 (a) NO (b) CO (c) CN^- (d) O_2
- 31.** Oxygen has an oxidation state of + 2 in
 (a) H_2O_2 (b) H_2O
 (c) F_2O (d) SO_2

32. Find the pH value of the mixture containing 50 cc M HCl and 30 cc M NaOH solution, assuming both to be completely ionised.
 (a) 0.7051 (b) 0.6021
 (c) 10.051 (d) 8.052
33. C_p / C_V for noble gases is
 (a) 1.66 (b) 1.43 (c) 1.80 (d) 1.33
34. Carbylamine test is performed in alcoholic KOH by heating a mixture of
 (a) chloroform and silver powder
 (b) trihalogenated methane and a primary amine
 (c) an alkyl halide and a primary amine
 (d) an alkyl cyanide and a primary amine
35. Relative acidity of the following is in the order
 (a) $\text{RCOOH} > \text{H}_2\text{CO}_3 > \text{C}_6\text{H}_5\text{OH} > \text{H}_2\text{O} > \text{ROH}$
 (b) $\text{RCOOH} > \text{ROH} > \text{H}_2\text{CO}_3 > \text{C}_6\text{H}_5\text{OH} > \text{H}_2\text{O}$
 (c) $\text{ROH} > \text{RCOOH} > \text{H}_2\text{CO}_3 > \text{C}_6\text{H}_5\text{OH} > \text{H}_2\text{O}$
 (d) $\text{RCOOH} > \text{C}_6\text{H}_5\text{OH} > \text{ROH} > \text{H}_2\text{CO}_3 > \text{H}_2\text{O}$
36. The compound which reacts fastest with Lucas reagent at room temperature is
 (a) butan-1-ol (b) butan-2-ol
 (c) 2-methyl propan-1-ol (d) 2-methyl propan-2-ol
37. $\text{HCHO} \xrightarrow{\text{Reduction}} \text{A} \xrightarrow{\text{P and I}_2} \text{B} \xrightarrow{\text{KCN}} \text{C}$
 $\xrightarrow{\text{Hydrolysis}} \text{D. 'D' is}$
 (a) acetic acid (b) ethylamine
 (c) acetamide (d) None of these
38. The conjugate base of the acid H_2S is
 (a) HS^- (b) S^{2-}
 (c) S (d) None of these
39. Which one of the following is not coloured ?
 (a) Cu^{2+} (b) Cu^+ (c) Ni^{2+} (d) Fe^{3+}
40. Glycine can be obtained from formaldehyde by
 (a) Strecker synthesis
 (b) Williamson's synthesis
 (c) Phthalimide synthesis
 (d) Coupling reaction
41. The rate of $\text{S}_\text{N}2$ reaction is maximum when the solvent is
 (a) CH_3OH (b) H_2O
 (c) DMSO (d) benzene
42. The effective atomic number of central Cu (at. no. 29) metal in $[\text{Cu}(\text{NH}_3)_4] \text{SO}_4$ is
 (a) 29 (b) 30
 (c) 35 (d) 36
43. The reaction is spontaneous if the cell potential is
 (a) positive (b) negative
 (c) zero (d) infinite
44. In a face centred cubic lattice a unit cell is shared equally by how many unit cells ?
 (a) 4 (b) 2
 (c) 6 (d) 8
45. Which of the following will show geometrical isomerism ?
 (a) 1-butene
 (b) 1, 2-dibromobutene
 (c) Propene
 (d) iso-butylene
46. Which amino acids are essential building units of proteins ?
 (a) α -amino acids
 (b) β -amino acids
 (c) γ -amino acids
 (d) None of the above
47. $\text{CH}_2 = \text{CH}_2 + \text{CH}_2\text{N}_2 \longrightarrow \Delta$
 Intermediate in the above reaction is
 (a) $\overset{+}{\text{C}}\text{H}_2 - \bar{\text{C}}\text{H}_2$ (b) $\text{CH}_2\text{CH}_2\overset{+}{\text{C}}\text{H}_2\bar{\text{N}}_2$
 (c) $\bar{\text{C}}\text{H}_2\text{CH}_2\overset{+}{\text{C}}\text{H}_2$ (d) $:\text{CH}_2$
48. The first compound of noble gas prepared by Bartlett was
 (a) XeOF_4 (b) $\text{Xe}^+ [\text{PtF}_6]^-$
 (c) XeF_4 (d) XeF_6
49. $\text{K}_2\text{Cr}_2\text{O}_7$ on heating with aqueous caustic soda gives
 (a) CrO_4^{2-} (b) $\text{Cr}(\text{OH})_2$
 (c) $\text{Cr}(\text{OH})_3$ (d) $\text{Cr}_2\text{O}_7^{2-}$
50. The energy of second Bohr orbit of the hydrogen atom is -328 kJ mol^{-1} , hence the energy of fourth Bohr orbit would be
 (a) -41 kJ mol^{-1} (b) $-1312 \text{ kJ mol}^{-1}$
 (c) -164 kJ mol^{-1} (d) -82 kJ mol^{-1}

Mathematics

1. If the roots of $x^2 + ax + 9 = 0$ are complex, then
 - (a) $a < 6$
 - (b) $a < -6$
 - (c) $|a| < 6$
 - (d) $|a| > 6$
2. If the projection of **PQ** on OX, OY, OZ are respectively 12, 3 and 4, then the magnitude of **PQ** is
 - (a) 169
 - (b) 19
 - (c) 13
 - (d) 144
3. In the set Q^+ of all positive rational numbers, the operation $*$ is defined by the formula $a * b = \frac{ab}{6}$. Then, the inverse of 9 with respect to $*$ is
 - (a) 4
 - (b) 3
 - (c) $\frac{1}{9}$
 - (d) $\frac{1}{3}$
4. $\int_0^1 \frac{d}{dx} \left[\sin^{-1} \left(\frac{2x}{1+x^2} \right) \right] dx$ is equal to
 - (a) 0
 - (b) $\frac{\pi}{2}$
 - (c) $\frac{\pi}{4}$
 - (d) $\frac{\pi}{3}$
5. If $4 \sin^{-1} x + \cos^{-1} x = \pi$, then x is equal to
 - (a) $\frac{1}{2}$
 - (b) 2
 - (c) 1
 - (d) $\frac{1}{3}$
6. $\sum_{n=1}^{\infty} \frac{(-1)^n}{n+1}$ is equal to
 - (a) e^{-1}
 - (b) $\log 2 - 1$
 - (c) 1
 - (d) 0
7. If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$, then the value of $x + y + z - xyz$ is
 - (a) 1
 - (b) 0
 - (c) -1
 - (d) $\frac{1}{2}$
8. $(p \wedge \sim q) \wedge (\sim p \vee q)$ is
 - (a) a contradiction
 - (b) a tautology
 - (c) either (a) or (b)
 - (d) neither (a) nor (b)
9. The coefficient of x in the expansion of $(1 + x + x^2 + x^3)^{-3}$ is
 - (a) 6
 - (b) 9
 - (c) 5
 - (d) -3
10. If $f(x+y) = f(x) \cdot f(y)$, $f(3) = 3$, $f'(0) = 11$, then $f'(3)$ is equal to
 - (a) $11 \cdot e^{33}$
 - (b) 33
 - (c) 11
 - (d) $\log 33$
11. The line $\frac{x}{a} - \frac{y}{b} = 1$ cuts the x -axis at P . The equation of the line through P perpendicular to the given line is
 - (a) $x + y = ab$
 - (b) $x + y = a + b$
 - (c) $ax + by = a^2$
 - (d) $bx + ay = b^2$
12. $\cos^{-1} x + \cos^{-1} y = 2\pi$, then the value of $\sin^{-1} x + \sin^{-1} y$ is equal to
 - (a) 0
 - (b) π
 - (c) $-\pi$
 - (d) None of these
13. If $\log_3 2$, $\log_3 (2^x - 5)$ and $\log_3 \left(2^x - \frac{7}{2} \right)$ are in AP, the value of x is
 - (a) 2
 - (b) 3
 - (c) 0
 - (d) $\frac{1}{3}$
14. $\int_0^1 x(1-x)^{12} dx$ is equal to
 - (a) $\frac{1}{132}$
 - (b) $\frac{1}{156}$
 - (c) $\frac{1}{182}$
 - (d) None of the above
15. The middle term of $\left(\sqrt{x} - \frac{1}{\sqrt{x}} \right)^6$ is
 - (a) -20
 - (b) -1
 - (c) 1
 - (d) None of these
16. If every element of a group G is its own inverse, then G is
 - (a) finite
 - (b) infinite
 - (c) not abelian
 - (d) abelian
17. If $P(n)$ is a statement such that $P(3)$ is true. Assuming $P(k)$ is true $\Rightarrow P(k+1)$ is true for all $k \geq 3$, then $P(n)$ is true
 - (a) for all n
 - (b) for $n \geq 3$
 - (c) for $n \geq 4$
 - (d) None of these

18. If $\Delta = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = k(a-b)(b-c)(c-a)$,

then k is equal to

- (a) -2 (b) 1 (c) 2 (d) abc

19. The number of ways in which a team of 11 player can be selected from 22 players including 2 of them and excluding 4 of them is

- (a) ${}^{16}C_{11}$ (b) ${}^{16}C_5$ (c) ${}^{16}C_9$ (d) ${}^{20}C_8$

20. If $\Delta_1 = \begin{vmatrix} x & a & b \\ b & x & a \\ a & b & x \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ are the

given determinants, then

- (a) $\Delta_1 = 3(\Delta_2)^2$ (b) $\left(\frac{d}{dx}\right)(\Delta_1) = 3\Delta_2$
(c) $\left(\frac{d}{dx}\right)(\Delta_1) = 3(\Delta_2)^2$ (d) $\Delta_1 = 3(\Delta_2)^{3/2}$

21. $\int_{-1/2}^{1/2} \frac{dx}{(1-x^2)^{1/2}}$ is equal to

- (a) $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) 0

22. $\lim_{n \rightarrow \infty} \left[\frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{6n} \right]$

- (a) $\log 2$ (b) $\log(1 + \sqrt{5})$
(c) $\log 6$ (d) 0

23. The degree of the differential equation

$$\left[5 + \left(\frac{dy}{dx} \right)^2 \right]^{\frac{5}{3}} = x^5 \left[\frac{d^2y}{dx^2} \right] \text{ is}$$

- (a) 4 (b) 3 (c) 5 (d) 10

24. The difference of the focal distance of any point on the hyperbola is equal to its

- (a) latusrectum
(b) eccentricity
(c) length of the transverse axis
(d) half the length of the transverse axis

25. If α, β, γ are the angles which a half ray makes with the positive direction of the axes, then $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma$ is equal to

- (a) 1 (b) 2 (c) 0 (d) -1

26. If $f(x) = \begin{cases} 3x^2 + 12x - 1, & -1 \leq x \leq 2 \\ 37 - x, & 2 \leq x \leq 3 \end{cases}$, then

- (a) $f(x)$ is decreasing on $[-1, 2]$
(b) $f'(2)$ does not exist
(c) $f(x)$ has the maximum value at $x = 2$
(d) None of the above

27. $\mathbf{a} = \frac{1}{7}(2\hat{i} + 3\hat{j} + 6\hat{k})$, $\mathbf{b} = \frac{1}{7}(3\hat{i} - \lambda\hat{j} + 2\hat{k})$. If $\mathbf{a}$ and $\mathbf{b}$ are mutually perpendicular, then value of λ is

- (a) 2 (b) -1
(c) 6 (d) -6

28. The locus of the point of intersection of two perpendicular tangents to a circle is called

- (a) point circle (b) circumcircle
(c) director circle (d) auxiliary circle

29. The area bounded by the curve $y = x^4 - 2x^3 + x^2 + 3$ with x -axis and ordinates corresponding to the minima of y is

- (a) 1 sq unit (b) $\frac{91}{30}$ sq unit
(c) $\frac{30}{9}$ sq unit (d) 4 sq unit

30. $\int (e^{a \log x} + e^{x \log a}) dx$ is equal to

- (a) $\frac{x^{a+1}}{a+1} + c$
(b) $\frac{x^{a+1}}{a+1} + \frac{a^x}{\log a} + c$
(c) $x^{a+1} + a^x + c$
(d) $\frac{x^{a+1}}{a-1} + \frac{\log a}{a^x} + c$

31. $\lim_{n \rightarrow \infty} \left(\frac{1}{\sqrt{4n^2 - 1}} + \frac{1}{\sqrt{4n^2 - 2^2}} + \dots + \frac{1}{\sqrt{3n^2}} \right)$ is equal to

- (a) 0 (b) 1
(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$

32. $\int \frac{dx}{x^2 + 4x + 13}$ is equal to

- (a) $\log(x^2 + 4x + 13) + c$ (b) $\frac{1}{3} \tan^{-1} \left(\frac{x+2}{3} \right) + c$
(c) $\log(2x + 4) + c$ (d) $\frac{1}{x^2 + 4x + 13} + c$

- 33.** Consider the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ the area of the triangle formed by the asymptotes and the tangent drawn to it at $(a, 0)$ is
 (a) $\frac{1}{2}ab$ (b) ab (c) $2ab$ (d) $4ab$
- 34.** The differential equation of the family of lines passing through the origin is
 (a) $x \frac{dy}{dx} + y = 0$ (b) $x + \frac{dy}{dx} = 0$
 (c) $x \frac{dy}{dx} - y = 0$ (d) $\frac{dy}{dx} = x$
- 35.** If $P = \begin{bmatrix} i & 0 & -i \\ 0 & -i & i \\ -i & i & 0 \end{bmatrix}$ and $Q = \begin{bmatrix} -i & i \\ 0 & 0 \\ i & -i \end{bmatrix}$, then PQ is equal to
 (a) $\begin{bmatrix} -2 & 2 \\ 1 & -1 \\ 1 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & -2 \\ -1 & 1 \\ -1 & 1 \end{bmatrix}$
 (c) $\begin{bmatrix} 2 & -2 \\ -1 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
- 36.** If $x = \sin^{-1} (3t - 4t^3)$ and $y = \cos^{-1} (\sqrt{1-t^2})$, then $\frac{dy}{dx}$ is equal to
 (a) $1/3$ (b) $2/5$
 (c) $3/2$ (d) $2/3$
- 37.** If $x^2 + px + q = 0$ is the quadratic equation whose roots are $a - 2$ and $b - 2$, where a and b are the roots of $x^2 - 3x + 1 = 0$, then
 (a) $p = 1, q = 5$ (b) $p = 5, q = 1$
 (c) $p = 1, q = 1$ (d) $p = 1, q = -1$
- 38.** If the position vectors of A, B, C are respectively $\hat{i} - 2\hat{j} + \hat{k}, 2\hat{i} + 3\hat{j}$ and $2\hat{i} - \hat{k}$, then the projection of $\overrightarrow{AB}$ on $\overrightarrow{BC}$ is equal to
 (a) $\frac{-14}{\sqrt{10}}$ (b) $\sqrt{5}$ (c) $\sqrt{7}$ (d) 2
- 39.** The area between $y^2 + 4x - 8 = 0$, the x -axis and the line $x = 1$ is
 (a) $\frac{4}{3}$ sq unit (b) $\frac{2}{3}$ sq unit
 (c) $\frac{1}{3}$ sq unit (d) 1 sq unit
- 40.** The solution of the equation $(2y - 1) dx - (2x + 3) dy = 0$ is
 (a) $\frac{2x-1}{2y+3} = c$ (b) $\frac{2x+3}{2y-1} = c$
 (c) $\frac{2x-1}{2y-1} = c$ (d) $\frac{2y+1}{2x-3} = c$
- 41.** If the n th term of the geometric progression, $5, -\frac{5}{2}, \frac{5}{4}, -\frac{5}{8}, \dots$ is $\frac{5}{1024}$, then the value of n is
 (a) 11 (b) 10 (c) 9 (d) 4
- 42.** If $77x \equiv 88 \pmod{5}$, then x is equal to
 (a) 4 (b) 61 (c) 59 (d) 48
- 43.** Negation of "Paris is in France and London is in England" is
 (a) Paris is in England and London is in France.
 (b) Paris is not in France or London is not in England.
 (c) Paris is in England or London is in France.
 (d) None of the above
- 44.** If $C(2n, 3) : C(n, 2) = 44 : 3$, then n is equal to
 (a) 6 (b) 7 (c) 5 (d) 8
- 45.** If $f(x) = \frac{3x + \tan^2 x}{x}$ is continuous at $x = 0$, then $f(0)$ is equal to
 (a) 3 (b) 2 (c) 4 (d) 0
- 46.** $0.2 + 0.22 + 0.222 + \dots$ to n terms is equal to
 (a) $\left(\frac{2}{9}\right) - \left(\frac{2}{81}\right)(1 - 10^{-n})$
 (b) $n - \left(\frac{1}{9}\right)(1 - 10^{-n})$
 (c) $\left(\frac{2}{9}\right) \left[n - \left(\frac{1}{9}\right)(1 - 10^{-n}) \right]$
 (d) $\left(\frac{2}{9}\right)$
- 47.** If ω is an imaginary cube root of 1, then $(1 + \omega - \omega^2)^5 + (1 - \omega + \omega^2)^5$ is equal to
 (a) 16 (b) 8 (c) 9 (d) 32
- 48.** The equation of the circle circumscribing the triangle formed by the lines $x + y = 6$, $2x + y = 4$ and $x + 2y = 5$ is
 (a) $x^2 + y^2 + 17x + 19y - 50 = 0$
 (b) $x^2 + y^2 - 17x - 19y - 50 = 0$
 (c) $x^2 + y^2 + 17x - 19y - 50 = 0$
 (d) $x^2 + y^2 - 17x - 19y + 50 = 0$

49. $\lim_{x \rightarrow 0} \frac{\sin 3x - \sin x}{\sin x}$ is
(a) -2 (b) 2
(c) 0 (d) None of these
50. If the product of roots of the equation $mx^2 + 6x + (2m - 1) = 0$ is -1, then the value of m is
(a) 1 (b) -1 (c) $\frac{1}{3}$ (d) $-\frac{1}{3}$
51. $\int_0^{2a} \frac{f(x)}{f(x) + f(2a - x)} dx$ is equal to
(a) a (b) $-a$ (c) 1 (d) 0
52. $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx$ is equal to
(a) $2 \tan x + c$ (b) $\sqrt{\cot x} + c$
(c) $2 \sqrt{\tan x} + c$ (d) $\tan^2 x + c$
53. The equation of the tangent to the curve $(1 + x^2)y = 2 - x$, where it crosses the x -axis, is
(a) $x + 5y = 2$ (b) $x - 5y = 2$
(c) $5x - y = 2$ (d) $5x + y - 2 = 0$
54. $\lim_{x \rightarrow 0} \frac{1 - \cos mx}{1 - \cos nx}$ is equal to
(a) $\frac{m}{n}$ (b) $\frac{m^2}{n^2}$ (c) 0 (d) $\frac{n^2}{m^2}$
55. If $\mathbf{a}, \mathbf{b}, \mathbf{c}$ are any three mutually perpendicular vectors of equal magnitude a , then $|\mathbf{a} + \mathbf{b} + \mathbf{c}|$
(a) a (b) $\sqrt{2}a$ (c) $\sqrt{3}a$ (d) $2a$
56. For what values of n is the graph K_n Eulerian?
(a) Odd values of n
(b) Even values of n
(c) Both odd and even values of n
(d) None of the above
57. When 5^{20} is divided by 7, the remainder is
(a) 1 (b) 3 (c) 4 (d) 6
58. If $a * b$ denote the bigger among a and b and $a \cdot b = (a * b) + 3$, then $4 \cdot 7$ is equal to
(a) 4 (b) 31 (c) 10 (d) 8
59. In a tree on n vertices there is exactly one vertex with degree 2 and remaining vertices are of degree either 1 or 3. Then the number of pendant vertices is
(a) 8 (b) 5 (c) 4 (d) 6
60. $\frac{1}{\log_{25} 10} + \frac{1}{\log_4 10} + \frac{1}{\log_{\sqrt{2}} 10} + \frac{1}{\log_{\sqrt{5}} 10}$ is equal to
(a) $3/2$ (b) 2 (c) 3 (d) $5/2$
61. If the angle between two lines represented by $2x^2 + 5xy + 3y^2 + 7y + 4 = 0$ is $\tan^{-1} m$, then m is equal to
(a) $1/5$ (b) 1 (c) $7/5$ (d) 7
62. The foot of the perpendicular from $(-2, 3)$ to the line $2x - y - 3 = 0$
(a) $(-2, 3)$ (b) $(2, 1)$ (c) $(3, 2)$ (d) $(1, 2)$
63. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} |\sin x| dx$ is
(a) 2 (b) 0 (c) $\frac{\pi}{2}$ (d) 1
64. If $\begin{bmatrix} 2+x & 3 & 4 \\ 1 & -1 & 2 \\ x & 1 & -5 \end{bmatrix}$ is a singular matrix, then x is
(a) $\frac{13}{25}$ (b) $-\frac{25}{13}$ (c) $\frac{5}{13}$ (d) $\frac{25}{13}$
65. In triangle ABC , $a(b^2 + c^2)\cos A + b(c^2 + a^2)\cos B + c(a^2 + b^2)\cos C$ is equal to
(a) abc (b) $2abc$ (c) $3abc$ (d) $4abc$
66. The function $y = a(1 - \cos x)$ is maximum when x is equal to
(a) π (b) $\frac{\pi}{2}$ (c) $-\frac{\pi}{2}$ (d) $-\frac{\pi}{6}$
67. The volume of the parallelepiped whose sides are given by $\mathbf{OA} = 2\hat{i} - 3\hat{j}$, $\mathbf{OB} = \hat{i} + \hat{j} - \hat{k}$, $\mathbf{OC} = 3\hat{i} - \hat{k}$
(a) $\frac{4}{13}$ cu unit (b) 4 cu unit
(c) $\frac{2}{7}$ cu unit (d) None of these

- 68.** Is it possible for wheel W_n ($n \geq 3$) to be bipartite?
 (a) No (b) Yes
 (c) Do not say (d) None of these
- 69.** The GCD of 364 and 462 is
 (a) 3 (b) 11 (c) 14 (d) 7
- 70.** The system $x + 4y - 2z = 3$, $3x + y + 5z = 7$,
 $2x + 3y + z = 5$ has
 (a) infinite number of solutions
 (b) unique solution
 (c) trivial solution
 (d) no solution

English & General Aptitude

Directions (Q. 1–4) : Read the following passage carefully and answer the questions given below it.

Most employees decide their own working hours, set production quotas, improving product and processes, are responsible for their own quality and for approval of leadership appointments. Everyone votes on major corporate decisions and on how to split the profits.

As confidence in its novel approach has grown, Semco has happily abolished a lot more of the conventions by which businesses are usually run. No secretaries, receptionists or personal assistants. Reserved parking spaces and dining rooms, dress codes and almost all rules have gone, including those for travel and expenses.

- 1.** From the passage it is clear that the novel approach referred to is
 (a) aristocratic (b) autocratic
 (c) democratic (d) bureaucratic
- 2.** The employees referred to are
 (a) employees of a public sector undertaking
 (b) employees of a private company
 (c) employees of essential services
 (d) government employees
- 3.** In the given passage, 'Semco' is the name of
 (a) a business establishment
 (b) a brand of the product
 (c) a novel approach to things and affairs
 (d) the leader of secretaries, receptionists and personal assistants
- 4.** The term 'leadership appointments' has been used in this passage to signify
 (a) appointing officers-in-charge of various units/sections
 (b) selecting political leaders
 (c) selecting company directors
 (d) choosing trade union leaders

Directions (Q. 5–8) : In each of the following sentences, find out the part which has an error. If there is no error, your answer is (d).

- 5.** It cannot be forecasted (a)/how society will emerge (b)/a generation hence. (c)/No error (d).
- 6.** The Prime Minister has said that India would not have spent so much on defence (a)/if some of the neighbouring countries (b)/adopted the policy of restricting defence expenditure (c)/No error (d).
- 7.** I've been to a few of his lectures, (a)/but understood little of (b)/what he has said. (c)/No error (d).
- 8.** More leisure, as well as an abundance of goods, (a)/are attainable (b)/through automation (c)/No error (d).

Directions (Q. 9–10) : In each of the following questions, choose the alternative which best expresses the meaning of the word given in capital letters.

- 9. COMPETENCE**
 (a) Efficiency
 (b) Competition
 (c) Ability
 (d) Compensation

10. ADJUNCT

- (a) Adaptation (b) Addition
 (c) Decree (d) Oath

Directions (Q. 11–12) : Choose the correct sequence of the parts P, Q, R and S to make a proper sentence.

- 11.** (1) There are
 (P) laid on school games
 (Q) who support the emphasis
 (R) still those devotees of sports
 (S) and for whom sports is
 (6) a kind of religion.

The proper sequence should be

- (a) PQRS (b) PSQR
(c) RPSQ (d) RQPS

12. (1) The fact that

- (P) go to the police (Q) did not let him
(R) to speak the truth (S) he was a murderer
(6) about the theft.

The proper sequence should be

- (a) PRSQ (b) QSPR
(c) RQSP (d) SQPR

Directions (Q. 13–15) : *In each of the following questions, choose the most suitable alternative to fill in the blank.*

13. True happiness consists giving pleasure to others.

- (a) for (b) by
(c) in (d) of

14. The meeting was presided by the Prime Minister.

- (a) on (b) over
(c) in (d) upon

15. He is definitely

- (a) wrongly (b) in wrong
(c) in a wrong (d) in the wrong

Directions (Q. 16–25) : *In the following questions, choose the option which shows common feature in the relationship given in each question.*

16. Ganga : Narmada : Tapti

- (a) They are name of rivers
(b) They are dance form of India
(c) They are the currency of different countries
(d) They are the parliaments name of different countries

17. Leap : Frisk : Trot

- (a) They are youngone of animals
(b) They are Indian monuments
(c) They are movement of animals
(d) They are the name of famous zoological parks

18. Pen : Rubber : Pencil

- (a) They are goods for all purpose
(b) They are stationery goods
(c) They are famous Indian sites
(d) They are sports terms

19. Sunday : Monday : Saturday

- (a) They are name of the years
(b) They are name of the months
(c) They are name of the week days
(d) They are name of the rivers

20. Sale : Tale : Male

- (a) They have 2 vowels
(b) They have 4 consonants
(c) The words have no vowels
(d) The words have no consonants

21. Peso : Won : Taka

- (a) They are famous monuments
(b) They are name of the young ones of animals
(c) They are synonymous words
(d) None of the above

22. Jaipur : Bengaluru : Mumbai

- (a) They are the cities in Rajasthan
(b) They are the famous business cities of India
(c) They are the three biggest villages of India
(d) They are the capitals of Indian states

23. Colombo : Kathmandu : Havana

- (a) They are African cities
(b) They are European cities
(c) They are capitals of countries
(d) They are sports cities

24. Squeak : Hiss : Howl

- (a) They are names of animals
(b) They are currencies
(c) They are biggest animals on earth
(d) They are sound produced by animals

25. Kathak : Bharatnatyam : Odissi

- (a) They are the name of music instruments
(b) They are the classical dance forms of India
(c) They are the folk dance forms of India
(d) They are the names of Indian tribes

Directions (Q. 26 – 30) : *In the following questions, choose the group of words that shows the same relationship as given at the top of every question.*

26. The first regular session of United Nations Organisation was held in

- (a) Jan, 1946 (b) Jun, 1946
(c) Jan, 1947 (d) Jun, 1947

27. Tbilisi is the capital of

- (a) Finland
- (b) Georgia
- (c) Germany
- (d) Hungary

28. Which defence production undertakings is engaged in the design, development and manufacturing of electronic equipments ?

- | | |
|----------|---------|
| (a) HAL | (b) BEL |
| (c) BEML | (d) BDL |

29. Shanti Swarup Bhatnagar Awards are given in the field of

- (a) sports players
- (b) scientists for their exceptional performance
- (c) medical sciences
- (d) music

30. Central Electronics Engineering Research Institute is located at

- | | |
|--------------|---------------|
| (a) Durgapur | (b) Karaikudi |
| (c) Pilani | (d) Roorkee |

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