THE RADIANT ACADEMY

Igniting Young Minds

STAR (STUDENT TALENT ACADEMIC REWARD)

STAR A Talent Search Exam

CLASS –XII

PHYSICS, CHEMISTRY & BIOLOGY

SAMPLE PAPER

GENERAL INSTRUCTIONS

TEST PATTERN					
Time	Total No. of Questions	Subject/Question Segregation	Type	Total Marks : 180	
				Correct	Negative
120 Minutes	1-60	Physics (1-20) Chemistry (21-40) Biology (41-60)	Objective Question	3 Mark	1 Mark

1. A student has to write his/her answers in the OMR sheet by darkening the appropriate bubble with the help Of Ball pen only as the correct answer(s) of the question attempted.
2. Blank papers, clip boards, log tables, slide rule, calculators, mobile or any other electronic gadgets in any form is not allowed.
3. Write your **Name** & **Roll No.** in the space provided in the bottom of this booklet.
4. Before answering the paper, fill up the required details in the blank space provided in the OMR sheet.
5. **In case of any dispute, the answer sheet available with the institute shall be final.**
6. **In case of tie the younger in age will get top rank**

NAME OF THE CANDIDATE : ……ROLL NO. : ……..…

I have read all the instructions and shall abide by them

I have verified the identity, name and roll number of the candidate.

……. ……

Signature of the Candidate **Signature of the Invigilator**

DO NOT BREAK THE SEALS WITHOUT BEING INSTRUCTED TO DO SO BY THE INVIGILATOR

1. PHYSICS

Straight Objective

This section contains 20 questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

1. A coil having inductance L and resistance R is connected to a battery of emf ε at t = 0. If t_1 and t_2 are the times for 90% and 99% completion of the current growth in the circuit, then t_1/t_2 will be **[EMI_M]**

(A*) 1 : 2 (B) 2 : 1 (C) $\frac{\log_e 10}{2}$ (D) $2\log_e 10$

Sol. $I = I_0\left(1-e^{-\frac{1}{r}}\right)$

$\frac{9}{10}I_0 = I_0\left(1-e^{-\frac{t_1}{r}}\right)$

$\Rightarrow e^{-\frac{t_1}{r}} = \frac{1}{10}$

$\Rightarrow e^{\frac{t_1}{r}} = 10$

$\Rightarrow t_1 = r \ln 10$ ...(i)

and $\frac{99}{100}I_0 = I_0\left(1-e^{-\frac{t_2}{r}}\right)$

$\Rightarrow e^{-\frac{t_2}{r}} = \frac{1}{100}$

$\Rightarrow t_2 = r \ln 100 = 2r \ln 10$ ...(2)

from equations (1) and (2), we have

$\Rightarrow \Rightarrow \frac{t_1}{t_2} = \frac{1}{2}$

2. Consider a neutral conducting sphere, A positive point charge is placed outside the sphere. Then the net charge on the sphere is

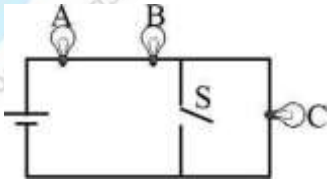
(A) Negative and distributed uniformly over the surface of the sphere

(B) Negative appears only at the point on the sphere closest to the point charge

(C) Negative and distributed non-uniformly over the entire surface of the sphere

(D*) Zero

3. A circuit consists of three identical lamps connected to a battery as shown in the figure. When the switch S is closed then the intensities of lamps A and B

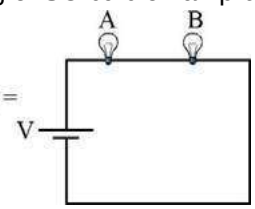


[C.E._M]

(A) will increase by eight times (B) will decrease by two times

(C*) will increase by more than two times (D) will remain the same

Sol. After closing of SC bulb or lamp become short circuited



potential across A and B before closing of S = V/3

potential across A and B after closing of S = V/2

As $P \propto V^2$

$$\therefore \frac{P_i}{P_f} = \frac{4}{9}$$

$$P_f = \frac{P_i \times 9}{4} = 2.25\ P_i$$

4. A rod of length l rotates with a uniform angular velocity ω about its perpendicular bisector. A uniform magnetic field B exists parallel to the axis of rotation. The potential difference between the two end of the rod is

(A*) Zero (B) $\frac{1}{2}\omega B l^2$ (C) $B\omega l^2$ (D) $2B\omega l^2$

5. Unpolarised light of intensity 32 W m^{-2} passes through three polarizers arranged such that the transmission axes of the first and the last polarizer are at right angles. If the intensity of emerging light is 3W m^{-2}, then what is the angle (in degree) between the transmission axes of the first two polarizeres?

(Wave) M

Ans. 30.0

Sol. Since unpolarised light is passing through the first polarizer, hence the intensity of light after crossing the first polarizer will be

$$I_1 = \frac{1}{2} I_0 = 16 Wm^{-2}$$

Let us assume that the angle between the transmission axis of the first and second polarizer is θ, then from Malus law we can find out the intensity of light after it crosses the second polarizer.

$I_2 = I_1 \cos^2\theta = 16 \cos^2\theta$

Similarly, the intensity of light after crossing the third polarizer is

$I_3 = I_2 \cos^2 (90^o - \theta) = 16 \cos^2\theta \sin^2\theta$

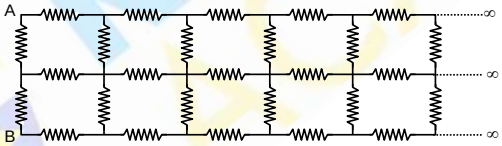
$\Rightarrow I_3 = 16 \cos^2\theta \sin^2\theta = 3$

$\Rightarrow 4 \cos^2\theta \sin^2\theta = 3/4$

$\Rightarrow \sin^2(2\theta) = 3/4$

$\theta = 30^o$

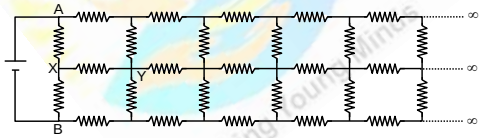
6. In given arrangement all resistors are of 1Ω. What is equivalent resistance between A & B.



[C.E._M]

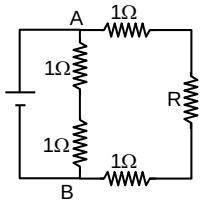
(A) $1+\sqrt{5}$ (B) $2+\sqrt{5}$ (C) $3-\sqrt{5}$ (D*) $\sqrt{5}-1$

Sol.



By symmetry we can say that current through an will be equal to current through XB so current through XY will be zero.

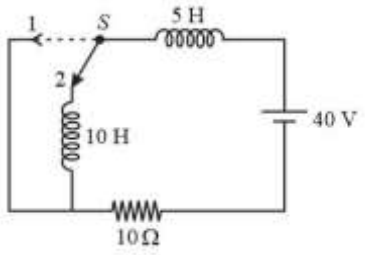
Now lets say equivalent resistance between A and B is P.



$$R = \frac{2 \times (2 + R)}{2 + (2 + R)}$$

$4R + R^2 = 4 + 2R$
$R^2 + 2R - 4 = 0$
$R = (\sqrt{5} - 1)\ \Omega$

7. In the circuit shown in the figure, the switch was kept in position – 1 for a very long time and then at t = 0 it is shifted to position – 2. The current in the circuit immediately after that is i = a/b A, then the value of a + b is **[EMI_M]**



Ans. 7

Sol. The total flux, before and after the position change of the switch, remains the same
$L_1i_1 = L_2i_2$
$L_1 = 5H$, $i_1 = 4$ A and $L_2 = 15$ H
5 x 4 = 15 x i

$$\Rightarrow i = \frac{4}{3} = \frac{a}{b}$$

$\Rightarrow a + b = 7$

8. Two concentric coils of 10 turns each are placed in the same plane. Their radii are 20 cm and 40 cm and carry 0.2 A and 0.3 A current respectively in opposite directions. The magnetic induction (in tesla) at the centre is **[EMF_M]**

(A) 3/4 μ_0 (B*) 5/4 μ_0 (C) 7/4 μ_0 (D) 9/4 μ_0

Sol. Two coils carry current in opposite directions, hence net magnetic field at centre will be difference of the two field.

$$\text{ie, } B_{net} = \frac{\mu_0}{4\pi}.2\pi N\left[\frac{i_1}{r_1} - \frac{i_2}{r_2}\right]$$

$$= \frac{10\mu_0}{2}\left[\frac{0.2}{0.2} - \frac{0.3}{0.4}\right]$$

$$= \frac{5}{4}\mu_0$$

9. In the spectrum of the hydrogen atom, the ratio of the wavelengths of the longest wavelength in Lyman series to the longest wavelength in the Balmer series is **[Modern Physics_M]**

(A*) 5/27 (B) 1/93 (C) 4/9 (D) 3/2

Sol. When an electron jumps down from any higher energy level to the first energy level, then the emitted lines form the Lyman series

$\frac{1}{\lambda_L}R\left(\frac{1}{1^2} - \frac{1}{n^2}\right)$, where R is the Rydberg constant.

Similarly, when an electron jumps down from any higher energy level to the second energy level, then the emitted lines form the Balmer series

$$\frac{1}{\lambda_B} = R\left(\frac{1}{2^2} - \frac{1}{n^2}\right)$$

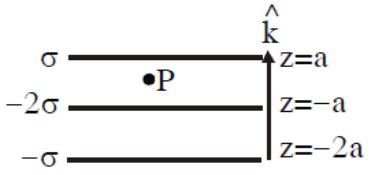
For maximum wavelength, the energy gap should be the smallest

$$n = 2, \frac{1}{\lambda_L} = R\left(1 - \frac{1}{2^2}\right) = R\left(1 - \frac{1}{4}\right) = \frac{3R}{4}$$

$$n = 3, \frac{1}{\lambda_B} = R\left(\frac{1}{2^2} - \frac{1}{3^2}\right) = \frac{5R}{36}$$

$$\frac{\lambda_L}{\lambda_B} = \frac{5}{27}$$

10. Three large parallel plane sheet of charge have uniform surface charge densities as shown in the figure. What is the electric field at P

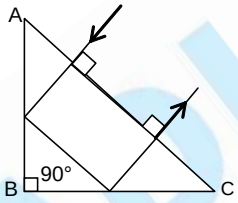


(A) $-\frac{4\sigma}{\epsilon_0}\hat{k}$ (B) $\frac{4\sigma}{\epsilon_0}\hat{k}$ (C) $-\frac{2\sigma}{\epsilon_0}\hat{k}$ (D) $\frac{2\sigma}{\epsilon_0}\hat{k}$

Ans. **(C)**

Sol. $\vec{E}_P = \left(\frac{\sigma}{2\epsilon_0} + \frac{2\sigma}{2\epsilon_0} + \frac{\sigma}{2\epsilon_0}\right)(-\hat{k})$

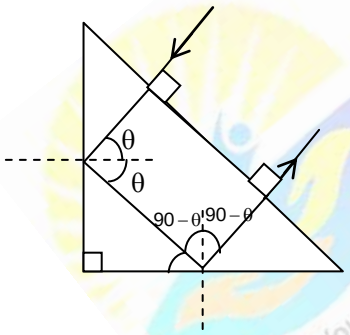
11. A right-angled isosceles prism ABC is immersed in a liquid of refractive index μ. Incident and emergent rays are parallel as shown. The minimum value of refractive index of prism is Pμ then find out P^2.



(A*) 2 (B) 3 (C) 4 (D) 6

Ans **02.0**

Sol.



$\theta = 45^0$

$\mu_P \sin 45^0 = \mu \sin 90^0$

$\mu_P = \frac{\mu}{\sin 45^0} = \sqrt{2}\mu$

12. A man moves 2 m towards a plane mirror and the mirror moves perpendicular to itself by 3 m towards the man. Then the distance(in m) by which his image moves w.r.t ground is

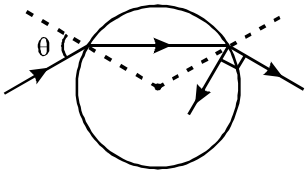
(A) 6 (B*) 8 (C) 10 (D) 4

Ans 08.0

Sol. Use $\Delta X_{mirror} = \frac{\Delta X_{object} + \Delta X_{image}}{2}$, and $\Delta X_{mirror} = 3$, $\Delta X_{object} = -2$,

we get $\Delta X_{image} = 8$

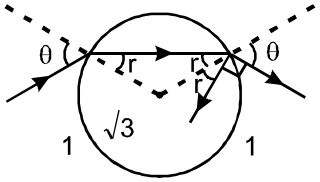
13. A ray incident at a point at an angle of incidence θ enters into a glass sphere placed in air which is reflected and refracted at the farther surface of the sphere as shown in the figure. The angle between reflected and refracted rays at this surface is 90°. If refractive index of the sphere is, the $\sqrt{3}$ angle θ is :



(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{6}$ (D) $\frac{2\pi}{3}$

Ans. (A)

Sol.



$1 \sin\theta = \sqrt{3} \sin r$

$1 \sin\theta = \sqrt{3} \cos\theta$

$\tan\theta = \sqrt{3}$

$\theta = \frac{\pi}{3}$

14. Two cells of emf ε_1 and ε_2 ($\varepsilon_2 < \varepsilon_1$) are joined as shown in figure :

When a potentiometer is connected between x and y it balances for 300 cm length against ε_1. On connecting the same potentiometer between x and z it balances for 100 cm length against ε_1 and ε_2. Then the ratio $\frac{\varepsilon_2}{\varepsilon_1}$ is :

[C.E._E]

(A) $\frac{1}{3}$ (B) $\frac{3}{4}$ (C) $\frac{1}{4}$ (D*) $\frac{2}{3}$

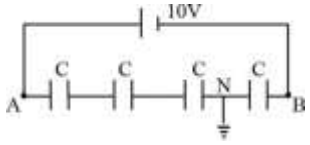
Sol. $\varepsilon_1 = 300\ \alpha$ .....(i)

$-\varepsilon_2 + \varepsilon_1 = 100\ \alpha$ .....(ii)

where, α is the potential gradient

$\therefore \frac{\varepsilon_2}{\varepsilon_1} = \frac{2}{3}$.

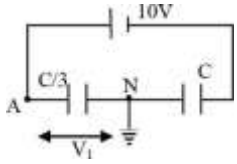
15. The potential at point A, in the circuit, is (Point N is grounded, i.e. the potential of that point is zero.)



[Capacitor_M]

(A) 10 V (B*) 7.5 V (C) 5 V (D) 2.5 V

Sol.



$$V_A - V_N = \frac{10 \times C}{C + \frac{C}{3}} = \frac{30C}{4C} = 7.5$$

$V_A - 0 = 7.5$

$V_A = 7.5$ V

16. A travelling nucleus A having a de-Broglie wavelength λ_A spontaneously splits into two nuclei B and C of equal masses. After the split, B travels in the same direction while C travels in the opposite direction with a speed equal to half of B. The values of the de-Broglie wavelengths λ_B and λ_C will be

(Modern Physics) E

(A) $\lambda_A, 2\lambda_A$ (B*) $\frac{\lambda_A}{2}, \lambda_A$ (C) $\lambda_A, \frac{\lambda_A}{2}$ (D) $2\lambda_A, \lambda_A$

Sol.

$A \rightarrow u$	$\leftarrow v/2$ C	$B \rightarrow v$
2m	m	m

Applying conservation of linear momentum

$2mu = mu - mu/2$

So,

$$\lambda_A = \frac{h}{2mu}\lambda B = \frac{h}{mv} = \frac{\lambda_A}{2}\lambda_C = \frac{h}{m\frac{v}{2}} = \lambda_A$$

17. The probability that a particular nucleus of ^{38}Cl will undergo beta decay in any time interval of 4s is [$T_{1/2}$ for ^{38}Cl is 37.2 min]

(Nuclear Physics) E

(A) 3.1×10^{-4} (B) 6.2×10^{-4} (C*) 12.4×10^{-4} (D) 24.8×10^{-4}

Sol. Probability for a particular nucleus to decay in any time intercal dt is

$$\frac{dN}{N} = \lambda dt$$

$$= \frac{0.693}{T_{1/2}} \times 4$$

$= 12.4 \times 10^{-4}$

18. Unpolarizsed light of intensity 32 W m^{-2} passes through three polarizers arranged such that the transmission axes of the first and the last polarizer are at right angles. If the intensity of emerging light is 3W m^{-2}, then what is the angle (in degree) between the transmission axes of the first two polarizeres?

(Wave) M

Ans. 30.0

Sol. Since unpolarized light is passing through the first polarizer, hence the intensity of light after crossing the first polarizer will be

$$I_1 = \frac{1}{2}I_0 = 16 Wm^{-2}$$

Let us assume that the angle between the transmission axis of the first and second polarizer is θ, then from Malus law we can find out the intensity of light after it crosses the second polarizer.

$I_2 = I_1 \cos^2\theta = 16 \cos^2\theta$

Similarly, the intensity of light after crossing the third polarizer is

$I_3 = I_2 \cos^2 (90^o - \theta) = 16 \cos^2\theta \sin^2\theta$

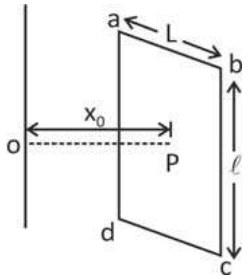
$\Rightarrow I_3 = 16 \cos^2\theta \sin^2\theta = 3$

$\Rightarrow 4 \cos^2\theta \sin^2\theta = 3/4$

$\Rightarrow \sin^2(2\theta) = 3/4$

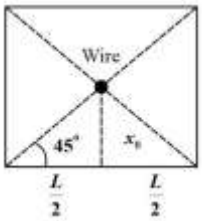
$\theta = 30^o$

19. Find the electric flux (in S.I. unit) through the rectangular plate abcd of length λ = 2m, width L and whose centre is at a distance OP = x_0 = L/2 from an infinite line of charge with linear charge density $\lambda = \frac{1}{36\pi} \times 10^{-9} Cm^{-1}$. Consider that the plane of the frame is perpendicular to line OP.



[Electrostatics_M]

Sol. 0.50



If we arrange three more rectangular plates (similar to the one which is given) around the wire, then we get a rectangular box open at both ends. We bring two more plates and use them to close this rectangular box. We can see from the figure that we have a symmetric system for which the total flux is

$$\phi = \frac{\lambda \ell}{\varepsilon_0}$$

Hence the flux through one plate is

$$\phi = \frac{\lambda \ell}{4\varepsilon_0} = 0.5$$

20. A coil of inductive reactance 31Ω has a resistance of 8Ω. It is placed in series with a condenser of capacitive reactance 25 Ω. The combination is connected to an ac source of 110 V. The power factor of the circuit is **[AC_M]**

(A) 0.33 (B) 0.56 (C) 0.64 (D*) 0.80

Sol. $X_L = 31\Omega$, $X_C = 25\Omega$, $R = 8\Omega$

Impedance of series LCR is

$$Z = \sqrt{(R^2) + (X_L - X_C)^2}$$

$$= \sqrt{(8)^2 + (31-25)^2} = \sqrt{64+36} = 10\Omega$$

Power factor, $\cos\phi = R/Z = 8/10 = 0.8$

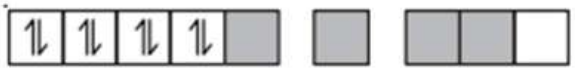
2. CHEMISTRY

Straight Objective Type

This section contains 20 questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

21. The complex compound bearing square planar geometry is

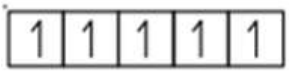
(A) $Ni(CO)^4$ (*B) $[Ni(CN)_4]^{2-}$ (C) $[Mn(CN)_6]^{3-}$ (D) $[MnCl_4]^{2-}$

Sol. $[Ni(CN)_4]^{2-} \Rightarrow 3d^6 \Rightarrow$ 

$\Rightarrow dsp^2$

$\Rightarrow$ Square planar

22. The complex compound having maximum magnetic moment is
(A) $[COF_6]^{3-}$ (B) $[Cr(NH_3)_6]^{3+}$ (*C) $[FeF_6]^{3-}$ (D) $[Mn(CN)_6]^{4-}$

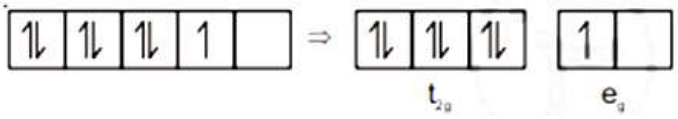
Sol. $[FeF_6]^{3-} \Rightarrow Fe^{3+} \Rightarrow 3d^5 \Rightarrow$  ($\because$ F^- is a weak field ligand)

$\Rightarrow$ Five unpaired electrons

$\Rightarrow \mu = \sqrt{5(5+2)}$ BM $= \sqrt{35}$ BM = 5.92 BM

23. CFSE(Δ_0) for metal ion in d7 configuration in presence of strong ligand field is
(A) $-0.6\Delta_0$ (B) $-0.8\Delta_0$ (C) $-1.6\Delta_0$ (*D) $-1.8\Delta_0$

Sol. d^7 configuration in strong field ligand

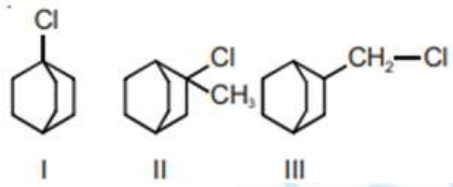


$$\text{CFSE} = (-0.4\times 6 + 0.6)\Delta_0$$
$$= (-2.4 + 0.6)\Delta_0$$
$$= -1.8\Delta_0$$

24. In case of high spin complex
(A) $\Delta_0 = P$ (B) $\Delta_0 > P$ (*C) $\Delta_0 < P$ (D) $\Delta_0 .P = 1$

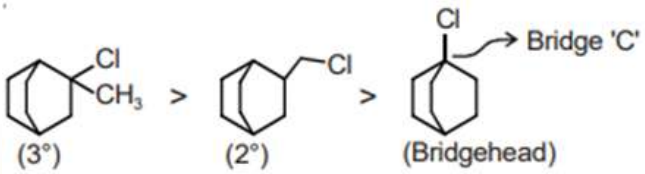
Sol. In case of high spin complexes $\Delta_0 < P$

25. The correct orders of reactivity towards S_N1 reaction is



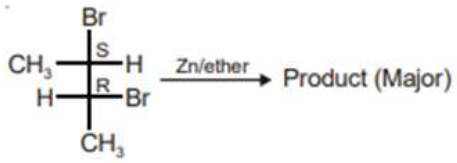
(A) I > II > III (*B) II > III >I (C)III> II> I (D) I> III> II

Sol. For SN1 reaction the correct order of reactivity would be



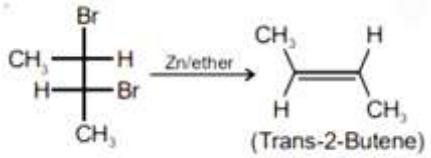
Note: Bridge-head carbocation is highly unstable, because sp2 hybridisation is not possible al bridge 'C' atom

26. In the given reaction



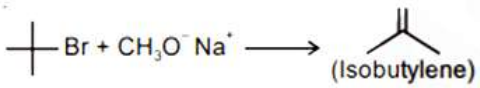
The product will be
(A) Cis-2-butene (*B) Trans-2-butene (C) 2-butyne (D) Buta-1, 3-diene

Sol.

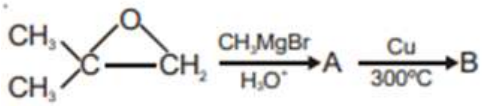


27. Reaction of t-butyl bromide with sodium methoxide produces
(A) Sodium t-butoxide (B) t-butyl methyl ether (C) Isobutane (*D) Isobutylene

Sol.



28.



B is

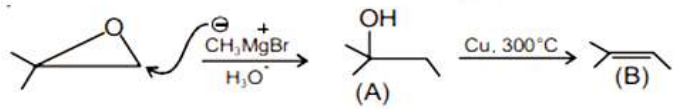
(A) $(CH_3)_3CHO$

(*B) $CH_3 - \underset{\underset{CH_3}{|}}{C} = CH - CH_3$

(C) $(CH_3)_2CHCOCH_3$

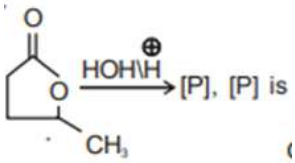
(D) $CH_3\overset{\overset{O}{\|}}{C} - CH_2 - CH_2CH_3$

Sol.



∴ In basic medium the opening of epoxide is S_N2 type. So, nucleophile CH_3 attack less hindered 'C' of epoxide

29. In the given reaction



(*A) $HOOC - CH_2 - CH_2 - \underset{\underset{OH}{|}}{CH} - CH_3$

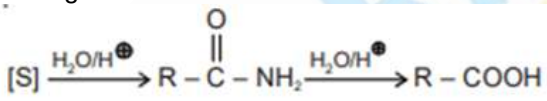
(B) $CH_3 - CH_2 - CH_2 - CH_2 - COOH$

(C) $HO - CH_2 - CH_2 - CH_2 - COOH$

(D) $CH_3 - CH_2 - \underset{\underset{OH}{|}}{CH} - CH_2 - COOH$

Sol. Hydrolysis of cyclic ester will produce carboxylic acid

30. In the given reaction

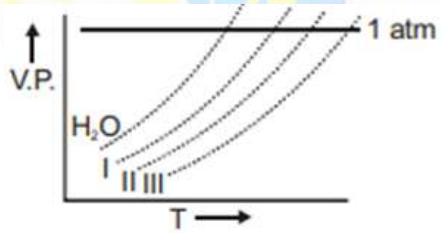


[S] will be

(*A) RCN (B) RNC

(C) RCHO (D) R_2CO

31.



Which is having highest elevation in boiling point?

(A) H_2O

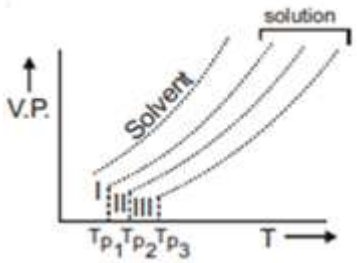
(B) Aqueous solution I

(C) Aqueous solution II

(*D) Aqueous solution III

Solutions.

When nonvolatile solute is added in volatile solvent → vapour pressure of solvent decreases and B.P. increases



$T_{b_3} > T_{b_2} > T_{b_1}$

T_b = boiling point of solution

As vapour pressure decrease $\Rightarrow$ B.P. of solution increases

So, III have minimum V.P. = maximum B.P. = Elevation in B.P.

32. If any solute 'A' dimerises in water at 1 atm pressure and the boiling point of this solution is 100.52ºC. If 2 moles of A is added to 1 kg of water and kb for water is 0.52ºC/molal, calculate the percentage association of A

(A) 50% (B) 30% (C) 25% (*D) 100%

Sol.

$2A \xrightleftharpoons{\text{dimerises}} (A)_2$

t = 0	1	0
$t = t_1$	1 - α	$\frac{\alpha}{2}$

$$i = 1 - \alpha + \frac{\alpha}{2} = 1 - \frac{\alpha}{2}$$

$$\Delta T_b = iK_b \times m$$

$$0.52 = \left(1 - \frac{\alpha}{2}\right)(0.52 \times 2)$$

$$1 - \frac{\alpha}{2} = \frac{1}{2}$$

$$\frac{\alpha}{2} = 1 - \frac{1}{2}; \qquad \frac{\alpha}{2} = \frac{1}{2}$$

α = 1 or (100%)

33. Substance A tetramerises in water to the extent of 80%. A solution of 2.5 of A in 100 g of water lowers the freezing point by 0.3ºC. The molar mass of A is

(K_f for water = 1.86 K kg mol^{-1})

(A) 122 (B) 31 (C) 244 (*D) 62

Sol.

$4A \xrightleftharpoons{\text{tetramerises}} (A)_4$

t = 0	1	0
$t = t_1$	1 - α	$\frac{\alpha}{4}$

$$\alpha = \frac{80}{100} = 0.8$$

$$i = 1 - \alpha + \frac{\alpha}{4}$$

$$\Rightarrow 1 - 0.8 + \frac{0.8}{4}$$

$$\Delta T_f = i(K_f \times m)$$

$$0.3 = 0.4\left[1.86 \times \frac{2.5 \times 1000}{M \times 100}\right]$$

$$M = 62g$$

34. Standard cell voltage for the cell $Pb/Pb^{2+}||Sn^{2+}/Sn$ is -0.01V. If the cell is to exhibit $E_{cell} = 0$ then the value of log $[Sn^{2+}] / [Pb^{2+}]$ should be

(*A) 0.33 (B) 0.5 (C) 1.5 (D) -0.5

Solutions

$$E = E^{\circ} + \frac{0.059}{2}\log\frac{[Sn^{+2}]}{[Pb^{+2}]}$$

$$0 = -0.01 + \frac{0.059}{2}\log\frac{[Sn^{+2}]}{[Pb^{+2}]}$$

$$0.01 = \frac{0.059}{2}\log\frac{[Sn^{+2}]}{[Pb^{+2}]}$$

$$\log\frac{[Sn^{+2}]}{[Pb^{+2}]} \Rightarrow \frac{0.01\times 2}{0.059} \Rightarrow 0.33$$

35. The following facts are available

$2A^- + B_2 \rightarrow 2B^- + A_2$

$2C^- + B_2 \rightarrow$ No reaction

$2D^- + A_2 \rightarrow 2A^- + D_2$

Which of the following statement is correct?

(A) $E^{\circ}_{C/C_2} > E^{\circ}_{B/B_2} > E^{\circ}_{A/A_2} > E^{\circ}_{D/D_2}$

(*B) $E^{\circ}_{C/C_2} < E^{\circ}_{B/B_2} < E^{\circ}_{A/A_2} < E^{\circ}_{D/D_2}$

(C) $E^{\circ}_{C/C_2} < E^{\circ}_{B/B_2} > E^{\circ}_{A/A_2} > E^{\circ}_{D/D_2}$

(D) Can't predict

Sol. According to given reactions

- B_2 can oxidise A^-, and cannot oxidise C^-
- A_2 can oxidise D^-

So reduction potential $C_2 > B_2 > A_2 > D_2$

(C) can reduced but not oxidised by B_2 (A) reduced by D^-

So, oxidation potential $\rightarrow C_2 < B_2 < A_2 < D_2$

36. The specific conductance of a 0.1 N KCl solution at 23ºC is 0.012 $ohm^{-1}cm^{-1}$. The resistance of cell containing the solution at same temperature was found to be 55 ohm. The cell constant will be

(A) 0.142 cm^{-1} (*B) 0.66 cm^{-1} (C) 0.918 cm^{-1} (D) 0.12 cm^{-1}

Sol. k = cell constant x $\frac{1}{R}$

$\Rightarrow$ cell constant = R x k = 0.012 x 55 = 0.66 cm^{-1}

37. Consider the following statements:

I. More easily liquefiable gases adsorb easily

II. Silica gels are used to remove moisture

III. $x/m = K.\ p^{1/n}$; (n > 1)

Choose the correct statement(s)

(A) I & II (B) II & III (C) I & III (*D) I, II & III

38. Example of anionic detergent is

(A) Sodium lauryl sulphate

(B) Cetyltrimethyl ammonium bromide

(C) Sodium dodecylbenzenesulphonate

(*D) Both (A) and (C)

Sol. Cetyltrimethyl ammonium bromide is cationic detergent.

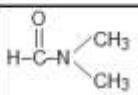
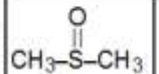
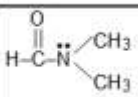
39. Principal emulsifying agents for oil-water emulsions is

(A) Long chain alcohols (B) Lampblack

(C) Heavy metal salts of fatty acids (*D) Natural and synthetic soaps

Sol. The principal emulsifying agents for O/W emulsions are proteins, gums, natural and synthetic soaps.

40. Choose the correct matching in the following– **[ORM-I (Attacking Reagent)_M]**

	I	II	III	IV	
(A)	H_2O	$^{\oplus}NH_4$	C_2H_5OH	$H^{\ominus}$	All are Nucleophile.
(B)	$H^{\oplus}$	SO_3	$:CCl_2$	$\overset{+}{N}O_2$	All are Electrophile.
(C)	$CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$	C_2H_5OH			All are Polar protic solvent.
(D)	$CH_3-\underset{\underset{OCH_2CH_3}{|}}{CH}-CH_3$	CH_3COCH_3		H_2O	All are Polar aprotic solvent.

Ans. (B)

3. BIOLOGY

Straight Objective Type

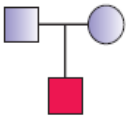
This section contains 20 questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

41. Select the wrong pair for the symbols of pedigree analysis.

(1)  — Five unaffected offsprings

(2)  — Consanguineous marriage

(3*)  — Sex specified

(4)  — Parents with male child affected with disease

42. How many linkage groups are found in man

(1) 7 (2) 10 (3) 23 (4*) 24

43. Placentra acts as a/an :

(1) Ultrafilter (2) Endocrine gland (3*) Both (1) and (2) (4) None of above

44. Which of the following is incorrect about parturition in pregnant female?

(1) Parturition is induced by a complex neuroendocrine mechanism.

(2*) At time of parturition progesterone estrogen ratio is increased.

(3) Parturition is due to release of oxytocin from maternal pituitary.

(4) Oxytocin acts on uterine myometrium and cause contraction of smooth muscles.

45.. Cu^{+2} ions released from copper releasing Intra Uterine Devices (IUDs)

(1) Increase phagocytosis of sperms (2*) Suppress sperm motility

(3) Prevent ovulation (4) Make uterus unsuitable for implantation

46. Codon with dual function is

(1) UGA (2) UUU (3*) AUG (4) AAA

47. Methyl guanosine triphosphate is added at 5' end of hn RNA in a process of

(1) Tailing (2) Splicing (3*) Capping (4) None of the above

48. In a nucleosome, the histone core is made of :

(1*) $2(H_{2A} + H_{2B} + H_3 + H_4)$ (2) $2(H_1 + H_2 + H_3 + H_4)$

(3) $4(H_{2A} + H_{2B} + H_3 + H_4)$ (4) $8(H_{2A} + H_{2B} + H_3 + H_4)$

49. Which of the following statement is incorrect

(1*) Absence of one sex chromosome causes down's syndrome

(2) Colourblindness occurs due to recessive gene on X-chromosome

(3) Experimental verification of the chromosomal theory of inheritance was given by Thomas Hunt Morgan

(4) Mendel chose 2 flower based characters for his experiments in pea plant

50. If zona pellucida is digested during morula stage in fallopian tube then which of the following condition is likely to happen?

(1*) It leads to ectopic pregnancy (2) Mobility is affected

(3) Cleavage is affected (4) Corona radiata behaves like zona pellucida

51. Match the disease in column I with the appropriate items (pathogen / prevention / treatment) in column II

Column I	**Column II**
(a) Amoebiasis	(i) *Treponema pallidum*
(b) Diphtheria	(ii) Use only sterilized food and water
(c) Cholera	(iii) DPT Vaccine
(d) Syphilis	(iv) Use oral rehydration

(1) a-(ii), b-(i),c-(iii),d-(iv) (2*) a-(ii), b-(iii),c-(iv),d-(i)

(3) a-(i), b-(ii),c-(iii),d-(iv) (4) a-(ii), b-(iv),c-(i),d-(iii)

52. Vectors for dengue and Chikungunya are –

(1) Aedes and culex (2) Anopheles and Aedes (3) Culex and anopheles (4*) Aedes and Aedes

53. Mitochondria and chloroplasts are semi-autonomous as they possess

(1) DNA (2) DNA + RNA (3*) DNA + RNA + ribosomes (4) Proteins

54. 9+2 organisation is present in **(Cell)**

(1) Flagella of bacteria (2*) Flagella and cilia of eukaryotic cell

(3) Basal body (4) Centriole and basal body

55. During photosynthesis, oxygen in carbohydrates come from : **(Photosynthesis)**
(1) Atmosphere (2*) CO_2 (3) H_2O (4) Starc

56. In photosynthesis, light reaction occurs in : **(Photosynthesis)**
(1) Stroma only (2) Stroma and grana
(3) Stroma, grana and granallamellae (4*) Stroma lamellae and grana

57. Which of the following structures or regions is *incorrectly* paired with its function?

(1)	Medulla oblongata:	:	controls respiration and cardiovascular reflexes.
(2)	Corpus callosum	:	band of fibers connecting left and right cerebral hemispheres.
(3)	Hypothalamus	:	production of releasing hormones and regulation of temperature, hunger and thirst.
(4*)	Limbic system	:	consists of fibre tracts that interconnect different regions of brain; controls movement.

58. Myelin sheath is produced by
(1*) Schwann cell and Oligodendrocytes (2) Astrocytes and Schwann cells
(3) Oligodendrocytes and Osteoclasts (4) Osteoclasts and Astrocytes

59. Specialised epidermal cells surrounding the guard cells are called :-
(1) Complementary cells (2*) Subsidiary cells
(3) Bulliform cells (4) Lenticels

60. The water potential of pure water is :
(1) Less than zero (2) More than zero but less than one
(3) More than one (4*) Zero