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ROY'S INSTITUTE OF COMPETITIVE EXAMINATION

The West Bengal Central School Service Commission

2nd SLST 2025

PHYSICAL SCIENCE

[CLASSES : IX - X]

1. Among the following compounds which one has zero dipole moment?
   (A) NH_3
   (B) H_2O
   (C) CCl_4
   (D) HCl
2. A lens behaves as a converging lens in air and a diverging lens in water. The refractive index of the material of the lens is
   (A) $\mu = 1$
   (B) $\mu = 1.33$
   (C) $1 < \mu < 1.33$
   (D) $\mu > 1.33$
3. Three 2Ω resistors are connected to form a triangle. The equivalent resistance between any two corners is
   (A) 6Ω
   (B) 2Ω
   (C) $\frac{3}{4}\Omega$
   (D) $\frac{4}{3}\Omega$
4. Oxidation numbers of chlorine in Cl_2O, Cl_2 and ClO_3^- are respectively
   (A) +1, –1, +5
   (B) +1, 0, –1
   (C) –1, 0, –1
   (D) +1, 0, +5
5. The reduction of ketone with $LiAlH_4$
   (A) always gives a primary alcohol.
   (B) always gives a secondary alcohol.
   (C) always gives a carboxylic acid.
   (D) always gives an alkane.

6. The statement which is not true about the order of a reaction is
   (A) order cannot be obtained theoretically.
   (B) order may be fractional.
   (C) order is the sum of the power to the concentration terms of reactants in rate expression.
   (D) order is always integer.
7. The radioactive nucleus $^{13}N_7$ decays to $^{13}C_6$ by emission of
   (A) Neutron
   (B) Proton
   (C) Electron
   (D) Positron
8. Which among the following heterocyclic compounds contains sulphur atom?
   (A) Pyrrole
   (B) Furan
   (C) Thiophene
   (D) Pyridine
9. The Compton shift of wavelength is maximum when the photon is scattered at an angle θ. The value of θ is
   (A) 0°
   (B) 45°
   (C) 90°
   (D) 180°
10. When the path of a light ray changes from one medium to another, the physical property that remains unchanged is
    (A) Velocity
    (B) Wavelength
    (C) Frequency
    (D) Refractive index
11. Which of the following pure amine molecules, no intermolecular hydrogen bonding exists/exist?
    (A) 1° amine
    (B) 2° amine
    (C) 3° amine
    (D) All of the above
12. The half-life of Radium is 1600 years. After 6400 years, what fract on of a Radium sample would remain unchanged?
    (A) $\frac{1}{4}$
    (B) $\frac{1}{2}$
    (C) $\frac{1}{8}$
    (D) $\frac{1}{16}$

13. The pH of 0.01(M) NaOH solution at 25ºC is

(A) 1

(B) 0

(C) 7

(D) 12

14. The temperature of an ideal black body becomes half its original temperature. The amount of radiation emitted by the body will reduce by a factor of

(A) $\frac{1}{16}$

(B) $\frac{1}{4}$

(C) $\frac{1}{2}$

(D) Remains unchanged

15. Sucrose on hydrolysis gives the following two monosaccharides:

(A) D-glucose and D-fructose

(B) D-glucose and D-galactose

(C) D-galactose and D-fructose

(D) D-fructose and D-ribose

16. When hydrogen nuclei is bombarded with a neutron, it forms

(A) Alpha particle

(B) Deuterium

(C) Beta particle

(D) Tritium

17. Which one of the following is not a double salt?

(A) $K_2SO_4.\ Al_2(SO_4)_3.\ 24H_2O$

(B) $FeSO_4.\ (NH_4)_2SO_4.\ 6H_2O$

(C) $K_2SO_4.\ Cr_2(SO_4)_3.\ 24\ H_2O$

(D) $K_4[Fe(CN)_6]$

18. A Carnot engine working between temperatures 300 K and 600 K has work output of 800 J per cycle. The amount of heat energy drown from the high temperature source in each cycle is

(A) 800 J

(B) 1600 J

(C) 3200 J

(D) 6400 J

19. The rate of aromatic electrophilic substitution reaction is most in which of the following compounds?

(A) Benzene

(B) Nitrobenzene

(C) Toluene

(D) m-dinitrobenzene

20. IUPAC name of $[Pt(NH_3)_3(Br)\ (NO_2)Cl]Cl$ is

(A) Triamminechlorobromonitroplatinum (IV) chloride

(B) Triamminebromochloronitroplatinum (IV) chloride

(C) Bromochloronitrotriammineplatinum (IV) chloride

(D) Triamminenitrochlorobromoplatinum (IV) chloride

21. Number of electrons required to balance the following reaction are:

$NO_3^- + 4H^+ + \_\_\_\_\ e \rightarrow 2H_2O + NO$

(A) 5

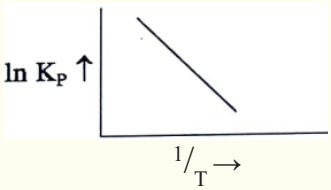
(B) 4

(C) 3

(D) 2

22. The plot which corresponds well with van't Hoff's equation for chemical equilibrium of an exothermic reaction is

(A)



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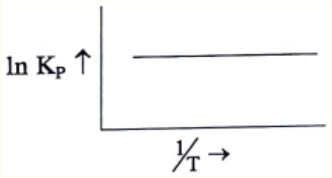

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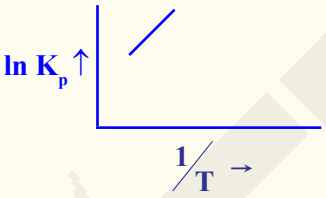
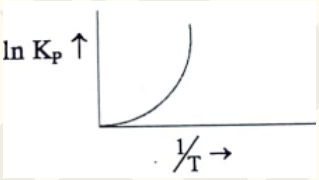


(D)



23. The back e.m.f. of a D.C.motor is maximum when

(A) the speed of the motor is still on increase.

(B) the motor has just started moving.

(C) the motor has picked up maximum speed.

(D) the motor has just been switched off.

24. In a transistor, when the saturation current is reached, the value of resistance is

(A) zero

(B) constant and finite

(C) infinite

(D) None of the above

25. The catalyst used in Friedel-Crafts' reaction is

(A) Anhydrous aluminium chloride

(B) Sodium nitrate

(C) Potassium hydroxide

(D) Copper sulfate

26. The expression for average velocity of gas molecules obeying kinetic theory of gases is (T = temperature in Kelvin Scale, M = molar mass)

(A) $\sqrt{\frac{2RT}{M}}$

(B) $\sqrt{\frac{3RT}{M}}$

(C) $\sqrt{\frac{8RT}{M}}$

(D) $\sqrt{\frac{8RT}{\pi M}}$

27. To measure the equivalent conductance ($\Lambda°$) of NH_4OH at infinitely diluted solution by using Kohlrausch's law needs the Λ^o value of

(A) NH_4NO_3, NaOH, $NaNO_3$

(B) NH_4Cl, NaOH, $NaNO_3$

(C) NH_4Cl, NaOH, KCl

(D) NH_4NO_3, KOH, NaCl

28. Which amongst the following is the best conductor of electricity?

(A) Filtered hot water

(B) Distilled water

(C) Filtered water at room temperature

(D) Saline water

29. The wavelength of the K_α line of X-Ray emitted from an anti-cathode made up of an element of atomic number Z is proportional to

(A) Z^2

(B) $(Z-1)^2$

(C) $\frac{1}{(Z-1)^2}$

(D) $\frac{1}{Z-1}$

30. Aspirin is produced by heating Salicylic acid with

(A) Acetic anhydride and Phosphoric acid

(B) Benzoic anhydride and Phosphoric acid

(C) Methyl alcohol and Sulphuric acid

(D) Phenol and Sulphuric acid

31. A car turns a corner on a slippery road at a constant speed of 12 m/s. If the coefficient of friction between the road and wheels is 0.4, the minimum radius of the arc (in meters) in which the car turns is

(A) 72

(B) 36

(C) 18

(D) 9

32. An A.C. Voltmeter measures

(A) peak value of voltage.

(B) root mean square value of voltage.

(C) instantaneous value of voltage.

(D) average value of voltage.

33. 16 grams of oxygen gas and x grams of hydrogen gas occupies the same volume at the same temperature and pressure. The value of x is

(A) 1 gram

(B) 2 grams

(C) 3 grams

(D) 4 grams

34. A liquid with coefficient of volume expansivity γ is filled in a container of material having coefficient of linear expansion α. If the liquid overflows on heating, then

(A) $\gamma = 3\alpha$

(B) $\gamma > 3\alpha$

(C) $\gamma < 3\alpha$

(D) $\gamma = 2\alpha$

35. Detergent soap is used for cleaning clothes because

(A) it decreases the surface tension of water solvent.

(B) it increases the strength of the solution.

(C) it attracts dirt.

(D) it changes the chemical property of the solution.

36. A light body and a heavy body have equal kinetic energies. Which one has greater linear momentum?

(A) The heavy body

(B) The light body

(C) Both have equal momentum

(D) Supplied data are insufficient.

37. Tyndall effect is shown by colloidal solution due to

(A) Brownian motion.

(B) scattering of light.

(C) charge on the colloid particles.

(D) very small size of the colloid particles.

38. In the following reaction X and Y are:

$$PhCHO \xrightarrow[(ii)\ H^+]{(i)\ 50\%\ aq.\ NaOH} X + Y$$

(A) $PhCH_2OH$ and PhCOOH

(B) $PhCH_2OH$ and $PhCH_3$

(C) $PhCH_3$ and PhCOOH

(D) Benzene and PhCOOH

39. Acetamide reacts with Br_2/aq. NaOH to give

(A) Methyl amine

(B) Dimethyl amine

(C) Ethyl amine

(D) Acetyl bromide

40. Inorganic graphite is

(A) $B_3N_3H_6$

(B) $(BN)_3$

(C) SiC

(D) $Fe(CO)_5$

41. A bullet of mass 25 gm moving with a velocity of 200 cm/s is stopped within 5 cm of the target. The average resistance offered by the target is

(A) 1 N

(B) 2 N

(C) 3 N

(D) 4 N

42. Among the following, the electronic configuration of inert element is

(A) $1s^2 2s^1$

(B) $1s^2 2s^2 2p^6 3s^2 3p^6$

(C) $1s^2 2s^2 2p^5$

(D) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

43. A ray of light passes through a equilateral prism in such a way that the angle of incidence is equal to the angle of emergence. If the angle of emergence is $\frac{3}{4}$ th of the angle of the prism, the value of angle of deviation is

(A) 45°

(B) 39°

(C) 20°

(D) 30°

44. A particle moves in such a way that its acceleration a is given by $a = -bx$ (where b is a constant and x is displacement from equilibrium position). The time period of oscillatory motion of the particle is

(A) $\frac{2\pi}{\sqrt{b}}$

(B) $\frac{\sqrt{2\pi}}{b}$

(C) $\frac{2\pi}{b}$

(D) $2\sqrt{\frac{\pi}{b}}$

45. The Q-factor (quality factor) of a series resonance circuit having the values of inductance L, capacitance C, resistance R and resonant frequency ω_0 is

(A) $\omega_0 \frac{L}{R}$

(B) $\omega_0 \frac{C}{R}$

(C) $\omega_0 LCR$

(D) $\omega_0 \frac{R}{L}$

46. If two waves having same amplitude and frequency superpose to produce a resultant wave of same amplitude, the waves differ in phase by

(A) π

(B) $\frac{2\pi}{3}$

(C) $\frac{\pi}{3}$

(D) 3π

47. Electromagnetic theory suggests that light consists of

(A) magnetic vector alone.

(B) electric vector alone.

(C) electric and magnetic vectors perpendicular to each other.

(D) electric and magnetic vectors parallel to each other.

48. Which of the following acids is not responsible for acid rain?

(A) CH_3COOH

(B) H_2SO_4

(C) H_2SO_3

(D) HNO_3

49. The breaking stress for a wire of radius r of a given material is FN/m^2. The breaking stress for a wire made of same material but of radius 2r is

(A) F

(B) $F/2$

(C) $F/3$

(D) $F/4$

50. A ring shaped piece of metal is heated. If it expands, then the size of the hole of the ring would

(A) expand.

(B) contract.

(C) expand or contract depending on the average radius of the ring.

(D) expand or contract depending on the coefficient of expansion of material of the ring.

51. Which of the following compounds show cis-trans isomers?

(A) 1-butene

(B) 2-butene

(C) Cyclopropane

(D) Acetone

52. Which of the following salt solutions will have the same value of van't Hoff factor as that of $K_4[Fe(CN)_6]$ solution at infinite dilution?

(A) $Al_2(SO_4)_3$

(B) NaCl

(C) $K_3[Fe(CN)_6]$

(D) Na_2SO_4

53. A flask containing air at 27°C temperature and one atmospheric pressure is corked up. A pressure of 2.5 atmospheres inside the flask would force the cork out. This happens at a temperature of

(A) 67.5°C

(B) 750°C

(C) 477°C

(D) 670°C

54. Which of the following compounds on treatment with $NaHCO_3$, liberates CO_2?

(A) Acetic acid

(B) Ethyl amine

(C) Acetone

(D) Ethyl alcohol

55. The electronic energy for n-th Bohr orbit of a hydrogen atom is

(A) $-\frac{13.6}{n^4}eV$

(B) $-\frac{13.6}{n^3}eV$

(C) $-\frac{13.6}{n^2}eV$

(D) $-\frac{13.6}{n}eV$

56. The refractive index of water and glass are $\frac{4}{3}$ and $\frac{5}{3}$ respectively. What will be the critical angle for the ray of light entering water from glass?

(A) $\sin^{-1}\left(\frac{4}{5}\right)$

(B) $\sin^{-1}\left(\frac{5}{4}\right)$

(C) $\sin^{-1}\left(\frac{1}{2}\right)$

(D) $\sin^{-1}\left(\frac{1}{3}\right)$

57. In relation of pressure (P) and volume (V) for an adiabatic reversible change of an ideal gas is $\left[\gamma = \frac{C_P}{C_V}\right]$

(A) $PV^{1-\gamma}$ = constant

(B) PV^{γ} = constant

(C) $P^{1-\gamma}V$ = constant

(D) $P^{\gamma}V^{1-\gamma}$ = constant

58. Which of the following represents the correct order of electron affinity?

(A) Cl > Br > I > F

(B) Cl > F < Br < I

(C) F > Cl > Br > I

(D) Cl > F > Br > I

59. Two spheres of equal masses but of radii r and 2r are allowed to fall through air. The ratio of their terminal velocities is

(A) 1 : 4

(B) 1 : 2

(C) 1 : 32

(D) 2 : 1

60. For sustaining oscillations in an electronic oscillator,

(A) Feedback factor should be unity.

(B) Feedback factor should be negative.

(C) Phase shaft should be zero.

(D) Both options (A) and (C) are correct.
