1. In the measurement of length 6 μm is equal to x pm. Then the value of x is

A) 1.5×10^{-5}

B) 1.2×10^{6}

C) 3×10^{-6}

D) 6×10^{6}

E) 2×10^{-12}

Correct Answer : Option D

2. Dimensions of the physical quantity X in the equation Force $= \dfrac{X}{\text{Volume}}$ are

A) $ML^{3}T^{2}$

B) MLT

C) $ML^{2}T^{2}$

D) MLT^{-2} (E)

E) $ML^{4}T^{2}$

Correct Answer : Option E

3. A man loses 50% of his velocity after running a distance of 100 m. If his retardation is uniform, the distance he will cover before coming to rest is

A) 45.2 m

B) 33.3 m

C) 27.5 m

D) 15.7 m

E) 50.5 m

Correct Answer : Option B

4. A projectile is given an initial velocity of $(\hat{i} + \hat{j})$ ms^{-1} where $\hat{i}$ is along the ground and $\hat{j}$ is along the vertical direction. The equation of its trajectory is ($g = 10$ ms^{-2})

A) $y^{2} = 2x$

B) $y^{2} - 1 = 5x$

C) $y = x - 5x^{2}$

D) $y = x^{2}$

E) $y = x^{2} - 2$

Correct Answer : Option C

5. A particle is describing a uniform circular motion with certain constant speed. The INCORRECT statement is

A) The velocity and acceleration vectors are perpendicular to each other

B) The velocity vector is tangential to the circular path

C) The centripetal acceleration is a variable acceleration

D) The acceleration vector points to the centre of the circle

E) The acceleration vector is tangential to the circular path

Correct Answer : Option E

6. A particle moves under the influence of a force in the *XY*-plane such that the components of its linear momentum $\vec{p}$ at any time t is $p_x = p\sin t$ and $p_y = p\cos t$. The angle between $\vec{F}$ and $\vec{p}$ at that time is

A) $45°$

B) $60°$

C) $30°$

D) $90°$

E) $0°$

Correct Answer : Option D

7. In a 'tug of war' game, two persons pull each other through a massless rope. The person who wins is

A) One whose weight is less

B) One who exerts more friction force (shearing force) on the ground

C) One who exerts more normal force (compressing force) on the ground

D) One who pulls the rope with a greater force

E) One whose weight is more

Correct Answer : Option B

8. When a spring of spring constant k is cut into two pieces whose lengths are l_1 and l_2, then the ratio of their spring constants k_1 and k_2 is

A) $\dfrac{l_2}{l_1}$

B) $\dfrac{l_1}{l_2}$

C) $\sqrt{l_1 l_2}$

D) $l_1 l_2$

E) $\dfrac{1}{l_1 l_2}$

Correct Answer : Option A

9. If *P* is the pressure at which heart is pumping the blood and the volume of blood pumped per second is *V*, then the power of heart is given by

A) $\dfrac{P}{V}$

B) $\dfrac{P^2}{V}$

C) PV

D) $\dfrac{P}{V_2}$

E) P^2V

Correct Answer : Option C

10. A block of mass M moves with a velocity v along a frictionless horizontal surface towards another block of mass $2M$ at rest. The velocity of centre of mass of the system of blocks is

A) $\dfrac{v}{2}$

B) $2v$

C) $3v$

D) $\dfrac{v}{3}$

E) $\dfrac{v}{4}$

Correct Answer : Option D

11. The radius of gyration of a regular solid cylinder of radius R about its axis is

A) $\dfrac{R}{2}$

B) R

C) $\dfrac{R}{\sqrt{2}}$

D) $2R$

E) $\dfrac{R}{4}$

Correct Answer : Option C

12. When two spheres of radii r and $r/2$ are brought in contact, the gravitational force of attraction between them is proportional to

A) r^6

B) r^4

C) r^{-6}

D) r^{-4}

E) r^{-2}

Correct Answer : Option E

13. The gravitational potential energy of a system of two bodies each of mass m and distance r between them is (G = gravitational constant, g = acceleration due to gravity)

A) $-\dfrac{Gm^2}{r^2}$

B) $-\dfrac{Gm^2}{r}$

C) $-\dfrac{gm^2}{r}$

D) $-G\dfrac{gm^2}{r}$

E) $-\dfrac{Ggm}{r^2}$

Correct Answer : Option B

14. Which of the following has maximum Young's modulus value?
A) Aluminium
B) Copper
C) Brass
D) Steel
E) Iron (Wrought)

Correct Answer : Option D

15. The energy stored in a soap bubble of diameter 4 cm is nearly (surface tension of soap solution is 0.07 Nm^{-1})

A) 8.5×10^{-3} J

B) 2.75×10^{-2} J

C) 7×10^{-4} J

D) 4.5×10^{-4} J

E) 3.15×10^{-3} J

Correct Answer : Option C

16. When two different liquids of same mass but at two different temperatures 27°C and 47°C are mixed together, the resulting temperature of the mixture is 35°C. The ratio of their specific heat capacities is

A) 1 : 3
B) 5: 3
C) 3 : 2
D) 4 : 1
E) 2 : 7

Correct Answer : Option C

17. Two perfectly black bodies are at temperatures T and 2T. The ratio between the wavelengths corresponding to maximum energy emission by the two black bodies is
A) 2 : 1
B) 1 : 2
C) 2 : 3
D) 3 : 2
E) 1 : 4

18. When water is heated from 0°C to 8°C, its volume

A) first decreases upto 4°C and then increases

B) first increases upto 4°C and then decreases

C) increases continuously

D) decreases continuously

E) does not change

19. The pressure of an ideal gas is proportional to the cube of its temperature (on absolute scale) in an adiabatic process. Then the value of the ratio C_p/C_v is

A) $\dfrac{7}{5}$

B) $\dfrac{5}{3}$

C) $\dfrac{4}{3}$

D) $\dfrac{3}{2}$

E) $\dfrac{7}{3}$

20. The average kinetic energy per molecule of an ideal gas at 27°C is E. The temperature of the gas at which the average kinetic energy per molecule will be 2E is

A) $127°C$

B) $227°C$

C) $327°C$

D) $400°C$

E) $527°C$

21. The instantaneous displacement of a particle executing simple harmonic motion is given by $x = 2(\cos \pi t + \sin \pi t)$. The amplitude of oscillation is

A) $3\sqrt{2}$

B) 4

C) $4\sqrt{2}$

D) $2\sqrt{2}$

E) $8\sqrt{2}$

> **Correct Answer :** Option D

22. The velocity of a travelling plane wave given by $y = 10^{-2} \sin\left(200t - \dfrac{x}{5}\right) m$, is

A) 10 ms^{-1}

B) 500 ms^{-1}

C) 400 ms^{-1}

D) 5 ms^{-1}

E) 1000 ms^{-1}

> **Correct Answer :** Option E

23. When a glass rod is rubbed with silk thread, it loses 1000 electrons. Then the charge on the glass rod is (electronic charge $e = 1.6 \times 10^{-19} C$)

A) $+1.6 \times 10^{-16}$ C

B) -1.6×10^{-19} C

C) -1.6×10^{-13} C

D) $+1.6 \times 10^{-19}$ C

E) -1.6×10^{-15} C

> **Correct Answer :** Option A

24. In bringing a proton towards another proton, the electrostatic potential energy of the system
A) decreases
B) increases
C) becomes zero
D) first increases and then decreases
E) remains the same

> **Correct Answer :** Option B

25. A parallel plate capacitor with a dielectric medium of dielectric constant 1.5 has a capacitance of C. If the dielectric is removed, then the capacitance of the capacitor becomes

A) $\dfrac{3}{2} C$

B) $\dfrac{1}{3} C$

C) $\dfrac{2}{3} C$

D) C

E) $\dfrac{C}{2}$

Correct Answer : Option C

26. When n identical cells are connected in parallel, they give

A) less current

B) more current

C) less voltage

D) more voltage

E) variable voltage and variable current

Correct Answer : Option B

27. Resistivity of a conductor increases with

A) increase in its length

B) decrease in its length

C) increase in its area of cross-section

D) decrease in its area of cross-section

E) increase in its temperature

Correct Answer : Option E

28. Kirchhoff's junction rule is based on conservation of

A) charge

B) energy

C) both energy and charge

D) angular momentum

E) linear momentum

Correct Answer : Option A

29. The magnetic force acting on a charged particle carrying a charge $3\,\mu C$ in a magnetic field of $5\,T$ acting in y-direction, when the particle velocity is $(\hat{i} + \hat{j}) \times 10^5\,ms^{-1}$ is

A) $0.5\,N$ in $+ x$ direction

B) $0.2\,N$ in $+ y$ direction

C) $2N$ in $- x$ direction

D) $1.5\,N$ in $- z$ direction

E) $1.5\,N$ in $+ z$ direction

Correct Answer : Option E

30. The magnetic moment μ associated with a charged particle carrying charge q moving in a circle of radius a with uniform speed v is

A) qva

B) $\dfrac{qva}{4}$

C) $\dfrac{qva}{2}$

D) $\dfrac{qva}{16}$

E) $\dfrac{qva}{8}$

Correct Answer : Option C

31. For a paramagnetic material, the magnetic susceptibility χ_{m} is

A) small, positive and varies inversely with temperature
B) small, negative and temperature independent
C) small, positive and temperature independent
D) very large, negative and temperature dependent
E) very large, positive and temperature independent

Correct Answer : Option A

32. An alternating current having peak value 14.14 A is used to heat a metal wire. The value of the direct current i required to produce the same heating effect in the same wire is

A) 0.707 A
B) 28.28 A
C) 7.07 A
D) 10 A
E) 14 A

Correct Answer : Option D

33. The number of windings in the primary and secondary of a transformer are 100 and 2000 respectively. If 50 V a.c is applied to the primary, the potential difference across the secondary is

A) 2000 V
B) 1000 V
C) 500 V
D) 1500 V
E) 2500 V

Correct Answer : Option B

34. The correct order of arrangement of electromagnetic waves according to their wavelengths is

A) Gamma rays < AM radio waves < FM radio waves < Micro waves
B) Micro waves < AM radio waves < FM radio waves < Gamma rays
C) Gamma rays < Micro waves < AM radio waves < FM radio waves
D) Gamma rays < Micro waves < FM radio waves < AM radio waves
E) AM radio waves < FM radio waves < Gamma rays < Micro waves

Correct Answer : Option D

35. An ink mark is made on a piece of paper and a glass slab of thickness t and refractive index μ is placed on it. If the image of the ink mark appears to be at a distance of x from the top surface of the slab, then the value of x is

A) μt

B) $\dfrac{t}{\mu}$

C) $\dfrac{\mu}{t}$

D) $\dfrac{\mu-1}{t}$

E) $\dfrac{t}{\mu-1}$

Correct Answer : Option B

36. If the ratio of amplitudes of two light waves is 2 : 1, then the ratio between the intensities of the two waves is

A) 4 : 1
B) 1 : 1
C) 1 : 2
D) 1 : 4
E) 2 : 1

Correct Answer : Option A

37. In Young's double slit experiment, to change the bandwidth from β to $\dfrac{\beta}{4}$ without changing the experimental setup, the wavelength of light λ used must be changed to

A) 4λ
B) 16λ
C) $\dfrac{\lambda}{4}$
D) $\dfrac{\lambda}{16}$
E) 8λ

Correct Answer : Option C

38. If the speed of a moving particle is decreased by 1%, the de Broglie wavelength of the wave associated with it

A) decreases by 1%
B) increases by 1%
C) decreases by 2%
D) increases by 2%
E) decreases by 5%

Correct Answer : Option B

39. The photoelectric work function for a photosensitive material is 5.2 eV. The energy of the incident radiation for which the stopping potential is 6 V is

A) 1.2eV
B) 5.6eV
C) 6eV
D) 10eV
E) 11.2eV

Correct Answer : Option E

40. When the hydrogen atom is excited from the ground state,

A) potential energy increases but kinetic energy decreases
B) both potential energy and kinetic energy decrease
C) both potential energy and kinetic energy increase
D) potential energy decreases but kinetic energy increases
E) there is no change in the total energy

Correct Answer : Option A

41. In a nuclear decay, after the emission of one α-particle and one β-particle

A) atomic number remains unchanged
B) mass number is reduced by 4 units
C) mass number is reduced by 8 units
D) mass number increases by 4 units
E) atomic number is increased by 2 units

Correct Answer : Option B

42. If nuclear radius of $^{125}_{52}Te$ is 6 fermi, then the nuclear radius of $^{27}_{13}Al$ in fermi is

A) 3.6
B) 5
C) 2.5
D) 1.7
E) 4.2

Correct Answer : Option A

43. Half-life of radon is 3.5 days. The amount of radon left out of 12 mg mass undecayed after 35 days is nearly

A) 0.006 mg
B) 0.012 mg
C) 0.024 mg
D) 0.036 mg
E) 0.048 mg

Correct Answer : Option B

44. In a p-n junction diode, reverse biasing

A) increases the number of majority charge carriers
B) decreases the number of minority charge carriers
C) increases the potential barrier
D) decreases the potential barrier
E) increases the number of both majority and minority charge carriers

Correct Answer : Option C

45. Which one of the following is not a semiconductor?

A) Si
B) Sb
C) Ge
D) CdS
E) GaAs

Correct Answer : Option B

46. The number of significant figures in 0.0500L is

A) one
B) two
C) three
D) four
E) five

Correct Answer : Option C

47. Isobars are atoms with the same

A) atomic number

B) mass number

C) number of electrons

D) number of protons

E) number of neutrons

Correct Answer : Option B

48. The element with atomic number 111 was first named as Unununnium. What is its IUPAC name?

A) Nobelium

B) Bohrium

C) Lawrencium

D) Rontgenium

E) Rutherfordium

Correct Answer : Option D

49. Octet rule is obeyed in

A) SCl_2

B) PF_5

C) SF_6

D) BCl_3

E) H_2SO_4

Correct Answer : Option A

50. A particular colour of light has wavelength of 663nm. What is the energy possessed by the light? (Planck's constant= 6.63×10^{-34} J s ; Velocity of light= 3×10^8 m s^{-1})

A) 6.63×10^{-19} J

B) 6.63×10^{-20} J

C) 1.5×10^{-19} J

D) 3.0×10^{-20} J

E) 3.0×10^{-19} J

Correct Answer : Option E

51. The molar enthalpy of vaporization of water at 1 bar and 100°C is 41 kJ mol^{-1}. What is the internal energy change, when 1 mol of water is vapourised at 1 bar pressure and 100°C. Assume water vapour as a perfect gas. (R=8.3 J K^{-1}mol^{-1})

A) 37.9 kJ mol^{-1}

B) 44.1 kJ mol^{-1}

C) 34.7 kJ mol^{-1}

D) 47.9 kJ mol^{-1}

E) 34.9 kJ mol^{-1}

Correct Answer : Option A

52. 0.1 M HCl and 0.1 M H_2SO_4 each of volume 2 mL are mixed and the volume is made up to 6 mL by adding 2 mL of 0.01 N NaCl solution. The pH of the resulting mixture is

A) 1.17

B) 1.0

C) 0.3

D) log 2 – log 3

E) log 3 – log 2

Correct Answer : Option B

53. Which of the following molecule has two sigma (σ) and two pi (π) bonds?

A) N_2

B) C_2H_6

C) N_2F_2

D) HCN

E) $C_2H_2Cl_2$

Correct Answer : Option D

54. The following results were obtained in the gas phase reaction between nitric oxide and oxygen at a given temperature.

$[NO]_0$/ mol L^{-1}	$[O_2]_0$/ mol L^{-1}	Initial rate of formation of NO_2/mol $L^{-1}s^{-1}$
0.30	0.30	0.096
0.60	0.30	0.384
0.30	0.60	0.192

The total order and order in $[O_2]$ of the reaction are respectively

A) 3 and 2

B) 2 and 2

C) 2 and 1

D) 3 and 0

E) 3 and 1

Correct Answer : Option E

55. Which of the following is an example of pseudo fist order reaction?

A) Thermal decomposition of N_2O_5 gas

B) Decomposition of HI on gold surface

C) Decomposition of NH_3 on platinum surface

D) Inversion of sucrose

E) Hydrogenation of ethene

Correct Answer : Option D

56. Which of the following changes alone would cause increase in the value of equilibrium constant of the reaction? $PCl_5(g) \leftrightharpoons PCl_3(g) + Cl_2(g)$; $\Delta H > 0$.

A) Increasing the volume of the reaction vessel

B) Decreasing the volume of the reaction vessel

C) Addition of catalyst to equilibrium mixture

D) Addition of $PCl_3(g)$ to the equilibrium mixture

E) Increasing the temperature

Correct Answer : Option E

57. For the gas phase homogenous equilibrium, $2X(g) \leftrightharpoons 2Y(g) + Z(g)$, K_C at 400K is 1×10^{-3} mol L^{-1}. What is the value of K_P for the equilibrium at 400K?
(R= 0.082 L atm $K^{-1}mol^{-1}$)

A) 1×10^{-3} atm

B) 3.16×10^{-4} atm

C) 4.24×10^{-4} atm

D) 3.28×10^{-2} atm

E) 1.28×10^{-2} atm

Correct Answer : Option D

58. Which of the following pair of aquated first transition metal ions have the same colour?

A) Cr^{3+}, Mn^{3+}

B) Ti^{3+}, Cu^{2+}

C) Fe^{2+}, Co^{2+}

D) Fe^{2+}, Cu^{2+}

E) Fe^{3+}, Co^{3+}

Correct Answer : Option A

59. For the reaction $3Fe_{(s)} + 2O_{2(g)} \mapsto Fe_3O_{4(s)}$, ΔS= -600 J $K^{-1}mol^{-1}$ at 300K and ΔH= -1650 kJ mol^{-1}. What is the value of free energy change for the reaction at 300K?

A) -1470J mol^{-1}

B) -1830 J mol^{-1}

C) -147.02 kJ mol^{-1}

D) -1830 kJ mol^{-1}
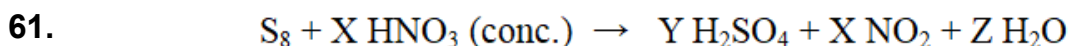
E) -1470 kJ mol^{-1}

Correct Answer : Option E

60. In which of the following aqueous solution of salt, pH is independent of concentration of the salt?

A) Ammonium chloride
B) Ferric chloride
C) Ammonium acetate
D) Sodium acetate
E) Ammonium sulphate

Correct Answer : Option C

The values of X, Y and Z in the following chemical equation

61.
$$S_8 + X\ HNO_3\ (conc.)\ \rightarrow\ Y\ H_2SO_4 + X\ NO_2 + Z\ H_2O$$

are respectively

A) 24, 4, 8
B) 36, 6, 18
C) 48, 8, 24
D) 48, 8, 16
E) 24, 8, 12

Correct Answer : Option D

62. Which of the 3d block element has the minimum melting point?

A) Ti
B) Fe
C) Cr
D) Mn
E) Ag

Correct Answer : Option E

63. Iron does not exhibit ------- oxidation state.

A) +6
B) +4
C) +3
D) +5
E) +2

Correct Answer : Option D

64. The correct electronic configuration of Uranium (Z=92) is

A) $[Rn]\ 5f^8 6d^1 7s^2$

B) $[Rn]\ 5f^4 6d^0 7s^2$

C) $[Rn]\ 5f^8 6d^3 7s^0$

D) $[Rn]\ 5f^4 6d^1 7s^1$

E) $[Rn]\ 5f^5 6d^1 7s^0$
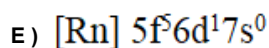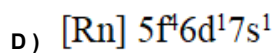
Correct Answer : Option A

65. Which one of the following is an outer orbital complex?

A) $[Co(NH_3)_6]^{3+}$

B) $[Fe(CN)_6]^3$

C) $[CoF_6]^{3-}$

D) $[Co(C_2O_4)_3]^{3-}$

E) $[Fe(NH_3)_6]^{3+}$
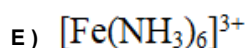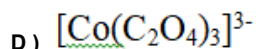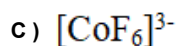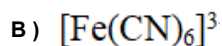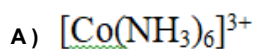
Correct Answer : Option C

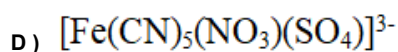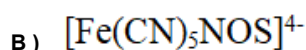**66.** Conformational isomerism is not possible in
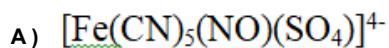
A) ethane
B) n-butane
C) 2,3-dimethylbutane
D) cyclohexane
E) ethene

Correct Answer : Option E

67. When sodium nitroprusside is added to sodium fusion extract the presence of sulphur is indicated by the formation of a violet coloured complex. Its formula is

A) $[Fe(CN)_5(NO)(SO_4)]^{4-}$

B) $[Fe(CN)_5NOS]^{4-}$

C) $[Fe(CN)_5(NO_2)(SO_4)]^{3-}$

D) $[Fe(CN)_5(NO_3)(SO_4)]^{3-}$

E) $[Fe(CN)_5(NO)(SO_4)]^{4-}$
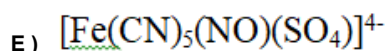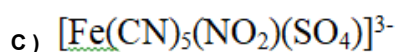
Correct Answer : Option B

68. When n-hexane is heated to 773K at 10-20 atmosphere pressure in the presence of Cr_2O_3 benzene is formed. This reaction is called

A) pyrolysis
B) refining
C) reforming
D) cracking
E) isomerisation

Correct Answer : Option C

69. The decreasing order of reactivity of butyl bromides in S_N2 reaction is

A) $(CH_3)_3CBr > CH_3CH_2CH_2CH_2Br > CH_3CH(CH_3)CH_2Br > CH_3CH_2CH(Br)CH_3$

B) $CH_3CH_2CH_2CH_2Br > CH_3CH(CH_3)CH_2Br > (CH_3)_3CBr > CH_3CH_2CH(Br)CH_3$

C) $(CH_3)_3CBr > CH_3CH_2CH(Br)CH_3 > CH_3CH(CH_3)CH_2Br > CH_3CH_2CH_2CH_2Br$

D) $CH_3CH_2CH_2CH_2Br > (CH_3)_3CBr > CH_3CH_2CH(Br)CH_3 > CH_3CH(CH_3)CH_2Br$

E) $CH_3CH_2CH_2CH_2Br > CH_3CH(CH_3)CH_2Br > CH_3CH_2CH(Br)CH_3 > (CH_3)_3CBr$

Correct Answer : Option E

70. Which of the following is the most acidic compound?
A) *p*-Nitrophenol
B) *o*-Nitrophenol
C) *o*-Cresol
D) *p*-Cresol
E) Phenol

Correct Answer : Option A

71. When propanoic acid is treated with bromine and red phosphorus in aqueous medium, 2-bromopropanoic acid is formed. This reaction is known as
A) Kolbe reaction
B) Wurtz reaction
C) Hell-Volhard -Zelinsky reaction
D) Etard reaction
E) Wurtz-Fittig reaction

Correct Answer : Option C

72. Which of the following groups is deactivating *ortho-para* directing in aromatic electrophilic substitution?

A) $-NO_2$

B) $-OCH_3$

C) $-CH_3$

D) $-Cl$

E) $-CHO$

Correct Answer : Option D

73. Gatterman reaction is used to convert benzene diazonium chloride to
A) benzene
B) nitrobenzene
C) phenetole
D) phenol
E) chlorobenzene

Correct Answer : Option E

74. The correct increasing order of basic strength is

A) $NH_3 < C_2H_5NH_2 < C_6H_5NH_2 < C_6H_5CH_2NH_2$

B) $C_6H_5NH_2 < NH_3 < C_6H_5CH_2NH_2 < C_2H_5NH_2$

C) $C_6H_5NH_2 < C_6H_5CH_2NH_2 < NH_3 < C_2H_5NH_2$

D) $C_6H_5CH_2NH_2 < NH_3 < C_2H_5NH_2 < C_6H_5NH_2$

E) $C_6H_5NH_2 < NH_3 < C_2H_5NH_2 < C_6H_5CH_2NH_2$

Correct Answer : Option B

75. Animal starch is

A) glycogen
B) lactose
C) cellulose
D) amylase
E) maltose

Correct Answer : Option A