GUJCET 2022 Set 16

PHYSICS

1) An air-cored solenoid with length 30 cm, area of cross-section 25 cm^2 and number of turns 500, carries a current of 2.5A. The current is suddenly switched off in a brief time of 10^{-3} s. How much is the average back emf induced across the ends of the open switch in the circuit? Ignore the variation in magnetic field near the ends of the solenoid.

(A) 6.54 V (B) 65.4 V

(C) 654 V (D) 0.654 V

2) For an ideal transformer, if $N_s > N_p$ then _____ .

(A) $V_s < V_p$ (B) $V_s > V_p$

(C) $V_s = V_p$ (D) None of these

3) A charged 10μF capacitor is connected to a 16mH inductor. What is the angular frequency of free oscillations of the circuit?

(A) 250 rad s^{-1} (B) 25 rad s^{-1}

(C) 1111 rad s^{-1} (D) 2500 rad s^{-1}

(Space for Rough Work)

4) A light bulb is rated at 200 W for a 220 V supply. Find the resistance of the bulb

(A) 220 Ω (B) 484 Ω

(C) 242 Ω (D) 400 Ω

5) A radio can tune into any station in the 6 MHz to 12 MHz band. What is the corresponding wavelength band? ($c = 3 \times 10^8$ m/s)

(A) 40 m to 60 m (B) 25 m to 50 m

(C) 20 m to 30 m (D) 10 m to 20 m

6) A charged particle oscillates about its mean equilibrium position with a frequency of 10^9 Hz. What is the frequency of the electromagnetic waves produced by the oscillator?

(A) 10^{18} Hz (B) 10^9 Hz

(C) 10^{-9} Hz (D) 10^{10} Hz

7) Light from a point source in air falls on a spherical glass surface (n = 1.5 and radius of curvature = 20 cm). The distance of the light source from the glass surface is 100 cm. Find the image distance.

(A) – 100 cm (B) – 200 cm

(C) 200 cm (D) 100 cm

8) Double - convex lenses are to be manufactured from a glass of refractive index 1.5: with both faces of the same radius of curvature. What is the radius of curvatur required if the focal length is to be 20 cm?

(A) 44 cm
(B) 2.2 cm
(C) 22 cm
(D) 4.4 cm

9) What is the focal length of a convex lens of focal length 30 cm in contact with a concave lens of focal length 10 cm?
[Ignore thickness of lens]

(A) – 15 cm
(B) – 40 cm
(C) – 20 cm
(D) – 30 cm

10) Unpolarised light is incident on a plane glass surface. What should be the angle of incidence so that the reflected and refracted rays are perpendicular to each other?

(A) 56°
(B) 57°
(C) 58°
(D) 59°

11) Two slits are made 3 millimetre (3 mm) apart and the screen is placed 2 m away. What is the fringe separation when blue-green light of wavelength 600 nm is used?

(A) 0.4 mm
(B) 0.6 mm
(C) 0.5 mm
(D) 0.7 mm

12) Estimate the distance for which ray optics is good approximation for an aperture of 5 mm and wavelength 500 nm.

(A) 50 m
(B) 18 m
(C) 40 m
(D) 60 m

13) What is the de-Broglie wavelength associated with an electron moving with a speed of 6.4×10^6 m/s?

[Mass of electron $m_e = 9.11 \times 10^{-31}$ kg, Planck's constant $h = 6.63 \times 10^{-34}$ J.s.]

(A) 0.124 nm
(B) 0.114 nm
(C) 0.135 nm
(D) 0.145 nm

14) An electron, an α-particle and a proton have the same kinetic energy. Which of these particles has the shortest de-Broglie wavelength?

(A) α-particle
(B) Electron
(C) Proton
(D) None of these

15) A difference of 5.4 eV separates two energy levels in an atom. What is the frequency of radiation emitted when the atom make a transition from the upper level to the lower level?

[1 eV = 1.6×10^{-19} J, h = 6.625×10^{-34} J.s.]

(A) 1.304×10^{15} Hz
(B) 5.6×10^{15} Hz
(C) 5.6×10^{14} Hz
(D) 1.304×10^{14} Hz

16) What is the shortest wavelength present in the Paschen series of spectral lines?

(A) 320 nm

(B) 720 nm

(C) 840 nm

(D) 820 nm

17) The radius of the innermost electron orbit of a hydrogen atom is 5.3×10^{-11} m. What are the radii of the n = 3 orbit?

(A) 4.12×10^{-10} m

(B) 4.77×10^{-10} m

(C) 2.12×10^{-10} m

(D) 2.24×10^{-10} m

18) In accordance with the Bohr's model, find the quantum number that characterises the earth's revolution around the sun in an orbit of radius 1.5×10^{11} m with orbital speed 3×10^{4} m/s. (Mass of earth = 6×10^{24} kg, h = 6.625×10^{-34} J.s.)

(A) 3.6×10^{74}

(B) 1.6×10^{74}

(C) 2.6×10^{74}

(D) 4.6×10^{74}

19) Given the following atomic masses

$^{238}_{92}U = 238.05079$ u

$^{4}_{2}He = 4.00260$ u

$^{234}_{90}Th = 234.04363$ u

Calculate the energy released during the alpha decay of $^{238}_{92}U$.

$\left(1\ u = 931.5\ MeV/C^2\right)$

(A) 4.25 MeV (B) 6.23 MeV

(C) 5.75 MeV (D) 3.25 MeV

20) A radioactive isotope has a half-life of T years. How long will it take the activity to reduce to 6.250 %?

(A) 3 T (B) 6 T

(C) 5 T (D) 4 T

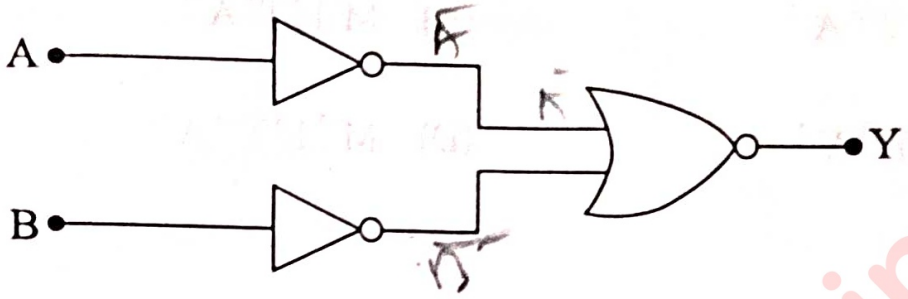
21) The half-life of $^{90}_{38}Sr$ is 28 years. What is the disintegration rate of 38g of this isotope?

$[N_A = 6.023 \times 10^{23}\ mol^{-1}]$

(A) 2.7×10^{14} Bq (B) 4.7×10^{14} Bq

(C) 3.7×10^{14} Bq (D) 5.7×10^{14} Bq

22) The circuits shown in fig. works as which gate?



(A) NAND gate
(B) OR gate
(C) AND gate
(D) NOR gate

23) When a forward bias is applied to a p-n junction, it _____ .

(A) raises the potential barrier
(B) reduces the majority carrier current to zero
(C) lowers the potential barrier
(D) none of the above

24) Suppose a pure Si crystal has 5×10^{28} atoms m^{-3}. It is doped by 1 ppm concentration of pentavalent As. Calculate the number of electrons and holes.

Given that $n_i = 1.5 \times 10^{16}\ m^{-3}$

(A) $6.5 \times 10^{9}\ m^{-3}$
(B) $4.5 \times 10^{9}\ m^{-3}$
(C) $5.5 \times 10^{9}\ m^{-3}$
(D) $5.5 \times 10^{-9}\ m^{-3}$

25) Dimensional formula of Electric flux = _____.

(A) $M^1 L^{-3} T^{-3} A^{-1}$

(B) $M^1 L^3 T^3 A^{-1}$

(C) $M^1 L^3 T^{-3} A^{-1}$

(D) $M^{-1} L^3 T^{-3} A^{-1}$

26) An electric dipole with dipole moment 4×10^{-9} cm is aligned at 60° with the direction of a uniform electric field of magnitude 5×10^4 NC^{-1}. Calculate the magnitude of the torque acting on the dipole.

(A) 17.3×10^{-5} Nm

(B) 1.73×10^{-4} Nm

(C) 1.73×10^{-5} Nm

(D) 17.3×10^{-4} Nm

27) An infinite line charge produces a field of 9×10^4 NC^{-1} at a distance of 2 cm. Calculate Electrical field produced at a distance of 3 cm.

(A) 6×10^4 NC^{-1}

(B) 6×10^3 NC^{-1}

(C) 6×10^{-5} NC^{-1}

(D) 6×10^2 NC^{-1}

28) How will you connect 4 (four) capacitors, each of capacitance 4μF for having equivalent capacitance 1.6 μF?

(A) Two in parallel and two in series

(B) All four in series

(C) All four in parallel

(D) Three in parallel and one in series

29) A slab of material of dielectric constant 3 has the same area as the plates of a parallel plate capacitor but has a thickness $\left(\frac{3}{4}\right) d$, where d is the separation of the plates. What is the Electrical potential difference between the plates, when the slab is inserted between the plates? Initial electrical potential difference V_0.

(A) $\frac{V_0}{6}$ (B) $\frac{V_0}{4}$

(C) $\frac{V_0}{2}$ (D) $\frac{V_0}{3}$

30) A molecule of a substance has a permanent electric dipole moment of magnitude 10^{-29} cm. 2 mole of this substance is polarised (at low temperature) by applying a strong electrostatic field of magnitude 10^6 Vm^{-1}. What should be potential energy of its?

[1 mole of the substance contains 6×10^{23} molecules]

(A) – 6 J (B) –12 J

(C) 12 J (D) 6 J

31) At room temperature (27 °C) the resistance of a heating element is 100 Ω. What is the temperature of the element if the resistance is found to be 137Ω, given that the temperature coefficient of the material of the resistor is $1.35 \times 10^{-4}\ °C^{-1}$.

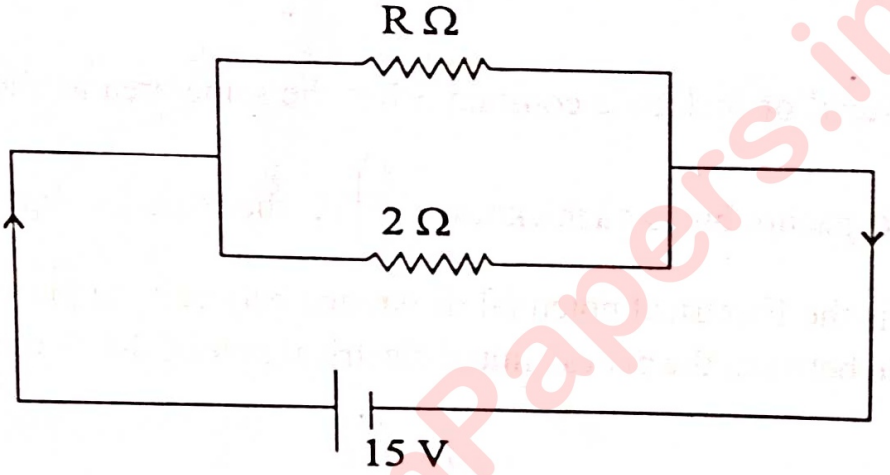
(A) 2767 °C

(B) 1227 °C

(C) 1027 °C

(D) 2327 °C

32)



For the given following circuit diagram, the dissipated of electrical power 150 W, then find value of Resistance R = _____.

(A) 5Ω

(B) 8Ω

(C) 6Ω

(D) 3Ω

33) The number density of free electrons in a copper conductor estimated $8.5 \times 10^{28}\ m^{-3}$. How long does an electron take to drift from one end of a wire 6 m long to its other end? The area of cross-section of the wire is $1.0 \times 10^{-6}\ m^2$ and it is carrying a current of 1.5A.

(A) 8.1×10^4 s

(B) 5.4×10^4 s

(C) 12.7×10^4 s

(D) 4.5×10^4 s

(Space for Rough Work)

34) A solenoid of length 0.25 m has a radius of 1 cm and is made up of 500 turns. It carries a current of 2.5 A. What is the magnitude of the magnetic field inside the solenoid?
($\mu_0 = 4\pi \times 10^{-7}$ SI)

(A) 6.28×10^{-3} T

(B) 6.28×10^{-2} T

(C) 6.28×10^{-4} T

(D) 6.28×10^{-1} T

35) How the shunt wire should be ?

(A) short and thin

(B) long and thin

(C) long and thick

(D) short and thick

36) Two long and parallel straight wires A and B carrying currents of 10 A and 4 A in the same direction are separated by a distance of 2 cm. Estimate the force on a 4 cm section of wire A.
($\mu_0 = 4\pi \times 10^{-7}$ SI)

(A) 1.6×10^{-4} N

(B) 1.6×10^{-5} N

(C) 1.6×10^{-6} N

(D) 1.6×10^{-3} N

37) A solenoid has a core of a material with relative permeability 400. The windings of the solenoid are insulated from the core and carry a current of 1 A. If the number of turns is 1000 per metre, find magnetic field (B) _____ T. ($\mu_0 = 4\pi \times 10^{-7}$ SI)

(A) $1.6\pi \times 10^{+2}$

(B) $16\pi \times 10^{2}$

(C) $16\pi \times 10^{-2}$

(D) $0.16\pi \times 10^{-2}$

38) A short bar magnet placed with its axis at 30° with a uniform external magnetic field of 0.25 T experiences a torque of magnitude equal to 4.5×10^{-2} J. What is the magnitude of magnetic moment of the magnet?

(A) $0.36\ J\ T^{-1}$

(B) $0.036\ J\ T^{-1}$

(C) $3.6\ J\ T^{-1}$

(D) $36\ J\ T^{-1}$

39) "The polarity of induced emf is such that it tends to produce a current which opposes the change in magnetic flux that produced it." This statement is known as _____.

(A) Faraday

(B) Maxwell

(C) Kirchhoff

(D) Lenz

40) A pair of adjacent coils has a mutual inductance of 1.5 H. If the current in one coil changes from 0 to 10 A in 0.5 s, what is the change of flux linkage with the other coil?

(A) 30 Wb

(B) 1.5 Wb

(C) 15 Wb

(D) 0.15 Wb

CHEMISTRY

41) Hybridisation in XeF_2 and XeF_4 are respectively _____.

(A) sp^2 and sp^3d^2

(B) sp^3d and sp^3d^2

(C) sp and sp^3

(D) sp^3d and sp^3

42) Which is the correct options for bonds and their number in pyrophosphoric acid?

(A) Two P-OH, Four P = O, One P-O-P

(B) Four P-OH, One P = O, One P-O-P

(C) Two P-OH, Four P = O, Two P-O-P

(D) Four P-OH, Two P = O, One P-O-P

43) Name a transition element which does not exhibit variable oxidation states.

(A) Zinc

(B) Copper

(C) Scandium

(D) Chromium

44) Which statement is incorrect from the following?

(A) CrO is basic, but Cr_2O_3 is amphoteric

(B) 'Cd' is not consider as transition element

(C) Atomic sizes of elements of '4d' series is greater than corresponding elements of '3d' series

(D) Atomic sizes of elements of '5d' series is greater than corresponding '4d' series

45) How many numbers of Geometrical Isomers of [Pt (NH_3) (Br) (Cl) (Py)] will have?

(A) 3 (B) 2

(C) 1 (D) 4

46) How many numbers of mole Ions produced from aqueous solution of 1 mole Iron (III) hexacyanido Ferrate (II) complex?

(A) 4 (B) 7

(C) 5 (D) 6

47) Which of the following ligand is ambidentate?

NO_3^-, NO_2^-, CN^-, SCN^-
(P) (Q) (R) (S)

(A) R and S

(B) P and Q

(C) Q and S

(D) Q and R

48) How many numbers of sigma (σ) and pi (π) bonds in DDT respectively?

(A) 28 and 6

(B) 29 and 6

(C) 30 and 6

(D) 21 and 6

49) Which of the following undergoes S_N2 reaction most readily?

(A) $C_6H_5CH(CH_3)Br$

(B) $C_6H_5CH(C_6H_5)Br$

(C) $C_6H_5C(CH_3)(C_6H_5)Br$

(D) $C_6H_5CH_2Br$

50) From following reactions, which reaction does not give "Benzene"?

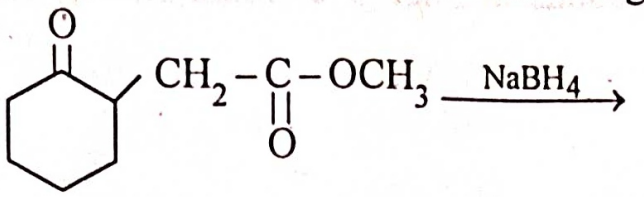
(A) $C_6H_5COONa + \text{Sodalime} \xrightarrow{\Delta}$

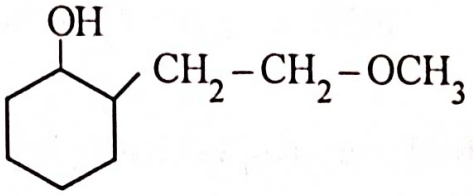
(B) $C_6H_5N_2^+Cl^- + H_3PO_2 + H_2O \longrightarrow$

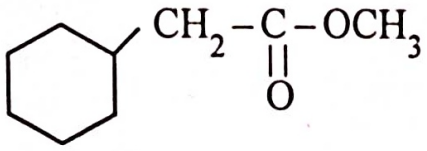
(C) $C_6H_5OH + Zn \xrightarrow{\Delta}$

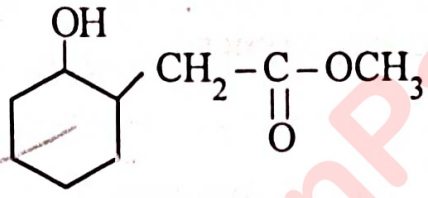
(D) $C_6H_5OH + H_2CrO_4 \xrightarrow{[O]}$

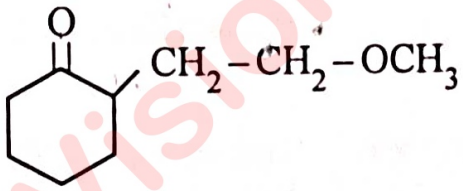
51) Which product is obtained from following reaction?



(A) 

(B) 

(C) 

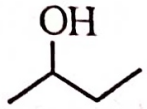
(D) 

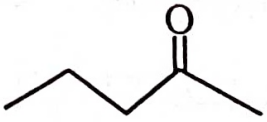
52) Which method is used to prepare salicylic acid from phenol?

(A) Stephen reaction
(B) Kolbe's reaction
(C) Etard reaction
(D) Reimer-Tiemann reaction

53) Which of the following compounds will not give "Iodoform" by reaction witl "sodiumhypoiodide"?

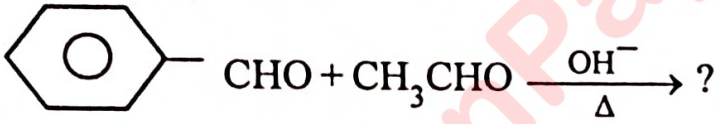
(A) CH_3-CHO

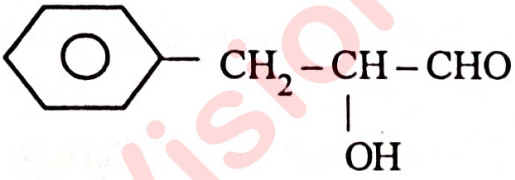
(B) 

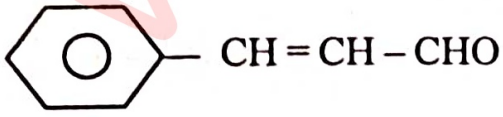
(C) 

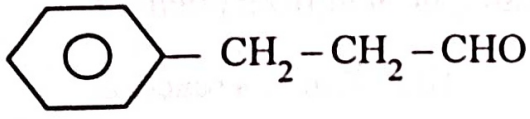
(D) $CH_3-CH_2-CO-CH_2-CH_3$

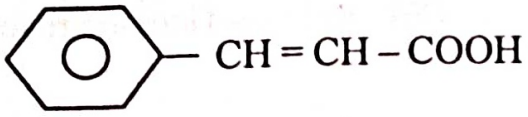
54) What will be the main product in the following reaction?



(A) 

(B) 

(C) 

(D) 

55) Which is the incorrect order of increasing acidic strength for the following?

(A) $CH_2FCH_2CH_2COOH < CH_3CHFCH_2COOH$

(B) $CH_2ClCOOH < CH_2FCOOH$

(C) $CH_3COOH < CH_2ClCOOH$

(D) $HCOOH < C_6H_5COOH$

56) How many numbers of Isomer for the compound having molecular formula C_3H_9N?

(A) 2 (B) 3

(C) 4 (D) 5

57) From which of the following reaction primary amine is produced?

(A) Reduction of Nitrile Compounds

(B) Reduction of Amide Compounds

(C) Hoffmann bromamide degradation reaction

(D) Above all reactions

58) Identify the compound 'C' from following reaction.

$$CH_3COOH \xrightarrow[\Delta]{NH_3} A \xrightarrow{Br_2+NaOH} B \xrightarrow[HCl]{NaNO_2} C$$

(A) $CH_3-CH_2N_2^+Cl^-$

(B) CH_3-CH_2OH

(C) CH_3OH

(D) $CH_3-CH_2-NH_2$

59) Select proper statement from following True (T) and False (F) statements.

(I) Pentose sugar + base → Nucleotide

(II) Nucleotide + Phosphate → Nucleoside

(III) DNA contains four bases A, G, C and T

(IV) RNA contains four bases A, G, C and U

(A) FTFT (B) FTTT

(C) FFTT (D) TTTT

60) Which glycosidic linkage occurs in 'Amylopectin'?

(A) $C_1 - C_3$ and $C_1 - C_4$

(B) $C_1 - C_4$ and $C_1 - C_6$

(C) $C_1 - C_2$ and $C_1 - C_6$

(D) $C_2 - C_4$ and $C_4 - C_6$

61) Which polymer is used in manufacture of paints and lacquers?

(A) Glyptal

(B) Teflon

(C) Neoprene

(D) Melamine

62) Which of the following polymer is not obtained by the condensation polymerization?

(A) Decron

(B) Nylon - 2 - Nylon - 6

(C) Nylon - 6, 6

(D) Polyacrylonitrile

63) Which of the following drug is used for treatment of Acidity?

(A) Ranitidine

(B) Meprobamate

(C) Salvarsan

(D) Codein

64) Which Artificial sweetener is unstable at cooking temperature?

(A) Sucralose

(B) Aspartame

(C) Alitame

(D) Saccharin

65) Cell edge length in bcc, ccp and simple cubic unit cell is respectively as _____

(A) $2r, \frac{4r}{\sqrt{3}}, 2\sqrt{2}\,r$

(B) $2r, 2\sqrt{2}\,r, \frac{4r}{\sqrt{3}}$

(C) $2\sqrt{2}\,r, \frac{4r}{\sqrt{3}}, 2r$

(D) $\frac{4r}{\sqrt{3}}, 2\sqrt{2}\,r, 2r$

66) Atoms of element N form hcp lattice and those of the element M occupy 1/3rd o tetrahedral voids. What will be the formula of the compound formed by the element M and N?

(A) M_4N_3

(B) M_3N_2

(C) M_2N_3

(D) M_3N

67) Calculate the mole fraction of aqueous solution of 1 molal urea (NH_2CONH_2)

(A) 0.01878

(B) 0.01768

(C) 0.01800

(D) 0.01698

68) Value of Henry's constant K_H _____.

(A) no effect by changing temperature

(B) decreases with increase in temperature

(C) increases with increase in temperature

(D) first decreases and then increases by increase in temperature

69) What is value of Van't Hoff factor (i) when 80% of $CaCl_2$ dissociates?

(A) 2.70
(B) 2.40
(C) 3
(D) 2.30

70) How much electricity in terms of Faraday is required for reduction of 2 mol $Cr_2O_7^{2-}$ into Cr^{3+} in acidic medium?

(A) 12 F
(B) 3 F
(C) 6 F
(D) 9 F

71) Which is proper value of x for the following to increase cell potential of

$$Zn_{(s)}\left|Zn^{2+}_{(x\,M)}\right|\left|Cu^{2+}_{(0.02\,M)}\right|Cu_{(s)}$$

(A) $x = 0.02$ M
(B) $x < 0.02$ M
(C) $x > 0.02$ M
(D) $x \geq 0.02$ M

72) Which substance is used as oxidising agent in nickel-cadmium cell?

(A) $Ni(OH)_3$
(B) Cd
(C) Ni
(D) CdO

73) What is the value of slope when graph plotted of $\log\frac{[R]_0}{[R]}$ Vs t (time) for first order reaction?

(A) $-\frac{K}{2.303}$
(B) $\frac{K}{2.303}$
(C) $-K$
(D) $\frac{2.303}{K}$

74) A reaction is first order with respect to a reactant A and second order with respect to reactant B. What is the effect of rate when concentration of both A and B increased by doubled?

(A) Eight times
(B) Quadrupled
(C) Doubled
(D) Sixteen times

75) Which colloidal sol results, when highly diluted solution of $AgNO_3$ is added to highly diluted KI solution?

(A) . AgI/NO_3^-
(B) AgI/K^+
(C) AgI/Ag^+
(D) AgI/I^-

76) Match the types of colloidal systems given in Column - I with the name given in Column - II.

Column - I		Column - II	
(i)	Solid in liquid	(p)	Aerosol
(ii)	Liquid in solid	(q)	Foam
(iii)	Liquid in gas	(r)	Sol
(iv)	Gas in liquid	(s)	Gel

(A) (i) → (r), (ii) → (s), (iii) → (p), (iv) → (q)
(B) (i) → (s), (ii) → (r), (iii) → (p), (iv) → (q)
(C) (i) → (r), (ii) → (s), (iii) → (q), (iv) → (p)
(D) (i) → (p), (ii) → (q), (iii) → (r), (iv) → (s)

77) In which colloids both Lyophilic and Lyophobic parts present?

(A) Micelle

(B) Gold sol

(C) Rubber sol

(D) Sol of As_2S_3

78) Which method is not proper to obtain metal of high purity from impure metal?

(A) Leaching

(B) Chromatographic methods

(C) Liquation

(D) Distillation

79) Which is known as "Copper Matte"?

(A) $Cu_2S + FeO$

(B) $Cu_2S + FeS$

(C) $Cu_2O + FeS$

(D) $Cu_2O + FeO$

80) Which products are obtained by reaction of hot and concentrated NaOH with dichlorine?

(A) $NaCl + NaClO_2 + H_2O$

(B) $NaCl + NaClO_4 + H_2O$

(C) $NaCl + NaClO_3 + H_2O$

(D) $NaCl + NaOCl + H_2O$