PROVISIONAL ANSWER KEY

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1. A solution contains 9.8 g of H_2SO_4 . How much NaOH is required to completely neutralize it? (molar mass of NaOH = 40 g mol^{-1})

A) 0.4 g
B) 0.2 g
C) 8 g
D) 1.2 g
E) 1.6 g

Correct Answer : Option C

2. Which of the following statements are correct about canal rays?

(i) They carry positively charged particles.
(ii) The mass of the particles of these rays does not depend upon the gas present in the cathode ray tube.
(iii) The particles behave in a different manner in electric field as those of cathode rays.
(iv) The charge to mass ratio of the particles does not depends on the gas present in the cathode ray tube.

A) (ii) and (iv)
B) (i) and (iv)
C) (i) and (ii)
D) (ii) and (iii)
E) (i) and (iii)

Correct Answer : Option E

3. A sub-atomic particle of mass $2.2x10^{-28}kg$ is moving with a velocity of $3.0x10^{5}ms^{-1}$. What is its de Broglie wavelength? (Planck's constant h = $6.6x10^{-34}Js$)

A) 1 pm
B) 0.1 pm
C) 2 pm
D) 0.2 pm
E) 0.5 pm

Correct Answer : Option B

4. Which of the following is a metalloid?

A) Antimony
B) Aluminium
C) Magnesium

D) Phosphorus

E) Calcium

Correct Answer : Option A

5. Main group elements are

A) s-block elements only

B) p-block elements only

C) both s-and p-block elements

D) d-block elements only

E) 4f and 5f-block elements

Correct Answer : Option C

6. In which of the following compounds there is an expanded octet around the central atom?

A) SCl_2

B) NO_2

C) NH_3

D) PCl_3

E) H_2SO_4

Correct Answer : Option E

7. Which of the following molecule has tetrahedral geometry?

A) SF_6

B) PCl_5

C) BF_3

D) $BeCl_2$

E) NH_4^+

Correct Answer : Option E

8. Enthalpy change is always negative for which one of the following processes?

A) Enthalpy of ionisation

B) Enthalpy of sublimation

C) Enthalpy of vapourisation

D) Enthalpy of bond dissolution

E) Enthalpy of combustion

Correct Answer : Option E

9. What are the thermodynamic conditions for a reaction to be spontaneous at low temperature and non-spontaneous at high temperature?

A) $\Delta H > 0, \Delta S > 0$

B) $\Delta H < 0, \Delta S > 0$
C) $\Delta H > 0, \Delta S < 0$
D) $\Delta H < 0, \Delta S < 0$
E) $\Delta H > 0, \Delta S = 0$

Correct Answer : Option D

10. A monobasic acid HA has pH of 3 in 0.1M solution at 298 K. What is the pKa of the acid at 298 K?

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

Correct Answer : Option C

11. The ion with the highest limiting molar conductance at 298 K is

A) H^+
B) Na^+
C) K^+
D) Ca^{2+}
E) Mg^{2+}

Correct Answer : Option A

12. What is the quantity of current required to deposit one mole of metallic magnesium from fused magnesium chloride? (1F=96500C)

A) $1.93 \times 10^4 C$
B) $1.93 \times 10^3 C$
C) $9.65 \times 10^3 C$
D) $9.65 \times 10^4 C$
E) $1.93 \times 10^5 C$

Correct Answer : Option E

13. Which of the following gas has highest solubility in water at 298 K?

A) Formaldehyde
B) Methane
C) CO_2
D) Vinyl chloride
E) Argon

Correct Answer : Option A

14. What is the unit of rate constant for a second order reaction?

A) $mol^2\,L^{-1}s^{-1}$

B) $mol^{-1}L^{-1}s^{-1}$

C) $mol^{-1}\,\mathrm{L}\;s^{-1}$

D) $mol\;\;\mathrm{L}^2\,s^{-1}$

E) $mol\,L^{-1}s^{-1}$

Correct Answer : Option C

15. Which of the following is an incorrect statement?

A) For a zero order reaction the rate of the reaction is independent of reactant concentration.

B) In a first order reaction the half-life period does not depend on the initial reactant concentration.

C) For a chemical reaction the rate constant increases with increase in temperature.

D) In a zero order reaction plot of reactant concentration against time is a straight line with negative slope.

E) In a first order reaction, the time required for 75% completion of the reaction is thrice the half-life period.

Correct Answer : Option E

16. Which of the following is a colourless transition metal ion?

A) Ca^{2+}

B) Cr^{3+}

C) Ti^{4+}

D) Fe^{2+}

E) Fe^{3+}

Correct Answer : Option C

17. The $3d$ metal that forms fluoride in +6 oxidation state is

A) Titanium

B) Chromium

C) Vanadium

D) Manganese

E) Cobalt

Correct Answer : Option B

18. The transition metal oxide used as a catalyst in the manufacture of sulphuric acid is

A) Nickel (II) oxide

B) Vanadium (III) oxide
C) Chromium (III) oxide
D) Chromium (II) oxide
E) Vanadium (V) oxide

Correct Answer : Option E

19. The transition metal ion with the least ionic radius (in pm) is

A) Sc^{3+}
B) Ti^{3+}
C) V^{3+}
D) Cr^{3+}
E) Mn^{3+}

Correct Answer : Option D

20. $KMnO_4$ is prepared from Mn(II) ion salts by oxidizing it with

A) $KClO_3$
B) $K_2S_2O_8$
C) KNO_3
D) $KClO_4$
E) KOH

Correct Answer : Option B

21. The lanthanoid with the outer electronic configuration $4f^7 5d^1 6s^2$ is

A) Neodymium
B) Samarium
C) Europium
D) Gadolinium
E) Holmium

Correct Answer : Option D

22. The IUPAC name of the complex $[Co(NH_3)_3(H_2O)_3]Cl_3$ is

A) triaquatriamminecobalt(III) chloride
B) triamminetriaquacobalt(III) chloride
C) triaquatriamminecobalt(II) chloride
D) triamminetriaquacobalt(II) chloride
E) triaquatriamminecobalt(III) trichloride

Correct Answer : Option B

23. The complexes $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ are examples of

A) Linkage isomerism
B) Solvate isomerism
C) Coordination isomerism
D) Ionization isomerism
E) Geometrical isomerism

Correct Answer : Option D

24. The metal ion present in the Wilkinson's catalyst is

A) Nickel
B) Platinum
C) Iron
D) Rhodium
E) Chromium

Correct Answer : Option D

25. Which of the following is a spin free complex?

A) $[Ni(CO)_4]$
B) $[Co(NH_3)_6]^{3+}$
C) $[Ni(CN)_4]^{2-}$
D) $[CoF_6]^{3-}$
E) $[Mn(CN)_6]^{3-}$

Correct Answer : Option D

26. The type of hybridization of the carbon atoms from left to right in $CH_3 - CH = CH - CN$ is

A) sp^3, sp, sp, sp^2
B) sp^3, sp^2, sp, sp
C) sp^3, sp^2, sp^2, sp
D) sp^3, sp^2, sp^2, sp^2
E) sp^3, sp^2, sp, sp^2

Correct Answer : Option C

27. Which of the following group shows –R effect?

A) $-OH$
B) $-OCOR$
C) $-NH_2$
D) $-CN$

E) $-OR$

Correct Answer : Option D

28. The hydrocarbon with molecular formula $C_{20}H_{42}$ is

A) Didodecane
B) Didecane
C) Dodidecane
D) Didocene
E) Eicosane

Correct Answer : Option E

29. When n-hexane is passing over Mo_2O_3 catalyst at 773K and 10-20 atm pressure, the product formed is

A) 1–hexene
B) 3-hexene
C) cyclohexane
D) benzene
E) cyclohexene

Correct Answer : Option D

30. One mole of an alkene on ozonolysis gives one mole of propan-2-one and one mole of formaldehyde What is the alkene?

A) 2-Butene
B) 1-Butene
C) Isobutene
D) 2-Methyl-2-butene
E) 2,3-Dimethyl-2-butene

Correct Answer : Option C

31. The correct decreasing order of acidity of alkynes is

A) $CH \equiv CH > CH_3 - C \equiv CH > CH_3 - C \equiv C - CH_3$
B) $CH_3 - C \equiv C - CH_3 > CH \equiv CH > CH_3 - C \equiv CH$
C) $CH_3 - C \equiv CH > CH \equiv CH > CH_3 - C \equiv C - CH_3$
D) $CH \equiv CH > CH_3 - C \equiv C - CH_3 > CH_3 - C \equiv CH$
E) $CH_3 - C \equiv CH > CH_3 - C \equiv C - CH_3 > CH \equiv CH$

Correct Answer : Option A

32. When toluene is treated with Cl_2 in the presence of Fe in dark, the product formed is

A) Benzyl chloride
B) mixture of o- & p-Chlorotoluene

C) 2,4,6-Trichlorotoluene
D) 2,4-Dichlorotoluene
E) Benzal dichloride

Correct Answer : Option B

33. Which of the following compound is used for the manufacture of phenol in large scale?
A) Chlorobenzene
B) Benzene
C) Aniline
D) Cumene
E) Cyclohexane

Correct Answer : Option D

34. When aryl halide is treated with Na in dry ether, biphenyl is formed. This reaction is called
A) Fittig reaction
B) Wurtz-Fittig reaction
C) Swarts reaction
D) Williamson's synthesis
E) Kolbe's reaction

Correct Answer : Option A

35. Asprin is
A) methyl salicylate
B) sodium benzoate
C) acetyl salicylic acid
D) 2-methyl salicylic acid
E) ethyl salicylate

Correct Answer : Option C

36. Phenol is converted into benzene by heating with
A) $Na\ /\ Hg$
B) Zn dust
C) Cr_2O_3
D) $LiAlH_4$
E) $NaBH_4$

Correct Answer : Option B

37. Intramolecular hydrogen bonding is present in
A) Water
B) Methanol

C) Phenol

D) o-Nitrophenol

E) p-Nitrophenol

Correct Answer : Option D

38. Which of the following is the weakest acid?

A) FCH_2COOH

B) $NC - CH_2COOH$

C) $Cl_3C - COOH$

D) $O_2N - CH_2COOH$

E) $Cl_2CHCOOH$

Correct Answer : Option A

39. Benzaldehyde reacts with acetophenone in the presence of $NaOH$ at 293 K to give benazlacetophenone. This reaction is an example of

A) Cannizzaro reaction

B) aldol condensation

C) Wolf-Kishner reduction

D) Clemmensen reduction

E) cross aldol condensation

Correct Answer : Option E

40. Which of the following carboxylic acid is used in rubber, textile, dyeing, leather and electroplating industries?

A) Methanoic acid

B) Ethanoic acid

C) Benzoic acid

D) Salicylic acid

E) Butanoic acid

Correct Answer : Option A

41. Acetanilide is prepared by treating acetic anhydride/pyridine with

A) Ethanamine

B) Methanamie

C) Benzenamine

D) N-Methylaniline

E) N-Methylethanamine

Correct Answer : Option C

42. Which of the following amine does not react with Hinsberg's reagent?

A) Methanamine
B) N-Methylethanamine
C) N,N-Dimethylethanamine
D) 1-Propanamine
E) 2-Propanamine

Correct Answer : Option C

43. Aryl fluorides are prepared from diazonium salts using
A) NaF
B) KF
C) BF_3
D) AlF_3
E) HBF_4

Correct Answer : Option E

44. Which of the following amino acid can be synthesized in the body?
A) Proline
B) Leucine
C) Valine
D) Arginine
E) Histidine

Correct Answer : Option A

45. Match the following;

a) Aldohexose	i) Maltose
b) Ketohexose	ii) Glycogen
c) Non-reducing disaccharide	iii) Glucose
d) Reducing disaccharide	iv) Sucrose
e) Polysaccharide	v) Fructose

A) a)-(iii); b)-(v); c)-(iv); d)-(i); e)-(ii)
B) a)-(iii); b)-(ii); c)-(i); d)-(v); e)-(iv)
C) a)-(i); b)-(ii); c)-(iii); d)-(v); e)-(iv)
D) a)-(iii); b)-(iv); c)-(v); d)-(i); e)-(ii)
E) a)-(iii); b)-(ii); c)-(iv); d)-(i); e)-(v)

Correct Answer : Option A

46. The dimensional formula for the product of the decay constant λ and the mean life τ of a radioactive substance is

A) LMT^2
B) $L^\circ MT^{-2}$
C) LMT

D) $L^{\circ}M^{\circ}T^{\circ}$

E) $L^{2}M^{2}T^{2}$

Correct Answer : Option D

47. An object when dropped from a height h from the ground, reaches the ground in t s. The time after which the object was passing through a point at a height $h / 2$ from the ground is

A) $\sqrt{2}t$

B) $\frac{t}{\sqrt{2}}$

C) $\frac{t}{2}$

D) $2t$

E) $\frac{t}{4}$

Correct Answer : Option B

48. The angle between two unit vectors $\hat{A}$ and $\hat{B}$ is 60°. The value of $\left|\hat{A}-\hat{B}\right|$ is

A) $\frac{1}{2}$

B) $\frac{3}{4}$

C) $\frac{1}{4}$

D) 1

E) $\frac{1}{8}$

Correct Answer : Option D

49. A person standing on the platform of a lift will experience weight loss, when the lift moves

A) downward with uniform velocity

B) upward with constant acceleration

C) downward with constant acceleration

D) upward with uniform velocity

E) upward with variable acceleration

Correct Answer : Option C

50. Three forces F_1, F_2 and F_3 acting on a body of mass m keep the body stationary. If the forces F_1 and F_2 are mutually perpendicular, the acceleration of the body when the force F_3 is removed is

A) $\frac{F_3}{m}$

B) $\frac{F_1 F_2}{m}$

C) $\frac{(F_1 - F_2)}{m}$

D) $\frac{F_1}{m}$

E) $\frac{F_2}{m}$

Correct Answer : Option A

51. A body initially at rest undergoes linear motion with constant acceleration under the action of a constant force. Then the power delivered to the body at time t is proportional to

A) $t^{1/2}$

B) t

C) t^3

D) t^2

E) $t^{3/2}$

Correct Answer : Option B

52. Pick out the INCORRECT statement from the following

A) Work done in uniform circular motion is zero

B) When a body is in dynamic equilibrium, work done is zero

C) Work done is positive for a freely falling body under gravity

D) Work done in a stretched string is positive

E) Work done depends on the time taken to complete the work

Correct Answer : Option E

53. A shell travelling along a parabolic path in the gravitational field of the earth undergoes explosion in mid air. The centre of mass of the fragments will move

A) horizontally and then vertically down

B) along the original parabolic path

C) vertically down

D) vertically up and then vertically down

E) horizontally and then in the parabolic path

Correct Answer : Option B

54. The ratio of radius of gyration of a circular ring to that of a circular disc, each of same mass and same radius about their respective central axes is

A) $\sqrt{2}:\sqrt{3}$

B) $1:\sqrt{2}$

C) $\sqrt{3}:\sqrt{2}$

D) $\sqrt{2}:1$

E) $1:1$

Correct Answer : Option D

55. Two bodies of masses m and $4m$ are kept at a distance of x. The distance on the axial point from m at which the gravitational field is zero is

A) $\frac{x}{3}$

B) $\frac{x}{4}$

C) $\frac{x}{8}$

D) $\frac{x}{2}$

E) $\frac{x}{5}$

Correct Answer : Option A

56. Work done in a stretched wire is

A) $Load \times strain$

B) $\frac{1}{2} \times load \times strain$

C) $Young's\ modulus \times strain$

D) $\frac{1}{4} \times Load \times extension$

E) $\frac{1}{2} \times load \times extension$

Correct Answer : Option E

57. The total pressure P inside an air bubble of radius r at a depth h below the surface of liquid of density ρ is
(T = surface tension of liquid, P_0 = atmospheric pressure)

A) $P_0 - hg\rho - \frac{2T}{r}$

B) $P_0 + hg\rho + \frac{2T}{r}$

C) $P_0 + hg\rho + \frac{4T}{r}$

D) $hg\rho + \frac{2T}{r}$

E) $P_0 + \frac{2T}{r}$

Correct Answer : Option B

58. If the value of C_p / C_v is unity in the equation PV^{Υ} = constant, then the process is (C_p = specific heat capacity at constant pressure
C_v = specific heat capacity at constant volume)

A) adiabatic
B) isochoric
C) isothermal
D) isobaric
E) irreversible

Correct Answer : Option C

59. The temperature at which the r.m.s. velocity of oxygen molecule is equal to that of hydrogen molecule at 20 K is

A) 300 K
B) 320 K
C) 330 K
D) 400 K
E) 375 K

Correct Answer : Option B

60. A particle executes linear simple harmonic motion and its potential energy (P.E), kinetic energy (K.E) and total energy (T.E) are measured as functions of displacement x from the mean position at the origin. Then

A) K.E. is minimum when $x = 0$
B) T.E. is zero when $x = 0$
C) P.E. is maximum when $x = 0$
D) K.E. is maximum when x is maximum
E) P.E. is maximum when x is maximum

Correct Answer : Option E

61. A closed organ pipe and an open organ pipe have the same length. The ratio of the frequencies in their third mode of vibrations is

A) 3 : 1
B) 2 : 3
C) 5 : 6
D) 4 : 5
E) 3 : 5

Correct Answer : Option C

62. A point charge $-q$, is placed at a distance x from an isolated conducting plane. The electric field at any point P on the other side of the plane is directed

A) radially away from the point charge
B) towards the plane perpendicularly

C) radially towards the point charge
D) away from the plane perpendicularly
E) parallel to the surface of the conducting plane

Correct Answer : Option B

63. Three capacitors each of capacitance $12\ \mu\ F$, are connected in series. When this combination is connected to a battery of 12 V, the charge drawn from the battery is

A) $32\ \mu\ C$
B) $24\ \mu\ C$
C) $48\ \mu\ C$
D) $16\ \mu\ C$
E) $12\ \mu\ C$

Correct Answer : Option C

64. Pick out the INCORRECT statement

A) Kirchhoff's junction rule is based on conservation of energy
B) Ohm's law asserts that the plot of current I versus potential V is linear
C) Current is a scalar quantity
D) Electrical conductivity is the reciprocal of electrical resistivity
E) Current density is a vector quantity

Correct Answer : Option A

65. An electric cell does 10 J of work in carrying a charge of 5 C around a simple closed circuit. The electromotive force of the cell is

A) 0.5 V
B) 1.5 V
C) 1 V
D) 6 V
E) 2 V

Correct Answer : Option E

66. A wire of length 1.2 m carrying a current of $4\ A$, when placed in a uniform magnetic field of $5\ T$ experiences a force of $12\ N$. Then the angle between the direction of current and the magnetic field is

A) 30°
B) 45°
C) 60°
D) 0°
E) 90°

Correct Answer : Option A

67. When a proton moves in a uniform magnetic field such that its velocity has a component along the direction of magnetic field, its trajectory will be a

A) circle

B) straight line

C) helix

D) parabola

E) ellipse

Correct Answer : Option C

68. An iron ring is held horizontally and a bar magnet is dropped gently through the ring with its length coinciding with the axis of the ring. The acceleration of the freely falling magnet through the ring
(g = acceleration due to gravity)

A) is less than g

B) is equal to g

C) is greater than g

D) depends on the radius of the ring

E) depends on the length of the magnet

Correct Answer : Option A

69. In a plane electromagnetic wave, the magnetic field is given by $B = 400 \times 10^{-6} sin\left[(4.0 \times 10^{-4})(t - x / c)\right]$ T .The peak value of electric field (in Vm^{-1}) is

A) 8×10^4

B) 6×10^4

C) 4×10^4

D) 3×10^4

E) 12×10^4

Correct Answer : Option E

70. A convex lens having power P is cut into two halves perpendicular to the principal axis. Then the power of each piece is

A) P

B) $\frac{P}{2}$

C) $2P$

D) $\frac{P}{4}$

E) $4P$

Correct Answer : Option B

71. In Young's double slit experiment performed in air medium, the fringe width observed is 1.4 mm. If the entire arrangement is kept in a liquid medium of refractive index 1.4, then the fringe width (in mm) will be

A) 1.4

B) 1.0

C) 0.7

D) 2.8

E) 0.5

Correct Answer : Option B

72. When blue light is incident on a certain metal surface, photoelectrons are emitted. When green light is incident on the same metallic surface, no electrons are emitted. If the same metallic surface is exposed to yellow light,

A) less energetic electrons will be emitted

B) no electrons will be emitted

C) more energetic electrons will be emitted

D) electron emission depends on the intensity of light

E) electron emission depends on the time of exposure

Correct Answer : Option B

73. Ionization potential of hydrogen atom is 13.6 eV . Hydrogen atom in the ground state initially is excited by monochromatic radiation of photon energy 12.75 eV . The number of spectral lines emitted by the hydrogen atom, according to Bohr's theory will be

A) 2

B) 4

C) 3

D) 6

E) 5

Correct Answer : Option D

74. When a radioactive material emits an α -particle, its position in the periodic table

A) is lowered by three places

B) is increased by two places

C) remains unchanged

D) is lowered by two places

E) is increased by one place

Correct Answer : Option D

75. The band gap energy of silicon is

A) 1.1 eV

B) 0.7 eV

C) 1.7 eV

D) 2.1 eV

E) 0.5 eV

Correct Answer : Option A