AIPMT MAIN EXAMINATION – 2012

PHYSICS, BIOLOGY & CHEMISTRY

DATE : 13-05-2012 **CODE - D**

Q.1 The instantaneous values of alternating current and voltages in a circuit are given as

$i = \frac{1}{\sqrt{2}} \sin(100\pi t)$ ampere

$e = \frac{1}{\sqrt{2}} \sin(100\pi t + \pi/3)$ volt

The average power in Watts consumed in the circuit is -

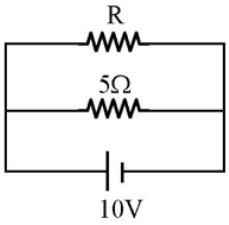
(1) $\frac{\sqrt{3}}{4}$ (2) $\frac{1}{2}$ (3) $\frac{1}{8}$ (4) $\frac{1}{4}$

Ans. **[3]**

Sol. $P = V_{rms} I_{rms} \cos\phi$

$= \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\cos\left(\frac{\pi}{3}\right) = \frac{1}{8}$

Q.2 The power dissipated in the circuit shown in the figure is 30 Watts. The value of R is -



(1) 15 Ω (2) 10 Ω (3) 30 Ω (4) 20 Ω

Ans. **[2]**

Sol. $P = \frac{V^2}{R_{eq}}$

$30 = \frac{(10)^2}{\left(\frac{5R}{R+5}\right)}$

$\frac{5R}{R+5} = \frac{10}{3}$

$3R = 2R + 10$

$R = 10\ \Omega$

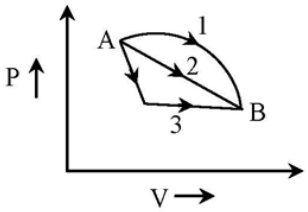
Q.3 The dimensions of $(\mu_0\varepsilon_0)^{-1/2}$ are -

(1) $[L^{-1}T]$ (2) $[LT^{-1}]$ (3) $[L^{1/2}T^{1/2}]$ (4) $[L^{1/2}T^{-1/2}]$

Ans. **[2]**

Sol. $C = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$ $\therefore$ dimension LT^{-1}

Q.4 An ideal gas goes from state A to state B via three different processes as indicated in the P-V diagram -



If Q_1, Q_2, Q_3 indicate the heat absorbed by the gas along the three processes and ΔU_1, ΔU_2, ΔU_3 indicate the change in internal energy along the three processes respectively, then -

(1) $Q_3 > Q_2 > Q_1$ and $\Delta U_1 = \Delta U_2 = \Delta U_3$ (2) $Q_1 = Q_2 = Q_3$ and $\Delta U_1 > \Delta U_2 > \Delta U_3$

(3) $Q_3 > Q_2 > Q_1$ and $\Delta U_1 > \Delta U_2 > \Delta U_3$ (4) $Q_1 > Q_2 > Q_3$ and $\Delta U_1 = \Delta U_2 = \Delta U_3$

Ans. **[4]**

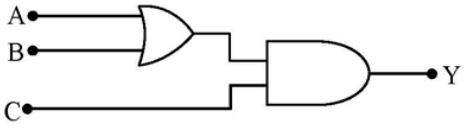
Sol. $dU_1 = dU_2 = dU_3$

$Q_1 > Q_2 > Q_3$

because $\Delta Q = \Delta W + dU$

Change in internal energy independent from path and work depends on path and $\Delta U_1 > \Delta U_2 > \Delta U_3$

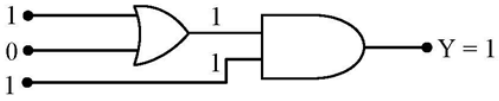
Q.5 To get an output Y = 1 in given circuit which of the following input will be correct -



	A	**B**	**C**
(1)	1	0	1
(2)	1	1	0
(3)	0	1	0
(4)	1	0	0

Ans. **[1]**

Sol. A B C = 1 0 1



Q.6 Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2} C and 5×10^{-2} C, respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is -

(1) 3×10^{-2} C (2) 4×10^{-2} C

(3) 1×10^{-2} C (4) 2×10^{-2} C

Ans. **[1]**

Sol. $Q_{total} = 4 \times 10^{-2}$ C

Charge distribution $\propto$ capacitance $\propto$ radius

$\therefore Q_{small} : Q_{big} = 1 : 3$

$Q_{big} = \frac{3}{4} \times 4 \times 10^{-2} = 3 \times 10^{-2}$ C

Q.7 Two radiations of photons energies 1 eV and 2.5 eV, successively illuminate a photosensitive metallic surface of work function 0.5 eV. The ratio of the maximum speeds of the emitted electrons is -

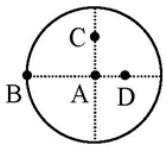
(1) 1 : 2 (2) 1 : 1 (3) 1 : 5 (4) 1 : 4

Ans. **[1]**

Sol. $v_{max} = \sqrt{\frac{2}{m}(KE_{max})} = \sqrt{\frac{2}{m}(E_{Ph} - W)}$

$\frac{v_1}{v_2} = \sqrt{\frac{1-0.5}{2.5-0.5}} = \sqrt{\frac{0.5}{2}} = 1 : 2$

Q.8 The moment of inertia of a uniform circular disc is maximum about an axis perpendicular to the disc and passing through -



(1) C (2) D (3) A (4) B

Ans. **[4]**

Sol. $I = I_{cm} + md^2$

d is maximum for B

Q.9 A train moving at a speed of 220 ms^{-1} towards a stationary object, emits a sound of frequency 1000 Hz. Some of the sound reaching the object gets reflected back to the train as echo. The frequency of the echo as detected by the driver of the train is - (speed of sound in air is 330 ms^{-1})

(1) 4000 Hz (2) 5000 Hz (3) 3000 Hz (4) 3500 Hz

Ans. **[2]**

Sol. $n' = n\left(\frac{v + v_s}{v - v_s}\right)$

$= 1000\left(\frac{330 + 220}{330 - 220}\right)$

$= 1000\left(\frac{550}{110}\right)$

$= 5000$ Hz

Q.10 The half life of a radioactive nucleus is 50 days. The time interval $(t_2 - t_1)$ between the time t_2 when $\frac{2}{3}$ of it has decayed and the time t_1 when $\frac{1}{3}$ of it had decayed is -

(1) 50 days (2) 60 days (3) 15 days (4) 30 days

Ans. **[1]**

Sol. * Radioactive substance disactive $2/3^{rd}$ in time t_2 and $1/3^{rd}$ in time t_1.

* It becomes $\frac{1}{2}$ when it disintegrate $2/3^{rd}$ to $1/3^{rd}$ so time $t_2 - t_1$ is half-life of substance.

Q.11 A car of mass m is moving on a level circular track of radius R. If μ_s represents the static friction between the road and tyres of the car, the maximum speed of the car in circular motion is given by -

(1) $\sqrt{Rg/\mu_s}$ (2) $\sqrt{mRg/\mu_s}$ (3) $\sqrt{\mu_s Rg}$ (4) $\sqrt{\mu_s mRg}$

Ans. **[3]**

Sol. $\mu mg \geq \frac{mv^2}{R}$

$v \leq \sqrt{\mu Rg}$

$v_{max} = \sqrt{\mu Rg}$

Q.12 A circular platform is mounted on a frictionless vertical axle. Its radius R = 2m and its moment of inertia about the axle is 200 kg m^2. It is initially at rest. A 50 kg man stands on the edge of the platform and begins to walk along the edge at the speed of 1ms^{-1} relative to the ground. Time taken by the man to complete one revolution is -

(1) $\frac{3\pi}{2}$s (2) 2π s (3) $\frac{\pi}{2}$s (4) π s

Ans. **[2]**

Sol. $I_1\omega_1 + I_2\omega_2 = 0$

$200\left(\frac{1}{2}\right) + 200\,\omega_2 = 0$

$\omega_2 = -\frac{1}{2}$

$\omega_R = \omega_1 - \omega_2 = 1$ rad/sec

$T = \frac{2\pi}{\omega} = 2\pi$sec

Q.13 If the momentum of an electron is changed by P, then the de-Broglie wavelength associated with it changes by 0.5%. The initial momentum of electron will be -

(1) 400 P (2) $\frac{P}{200}$ (3) 100 P (4) 200 P

Ans. **[4]**

Sol. $P = \frac{h}{\lambda} \Rightarrow \left|\frac{\Delta P}{P}\right| = \frac{\Delta\lambda}{\lambda}$

$$\frac{\Delta P}{P_i} = \frac{\Delta\lambda}{\lambda} \Rightarrow P_i = \frac{P}{\frac{0.5}{100}}$$

$$P_i = \frac{1000}{5} P = 200\ P$$

Q.14 If v_e is escape velocity and v_o is orbital velocity of a satellite for orbit close to the earth's surface, then these are related by -

(1) $v_o = v_e$ (2) $v_e = \sqrt{2v_o}$ (3) $v_e = \sqrt{2}\, v_o$ (4) $v_o = \sqrt{2}\, v_e$

Ans. **[3]**

Sol. $v_{escape} = \sqrt{\frac{2GM}{R}}$

$$v_{orbital} = \sqrt{\frac{GM}{R}}$$

$$v_{escape} = \sqrt{2}\, v_o$$

Q.15 The equation of a simple harmonic wave is given by

$$y = 3 \sin \frac{\pi}{2} (50t - x)$$

where x and y are in meters and t is in seconds. The ratio of maximum particle velocity to the wave velocity is -

(1) $\frac{3}{2}\pi$ (2) 3π (3) $\frac{2}{3}\pi$ (4) 2π

Ans. **[1]**

Sol. $v_{max} = a\omega$

$v = n\lambda$

$$\frac{v_{max}}{v} = \frac{a\omega}{n\lambda} = \frac{a(2\pi n)}{n\lambda} = \frac{2\pi a}{\lambda} = \frac{2\pi a}{\frac{2\pi}{K}}$$

$$= Ka = \frac{\pi}{2} \times 3 = \frac{3\pi}{2}$$

Q.16 A proton carrying 1 MeV kinetic energy is moving in a circular path of radius R in uniform magnetic field. What should be the energy of an α-particle to describe a circle of same radius in the same field ?

(1) 1 MeV (2) 0.5 MeV (3) 4 MeV (4) 2 MeV

Ans. **[1]**

Sol. $r = \frac{\sqrt{2m(KE)}}{qB}$

$q \propto \sqrt{m(KE)}$

$\frac{e}{2e} = \sqrt{\frac{(m_p)(1MeV)}{(4m_p)(KE)}}$

$\frac{1}{4} = \frac{1}{4(KE)}$

KE = 1 MeV

Q.17 Three masses are placed on the x-axis : 300 g at origin, 500 g at x = 40 cm and 400 g at x = 70 cm. The distance of the centre of mass from the origin is -

(1) 45 cm (2) 50 cm (3) 30 cm (4) 40 cm

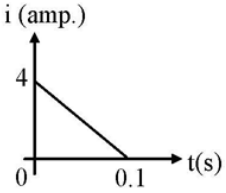
Ans. **[4]**

Sol. $x_{cm} = \frac{m_1x_1 + m_2x_2 + m_3x_3}{m_1 + m_2 + m_3}$

$= \frac{300\times 0 + 500\times 40 + 400\times 70}{300 + 500 + 400}$

$= \frac{48000}{1200} = 40$ cm

Q.18 In a coil of resistance 10 Ω, the induced current developed by changing magnetic flux through it, is shown in figure as a function of time. The magnitude of change in flux through the coil in Weber is -



(1) 2 (2) 6 (3) 4 (4) 8

Ans. **[1]**

Sol. $I = \left|\frac{1}{R}\frac{d\phi}{dt}\right|$

$\Rightarrow |d\phi| = |IRdt|$

$d\phi$ = (Area of triangle) $\times$ R

$= \left(\frac{1}{2}\times 4\times 0.1\right) \times 10 = 2$Wb

Q.19 A parallel plate capacitor has a uniform electric field E in the space between the plates. If the distance between the plates is d and area of each plate is A, the energy stored in the capacitor is -

(1) E^2Ad/ε_0 (2) $\frac{1}{2}\varepsilon_0E^2Ad$ (3) ε_0EAd (4) $\frac{1}{2}\varepsilon_0E^2$

Ans. **[2]**

Sol. Total energy = energy density × volume

$$= \left(\frac{1}{2}\epsilon_0 E^2\right)(Ad)$$

Q.20 A car of mass m starts from rest and accelerates so that the instantaneous power delivered to the car has a constant magnitude P_0. The instantaneous velocity of this car is proportional to -

(1) $t^{1/2}$ (2) $t^{-1/2}$ (3) $t/\sqrt{m}$ (4) t^2P_0

Ans. **[1]**

Sol. $P_0 = F.v = mav$

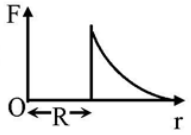
$$P_0 = mv\frac{dv}{dt}$$

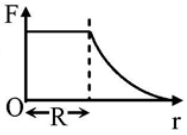
$$\int mvdv = \int P_0dt$$

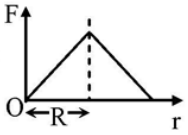
$$m\frac{v^2}{2} = P_0t$$

$$v \propto \sqrt{t}$$

Q.21 Which one of the following plots represents the variation of gravitational field on a particle with distance r due to a thin spherical shell of radius R ? (r is measured from the centre of the spherical shell).

(1) 

(2) 

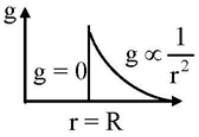
(3) 

(4) 

Ans. **[1]**

Sol. $g_{in} = 0$

$$g_{out} = \frac{GM}{r^2}$$



Q.22 The input resistance of a silicon transistor is 100 Ω. Base current is changed by 40 μA which results in a change in collector current by 2 mA. This transistor is used as a common emitter amplifier with a load resistance of 4 KΩ. The voltage gain of the amplifier is-

(1) 3000 (2) 4000 (3) 1000 (4) 2000

Ans. **[4]**

Sol. Current gain $(\beta) = \frac{\Delta I_C}{\Delta I_B} = \frac{2\times10^{-3}}{40\times10^{-6}}$

$\beta = 50$

Voltage gain $= \beta\left(\frac{R_{out}}{R_{in}}\right)$

$= 50\left(\frac{4\times10^{3}}{100}\right)$

$= 2000$

Q.23 For the angle of minimum deviation of a prism to be equal to its refracting angle, the prism must be made of a material whose refractive index -

(1) lies between 2 and $\sqrt{2}$ (2) is less than 1

(3) is greater than 2 (4) lies between $\sqrt{2}$ and 1

Ans. **[1]**

Sol. $\mu = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

$\mu = \frac{\sin(A)}{\sin\left(\frac{A}{2}\right)} = \frac{2\sin(A/2)\cos(A/2)}{\sin(A/2)}$

$\boxed{\mu = 2\cos(A/2)}$

* $i_{min} = 0 = A_{min} \Rightarrow \mu_{min} = 2$

* $i_{max} = \pi/2 = A_{max} \Rightarrow \mu_{max} = \sqrt{2}$

range of μ between $\sqrt{2} < \mu < 2$

$\delta_m = i + e - A$

* Given $\delta_{min} = A$, for δ_{min} =, $i = e$

$A = i + e - A$

$2A = i + e \Rightarrow 2A = 2i \Rightarrow A = i$

Q.24 The transition from the state n = 3 to n = 1 in a hydrogen like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition from -

(1) $3 \to 2$ (2) $4 \to 2$ (3) $4 \to 3$ (4) $2 \to 1$

Ans. **[3]**

Sol. Infrared radiation found in Paschan, Bracket and Fund series and it is obtain when "e^-" transition high energy level to minimum 3^{rd} energy level.

Q.25 A rod of length 10 cm lies along the principal axis of concave mirror of focal length 10 cm in such a way that its end closer to the pole is 20 cm away from the mirror. The length of the image is -

(1) 15 cm (2) 2.5 cm (3) 5 cm (4) 10 cm

Ans. **[3]**

Sol.

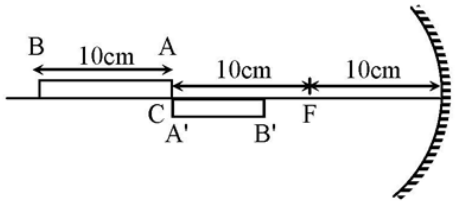


Image position of end A

$$\frac{1}{v_A}+\frac{1}{-20}=\frac{1}{-10}$$

$v_A = -20$ cm

Image position of the end B

$$\frac{1}{v_B}+\frac{1}{-30}=\frac{1}{-10}$$

$$\frac{1}{v_B}=-\frac{1}{15}$$

$v_B = -15$ cm

Length of the image is

$L_{A'B'} = |v_A| - |v_B| = 20 - 15 = 5$ cm

Q.26 A slab of stone of area 0.36 m^2 and thickness 0.1 is exposed on the lower surface to steam at 100°C. A block of ice at 0°C rests on the upper surface of the slab. In one hour 4.8 kg of ice is melted. The thermal conductivity of slab is- (Given latent heat of fusion of ice = 3.36×10^5 J kg^{-1})

(1) 1.29 J/m/s/°C (2) 2.05 J/m/s/°C (3) 1.02 J/m/s/°C (4) 1.24 J/m/s/°C

Ans. **[4]**

Sol. $$\frac{dQ}{dt}=\frac{KA}{L}(T_1-T_2)$$

$$Q=\frac{KA}{L}(T_1-T_2)\,t$$

$$Q = mL_f$$

$$\frac{KA}{L}(T_1-T_2)t = mL_f$$

$$K=\frac{mL_f(L)}{A(T_1-T_2)t}$$

$$K=\frac{4.8\times3.36\times10^5\times0.1}{0.36\times100\times3600}\ \text{J/m/s/°C}$$

$$=\frac{4.8\times3.36}{0.36\times36}$$

$= 1.24$ J/m/s/°C

Q.27 A stone is dropped from a height h. It hits the ground with a certain momentum P. If the same stone is dropped from a height 100 % more than the previous height, the momentum when it hits the ground will change by -

(1) 41 % (2) 200 % (3) 100 % (4) 68 %

Ans. **[1]**

Sol. $v = \sqrt{2gh}$

$P = mv = m\sqrt{2gh}$

$P \propto \sqrt{h}$

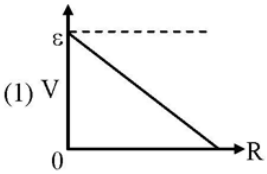
$\frac{P_2}{P_1} = \sqrt{\frac{h_2}{h_1}} = \sqrt{\frac{2h}{h}} = \sqrt{2}$

$P_2 = 1.414\ P_1$

$\%\ \text{change} = \frac{P_2 - P_1}{P_1} \times 100\%$

$= 41.4\%$

Q.28 A cell having an emf ε and internal resistance r is connected across a variable external resistance R. As the resistance R is increased, the plot of potential difference V across R is given by -

(1)


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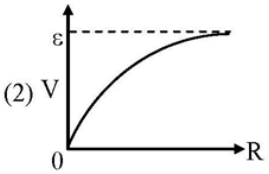

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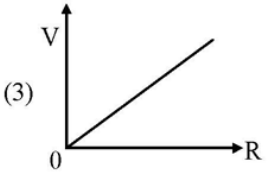

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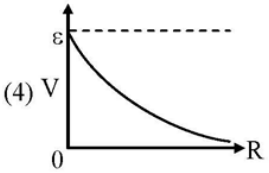
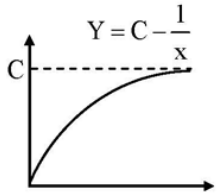


Ans. **[2]**

Sol.



$E = I(R + r) = IR + Ir$

$E = V + Ir$

$E = V + \frac{Er}{R + r}$

$V = E - \frac{E}{R + r} \times r \qquad Y = C - \frac{1}{x}$

Q.29 A magnetic needle suspended parallel to a magnetic field requires $\sqrt{3}$ J of work to turn it through 60°. The torque needed to maintain the needle in this position will be-

(1) 3 J (2) $\sqrt{3}$ J (3) $\frac{3}{2}$ J (4) $2\sqrt{3}$ J

Ans. **[1]**

Sol. $W = MB(\cos\theta_1 - \cos\theta_2)$

$\sqrt{3} = MB(\cos 0^\circ - \cos 60^\circ)$

$\sqrt{3} = \frac{MB}{2}$ ...(1)

$\tau = MB\sin\theta$

$\tau = MB\sin 60^\circ = \sqrt{3}\frac{MB}{2}$ ...(2)

$\therefore \tau = (\sqrt{3})(\sqrt{3}) = 3J$

Q.30 The ratio of amplitude of magnetic field to the amplitude of electric field for an electromagnetic wave propagating in vacuum is equal to -

(1) reciprocal of speed of light in vacuum

(2) the ratio of magnetic permeability to the electric susceptibility of vacuum

(3) unity

(4) the speed of light in vacuum

Ans. **[1]**

Sol. $c = \frac{E_0}{B_0}$

$\frac{B_0}{E_0} = \frac{1}{c}$

Q.31 Read the following four statements (A-D) :

(A) In transcription, adenosine pairs with uracil

(B) Regulation of *lac* operon by repressor is referred to as positive regulation

(C) The human genome has approximately 50,000 genes

(D) Haemophilia is a sex-linked recessive disease

How many of the above statements are right ?

(1) Three (2) Four (3) One (4) Two

Ans. **[4]**

Sol. (NCERT, Class - XIIth, Page No. 117)

Q.32 How many organisms in the list given below are *autotrophs* ?

Lactobacillus, Nostoc, Chara, Nitrosomonas, Nitrobacter, Streptomyces, Sacharomyces, Trypanosoma, Porphyra, Wolfia

(1) Five (2) Six (3) Three (4) Four

Ans. **[2]**

Sol. 4- Photoautotroph

Nostoc, Chara, Porphyra, Wolfia

2-chemo-autotroph

Nitrosomonas and nitrobacter total autotrophs = 6

Q.33 How many plants in the list given below have marginal placentation ?

Mustard, Gram, Tulip, Asparagus, Arhar, Sun hemp, Chilli, Colchicine, Onion, Moong, Pea, Tobacco, Lupin

(1) Five (2) Six (3) Three (4) Four

Ans. **[2]**

Sol. Marginal placentation is present in Fabaceae family. (NCERT-XI pg.79)

Q.34 As compared to a dicot root, a monocot root has :

(1) Many xylem bundles (2) Inconspicuous annual rings

(3) Relatively thicker periderm (4) More abundant secondary xylem

Ans. **[1]**

Sol. Dicot root is diarch to hexarch while in monocot polyarch condition is present. (NCERT-XI pg. 91)

Q.35 A test cross is carried out to :

(1) Predict whether two traits are linked

(2) Assess the number of alleles of a gene

(3) Determine whether two species or varieties will breed successfully

(4) Determine the genotype of a plant at F_2

Ans. **[4]**

Sol. (NCERT, Class - XIIth, Page No. 74)

Q.36 Which one of the following categories of animals, is correctly described with no single exception in it ?

(1) All bony fishes have four pairs of gills and an operculum on each side

(2) All sponges are marine and have collared cells

(3) All mammals are viviparous and possess diaphragm for breathing

(4) All reptiles possess scales, have a three chambered heart and are cold blood (poikilothermal)

Ans. **[1]**

Sol. (NCERT- XIth, Page No. 57) (Chapter - Animal Kingdom, Class - Osteichthyes)

Q.37 The rate of formation of new organic matter by rabbit in a grassland, is called :

(1) Secondary productivity (2) Net primary productivity

(3) Gross primary productivity (4) Net productivity

Ans. **[1]**

Sol. The rate of accumulation of biomass at primary consumer level is secondary productivity.

Q.38 In genetic engineering, the antibiotics are used :

(1) To select healthy vectors

(2) As sequences from where replication starts

(3) To keep the cultures free of infection

(4) As selectable markers

Ans. **[4]**

Sol. NCERT-XII-page-199

Antibiotics medium are used to mark or select transformant & Recombinant bacteria so we can say antibiotics used as a selectable markers with marker gene (Antibiotics resistant gene).

Q.39 The secretory phase in the human menstrual cycle is also called :

(1) Follicular phase lasting for about 6 days

(2) Luteal phase and lasts for about 13 days

(3) Follicular phase and lasts for about 13 days

(4) Luteal phase and lasts for about 6 days

Ans. **[2]**

Sol. Secretory phase is the phase under corpus luteum which last for 13-14 days in case of absence of pregnancy.

Q.40 In gobar gas, the maximum amount is that of :

(1) Methane (2) Propane (3) Carbon dioxide (4) Butane

Ans. **[1]**

Sol. The major component of Bio/Gobar gas is 60% to 70% methane.

Q.41 Through their effect on plant growth regulators, what do the temperature and light control in the plants ?

(1) Flowering (2) Closure of stomata

(3) Fruit elongation (4) Apical dominance

Ans. **[1]**

Sol. Effect of temperature (low temperature) on flowering is vernalization and also relative length of day and night affects flowering called as photoperiodism. Both these involves hormone vernalin and florigen.

Q.42 Which one of the following human organs is often called the "graveyard" of RBCs?

(1) Kidney (2) Spleen (3) Liver (4) Gall bladder

Ans. **[2]**

Sol. (NCERT - XIth, Page No. 279) (Chapter - Body fluids and circulation formed elements (Erythrocytes)

Q.43 Which one of the following pairs of animals are similar to each other pertaining to the feature stated against them ?

(1) Garden lizard and Crocodile - Three chambered heart

(2) *Ascaris and Ancylostoma* - Metameric segmentation

(3) Sea horse and Flying fish - Cold blooded (poikilothermal)

(4) Pteropus and *Ornithorhyncus* - Viviparity

Ans. **[3]**

Sol. (NCERT - XIth, Page No. 57) (Chapter - Animal kingdom, Class - Osteichthyes)

Q.44 The idea of mutations was brought forth by :

(1) **Gregor Mendol**, who worked on *Pisum sativum*

(2) **Hardy Weinberg**, who worked on allele frequencies in a population

(3) **Charles Darwin**, who observed a wide variety of organisms during sea voyage

(4) **Hugo do Vries**, who worked on evening primrose

Ans. **[4]**

Sol. (NCERT - XIIth, Page No. 146) (Chapter - Evolution (7.6))

Q.45 Select the correct statement about biodiversity :

(1) Large scale planting of Bt cotton has no adverse effect on biodiversity

(2) Western Ghats have a very high degree of species richness and endemism

(3) Conservation of biodiversity is just a fad pursued by the developed countries

(4) The desert areas of Rajasthan and Gujarat have a very high level of desert animal species as well as numerous rare animals

Ans. **[2]**

Sol. Western Ghats of India are biodiversity hot spot, have high degree of species richness and high degree of endemism of species.

Q.46 Plants with ovaries having only one or a few ovules, are generally pollinated by :

(1) Butterflies (2) Birds (3) Wind (4) Bees

Ans. **[3]**

Sol. Wind pollinated flowers generally have one or few ovules in ovaries it increase the probability of successful pollination of each ovule.

(Ref. Bio. NCERT 12th, Page No. 29)

Q.47 Consider the following four statements (a-d) and select the option which includes all the correct ones only :

(a) Single cell *Spirulina* can produce large quantities of food rich in protein, minerals, vitamins etc.

(b) Body weight-wise the microorganisms *Methylophilus methylotrophus* may be able to produce several times more proteins than the cow per day

(c) Common button mushrooms are a very rich source of vitamin C

(d) A rice variety has been developed which is very rich in calcium

Options :

(1) Statements (a), (c) and (d) (2) Statements (b), (c) and (d)

(3) Statements (a), (b) (4) Statements (c), (d)

Ans. **[3]**

Sol. Statement (a) - Spirullina is source of single cell protein rich in protein, minerals and vitamins.

(Ref. Bio. NCERT 12th, Chapter # 9, Page No. 176)

Methylophilous methylotrophus produce 25 tons of proteins in same period of time by which of cow produce 200 gm. of protein.

Q.48 Which one of the following biomolecules is **correctly** characterised ?

(1) Palmitic acid - an unsaturated fatty acid with 18 carbon atoms

(2) Adenylic acid - adenosine with a glucose phosphate molecule

(3) Alanine amino acid - Contains an amino group and an acidic group anywhere in the molecule

(4) Lecithin - a phosphorylated glyceride found in cell membrane

Ans. **[4]**

Sol. Lecithin is phosphoglycerid present in plasma membrane. (NCERT-XI pg 144)

Q.49 For its action, nitrogenase requires :

(1) Light (2) Mn^{2+}

(3) Super oxygen radicals (4) High input of energy

Ans. **[4]**

Sol. Enzyme nitrogenase requires high input of energy to carryout biological nitrogen fixation.

$$N_2 + 8H^+ + 8e^- + 16\ ATP \xrightarrow{\text{Nitrogenase}} 2NH_3 + H_2 + 16\ ADP$$

Q.50 Tobacco plants resistant to a nematode have been developed by the introduction of DNA that produced (in the host cells) :

(1) A particular hormone (2) An antifeedant

(3) A toxic protein (4) Both sense and anti-sense RNA

Ans. **[4]**

Sol. Nematode or pest resistant tobacco were developed by RNA interference technology, which involve formation of sense and antisense RNA both.

Q.51 Where do certain symbiotic microorganisms normally occur in human body ?

(1) Oral lining and tongue surface (2) Vermiform appendix and rectum

(3) Duodenum (4) Caecum

Ans. **[4]**

Sol. Caecum is a small blind sac which hosts some symbiotic micro organism.
(From - IX NCERT, Page No. 259 on 25th line.)

Q.52 Identify the meiotic stage in which the homologous chromosomes separate while the sister chromatids remain associated at their centromeres :

(1) Metaphase-II (2) Anaphase-I

(3) Anaphase-II (4) Metaphase-I

Ans. **[2]**

Sol. Separation of homologous chromosome occur in anaphase I of meiosis I. (NCERT-XI pg.169)

Q.53 Which one of the following cellular parts is **correctly** described ?

(1) Centrioles - sites for active RNA synthesis

(2) Ribosomes - those on chloroplasts are larger (80s) while those in the cytoplasm are smaller (70s)

(3) Lysosomes - optimally active at a pH of about 8.5

(4) Thylakoids - flattened membranous sacs forming the grana of chloroplasts

Ans. **[4]**

Sol. Thylakoids form granum in chloroplast. (NCERT-XI pg.136)

Q.54 *Cuscuta* is an example of :

(1) Brood parasitism (2) Predation

(3) Endoparasitism (4) Ectoparasitism

Ans. **[4]**

Sol. Cuscuta is a total shoot parasite of many plants lives on body of plant, so a ectoparasite.

Q.55 The supportive skeletal structures in the human external ears and in the nose tip are examples of :

(1) Areolar tissue (2) Bone

(3) Cartilage (4) Ligament

Ans. **[3]**

Sol. Ear pinna and tip nose are example of yellow elastin cartilage.

(NCERT - XIth, Page No. 104) (Chapter - Structural organization in Animals)

Q.56 Read the following five statements (A - E) and answer as asked next to them.

(A) In *Equisetum* the female gametophyte is retained on the parent sporophyte

(B) In *Ginkgo* male gametophyte is not independent

(C) The sporophyte in *Riccia* is more developed than that in *Polytrichum*

(D) Sexual reproduction in *Volvox* is isogamous

(E) The spores of slime molds lack cell walls

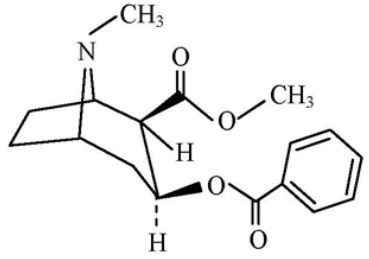
How many of the above statements are **correct** ?

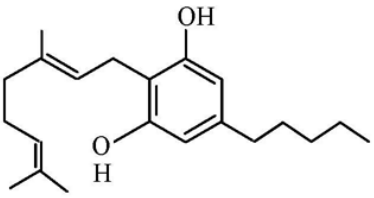
(1) Three (2) Four (3) One (4) Two

Ans. **[3]**

Sol. Ginkgo male gamete is motile free swimming but male gametophyte is not independent and not of free existence

Q.57 Identify the molecules (a) and (b) shown below and select the right option giving their source and use.

(a) 

(b) 

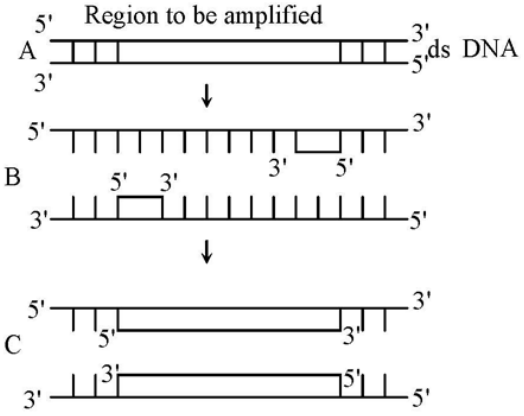
Options :

	Molecule	Source	Use
(1)	(b) Heroin	*Cannabis sativa*	Depressant and slows down body functions
(2)	(b) Cannabinoid	*Atropa belladona*	Produces hallucinations
(3)	(a) Morphine	*Papaver somniferum*	Sedative and pain killer
(4)	(a) Cocaine	*Erythroxylum coca*	Accelerates the transport of dopamine

Ans. **[3]**

Sol. (NCERT, Class - XIIth, Page No. 158 to 159)

Q.58 The figure below shows three steps (A, B, C) of Polymerase Chain Reaction (PCR). Select the option giving correct identification together with what it represents ?



Options :

(1) A - Denaturation at a temperature of about 50°C

(2) C - Extension in the presence of heat stable DNA polymerase

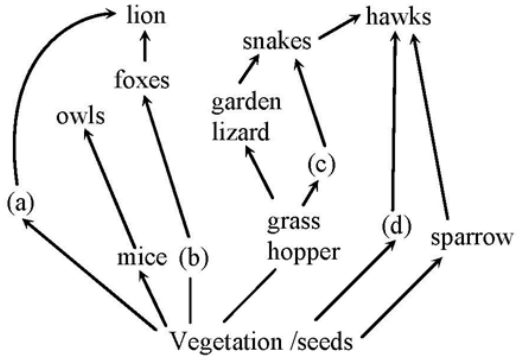
(3) A - Annealing with two sets of primers

(4) B - Denaturation at a temperature of about 98°C separating the two DNA strands

Ans. **[2]**

Sol. C indicate the extension of DNA in presence of Taq DNA polymerase.

Q.59 Identify the likely organisms (a), (b), (c) and (d) in the food web shown below :



Options :

	(a)	(b)	(c)	(d)
(1)	dog	squirrel	bat	deer
(2)	rat	dog	tortoise	crow
(3)	squirrel	cat	rat	pigeon
(4)	deer	rabbit	frog	rat

Ans. **[4]**

Sol. Vegetation seed

a - Deer → Lion

b - Rabbit → Fox → Lion

Grass hopper → c - Frog → Snake

d - Rat → Hawk

Q.60 Which one of the following pairs of chemical substances, is **correctly** categarised ?

(1) Pepsin and prolactin - Two digestive enzymes secreted in stomach

(2) Troponin and myosin - Complex proteins in striated muscles

(3) Secretin and rhodopsin - Polypeptide hormones

(4) Calcitonin and thymosin - Thyroid hormones

Ans. **[2]**

Sol. A complex protein Troponin is distributed at regular intervals on the tropomyosin.
(From - IX - NCERT, Page No. 306 on 4th, 5th, 6th Line)

Q.61 Vernalisation stimulates flowering in -

(1) Turmeric (2) Carrot (3) Ginger (4) Zamikand

Ans. **[2]**

Sol. Carrot is a biennial plant requires stimuli of low temperature i.e. vernalization for flowering.

Q.62 Green revolution in India occurred during -

(1) 1970's (2) 1980's (3) 1950's (4) 1960's

Ans. **[4]**

Sol. Green revolution in India occurs in mid 1960s.

Ref. NCERT 12th (Eng) Chapter-9 Page no. 172

Q.63 A fall in glomerular filtration rate (GFR) activates -

(1) Adrenal cortex to release aldosterone

(2) Adrenal medulla to release adrenaline

(3) Posterior pituitary to release vasopressin

(4) Juxta glomerular cells to release renin

Ans. **[4]**

Sol. Fall in BP leading to fall in GFR causes activation of Renin – Angiotensin Aldosterone system RAAS due to which JG apparatus releases Renin.

Q.64 What is the function of germ pore ?

(1) Absorption of water for seed germination

(2) Initiation of pollen tube

(3) Release of male gametes

(4) Emergence of radicle

Ans. **[2]**

Sol. Germ pore is the place on pollen grains exine where the sporopollen is absent. It helps in formation of pollen tube by intine.

Q.65 Which one of the following option gives the **correct** categorization of six animals according to the type of nitrogenous wastes (A, B, C,), they give out ?

	A AMMONOTELIC	B UREOTELIC	C URICOTELIC
(1)	Frog, Lizards	Aquatic Amphibia, Humans	Cockroach, Pigeon
(2)	Aquatic Amphibia	Frog, Humans	Pigeon, Lizards, Cockroach
(3)	Aquatic Amphibia	Cockroach, Humans	Frog, Pigeon, Lizards
(4)	Pigeon, Humans	Aquatic Amphibia, Lizards	Cockroach, Frog

Ans. **[2]**

Sol. In case of toxicity and solubility

Ammonia > urea > uric acid

more toxic substance will require more amount of water for elimination

Refer CP sheet excretory system Topic mode of elimination of nitrogenous waste

Q.66 Which one of the following sets of items in the option 1 – 4 are correctly categorized with one exception in it ?

	ITEMS	CATEGORY	EXCEPTION
(1)	Kangaroo, Koala, wombat	Australian marsupials	Wombat
(2)	*Plasmodium, Cuscuta, Trypanosoma*	Protozoan parasites	*Cuscuta*
(3)	Typhoid, Pneumonia, Diphtheria	Bacterial diseases	Diphtheria
(4)	UAA, UAG, UGA	Stop codons	UAG

Ans. **[2]**

Sol. All are paracites
Plasmodium & Trypanosoma both are protozoans
& Cuscuta – plant

Q.67 Which one of the following generally acts as an antagonist to gibberellins ?
(1) Ethylene (2) ABA (3) IAA (4) Zeatin

Ans. **[2]**

Sol. ABA is generally antagonistic to Gibberellin specifically in maintaining seed dormancy while Gibberellin breaks seed dormancy

Q.68 Which one of the following organisms is **scientifically correctly named, correctly printed** according to the International Rules of Nomenclature and **correctly described** ?
(1) *Plasmodium falciparum* – a protozoan pathogen causing the most serious type of malaria
(2) *Felis tigris* – The Indian tiger, well protected in Gir forests.
(3) *E.Coli* – Full name *Entamoeba coli*, a commonly occurring bacterium in human intestine
(4) *Musca domestica* – The common house lizards, a reptile

Ans. **[1]**

Sol. P.falciparum – protozoan pathogen cause malignant malaria or cerebral malaria and may cause death.

Q.69 Read the following four statements (A-D) :
(A) Colostrum is recommended for the new born because it is rich in antigen
(B) Chikengunya is caused by a Gram negative bacterium
(C) Tissue culture has proved useful in obtaining virus-free plants
(D) Beer is manufactured by distillation of fermented grape juice
How many of the above statements are **wrong** ?
(1) Three (2) Four (3) One (4) Two

Ans. **[1]**

Sol. Refer NCERT Pg 177 Topic Tissue culture Par 9.4

Q.70 Which one of the following organisms is **correctly** matched with its three characteristics ?

(1) Tomato : Twisted aestivation, Axile placentation, Berry

(2) Onion : Bulb, Imbricate aestivation, Axile placentation

(3) Maize : C_3 pathway, Closed vascular bundles, Scutellum

(4) Pea : C_3 pathway, Endospermic seed, Vaxillary aestivation

Ans. **[2]**

Sol. NCERT-XI pg.81

Q.71 The second stage of hydrosere is occupied by plants like

(1) *Typha* (2) *Salix* (3) *Vallisneria* (4) *Azolla*

Ans. **[3]**

Sol. Second stage of hydrosere is submerged hydrophyte stage

Vallisenaria is a submerged hydrophyte plant

Q.72 Which one of the following statements is correct with respect to immunity ?

(1) The antibodies against small pox pathogen are produced by T-lymphocytes

(2) Antibodies are protein molecules each of which has four light chains

(3) Rejection of a kidney graft is the function of B-lymphocytes

(4) Preformed antibodies need to be injected to treat the bite by a viper snake

Ans. **[4]**

Sol. NCERT – pg.152 (Class-XII)

Q.73 Which one of the following represents a palindromic sequence in DNA ?

(1) 5'-CCAATG-3'
3'-GAATCC-5'

(2) 5'-CATTAG-3'
3'-GATAAC-5'

(3) 5'-GATACC-3'
3'-CCTAAG-5'

(4) 5'-GAATTC-3'
3'-CTTAAG-5'

Ans. **[4]**

Sol. Pallindromic sequences are DNA squence which are same in both strand from 5'→ 3' direction

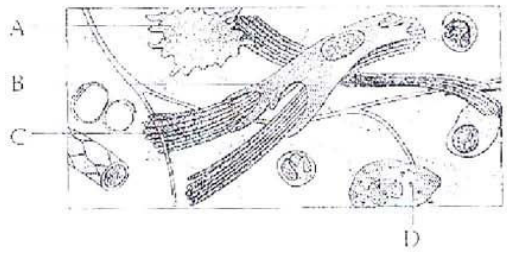
Q.74 For its activity, carboxypeptidase requires :

(1) Iron (2) Niacin (3) Copper (4) Zinc

Ans. **[4]**

Sol. Zinc is cofactor required for activity of enzyme carboxypeptidase.

Q.75 Given below is the diagrammatic sketch of a certain type of connective tissue. identify the parts labeled A, B, C and D and select the right option about them



Option

	Part-A	Part-B	Part-C	Part-D
(1)	Mast cell	Marcophage	Fibroblast	Collagen fibres
(2)	Macrophage	Collegen fibres	Fibroblast	Mast cell
(3)	Mast cell	Collagen fibres	Fibroblast	Macrophage
(4)	Macrophage	Fibroblast	Collagen fibres	Mast cell

Ans. **[4]**

Sol. NCERT XI Fig. 7.4(a) Page no. 103 (Connective tissue)

Q.76 In the five-kingdom classification, *Chlamydomonas* and *Chlorella* have been included in

(1) Algae (2) Plantae (3) Monera (4) Protista

Ans. **[4]**

Sol. According to 5 kingdom classification *Chlamydomonas* and *Chlorella* are the members of Protista. (NCERT-XI pg. 18)

Q.77 Read the following four statements (A-D)

(A) Both, photophosphorylation and oxidative phosphorylation involve uphill transport of protons across the membrane

(B) In dicot stems, a new cambium originates from cells of pericycle at the time of secondary growth

(C) Stamens in flowers of Gloriosa and Petunia are polyandrous

(D) Symbiotic nitrogen-fixers occur in free-living state also in soil

How many of the above statements are right

(1) Three (2) Four (3) One (4) Two

Ans. **[4]**

Sol. Stamens in gloriasa (Liliaceae) and petunia (Solanceae) are free and does not show cohesion. Symbiotic N_2 fixer occur in soil, in free living state also.

Q.78 The domestic sewage in large cities :

(1) is processed by aerobic and then anaerobic bacteria in the secondary treatment in Sewage Treatment Plant (STPs)

(2) When treated in STPs does not really require the aeration step as the sewage contains adequate oxygen

(3) has very high amounts of suspended solids and dissolved salts

(4) has a high BOD as it contains both aerobic and anaerobic bacteria.

Ans. **[1]**

Sol. In waste water treatment plant, the secondary treatment includes the biological treatment where the aerobic bacteria and anaerobic bacteria fungi are involed

Ref. NCERT (Eng.) Chapter-10 page no. 184

Q.79 Which one of the following pairs is wrongly matched ?

(1) Salvinia - Prothallus (2) Viroids – RNA

(3) Mustard-Synergids (4) Ginkgo-Archegonia

Ans. **[1]**

Sol. In Salvinia, both male and female gametophytes are found in massulaes not in prothallus.

Q.80 What is it that forms the basis of DNA Fingerprinting ?

(1) The relative difference in the DNA occurrence in blood, skin and saliva

(2) The relative amount of DNA in the ridges and grooves of the fingerprints

(3) Satellite DNA occurring as highly repeated short DNA segments

(4) The relative proportions of purines and pyrimidines in DNA

Ans. **[3]**

Sol. NCERT – pg. 121 (Class-XII)

Q.81 Which one of the following characteristics is common both in humans and adult frogs ?

(1) Internal fertilization

(2) Nucleated RBCs

(3) Ureotelic mode of excretion

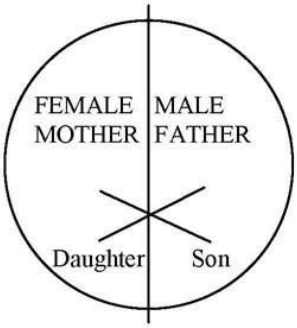
(4) Four – chambered heart

Ans. **[3]**

Sol. In frogs & humans NH_3 is convered into urea in liver for excretion

Refer CP Sheet Ecretory system, elimination of nitrogenous waste

Q.82 Represented below is the inheritance pattern of the certain type of traits in humans. Which one of the following conditions could be an example of this pattern ?

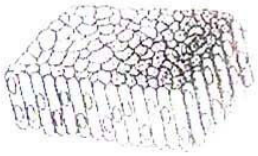


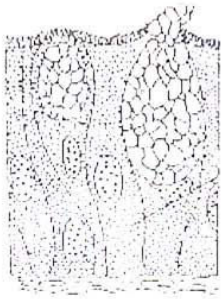
(1) Sickel cell anaemia (2) Haemophilia (3) Thalassemia (4) Phenylketonuria

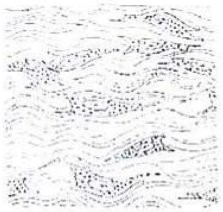
Ans. **[2]**

Sol. Criss cross inheritance is present in X-linked character ex-Haemophilia.

Q.83 The four sketches (A, B, C and D) given below, represent four different types of animal tissues. Which one of these is correctly identified in the options given, along with its correct location and function ?

(A) 

(B) 

(C) 

(D) 

		Tissue	Location	Function
(1)	(C)	Collagen fibres	Cartilage	Attach skeletal muscles to bones
(2)	(D)	Smooth muscle tissue	Heart	Heart contraction
(3)	(A)	Columnar epithelium	Nephron	Secretion and absorption
(4)	(B)	Glandular epithelium	Intestine	Secretion

Ans. **[4]**

Sol. NCERT XI fig. 7.2(a) Page 102 (Glandular Epithilium)

Q.84 Which one of the following structures is an organelle within an organelle ?

(1) Peroxisome (2) ER

(3) Mesosome (4) Ribosome

Ans. **[4]**

Sol. Ribosome is known as organelle within organelle because it is present in mitochondria & chloroplast also

Q.85 The first clinical gene therapy was given for treating -

(1) Chicken pox (2) Rheumatoid arthritis

(3) Adenosine deaminase deficiency (4) Diabetes mellitus

Ans. **[3]**

Sol. NCERT – pg. 211 (Class-XII)

Q.86 Sacred groves are specially useful in -

(1) preventing soil erosion (2) year-round flow of water in rivers

(3) conserving rare and threatened species (4) generating environmental awareness

Ans. **[3]**

Sol. Sacred grooves are method for insitu conservation of biodiversity and conserving rare and threatened species.
Ref. NCERT 12th (Eng) page no. 267 Chapter-15

Q.87 Which one of the following is a wrong statement regarding mutations ?

(1) Cancer cells commonly show chromosomal aberrations

(2) UV and Gamma rays are mutagens

(3) Change in a single base pair of DNA does not cause mutation

(4) Deletion and insertion of base pairs cause frame-shift mutations

Ans. **[3]**

Sol. Point mutation NCERT pg. 113 (Class-XII)

Q.88 Biolistics (gene-gun) is suitable for -

(1) Transformation of plant cells

(2) Constructing recombinant DNA by joining with vectors

(3) DNA finger printing

(4) Disarming pathogen vectors

Ans. **[1]**

Sol. Biolistic gun or gene gun method is used for transfer the gene in plant cell directly. It is a method of vectorless gene transfer in plant.

Q.89 Which one of the following statements is wrong ?

(1) Vegetative cell is larger than generative cell

(2) Pollen grains in some plants remain viable for months

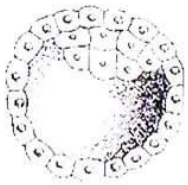
(3) Intine is made up of cellulose and pectin

(4) When pollen is shed at two-called stage, double fertilization does not take place

Ans. **[4]**

Sol. In 60% angiosperms the pollen grains are shed in 2 celled, 2 nucleate stage and further development of male gametophyte (Pollen grain) occurs on stigma it leads to formation of mature male gametophyte, 3 celled, 3 nucleated stage, which successfully participate in double fertilization.

Q.90 Identify the human development stage shown below as well as the related right place of its occurrence in a normal pregnant women and select the right option for the two together -



	Developmental stage	**Site of occurrence**
(1)	Blastula	End part of Fallopian tube
(2)	Blastocyst	Uterine wall
(3)	8-celled morula	Starting point of Fallopian tube
(4)	Late morula	Middle part of Fallopian tube

Ans. **[2]**

Sol. Implantation occurs on uterine wall in Blastula stage & human blastula is called blastocyst

Refer CP sheet embryology (Human Embryology) Topic Implantation.

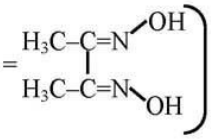
Q.91 Red precipitate is obtained when ethanol solution of dimethylglyoxime is added to ammoniacal Ni(II). Which of the following statements is not rue ?

(1) Complex has symmetrical H-bonding

(2) Red complex has a tetrahedral geometry

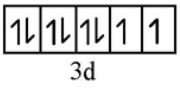
(3) Dimethylglyoxime functions as bidentate ligand

(4) Red complex has a square planar geometry.

dimethylglyoxime = 

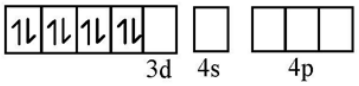
Ans. **[2]**

Sol. $Ni^{+2} + 2Dmg^{-} \rightarrow [Ni\ (Dmg)_2]$

Ni^{+2} = [Ar] $3d^8$ 

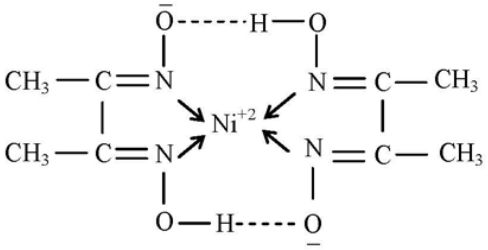
3d

Dmg^- is strong ligand so pairing possible



3d 4s 4p

dsp^2, square planer



Dimethyl glyoxime act as bidentate ligand.

Q.92 During change of O_2 to O_2^- ion, the electron adds on which one of the following orbitals ?

(1) π orbital (2) σ*orbital (3) σ orbital (4) π*orbital

Ans. **[4]**

Sol. configuration of O_2^- is

KK $\sigma(2s)^2\ \sigma^*(2s)^2\ \sigma(2pz)^2\pi(2px)^2\pi(2py)^2\ \pi^*(2px)^2\pi^*(2py)^1$

Q.93 Consider the reaction:

$RCHO + NH_2NH_2 \rightarrow RCH = N - NH_2$

What sort of reaction is it ?

(1) Free radical addition – elimination reaction

(2) Electrophilic substitution-elimination reaction

(3) Nucleophilic addition – elimination reaction

(4) Electrophilic addition – elimination reaction

Ans. **[3]**

Sol. Nucleophilic addition – elimination reaction.

Q.94 In which of the following arrangements the given sequence is not strictly according to the property indicated against it ?

(1) $H_2O < H_2S < H_2Se < H_2Te$: increasing pK_a values

(2) $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing acidic character

(3) $CO_2 < SiO_2 < SnO_2 < PbO_2$: increasing oxidising power

(4) HF < HCl < HBr < HI : increasing acidic strength

Ans. **[1]**

Sol. H_2O | In Hydrides top to bottom
H_2S | acidic nature increases so
H_2Se | $K_a \uparrow \ \therefore pK_a \downarrow$
H_2Te ↓

Q.95 The Gibbs' energy for the decomposition of Al_2O_3 at 500°C is as follows:

$$\frac{2}{3}Al_2O_3 \rightarrow \frac{4}{3}Al + O_2;\ \Delta_rG = +960\ kJ\ mol^{-1}.$$

The potential difference needed for the electrolytic reduction of aluminium oxide (Al_2O_3) at 500°C is at least :

(1) 3.0 V (2) 2.5 V (3) 5.0 V (4) 4.5 V

Ans. **[2]**

Sol. $\Delta G^o = -nFE^o$

$960 \times 1000 = -4 \times 96500 \times E^o$

$E^o = -2.48V$

So difference = 2.5 V

Q.96 Given that the equilibrium constant for the reaction

$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$

has a value of 278 at a particular temperature. What is the value of the equilibrium constant for the following reaction at the same temperature ?

$SO_{3(g)} \rightleftharpoons SO_{2(g)} + 1/2\ O_{2(g)}$

(1) 3.6×10^{-3} (2) 6.0×10^{-2} (3) 1.3×10^{-5} (4) 1.8×10^{-3}

Ans. **[2]**

Sol. $K' = \left(\frac{1}{K}\right)^{\frac{1}{2}} = \left(\frac{1}{278}\right)^{\frac{1}{2}} = 6 \times 10^{-2}$

Q.97 Which of the following compounds can be used as antifreeze in automobile radiators ?

(1) Glycol (2) Nitrophenol (3) Ethyl alcohol (4) Methyl alcohol

Ans. **[1]**

Sol. Glycol is an antifreeze agent.

Q.98 Molar conductivities (Λ°_m) at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively. Λ°_m for CH_3COOH will be:

(1) 180.5 S cm^2 mol^{-1} (2) 290.8 S cm^2 mol^{-1} (3) 390.5 S cm^2 mol^{-1} (4) 425.5 S cm^2 mol^{-1}

Ans. **[3]**

Sol. $CH_3COONa + HCl \rightarrow NaCl + CH_3COOH$

$91 + 425.9 = 126.4 + x$

$\therefore \quad x = 390.5 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$

Q.99 Vapour pressure of chloroform ($CHCl_3$) and dichloromethane (CH_2Cl_2) at 25°C are 200 mmHg and 41.5 mmHg respectively. Vapour pressure of the solution obtained by mixing 25.5 g of $CHCl_3$ and 40 g of CH_2Cl_2 at the same temperature will be:

(Molecular mass of $CHCl_3$ = 119.5 u and molecular mass of CH_2Cl_2 = 85 u)

(1) 615.0 mm Hg (2) 347.9 mm Hg (3) 285.5 mm Hg (4) 173.9 mm Hg

Ans. **[Bonus]**

Sol. $CHCl_3$ CH_2Cl_2

(A) (B)

$n_A = \frac{25.5}{119.5} = 0.213$ $n_B = \frac{40}{85} = 0.47$

$X_A = \frac{n_A}{n_A + n_B} = \frac{0.213}{0.684} = 0.31$

$X_B = 1 - 0.31 = 0.69$

$P = P^{\circ}_A X_A + P^{\circ}_B X_B$

$= 200 \times (0.31) + 41.5\ (0.69)$

$= 62.28 + 28.63 = 90.38$

Note: This question will be bonus because V.P. of Dichloromethane cannot be less than chloroform. (it would be 415 mm of Hg)

Q.100 A certain gas takes three times as long to effuse out as helium. Its molecular mass will be:

(1) 36 u (2) 64 u (3) 9 u (4) 27 u

Ans. **[1]**

Sol. $\frac{r_1}{r_2} = \sqrt{\frac{M_{w_2}}{M_{w_1}}}$

$\frac{V_1}{t_1} \times \frac{t_2}{V_2} = \sqrt{\frac{M_{w_2}}{M_{w_1}}}$

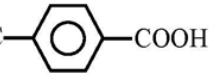
volume is same

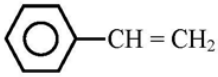
$\frac{3}{1} = \sqrt{\frac{M_{w_2}}{4}}$

$$9 = \frac{M_{w_2}}{4} \qquad \therefore\ M_{w_2} = 36$$

Q.101 Which one of the following sets forms the biodegradable polymer ?

(1) $H_2N - CH_2 - COOH$ and $H_2N - (CH_2)_5 - COOH$

(2) $HO - CH_2 - CH_2 - OH$ and 

(3)  and $CH_2 = CH - CH = CH_2$

(4) $CH_2 = CH - CN$ and $CH_2 = CH - CH = CH_2$

Ans. **[1]**

Sol. Nylon-2-Nylon-6 is the product which is a bio-degradable polymer.

Q.102 The catalytic activity of transition metals and their compounds is ascribed mainly to:

(1) their unfilled d-orbitals (2) their ability of adopt variable oxidation states

(3) their chemical reactivity (4) their magnetic behaviour

Ans. **[2]**

Sol. Transition metals are show variable oxidation states

$$2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$$

$$SO_2 + \overset{+5}{V}_2O_5 \longrightarrow SO_3 + \overset{+4}{V}_2O_4$$

$$\overset{+4}{V}_2O_4 + O_2 \longrightarrow \overset{+5}{V}_2O_5$$

Q.103 Given the reaction between 2 gases represented by A_2 and B_2 to give the compound $AB_{(g)}$.

$A_{2(g)} + B_{2(g)} \rightleftharpoons 2\,AB_{(g)}$

At equilibrium, the concentration

of $A_2 = 3.0 \times 10^{-3}$ M

of $B_2 = 4.2 \times 10^{-3}$ M

of $AB = 2.8 \times 10^{-3}$ M

If the reaction takes place in a sealed vessel at 527°C, then the value of K_C will be :

(1) 1.9 (2) 0.62 (3) 4.5 (4) 2.0

Ans. **[2]**

Sol. $A_2 + B_2 \rightleftharpoons 2AB$

(g) (g) (g)

$$K_c = \frac{[AB]^2}{[A_2][B_2]} = \frac{2.8 \times 2.8 \times 10^{-6}}{3 \times 10^{-3} \times 4.2 \times 10^{-3}} = 0.62$$

Q.104 Standard reduction potentials of the half reactions are given below :

$F_{2(g)} + 2e^- \rightarrow 2F^-_{(aq)}$; $E^o = +2.85$ V

$Cl_{2(g)} + 2e^- \rightarrow 2Cl^-_{(aq)}$; $E^o = +1.36$ V

$Br_{2(l)} + 2e^- \rightarrow 2Br^-_{(aq)}$; $E^o = +1.06$ V

$I_{2(g)} + e^- \rightarrow 2I^-_{(aq)}$; $E^o = +0.53$ V

The strongest oxidizing and reducing agents respectively are -

(1) Br_2 and Cl^- (2) Cl_2 and Br^- (3) Cl_2 and I_2 (4) F_2 and I^-

Ans. **[4]**

Sol. All are SRP
I
Br
Cl
F
So Best O.A. $\rightarrow F_2$
Best R.A. $\rightarrow I^-$

Q.105 Four diatomic species are listed below. Identify the correct order in which the bond order is increasing in them -

(1) $O_2^- < NO < C_2^{2-} < He_2^+$ (2) $C_2^{2-} < He_2^+ < O_2^- < NO$

(3) $He_2^+ < O_2^- < NO < C_2^{2-}$ (4) $NO < O_2^- < C_2^{2-} < He_2^+$

Ans. **[3]**

Sol. $C_2^{2-} \Rightarrow$ total electron = 14

configuration

KK $\sigma 2s^2\ \sigma^*2s^2\ \pi 2px^2\ \pi 2py^2\ \sigma 2pz^2$

$$\text{Bonderder} = \frac{Nb - Na}{2} = \frac{8-2}{2} = 3$$

NO $\Rightarrow$ total electron = 5 + 6 = 11
KK $\sigma 2s^2\ \sigma^*2s^2\ \sigma 2pz^2\ \pi 2px^2\ \pi 2py^2\ \pi 2px^1$

$$\text{Bond order} = \frac{(8-3)}{2} = 2.5$$

$O_2^- \Rightarrow$ KK $\sigma(2s)^2\ \sigma^*(2s)^2\ \sigma(2pz)^2\pi(2px)^2\pi(2py)^2\ \ \pi^*(2px)^2\pi^*(2py)^1$

$$\text{B.O} = \frac{8-5}{2} = 1.5$$

$He^{2+} \Rightarrow \sigma 1s^2\sigma^*1s^1$

$$\text{B.O.} = \frac{2-1}{2} = 0.5$$

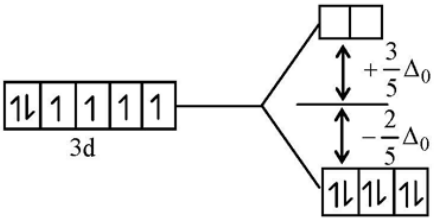
Q.106 Low spin complex of d^6-cation in an octahedral field will have the following energy :

(1) $\frac{-12}{5}\Delta_0 + 3P$ (2) $\frac{-2}{5}\Delta_0 + 2P$ (3) $\frac{-2}{5}\Delta_0 + P$ (4) $\frac{-12}{5}\Delta_0 + P$

(Δ_0 = Crystal field splitting energy in an octahedral field, P = Electron pairing energy)

Ans. **[1]**

Sol. Low spin complex of d^6 cation having $\Delta_0 > P.E.$



Configuration is $t_2g^6eg^0$ and 3 electron are paired in t_{2g} orbital

$$\left(-\frac{2}{5}\Delta_0\right)\times 6 + 3P$$

$$-\frac{12}{5}\Delta_0 + 3P$$

Q.107 Which of the following compounds will give a yellow precipitate with iodine and alkali ?

(1) Methyl acetate (2) Acetamide (3) 2-Hydroxypropane (4) Acetophenone

Ans. **[3]**

Sol. $CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$ gives iodoform test. BUT

$CH_3-\overset{\overset{O}{\|}}{C}-\ddot{O}CH_3$; $CH_3-\overset{\overset{O}{\|}}{C}-\ddot{N}H_2$; $CH_3-\overset{\overset{O}{\|}}{C}-C_6H_5$ does not give because α–H is not active due to +M effect of nearby group.

Q.108 The orbital angular momentum of a p-electron is given as -

(1) $\sqrt{3}\ \frac{h}{2\pi}$ (2) $\sqrt{\frac{3}{2}}\ \frac{h}{\pi}$ (3) $\sqrt{6}\ .\ \sqrt{\frac{h}{2\pi}}$ (4) $\frac{h}{\sqrt{2}\pi}$

Ans. **[4]**

Sol. Orbital angular momentum = $\sqrt{\ell(\ell+1)}\times\frac{h}{2\pi}$

$$= \sqrt{l(l+1)} \times \frac{h}{2\pi} = \frac{h}{\sqrt{2}\pi}$$

Q.109 Which one of the following does not correctly represent the correct order of the property indicated against it ?

(1) $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$; increasing magnetic moment

(2) Ti < V < Cr < Mn : increasing melting point

(3) Ti < V < Mn < Cr : increasing 2nd ionization enthalpy

(4) Ti < V < Cr < Mn : increasing number of oxidation states

Ans. **[2]**

Sol. Along the 3d series melting point increases upto the Cr than decreases.

Q.110 Chloroamphenicol is an :

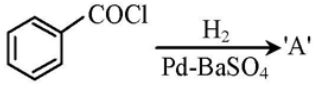
(1) antihistaminic (2) antiseptic and disinfectant

(3) antibiotic-broad spectrum (4) antifertility drug

Ans. **[3]**

Sol. It is broad – spectrum antibiotic

Q.111 Consider the following reaction :

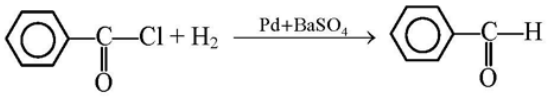


The product 'A' is -

(1) C_6H_5OH (2) $C_6H_5COCH_3$ (3) C_6H_5Cl (4) C_6H_5CHO

Ans. **[4]**

Sol. Rossenmund reduction gives aldehyde



Q.112 Which of the following reagents will be able to distinguish between 1-butyne and 2-butyne ?

(1) HCl (2) O_2 (3) Br_2 (4) $NaNH_2$

Ans. **[4]**

Sol. $CH_3CH_2C \equiv CH \xrightarrow{NaNH_2} CH_3CH_2C \equiv CNa + \frac{1}{2} H_2 \uparrow$

$CH_3–C\equiv C–CH_3 \xrightarrow{NaNH_2}$ No reaction

Q.113 For real gases van der Waals equation is written as

$$\left(p+\frac{an^2}{V^2}\right)(V-nb)=nRT$$

Where 'a' and 'b' are van der Waals constants.

Two sets of gases are :

(I) O_2, CO_2, H_2 and He (II) CH_4, O_2 and H_2

The gases given in set-I in increasing order of 'b' and gases given in set-II in decreasing order of 'a', are arranged below. Select the correct order from the following :

(1) (I) $O_2 < He < H_2 < CO_2$ (II) $H_2 > O_2 > CH_4$ (2) (I) $H_2 < He < O_2 < CO_2$ (II) $CH_4 > O_2 > H_2$

(3) (I) $H_2 < O_2 < He < CO_2$(II) $O_2 > CH_4 > H_2$ (4) (I) $He < H_2 < CO_2 < O_2$ (II) $CH_4 > H_2 > O_2$

Ans. **[2]**

Sol. As per actual data's

sequence of Vander Wall constant (a)

$H_2 < He < O_2 < CO_2$

value 0.244 0.34 1.36 3.54

and sequence of Vander Wall constant (b)

$CH_4 > O_2 > H_2$

value 0.042 0.031 0.026

Q.114 Activation energy (E_a) and rate constant (k_1 and k_2) of a chemical reaction at two different temperatures (T_1 and T_2) are related by -

(1) $\ln\frac{k_2}{k_1}=-\frac{E_a}{R}\left(\frac{1}{T_2}-\frac{1}{T_1}\right)$ (2) $\ln\frac{k_2}{k_1}=-\frac{E_a}{R}\left(\frac{1}{T_2}+\frac{1}{T_1}\right)$

(3) $\ln\frac{k_2}{k_1}=\frac{E_a}{R}\left(\frac{1}{T_1}-\frac{1}{T_2}\right)$ (4) $\ln\frac{k_2}{k_1}=-\frac{E_a}{R}\left(\frac{1}{T_1}-\frac{1}{T_2}\right)$

Ans. **[1, 3]**

Sol. Ace. to Arrheneis equation

$$\ell n\frac{K_2}{K_1}=\frac{E_a}{R}\left[\frac{1}{T_1}-\frac{1}{T_2}\right]$$

option (1) and (3) are same

Q.115 Which of the following exhibits only + 3 oxidation state ?

(1) Th (2) Ac (3) Pa (4) U

Ans. **[2]**

Sol. Actinium:-

Atomic No = 89

Configuration = [Rn] $6d^1 7s^2$

stable oxidation state $\Rightarrow$ +3

Th = +3, +4

Pa = +3, +4, +5

U = +3, +4, +5, +6

Q.116 Equal volumes of two monoatomic gases, A and B, at same temperature and pressure are mixed. The ratio of specific heats (C_p/C_v) of the mixture will be -

(1) 1.50 (2) 3.3 (3) 1.67 (4) 0.83

Ans. **[3]**

Sol. For monoatomic

$$\frac{C_P}{C_V} = \gamma = 1.67$$

$\because$ Equal volume of two monoatomic gases so γ will remain same

Q.117 Structure of a mixed oxide is cubic close-packed (c.c.p.). The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B. The formula of the oxide is -

(1) A_2BO_2 (2) $A_2B_3O_4$ (3) AB_2O_2 (4) $AB\ O_2$

Ans. **[3]**

Sol. O^{-2} ion according to ccp = 4

So tetrahedral void = 8 and octahedral void = 4

but A ion occupied $\frac{1}{4}$th tetrahedral = 2

and B ion occupied all octahedral = 4

A	B	O	
2	4	4	AB_2O_2
1	2	2	

Q.118 Four successive members of the first series of the transition metals are listed below.For which one of the them the standard potential $\left(E^{o}_{M^{2+}/M}\right)$ value has a positive sign ?

(1) Ni (Z = 28) (2) Cu (Z = 29) (3) Fe (Z = 26) (4) Co (Z = 27)

Ans. **[2]**

Sol. In ECS Cu is lower then hydrogen

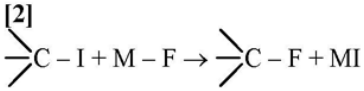
Q.119 In the replacement reaction

$$\diagdown\!\!\diagup CI + MF \rightarrow \diagdown\!\!\diagup CF + MI$$

The reaction will be most favourable if M happens to be -

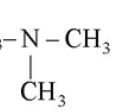
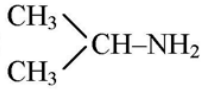
(1) K (2) Rb (3) Li (4) Na

Ans. **[2]**

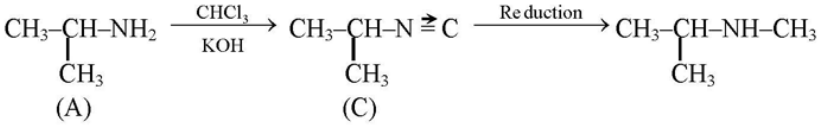


Reaction is faster with Rb because lattice energy of RbF is less than LiF, NaF, KF.

Q.120 An organic compound (C_3H_9N) (A), when treated with nitrous acid, gave an alcohol and N_2 gas was evolved. (A) on warming with $CHCl_3$ and caustic potash gave (C) which on reduction gave isopropylmethylamine. Predict the structure of (A).

(1) $CH_3CH_2–NH–CH_3$ (2)  (3) $CH_3CH_2CH_2–NH_2$ (4) 

Ans. **[4]**

Sol. 

(A) (C)