Physics

1. A magnet of magnetic moment M and pole strength 'm' is divided in two equal parts, then what will be the magnetic moment of each part?

1	M/4
2	M/2
3	M
4	2M

2. A coil of 40Ω resistance has 100 turns and radius 6 mm is connected to ammeter of resistance of 160 ohm. Coil is placed perpendicular to the magnetic field. 32 μC charge flows through the coil, when it is taken out of the field. Find the intensity of magnetic field.

1	0.566 T
2	0.655 T
3	5.66 T
4	6.55 T

3

Two particles are executing S.H.M. The equation of their motion are

$$y_1 = 10 \sin\left(\omega t + \frac{\pi T}{4}\right), y_2 = 25 \sin\left(\omega t + \frac{\sqrt{3}\,\pi T}{4}\right).$$ Find the ratio of their amplitude.

1. 1:2

2. 1:1

3. 2:5

4. None of these

4

The weight of a body of mass 'm' decreases by 1%, when it is raised to height 'h' above the earth's surface. If the body is taken to a depth 'h' in a mine, then find the change in its weight.

1. 0.5% decrease

2. 0.5% increase

3. 1% increase

4. 2% decrease

5

Which circular rods, each made of the same material and whose ends are maintained at the same temperature will conduct most heat? (Given: radius r and length l)

1	$r = r_0; \; l = 2l_0$
2	$r = r_0; \; l = l_0$
3	$r = 2r_0; \; l = l_0$
4	$r = 2r_0; \; l = 2l_0$

6

If the pressure on 1200 ml of a gas is increased from 70 cm to 120 cm of mercury at constant temperature, then what will be the new volume of the gas?

1	400 ml
2	500 ml
3	600 ml
4	700 ml

7

Four masses 8, 2, 4, 2 kg are placed at the corners A, B, C, D of a square ABCD having diagonal 80 cm. What will be the distance of centre of mass from A?

1	60 cm
2	40 cm

3	30 cm
4	20 cm

8

First experimental value of G is given by:

1	Copernicus
2	Brook Teylor
3	Cavendish
4	None of these

9

Two thermally insulated vessels 1 and 2 are filled with air at temperatures (T_1, T_2), volume (V_1, V_2) and pressure (P_1, P_2). If the valve joining the two vessels is opened, then what will be the temperature inside the vessel at equilibrium?

1	$\dfrac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_1 + P_2 V_2 T_2}$
2	$\dfrac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_2 + P_2 V_2 T_1}$
3	$(T_1 + T_2)/2$
4	$T_1 + T_2$

10

At 300 K, what is the ratio of the speed of sound in nitrogen gas to that in helium gas?

1	$\sqrt{6/5}$
2	$\sqrt{3/5}$
3	$\sqrt{2/7}$
4	$\sqrt{1/7}$

11

A body of mass 2 kg is kept by pressing to a vertical wall by a force of 100 N. The coefficient of friction between wall and body is 0.3. Then find the frictional force.

1	20 N
2	600 N
3	700 N
4	6 N

12

Which of the following has same dimensions as that of pressure gradient?

| 1	Energy gradient
2	Velocity gradient
3	Potential gradient
4	None of these

---

13 Following figure shows arrangement of blocks A and B. The pulley is frictionless. The mass of A is 10 kg. The coefficient of friction of A with the horizontal surface is 0.20. What will be the minimum mass of B to start the motion?
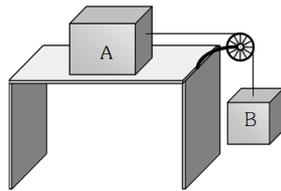
1	10 kg
2	5 kg
3	2 kg
4	0.2 kg

---

14 A source of e.m.f. E = 15 V and having negligible internal resistance is connected to a variable resistance so that the current in the circuit increases with time as i = 1.2 t + 3. Then, find the total charge that will flow in first 5 second.

	1	40 C
	2	30 C
	3	20 C
	4	10 C

15 What will be the pressure exerted by an electromagnetic wave of intensity I (watts/m^2) on a non-reflecting surface? [where, c = velocity of light]

	1	I/c^2
	2	I/c
	3	Ic^2
	4	Ic

16 If a ceiling fan is switched off, its angular velocity reduces to 50% while it makes 36 rotations. Few more rotations taken by it before coming to rest are: (Assume uniform angular retardation)

	1	12
	2	24

3	
	36

4	
	48

17

When the unit of force and length each is increased four times, then determine the increase in unit of energy.

1	
	2 times

| 2	
	4 times

3	
	8 times

4	
	16 times

18

A siphon in use is demonstrated in the following figure. The density of the liquid flowing in siphon is 1.5 gm/cc. What will be the pressure difference between the point P and S?
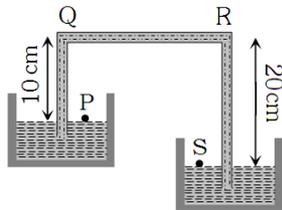
1	
	$2 × 10^5$ N/m

2	
	10^5 N/m

3	Infinity
4	Zero

19

A particle travels 10 m in first 5 seconds and 10 m in next 3 seconds. Assuming constant acceleration what is the distance travelled in next 2 seconds?

1	8.3 m
2	9.3 m
3	11.3 m
4	None of above

20

Longitudinal stress of 1 kg/mm^2 is applied on a wire. Find the percentage increase in length. (Y = 10^{11} N/m^2)

1	0.01
2	0.003
3	0.002
4	0.001

21

A drop of mercury of radius 2 mm is split into 8 identical droplets. Find the increase in surface energy. (Surface tension of mercury = $0.465 \, J/m^2$)

1	26.8 µJ
2	23.4 µJ
3	18.5 µJ
4	16.8 µJ

22

If 2-bodies of equal masses revolve in circular orbits of radii R_1 and R_2 with the same period, then find the ratio of their centripetal forces.

1	$\dfrac{R_1}{R_2}$
2	$\left(\dfrac{R_1}{R_2}\right)^2$
3	$\left(\dfrac{R_2}{R_1}\right)^2$
4	$\sqrt{R_1 R_2}$

23

Let P, Q, R and S be 4 point masse with respective masses 1 kg, 1 kg, 2 kg and 2 kg form the corners of a square of side 'a'. Centre of mass of the system will be at maximum distance from which of the following point(s)?

1	P only
2	R only
3	P and Q
4	R and S

24

A uniform metal chain is placed on a rough table such that one end of chain hangs down over the edge of the table. When one-third of its length hangs over the edge, the chain starts sliding. Then find the the coefficient of static friction.

1	$\dfrac{1}{4}$
2	$\dfrac{1}{2}$
3	$\dfrac{2}{3}$
4	$\dfrac{3}{4}$

25

Initial velocity of a particle is u (at $t = 0$) and the acceleration f is given by at. Then determine the valid relation.

1	$v = u$
2	$v = u + at$

3	$v = u + at^2$
4	$v = u + a\dfrac{t^2}{2}$

26

A cord is used to lower vertically a block of mass M by a distance 'd' with constant downward acceleration $\dfrac{g}{4}$. Determine the work done by the cord on the block.

1	$-3Mg\dfrac{d}{4}$
2	$Mg\dfrac{d}{4}$
3	$3Mg\dfrac{d}{4}$
4	Mgd

27

The maximum density of H_2O is obtained at which temperature?

1	4°F
2	32°F
3	39.2°F
4	42°F

28

The length of second's hand in a watch is 1 cm. Then find the change in velocity of its tip in 15 second.

1     $\dfrac{\pi}{30}$ cm/s

2     $\dfrac{\pi\sqrt{2}}{30}$ cm/s

3     $\dfrac{\pi}{30\sqrt{2}}$ cm/s

4   Zero

29

Two charges placed in air repel each other by a force of 10^{-4} N. The force becomes 2.5×10^{-5} N, when oil is introduced between the charges. What is the dielectric constant of oil?

1   4

2   2.5

3   2

4   1.5

30

If particle is moving with a constant speed along a straight line path, then what a force need not do?

1   Decrease the momentum

2   Increase its speed

3   Keep it moving with uniform velocity

4   Change the direction

31

What is the resultant if a bimetallic strip is heated?

1   It bends in the form of an arc with the more expandable metal outside

2   It bends in the form of an arc with the more expandable metal inside

3   It does not bend at all

4   It gets twisted in the form of an helix

32

A plane mirror makes an angle of 30º with horizontal. If a vertical ray strikes the mirror, then determine the angle between mirror and reflected ray.

1   90º

2	60º
3	45º
4	30º

33

A particle moves in the xy-plane under the action of a force F such that the components of its linear momentum 'p' at any time 't' are $P_x = 2\cos t$, $P_y = 2\sin t$. What is the angle between F and p at time t?

1	0°
2	30°
3	90°
4	180°

34

100 coplanar forces each equal to 10 N act on a body. Let each force makes angle $\pi/50$ with the preceding force, then determine the resultant of the forces.

1	Zero
2	250 N
3	500 N

4	1000 N

35	What does ice formed over lakes possess?

1	It acts as good radiator

2	An ability to permit quick convection and retards further formation of ice

3	Very low conductivity and retards further formation of ice

4	Very high thermal conductivity and helps in further ice formation

---

36	In an ac circuit, the instantaneous values of e.m.f. and current are e = 200 sin 314 t volt and $i = \sin\left(314\,t + \dfrac{\pi}{3}\right)$ ampere. Find the average power consumed (in watt).

1	25

2	50

3	100

4	200

37

The volume of an air bubble becomes three times as it rises from the bottom of a lake to its surface. Suppose atmospheric pressure to be 75 cm of Hg and the density of water to be 1/10 of the density of mercury, then what is the depth of the lake?

1	20 m
2	15 m
3	10 m
4	5 m

38

Determine the incorrect statement regarding the first law of thermodynamics.

1	It introduces the concept of the entropy
2	It introduces the concept of the internal energy
3	It is not applicable to any cyclic process
4	None of the above

39

In a thermodynamic process, pressure of a fixed mass of a gas is changed in such a manner that the gas molecules gives out 20 J of heat and 10 J of work is done on the gas. If the initial internal energy of the gas was 40 J, then what will be the final internal energy?

1	60 J
2	40 J
3	30 J
4	20 J

40

A 1×10^{-20} kg particle is vibrating with simple harmonic motion with a period of 1×10^{-5}s and a maximum speed of 1×10^3 m/s. What is the maximum displacement of the particle?

1	10 m
2	1 m
3	1.59 mm
4	None of these

41

An electron is revolving round a proton, forming a magnetic field of 16 weber/m^2 in a circular orbit of radius 1 Ã.... What will be it's angular velocity?

1	$4\pi \times 10^{12}$ rad/s
2	$2\pi \times 10^{12}$ rad/s

3	$1/2\pi \times 10^{12}$ rad/s
4	10^{17} rad/s

42

If the ratio of amplitude of two waves is 4:3, then what is the ratio of maximum and minimum intensity?

1	1:49
2	49:1
3	18:16
4	16:18

43

A person lifts a heavy book from the floor of the room and keep it in the book-shelf having a height 2 m. He takes 5 seconds to do so. The work done by him will depend upon which of the following factors?

1	Mass of the book and time taken
2	Height of the book-shelf and time taken
3	Weight of the book and height of the book-shelf

4 Mass of the book, height of the book-shelf and time taken

44

In the diagram shown below, m_1 and m_2 are the masses of two particles and x_1 and x_2 are the respective distances from the origin O. What is the centre of mass of the system?
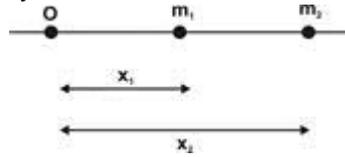
1 $\dfrac{x_1 + x_2}{2}$

2 $\dfrac{m_1x_2 + m_2x_1}{m_1 + m_2}$

3 $\dfrac{m_1x_1 + m_2x_2}{m_1 + m_2}$

4 $\dfrac{m_1m_2 + x_1x_2}{m_1 + m_2}$

45

A train has a speed of 60 km/hr for the first one hour and 40 km/hr for the next half hour. What is its average speed in km/hr?

1 45 km/hr

2 50 km/hr

3 53.33 km/hr

46

The ratio of two specific heats of gas C_p/C_v for argon is 1.6 and for hydrogen is 1.4. Adiabatic elasticity of argon at pressure P is E. Determine the pressure at which adiabatic elasticity of hydrogen will also be equal to E.

1

P

2

1.4 P

3

$\frac{7}{8}P$

4

$\frac{8}{7}P$

47

Oil spreads over the surface of water whereas water does not spread over the surface of the oil. Why?

1

Viscosity of water is high

2

Viscosity of oil is high

3

Surface tension of water is very high

4

Surface tension of water is very low

48

The resultant of two vectors $\vec{P}$ and $\vec{Q}$ is $\vec{R}$. If Q is doubled, the new resultant is perpendicular to P. Then determine R.

1	R=P

2	R=(P+Q)

3	R=(P-Q)

4	R=Q

49

The magnitude of physical quantity _____.

1	does not depend on the method of measurement

2	depends on the method of measurement

3	directly proportional to the fundamental units of mass, length and time

4	is more in SI system than in CGS system

50

A cork is submerged in water by a spring attached to the bottom of a pail. What change is observed in spring length, if the pail is kept in a elevator moving with an acceleration downwards?

1	It decreases
2	It increases
3	It remains unchanged
4	Data insufficient

Chemistry

1 In the given reaction $CH_3 - Br + 2Na + Br - CH_3 \rightarrow$ Product.

The reaction is termed as

1	Levitt reaction
2	Aldol condensation
3	Perkin's reaction
4	Wurtz reaction

2 The number of neutral molecules or negative groups attached to the central metal atom in a complex ion is known as

1	primary valency

2	coordination number
3	atomic number
4	effective atomic number

---

3 When ethyl alcohol (C_2H_5OH) reacts with thionyl chloride, in the presence of pyridine, the product obtained is

1	$CH_3CH_2Cl + HCl + SO_2$
2	$CH_3CH_2Cl + H_2O + SO_2$
3	$C_2H_5Cl + Cl_2 + SO_2$
4	$CH_3CH_2Cl + HCl$

---
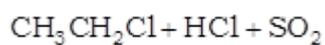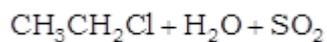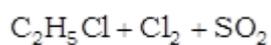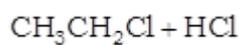
4 _____ is not an allylic halide.

1	3-Bromo-2-methylbut-1-ene
2	4-Bromopent-2-ene
3	1-Bromobut-2-ene

4	4-Bromobut-1-ene

5

In the reaction $CH_3COOH \xrightarrow{PCl_5} (A) \xrightarrow{NH_3} (B) \xrightarrow{NaBrO} (C)$, then what is its final product (C)?

1	Amino methane
2	Ammonium acetate
3	Acetamide
4	Ethanal

6

1.520 g of the hydroxide of a metal on ignition gave 0.995 gm of oxide. What is the equivalent weight of metal?

1	19.00
2	9.00
3	1.520
4	0.995

7

What is the EAN of iron in potassium ferricyanide?

1	18
2	54
3	35
4	23

8

What is an electrically charged atom or group of atoms called?

1	Atoms
2	Ions
3	Cations
4	Anions

9

In a closed vessel, a mixture of two moles of carbon monoxide and one mole of oxygen is ignited to convert the carbon monoxide to carbon dioxide. If ΔH is the enthalpy change and ΔU is the change in internal energy, then

1	$\Delta H < \Delta U$

2	$\Delta H > \Delta U$
3	$\Delta H = \Delta U$
4	The relationship depends on the capacity of the vessel

10 A catalyst increases the rate of the reaction by

1	reacting with products
2	reacting with reactants
3	decreasing the activation energy
4	increasing the activation energy

11 Which is the correct statement about electrovalent compound's?

1	Are insoluble in polar solvent
2	Conduct current in fused state
3	Boiling points are low
4	Belting points are low

12

What are the ultimate products of oxidation of most of hydrogen (H) and carbon (C) in food stuffs?

1 H_2O and CO_2

2 H_2O alone

3 CO_2 alone

4 None of these

13

Normality (N) of a solution=

1 $\dfrac{\text{No. of moles of solute}}{\text{Mass of solvent in kg}}$

2 $\dfrac{\text{No. of moles of solute}}{\text{Volume of solution in litre}}$

3 $\dfrac{\text{No. of gram equivalent of solute}}{\text{Volume of solution in litre}}$

4 None of these

14

Find the number of unpaired electrons in Zn^{++}.

1	0
2	2
3	3
4	4

---

15 A hydrocarbon has C = 85.72% and remaining H. Identify the hydrocarbon.

1	C_2H_6
2	C_2H_4
3	CH_4
4	C_2H_2

---

16 Elements in which $4f$ orbitals are progressively filled are known as

1	inert gases
2	actinides
3	lanthanides

4

transition elements

17

In a chemical reaction, an oxidant

1

gains electrons

2

loses electrons

3

electron change takes place

4

both loses and gains electron

18

Which one of the following possess the smallest bond angle?

1

CO_2

2

CH_4

3

NH_3

4

H_2O

19

Which of the following is molecular formula of amyl alcohol?

1	$C_5H_{10}O$
2	$C_5H_{12}O$
3	$C_6H_{13}O$
4	$C_7H_{14}O$
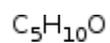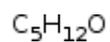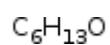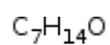
20

What is the compound called, when remaining two valencies of carbonyl group are satisfied by two alkyl groups?

1	Ketone
2	Aldehyde
3	Acid
4	Acid chloride

21

Consider the reaction : $N_2 + 3H_2 \rightarrow 2NH_3$ which is carried out at constant temp. and pressure. Which of the following expression is true if ΔH and ΔU are the enthalpy and internal energy changes for the reaction?

1	$\Delta H > \Delta U$
2	$\Delta H < \Delta U$
3	$\Delta H = \Delta U$

4	$\Delta H = 0$

22

At equilibrium, the rate of forward _____ to the reverse reaction is

1	at equilibrium
2	high
3	equal
4	less

23

____ is non-electrolytes.

1	CH_3COOH
2	$C_{12}H_{22}O_{11}$
3	$CaCl_2$
4	$NaCl$

24

The phosphate of a metal has the formula MPO_4. What will be the formula of its nitrate?

1	$M(NO_3)_3$
2	$M(NO_3)_2$
3	$M_2(NO_3)_2$
4	$M(NO_3)_3$

25

What will be the total number of moles at equilibrium if in the reaction
$$N_2O_4 \rightleftharpoons 2NO_2$$

Given That initial moles of N_2O_4 is 1 and degree of dissociation is α

1	$(1+\alpha)$
2	$(1-\alpha)^2$
3	1
4	3

26

Find the number of atoms in 4.25 g of NH_3.

1	6×10^{23}
2	4×10^{23}

3	2×10^{23}
4	1×10^{23}

27

An organic compound possess % of C and % of H in the ratio 6 : 1 and % of C and % of O in the ratio 3 : 4. Identify the compound.

1	CH_3OH
2	HCHO
3	$(COOH)_2$
4	CH_3CH_2OH

28

If the atomic weight of an element is 23 times that of the lightest element and it has 11 protons, then what it contains?

| 1	11 protons, 11 neutrons, 23 electrons
2	11 protons, 12 neutrons, 11 electrons
3	11 protons, 11 neutrons, 11 electrons
4	11 protons, 23 neutrons, 11 electrons

29

A schematic plot of $\ln K_{eq}$ vs inverse of temperature for a reaction is given below.
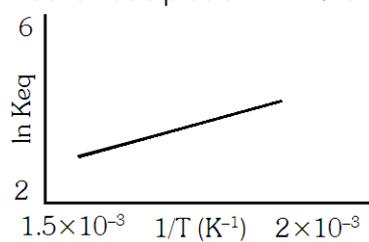
Then the reaction must be

1	endothermic

2	exothermic

3	one with negligible enthalpy change

4	highly spontaneous at ordinary temperature

30

Cigarette or gas lighter is made up of which of the following?

1	Noble metal

2	Misch metal

3	Alkali metal

4	None

31

On which of the following, ionization depends?

1	Dilution
2	Pressure
3	Volume
4	None of these

32

Write the IUPAC name of the following compound.
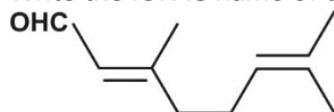
1	3-methylnona-2, 6-dien-1-al
2	2-methylnona-2, 6-dien-1-al
3	4, 6-dimethylhepta-3, 5-dien-1-al
4	3, 7-dimethylocta-2,6-dien-1-al

33

Which one of the following statements is incorrect in relation to enzyme?

1	They always increase activation energy

2	pH affects their functioning
3	Temp. affects their functioning
4	Their reactions are specific

34 Which of the following is primary alcohol?

1	Butan-1-ol
2	Butane-1-ol
3	Propane-2-ol
4	Isopropyl alcohol

35 What will be the number of faradays needed to reduce 4 g equivalents of Cu^{2+} to Cu metal?

1	1
2	2
3	4

36   Identify the typical element.

1	Na

2	K

3	Sc

4	He

37   General formula $(RCO)_2O$ represents

1	an acid anhydride

2	an ether

3	a ketone

4	an ester

38   Marsh gas detector used by the miners works on which of the following principle?

1	Berzelius hypothesis
2	Gay-Lussac's law of gaseous volumes
3	Avogadro's hypothesis
4	difference in the rates of diffusion of gases

39

The combustion of 5.0 of coke raised the temperature of 1 kg of water from $10^{\circ}C$ to $47^{\circ}C$. Estimate the fuel value of coke in kcal/g.

1	7.4 kcal/g
2	8.4 kcal/g
3	6.4 kcal/g
4	9.4 kcal/g

40

If 2 moles of A, 3.0 moles of B and 2.0 moles of C are placed in a 2.0 l flask and the equilibrium concentration of C is 0.5 mole/l in the reaction $A + 2B \rightleftharpoons 2C$. What is the equilibrium constant (K_c) for the reaction?

1	0.026

2	0.05
3	0.074
4	0.147

41

Identify the first element of rare-earth metals.

1	Actinium
2	Cerium
3	Uranium
4	Lanthanum

42

Conversion of PbO_2 to $Pb(NO_3)_2$ is which of the following process?

1	reduction
2	oxidation
3	neither oxidation nor reduction
4	

both oxidation and reduction

43

In which of the following equilibrium, change in volume of the system does not alter the number of moles?

1	$SO_2Cl_{2(g)} \rightleftharpoons SO_{2(g)} + Cl_{2(g)}$
2	$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
3	$PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$
4	$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$
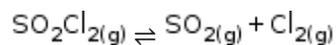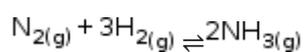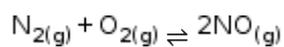
44

The halides that has maximum melting point is:

1	NaF
2	NaI
3	NaBr
4	NaCl

45

The equivalent weight of $MnSO_4$ is half its molecular weight, when it is converted to ___.

1	MnO_4^{2-}
2	MnO_4
3	MnO_2
4	Mn_2O_3

46
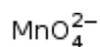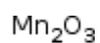
Polyethylene is a/an

1	homo polymer
2	random copolymer
3	alternate copolymer
4	crosslinked copolymer

47

The following equilibrium exists in aqueous solution, $CH_3COOH \rightleftharpoons CH_3COO^- + H^+$. What will happen if dilute HCl is added, without change in temperature?

1	The equilibrium constant will increase
2	Concentration of CH_3COO^- will increase
3	Concentration of CH_3COO^- will decrease

4	The equilibrium constant will decrease

48 Which among the following proteins transports oxygen in the blood stream?

1	Albumin
2	Myoglobin
3	Insulin
4	Haemoglobin

49 Which of the following expression is used when a solute is present in trace quantities?

1	Parts per million
2	Microgram percent
3	Milligram percent
4	Gram per million

50

The acid having the highest pK$_a$ value among the following is

1	FCH$_2$COOH
2	ClCH$_2$COOH
3	CH$_3$COOH
4	HCOOH

Botany

1

Transfer of energy from one trophic level to other trophic level is as per the second law of thermodynamics. What is the efficiency of energy transfer from herbivorous to carnivorous?

1	5%
2	10%
3	25%
4	50%

2

Stilt roots which grow obliquely from basal nodes of culm stem and acting as brace are present in

1	Maize

2	Sorghum
3	Sugarcane
4	All of these

3 Slipper animalcule is _____.

1	Protozoa
2	Entamoeba
3	Trypanosoma
4	Paramecium

4 The seed coat in both gymnosperms and angiosperms is derived from which of the following part?

1	Microsporangium
2	Megaspore
3	Megasporangium

4	Microspore

---

5 Which is an advantage of cleistogamy?

1	No dependence on pollinators
2	Vivipary
3	More vigorous offspring
4	Higher genetic variability

---

6 What is a Sharbati Sonora?

1	Dwarf wheat variety
2	High yielding wheat
3	High percentage of protein containing wheat
4	All of the above

---

7 In single Krebs' cycle, decarboxylation takes place at how many steps?

1	Four
2	Five
3	Three
4	Two

8 Make suitable pair

(A)	Emerson effect	(a)	C_4 cycle
(B)	Hill reaction	(b)	Photolysis
(C)	Calvin's cycle	(c)	C_3 cycle
(D)	Hatch and Slack Cycle	(d)	Photosystem – I and II

1	Aa, Bb, Cc, Dd
2	Aa, Bc, Cd, Da
3	Ac, Bd, Ca, Db
4	Ad, Bb, Cc, Da

9 What is incorrect for mycoplasma?

1	Show absence of cell wall

2	Show osmotic response
3	Are sensitive to modern antibiotics
4	Are obligate intracellular parasites

10 _____ part of the pollen causes pollen allergy.

1	Intine
2	Exine
3	Pollen cytoplasm
4	Both (a) and (b)

11 You are given a tissue with its potential for differentiation in an artificial culture. Identify the pairs of hormones would you add to the medium to secure shoots as well as roots.

1	IAA and gibberellin
2	Auxin and cytokinin
3	Gibberellin and abscisic acid

| 4 | Auxin and abscisic acid |

| 12 | Each couple should produce only two children which will help in which of the following process? |

1	Improving food web
2	Stabilizing the ecosystem
3	Fertility of soil
4	Checking pollution

| 13 | How many principles of inheritance was enunciated by Mendel? |

1	5
2	4
3	3
4	2

14

According to IUCN Red list, during the last two decades, in which of the threatened species there is the maximum increases in the number?

1	Amphibians
2	Mammals
3	Birds
4	Reptiles

15

When AABB and aabb are crossed, in F_2 generation, what will be the ratio of AaBb?

1	8 / 16
2	4 / 16
3	2 / 16
4	1 / 16

16

On earth, the solar energy converted to biomass amounts to:

1	2%

2	0.2%
3	0.02%
4	20%

---

17 In the life cycle of _____, group flagellated cells are not formed.

1	chlorophyceae
2	rhodophyceae
3	phaeophyceae
4	Both (2) and (3)

---

18 _____ is the chloroplast in Spirogyra.

1	Girdle shaped
2	Star shaped
3	Cup shaped
4	Spiral band shaped

19 Discovery of Emerson effect has clearly shows the existence of

1 Photo respiration

2 Photo phosphorylation

3 Light and dark reactions in photosynthesis

4 Two distinct photochemical reactions or processes

20 _____ causes delay in germination of seeds.

1 Impermeability of seed coat

2 Mechanical resistance of testa

3 Unavailability of water and O_2

4 All the above

21 DNA replication occur in which phase?

1	S phase
2	G$_1$ phase
3	G$_2$ phase
4	Mitotic phase

22 Which of the following is false for Euglena?

1	Presence of cellulose cell wall
2	Presence of chl. - 'a' and 'b'
3	Presence of protoplasmic capsule
4	Presence of proteinaceous pellicle

23 FAD is electron acceptor in the citric acid cycle during the oxidation of

1	malic acid to oxaloacetic acid
2	succinic acid to malic acid
3	alpha- ketoglutaric acid to succinic acid

4	citric acid to alpha -ketoglutaric acid

---

24 Conversion of pyruvic acid into ethyl alcohol is facilitated by which of the following enzymes

1	Dehydrogenase
2	Carboxylase
3	Decarboxylase and dehydrogenase
4	Phosphatase

---

25 Who discovered the cyclic adenosine monophosphate?

1	Weismann
2	E.W. Sutherland
3	Beerman
4	Bekhor et al

26

Intracellular compartments are not found in cells of _____

1. prokaryotes

2. lower plants

3. higher plants

4. eukaryotes

27

_____is an example of algae

1. Marsilea

2. Equisetum

3. Selaginella

4. Spirogyra

28

In the process of glycolysis, fructose 1, 6-bisphospate is split into

1. dihydroxyacetone phosphate and 1-phosphoglyceraldehyde

2. dihydroxyacetone phosphate and 2-phosphoglyceraldehyde

3	dihydroxyacetone phosphate and 2-phosphoglycerate
4	dihydroxyacetone phosphate and 3-phosphoglyceraldehyde

---

29   _____ is not a cell organelle.

1	Microsome
2	Golgi complex
3	Ribosome
4	Mitochondria

---

30   Following figures represents the process of binary fission in Amoeba.

(i)

(ii)

(iii)

(iv)

(v)
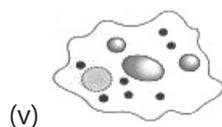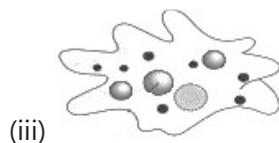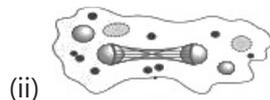
Choose the correct sequence from the following.

1	(iii) → (iv) → (i) → (ii) → (v)
2	(iv) → (iii) → (i) → (ii) → (v)
3	(iv) → (iii) → (ii) → (v) → (i)
4	(iii) → (v) → (iii) → (iv) → (i)

31 At G$_1$ stage, which phenomenon occur?

1	RNA synthesis
2	DNA synthesis
3	Reverse transcription
4	All of the above

32 Which is the phenomenon that operates in the formation of root or shoot in a callus culture?

1	Differentiation
2	Re-differentiation

3	Re- juvenation
4	De-differentiation

33 Haploids can be derived form _____.

1	embryo
2	root apex
3	shoot apex
4	pollen grains

34 Choose from the following animals which shows menstrual cycles.

1	Monkeys and humans
2	Orangutans ans monkeys
3	Gorillas and chimpanzees
4	All of these

35

In a longitudinal section of a root, starting from the tip upward, the four zones takes place in the following order

1   Cell division, cell maturation, cell enlargement, root cap

2   Cell division, cell enlargement, cell maturation, root cap

3   Root cap, cell division, cell enlargement, cell maturation

4   Root cap, cell division, cell maturation, cell enlargement

36

How many type of cells create a simple permanent tissue?

1   Three

2   Two

3   One

4   More

37

What happens during mitosis?

1   Nuclear and cytoplasmic division

2	Many divisions of a nucleus
3	Cleavage of cytoplasm
4	Formation of a paternal nucleus

---

38 Identify incorrect statement about G_0 phase.

1	Mitosis occurs after G_0 phase.
2	Biocatalysts can be used to exit G_0 phase.
3	Cell metabolism occurs continuously in G_0 phase.
4	Cell volume keeps on increasing during this phase.

---

39 Which one of the following elements has its end walls perforated?

1	Tracheid
2	Vessel
3	Scleried

4	Fiber

---

40 The possibility of being outermost layer of cell is highest for which one of the following?

1	Primary wall

2	Middle lamella

3	Cell membrane

4	Plasmalemma

---

41 Porous wood consist of:

1	Fibres

2	Vessels

3	Solid secretions

4	Trachieds

42 Which characters of Nostoc resembles other prokaryotes?

1 Multiplication by fission

2 Absence of definite nucleus

3 Ability to fix nitrogen

4 All the above

43 In formation of clone of bacteria, which one of the following processes results?

1 Transduction

2 Transformation

3 Conjugation

4 Binary Fission

44 Supercoiled DNA can be traced in _____.

1 eukaryotes only

2 prokaryotes only

3	prokaryotes and eukaryotes

4	none of these

45

Coconut milk stimulates cell division as it is a rich source of _____ phytohormone.

1	Auxin

2	Cytokinin

3	Ethylene

4	Gibberellin

46

In angiosperms, lateral roots arise from _____.

1	cortex

2	endodermis

3	pericycle

4	epiblemma

47

In an ecosystem, at a particular time, standing crop includes which of the following factor?

1	Total detritus
2	Total living material
3	Both (a) and (b)
4	Total nutrients present in the crop

48

Starch sheath is also known as

1	epidermis
2	hypodermis
3	casparian strip
4	none of these

49

In photophosphorylation, under the circumstances when NADP is no longer available as acceptor the electrons are passed to _____ species.

1	cytochrome b_6
2	plastocyanin
3	cytochrome -f
4	both (a) and (c)

---

50 During seed germination its stored food is mobilised by which of the following plant hormone?

1	ABA
2	Gibberellin
3	Cytokinin
4	Ethylene

Zoology

1 _____ is the least likely to be involved in stabilising the three -dimensional folding of most proteins.

1	Electrostatic interaction

2	Hydrogen bonds
3	Hydrophobic interaction
4	Ester bonds

---

2   Find an odd one from the following.

1	Ptyalin
2	Thyroxin
3	Estradiol
4	Adrenocorticosteroid

---

3   _____ present in the inner lining of the kidney.

1	Amoebocyte
2	Podocyte
3	Choanocyte
4	Nephrocyte

4 Which of the following structure is sound receptor in cockroach?

1	Anal cerci
2	Tarsus
3	Compound eye
4	Walking leg

5 A biologist studied the population of rats in a barn. He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. What is the net increase in population?

1	05
2	15
3	10
4	0

6 Mark the alkaloid among the following.

1	Morphine
2	Curcumin
3	Ricin
4	Cellulose

---

7 _____ hormone also produces anti- inflammatory reactions in man and suppresses the immune response in addition to its primary functions.

1	Erythropoietin
2	Cortisol
3	Thyrocalcitonin
4	Thymosin

---

8 Which of the following were the first chemicals formed on the earth?

1	Methane, ammonia and water
2	Polysaccharides, proteins and fats

3	Nucleotides, proteins and fats
4	Monosaccharides, amino acids and fatty acids

9 Fish proteins are considered nutritionally superior to most vegetable proteins as

1	They are rich in all the 20 amino acids
2	They are rich in essential amino acids
3	They are rich in polypeptides
4	They are rich in peptide bonds

10 _____ produces heparin.

1	Blood cells
2	Kidney cells
3	Bone marrow
4	Liver cell

11

Ovulation in mammals relates to _____.

1   degeneration of unfertilized ovum

2   release of ovum from ovary

3   fertilization of mature ovum

4   formation of primary oocyte in ovary

12

Find the wrong statements in relation to transgenic Bt cotton plant.

1   Crop yield loss due to attack by Bacillus thuringiensis bacterium is reduced.

2   Crop yield loss due to attack by lepidopteran insect pests is reduced.

3   Better quality cotton is produced.

4   The use of chemical insecticides in the cotton field is minimised.

13

Oral contraceptive pill is consist of

1   estrogen and progesterone

2	estrogen and growth hormone
3	progesterone and testosterone
4	estrogen and testosterone

14 Ventilation is regulated by

1	Cerebrum
2	Cerebellum
3	Medulla oblongata
4	Mesencephalon

15 The hormones not involved in sugar metabolism is

1	insulin
2	cortisone
3	glucagon
4	aldosterone

16

The first living organism acquired energy by _____.

1   photophosphorylation

2   fermentation

3   oxidative phosphorylation

4   pentose phosphate pathway

17

With the help of _____ eye infection is prevented.

1   lysosome

2   lysozyme

3   liposomes

4   lysigenous activity

18

Which cell prevents attack of ones own tissues by the immune system?

1	Killer cells
2	Memory cells
3	Suppressor cells
4	Helper cells

19 _____ is added to the blood during haemodialysis to prevent blood clotting.

1	Thrombin
2	Haemocyanin
3	Heparin
4	Haemoglobin

20 Which of the following chemical characteristics is not common to all living beings?

1	Ribosomes are the sites of protein synthesis
2	Type of protein present in the body
3	Energy is stored by high phosphate bonds

4	Similar triplet code for amino acids

21 The nitrogenous excretory products are formed from the catabolism of amino acids by which one of the following cycle?

1	Nitrogen cycle
2	Calvin cycle
3	Ornithine cycle
4	Krebs' cycle

22 Where the stimulation of a muscle fibre by a motor neuron occurs?

1	The neuro-muscular junction
2	The transverse tubules
3	The sacroplasmic reticulum
4	The myofibril

23

_____ parts of heart first receives deoxygenated blood.

1. Left auricle

2. Left ventricle

3. Right auricle

4. Right ventricle

24

To record _____ sphygmomanometer instrument is used.

1. systolic pressure

2. diastolic pressure

3. both systolic and diastolic pressure

4. none of the above

25

Haversian canals are present in ____.

1. brain

2. spinal cord

3	sponge
4	long bones

---

26 E.coli has _____ DNA.

1	double stranded and circular
2	double stranded and linear
3	single stranded and circular
4	single stranded and linear

---

27 Which of the following is the correct statement?

1	Duck-billed platypus is connecting link between mammals and reptiles
2	Archaeopteryx is connecting link between aves and mammals
3	Hydra is connecting link between protozoa and metazoa
4	Sea horse is connecting link between horse and fish

28 Tracheal cartilaginous rings in mammals are ___.

1 complete rings

2 incomplete laterally

3 incomplete rings

4 incomplete dorsally

29 A relationship in which a sea anemone attached to shall of the hermit crab is termed as ___.

1 commonsalism

2 amensalism

3 protocooperation

4 mutualism

30 Sticky ends of a fragmented DNA molecule are prepared from

1 unpaired bases

2	calcium salts
3	endonuclease
4	methyl groups

---

31 Pigment iodopsin is contained in____ cell.

1	rod cells
2	cone cells
3	horizontal cells
4	amacrine cells

---

32 The figure given below particularly shows:
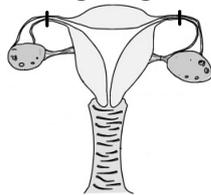
1	Tubectomy
2	Ovarian cancer

3	Vasectomy
4	Uterine cancer

33 Which of the following were the first living organisms on the earth?

1	Photoautotrophs
2	Autotrophs
3	Cynobacteria
4	Chemoheterotrophs

34 Wassermann test is used to detect ____.

1	Typhoid
2	Tuberculosis
3	Syphilis
4	Scarlet fever

35

Which of the following is a function of nervous tissue?

1. Sensibility

2. Irritability

3. Contraction

4. Responsiveness

36

_____ is the most appropriate in normal circumstances.

1. During inspiration, the intrapulmonary pressure is less than the atmospheric pressure.

2. During expiration, the intrapulmonary pressure is less than the atmospheric pressure.

3. During expiration, the intrapulmonary pressure is equal to the atmospheric pressure.

4. During inspiration, the intrapulmonary pressure is more than the atmospheric pressure.

37 Retrogressive metamorphosis found in

1. Cephalochordata

2. Hemichordata

3. Urochordata

4. Vertebrata

38 The cardiac cycle in normal subject is counted in

1. 0.5 second

2. 0.8 second

3. 1.2 seconds

4. 1.0 second

39 In which of the following zone, large woody vines are more commonly found?

1. Mangroves

2. Temperate forests

3	Tropical rainforests
4	Alpine forests

40

Which of the following combination of labeling hormonal control of female reproductive system is correct?
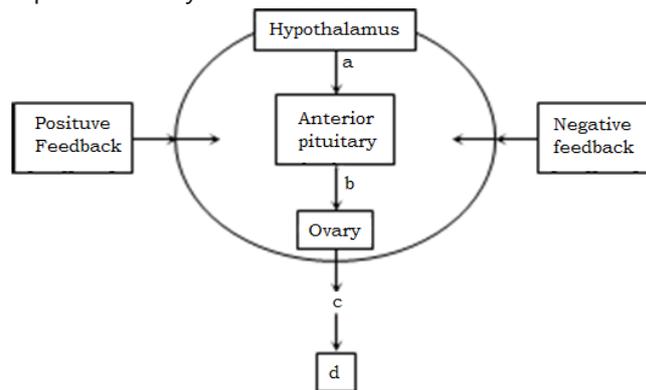
1	(a)-GnRH (b)-TSH (c)-LTH (d)-uterus
2	(a)-GnRH (b)-STH (c)-LH (d)-uterus
3	(a)-GnRH (b)-ACTH (c)-LH (d)-uterus
4	(a)-GnRH (b)-LH/FSH (c)-estrogen or progestrone (d)-uterus

41

In _____ organisms, does the external fertilisation occur.

1	Hemichordata and fern

2	Echinodermata and moss
3	Amphibian and algae
4	Reptile and gymnosperm

42 Effective filtration pressure in glomerulus is caused because of

1	secretion of adrenaline
2	powerful pumping action of the heart
3	afferent arteriole is slightly larger than efferent arteriole
4	vacuum develops in proximal convoluted tubule and sucks the blood

43 The excitatory neurotransmitter involved in the transmission of impulse at the neuro-muscular junction is

1	serotonin
2	epinephrine
3	acetylcholine

4	glycine

44

Which of the following primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals?

1	Methanogens

2	Eubacteria

3	Thermoacidophiles

4	Halophiles

45

_____ is a vector used for cloning genes in plants.

1	Rhizobium

2	Agrobacterium

3	Azotobacter

4	Pseudomonas

46 Find the correct statements about human sperm.

1 Acrosome serves no particular function

2 The sperm lysins in the acrosome dissolve the egg envelope facilitating fertilization

3 Acrosome serves as a sensory structure leading the sperm towards the ovum

4 Acrosome has a conical pointed structure used for piercing and penetrating the egg, resulting in fertilization

47 The body cavity of cockroach is ____.

1 pseudocoel

2 haemocoel

3 coelenteron

4 coelom

48 Low Ca^{++} in the body fluid may be the cause of ____ disease.

1 tetany

2	anaemia
3	gout
4	angina pectoris

49

What is Paddy straw mushroom?

1	Volvariella
2	Pleurotus
3	Agaricus
4	Amanita

50

pH of human blood varies between _____.

1	6.0 to 7.0
2	7.0 to 8.0
3	7.3 to 7.45

4	7.5 to 8.0

Physics - Answer keys

1	2
2	1
3	3
4	1
5	3
6	4
7	3
8	3
9	2
10	2
11	1
12	4
13	3
14	2
15	2
16	1
17	4
18	4
19	1
20	4
21	2
22	1

23	3
24	2
25	4
26	1
27	3
28	2
29	1
30	3
31	1
32	2
33	3
34	1
35	3
36	2
37	2
38	1
39	1
40	3
41	4
42	2
43	3
44	3
45	3
46	4
47	3
48	4

49	1
50	1

Chemistry - Answer keys

1	4
2	2
3	1
4	4
5	1
6	2
7	3
8	2
9	1
10	3
11	2
12	1
13	3
14	1
15	2
16	3
17	1
18	4
19	2
20	1
21	2
22	3
23	2

24	1
25	1
26	1
27	2
28	2
29	2
30	2
31	1
32	4
33	1
34	2
35	3
36	1
37	1
38	4
39	1
40	2
41	2
42	1
43	4
44	1
45	3
46	1
47	3
48	4
49	1

50	3

1	2
2	4
3	4
4	3
5	1
6	4
7	4
8	4
9	4
10	3
11	2
12	2
13	3
14	1
15	2
16	2
17	2
18	4
19	4
20	4
21	1
22	1
23	2
24	3

25	2
26	1
27	4
28	4
29	1
30	4
31	1
32	1
33	4
34	4
35	3
36	3
37	1
38	1
39	2
40	2
41	2
42	4
43	4
44	3
45	2
46	3
47	2
48	4
49	4
50	2

Zoology - Answer keys

#	Answer
1	4
2	1
3	2
4	1
5	4
6	1
7	2
8	1
9	2
10	4
11	2
12	1
13	1
14	3
15	4
16	2
17	2
18	3
19	3
20	2
21	3
22	1
23	3
24	3
25	4

Physics - Solutions

1

If cut along the axis of magnet of length l, then new pole strength $m' = \dfrac{m}{2}$ and new length $l' = l$.

∴New magnetic moment, $M' = \dfrac{m}{2} \times l = \dfrac{ml}{2} = \dfrac{M}{2}$.

And if cut perpendicular to the axis of magnet, then new pole strength $m' = m$ and new length, $l' = l/2$

∴New magnetic moment, $M' = m \times \dfrac{l}{2} = \dfrac{ml}{2} = \dfrac{M}{2}$.

2

We have, $q = -\dfrac{N}{R}(B_2 - B_1)A \cos\theta$

$\Rightarrow 32 \times 10^{-6} = -\dfrac{100}{(160+40)}(0-B) \times \pi \times (6 \times 10^{-3})^2 \times \cos 0°$

$\Rightarrow B = 0.565$ T

3

From the given equations,

$\dfrac{a_1}{a_2} = \dfrac{10}{25} = \dfrac{2}{5}$

4

Here, for height, $\dfrac{\Delta g}{g} \times 100\% = \dfrac{2h}{R} = 1\%$;

Thus for depth, $\dfrac{\Delta g}{g} \times 100\% = \dfrac{d}{R} = \dfrac{h}{R} = \dfrac{1}{2}\% = 0.5\%$

5

We know, $\dfrac{Q}{t} \propto \dfrac{r^2}{l}$; thus from the given options ($r = 2r_0$; $l = l_0$) has higher value of $\dfrac{r^2}{l}$.

6

We know that, at constant temperature,

PV = constant $\Rightarrow \dfrac{P_1}{P_2} = \dfrac{V_2}{V_1}$

$\Rightarrow \dfrac{70}{120} = \dfrac{V_2}{1200} \Rightarrow V_2 = 700$ ml.

7

From the above information figure can be drawn as follows,
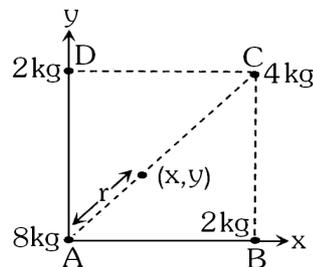
According to figure, let A is the origin and co-ordinates of centre of mass be (x, y) then,

$x = \dfrac{m_1 x_1 + m_2 x_2 + m_3 x_3 + m_4 x_4}{m_1 + m_2 + m_3 + m_4}$

$\Rightarrow \dfrac{0 + 2 \times \dfrac{80}{\sqrt{2}} + 4 \times \dfrac{80}{\sqrt{2}} + 0}{16} = \dfrac{30}{\sqrt{2}}$

Similarly, $y = \dfrac{30}{\sqrt{2}}$, therefore $r = \sqrt{x^2 + y^2} = 30$ cm.

8 Cavendish

9 Number of moles of the system remains same,

$$\therefore \frac{P_1V_1}{RT_1} + \frac{P_2V_2}{RT_2} = \frac{P(V_1+V_2)}{RT}$$

$$\Rightarrow T = \frac{P(V_1+V_2)T_1T_2}{(P_1V_1T_2 + P_2V_2T_1)}$$

By the Boyle's law, $P_1V_1 + P_2V_2 = P(V_1+V_2)$

$$\therefore T = \frac{(P_1V_1+P_2V_2)T_1T_2}{(P_1V_1T_2 + P_2V_2T_1)}$$

10 The velocity of sound in gas, $v = \sqrt{\frac{\gamma RT}{M}} \Rightarrow v \propto \sqrt{\frac{\gamma T}{M}}$

$$\therefore \frac{v_{N_2}}{v_{He}} = \sqrt{\frac{\gamma_{N_2}}{\gamma_{He}} \times \frac{M_{He}}{M_{H_2}}} = \sqrt{\frac{\frac{7}{5}R \times 4}{\frac{5}{3}R \times 28}} = \frac{\sqrt{3}}{5}$$

11 As per from given condition,

Static friction = Applied force = Weight of body $= 2 \times 10 = 20$ N

12 Pressure gradient $= \frac{P}{x} = \frac{[ML^{-1}T^{-2}]}{[L]} = [ML^{-2}T^{-2}]$

Energy gradient $= \frac{E}{x} = \frac{[ML^2T^2]}{[L]} = [MLT^{-2}]$

Velocity gradient $= \frac{v}{x} = \frac{[LT^{-1}]}{[L]} = [T^{-1}]$

Potential gradient $= \frac{V}{x} = \frac{[ML^2T^{-3}A^{-1}]}{[L]} = [MLT^{-3}A^{-1}]$

13 Here, $\mu = \frac{m_B}{m_A} \Rightarrow 0.2 = \frac{m_B}{10} \Rightarrow m_B = 2$ kg

14 Current, $i = \frac{dQ}{dt} \Rightarrow dQ = i\,dt$

$$\Rightarrow Q = \int_{t_1}^{t_2} i\,dt = \int_0^5 (1.2t+3)dt$$

$$= \left[\frac{1.2t^2}{2} + 3t \right]_0^5 = 30 \text{ C}$$

15 I/c

16 Using equation, $\omega^2 = \omega_0^2 - 2\alpha\theta$

$$\left(\frac{\omega_0}{2} \right)^2 = \omega_0^2 - 2\alpha(n \times 2\pi) \Rightarrow \alpha = \frac{3}{4}\frac{\omega_0^2}{4\pi \times 36}, \ (n = 36) \ \text{...(i)}$$

Now consider fan completes total n' revolution from the starting to come to rest,

$$\therefore 0 = \omega_0^2 - 2\alpha(2\pi n') \Rightarrow n' = \frac{\omega_0^2}{4\alpha\pi}$$

Substituting the value of 'α' from equation (i),

$$n' = \frac{\omega_0^2}{4\pi} \frac{4 \times 4\pi \times 36}{3\omega_0^2} = 48$$ revolutions

Thus, Number of rotations = 48 - 36 = 12

17

As we know, Work = Force×Displacement (length)

Therefore from the above relation, if unit of force and length is increased four times then the unit of energy will increase 16 times.

18

Since, both the points are at the surface of liquid and these points are in the open atmosphere. Hence both point possess similar pressure and equal to 1 atm. Therefore, the pressure difference will be zero.

19

Let at $(t = 0)$ initial velocity of particle $= u$

For first 5 seconds motion $s_5 = 10$ metre

we have, $s = ut + \frac{1}{2}at^2 \Rightarrow 10 = 5u + \frac{1}{2}a(5)^2$

$2u + 5a = 4$ …(i)

For first 8 sec of motion $s_8 = 20$ metre

$\therefore 20 = 8u + \frac{1}{2}a(8)^2 \Rightarrow 2u + 8a = 5$ …(ii)

Solving (i) and (ii), $u = \frac{7}{6} m/s$ and $a = \frac{1}{3} m/s^2$

Now distance travelled by particle in Total 10 seconds.

$$s_{10} = u \times 10 + \frac{1}{2}a(10)^2$$

By putting the value of u and a we will get $s_{10} = 28.3 m$

Thus, the distance in last 2 seconds $= s_{10} - s_8 = 28.3 - 20 = 8.3 m$.

20

Here, longitudinal strain is, $\frac{l}{L} = \frac{stress}{Y} = \frac{10^6}{10^{11}} = 10^{-5}$

$\therefore$ Percentage increase in length $= 10^{-5} \times 100 = 0.001\%$

21

From the given problem,

Increase in surface energy or work done in splitting a big drop $= 4\pi R^2 T(n^{1/3} - 1)$

$\Rightarrow W = 4\pi \times (2 \times 10^{-3})^2 \times 0.465(8^{1/3} - 1) = 23.4 \mu J$

22

We know, $F = m\left(\frac{4\pi^2}{T^2}\right)R$.

Therefore, if masses and time periods are same then, $F_1/F_2 = R_1/R_2$

23
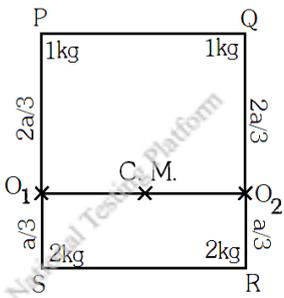
From the figure, centre of mass of P and S will be at O_1 and Q, R will be at O_2. Thus, the centre of mass of the system is at the midpoint of O_1 and O_2 which is farthest from P and Q.

24

From the given conditions,

$$\mu_s = \frac{\text{Length of the chain hanging from the table}}{\text{Length of the chain lying on the table}}$$

$$\Rightarrow \frac{l/3}{l-l/3} = \frac{l/3}{2l/3} = \frac{1}{2}$$

25

If acceleration depends on time, then

$$v = u + \int (f) dt = u + \int (at)\, dt = u + \frac{at^2}{2}$$

26

As the block moves vertically downward with acceleration $\frac{g}{4}$, then tension in the cord is,

$$T = M\left(g - \frac{g}{4}\right) = \frac{3}{4} Mg$$

Work done by the cord $= \vec{F}.\vec{s} = Fs\cos\theta$

$$\Rightarrow T d \cos(180°) = -\left(\frac{3Mg}{4}\right) \times d = -3Mg\frac{d}{4}$$
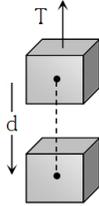
27

As we know, maximum density of water is at 4° C,

$$\therefore \frac{C}{5} = \frac{F-32}{9}$$

$$\Rightarrow \frac{\frac{4}{5}}{5} = \frac{F-32}{9} \Rightarrow F = 39.2°F$$

28

In 15 second, the second hand rotates through 90° as shown in figure.

Change in velocity, $|\overrightarrow{\Delta v}| = 2v\sin(\theta/2)$
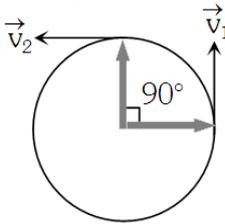
$$\Rightarrow 2(r\omega)\sin(90°/2) = 2 \times 1 \times \frac{2\pi}{T} \times \frac{1}{\sqrt{2}}$$

$$\Rightarrow \frac{4\pi}{60\sqrt{2}} = \frac{\pi\sqrt{2}}{30} \frac{cm}{s} \quad [\because T = 60\ s]$$

29

Here, by using $K = \dfrac{F_a}{F_m} \Rightarrow K = \dfrac{10^{-4}}{2.5 \times 10^{-5}} = 4$

30

Because of inertia, particle will move with uniform velocity.

31

A bimetallic strip on heating bends in the form of an arc with more expandable metal (A) outside as shown in figure below.
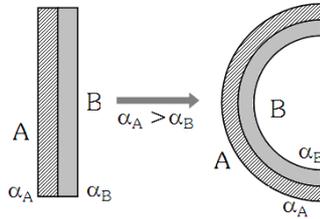
32

According to the problem, the angle between mirror and reflected ray is shown in the following figure.
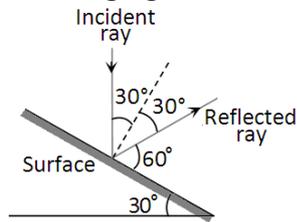
33

From the given information, $\vec{p} = p_x \hat{i} + p_y \hat{j} = 2\cos t\, \hat{i} + 2\sin t\, \hat{j}$

$\therefore \vec{F} = \dfrac{d\vec{p}}{dt} = -2\sin t\, \hat{i} + 2\cos t\, \hat{j}$

Now, $\vec{F} \cdot \vec{p} = 0$ means angle between $\vec{F}$ and $\vec{p}$ is 90°.

34

Total angle $= 100 \times \dfrac{\pi}{50} = 2\pi$

Hence, all the force will pass through one point and all forces will be balanced. Means their resultant will be zero.

35

Very low conductivity and retards further formation of ice.

36

From given, $V_{rms} = \dfrac{200}{\sqrt{2}}$, $i_{rms} = \dfrac{1}{\sqrt{2}}$

$\therefore P = V_{rms} \cdot i_{rms} \cdot \cos\phi$

$\Rightarrow P = \dfrac{200}{\sqrt{2}} \dfrac{1}{\sqrt{2}} \cos\dfrac{\pi}{3} = 50$ watt

37

Since, $P_1 V_1 = P_2 V_2 \Rightarrow (P_0 + h\rho g)V = P_0 \times 3V$

$\Rightarrow h\rho g = 2P_0 \Rightarrow h = \dfrac{2 \times 75 \times 13.6 \times g}{\frac{13.6}{10} \times g} = 15$ m

38

As entropy is related to second law of thermodynamics.

39

Here, $\Delta Q = \Delta U + \Delta W = (U_f - U_i) + \Delta W$

$\Rightarrow 30 = (U_f - 40) + 10 \Rightarrow U_f = 60\ \text{J}$

40

The maximum velocity, $v_{max} = a\omega = a \times \dfrac{2\pi}{T}$

$\Rightarrow a = \dfrac{v_{max} \times T}{2\pi}$

$\Rightarrow \dfrac{1 \times 10^3 \times (1 \times 10^{-5})}{2\pi} = 1.59\ \text{mm}$

41

The magnetic field because of revolution of electron is,

$B = \dfrac{\mu_0}{4\pi} \cdot \dfrac{2\pi i}{r}$

$\Rightarrow B = \dfrac{\mu_0}{4\pi} \cdot \dfrac{2\pi \cdot \left(\dfrac{e\omega}{2\pi}\right)}{r} = 10^{-7} \times \dfrac{e\omega}{r}$

$\Rightarrow 16 = 10^{-7} \times \dfrac{1.6 \times 10^{-19}\omega}{1 \times 10^{-10}}$

$\Rightarrow \omega = 10^{17}\ \text{rad/s}.$

42

From given, $\dfrac{I_{max}}{I_{min}} = \left(\dfrac{\dfrac{a_1}{a_2} + 1}{\dfrac{a_1}{a_2} - 1}\right)^2$

$\Rightarrow \dfrac{I_{max}}{I_{min}} = \left(\dfrac{\dfrac{4}{3} + 1}{\dfrac{4}{3} - 1}\right)^2 = \dfrac{49}{1}$

43

As, Work done = Force × Displacement

∴ Work done = Weight of the book × Height of the book shelf

44

The centre of mass of the given system is $X_{CM} = \dfrac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$

45

From given information, distance travelled by train in first 1 hr is 60 km and distance in next 1/2 hr is 20 km.

Thus, Average speed $= \dfrac{\text{Total distance}}{\text{Total time}} = \dfrac{60 + 20}{3/2} = 53.33\ \text{km/hr}$

46

Here, Adiabatic elasticity $E = \gamma P$

For argon $E_{Ar} = 1.6\ P$ …(i)

and for hydrogen $E_{H2} = 1.4\ P'$ …(ii)

As elasticity of hydrogen and argon are equal,

∴ $1.6\ P = 1.4\ P' \Rightarrow P' = \dfrac{8}{7}P$

47

As surface tension of water is very high.

48

R=Q

49

Since magnitude is absolute.

50

Let, Density of cork $= d$, Density of water $= \rho$
Resultant upward force on cork $= V(\rho - d)g$
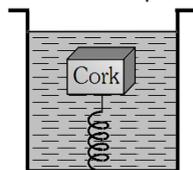
This causes elongation in the spring. As the lift moves down with acceleration 'a', the resultant upward force on cork $= V(\rho - d)(g - a)$, which is less than the previous value. Therefore the elongation decreases.

# Chemistry - Solutions

1

Wurtz reaction

2

When a ligand attaches to the central metal atom through two or more atoms to form a ring like structure is called as chelats while the ligand is called chelating ligand.

3

$$C_2H_5OH + SOCl_2 \xrightarrow{\text{Pyridine}} C_2H_5Cl + SO_2 + HCl$$
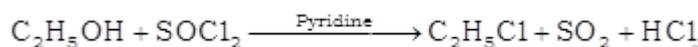
4

An allylic halide is an alkyl halide in this there are one or more halogen atoms on allylic carbons. Except 4-Bromobut-1-ene, all are allylic halides.
$$Br - CH_2 - CH_2 - CH = CH_2$$

5

$$CH_3COOH \xrightarrow{PCl_5} CH_3COCl \xrightarrow{NH_3} CH_3CONH_2 \xrightarrow{NaOBr} CH_3NH_2$$

6
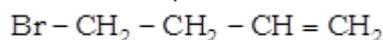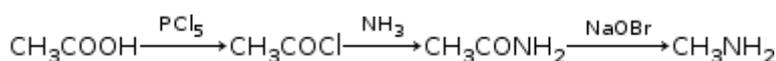
Here, $\dfrac{\text{wt.of metal hydroxide}}{\text{wt.of metal oxide}} = \dfrac{EM + EOH^-}{EM + EO^-}$

$\Rightarrow \dfrac{1.520}{0.995} = \dfrac{x + 17}{x + 8}$
$\Rightarrow 1.520\,x + 1.520 \times 8 = 0.995\,x + 0.995 \times 17$
$\Rightarrow 1.520\,x + 12.160 = 0.995\,x + 16.915$
$\Rightarrow 0.525\,x = 4.755 \Rightarrow x = \dfrac{4.755}{0.525} = 9$

7

Here, EAN of a central metal ion = (atomic no. of central atom) - oxidation state + no. of ligands Ã— 2 $= 26 - 3 + (6 \times 2) = 23 + 12 = 35$

8

Atoms that contain positive and nagative signs are known as ion.

9

Formation of CO_2 from CO represents an exothermic reaction, heat is evolved from the system means energy is lowered. Hence, exothermic reactions occur spontaneously on

account of decrease in enthalpy of system. Thus, $\Delta U > \Delta H$ is correct.

10 Catalyst increases the rate of the chemical reaction by decreasing the activation energy.

11 Electrovalent compounds are good conductor of heat as well as electricity in molten state or in aqueous solution.

12 H_2O and CO_2

13 $$\frac{\text{No. of gram equivalent of solute}}{\text{Volume of solution in litre}}$$

14 Zn^{+2} - $3d^{10}4s^0$ It means there are no unpaired electrons.

15

Element	%	No. of Moles	Simple ratio
C	85.72	85.72/12 = 7.14	1
H	14.18	14.18/1 = 14.18	2

$\therefore$ Empirical formula = C_2H_4

16 Lanthanides

17 Any substance which is capable of oxidizing other substances and is capable of accepting/gaining electron during oxidation is known as oxidizing agent or oxidant.

18 H_2O

19 $C_5H_{12}O$

20 Ketone

21 At constant P or T,
$$\Delta H = \Delta U + \Delta nRT$$
$$\Rightarrow \Delta n = n_p - n_R = 2 - 4 = -2$$
$$\therefore \Delta H < \Delta U$$

22 Rate of both forward and backward reactions become equal at equilibrium.

23 Here, $C_{12}H_{22}O_{11}$ is a non-electrolyte.

24 The oxidation state of M is +3 in MPO_4. So, the formula of nitrate is $M(NO_3)_3$.

25
$$N_2O_4 \qquad 2NO_2$$
$$\quad 1 \qquad\quad 0$$
$$(1-\alpha) \rightleftharpoons 2\alpha$$

So, Total moles at equilibrium $= (1-\alpha) + 2\alpha = 1 + \alpha$

26

Since 17 gm NH_3 contains 6×10^{23} molecules of NH_3,

$\therefore$ 4.25 gm NH_3 contains = $\dfrac{6 \times 10^{23}}{17} \times 4.25$

$\therefore$ No. of atoms = $\dfrac{6 \times 10^{23} \times 4.25}{17} \times 4 = 6 \times 10^{23}$

27

HCHO

28

We know, Mass no. $\approx$ Atomic Wt.

Mass no. = No. of protons+No. of neutrons

At. no. = No. of protons

29

Exothermic

30

Misch metal

31

Ionization is dependent upon dilution, when dilution increases then ionization also increases.

32

It is 3, 7-dimethylocta-2,6-dien-1-al

33

Enzymes do not always increase the activation energy.

34

Butane-1-ol

35

Number of gram equivalents = Number of faradays passed

36

Na is a typical element in third row.

37

$$2RCOOH \xrightarrow{-H_2O} \underset{\text{Acid anhydride}}{(RCO)_2O}$$
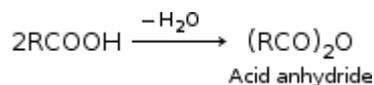
38

Difference in the rates of diffusion of gases.

39

Heat produced from 5 g coke $= 1 \times 37 = 37$ kcal

Heat produced from 1 g coke = 7.4 kcal/g

40

	A	+	2B	$\rightleftharpoons$	2C
Initial conc.	2		3		2
at equili.	2.5		4		1
Molar	$\dfrac{2.5}{2} = 1.25$		$\dfrac{4}{2} = 2$		$\dfrac{1}{2} = 0.5$
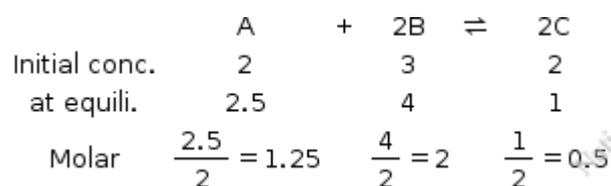
$\therefore K = \dfrac{[0.5]^2}{[1.25] \times [2]^2} = 0.05$

Equilibrium constant (K_c) = 0.05

41

Cerium is the first element of rare-earth metals.

42

$\overset{+4}{Pb}O_2 \rightarrow \overset{+2}{Pb}(NO_3)_2$. Here, reduction occurs.

43

$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$; change in volume of the system does not alter the number of moles
Here, $\Delta n = 2 - 2 = 0$.

44

Here, NaF has maximum melting point, melting point decreases of sodium halide with increase in size of halide and their bond energy gets lower.

45

In this case, $\overset{+2}{Mn}SO_4 \rightarrow \overset{+4}{Mn}O_2$
Here, change of valency $= 4 - 2 = 2$
$\therefore$ Equivalent weight $= \dfrac{M}{2}$

46

Polyethylene is an example of homopolymer.
$n\, CH_2 = CH_2 \rightarrow (-CH_2 - CH_2)_n$

47

Because of common ion effect of H^+.

48

Haemoglobin

49

Parts per million

50

Weak acid contains highest pK_a value and the strongest acid contains less pK_a value.

Botany - Solutions

1

10%

2

All of these

3

Paramecium

4

In angiosperms and gymnosperms, the seed coat is derived from megasporangium or ovule. Seed coat develops from the integuments of the ovule and the outer coat is known as testa and the inner layer is called tegmen. Two outer layers of integument i.e., outer fleshy layer and middle stony layer form the seed coat.

5

Cleistogamy refer to the process of pollination and fertilization before the flower has opened. In this flowers, the anther and stigma lie close to each other. When anthers dehisce in the flower buds, pollen grains come in contact with the stigma to effect pollination. So,

cleistogamous flowers are invariably autogamous as there is no chance of cross-pollen landing on the stigma. Cleistogamous flowers produce assured seed-set even in the absence of pollinators.

6

All of the above

7

In singlee Krebs€™ cycle two decarboxylations occur at following steps:

$$\underset{(6-C)}{\text{Oxalosuccinate}} \xrightarrow{\substack{\text{Oxylosuccinate} \\ \text{decarboxylate}}}$$

$$\underset{(5-C)}{\alpha - \text{ketoglutarate}} + CO_2$$

$$\underset{(5-C)}{\alpha - \text{ketoglutarate}} + NAD + Co - A \xrightarrow{\substack{\alpha-\text{ketoglutarate} \\ \text{dehydrogenase}}}$$

$$\underset{(4-C)}{\text{Succinyl}Co - A} + NADH_2 + CO_2$$
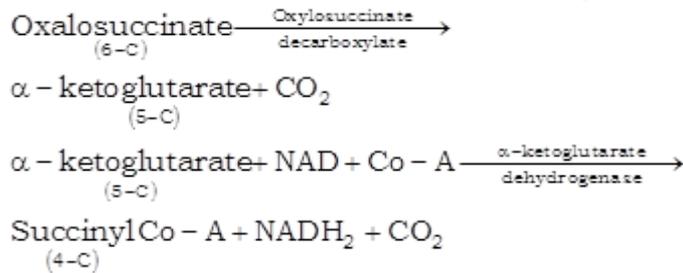
8

Ad, Bb, Cc, Da

9

Mycoplasma can grow out side the host cell. Thus it is clear that mycoplasma are not obligate parasite like viruses.

10

Pollen cytoplasm part of the pollen causes pollen allergy. Pollen allergy is an allergy caused when contacted with specific pollens and allergens in the pollen are concentrated in the cytoplasm. When allergens from an inhaled pollen grain are released and bind with antibodies they produce a number of symptoms like runny or stuffy nose, sneezing, red, itchy and watery eyes and swelling around the eyes.

11

Cytokinin and auxin are two plant hormones which are supplied to the tissue culture medium in definite properties and they bring about cell division and differentiation of callus. Root and shoot formation during tissue culture requires both hormones, cytokinin and auxin in fixed proportions. A low auxin to cytokinin ratio promotes shoot formation whereas a high auxin to cytokinin ratio promotes rooting of callus.

12

Stabilizing the ecosystem

13

He enunciated three major principles of inheritance i.e. Law of dominance, law of segregation also law of independent assortment.

14

Threatened species are liable to become extinct if not allowed to realise its full biotic potential by providing protection from exotic species, human exploitation and other activities. As per IUCN red list, during the last two decades, the maximum increases in the number of threatened species is among amphibians.

15

4 / 16

16

0.2%

17

In members of rhodophyceae spores and gametes are non-motile.

18

Spiral band shaped

19

Emerson effect gave idea of two photochemical reaction one carried by shorter wavelength by absorbing from chlorophyll a (chl a 680) while other a long wavelength chlorophyll a (chl a 700).

20

All the above

21

S phase

22

Presence of cellulose cell wall

23

FAD is electron acceptor in the citric acid cycle during oxidation of succinate. Succinate undergoes dehydrogenation to form fumarate with the help of membrane based enzyme succinate dehydrogenase. $FADH_2$ (reduced Flavin adenine dinucleotide) is produced.

$$\text{Succinate + FAD} \xrightleftharpoons[]{\text{Succinate dehydrogenase}} \text{Fumarate} + FADH_2$$

24

$$\text{Pyruvic acid} \xrightarrow[-CO_2]{\text{Decarboxylase}} \text{Acetaldehyde} \xrightarrow[+2NADH_2]{\text{dehydrogenase}} \text{Ethyl alcohol} + 2NAD$$
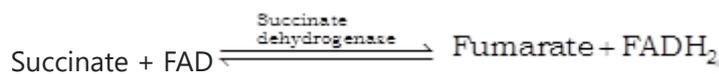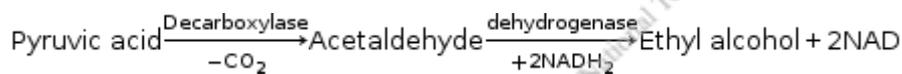
**25**

E.W. Sutherland

26

Since, cell organelles are not present in prokaryotes.

27

first three are pteridophytes while Spirogyra is an algae.

28

In the process of glycolysis, fructose-1, 6-bisphosphate splits up in the presence of aldolase enzyme to form one molecule each of 3-carbon compounds, 3-phosphoglyceraldehyde, PGAL (or glyceraldehyde-3-phosphate) and dihydroxy acetone -3-phosphate (DiHAP).

$$\text{Fructose-1, 6-bisphosphate} \xrightarrow{\text{Aldolase}} \text{3-phosphoglyceraldehyde} + \text{Dihydroxyacetone -3-phosphate.}$$
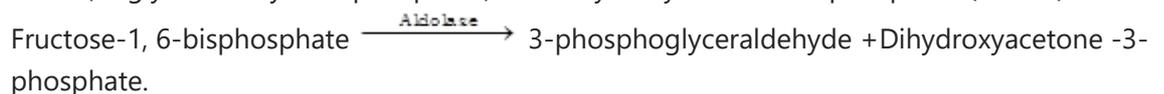
29

Microsome

30

(iii) → (v) → (iii) → (iv) → (i)

31

RNA synthesis

32

The cells derived from root apical and shoot apical meristems and cambium differentiate and mature to perform special functions. This act leading to maturation is termed as differentiation. In the process of differentiation, cells undergo few to major structural changes both in their cell walls and protoplasm.

33 Haploids can be obtained by culturing pollen grains. Only pollen grains are haploids while root apex, shoot apex and embryo are diploid.

34 Menstrual cycle occurs in primates only.

35 Root cap, cell division, cell enlargement, cell maturation

36 The simple permanent tissue is made up of one type of cells that forms a uniform system of cells and perform a common function.

37 Nuclear and cytoplasmic division

38 In G_0 phase inactivation of cell cycle take place because of non- availability of mitogens and energy rich compounds. The cells in this phase remain metabolically active and usually grow in size assuming particular shape (cell differentiation) and cell enters G_0 phase from a cell cycle checkpoint in the G_1 phase. G_1 phase checkpoint (restriction point) takes the key decision whether the cell should divide, delay division or enter resting stage. Cells then remain in G_0 phase until there is a reason for them to divide. Several biocatalysts can help a cell in G_0 phase to proceed through cell division when required.

39 The opening in vessel element walls are known as perforations, which may be simple perforation or multiple perforations.

40 Middle lamella is the first layer formed during cell division and makes up the outer wall of the cell which is shared by adjacent cells

41 Porous wood (In angiosperms) consists mainly vessels.

42 All the above

43 In binary fission, parent organism divides into 2 halves, each half forming independent daughter organism. Mitosis is involved in binary fission. Resultant offspring are genetically identical to parent and to each other.

44 Prokaryotes and eukaryotes

45

Coconut milk stimulates cell division as it is a rich source of cytokinin which are the plant growth hormone, basic in nature and promote cytokinesis (cell division) either alone or in conjunction with auxin. In plant tissue culture experiments coconut milk is widely used in nutrient medium.

46

Pericycle

47

Standing crop refer to the total amount of living material in a specified population at a particular time, expressed as biomass i.e. standing biomass or its equivalent in terms of energy. The standing crop may vary at different times of the year; eg., in a population of deciduous trees between summer and winter.

48

Starch sheath is also known as endodermis, a single layer of compactly arranged cells which are generally Parenchymatous, but have distinct wall characteristics clearly seen in roots. In some stems it is identifiable by innermost layer of cortex. Caspary (1865-66) intrduced a band of the wall material in the radial and transverse walls of endodermis. This particular wall material is chemically different from the rest of the wall. It is known as casparian strip or starch sheath and it is believed to be made of suberin and found in roots.

49

In photophosphorylation, when NADP is no longer available as electron acceptors, the electrons are passed to cytochrome $b_6 - f$ complex. The cytochrome $b_6 - f$ complex contains two cytochromes and an iron-sulphur (Fe-S) protein and then electrons are transferred to plastocyanin (water soluble copper containing protein) and then to P_{700}^+. It represents the cyclic photophosphorylation as electron released from P_{700} comes back to P_{700}^+.

50

During seed germination its stored food is mobilised by gibberellin. They are plant growth substances chemically related to terpenes and occurring naturally in plants and fungi. They promote elongation of stems, e.g., bolting in cabbage plants, and the mobilization of food reserves in germinating seeds, and are influential in inducing flowering and fruit development.

Zoology - Solutions

1

Ester bonds is the least likely to be involved in stabilising the three -dimensional folding of most proteins. Tertiary structure or three dimensional structure of protein is stabilized by several types of bonds - hydrogen bonds, ionic bonds, Van der Waal's interactions, covalent bonds and hydrophobic bonds.

2

Ptyalin is an enzyme which is found in salivary juice.

3

The inner lining of the kidney has podocyte, which are a layer of specialized epithelial cells in Bowman's capsule of kidney with major foot like processes, each supporting a series of minor

processes. These minor processes are interwoven with those from other podocytes to form a number of slits, through which filtration can occur and these slits (approximately 0.1 mm wide) permit the passage of all plasma constituents but act as a barrier to blood cells.

4 Anal cerci

5 Natality and immigration positively contribute to the population growth whereas mortality and emigration are negative factors. In the given question, the net increase in population is natality + immigration = 250+20=270
The net decrease in population is
mortality + emigration =240+30=270
So, net increase in population = 270-270=0

6 It is the active principle opium alkaloid.

7 Cortisol hormone also produces anti- inflammatory reactions in man and suppresses the immune response in addition to its primary functions. Cortisol is a glucocorticoid hormone secreted by adrenal cortex and it is steroid in nature. Apart from its primary functions (which are regulation of metabolism of carbodydrates, proteins and fats), it also has anti-inflammatory functions.

8 During cooling process of earth the first chemicals were formed as methane, ammonia and water by combination of active H with C, N and O.

9 Fish proteins are considered nutritionally superior to most vegetable proteins as they are rich in essential amino acids. Essential amino acids refer to those amino acids which the human body cannot synthesis from raw materials.

10 Liver cell and also white blood cells (basophills, mast cells produces heparin. It is a glycosaminoglycan, an anticoagulant, which acts by inhibiting the action of the enzyme thrombin in the final stage of blood coagulation. An extracted purified form of heparin is commonly use for the prevention of blood coagulation both in patients with thromobosis and in blood sample collected for examination.

11 Release of ovum from ovary

12 Bacillus thuringiensis (Bt for short) is a soil bacterium produces proteins that kill certain insects such as lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes). Bacillus thuringiensis forms some protein crystals. These crystals contain a toxic insecticidal protein.

13 Oral contraceptive pills consist of either progesterone only or a combination of progesterone and estrogen. The way of action of pills are:
(i) Inhibition of ovulation.
(ii) Inhibition of motility and secretory activity of oviducts (Fallopian tubes).

(iii) Changes in cervical mucus impairing its ability to allow passage and transport of sperms.
(iv)Alternation in uterine endometrium to make it unsuitable for implantation

14

Medulla oblongata

15

The hormones not involved in sugar metabolism is aldosterone. Aldosterone (salt -retaining hormone) is the principal mineralocorticoid in humans, secreted by adrenal cortex and its main function is to regulate sodium content of the body.

Insulin and glucagon are respectively secreted by beta cells and alpha cells of islets of Langerhans of pancreas. Cortisone is a glucocorticoid secreted by adrenal cortex. All these three hormones are involved in sugar metabolism.

16

The first living organisms were virus like with simple structure. They probably obtained energy by fermentation of some of other organic molecules.

17

lysozyme

18

Suppressor cells

19

When kidneys are completely damaged, haemodialysis is done and it is a process of diffusion across a semipermeable membrane to remove unwanted substance from blood while adding desirable components. Heparin, a glycosaminoglycan is added to prevent blood coagulation, during the process.

20

Type of protein present in the body

21

Ornithine cycle

22

A neuron that transmits a stimulus to muscle tissue is termed as motor neuron. A motor unit comprises of a single motor neuron (nerve cell) and the muscle fibres it innervates. The portion of the muscle plasma membrane (sarcolemma) that lies beneath the nerve endings (axon terminals) is called the motor end plate and
the axon terminals and the motor end plate together constitute the neuro-muscular junction or neuromotor junction.

23

Deoxygenated blood carried by the superior vena cava, inferior vena cava and coronary sinus open into the right atrium. The superior vena cava carries blood from the body's upper region. The inferior vena cava is larger than the superior and carries blood from the lower body's region and the coronary sinus carries the majority of blood from the heart it self. The coronary veins opens into the coronary sinus.

24

Sphygmomanometer is an device used for measuring blood pressure in the arteries. It consists of an inflatable cuff connected via a rubber tube to a column of mercury with a graduated scale. The cuff is applied to a limb usually the arm and inflated to exert pressure on a large artery until the blood flow stops then pressure is slowly released and, with the aid

of a stethoscope to listen to the pulse, it is possible to determine both the systolic and diastolic pressures (which can be read on the scale).

25 Haversian canals are present in long bones such as humerus, femur, tibia etc.

26 The bacterium E. coli have double stranded circular DNA. Many genetical researches are carried out on E. coli for the study of genetic engineering.

27 Duck bill platypus is a connecting link between mammals and reptiles as it possesses a mixture of characters of both mammals and reptiles.

28 Incomplete dorsally

29 Commonsalism

30 Unpaired bases

31 The cone cells contain the light -sensitive pigment iodopsin, it is according to the trichromatic theory-exists in three forms, each form occurring in a different cone cell. Each form of iodopsin is sensitive to either red, blue, or green light. The relative stimulation of each type of cone will determine the colour that is interpreted by the brain.

32 Tubectomy is kind of contraception method. It is a surgical method carried out in females, where a small part of the Fallopian tube is removed or tied up through a small cut in the abdomen or through vagina. Transport of gametes is prevented by it.

33 The first living organisms were chemoheterotrophs like present day sulphur bacteria

34 Syphilis

35 Irritability

36 During inspiration, the intrapulmonary pressure is less than the atmospheric pressure is the most appropriate in normal circumstances. The movement of air into and out of the lungs is guarded by creating a pressure gradient between the lungs and the atmosphere. Inspiration can occur if the pressure within the lungs (intrapulmonary pressure) is less than the atmospheric pressure, i.e., there is a negative pressure in the lungs with respect to atmospheric pressure. The diaphragm and a specialized set of muscles-external and internal intercostal between the ribs, help in generation of such gradients.

37 Retrogressive metamorphosis is a kind of metamorphosis seen in Herdmania (urochordates). It involves transformation of an active, free swimming larva with advanced characters into sedentary and simple adult. Thus in retrogressive metamorphosis, retrogression or degeneration is shown by larva to form adult.

38

Cardiac cycle is the sequence of events between one heartbeat and the next, normally occupying less than a second and these events comprise contraction (systole) and relaxation (diastole) of the chambers of heart.
At a resting heart, the human cardiac cycle lasts approx. 0.85 second in which arterial systole accounts 0.1 second and ventricular systole accounts 0.3 second and complete cardiac diastole accounts 0.4 second.

39

Lianas are large climbing woody vines commonly found in tropical rainforest trees. They have adapted to life in rainforest by having their roots in the ground and climbing high onto the tree canopy to reach available sunlight. Many lianas start life in the rainforest canopy and send roots down to the ground.

40

a)-GnRH (b)-LH/FSH (c)-estrogen or progestrone (d)-uterus

41

When fertilisation occurs outside the body of the organisms, this type of gametic fusion is known as external fertilisation or external syngamy. The external medium such as water is required for this type of fertilisation. So, in most aquatic organisms such as a majority of algae, fishes and amphibians, external fertilisation occurs.

42

Glomerulus is a capillary network within the Bowman's capsules and blood enters glomerular capillaries through afferent arterioles and leaves through efferent arterioles. The diameter of afferent arteriole is much more than that of efferent arteriole. This increases the volume of blood in glomerulus and increases the filtration rate.

43

The excitatory neurotransmitter involved in the transmission of impulse at the neuro-muscular junction is acetylcholine. The neurotransmitter acetylcholine (Ach) is released at all neuromuscular junctions between motor neurons and skeletal muscle cells, at all synapses between preganglionic and postganglionic neurons in the autonomic nervous system, and at certain synapses between neurons in the central nervous system.

44

Methanogens are obligate anaerobes found in anaerobic environments like marshes, swamps, sludge (formed during sewage treatment) and digestive systems of ruminants. Mostly they obtain their energy by reducing carbon dioxide and oxidising hydrogen with the production of methane. E.g., Methanobacillus and Methanothrix.

45

Ti plasmid from the soil bacterium Agrobacterium tumefaciens is widely used as vector for gene transfer to plant cells. The part of Ti plasmid transferred into plant cell DNA, is called the T-DNA. This T-DNA with desired DNA spliced into it, is inserted into the chromosomes of the host plant where it produces copies of itself, by migrating from one chromosomal position to another at random.

46

Acrosome is the cap-like structure on the front end of a spermatozoon and it breaks down just before fertilization (the acrosome reaction), releasing a number of hydrolytic enzymes, also known as sperm lysins that assist penetration between the follicle cells that still surround

the ovum, thus facilitating fertilization. Failure of the acrosome reaction is a cause of male infertility.

47

Haemocoel

48

Low Ca^{++} in the body fluid may be the cause of tetany disease. Tetany is a spasm and twitching of the muscles, particularly those of the face, hands, and feet. It is usually caused by a reduction in the blood calcium level, which may be because of underactive parathyroid glands (hypoparathyroidism).

49

Volvariella

50

The pH of blood varies between 7.36 to 7.45, the average is about 7.4.