1. (a) $S = ut$

2. $n = \frac{1}{2l}\sqrt{\frac{T}{\mu}}$

(b)

$n\alpha\sqrt{T}$

3. $W = F_{B_1} + F_{B_2}$

(c)

$V\rho g = \frac{V}{3}d_1 g + \frac{2V}{3}d_2 g$

$\rho = 5.1 gm/c.c$

4. $P = \frac{W}{t}$

(d)

$\frac{P_1}{P_2} = \left(\frac{W_1}{W_2}\right)\left(\frac{t_2}{t_1}\right)$

5. (b) $RP = \frac{D}{1.22\lambda}$

6. (a)Conceptual

7. **(c)**

B = 10 log $\frac{I}{I_0}$

If P is power of sound source then

β = 10 log $\frac{(P/4\pi r^2)}{I_0}$ where $I_o = 10^{-12} w/m^2$

= 10 log $\frac{P}{4\pi r^2 . I_0}$

= 10[logP-log($4\pi I_0 . r^2$)]

= 10[logP-log$4\pi I_0$-2logr] = a- b log r where a = 10 log P - 10 log ρI_0

= constant b = 20 $\Rightarrow$ constant

8. $f^1 = \left(\frac{V + V_0}{V}\right) f$

(b)

9. $\theta_1 = \frac{1}{2}\alpha t_1^2$

(c)

$\theta_2 = \frac{1}{2}\alpha t_2^2$

$\Delta\theta = \theta_2 - \theta_1$

10. $T_1 = \frac{2u\sin(\alpha - \beta)}{g\cos\beta}$

(a)

$= \frac{2u}{g}\text{Tan}\,\theta$

$T_2 = \frac{2u}{g}\text{Tan}\,\theta$

$\therefore T_1 = T_2$

11. $R_0 = \frac{v^2}{P} = 10\Omega$

(d)

$i = 3A$

$R^1 = \frac{v^1}{i} = 40\Omega$

$\therefore R = R^1 - R_0 = 30\Omega$

12. $KE_1 = mgh + \frac{1}{2}mv_0^2$

(a)

$\frac{KE_1}{2} = mgh$

$V_0 = 20 m/s$

13. $n^1 = \left(\frac{v + v_0}{v - v_s}\right) n$

(a)

14. $\frac{P_1}{n_1 T_1} = \frac{P_2}{n_2 T_2}$

(a)

Mass leaking out = $1 - n_2(32) = \frac{1}{3} gm$

15. (b)

$$m(l+x)\omega^2 = kx$$

16. (a)

$$\frac{x}{l} = \frac{\mu_s}{1+\mu_s}$$

17. (c)

$$F = \rho A\left(V_2^2 - V_1^2\right)$$

$$P_1 + \frac{1}{2}\rho V_1^2 + \rho gh = P_2 + \frac{1}{2}\rho V_2^2$$

$$\therefore F = 2A\rho gh$$

18. (d)

$$\int \vec{B}.\vec{dl} = \mu_0 \sum i_{enclosed}$$

19. (c)

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$T^1 = 2\pi\sqrt{\frac{l}{g+a}}$$

20. (b)

$$\Delta Q = \Delta U + \Delta W$$

21. (a)

$$q = \frac{N\Delta\phi}{R} = 0.08C$$

22. (c) $\tau = I\alpha$

23. (d)Coonceptual

24. **(b)**

Distance between n^{th} bright and m^{th} dark fringe ($n > m$) is given as $x = \left(n - m + \frac{1}{2}\right)\beta = \left(n - m + \frac{1}{2}\right)\frac{\lambda D}{d}$

$$\Rightarrow \quad x = \left(5 - 3 + \frac{1}{2}\right) \times \frac{6.5 \times 10^{-7} \times 1}{1 \times 10^{-3}} = 1.63\, mm\ .$$

25. (c)

$$f = f_0\left(\frac{V + V_0}{V - V_s}\right)$$

26. (a)

$$E_n = \frac{-13.6}{n^2} eV$$

$$E_{Ionization} = -E_n$$

27. **(b)**

Rate of cooling α difference in temperature

$$-\frac{dT}{dt} \alpha\ \Delta\theta$$

$$\frac{dT}{dt} = -K\Delta\theta$$

$$dT = -K\Delta\theta.dt$$

In First Case	For second case
$dT = 61-59=2$ $\Delta\theta = 60 - 30 = 30$ $dt = 4$ minutes $\therefore$ $K = -\frac{dT}{\Delta\theta dt} = -\frac{2}{30x4} = -\frac{1}{60}$	$dT = 2$ $\Delta\theta = 50 - 30 = 20$ $\therefore$ $dt = \frac{dT}{K\Delta\theta} = \frac{2}{\frac{1}{60} x\, 20} = 6 \min$.

28. (a) $L = I\omega$

29. (a) $\Delta V = A\Delta h$

$$\Delta V = V_i \gamma \Delta T$$

$$\Delta h = 3.55cm$$

30. (c)

$$B = \frac{\mu_0 i}{4\pi R}\theta$$

31. (d)Conceptual

32. **(a)**

This question is same as that of previous one so

$$n' = \frac{v + v_{car}}{v - v_{car}}.n = 720\ Hz$$

33. (b)

$$T = 2\pi\sqrt{\frac{l}{\sqrt{g^2 + a^2}}}$$

34. $n_1\lambda_1 = n_2\lambda_2$

(a)

35. $I = \dfrac{P}{4\pi r^2} = \dfrac{\sigma R^2 T^4}{r^2}$

(b)

Total radiant power received by earth

$= \pi r_0^2 \times I$

$= \dfrac{\pi r_0^2 R^2 \sigma T^4}{r^2}$

36. $R_g = \dfrac{V_g}{I_g} = 5\Omega$

(b)

$S = \dfrac{I_g R_g}{I - I_g} = 12.5\times10^{-3}\Omega$

37. $\alpha = \dfrac{\Delta I_C}{\Delta I_E} = 0.99$

(d)

$\beta = \dfrac{\alpha}{1-\alpha} = 79$

38. $\vec{L} = \vec{r} \times \vec{p}$

(b)

39. **(a)**

$B = \mu_0 ni$; where $n = \dfrac{20}{10}\dfrac{turn}{cm} = 2000\ \dfrac{turn}{m}$. So, 20×10^{-5}

$= 4\pi \times 2000 \times i \Rightarrow i = 8A.$

40. $V = \sqrt{\dfrac{GM}{r}}$ F or r > R

(b)

$V = \sqrt{\dfrac{4}{3}\pi r^2 G\rho}$ F or $r \le R$

41. $\mu = \text{Tan}\, i_p$

(c)

$\dfrac{C}{V} = \text{Tan}\, i_p$

42. $\dfrac{f^1}{f} = \dfrac{-\omega}{\omega^1} = \dfrac{-1}{2}$

(b)

43. $h\upsilon = h\upsilon_0 + \dfrac{1}{2}mV_{max}^2$

(a)

44. $mu\cos\theta = \dfrac{-m}{2}u\cos\theta + \dfrac{m}{2}V$

(d)

$V = 3u\cos\theta$

$E_1 = \dfrac{1}{2}\dfrac{m}{2}u^2\cos^2\theta$

$E_1 = \dfrac{1}{4}mu^2\cos^2\theta$

$E_2 = \dfrac{9}{4}mu^2\cos^2\theta$

$E_2 = 9E_1$

45. $R_{net} = \dfrac{3\times6}{3+6} + 2 = 4\Omega$

(a)

$I = \dfrac{V}{R_{net}} = 2.5A$

$I_1 = 2.5\times\dfrac{3}{3+6} = \dfrac{5}{6}A$

46. $\beta = \dfrac{Q_2}{W}$

(a)

47. $I = \dfrac{3.5-0.5}{100} = 30mA$

(d)

48. (d) $F = mr\omega^2$

49. $t_3 = \sqrt{t_1 t_2}$

(b)

50. (b) $N = N_0 e^{-\lambda t}$

CHEMISTRY

1. $m=\dfrac{17\times1000}{1000\times d-17\times M.W}$

(a)

$$m=\frac{10^{-2}\times1000}{1000\times1.1-10^{-2}\times106}$$

$$m=\frac{10}{1099.4}=9\times10^{-3}$$

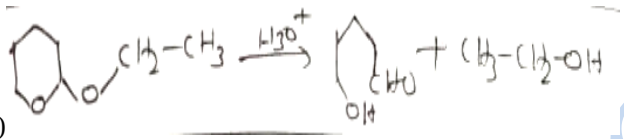
2. $PCl_5 \rightleftharpoons PCl_3+Cl_2$

(c)

$$x=\sqrt{\frac{kp}{P}}=\sqrt{\frac{0.202}{1.5}}=\sqrt{0.134}=0.366$$

Volume percentage $=\dfrac{Mole\,of\,Cl_2}{Total\,moles}\times100=\dfrac{0.366}{1.366}\times100=26.84\%$

3. (c)



4. **(a)**

Frequency of revolution of electron is f $\propto \dfrac{1}{n^3}$

frequency of photon emitted

$$\nu\propto\left(\frac{1}{(n-1)^2}-\frac{1}{n^2}\right)$$

$$\nu\propto\left[\frac{n^2-(n-1)^2}{n(n-1)]^2}\right]$$

$$\nu\propto\frac{[(2n-1)]}{n^2(n-1)^2}$$

when n >> 1

$$\nu\propto\frac{2n}{n^4}$$

$$\nu\propto\frac{1}{n^3}$$

5. (c) $ROH+TsCl\rightarrow ROTs$ Tosylate Ion $\left[TSO^-\right]$ is good leaving hence substituted by – SN through SN^2 mechanism.

6. $\dfrac{1}{\lambda_3}=\dfrac{1}{\lambda_1}+\dfrac{1}{\lambda_2}$ $\qquad \lambda_3=\dfrac{\lambda_1\lambda_2}{\lambda_1+\lambda_2}$

(b)

7. (b)Chalcopyrite is a natural sulphide of Cu and $Fe\left(CuFe52\right)$.

8. (c) $C_6H_5COOC_2H_5$ esters cannot undergo Claisen – self condensation as there is no $\alpha-$ hydrogen.

9. $Cl_2+2H_2O\rightarrow2ClO^-+4H^++2e^-$

(b)

$$E^0=-1.61V$$

$$ClO^-+2H_2O\rightarrow ClO_3^-+4H^++4e^-$$

$$E^0=-0.50V$$

10. (a) $4r=\sqrt{2}a$

$$r=\frac{\sqrt{2a}}{4}=\frac{1.414\times5.14}{4}=1.815A^0$$

11. $\Lambda m=\dfrac{1000K}{C}=3.75$ $\qquad \alpha=\dfrac{\Lambda m}{\Lambda_m^{\alpha}}=\dfrac{3.5}{250}=0.015$

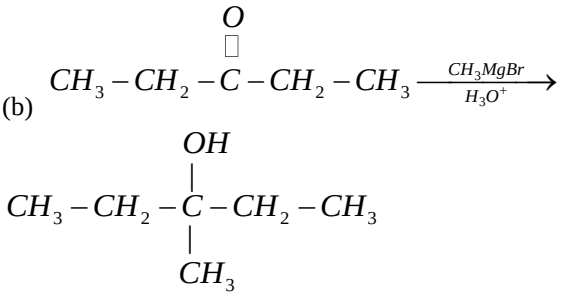
(c)

$$K_a=C\alpha^2=0.1(0.015)^2=2.25\times10^{-5}$$

12. (a) $\%\alpha=105.7x-5220-52x=8220$

$$x=\frac{2800}{98.5}=28.4$$

13. (b)



14. $\left[OH^-\right]Ion=10^{-10}+10^{-7}$

(b)

$pOH=-\log\left[10^{-10}+10^{-7}\right]$ $\qquad \left(10^{-10}\square\ 10^{-7}\right)$

$pOH=7$

pH=7

15. $Na_2S_2O_3 + AgBr \rightarrow Na_3Ag\left(S_2O_3\right)_2 + NaBr$
(c)

16. (d)
$CH_3CH_2NH_2 + CHCl_3 + 3KOH \rightarrow C_2H_5NC + 3KCl + 3H_2O$

17. $\Delta S = nR\ln\left(\frac{P1}{P2}\right)$
(c)

18. $Mn - [Ar]3d^5 4s^2$
(c)

$Mn^{+2} - 3d^5$ half filled 3d – orbital which requires higher ionization energy.

19. (d) N_2O is neutral oxide of nitrogen also known as laughing gas.

20. $\frac{P^0 - P_S}{P^0} = \frac{n_s}{n_s + n_{sol}}$ $P^0 - P_S = \frac{1}{1+\frac{1000}{18}} \times 760$

(c)

$P^0 - P_s = 13.43 mm$

21. (a)It is expulsion of a liquid from a gel, which hardens the gel.

22. (b) Fe^{+2} ions $= x$; Fe^{+3} $Ions = \frac{2x}{3}$;

$Fe^{+2} : Fe^{+3} = 3:2$

23. (d)For a sealed regid container m and v remains constant hence the density remains same even if temperature changes.

24. **(d)**
Number of revolution = Area between the graph and time axis = Area of trapezium

$= \frac{1}{2} \times (2.5+5) \times 3000 = 11250$ revolution.

25. (a)Chlorides of Ag are insoluble, while chlorides Ba and Ca imparts colour to Bunsen flame.

26. (d)
$H_3BO_3 \xrightarrow{100^0 C} HBO_2 \xrightarrow{160^0 C} H_4B_2O_7 \xrightarrow[7250^0 C]{\Delta} B_2O_3 + 2H_2O$

27. (c) $\Delta H = \Delta E + P\Delta V$
$\Delta H = 30 + (4\times5 - 2\times3) = 44\, L - atm$

28. **(b)**
When spring is gradually lowered to it's equilibrium position

$kx = mg \;\; \therefore \;\; x = \frac{mg}{k}$.

When spring is allowed to fall suddenly it oscillates about it's mean position
Let y is the amplitude of vibration then at lower extreme, by the conservation of energy

$\Rightarrow \frac{1}{2}ky^2 = mgy \Rightarrow y = \frac{2mg}{k} = 2x.$

29. (b)
$\Delta H^0 = H_P - H_R = -110.5 + -241.8 + 393.5 = 41.2$

30. (d) $K = Ae^{-Eu/RT}$ $\quad -e^{-Eu/RT} = \frac{0.01}{100} \Rightarrow \frac{Ea}{RT}$

$= 2.303\log 10^{-4}$

$Ea = 2.303 \times 4 \times 400 = 30.6\, KJ/mol$

31. (b)

$PhCHO + CH_3CHO \xrightarrow{OH^-} Ph - \underset{\underset{OH}{|}}{CH} - CH_2CHO$

$2CH_3CHO \xrightarrow{OH^-} CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - CHO$

32. (c) $\Delta T_f = iK_f m$

$0.0054 = i \times 1.8 \times .001 \qquad i = 3$

33. (a)In the presence of peroxy acid, among $C=C$ and $C\equiv C$, it is alkene selectely undergo hydroxylation forming diol.

34. (c)Conceptual

35. (d) XeF_2 square planar shape. It is non polar.

36. (b) $PbO_2+H_2O_2$ convert Pb^{+4} into more stable Pb^{+2} liberating oxygen.

37. $$\lambda=\frac{h}{\sqrt{2mK.E.}}$$

(c)

$$h=\frac{6.6\times10^{-34}}{\sqrt{2\times9.1\times10^{-31}\times13.6\times1.6\times10^{-19}}}$$

$\lambda=3.34\times10^{-10}m$ Energy absorbed by an atom $=2\times13.6$

Energy converted in escape $=13.6\,ey$

Energy converted into K.E. $=13.6\times1.6\times10^{-19}\,J$

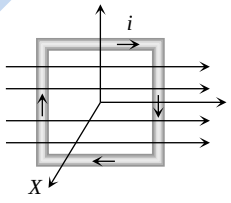
38. (c)No carbo cation can form at and bridge head carbon.

39. **(b)**

The magnetic field is $\vec{B}=B_0\hat{j}$ and the magnetic moment $\vec{m}=i\vec{A}=-i(NL^2\hat{i})$

The torque is given by $\vec{\tau}=\vec{m}\times\vec{B}$

$=-iNL^2\hat{i}\times B_0\hat{j}=-iNB_0L^2\hat{i}\times\hat{j}$



$=-iNB_0L^2\hat{k}$

40. $$\frac{C}{\frac{20}{12}}\quad\frac{N}{\frac{46.66}{14}}\quad\frac{H}{\frac{6.66}{1}}\quad\frac{O}{\frac{26.68}{16}}\qquad 1:2:4:1$$

(c)

$$CN_2H_4O$$

41. (b)Analgin

42. (d)Terbium(Z=65)

43. (c) $NaBH_4$ is mild reducing agent which reduces carbonyl into alcohol but do not reduce ester.

44. **(b)**

According to Wien's law $\lambda_m\propto\frac{1}{T}$ and from the figure $(\lambda_m)_1<(\lambda_m)_3<(\lambda_m)_2$ therefore $T_1>T_3>T_2$.

45. (c)This is an example of peptization.

46. (a) $Cl-$carbon of $D(+)$ glucose is called anomeric carbon.

47. (c)I) $CH_3-\ddot{\underset{\cdot\cdot}{O}}\overset{\oplus}{C}H_2$ more stable than $\overset{\oplus}{C}H_2$ because of +M effect of $CH_3\ddot{\underset{\cdot\cdot}{O}}-$

II) $Me_3\overset{\oplus}{C}H$ is more stable than $CH_3-CH_2-\overset{\oplus}{C}H_2$

III) +ve charge delocalized in $CH_2=CH-\overset{\oplus}{C}H_2$ so more stable than $CH_3-CH_2-\overset{\oplus}{C}H_2$

48. $$NaCN+ZnS\longrightarrow Na_2\left[Zn(CN)_4\right]$$

(b)

49. $-Cl>-OCOR>-OR>-NH_2$ (Leaving group order)

(a)

50. (d)X particle = $\frac{1}{8}\times6+\frac{1}{2}\times6=\frac{15}{4}$

Y Particle = 3, Z particle = 6

$$X_{\frac{15}{4}}Y_3Z_6 = X_5Y_4Z_8$$

BIOLOGY

1. (d)

2. (b)
3. (b)
4. (c)
5. C

6. (b)

7. A

8. (b)
9. (*d*) Diffusion rates are affected by the concentration gradient, the permeability of the membrane separating them, temperature and pressure.

10. (c)

11. (c)
12. (*a*) C4-plants have evolved PEP as primary acceptor of CO2 to avoid the sensitivity of RuBP carboxylaseoxygenase to high concentration of oxygen, so that they can avoid photorespiratory loss of CO2.

13. (b)
14. (*a*) The external factors would include the availability of sunlight, temperature, CO2 concentration and water. As a plant photosynthesises, all these factors will simultaneously affect its rate.

15. (b)
16. (b)
17. B

18. (a)

19. (d)

20. (d)

21. (*c*) Growth at the cellular level principally results from increase in the amount of protoplasm. Since increase in protoplasm is difficult to measure directly, therefore, growth is measured by a variety of parameters like increase in fresh weight, dry weight, length, area and volume, etc., and any one parameter is not good enough to demonstrate growth.

22. (D)
23. (c)
24. (*b*) *Cephaleuros* is a parasitic thalloid green alga. Its common name is red rust. This alga is parasitic on some economic important plants of the tropics and subtropics, e.g. tea, guava, mango, coffee, etc. It damages the area with algal growth on leaves, kills the new shoots and disfigure fruit.

25. (a)
26. (c)
27. (b)
28. (a)
29. C

30. (c)
31. (d)

32. (*d*) Option (d) is correct. As synthesis of sugars or carbohydrates takes place in the biosynthetic phase of photosynthesis. This process does not directly depends on the presence of light, but is dependent on the products of the light reaction, i.e. ATP and NADPH, besides CO2 and H O 2 . Therefore if light becomes unavailable during photosynthesis then biosynthetic phase continues for some time and then stops, due to unavailability of products.

33. A

34. (b)

35. (*d*) In class–Chlorophyceae, the cells possess one or more chloroplasts. The shape of chloroplasts may be

Cup-shaped — *Chlamydomonas*
Spiral — *Spirogyra*
Reticulate — *Chlamydomonas reticulata*
Disc-shaped — *Chara*

36. (a)

37. B

38. B

39. (b)
40. (d)

41. (d)
42. C

43. (d)
44. (b)
45. (d)

46. (a)
47. C

48. (b)

49. (a)

50. (a)

1. (b)

2. (d)

3. (d)

4. (d)

5. (a)

6. (b)
7. (d)

8. (d)

9. (c)

10. (a)

11. (a)

12. (a)

13. (d)

14. (a)

15. (d)

16. (b)

17. (a)

18. (c)

19. (b)
20. (a)

21. (a)

22. (b)
23. (c)

24. (c)

25. (d)

26. (c)

27. (d)
28. (b)
29. (c)

30. (b)
31. (c)

32. (d)

33. (a)

34. (d)

35. (a)

36. (b)
37. (c)
38. (c)

39. (d)

40. (a)

41. (d)
42. (b)
43. (a)

44. (a)

45. (b)

46. (d)

47. (a)

48. (c)
49. (b)
50. (c)