ENTRANCE EXAMINATION 2011

Entrance Examination for Admission to BASLP

Time: 50 minutes   Max. Marks 50

JUNE 2011

CHEMISTRY

1. The number of molecules present in a drop of water weighing 0.06g is approximately
   a) 10^{21}
   b) 2×10^{21}
   c) 3×10^{21}
   d) 4×10^{21}

2. The maximum number of 4f electrons having spin quantum number $-\frac{1}{2}$ is
   a) 4
   b) 5
   c) 7
   d) 14

3. The ionic radii of N^{3-}, O^{2-}, F^-, Na^+ follow the order
   a) $N^{3-} > O^{2-} > F^- > Na^+$
   b) $N^{3-} > Na^+ > O^{2-} > F^-$
   c) $Na^+ > O^{2-} > N^{3-} > F^-$
   d) $O^{2-} > F^- > Na^+ > N^{3-}$

4. In one of the following molecules the state of hybridization of the central atom is not the same as in the others
   a) B in BF_3
   b) O in H_3O^+
   c) N in NH_3
   d) P in PCl_3

5. If V_0 is the volume of a given mass of gas at 273 K at a constant pressure, then according to Charle's Law, the volume at 10^0C will be
   a) 10 Vo
   b) $1/273 (V_0 + 10)$
   c) $Vo + 10/273$
   d) $(283/273)$ Vo

6. The enthalpy of formation for $C_2H_4(g)$, CO_2 (g) and $H_2O(l)$ at 25^0c and 1 atm pressure are 52, -394 and -286 kJmol^{-1} respectively. The enthalpy of combustion of $C_2H_4(g)$ will be
   a) +1412 kJ mol^{-1}
   b) -1412 kJ mol^{-1}
   c) +141.2 kJ mol^{-1}
   d) -141.2 kJ mol^{-1}

7. The dissociation of $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$ is an endothermic reaction. Which of the following will favour the forward reaction
   a) Adding $Cl_{2(g)}$ to the equilibrium mixture at a constant volume
   b) Compressing the gaseous mixture
   c) Increasing the volume of the gaseous mixture
   d) Decreasing the temperature

8. In the reaction $3 Br_2 + 6 CO_3^{2-} + 3H_2O \rightarrow 5 Br^- + BrO_3^- + 6 HCO_3^-$
   a) Bromine is oxidized and carbonate is reduced
   b) Bromine is reduced and water is oxidised
   c) Bromine is neither reduced nor oxidised
   d) Bromine is both reduced and oxidised

C1

9. H_2O_2 is always stored in black bottles because
   a) It is highly unstable
   b) Its enthalpy of decomposition is high
   c) It undergoes auto oxidation on prolonged standing
   d) None of these

10. A silvery white metal lighter than water can be produced only by the electrolysis of its fused chloride with difficulty. The metal is used as coolant in nuclear reactors. The metal is
    a) K
    b) Mg
    c) Ca
    d) Na

11. Which of the following oxides of Nitrogen is obtained when copper is heated with conc. HNO_3
    a) N_2O_5
    b) N_2O
    c) NO_2
    d) NO

12. The IUPAC name of the compound

    $CH_3 - CH(OH) - CH_2 - CH(OH) - CH_3$ is

    a) 1, 1 – Dimethyl butane – 1,3 - diol
    b) 1,3,3 – Trimethyl propane – 1,3-diol
    c) Pentane – 2, 4 - diol
    d) 1,3,3 – Trimethyl – 1,3-propane diol

13. Point out the incorrect statement about resonance
    a) Resonance structures should have equal energy
    b) In resonance structures the constituent atoms must be in the same position
    c) In resonance structures there should not be same number of electron pairs
    d) Resonance structures should differ only in the location of electrons around the constituent atoms

14. What is X in the following sequence of reactions?

    $$X \xrightarrow[-\frac{1}{2}H_2]{Na} Y \xrightarrow[Heat]{NaOH/CaO} CH_4$$

    a) Methanoic acid
    b) Ethanoic acid
    c) Propane
    d) Methane

15. $R - CH_2 - CCl_2 - R \xrightarrow{Reagent} R\text{-}C \equiv C\text{-}R$
    The reagent is
    a) Na
    b) HCl in H_2O
    c) KOH in C_2H_5OH
    d) Zn in alcohol

16. Which of the following does not contribute towards the formation of photo chemical smog
    a) NO
    b) SO_2
    c) O_3
    d) Hydrocarbons

17. Which of the following species is paramagnetic
    a) O_2
    b) N_2
    c) O_2^{2-}
    d) H_2

18. A base according to Bronsted concept is a substance which can
   a) Lose a pair of electrons
   b) Donate protons
   c) Gain a pair of electrons
   d) Accept protons

19. The number of unpaired electrons in Cu^+ (Z=29) is
   a) 1
   b) 2
   c) 0
   d) 3

20. Alkyl groups are o- and p- directing because of
   a) Inductive effect
   b) Mesomeric effect
   c) Electromeric effect
   d) Hyper conjugation effect

21. To get n- type doped semiconductor, impurity to be added to silicon should have the following number of valence electrons
   a) 2
   b) 5
   c) 3
   d) 1

22. A binary solution of ethanol and n-heptane is an example of
   a) Ideal solution
   b) Non ideal solution with +ve deviation
   c) Non ideal solution with –ve deviation
   d) Unpredictable behaviour

23. In which one of the following, One Faraday of electricity will liberate ½ gram atom of the metal
   a) $AlCl_3$
   b) $FeCl_3$
   c) $CuSO_4$
   d) $NaCl$

24. A reaction is first order when
   a) The amount of product formed increases linearly with time
   b) The rate decreases linearly with time
   c) The rate is linearly related to the concentration of he reactant
   d) The concentration of the reactant decreases linearly with time

25. The flocculation values of KCl, $MgCl_2$, $CrCl_3$ and $SnCl_4$ for a negatively charged sol are in the order
   a) $KCl < MgCl_2 < CrCl_3 < SnCl_4$
   b) $KCl = MgCl_2 = CrCl_3 = SnCl_4$
   c) $MgCl_2 < KCl < CrCl_3 < SnCl_4$
   d) $SnCl_4 < CrCl_3 < MgCl_2 < KCl$

26. Cryolite is
   a) Na_3AlF_6 and is used in the electrolysis of alumina for decreasing electrical conductivity
   b) Na_3AlF_6 and is used in the electrolysis of alumina for lowering the melting point of alumina
   c) Na_3AlF_6 and is used in the electrolytic purification of alumina
   d) Na_3AlF_6 and is used in the electrolysis of alumina

27. What will be the product obtained by heating $(NH_4)_2 Cr_2O_7$?
   a) $Cr_2O_3 + NH_3 + H_2O + N_2$
   b) $NH_3 + Cr_2O_3$
   c) $Cr_2O_3 + N_2 + H_2O$
   d) $N_2O + H_2 + Cr_2O_3$

28. In an octahedral complex, the value of spin only magnetic moment for one of the following configurations is 2.84 BM. The correct one is
   a) d^4 (in strong ligand field)
   b) d^4 (in weak ligand field)
   c) d^3 (in weak as well as strong fields)
   d) d^5 (in strong ligand field)

29. One mole of complex compound Co $(NH_3)_5$ Cl_3 gives 3 moles of ions on dissolution in water. One mole of the same complex reacts with two moles of $AgNO_3$ solution to yield two moles of $AgCl_{(s)}$. The structure of the complex is

    a) [Co $(NH_3)_3$ Cl_3] .2 NH_3 c) [Co $(NH_3)_4$ Cl] Cl_2 .NH_3

    b) [Co $(NH_3)_4$ Cl_2] Cl. NH_3 d) [Co $(NH_3)_5$ Cl] Cl_2

30. An alkyl halide by formation of its Grignard reagent and heating with water yields propane. What is the original alkyl halide?

    a) Methyl Iodide   c) Ethyl bromide

    b) Ethyl iodide   d) Propyl bromide

31. An organic compound X on treatment with acidified $K_2Cr_2O_7$ gives a compound Y which reacts with Iodine and sodium carbonate to form tri iodo methane. The compound X is

    a) CH_3OH c) CH_3CHO

    b) CH_3COCH_3 d) CH_3CHOH CH_3

32. In the following reaction product P is

    $$\overset{O}{\underset{R-C-Cl}{\overset{\parallel}{}}} \xrightarrow[Pd\text{-}BaSO_4]{H_2} P$$

    a) RCH_2OH c) RCHO

    b) RCOOH   d) RCH_3

33. Which of the following reagents can be used to convert primary amides into primary amines containing the same number of carbon atoms

    a) Br_2+ NaOH   c) Sn + HCl

    b) $LiAlH_4$ d) Na + C_2H_5OH

34. Which of the following has a branched chain structure?

    a) Amylopectin   c) Cellulose

    b) Amylose   d) Nylon

35. Cellulose is a straight chain polysaccharide composed of only

    a) D- glucose units joined by α-glycosidic linkage   c) D-galactose units joined by α-glycosidic linkage

    b) D- glucose units joined by β - glycosidic linkage   d) D-galactose units joined by β-glycosidic linkage

36. Among the following a homopolymer is

    a) PMMA   c) Glyptal

    b) Bakelite   d) Dacron

37. The antiseptic action of Dettol is due to

    a) Chloro benzene   c) Chloroquine

    b) Chloroxylenol   d) Chloroamphenicol

38. The term fools gold is used for a mineral which shines like gold. It is

    a) iron pyrites   c) cinnabar

    b) copper pyrites   d) cadmium sulphide

39. Ethylene glycol is added to water as anti-freeze. It will
   a) decrease the freezing point of water in winter and increase the boiling point of water in summer
   c) only increase the boiling point of water
   b) only decrease the freezing point of water
   d) be used for cleaning the radiator in a car

40. A catalyst increases the rate of reaction because it
   a) increases the activation energy
   c) decreases the collision diameter
   b) lowers the energy barrier for reaction
   d) increases the temperature coefficient

41. Formula of sodium nitro prusside is
   a) $Na_2 [Fe(CN)_3 NO]$
   c) $Na_2 [Fe(CN)_5 NO]$
   b) $Na_3 [Fe(CN)_5 ONO]$
   d) $Na_4 [Fe(CN)_4 NO]$

42. The formation of cyanohydrins from a ketone is an example of:
   a) electrophilic addition
   c) nucleophilic substitution
   b) nucleophilic addition
   d) electrophilic substitution

43. Which of the following on dehydration with conc. H_2SO_4 gives 2 -
   a) Butan – 2-ol
   c) 2-methyl-1-propanol
   b) 2-methyl propan-2-ol
   d) butanal

44. For the reaction

   $2 A + B \longrightarrow 3 C + D$, which of the following does not express the reaction rate

   a) $\dfrac{d [D]}{dt}$
   c) $\dfrac{-d [CD]}{3 dt}$

   b) $\dfrac{-d [A]}{2 dt}$
   d) $\dfrac{-d [B]}{dt}$

45. The structure of rock salt is
   a) Simple cubic
   c) ccp
   b) bcc
   d) hcp

46. The electrode potential of a half cell depends upon
   a) Nature of metal
   c) Temperature
   b) Concentration of metal ions is solutions
   d) All

47. The formation of $O_2^+ [Pt F_6]^-$ is the basis for the formation of xenon fluorides. This is because
   a) O_2 and Xe have comparable sizes
   c) O_2 and Xe have comparable ionisation energies
   b) Both O_2 and Xe are gases
   d) O_2 and Xe have comparable electronegativities

48. The helical structure of proteins is stabilized by
   a) Dipeptide bonds
   c) Ether bonds
   b) Hydrogen bonds
   d) Peptide bonds

C5

49.	Which of the following are anti bacterials
	a)	Penicillin
	b)	Sulphapyridine
	c)	Ofloxacin
	d)	All

50.	Which is not true about polymers
	a)	Polymers do not carry any charge
	b)	Polymers have high viscosity
	c)	Polymers scatter light
	d)	Polymers have low molecules weight

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MATHEMATICS

1. If A and B have n elements in common, then the number of elements common to AxB and BxA is
   - a) n
   - b) 2n
   - c) n^2
   - d) 0

2. $If\ x + y = \begin{bmatrix} 5 & 2 \\ 0 & 9 \end{bmatrix}\ and\ x - y = \begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}\ then\ x\ is$
   - a) $\begin{bmatrix} 8 & 8 \\ 0 & 8 \end{bmatrix}$
   - b) $\begin{bmatrix} 4 & 4 \\ 0 & 4 \end{bmatrix}$
   - c) $\begin{bmatrix} 4 & 4 \\ 0 & 5 \end{bmatrix}$
   - d) $\begin{bmatrix} 8 & 8 \\ 0 & 10 \end{bmatrix}$

3. If B is a 2x2 matrix and $B \begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$ then B is
   - a) $\begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$
   - b) $\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix}$
   - c) $\begin{bmatrix} 24 & 12 \\ -6 & 6 \end{bmatrix}$
   - d) $\begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$

4. If $f(x) = x^2+2$, $g(x) = 3x$ then $(gof)(x)$ is
   - a) $9x^2+2$
   - b) $3x^2+2$
   - c) $3x(x^2+2)$
   - d) $3(x^2+2)$

5. Number of elements in the range of the constant function is
   - a) 0
   - b) 1
   - c) 2
   - d) 3

6. The value of $\begin{vmatrix} cos15° & sin15° \\ sin75° & cos\ 75° \end{vmatrix}$ is
   - a) 0
   - b) 1
   - c) 2
   - d) 3

7. The value of the determinant $\begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix}$ is
   - a) (x+2a)(x-a)
   - b) $(x+a)(x-a)^2$
   - c) $(x+2a)(x-a)^2$
   - d) $(x+2a)^2(x-a)$

8. The principal solution of $tan\ x = \frac{1}{\sqrt{3}}$ is
   - a) $\frac{\pi}{3}, \frac{4\pi}{3}$
   - b) $\frac{\pi}{6}, \frac{7\pi}{6}$
   - c) $\frac{\pi}{3}, \frac{2\pi}{3}$
   - d) $\frac{\pi}{6}, \frac{5\pi}{6}$

9. The large hand of a big clock is 70 cm long. Then the distant covered by the extremity in 6 minutes time is
   a) 11 cm
   b) 22 cm
   c) 33 cm
   d) 44 cm

10. Let A = {1,2,3,4} and a relation R is defined by xRy iff x<y then R is
   a) Reflexive
   b) Symmetric
   c) Transitive
   d) Equivalence

11. Which one of the following is one-one
   a) $f(x) = x^2$
   b) $f(x) = \dfrac{x^2 - 1}{2}$
   c) $f(x) = 2x + 5$
   d) $f(x) = \cos x, (0 \le x \le 2\pi)$

12. If $\tan^{-1}(3x) + \tan^{-1}(2x) = \dfrac{\pi}{4}$, then x is
   a) 1, 6
   b) 0, 1
   c) $\dfrac{1}{6}$
   d) 1

13. If $\cos^2[\tan^{-1}\{\sin(\cot^{-1}x)\}] = y$ then y is
   a) $\dfrac{x-1}{x+1}$
   b) $\dfrac{x^2+1}{x^2-2}$
   c) $\dfrac{x^2-1}{x^2+2}$
   d) $\dfrac{x^2+1}{x^2+2}$

14. The conjugate of $\dfrac{2-3i}{3+4i}$ is
   a) $\dfrac{6-17i}{25}$
   b) $\dfrac{-6+17i}{25}$
   c) $\dfrac{-6-17i}{25}$
   d) $\dfrac{6+17i}{25}$

15. If $f(x) = \begin{cases} \dfrac{1-\cos 4x}{16x^2}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at x = 0 then k is
   a) $\dfrac{1}{2}$
   b) 1
   c) $\dfrac{1}{4}$
   d) $\dfrac{1}{8}$

16. The solution of the inequality $\dfrac{x}{2} + \dfrac{x}{3} < \dfrac{1}{4} + \dfrac{1}{6}$ is
   a) $(-\infty, \tfrac{1}{2})$
   b) $(\tfrac{1}{2}, \infty)$
   c) $(-\infty, \tfrac{5}{2})$
   d) $(\tfrac{5}{2}, \infty)$

17. If $y = x^{\sqrt{x}}$ then $\dfrac{dy}{dx}$ is equal to
   a) $x^{\sqrt{x}}\left[\dfrac{1 + \log x}{\sqrt{x}}\right]$
   b) $x^{\sqrt{x}}\left[\dfrac{2 + \log x}{2\sqrt{x}}\right]$
   c) $\sqrt{x}\, x^{\sqrt{x}-1}$
   d) $\dfrac{1}{\sqrt{x}}\, x^{\sqrt{x}-1}$

M2

18. If $\sin y = x\cos(a+y)$ then $\frac{dy}{dx}$ is

a) $\dfrac{\sin^2(a+y)}{\sin a}$

b) $\dfrac{\cos a}{\cos(a+y)}$

c) $\dfrac{\sin a}{\sin(a+y)}$

d) $\dfrac{\cos^2(a+y)}{\cos a}$

19. If $x = e^\theta\left(\theta+\frac{1}{\theta}\right)$, $y = e^{-\theta}\left(\theta-\frac{1}{\theta}\right)$ then $\frac{dy}{dx}$ at $\theta = 1$ is

a) $\dfrac{1}{e}$

b) $-\dfrac{1}{e}$

c) $\dfrac{1}{e^2}$

d) $-\dfrac{1}{e^2}$

20. If $np_r = 720, nc_r = 120$ then r is

a) 1

b) 2

c) 3

d) 4

21. The number of ways for a students choose a programme of 5 courses if 9 courses are available and two specific courses are compulsory for every students are

a) $9C_5$

b) $9C_3$

c) $7C_5$

d) $7C_3$

22. The curves $x=y^2$ and $xy=a$ cut orthogonally if

a) $4a^2 = 1$

b) $4a^2 = -1$

c) $8a^2 = 1$

d) $8a^2 = -1$

23. The side of an equilateral triangle is 2cm and is increasing at the rate of 8cm/hr. The area of the triangle is increasing at the rate of

a) $8\sqrt{3}\ sqcm/hr.$

b) $4\sqrt{3}\ sqcm/hr.$

c) $\dfrac{\sqrt{3}}{8}\ sqcm/hr.$

d) $\dfrac{8}{\sqrt{3}}\ sqcm/hr.$

24. Two numbers whose sum is 12 and sum of whose cubes is minimum are

a) 10, 2

b) 6, 6

c) 4, 8

d) 5, 7

25. The term not containing x in the expansion of $\left(\sqrt{x}-\frac{2}{x^2}\right)^{20}$ is

a) 3

b) 4

c) 15

d) 5

26. The value of $c_0 - c_1 + c_2 - c_3 + \cdots + \cdots + (-1)^n c_n$ is

a) 0

b) 2^n

c) 2^{n-1}

d) 2^{n+1}

27. If $f'(x) = \frac{1}{x} + x$ and $f(1) = \frac{5}{2}$ then $f(x)$ is

a) $-\dfrac{1}{x^2}+1$

b) $logx + \dfrac{x^2}{2} + 4$

c) $logx + \dfrac{x^2}{2} + 2$

d) $-\dfrac{1}{x^2}+\dfrac{x^2}{2}$

28. $\int \frac{\cot(logx)}{x}\ dx$ is equal to
    a) $logsin(logx) + c$
    c) $logsec(logx) + c$
    b) $logcos(logx) + c$
    d) $logtan(logx) + c$

29. The sum of the series 7+77+777+..... up to n terms is
    a) $\frac{7}{9}\left[\frac{10}{9}(10^n - 1) - n\right]$
    c) $\frac{7}{9}[10^n - 1 - n]$
    b) $\frac{70}{81}(10^n - 1) - n$
    d) $\frac{700}{81}(10^n - 1) - n$

30. The sum to 10 terms of the series $1 + 4 + 9 + 16 + \cdots$ is
    a) 365
    c) 385
    b) 375
    d) 395

31. $\int_0^a \frac{\sqrt{x}}{\sqrt{x}+\sqrt{a-x}}\ dx$ is
    a) $\frac{a}{2}$
    c) 0
    b) A
    d) $\frac{a}{4}$

32. $\int_{-1}^{1}|x|\ dx$ is
    a) 0
    c) $\frac{1}{4}$
    b) $\frac{1}{2}$
    d) 1

33. The equation of the line passing through the point on intersection of 3x+4y-7=0 and 2x-5y+8=0 and parallel to x-3y+5=0
    a) 23x-69y+111=0
    c) x-3y+35=0
    b) 23x+69y+11
    d) x+3y+35=0

34. Sum of the focal distances of any point on the ellipse $25x^2 + 9y^2 = 225$ is
    a) 6
    c) 9
    b) 10
    d) 25

35. The angle between 2x+3y=7 and x+y=8 is
    a) $tan^{-1}\left(\frac{3}{4}\right)$
    c) $tan^{-1}(5)$
    b) $tan^{-1}\left(\frac{3}{5}\right)$
    d) $tan^{-1}\left(\frac{1}{5}\right)$

36. The area bounded by $y=4x^2$, x=0, y=1, y=4 is
    a) $\frac{7}{3}$
    c) $\frac{2}{3}$
    b) $\frac{1}{3}$
    d) $\frac{4}{3}$

37. The direction cosines of a line which is equally inclined to the axes are
    a) $\pm1, \pm1, \pm1$
    c) $\pm\sqrt{3}, \pm\sqrt{3}, \pm\sqrt{3}$
    b) $\pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}$
    d) 1, 1, 1

M4

38. The order and degree of the differential equation $y = x \left(\frac{dy}{dx}\right)^3 + \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$

    a)   1, 3   c)   3, 1

    b)   1, 6   d)   6, 1

39. The solution of the differential equation $\frac{dy}{dx} = (1 + y^2)(1 + x^2)$ is

    a) $tan^{-1}y = x + \dfrac{x^3}{3} + c$ c) $tan^{-1}x = y + \dfrac{y^3}{3} + c$

    b) $tan^{-1}x = tan^{-1}y + c$ d) $log(1 + y^2) = x + \dfrac{x^3}{3} + c$

40. The value of $\lim_{x \to 2} \frac{x^n - 2^n}{x - 2} = 80$, then n is

    a)   2   c)   4

    b)   3   d)   5

41. The value of $\lim_{x \to 0} \frac{sin5x}{tan3x}$ is

    a)   0   c) $\dfrac{3}{5}$

    b) $\dfrac{5}{3}$ d)   1

42. If the two vectors $2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ and $-4\hat{\imath} - 6\hat{\jmath} + \lambda\hat{k}$ are perpendicular to each other then the value of λ is

    a)   26   c)   10

    b)   −26   d)   −10

43. A vector which is perpendicular to the two vectors $\vec{a} = \hat{\imath} - \hat{\jmath} + 2\hat{k}$ and $\vec{b} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ is

    a) $5\hat{\imath} + 5\hat{\jmath} + 5\hat{k}$ c) $5\hat{\imath} - 5\hat{\jmath} + 5\hat{k}$

    b) $-5\hat{\imath} + 5\hat{\jmath} + 5\hat{k}$ d) $-5\hat{\imath} - 5\hat{\jmath} - 5\hat{k}$

44. The variance of 20 observations is 5. If each observations is multiplied by 3, then the new variance is

    a)   5   c)   15

    b)   8   d)   45

45. The coordinates of the point which divides the line segment joining the points (2, 1, 4) and (5, -2, 3) in the ratio 3:2 internally is

    a) $\left(\dfrac{19}{5}, \dfrac{-4}{5}, \dfrac{17}{5}\right)$ c) $\left(\dfrac{19}{5}, \dfrac{4}{5}, \dfrac{1}{5}\right)$

    b) $\left(\dfrac{19}{5}, \dfrac{4}{5}, \dfrac{17}{5}\right)$ d) $\left(\dfrac{11}{5}, \dfrac{-4}{5}, \dfrac{1}{5}\right)$

46. The distance from the point (1, 2, 3) to the plane x+2y+4z=38 is

    a) $\sqrt{21}$ c)   21

    b) $\dfrac{11}{\sqrt{21}}$ d)   11

47. If A and B are two events such that $P(A) \neq 0$ and A is subset of B then $P\left(\frac{B}{A}\right)$ is equal to

    a)   0   c) $P(B)$

    b)   1   d) $P(A)$

48. A random variable X has the following probability distribution

X	-2	-1	0	1	2	3
P(X)	0.1	k	0.2	2k	0.3	k

    a)   0.1   c)   0.3
    b)   0.2   d)   0.4

49. If the binary operation $*$ on the set of integers Z, is defined by $a*b=a+3b^2$ then $2*3$ is
    a)   29   c)   11
    b)   83   d)   14

50. The probabilities of solving a problem independently by A & B are $\frac{1}{4}$ and $\frac{1}{5}$ respectively. If both try to solve the problem, then the probability that the problem to be solved is

    a) $\dfrac{1}{20}$ c) $\dfrac{7}{20}$

    b) $\dfrac{3}{5}$ d) $\dfrac{2}{5}$

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BIOLOGY

1. Phyogenetic classification system is based on
   a) Fossils   c) Morphology
   b) Evolution   d) Physiology

2. Smallest living cell that can survive without oxygen is -
   a) Viroid   c) Bacillus
   b) Mycoplasma   d) Anabaena

3. Kelps are
   a) Fresh Water algae   c) Terrestrial algae
   b) Marine algae   d) Amphibians

4. Which of the following is a cnidarian
   a) Ancylostoma   c) Ascidia
   b) Aplysia   d) Adamsia

5. Multiple root cap is found in
   a) Maize   c) Pandanus
   b) Raddish   d) Solanum

6. Bicollateral vascular bundles are present in
   a) Cucurbita   c) Maize
   b) Sunflower   d) Dracaena

7. The Plasma protein, which maintain the osmotic pressure of blood is
   a) Albumin   c) Fibrinogen
   b) Heparin   d) Prothrombin

8. The central core of cilium or flagellum is called_____
   a) Axon   c) Axoneme
   b) Axoplasm   d) Acrosome

9. Nucleotide is
   a) Adenosine   c) Arachidonic acid
   b) Adenylic acid   d) Uridine

10. The enzyme involved in crossing over of meiotic cell division
    a) Ribonuclease   c) Realh
    b) Recombinase   d) Restriction endonuclease

B1

11. Plant root endodermis is impervious to water due to
    a) Starch sheath
    b) Keratin
    c) Casparian strip
    d) None of these

12. Denitrification is carried out by bacteria
    a) Thiobacillus
    b) Nitrosomonas
    c) Nitrobacter
    d) Nitorcoccus

13. Chloroplast without grana are known to occur in
    a) Bundle sheath cells of C3 plants
    b) Mesophyll cells of C4 plants
    c) Bundle sheath cells of C4 plants
    d) Mesophyll cells of all plants

14. In Kreb's cycle FAD participates as electron acceptor during the conversion of
    a) Succinyl COA to succinic acid
    b) α Ketoglutarate to succinyl CoA
    c) Succinic acid to Malic acid
    d) Malic acid to oxaloacetic acid

15. Succus entericus is the name given to
    a) A junction between ileum and large intestine
    b) Intestinal juice
    c) Swelling in the gut
    d) Appendix

16. The volume of air involved in breathing movements can be estimated by ......
    a) Sphygmomanometer
    b) Anemometer
    c) Spirometer
    d) Auxanometer

17. The part of human ear concerned with hearing is.......
    a) Tympanic membrane and tectorial membrane
    b) Tympanic membrane and basilar membrane
    c) Basilar membrane and tectorial membrane
    d) Ampulla

18. Erythroblastosis foetalis can happen if
    a) Mother Rh –ve and foetus Rh +ve
    b) Mother Rh+ve and foetus Rh -ve
    c) Father and foetus Rh+ve
    d) Mother and foetus Rh-ve

19. Patella is a cup shaped bone that covers the
    a) Knee ventrally
    b) Knee dorsally
    c) Ankle laterally
    d) Elbow

20. A peptide harmone secreted by gastrointestinal tract
    a) Cortisol
    b) estradiol
    c) epinephrine
    d) secretin

21. Oestrus cycle is characteristic of
    a) Human females
    b) Mammalian females
    c) Mammlian females other than primates
    d) Mammals

22. Exine of Pollen grain is formed of
    a) Callose
    b) Pecto-cellulose
    c) Ligno-cellulose
    d) Sporopollenin

B2

23. Double fertilization occurs in
    a) Pinus
    b) Selaginella
    c) Funaria
    d) Dalbergia

24. The residual persistent nucellus in seeds is
    a) Perisperm
    b) Pericarp
    c) Endosperm
    d) Scutellum

25. Site of fertilization in human female is
    a) Ovary
    b) Uterus
    c) Placenta
    d) Fallopian tube

26. In uterus, endometrium increases in thickness in response to
    a) Oxytocin
    b) Estrogen
    c) Prolactin
    d) Relaxin

27. Pills are very effective contraceptive as
    a) They block fallopian tube
    b) Inhibit ovulation
    c) Stimulate release of FSH and LH
    d) Degenerate sperms

28. Genotype of A- blood group father of O-group child would be
    a) $I^A I^A$
    b) $I^A i$
    c) $I^A I^B$
    d) ii

29. Dihybrid ratio is connected with principle of
    a) Purity of gametes
    b) Segregation
    c) Independent assortment
    d) Incomplete dominance

30. RNA codon for DNA sequence ATG will be
    a) AUG
    b) UTG
    c) UAC
    d) TAC

31. Which one does not cause cancer
    a) Activation of proto oncogenes
    b) Viral oncogenes
    c) Protooncogenes
    d) Both A and B

32. A gene of operon which forms the repressor protein
    a) Operator
    b) Promoter
    c) Regulator Structural
    d) Structural gene

33. In Miller's experiment, the raw materials were
    a) H_2O, HCN, H_2 and CH_4
    b) CH_4, NH_3, H_2 and H_2O
    c) CH_4, HCN, N_2 and H_2
    d) CH_4, H_2O, N_2 and H_2

34. Thorn of bougainvillea and tendril of cucurbita are examples of
    a) Vestigeal organs
    b) Convergent evolution
    c) Homologous organs
    d) Analogous organs

35. Immunity acquired after an infection is
    a) Active immunity
    b) Passive immunity
    c) Innate immunity
    d) Both B and C

B3

36. Antibodies are complex
    a) Proteins
    b) Lipids
    c) Steroids
    d) Prostaglandins

37. Selection of homozygous plant is
    a) Mass selection
    b) Mixed selection
    c) Pureline selection
    d) None of these

38. Himgiri is a disease resistant variety of
    a) Rice
    b) Wheat
    c) Maize
    d) Cauliflower

39. Pickout the microbe that form mycorrhiza
    a) Glomus
    b) Nostoc
    c) Oscillatoria
    d) Azospirillum

40. Group of bacteria used in biogas production is
    a) Eubacteria
    b) Organotrophs
    c) Methanotrophs
    d) Methanogens

41. "Molecular scissors" used in genetic engineering is
    a) DNA ligase
    b) DNA polymerase
    c) Helicase
    d) Restriction endonuclease

42. PCR is required for
    a) DNA proof reading
    b) DNA amplification
    c) Protein synthesis
    d) Amino acid synthesis

43. Bio-piracy is related to which of the following:
    a) Traditional knowledge
    b) Biomolecules
    c) Genes isolated from bio-resources
    d) All the above

44. The Bt toxin gene which controls cotton boll worm is
    a) Cry II Ab
    b) Cry IAb
    c) Cry II Ac
    d) All of these

45. Decomposition rate is slower if detritus is rich in .....
    a) Nitrogen
    b) Sugars
    c) Lignin and chitin
    d) Water

46. Animals of colder areas have shorter ears and limbs. It is
    a) Allen's Law
    b) Bergman's Law
    c) Dollo's Law
    d) Cope's Law

47. Once bare rocky area is supporting a forest. The sequence of vegetation types would have been
    a) Shrubs, herbs, mosses and lichens
    b) Lichens, mosses, shrubs and herbs
    c) Mosses, lichens, herbs and shrubs
    d) Lichens, mosses, herbs and shrubs

B4

48. The earth summit held at Rio de Janeiro in 1992 called upon all nations to ...
   a) to compile red list
   b) discuss effects of global warming
   c) Conserve biodiversity
   d) Control emission of CFC

49. Government of India has passed the Environment protection Act in the year
   a) 1989
   b) 1986
   c) 1974
   d) 1971

50. Pariculate matter from a thermal power plant exhaust can be removed by
   a) Scrubber
   b) Catalytic converter
   c) Incinerators
   d) Electrostatic precipitator

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Time: 50 minutes   Max. Marks 50

PHYSICS

1. Conversion of S.I. value of universal gravitation constant in CGS system we get value as
    a) $6.67 \times 10^{-11} Nm2\ kg^{-2}$
    c) $6.67 \times 10^{-11} dyne\ cm^2 g^{-2}$
    b) $6.67 \times 10^{-8} dyne\ cm^2 g^{-2}$
    d) $6.67 \times 10^{-8} gcm^2\ s^{-2}$

2. A car covers first half the distance between two places at a speed of 40 kmh⁻¹ and the second half at 60 kmh⁻¹. What is the average speed of the car?
    a) 48 kmh⁻¹
    c) 20 kmh⁻¹
    b) 50 kmh⁻¹
    d) 100 kmh⁻¹

3. What do the following velocity-time graph represent?
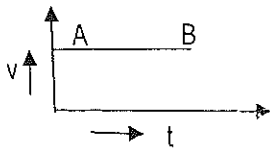
    a) Body has uniform velocity throughout the motion
    c) Both (a) and (b)
    b) Acceleration of the body is zero
    d) None of the above

4. Which of the following is not essential for the three vectors to produce zero resultant?
    a) They should lie in the same plane
    c) They should act along the sides of parallelogram
    b) It should be possible to represent them by three sides of triangle taken in the same order
    d) The resultant of any two vectors should be equal and opposite to the third vector

5. How much high above the ground, can a boy throw the ball if he is able to throw the same ball up to a maximum horizontal distance of 50m?
    a) 100 m
    c) 50 m
    b) 10 m
    d) 25 m

6. The physical quantity which is equal to the change in momentum of a body is known as
    a) force
    c) acceleration
    b) Impulse
    d) reaction

7. Three blocks of masses, m1, m2 and m3 kg are placed in contact with each other on a frictionless table. A force F is applied on the heaviest mass m1, the acceleration of m3 will be
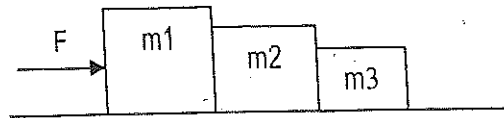
a) F/m_1
b) F/m_{1+m_2}
c) F/m_{2+m_3}
d) $F/m_{1+m_2+m_3}$

8. Two bodies with kinetic energies in the ratio of 4:1 are moving with same linear momentum. The ratio of their masses are
   a) 1:4
   b) 1:1
   c) 1:2
   d) 4:1

9. A ball hits a floor and rebounds after an inelastic collision. In this case
   a) The total momentum of the ball and earth is conserved
   b) Total energy of the ball and earth is conserved.
   c) The momentum of the ball just after the collision is same as the just before the collision
   d) The mechanical energy of the ball remains the same during the collision

10. According to Kepler's second law, the radius vector to a planet from the sun sweeps out equal areas in equal intervals of time. This law is a consequence of the conservation of
    a) Angular speed
    b) Angular momentum
    c) Linear momentum
    d) Kinetic energy

11. At what depth, below the surface of the earth, the value of 'g' becomes 25% of its value on the surface of the earth. Radius of the earth is 6400 km.
    a) 4800 km
    b) 1600 km
    c) 3200 km
    d) 1200 km

12. Four particles of masses m, m, 2m and 2m are placed at the four corners of a square of side 'a'. The co-ordinates of the centre of mass are
    a) (a/2, 2a)
    b) (a/2,a)
    c) (a/2,2a/3)
    d) (a, a/3)

13. If the earth shrinks to half of its radius without change in mass, the duration of the day will be
    a) 24 hr
    b) 48 hr
    c) 13 hr
    d) 6 hr

14. The Youngs modulus of a wire of length L and radius r is Y newton per square meter. If the length is reduced to L/2 and radius r/2 its youngs modulus will be
    a) Y/2
    b) 2 Y
    c) Y
    d) 4 Y

15. A drop of olive oil is introduced in a mixture of alcohol and water. The density of the mixture is the same as that of olive oil. The upward thrust on the drop is
    a) Zero
    b) More than the weight of the drop
    c) Less than the weight of the drop
    d) Equal to the weight of the drop

16. Two balloons are filled, one with pure Helium gas and other by air respectively. If the pressure and temperature of these balloons are same then the number of molecules per unit volume is
    a) Same in both balloons
    b) More in the Helium filled balloons
    c) More in the air filled balloons
    d) In the ratio of 1:4

17. The work of 146 KJ is performed in order to compress one kilo mole of a gas adiabatically and in this process, the temperature of the gas increases by 7^0C. The gas is (R=8.3 Jmol^{-1}K^{-1})
    a) Mono atomic
    b) Diatomic
    c) Triatomic
    d) A mixture of monoatomic and diatomic

18. An air bubble is rising through water kept in a long glass jar. The radius of the bubble
    a) Gradually decreases
    b) Gradually increases
    c) Remains the same
    d) First increases then decreases

19. A source of sound emitting a tone of frequency 400 Hz moves towards an observer with a velocity v. If the observer also moves away from the source with the same velocity v, then the apparent frequency heard by the observer is
    a) 400 Hz
    b) 300 Hz
    c) 200 Hz
    d) 100 Hz

20. A particle executes SHM with an amplitude 'a'. The period of oscillation is T. The minimum time taken by the particle to travel half of the amplitude from the equilibrium position is
    a) T/2
    b) T/12
    c) T/4
    d) T/8

21. Two point charges +8q and -2q are located at x=0 and x=L respectively. The location of a point on the x – axis at which the net electric field due to these two point charges is zero, is
    a) L/4
    b) 2L
    c) 4L
    d) 8L

22. Three capacitors of equal capacitance when connected in series have a net capacitance of C1 and when connected in parallel, have net capacitance C2 what will be the value of C1/C2
    a) 1/3
    b) 1/9
    c) 3/1
    d) 9/1

23. A parallel plate capacitor is charged and the charging battery is then disconnected. If the plates of the capacitor are moved further apart by means of insulating handles
    a) Charge on the capacitor increases
    b) Voltage across the plate increases
    c) The capacitance increases
    d) The charge on the capacitor decrease

24. The electric potential at a point on the equitorial line on an electric dipole is
    a) Directly proportional to distance
    b) Inversely proportional to distance
    c) Inversely proportional to squre of distance
    d) None of the above

25. Just as electricity is supplied at 220V for domestic use in India, it is supplied at 110V in USA. If the resistance of the 60W bulb for use in India is R, that of 60W bulb for USA will be
    a) R/4
    b) R/2
    c) R
    d) 2R

26. In a wheat stone bridge, three resistances P, Q and R connected in three arms and fourth arm is formed by tow resistance S1 and S2 connected in parallel. The condition for the bridge to be balanced will be

a) $\dfrac{P}{Q} = \dfrac{R(S1 + S2)}{S1\,S2}$

c) $\dfrac{P}{Q} = \dfrac{(S1 + S2)}{2\,S1\,S2}$

b) $\dfrac{P}{Q} = \dfrac{2R}{S1 + S2}$

d) $\dfrac{P}{Q} = \dfrac{R}{S1 + S2}$

27. If an ammeter is to be used in the place of voltmeter, then we must connect with the ammeter a
   a) Low resistance in parallel
   b) High resistance in parallel
   c) High resistance in series
   d) Low resistance in series

28. If the magnetic field is parallel to a surface then the magnetic flux through the surface is
   a) Zero
   b) Small but not zero
   c) Infinite
   d) Large but not infinite

29. Two long conductors, separated by a distance 'd' carry current I_1 and I_2 in the same direction. They exert a force F on each other. Now the current in one of them is increased to two times and its direction is reversed. The distance is also increased to 3d. the new value of the force between them is
   a) F/3
   b) - 2F
   c) - 2F/3
   d) - F/3

30. A small rod of bismuth is suspended freely between the poles of a strong electromagnet. It is found to arrange it self at right angel to the magnetic field. The observation establishes that bismuth is
   a) Ferro magnetic
   b) Dia magnetic
   c) Anti ferromagnetic
   d) paramagnetic

31. The dip angle at the equators is
   a) 45^0
   b) 90^0
   c) 0^0
   d) 60^0

32. In a transformer number of turns in the primary coil are 140 and that of secondary coil are 280. If the current in the primary coil is 4A, them that in the secondary coil is
   a) 4A
   b) 10A
   c) 6A
   d) 2A

33. The potential difference and current in the LCR circuit are
   V = 5 sinwt   the power dissipated in the circuit
   I = 4 sinwt
   a) 40 W
   b) 4 W
   c) 10 W
   d) 20 W

34. In an inductive coil, current
   a) Lags behind emf by $\dfrac{\pi}{2}$
   b) Leads emf by $\dfrac{\pi}{2}$
   c) Lags behind emf by π
   d) Both current and voltage are in phase

35. Which part of electromagnetic spectrum is used for viewing objects through haze and fog?
   a) γ – rays
   b) X - rays
   c) IR - rays
   d) UV rays

36. When an unpolarised light of intensity I_o is incident on a polarising sheet, the intensity of the light which does not get transmitted is

a) $\dfrac{Io}{4}$

c) Io

b) zero

d) $Io/_2$

37. In a certain double shit experimental arrangement, interference fringes of width 1 mm each are observed when light of wavelength, 5000 A° is used keeping the set up unaltered , if the source is replaced by another of wavelength 6000° then the fringe width will be

a) 0.5 mm

c) 1 mm

b) 1.2 mm

d) 1.5 mm

38. If the refractive index for water and glass are 4/3 and 5/3 respectively and the light is tending to go from glass to water, what is the value of critical angle

a) sin^{-1} (3/5)

c) 4/5

b) sin^{-1} (4/5)

d) 3/5

39. Two lenses of power – 15D and + 5D are in contact with each other. The local length of the combination is

a) + 10 CM

c) -10 CM

b) -20 CM

d) + 20CM

40. If the behavior of the light rays through a convex looking lens is shown in the figure then

a) $\mu_1 = \mu_2$

c) $\mu_1 < \mu_2$
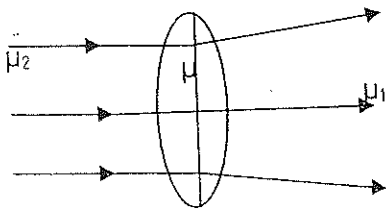
b) $\mu_1 > \mu_2$

d) $\mu_1 \leq \mu_2$

41. The work functions for metals A, B and C are respectively 1.92 ev, 2 ev and 5ev. Accordingly to einstein's equation the metals which will emit photo electrons for a radiation of wave length 4100 A° are

a) A and C

c) A and B only

b) All the three metals

d) None of the above

42. R_1 and R_2 are the radii of atomic nuclei of mass numbers 64 and 27 respectively the ratio of R_1 / R_2 is

a) 4/3

c) 64/27

b) 1

d) 27/64

43. When it disintegrates, a certain radioactive nuclide P-emists, γ - radiation and a single α – particle, forming a daughter product Q, which one of the following statements are correct

a) P and Q are isotopes of the same element

c) The mass number of P is one less than that of Q

b) The mass number of P is one more than that of Q

d) P has more protons in its nucleus than Q

44. Any nuclear fission process is always accompanied by emission of
   a) Positron
   b) Neutron
   c) Electron
   d) Meason

45. A proton and an α- particle are accelerated through the same potential difference. The ratio of de Broglie wave length of the proton to that the α- particle will be
   a) 2:1
   b) 1:1
   c) 1:2
   d) $2\sqrt{2}:1$

46. A semi conductor is known to have an electron concentration of 8×10^{13} cm^{-3} and hole concentration of 5×10^{12} the semiconductor is
   a) n – type semiconductor
   b) p – type semiconductor
   c) Intrinsic semiconductor
   d) None of the above

47. If the forward voltage in a diode is increased, the width of the depletion layer
   a) Increases
   b) Fluctuates
   c) Decreases
   d) Does not change

48. A transistor is operated in common emitter configuration at constant collector voltage $V_c = 1.5$ V such that the change in the base current from 100 μA to 150 μA produces a change in the collector current from 5mA to 10 mA. The current gain is
   a) 67
   b) 75
   c) 100
   d) 50

49. What should be the length of the dipole antenna for a carrier wave of frequency 3×10^8 Hz ?
   a) 0.5 M
   b) 0.75 M
   c) 1 M
   d) 1.5 M

50. What should be the frequency of carrier wave with reference to message signal for the process of modulation ?
   a) $f_c < f_s$
   b) $f_c > f_s$
   c) $f_c = f_s$
   d) None of the above

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