1.

(c) $[M^0L^0T^{-1}]$

Explanation:

$[\omega] = \frac{[\theta]}{[t]} = \frac{1}{T} = [M^0L^0T^{-1}]$

2.

(d) watt

Explanation:

The SI unit of power is watt.

3.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

According to statement of reason, $\vec{A} \times \vec{B} = AB\sin\theta$.

As $\vec{B} = \vec{A}$, angle between $\vec{A} \times \vec{A}, \theta = 0$. Therefore, $\vec{A} \times \vec{A} = A\sin 0° = \vec{0}$ i.e. the cross product of a vector with itself is zero.

4.

(b) 20 s

Explanation:

Relative velocity of bird with respect the train is 15 -10 = 5 ms^{-1}
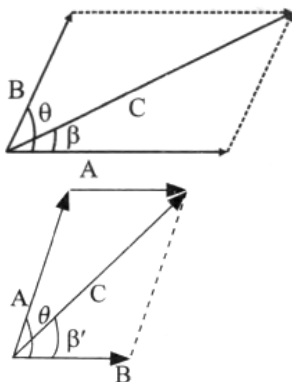
Relative distance = 100 m = Length of is train

Time taken by the bird to overtake $= \frac{\text{Relative distance}}{\text{Relative velocity}} = \frac{100}{5} = 20$ s

5. **(a)** magnitude

Explanation:

According to the figure,

Magnitude in 1st case is

C $= \sqrt{A^2 + B^2 + 2AB\cos(\theta)}$

Direction becomes

$\beta = \tan^{-1}\left\{\frac{B\sin(\theta)}{A+B\cos(\theta)}\right\}$

If A & B interchanged.

In 2nd case

C $= \sqrt{A^2 + B^2 + 2AB\cos(\theta)}$

C Direction becomes

$$\beta' = \tan^{-1}\left\{\frac{A\sin(\theta)}{B + A\cos(\theta)}\right\}$$

So that, magnitude remains the same but the direction changes.

6.

(c) A is true but R is false.

Explanation:

The equation of the trajectory of a projectile is $y = x\tan\theta - \frac{1}{2}\frac{g}{u^2\cos^2\theta}x^2$. Thus y component depends on x component.

7. **(a)** 40 N

Explanation:

Given, mass of child, m = 5 kg

Radius of merry-go-round, R = 2 m

Angular velocity, $\omega = \frac{2\pi}{3.14} = 2\text{rad/s}$

The centrifugal force on the child will be

$F = M\omega^2 R = 5 \times 2^2 \times 2 = 40$ N

8. **(a)** $\frac{Mv}{m}$

Explanation:

By conservation of momentum,

Mv = m $\times$ 0 + mv'

$\therefore v' = \frac{Mv}{m}$

9. **(a)** [M^{1}L^{0}T^{-2}]

Explanation:

W = $\frac{1}{2}$ kx^2

$\therefore$ [M^{1}L^{2}T^{-2}] = [k] [L^2]

or [k] = [M^{1}L^{0}T^{-2}]

10. **(a)** $\frac{Ml^2\omega}{3t}$

Explanation:

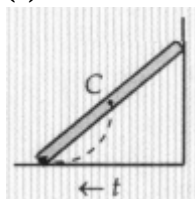As Torque(τ) is equal to the product of Moment of Inertia (I) and Angular acceleration (α)

$\tau = I\alpha$

$\tau = I\frac{\Delta\omega}{\Delta t}$

$\tau = \left[\frac{M(2l)^2}{12}\right]\left[\frac{\omega}{t}\right]$

$\tau = \frac{Ml^2\omega}{3t}$

11. **(a)**

Explanation:

The centre of mass remains at the centre of the ladder. Hence Fig. (a) represents the correct trace of CM.

12. **(a)** 11.2 km/s

Explanation:

Escape velocity does not depend on the angle of projection. Escape velocity will remain the same. Hence, escape velocity is 11.2 km/s.

13. **(a)** four times that on A

Explanation:

four times that on A

14. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.

Explanation:

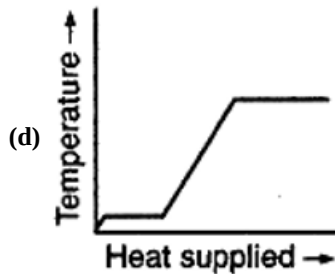Assertion and reason both are correct statements and reason is correct explanation for assertion.

15.
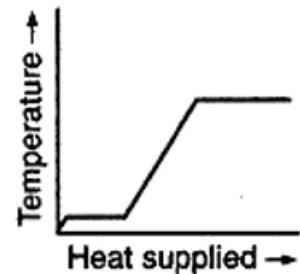
(b) metal has high thermal conductivity

Explanation:

Due to higher thermal conductivity of metal than wood, heat begins to flow readily from our body to the metal surface and so we feel colder.

16.

(d)

Explanation:

17.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

Explanation:

Assertion and reason both are correct statements but reason is not correct explanation for assertion.

18. **(a)** 1.39 atm

Explanation:

$P_1 V_1^{\gamma} = P_2 V_2^{\gamma}$

$P_2 = P_1 \left(\frac{V_1}{V_2} \right)^{\gamma} = 5 \times \left(\frac{12}{30} \right)^{1.4} = 5 \times (0.4)^{1.4} = 1.39$ atm

19.

(b) 75.0 J

Explanation:

Helium is a monoatomic gas.($C_V = 1.5R$)

change in internal energy

$\Delta U = n C_V \Delta T$

$= 3 \times 1.5 \times 8.31 \times 2 = 75J$

20.

(b) 7 s

Explanation:

Since the system dissipates its energy gradually, and hence amplitude will also decrease with time according to

$a = a_0 e^{-bt/m}$ ...(i)

$\because$ Energy of vibration drop to half of its initial value (E_0), as

$E \propto a^2 \Rightarrow a \propto \sqrt{E}$

$a = \frac{a_0}{\sqrt{2}} \Rightarrow \frac{bt}{2m} = \frac{10^{-2}t}{2 \times 0.1} = \frac{t}{20}$

From eq^n (i),

$\frac{a_0}{\sqrt{2}} = a_0 e^{-t/20}$

$\frac{1}{\sqrt{2}} = e^{-t/20}$ or $\sqrt{2} = e^{t/20}$

$\ln\sqrt{2} = \frac{t}{20}$

$\therefore$ t = 6.93 seconds

21.

(b) $T_{IV} > T_{III} > T_I > T_{II}$

Explanation:

For I, $k_I = k_1 + k_2 + \left(\frac{k_1 - k_2}{k_1 + k_2}\right) = 1 + 1 + \frac{1}{2} = 2.5$

$T_1 = \frac{1}{2\pi}\sqrt{\frac{m}{2.5}} = 0.63$ C ...($\frac{\sqrt{m}}{2\pi}$ = constant = C)

For II, $k_{II} = k_1 + k_2 + k_3 + k_4 = 1 + 1 + 1 + 1 = 4$

$T_{II} = \frac{C}{\sqrt{4}} = 0.5$ C

For III, $k_{III} = \left(\frac{k_1 k_2 k_3}{k_1 k_2 + k_2 k_3 + k_3 k_1}\right) + k_4 = \frac{1}{3} + 1 = 1.33$

$T_{III} = \frac{C}{\sqrt{1.33}} = 0.86$ C

For IV, $k_{IV} = \left(\frac{k_l k_2}{k_1 + k_2}\right) + \left(\frac{k_3 k_4}{k_3 + k_4}\right) = \left(\frac{1}{2} + \frac{1}{2}\right) = 1$

$T_{IV} \frac{C}{\sqrt{1}} = 1$ C

Hence, $T_{IV} > T_{III} > T_I > T_{II}$

22. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

23.

(c) it may have formly distributed charge

Explanation:

In each of the cases given above, the electric field is not uniform.

24.

(b) $4\sqrt{\frac{kmg}{\tan\theta}}$

Explanation:
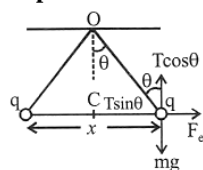
In equilibrium, $F_e = T \sin\theta$

mg = T cosθ

$\tan\theta = \frac{F_e}{mg} = \frac{q^2}{4\pi\epsilon_0 x^2 \times mg} \therefore x = \sqrt{\frac{q^2}{4\pi\epsilon_0 \tan\theta mg}}$

Electric potential at the centre of the line

$V = \frac{kq}{\frac{x}{2}} + \frac{kq}{\frac{x}{2}} = 4\sqrt{\frac{kmg}{\tan\theta}}$

25.

(c) $r_1 < r < r_2$

Explanation:

The electric field of a hollow spherical capacitor is localized in between the inner and outer surfaces of the spherical conductor. Therefore, at point $r_1 < r < r_2$, the electric field will not be zero.

26.

(b) 10^{-5} C-m

Explanation:

$V = \frac{1}{4\pi\varepsilon_0} \frac{p\cos\theta}{r^2}$

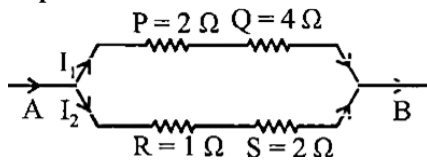Here, $V = 1.8 \times 10^5\,V$, $\theta = 60°$, r = $50 \times 10^{-2} = 0.5$ m

$\therefore 1.8 \times 10^5 = 9 \times 10^9 \times \frac{p\cos 60°}{(0.5)^2}$

or p = $\frac{1.8\times 10^5 \times 0.25 \times 2}{9\times 10^9}$ = 10^{-5} C-m

27.

(c) S

Explanation:

P = 2 Ω Q = 4 Ω

R = 1 Ω S = 2 Ω

$R_1 = P + Q = 2\ \Omega + 4\ \Omega = 6\ \Omega$

$R_2 = R + S = 1\ \Omega + 2\ \Omega = 3\ \Omega$

$I_1 R_1 = I_2 R_2$

$I_1 = \frac{R_2}{R_1} I_2 = \frac{3}{6} I_2 = \frac{I_2}{2}$

Heat flow H = I^2 Rt

For Q, $H_Q = I_1^2 Qt = \frac{I_2^2}{4} \times 4t = I_2^2 t$

For S, $H_S = I_2^2 St = I_2^2 \cdot 2t = 2I_2^2 t$

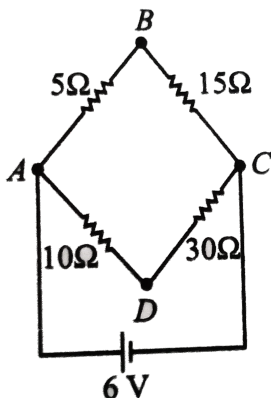$\therefore$ Greatest amount of heat generated by S.

28.

(b) 0 volt

Explanation:

The given figure is a circuit of balanced Wheatstone bridge as shown in the figure.

Point B and D would be at the same potential. i.e. VB − VD = 0 volt

29.

(c) speed

Explanation:

When electron moves in a magnetic field:

$\frac{mv^2}{r}$ = qvB or r = $\frac{mv}{qB}$

30.

(b) an end-on position

Explanation:

A point on the axial line is in end-on position.

31. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

The magnetic field at distance from centre of loop, can be resolved into a component along x-axis and perpendicular to it. When perpendicular components are summed over the whole loop, the result is zero. That is, by symmetry any element on one side of the loop sets up a perpendicular component that cancels the component set up by an element dimetrically opposite to it.

32. **(a)** $\mu \propto n$

Explanation:

$L = n \cdot \frac{h}{2\pi}$ and $\mu = \frac{e}{2m} \cdot L$

$\therefore \mu = \frac{e}{2m} \cdot \frac{nh}{2\pi}$ $\therefore$ u $\propto$ n.
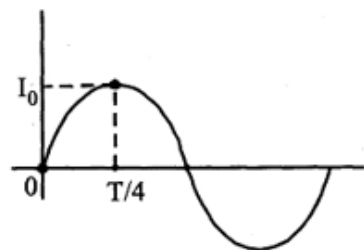
33.

(c) Zero

Explanation:

Induced EMF is zero because flux linked with it remains constant.

34. **(a)** $\frac{1}{240}$ s

Explanation:

We have

ω = 120 π

and, T = $\frac{2\pi}{\omega} = \frac{2\pi}{120\pi} = \frac{\pi}{60\pi} = \frac{1}{60}$

So, req. time = $\frac{T}{4} = \frac{1}{240}$ s

35. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

The capacitive reactance of the capacitor is given by $X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C}$

So this is infinite for dc (f = 0) and has a very small value for ac. Therefore a capacitor blocks dc.

36.

(c) E(x, t) = $E_{max} \cos\left(5.93 \times 10^5 \ x + 1.78 \times 10^{14} \ t\right)$

Explanation:

$k = \frac{2\pi}{\lambda} = \frac{2 \times 3.14}{10.6 \times 10^{-6}} = 5.93 \times 10^5 \, rad/m$

$\omega = 2\pi\nu = 2\pi \frac{c}{\lambda} = \frac{2 \times 3.14 \times 3 \times 10^8}{10.6 \times 10^{-6}} = 1.78 \times 10^{14} \, rad/s$

Since wave is propagating along -X axis,

E(x, t) = $E_{max} \cos[kx + \omega t]$

E(x, t) = $E_{max} \cos\left(5.93 \times 10^5 \ x + 1.78 \times 10^{14} \ t\right)$

37. **(a)** potential difference

Explanation:

The quality of X-rays is determined by the potential difference.

38. **(a)** Become infinite

Explanation:

$\frac{1}{f} = \left(\frac{\mu_2}{\mu_1} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

Since, $\mu_2 = \mu_1$,

$\frac{1}{f} = 0$, $hence\ f = \infty$

39.

(c) A is true but R is false.

Explanation:

The light disperse into different colours, on entering the glass slab because velocity of light being different for different colours. But when it emerges from the other parallel face, the rays of different colours again come out in same direction and therefore combine to form white light.

40.

(b) 4

Explanation:

$\Delta x = n\lambda$

or $d\sin\theta = n\lambda$ [For maximum intensity]

For maximum number of possible interference maxima,

$\sin\theta = 1$

$\therefore d = n\lambda$ or $\lambda = n\lambda$ or n = 4

41. **(a)** 1.0 eV

Explanation:

Using, E = hυ - ϕ for the two cases we get,

0.5 = hυ - ϕ ...(i) and

0.8 = 1.2 hν - ϕ ...(ii)

Multiplying equation (i) by 1.2 and subtracting equation (ii) from it we get,

$0.2\phi = 0.2$

or, ϕ = 1 eV

42.

(d) A and B only

Explanation:

The work function for the wavelength of 4100A$^{\circ}$ is

$W = \frac{hc}{\lambda} = \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{4100 \times 10^{-10}}$

= 4.8 $\times$ 10^{-19} J

$= \frac{4.8 \times 10^{-19}}{1.6 \times 10^{-19}} eV = 3eV$

Now, we have

W_A = 1.92eV, W_B = 2.0eV, W_C = 5eV

Since $W_A > W$

Hence, $W_B < W$, hence, A and B will emit photoelectrons.

43.

(c) 1.52 $\times 10^{-16}$ s

Explanation:

Orbital period for orbit n is given by:

$T_n = \frac{2\pi r}{v_n}$, where $r_1 = 0.53 \times 10^{-10}\ m$

So, $T_1 = \frac{2\pi \times 0.53 \times 10^{-10}}{2.19 \times 10^6} = 1.52 \times 10^{-16}\ s$

44.

(b) Both A and R are true but R is not the correct explanation of A.
Explanation:
Rutherford confirmed that the repulsive force of α-particle due to nucleus varies with distance according to inverse square law and that the positive charges are concentrated at the centre and not distributed throughout the atom.

45.

(b) (B)
Explanation:
The energy released in nuclear fission is due to the fact that total binding energy of fragments is more than the binding energy of the parent nucleus.

46. **(a)** 10^{-15} m
Explanation:
The nuclear force is powerfully attractive b/w nucleons at a distance of about 1 Femtometre (1×10^{-15} m).

47.

(b) heavily doping p and n sides of the junction
Explanation:
Zener diode is a special purpose semiconductor diode designed to operate under reverse bias in the breakdown region and used as a voltage regulator. Due to heavy doping of both p and n sides, depletion region formed is very thin and the electric field of the junction is very high. When applied reverse bias voltage reaches breadown voltage, there is a large change in the current, but almost insignificant change in the reverse bias.

48.

(b) In forward biasing, the voltage across R is V
Explanation:
In forward biasing, the voltage across R is V

49. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
Both A and R are true and R is the correct explanation of A.

50.

(d) 20 mA
Explanation:
20 mA

51.

(d) end error
Explanation:
end error

1.

(c) 10 %

Explanation:

Since , mass % =[{(mass of solute) $\times$) / (mass of solution) } $\times 100$]

$\therefore$ Substituting the given values we get,

Mass per cent

= [(2 g) / { (2 g of A) + 18 g of water }]

= [(2 /20) x 100]

= 10%

2.

(d) 165.9 u

Explanation:

Molar mass of $AgBO_3$ = [atomic mass of Ag + atomic mass of B + 3 (atomic mass of O))] u

Substituting the atomic masses of Ag, B & O as 107.9, 10 & 16 respectively. we get -

Molar mass of $AgBO_3$ = [107.9 + 10 + (3 $\times$ 16)]u

= 165.9 u

3.

(c) Option (iii)

Explanation:

Dual character of the electromagnetic radiation and experimental results regarding atomic spectra which can be explained only by assuming quantised electronic energy levels in atoms.

4.

(b) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^9\ 4s^2$

Explanation:

Correct electronic configuration of the two subshells (3d and 4s) should be $3\ d^{10}4s^1$

In certain elements such as Cu or Cr, where the two subshells (4s and 3d) differ slightly in their energies, an electron shifts from a subshell of lower energy (4s) to a subshell of higher energy (3d), provided such a shift results in all orbitals of the subshell of higher energy getting either completely filled or half-filled. Therefore it is wrong.

5.

(c) F > O > Cl > N

Explanation:

All these elements are p-block elements.

The oxidizing character of elements increases from left to right across a period because of the presence of vacant d - orbitals in their valence shells. Thus we get the decreasing order of oxidizing properties as F > O > N

Again, the oxidizing character of elements decreases down the group. Thus, we get F > Cl. However, the oxidizing character of O is more than that of Cl ie. O > Cl

Hence, the correct order of chemical reactivities of F, Cl, O, N in terms of their oxidizing properties is F > O > Cl > N.

6.

(b) An oxidising agent

Explanation:

The transition metal in its highest oxidation state will have no desire to further loose electrons. It will act as an oxidizing agent where it will accept electrons and is reduced in a chemical reaction.

7.

(b) atomic orbitals must have comparable energies and of proper symmetry

Explanation:

According to molecular orbital theory (MOT), the atomic orbitals of comparable energies and proper symmetry combine to form molecular orbitals.

8.

(c) energy decreases

Explanation:

A chemical bond is a lasting attraction between atoms that enables the formation of chemical compounds. The bond may result from the electrostatic force of attraction between atoms with opposite charges, or through the sharing of electrons as in the covalent bonds. When a bond forms, electrons are attracted to the space between nuclei where the electrostatic force of attraction is greater. As the electrons fall to a position of lower potential energy, the total mechanical energy of the molecular system decreases. Part of the mechanical energy of the unbound atoms is lost when they form the molecular system with a lower total mechanical energy.

9.

(b) Electronic theory of chemical bonding

Explanation:

Ionic crystalline compounds formed by ion-formation by electron transfer proves the electronic theory of chemical bonding. According to this theory, ionic bonds are formed when an atom loses electron/ electrons to become a positive ion and another atom gains the electron/ electrons to become a negative ion. Ionic bonding is a process of complete transfer of Valence electrons.

10.

(d) Heat of combustion

Explanation:

Combustion is an exothermic process. Hence heat of combustion has a negative value.

11.

(b) heat and its transformations to and from other forms of energy.

Explanation:

Thermodynamics deals with heat and its transformation from one form to another. The branch of physical science that deals with the relations between heat and other forms of energy (such as mechanical, electrical, or chemical energy) and by extension of the relationships between all forms of energy.

12.

(d) 100° C

Explanation:

Water and water vapour are in equilibrium position at atmospheric pressure (1.013 bar) and at 100°C in a closed vessel. The boiling point of water is 100°C at 1.013 bar pressure. For any pure liquid at one atmospheric pressure (1.013 bar), the temperature at which the liquid and vapours are at equilibrium is called the normal boiling point of the liquid. The boiling point of the liquid depends on the atmospheric pressure.

13.

(c) Increase in Temperature

Explanation:

The given reaction is endothermic, so on increasing the temperature, it will shift in forward direction.

14.

(b) partial pressure

Explanation:

$$K_p = \frac{\left(\mathbf{P}_{products}\right)^{sttoichimery}}{\left(\mathbf{P}_{reactant}\right)^{stoichimetry}}$$

15. **(a)** dynamic equilibrium

Explanation:

Ice and water kept in a perfectly insulated thermos flask at 273K and the atmospheric pressure are in an equilibrium state and the system shows interesting characteristic features. The mass of ice and water do not change with time and the temperature remains constant. However, the equilibrium is not static. The intense activity can be noticed at the boundary between ice and water. Molecules from the liquid water collide against ice and adhere to it and some molecules of ice escape into the liquid phase. There is no change of mass of ice and water, as the rates of transfer of molecules from ice into water and of reverse transfer from water into the ice are equal at atmosphere pressure and 273K.

16. **(a)** CrO_2Cl_2

Explanation:

Let x be the oxidation state of Mn in MnO_4^-.

Since the overall charge on the complex is −1, the sum of oxidation states of all elements in it should be equal to −1.

Therefore, x + 4(−2) = −1

or, x = +7

Hence, the oxidation state of Mn in MnO_4^- is +7.

Similarly,

The oxidation state of Cr in $[Cr(CN)_6]_3^-$, Ni in NiF_6^{6-} and Cr in CrO_2Cl_2 is +3, +4 and +6 respectively.

Hence, the species with an atom in +6 oxidation state is CrO_2Cl_2.

17.

(b) MnO_2

Explanation:

$$Mn\overset{+2}{S}O_4^{2-} \longrightarrow \overset{+4}{Mn}O_2 + 2e^-$$

Here, change in oxidation of Mn = 2

So, n - factor = 2

Equivalent weight = $\frac{M}{2}$

Therefore, the equivalent weight of $MnSO_4$ is half of its molecular weight when it is converted to MnO_2

18.

(c) X = B_2O_3, Y = BN

Explanation:

$$\underset{\substack{(X) \\ Boric\ anhydride}}{B_2O_3} \xrightarrow{Na/K} \underset{Boron}{B} \xrightarrow[\Delta]{N_2} \underset{\substack{(Y) \\ Boron\ nitride}}{BN}$$

19. **(a)** Graham's salt

Explanation:

Graham's salt

20.

(c) I $\Rightarrow$ Trigonal planar

II $\Rightarrow$ Pyramidal

III $\Rightarrow$ Trigonal planar

Explanation:

I $\Rightarrow$ Trigonal planar

II $\Rightarrow$ Pyramidal

III $\Rightarrow$ Trigonal planar

21.

(d)
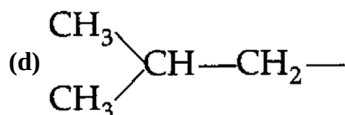
Explanation:

Iso means one, CH_3 group is present in the side chain and thus the structure of iso-butyl group is

22.

(b) $(CH_3)_3 \overset{+}{C}$
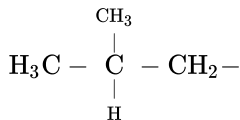
Explanation:

3° Alkyl carbocation is more stable than 1° benzyl carbocation.

23.

(b) iii, ii, i, iv

Explanation:

If the size of electron donating atom is nearly same then,

Nucleophilicity $\propto \dfrac{1}{\text{Basicity of anion}}$

24.

(d)

Explanation:

25.

(b)
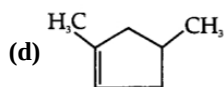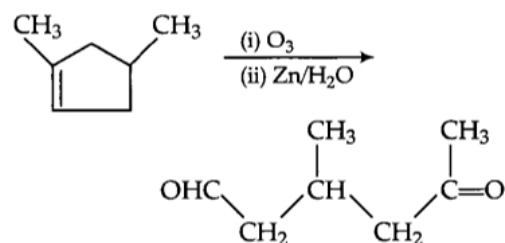
Explanation:

The reaction follows α,β-elimination mechanism to give a more substituted stable alkene as a major product. As the substrate is a α, γ -dibromo (1,3-) compound it gives a conjugated diene.

26.

(b) 0.1 N solution of NaCl is hypertonic with respect to 0.1 N solution of Na_2SO_4.

Explanation:

0.1 N solution of NaCl is hypertonic with respect to 0.1 N solution of Na_2SO_4.

$\pi_{NaCl} = 0.1 \times 2 \times ST$;

$\pi_{Na_2SO_4} = \frac{0.1}{2} \times 3 \times ST$
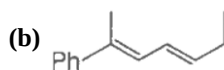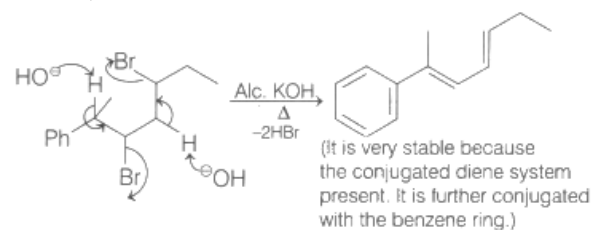
(A): The vapour pressure of a liquid does not depend on the size of the vessel but on the temperature and nature of the liquid.

(B): The components of an azeotropic solution cannot be separated by distillation.

(C): Solvent particles move from hypotonic solution to hypertonic solution, if separated by a semipermeable membrane.

27. **(a)** 45 g

Explanation:

Molality (experimental)

$= \frac{\Delta T_f}{K_f} = \frac{3.82}{1.86}$ = 2.054 mol/1000 g solvent

Molality (theortical) = $\frac{\text{moles of solute}}{\text{wt. of solvent(g)}} \times 1000$

$= \frac{5 \text{ g}/142 \text{ g/mole}}{x} \times 1000$

$$Na_2SO_4 \longrightarrow 2Na^+ + SO_4^{2-}$$
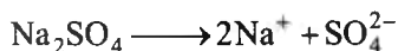
Moles before dissociation   1   0   0

Moles after dissociation $1 - \alpha$ 2α α

Von't Hoff factor (i) = $\frac{\text{Moles after dissociation}}{\text{Moles before dissociation}}$

$= \frac{(1-\alpha) + 2\alpha + \alpha}{1}$

Na_2SO_4 is ionised 81.5% means α = 0.815

$= \frac{(1-0.815) + 2 \times 0.815 + 0.815}{1}$ = 2.63

i = $\frac{\text{Observed molality}}{\text{Calculated molality}}$

$2.63 = \frac{2.054}{\frac{0.0352}{x} \times 1000}$

x = 45.07 g

28.

(b) Manganese dioxide

Explanation:

Manganese dioxide

29. **(a)** 10^{10}

Explanation:

For a cell reaction in equilibrium at 298 K,

$E^o_{cell} = \frac{0.0591}{n} \log K_C$

(K_C = equilibrium constant)

Give, E^o_{cell} ,= 0.591 V

Now, $\log K_C = \frac{E^o_{cell} \times n}{0.0591}$

$= \frac{0.591 \times n}{0.0591}$

$\log K_C = 10$

K_C = antilog 10

$K_C = 1 \times 10^{10}$

30. **(a)** reduce to one-eight of its initial rate

Explanation:

Rate = K $[NO]^2 [O_2]^1$; Concentration of each species are reduced by 1/2 on increasing volume to two times and thus rate becomes 1/8 times of initial rate.

31.

(b) -1
Explanation:
-1

32.

(c) i - reducing, ii - oxidizing, iii - reducing, iv - reducing
Explanation:
i - reducing, ii - oxidizing, iii - reducing, iv - reducing

33. **(a)** The oxidation state of Cl is +3.
Explanation:
The oxidation state of Cl is +3.

34.

(b) Iron
Explanation:
Iron corrodes readily in moist air because iron is more reactive than Ni, Au and Ag.

35. **(a)** A_2

Explanation:

A_2

36. **(a)** square planar
Explanation:

$dsp^2 \rightarrow$ Square planar

37.

(b) +3, 0 and +6
Explanation:
Let the oxidation state of Cr in all cases is x

  i. Oxidation state of Cr in $[Cr(H_2O)_6]Cl_3$

    $x + (0 \times 6) + (-1 \times 3) = 0$

    or x + 0 - 3 = 0 or x = + 3
  ii. Oxidation state of Cr in $[Cr(C_6H_6)_2]$

    $x + (2 \times 0) = 0$ or x = 0
  iii. Oxidation state of Cr in

    $K_2[Cr(CN)_2(O)_2(O_2)(NH_3)]$
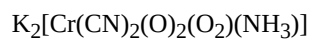
    $1 \times 2 + x + (-1 \times 2) + (-2 \times 2) + (-2) + 0 = 0$

    or 2 + x - 2 - 4 - 2 = 0 or x - 6 = 0

    hence x = + 6

    Thus, +3, 0 and +6 is the answer.

38.

(b)

Explanation:

39.

(d) p-orbital of fluorine and sp^2 hybrid orbital of C-atom of benzene

Explanation:

p-orbital of fluorine and sp^2 hybrid orbital of C-atom of benzene

40.

(c) HCHO + PhCH(CH$_3$) CH$_2$MgX

Explanation:

$CH_3CH_2 - \overset{\overset{OH}{|}}{\underset{\underset{Ph}{|}}{C}} - CH_3$ cannot be prepared by HCHO and PhCH(CH$_3$)CH$_2$MgX. This can be easily illustrated by the

following reaction.

The obtained product is not the required substance. While other options can readily be prepare by the required substance. The reactions are as follow

41.

(d) $(CH_3)_2C=CH_2$

Explanation:

42. **(a)**

Explanation:

m-CPBA react with carbonyl as well alkene to form epoxide.

43.

(d)

Explanation:

Phthalic acid

Phthalimide

44.

(c) 4-methoxybenzenamine

Explanation:

4-methoxybenzenamine

(p-Anisidine)

45.

(d) Methyl isocyanide

Explanation:

$$\underset{\text{(Methyl isocyanide)}}{CH_3 - N \equiv C} + 4[H] \xrightarrow{\text{LiAlH}_4} \underset{\text{Dimethyl amine}}{CH_3NHCH_3}$$
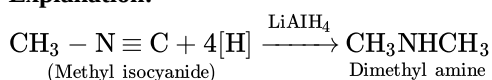
46. (a) C-N bond length in proteins is longer than usual bond length of N-C bond structure

Explanation:

Peptide bond is formed by the reaction of one-COOH group of one amino acid with the -NH$_2$ group of another amino acid.
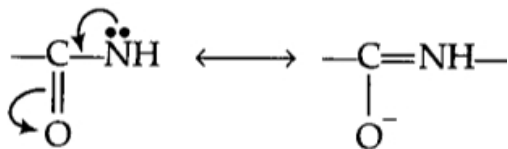
As some double bond character is found between C-N bond, the bond length of C-N in protein should be smaller than the usual C-N bond.

47.

(b) A-T, G-C

Explanation:

A-T, G-C

48. (a) Distillation

Explanation:

The distillation method will be useful for the separation of a mixture of benzene and chloro-benzene.

49.

(d) Acetone and methanol

Explanation:

The apparatus is that of a simple distillation experiment. Simple distillation is used for the separation of a mixture of two or more miscible organic liquids whose boiling points differ by 30 to 50 K. Since the difference in boiling points between acetone and methanol is < 10 K, this mixture cannot be separated using a simple distillation apparatus. The separation can be carried out using a fractional distillation apparatus.

50. (a) 2-phenylethan-1-amine and benzene-1, 4- diamine

Explanation:

Carbylamine test is given by aliphatic as well as aromatic primary amines whereas azo dye test is given by only aromatic primary amines.

51. (a) NH$_2$-NH$_2$

Explanation:

NH$_2$-NH$_2$

BOTANY MODEL PAPER46-

NEET-UG - Biology

BOTANY (Section-A)

1.

   (b) Poales

   Explanation:

   Wheat belongs to Order Poales.

2.

   (d) Carolus Linnaeus

   Explanation:

   Carolus Linnaeus wrote Species Plantarum and provided a basis for the classification of plants.

3.   **(a)** Late blight of potato - Alternaria solani

   Explanation:

   Late blight of potato disease is caused by Phytophthora infestans. It is a phycomycetes fungus. Alternaria solani is the causal organism of early blight of potato disease.

4.

   (c) Extrachromosomal hereditary material of bacteria associated with nucleoid.

   Explanation:

   Episome is a genetic element inside some bacterial cells, especially the DNA of some bacteriophages, that can replicate independently of the host and also in association with a chromosome with which it becomes integrated.

5.

   (d) Egg and synergids

   Explanation:

   Egg and synergids

6.

   (d) (i), (ii) and (v)

   Explanation:

   (i), (ii) and (v) statements are true.

   - Pteridophytes are the first terrestrial plants to possess vascular tissues – xylem and phloem.
   - The pteridophytes are found in cool, damp, shady places though some may flourish well in sandy-soil conditions.
   - In bryophytes, the dominant phase in the life cycle is the gametophytic plant body. However, in pteridophytes, the main plant body is a sporophyte that is differentiated into true root, stem, and leaves. These organs possess well-differentiated vascular tissues.
   - The sporophytes bear sporangia that are subtended by leaf-like appendages called sporophylls. In some cases, sporophylls may form distinct compact structures called strobili or cones (Selaginella, Equisetum).
   - The sporangia produce spores by meiosis in spore mother cells.
   - The spores germinate to give rise to inconspicuous, small but multicellular free-living, mostly photosynthetic thalloid gametophytes called prothallus.

7.   **(a)** Spirulina

   Explanation:

   Chlorella a unicellular alga rich in proteins is used as food supplement even by space travelers.

8.

   (d) Pollen grain

Explanation:

Pollen grain is a male gametophyte whereas all the other three structures are the parts of ovule.

9.

(b) Parthenocarpy

Explanation:

Parthenocarpy

10. **(a)** water, mineral salts, some organic nitrogen and hormones.

Explanation:

Xylemis associated with translocation of main water, mineral salts, some organic nitrogen, and hormones.

11. **(a)** Thalamus

Explanation:

The thalamus or the receptacle is the condensed structure on the pedicle from which the floral organs arise. The thalamus typically has the nodes and internodes but the internodes are highly condensed or reduced.

12.

(b) Protoxylem

Explanation:

Protoxylem

13.

(b) 1 : 2 : 1

Explanation:

1 : 2 : 1

14.

(b) Sutton and Boveri

Explanation:

Sutton and Boveri

15.

(b) Anticodon

Explanation:

Anticodon

16.

(d) The repressor of the operon is synthesised during specific periods from gene r.

Explanation:

The repressor of the operon is synthesised (all the-time constitutively) from the gene i. The repressor protein binds to the operator region of the operon and prevents RNA polymerase from transcribing the operon.

17. **(a)** More than one is correct

Explanation:

More than one is correct

Aconeme like structure is found in both cilia and flagellum. The length of axoneme is 5-20um in case of cilium and 100-200um in the case of the flagellum.

18.

(c) A - (iii), B - (iv), C - (i), D - (ii)

Explanation:

A - (iii), B - (iv), C - (i), D - (ii)

- Thylakoid-flattened membranous sac in stroma

- Cristae- Infolding of mitochondria
- Cisternae-disc-shaped sacs in the golgi apparatus
- Chromatin-condensed structure of DNA

19.

(c) Hashish causes after thought perceptions and hallucinations

Explanation:

Barbiturates are sedative and hypnotic drugs

Opium is also a narcotic drug, which has a depressing effect on CNS.

Morphine is both sedative aswellasanalgesic drug.

20.

(d) Trichinella spiralis

Explanation:

Trichinella spiralis

21.

(c) G_2 and M

Explanation:

During the G_2 phase, proteins are synthesised in preparation for mitosis while cell growth continues. During G_2 and M phases, cell cycle amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C at S phase.

22.

(b) No population can grow exponentially for long

Explanation:

No population can grow exponentially long because

i. limited resources

ii. carrying capacity

iii. inter species competition

iv. natural resistance

23. **(a)** (A)-biomass; (B)-marine

Explanation:

An inverted pyramid of biomass may occasionally be observed in marine communities.

24.

(d) Presence of large amounts of nutrients in water suppresses growth of planktons

Explanation:

Presence of large amounts of nutrients in water suppresses growth of planktons

25. **(a)** Bharatpur

Explanation:

Bharatpur

26.

(b) Assam

Explanation:

The Indian rhinoceros is an endemic of north-east region of India. Kaziranga national park (Assam) is famous for rhinoceros.

27.

(d) Pigeon

Explanation:

Pigeon is not an example of recent extinction because extinction is a natural phenomenon in which a species goes extinct if it is not able to adapt to changes in it's environment or compete effectively with other organisms. Examples of recent extinctions include dodo (Mauritius), quagga (Africa), Steller's sea cow (Russia), thylacine (Australia) and three sub species of tiger (Bali, Java, Caspian).

28. **(a)** 25
     Explanation:
     The microspore mother cell produces four pollen or microspores by one meiosis which cannot divide further. Hence, for producing 100 microspores/pollen, 100/4 = 25 meiotic divisions are required.

29.
     (d) (i), (iv), (iii), (ii)
     Explanation:
     Cells do not show golgi complexes, endoplasmic reticulum, nucleolus and the nuclear envelope. Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres to both poles.Chromatids move to opposite poles. Nucleolus, golgi complex and ER reform.

30.
     (b) Ferricyanide acted as electron acceptor and allows Hill reaction.
     Explanation:
     The hydrogen acceptors or Hill oxidants (e.g., ferricyanides, chromates, benzoquinones, dichlorophenol, indophenol, etc.) got reduced Gust as NADP is when the chloroplast is in vivo) while water (H_2O) is oxidised into oxygen and protons during the reaction and oxygen is evolved. The reaction involving the production of oxygen by the illuminated chloroplasts is called Hill reaction.

31.
     (c) Cytochrome
     Explanation:
     Cytochrome

32.
     (d) PS-II
     Explanation:
     The red drop effect is a sharp decrease in quantum yield (number of oxygen molecules released per quantum of light absorbed this number is usually 1/8 or 12%) at wavelengths greater than 680 nm in green plants. It is called the 'red drop' because it occurs in the red part of the spectrum.

33.
     (b) paper chromatography.
     Explanation:
     Paper chromatography is the technique used to separate photosynthetic pigments.

34.
     (b) NADP
     Explanation:
     NADP

35.
     (c) Arithmetic growth
     Explanation:
     Arithmetic growth

36. **(a)** Taxa
Explanation:
Taxa is a group of one or more populations of an organism or organisms seen by taxonomists to form a unit. Hence, all these are examples of taxa.

37.
(b) All of these
Explanation:
Bacteria occurs everywhere except flame. Archaebacteria occurs in most harsh conditions such as extreme salty areas, hot springs, marshy areas etc.

38.
(b) A few orders which could not be placed satisfactorily in the classification
Explanation:
In Genera Plantarum, the seed plants were classified as Gymnosperms, Dicotyledons ans Monocotyledons. But there were certain plants which were not classified in either of class and called as disputed orders. These disputed orders were then mentioned in Ordines Anomali.

39.
(d) Both (The pollen grain germinates on the stigma) and (Two male gametes are discharged into the embryosac)

Explanation:
Pollen germination and release of male gametes occur before fertilisation.

40. **(a)** Right angle to long axis of cell
Explanation:
In anticlinal division, the plane of division is perpendicular to the surface of organ or Right angle to the long axis of cell. This is in contrast to periclinal cell division that are parallel to the outer surface.

41.
(c) It is dominant disease
Explanation:
It is dominant disease

42. **(a)** DNA
Explanation:
DNA

43. **(a)** Golgi apparatus
Explanation:
Golgi apparatus is an organelle present in most eukaryotic cells. It is made up of membrane-bound sacs, and is also called a Golgi body, Golgi complex, or dictyosome. The job of the Golgi apparatus is to process and bundle macromolecules like proteins and lipids as they are synthesised within the cell.

44.
(c) effects on non-target pathogens.
Explanation:
Baculoviruses (Nucleopolyhedrovirus) do not show effects on non-target pathogens.

45. **(a)** Anaerobic
Explanation:
Anaerobic

46.

(c) Zeamays

Explanation:

Bioethanol can be obtained from very common crops like Zea mays, Solanum tuberosum, Saccharum officinarum, etc. Zea mays is a rich source of cellulose. This cellulosic material is utilized for the production of ethanol by the process of microbial fermentation.

47.

(c) Lentic biota

Explanation:

Lentic biota

48.

(d) Removal of all yellow leaves and spraying the remaining green leaves with 2, 4, 5 - trichlorophenoxy acetic acid.

Explanation:

Removal of all yellow leaves and spraying the remaining of the leaves with 2, 4, 5 trichlorophenoxyacetic acid could be most beneficial to obtain maximum seed yield from the premature yellowing of leaves of a pulse crops with decreased yield.

49.   **(a)** Division $\rightarrow$ elongation $\rightarrow$ differentiation

Explanation:

Division $\rightarrow$ elongation $\rightarrow$ differentiation

50.

(d) Phaeophyceae

Explanation:

Phaeophyceae

1.

(b) Coelocantha

Explanation:

Coelocantha

2. **(a)** (iii) and (iv)

Explanation:

Coelenterates, ctenophores, and echinoderms have radial symmetry. Animals belonging to phylum Annelida and Arthropoda have bilateral symmetry. Hence, (iii) and (iv) are wrong statements for the symmetry of animals.

3.

(c) Three

Explanation:

  i. An undifferentiated layer, mesoglea, is present in between the ectoderm and the endoderm in diploblastic animals.

  ii. Annelids, molluscs, arthropods, echinoderms, hemichordates, and chordates possess coelom and are called coelomates.

  iii. Aschelminthes are called pseudocoelomates.

  iv. The animals in which the body cavity is absent are called acoelomates.

  v. Platyhelminthes to chordates are called triploblastic animals.

Hence, three statements are correct for the basis of the classification of animals.

4.

(b) Upper and lower lips respectively

Explanation:

The mouthparts of a cockroach consist of a labrum (upper lip), a pair of mandibles, a pair of maxillae, and a labium (lower lip).

5.

(c) Nucleated RBCs

Explanation:

The blood cells in frog are RBC (red blood cells) or erythrocytes, WBC (white blood cells) or leucocytes and platelets. RBC's are nucleated and contain red coloured pigment namely haemoglobin.

6.

(c) (A)-(v), (B)-(ii), (C)-(iii), (D)-(ii), (E)-(iii)

Explanation:

(A)-(v), (B)-(ii), (C)-(iii), (D)-(ii), (E)-(iii)

7.

(b) Oxygen dissociation curve

Explanation:

Oxygen dissociation curve

8. **(a)**

(i)	(ii)	(iii)	(iv)	(v)
(D)	(E)	(E)	(A)	(B)

Explanation:

(i)	(ii)	(iii)	(iv)	(v)
(D)	(E)	(E)	(A)	(B)

9. **(a)** ribs

Explanation:

Intercostal muscles are found in ribs.These muscles are of two types-external intercostal muscle for normal inspiration and expiration and internal intercostal muscle for forceful expiration.

10.

(d) $CO_2 > O_2 > N_2$

Explanation:

$CO_2 > O_2 > N_2$

11.

(b) Alveoli

Explanation:

The mammary glands are paired structures (breasts) that contain glandular tissue and variable amount of fat. The glandular tissue of each breast is divided into 15-20 mammary lobes containing clusters of cells called alveoli. The cells of alveoli secrete milk, which is stored in the cavities (lumens) of alveoli. The alveoli open into mammary tubules.

12.

(c) Ectoderm

Explanation:

Ectoderm

13.

(d) after the entry of sperm.

Explanation:

The entry of the sperm induces the completion of the meiotic division of the secondary oocyte. The second meiotic division is also unequal and results in the formation of a second polar body and a haploid ovum (ootid).

14.

(b) Both (AIDS) and (Hepatitis-B)

Explanation:

Besides unprotected sex, some of the STDs like hepatitis-B and HIV can also be transmitted by sharing of injection needles, surgical instruments, etc., with infected persons, transfusion of blood, or from an infected mother to the foetus too.

15. **(a)** All of these

Explanation:

All of these

16.

(c) I-D, II-C, III-B, IV-A

Explanation:

I-D, II-C, III-B, IV-A

17.

(b) Cro-magnon man

Explanation:

Cro-magnon man

18.

(c) Flame cells

Explanation:

The excretory organs of flatworms (Platyhelminthes) are flame cells and function like a kidney, removing waste materials.

Nephridia remove metabolic wastes from an animal's body. They are present in annelids.

The Malpighian tubule is a tubular excretory organ, numbers of which open into the gut in insects and some other arthropods.

Nematodes have a unique excretory system consisting, in simpler species, of one or two one-celled glands called renette cells.

19.

(c) B

Explanation:

B

20. **(a)** All of the these

Explanation:

All of the these

21.

(b) sarcomere

Explanation:

Sarcomere is a structural unit of a myofibril in striated muscle, consisting of a dark band and the nearer half of each adjacent pale band.

22.

(c) Cochlea

Explanation:

Cochlea

23.

(d) Foramen Magnum

Explanation:

The cranial cavity in which the brain is lodged posteriorly opens by foramen magnum. The brain is connected to the spinal cord at this foramen.

24.

(b) Contraction of urinary bladder

Explanation:

Contraction of urinary bladder

25.

(c) Limbic system: Consists of fibre tracts that interconnect different regions of brain: Controls movement.

Explanation:

In a brain, every part has a specific function. All the involuntary movements in the body are controlled by medulla oblongata.

26. **(a)** of the different concentrations of ions across the cell.

Explanation:

The resting potential occurs because of the different concentrations of ions across the cell.

27.

(d) Increase in blood glucose

Explanation:

Increase in blood glucose

28.

(b) Insulin

Explanation:

Insulin is a peptide hormone, which plays a major role in the regulation of glucose homeostasis. Insulin acts mainly on hepatocytes and adipocytes (cells of adipose tissue), and enhances cellular glucose uptake and utilization. As a result, there is a rapid movement of glucose from blood to hepatocytes and adipocytes resulting in decreased blood glucose levels (hypoglycemia).

29.

(c) In the right upper corner of atrium

Explanation:

The pacemaker of the heart is also called the sino-atrial node (SAN). It is present in the right upper corner of the right atrium. It is responsible for initiating and maintaining the rhythmic contractile activity of the heart.

30.

(d) Action mentioned in Statements 1 and 2 are synchronous.

Explanation:

Atria receives blood from all parts of the body which flows to the ventricles. Action potential generated at the sinoatrial node passes from the atria to the ventricles. Both these events take place at the same time.

Thus, actions mentioned in Statements 1 and 2 are synchronous.'

31.

(c) SA node

Explanation:

The heartbeat is initiated as:

   i. The SA node (called the pacemaker of the heart) sends out an electrical impulse.
  ii. The upper heart chambers (atria) contract.
 iii. The AV node sends an impulse into the ventricles.
  iv. The lower heart chambers (ventricles) contract or pump.
   v. The SA node sends another signal to the atria to contract, which starts the cycle over again.
  vi. This cycle of an electrical signal followed by a contraction is one heartbeat.

32.

(c) Statement (i) is incorrect.

Explanation:

Restriction enzymes belong to a larger class of enzymes called nucleases. These are of two kinds exonucleases and endonucleases.

33.

(b) Electrophoresis

Explanation:

Electrophoresis

34.

(c) Dairy and food industries, metal painting and metallurgy etc.

Explanation:

Scientifically speaking Agar is a jelly-like substance derived from seaweed species of the group Gelidium, Gracilaria, Pterocladia, etc., and it is perhaps microbiology's most important substance. For the longest time, Agar has been used as a solid substrate to culture and isolate bacteria.

Besides that Agar is used in a wide range of foods making it an important commodity in the nutrition and food industry. But that's not all. Additionally, agar can also be used as a laxative, an appetite suppressant, a vegetarian substitute for gelatin, a

thickener for soups, a preservative in fruit preserves, ice cream, and other desserts, a clarifying agent in brewing, and for sizing paper and fabrics.

35.

(b) Transgenic mice

Explanation:

Transgenic mice are developed to tests the safety of polio vaccine before being used on human.

ZOOLOGY (Section-B)

36.   **(a)** (a)-(iv), (b)-(v), (c)-(i), (d)-(ii), (e)-(iii)

Explanation:

(a) Hyla - (iv) Tree frog

(b) Ichthyophis - (v) Limbless amphibia

(c) Chelone - (i) Turtle

(d) Testudo - (ii) Tortoise

(e) Bangarus - (iii) Krait

Hence, the correct matching pairs are: (a)-(iv), (b)-(v), (c)-(i), (d)-(ii), (e)-(iii).

37.

(b) It prevents the backflow of blood from the ventricle into the atria and is located between the atria.

Explanation:

The Atrioventricular (AV) valve in the frog's heart prevents the backflow of blood from the ventricle into the atria and is located between the atria, ensuring unidirectional blood flow.

38.

(c) Whale

Explanation:

Whale is a mammal and in mammals, two separate circulatory pathways are found-systemic circulation and pulmonary circulation. Oxygenated and deoxygenated blood received by the left and right atria respectively passes on to the left and right ventricles. Thus, oxygenated and deoxygenated blood is not mixed. This is referred to as double circulation.

39.

(d) Haemoglobin is necessary for transport of oxygen and carbonic anhydrase for transport of carbon dioxide.

Explanation:

Hemoglobin is an iron-containing protein in red blood cells that is responsible for transporting oxygen to the tissues and removing carbon dioxide from them. Carbonic anhydrase helps in transport of carbon dioxide.

40.

(d) Menopause

Explanation:

Menopause is a phase in woman's life when ovulation and menstruation stop. It occurs between 45 years and 55 years of age.

41.

(b) 15 weeks

Explanation:

15 weeks

42.

(d) Molecular evidences

Explanation:

At the cellular and molecular level, living things are remarkably similar to each other. These fundamental similarities are most easily explained by evolutionary theory: life shares a common ancestor. Such evidences are called molecular evidences.

Palaeontological evidences are the evidences from the study of fossils of ancient animals and plants preserved in rocks. Biogeography is concerned with the origins and evolutionary histories of species on a long time scale, and also with the current interactions of species with their environments and each other on a much shorter time scale.

43.

(b) Planaria

Explanation:

Planaria

44.

(b) Only (vi)

Explanation:

A complex troponin protein of three globular peptides (Troponin T- Binding to tropomyosin as well as to the other two troponin components; Troponin I- inhibiting the F-actin - myosin interaction, also binding to other components of troponin; Troponin C - calcium binding polypeptide) is distributed at regular intervals on the tropomyosin. In the resting stage of muscle fibre, a sub-unit of troponin masks the active sites for myosin on the actin filaments.

45.

(c) Iris muscles

Explanation:

The size of pupil is controlled by two types of muscles of iris, circular muscles and radial muscles. Radial muscles contract in dim light and circular muscles contract in bright light.

46.

(c) Thyroxine

Explanation:

Thyroxine

47.

(c) Gonadotropin

Explanation:

Gonadotropin

48. **(a)** Portal circulation

Explanation:

Portal circulation is a part of venous circulation present between two groups of capillaries. It starts in capillaries and terminates in capillaries. Portal vein drains blood into organs other than the heart along with other small veins and thus constitutes the portal system.

49.

(b) (i) and (ii)

Explanation:

Key tools of recombinant DNA technology are restriction enzymes, polymerase enzymes, ligases, vectors, and the host organism.

50.

(b) Bio-insecticidal plants

Explanation:

Bio-insecticidal plants