

Physics

1

If pressure of a gas contained in a closed vessel is increased by 0.4%, when heated by 1°C , then find the initial temperature.

1

25°C

2

250°C

3

250 K

4

2500 K

2

When the distance between 2 masses is doubled, then what can be said about the gravitational attraction between them?

1

It is reduced to a quarter

2

It is reduced to half

3

It becomes four times

4

It is doubled

3

If $x = a \sin\left(\omega t + \frac{\pi}{6}\right)$ and $x' = a \cos \omega t$, then find the phase difference between two waves.

1

 π

2

 $\pi/2$

3

 $\pi/3$

4

 $\pi/6$

4

Two boys are standing at the ends A and B of a ground, where $AB = a$. The boy at B starts running in a direction perpendicular to AB with velocity v_1 . At what time the boy at A starts running simultaneously with velocity v and catches the other boy?

1

 $a/(v+v_1)$

2

 $a/(v-v_1)$

3

 $a/\sqrt{v^2+v_1^2}$

4

 $\sqrt{a^2/(v^2-v_1^2)}$

5

Displacement-time graph for two particles A and B are straight lines inclined at angles of 30° and 60° with the time axis. Find the ratio of the velocities $V_A:V_B$.

1	1:2
2	$1:\sqrt{3}$
3	1:3
4	$\sqrt{3}:1$

6

A piece of glass is heated to a high temperature and then allowed to cool. If it cracks, then a probable reason for this is which property of glass?

1	High specific heat
2	Low thermal conductivity
3	High thermal conductivity
4	High melting point

7

The kinetic energy acquired by a body of mass 'm' is travelling some distance 's', starting from rest under the actions of a constant force, is in proportion with:

1

 m^0

2

 \sqrt{m}

3

 m

4

 m^2

8

Two metal cubes A and B of same size are arranged as shown in the following figure. The extreme ends of the combination are maintained at the indicated temperatures. The arrangement is thermally insulated. The coefficients of thermal conductivity of A and B are $300 \text{ W/m } ^\circ\text{C}$ and $200 \text{ W/m } ^\circ\text{C}$. After steady state is reached, what will be the temperature of the interface?



1

 90°C

2

 60°C

3

 45°C

4

 30°C

9

Determine the expression $\left(\frac{1}{\sqrt{2}} \hat{i} + \frac{1}{\sqrt{2}} \hat{j} \right)$.

1

Null vector

2

vector of magnitude $\sqrt{2}$

3

Scalar

4

Unit vector

10

A uniform metal rod is used as a bar pendulum. If the room temperature rises by 10°C and the coefficient of linear expansion of the metal of the rod is $2 \times 10^{-6}/^\circ\text{C}$, then the period of the pendulum will have how much percentage increase?

1

1×10^{-3}

2

2×10^{-3}

3

-1×10^{-3}

4

-2×10^{-3}

11

A current flows in a conductor from east to west. What is the direction of the magnetic field at a points above the conductor?

1

Towards east

2

Towards west

3

Towards north

4

Towards south

12

A large force is acting on a body for a short time. The impulse imparted is equal to the change in which of the following characteristic?

1

Velocity

2

Momentum

3

Energy

4

Acceleration

13

If velocity ' v ', acceleration ' A ' and force ' F ' are chosen as fundamental quantities, then what would be the dimensional formula of angular momentum in terms of ' v ', ' A ' and ' F '?

1

 $[Fv^3A^{-2}]$

2

 $[Fv^2A^{-1}]$

3

$[FA^{-1}U]$

4

$[F^2U^2A^{-1}]$

14

A ball is released from the top of a tower. Find the ratio of work done in first, second and third second of the motion of the ball.

1

1:2:3

2

1:3:5

3

1:4:9

4

1:5:3

15

If a wheel completes 2000 revolutions to cover the 9.5 km. distance, then find the diameter of the wheel.

1

1.5 cm

2

7.5 cm

3

1.5 m

4

7.5 m

16

The ratio of densities of nitrogen and oxygen is 14:16. At what temperature the speed of sound in nitrogen will be same at that in oxygen at 55°C?

1

14°C

2

35°C

3

48°C

4

65°C

17

A 2 kg body and a 3 kg body are moving along the x-axis. At a particular instant the 2 kg body has a velocity of 3 ms^{-1} and the 3 kg body has the velocity of 2 ms^{-1} . Then calculate the velocity of the centre of mass at that instant.

1

0

2

 1 ms^{-1}

3

 5 ms^{-1}

4

None of these

18

A beaker containing a liquid is kept inside a big closed jar. If the air inside the jar is continuously pumped out, then what can be said about the pressure in the liquid near the bottom of the liquid?

1

It decreases

2

It remain constant

3

It increases

4

It first decrease and then increase

19

An iron rod of length 2 m as well as cross section area of 50 mm^2 , stretched by 0.5 mm, when a mass of 250 kg is hung from its lower end. Then calculate the Young's modulus of the iron rod.

1

 $19.6 \times 10^{20} \text{ N/m}^2$

2

 $19.6 \times 10^{10} \text{ N/m}^2$

3

 $19.6 \times 10^{15} \text{ N/m}^2$

4

 $19.6 \times 10^{18} \text{ N/m}^2$

20

A boy walks uniformly along the sides of a rectangular park of size 400 m \times 300 m, starting from one corner to the other corner diagonally opposite. Which of the following statement is incorrect?

1

His displacement is 500 m.

2

His displacement is 700 m.

3

He has travelled a distance of 700 m.

4

His velocity is not uniform throughout the walk.

21

The resistance of a coil is 4.2Ω at 100°C and the temperature coefficient of resistance of its material is $0.004/^\circ\text{C}$. Find its resistance at 0°C .

1

3Ω

2

4Ω

3

5Ω

4

6Ω

22

What does a system must posses while exhibiting S.H.M?

1

Elasticity as well as inertia

2

Inertia only

3

Elasticity, inertia and an external force

4

Elasticity only

23

Two wires of equal lengths are made of the same material. Wire A has a diameter that is twice as that of wire B. If identical weights are suspended from the ends of these wires, then determine the increase in length.

1

One-fourth for wire A as for wire B

2

Half for wire A as for wire B

3

Twice for wire A as for wire B

4

Four times for wire A as for wire B

24

Radius of earth on equator is 6400 km. Due to rotation what should be the velocity of earth about its own axis so that the weight at equator become $\frac{3}{5}$ of initial value?

1

 $8.7 \times 10^{-4} \text{ rad/s}$

2

 $7.8 \times 10^{-4} \text{ rad/s}$

3

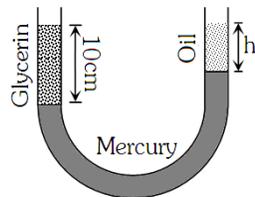
 $7.4 \times 10^{-4} \text{ rad/s}$

4

 $6.7 \times 10^{-4} \text{ rad/s}$

25

A vertical U-tube of uniform inner cross section contains mercury in both sides of its arms. A glycerin (density = 1.3 g/cm^3) column of length 10 cm is introduced into one of its arms. Oil of density 0.8 gm/cm^3 is poured into the other arm until the upper surfaces of the oil and glycerin are in the same horizontal level. What is the length of the oil column? (where, Density of mercury = 13.6 g/cm^3)



1

7.2 cm

2

8.2 cm

3

9.7 cm

4

10.4 cm

26

An ac source is of $\frac{200}{\sqrt{2}}$ volt, 50 hertz. What is the value of voltage after $\frac{1}{600}$ s from the start?

1

50 volt

2

 $\frac{200}{\sqrt{2}}$ volt

3

100 volt

4

200 volt

27

Name the parameters which does not characterize the thermodynamic state of matter.

1

Pressure

2

Volume

3

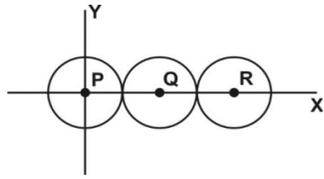
Temperature

4

Work

28

Three identical spheres, each of mass 1 kg are kept as shown in figure, touching each other, with their centres on a straight line. If their centres are marked P, Q, R respectively, estimate the distance of centre of mass of the system from P.



1

$$\frac{PR + QR}{3}$$

2

$$\frac{PQ + PR}{3}$$

3

$$\frac{PQ + QR}{3}$$

4

$$\frac{PQ + PR + QR}{3}$$

29

The total charge induced in a conducting loop when it is moved in magnetic field depends on which of the following?

1

Initial magnetic flux only

2

Final magnetic flux only

3

The total change in magnetic flux

4

The rate of change of magnetic flux

30

A bar magnet of magnetic moment $200 \text{ A}\cdot\text{m}^2$ is suspended in a magnetic field of intensity $0.25 \text{ N/A}\cdot\text{m}$. The couple required to deflect it through 30° is

1

15 N-m

2

20 N-m

3

25 N-m

4

50 N-m

31

The unit of ____ is Par sec.

1

velocity

2

distance

3

angle

4

time

32

When 10^{19} electrons are removed from a neutral metal plate, then calculate the electric charge on it.

1

 10^{-19} C

2

 10^{+19} C

3

 $- 1.6 \text{ C}$

4

 $+1.6 \text{ C}$

33

A constant force acts on a body of mass 0.9 kg at rest for 10 seconds. If the body moves a distance of 250 m, then what is the magnitude of the force?

1

4.5 N

2

4 N

3

3.5 N

4

3 N

34

Name the rays that possess maximum frequency.

1

Ultraviolet

2

Infrared

3

Blue light

4

Gamma

35

Define absolute zero (0 K) temperature.

1

Temperature at which volume and pressure of a gas becomes zero

2

Temperature at which matter ceases to exist

3

Temperature at which ice melts and water freezes

4

None of these

36

For a diatomic gas change in internal energy for unit change in temperature for constant pressure and constant volume is ΔU_1 and ΔU_2 respectively. What is the ratio of ΔU_1 : ΔU_2 ?

1

5 : 7

2

1 : 1

3

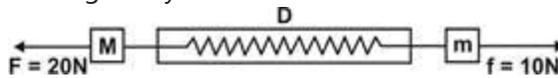
3 : 5

4

5 : 3

37

A dynamometer D is attached to two bodies of masses $M = 6 \text{ kg}$ and $m = 4 \text{ kg}$. Forces $F = 20 \text{ N}$ and $f = 10 \text{ N}$ are applied to the masses as shown in the figure. What is the reading on dynamometer?



1

6 N

2

20 N

3

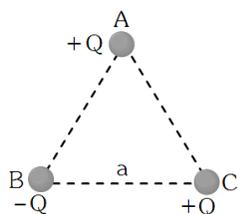
10 N

4

14 N

38

Following figure shows three charges that are kept at the vertices of an equilateral triangle of side 'a'. How much force is experienced by the charge kept at the vertex A in a direction normal to BC?



1

Zero

2

$$Q^2/(2\pi\epsilon_0 a^2)$$

3

$$Q^2/(4\pi\epsilon_0 a^2)$$

4

$$-Q^2/(4\pi\epsilon_0 a^2)$$

39

A monkey climbs up and another monkey climbs down a rope hanging from a tree with same uniform acceleration separately. If the respective masses of monkeys are in the ratio 2 : 3, what must be the common acceleration?

1

$$\frac{g}{5}$$

2

g

3

$$\frac{g}{2}$$

4

6g

40

A cream gets separated from milk when it is churned. Which force acts in this process?

1

Frictional force

2

Centrifugal force

3

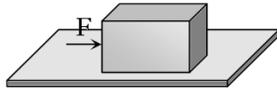
Centripetal force

4

Gravitational force

41

Following figure shows a block of mass 2 kg is kept on the floor. The coefficient of static friction is 0.4. If a force F of 2.5 Newtons is applied on the block, then what will be the frictional force between the block and the floor?



1

10 N

2

7.84 N

3

5 N

4

2.5 N

42

Surface tension is because of ____.

1

gravitational forces

2

adhesive forces between molecules

3

cohesive forces between molecules

4

frictional forces between molecules

43

On 0°C pressure measured by barometer is 760 mm. Determine the pressure on 100°C .

1

780 mm

2

760 mm

3

730 mm

4

None of these

44

A spherical liquid drop of radius R is divided into eight equal droplets. If surface tension is T , then determine the work done in this process.

1

 $2\pi RT^2$

2

 $4\pi R^2T$

3

 $3\pi R^2T$

4

$$2\pi R^2 T$$

45

For which property of medium, it can carry a longitudinal wave?

1

Elasticity

2

Compressibility

3

Density

4

Mass

46

An ice cart of mass 60 kg rests on a horizontal snow patch with coefficient of static friction $\frac{1}{3}$. Assuming that there is no vertical acceleration, then ___ is the magnitude of the maximum horizontal force required to move the ice cart. ($g = 9.8 \text{ m s}^{-2}$)

1

100 N

2

110 N

3

196 N

4

209 N

47

If particle 'P' is moving in a circle of radius 'a' with a uniform speed 'v'. 'C' is the centre of the circle and AB is a diameter. Determine the ratio of the angular velocity of 'P' about A and C, when passing through 'B'.

1

4:1

2

2:1

3

1:2

4

1:1

48

What can be said about the two lines of force due to a bar magnet?

1

They do not intersect at all

2

They intersect on the equatorial axis of the magnet

3

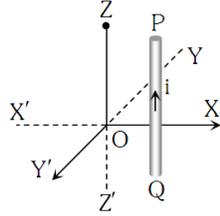
They intersect near the poles of the magnet

4

They intersect at the neutral point

49

As shown in the given figure, a vertical wire is placed in Z-X plane that carries a current from Q to P. The magnetic field due to current will have the direction at the origin O along



1

OY'

2

OY

3

OX'

4

OX

50

2 wires are made up of two different materials whose specific resistance are in the ratio 2:3, length 3:4 and area 4:5. Find the ratio of their resistances.

1

1:2

2

5:8

3

6:8

4

6:5

Chemistry

1

Electrolysis involves oxidation and reduction respectively at

1

cathode and anode

2

anode and cathode

3

at both the electrodes

4

none of the above

2

Which of the following is not nitro-derivative?

1

$\text{CH}_3\text{CH}_2\text{ONO}$

2

$\text{C}_6\text{H}_5\text{NO}_2$

3

$\text{CH}_3\text{CH}(\text{CH}_3) - \text{N} \begin{matrix} // \text{O} \\ \backslash \text{O} \end{matrix}$

4

$\text{C}_6\text{H}_4(\text{OH})\text{NO}_2$

3

When P reacts with caustic soda, the products are PH_3 and NaH_2PO_2 . This gives an example of

1	reduction
2	oxidation
3	neutralization
4	Disproportionation

4

On going left to right in a period, in case of transition metals, their atomic volumes

1	increase
2	decrease
3	remain same
4	none of these of correct

5

Aldehydes are isomeric with which of the following?

1

Fatty acids

2

Alcohols

3

Ethers

4

Ketones

6

Which of the following represents an example of condensation polymers?

1

Terylene

2

Orlon

3

PVC

4

Polythene

7

For 1 mole of a gas which of the following is correct?

1

$$C_p - C_v = R$$

2

$$C_p = C_v + R$$

3

Both (a) and (b)

4

None of these

8

The value of equilibrium constant is 50. If 0.5 moles each of H_2 and I_2 is added to the system the value of equilibrium constant will be

1

30

2

40

3

50

4

60

9

A tightly closed dessicator in action is an example of which type of system?

1

Isolated system

2

Open system

3

Closed system

4

None of these

10

In electrolysis process, cations and anions of the electrolyte are

1

discharged

2

charged

3

hydrolyzed

4

hydrated

11

When chlorine is passed through warm benzene in presence of the sunlight, then which product is obtained?

1

DDT

2

Gammexane

3

Chlorobenzene

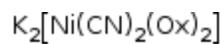
4

Benzotrichloride

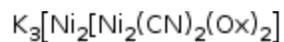
12

What is the formula of potassium dicyano bis (oxalato) nickelate (II)?

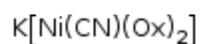
1



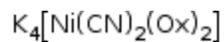
2



3



4



13

On analysis, a saturated hydrocarbon is found to contain 83.70 % carbon and 16.30% hydrogen. What will be the empirical formula ? (at. wt. of C=12, at. wt. of H = 1)

1



2



3



4



14

Identify the two gases that bleaches the colour of flowers by reduction while the other by oxidation respectively.

1

 SO_2 and Cl_2

2

 CO and Cl_2

3

 H_2S and Br_2

4

 NH_3 and SO_2

15

Why the law of definite proportions is not applicable to nitrogen oxide?

1

Because nitrogen equivalent weight is variable

2

Because nitrogen atomic weight is not constant

3

Because nitrogen molecular weight is variable

4

Because oxygen atomic weight is variable

16

Identify the ionic species which will impart colour to an aqueous solution.

1

 Cr^{3+}

2

 Zn^{2+}

3



4



17

Which of the following conditions of standard state are used in thermochemistry?

1

0 K and 1 atm

2

25°C and 1 atm

3

20°C and 1 atm

4

0°C and 1 atm

18

Point out the false statement.

1

Glucose is oxidized by bromine water.

2

Sucrose is a non reducing sugar.

3

Glucose rotates plane polarized light in clock-wise direction.

4

Fructose is oxidized by bromine water.

19

How are the transition metals mostly?

1

Paramagnetic

2

Diamagnetic

3

Neither diamagnetic nor paramagnetic

4

Both diamagnetic and paramagnetic

20

Two samples of lead oxide were separately reduced to metallic lead by heating in a current of hydrogen. The weight of lead from one oxide was half the weight of lead obtained from the other oxide. What does the data illustrates?

1

Law of equivalent proportions

2

Law of multiple proportions

3

Law of constant proportions

4

Law of reciprocal proportions

21

Bakelites are

1

resins

2

rubber

3

rayon

4

plasticisers

22

What is the volume strength of $1.5 \text{ N H}_2\text{O}_2$ solution?

1

8.8

2

8.4

3

5.2

4

4.8

23

Identify from the following that forms with an excess of CN^- (Cyanide) a complex having coordination number two.

1	Fe^{2+}
2	Ni^{2+}
3	Ag^+
4	Cu^+

24

If doubling the concentration of a reactant 'A' increases the rate four times and tripling the concentration of 'A' increases the rate nine times, then the rate is proportional to

1	square of concentration of 'A'
2	concentration of 'A'
3	under root of the concentration of 'A'
4	cube of concentration of 'A'

25

Urea is

1	amphoteric
2	neutral

3

diacidic base

4

monoacidic base

26

Generally an atom having atomic number 20 is combined chemically with the atom whose atomic number is ____.

1

10

2

11

3

14

4

16

27

Chloride of metal is MCl_2 . What will be the formula of its phosphate?

1

 $M_3(PO_4)_2$

2

 M_2PO_4

3

 MPO_4

4

 $M_2(PO_4)_3$

28

In which of the following group, element of atomic number 6 is placed?

1

4th period

2

4th group

3

6th group

4

3rd group

29

The addition of tetraethyl lead to petrol

1

lowers its octane number

2

raises its octane number

3

may raise or lower the octane number

4

has no effect on octane number

30

2 g of hydrogen combine with 16 g of oxygen to form water and with 6 g of carbon to form methane. In carbon dioxide 12 g of carbon are combined with 32 g of oxygen. Which law is illustrated by these figures?

1

Constant proportions

2

Multiple proportions

3

Reciprocal proportions

4

Conservation of mass

31

Find the electronic configuration of the element that is just above the element with atomic number 43 in the same periodic group.

1

 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1 4p^6$

2

 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^1$

3

 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^5$

4

 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$

32

Why nuclei tend to have more neutrons than protons at high mass numbers?

1

Neutrons decrease the binding energy

2

More neutrons minimize the coulomb repulsion

3

Neutrons have more mass than protons

4

Neutrons are neutral particles

33

Which of the following is correct for the zero order reaction?

1

Plot of $[R]_0$ vs time is a straight line

2

Plot of $[R]$ vs time is a straight line

3

Plot of $[R]_0$ vs time has slope = - k

4

Plot of $[R]$ vs time has slope = k

34

Find out the correct statement regarding enzymes.

1

Enzymes are specific biological catalysts that possess well-defined active sites

2

Enzymes are specific biological catalysts that can normally function at very high temperature ($T \sim 1000 \text{ K}$)

3

Enzymes are normally heterogeneous catalysts that are very specific in their action

4

Enzymes are specific biological catalysts that cannot be poisoned

35

Extent of ionization process increases

1

on stirring the solution vigorously

2

on decreasing the temperature of solution

3

on addition of excess water to solution

4

with the increase in concentration of solute

36

Which one of the following is the correct statement about carbonyl group?

1

Carbon oxygen bond is non-polar

2

Carbon atom is sp^2 hybridised

3

Oxygen has five non-bonding elements

4

It is non-planar

37

Absolute alcohol contains

1

95% ethanol + 5% methanol

2

Ethanol + water + phenol

3

95% alcohol + 5% H_2O

4

100% pure ethanol

38

The statement "The mass of a gas dissolved in a given mass of a solvent at any temperature is proportional to the pressure of the gas above the solvent" is stated in___.

1

Henry's Law

2

Dalton's Law of Partial Pressures

3

Law of Mass Action

4

None of these

39

The property of an element which is not variable is:

1

Atomic weight

2

Valency

3

Equivalent weight

4

Atomic Number

40

An element possesses the electronic configuration $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^5, 4s^1$. It is a

1

inert gas

2

d-block element

3

p-block element

4

s-block element

41

Why ammonium hydroxide is a weak base?

1

Because it is only slightly ionized

2

Because it has low vapour pressure

3

Because it is not a hydroxide of any metal

4

Because it has low density

42

In the chemical reaction $A \rightleftharpoons B$, the system will be called in equilibrium when ____.

1

50% of A changes to B

2

A completely changes to B

3

only 10% of A changes to B

4

the rate of change of A to B and B to A on both the sides are same

43

How many oxygen atoms are in a acetamide molecule?

1

4

2

3

3

2

4

1

44

Ionic compounds are ____.

1

neutral

2

non-electrolyte

3

weak electrolyte

4

good electrolyte

45

An organic compound consists of C = 38.8%, H = 16% and N = 45.2%. What is the empirical formula of the compound?

1

 C_2H_5CN

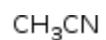
2

 $CH_2(NH)_2$

3

 CH_3NH_2

4



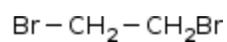
46

Ethylene reacts with bromine in order to form

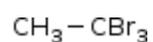
1



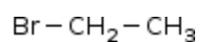
2



3



4



47

If $P = 31$; $O = 16$; $H = 1$, then what should be the equivalent weight of phosphorous acid?

1

20.5

2

41

3

82

4

None of these

48

Amongst the C - X bond (where X = Cl, Br, I), find the correct bond energy order.

1

 $C - Cl > C - Br > C - I$

2

 $C - I > C - Cl > C - Br$

3

 $C - I > C - Br > C - Cl$

4

 $C - Br > C - Cl > C - I$

49

C_3H_9N indicates

1

tertiary amine

2

primary amine

3

secondary amine

4

all of these

50

Cresols are

1

hydroxy toluenes

2

dihydric phenols

3

trihydric phenols

4

trihydric alcohols

Botany

1

In citric acid cycle, Which is the step not mediated by dehydrogenase enzyme?

1

Oxaloacetic acid to citric acid

2

Citric acid to α -ketoglutaric acid

3

Malic acid to oxaloacetic acid

4

Succinic acid to Fumaric acid

2

Due to _____, protozoans are able to live efficiently.

1

motility

2

ability to manufacture food

3

rapid reproduction

4

specialised organelles

3

Which process may be toxic to plants?

1

Photosynthesis

2

Photolysis of water

3

Aerobic respiration

4

Anaerobic respiration

4

In chlamydomonas the meiosis is present in _____.

1

zoospore

2

sporogonium

3

zygote

4

gamete

5

"Prokaryote" means a cell _____.

1

without chloroplast

2

with diffused nucleus

3

with one nucleus

4

with many nuclei

6

The study of chromosomes at meiotic diplotene represent that

1

The homologous chromosomes remain united by chiasmata

2

The intimately paired chromosomes repel each other and begin to separate

3

The pairing of homologous chromosomes which had initiated in the earlier stage is completed

4

None of the above

7

In organisms showing internal fertilization female gamete is non motile. Why the lack of motility is advantageous?

1

As it assists in rapid division of female gamete

2

As it facilitates less expenditure of energy

3

As it helps cell to store extra nutrients for rapid embryo development

4

Both (2) and (3)

8

Velamen takes part in _____.

1

transpiration

2

exchange of gases

3

absorption of moisture from air

4

absorption of water from soil

9

_____ tissue performs mechanical function in hydrophytic plants?

1	Parenchyma
2	Sclerenchyma
3	Collenchyma
4	None of the above

10

Which of the following is not the characteristic of xerophytic plants?

1	Developed root
2	Thick stomata
3	Aerenchyma
4	All the above

11

Okazaki fragments are joined in correct sequence by which of the following?

1	Primase
---	---------

2

RNA polymerase

3

DNA ligase

4

DNA polymerase

12

Identify the correctly matched pair/s

(A) Leptotene :: Terminalisation

(B) Metaphase-I :: Condensation

(C) Anaphase-I :: Disjunction of homologous chromosomes

(D) Telophase-I :: Formation of cell plate

1

Only (A) is correct

2

(B) and (C) are correct.

3

Only (C) is correct.

4

(A) and (D) are correct.

13

Mark the incorrect statement.

1

Species diversity increases as we move away from the equator towards the poles.

2

The historic convention on biological diversity was held in 1992.

3

Lantana and Eichhornia are invasive weed species in India.

4

Stellar's sea cow and passenger pigeon got extinct due to over exploitation by man.

14

Which one of the following plant species is in endangered list?

1

Eucalyptus

2

Nepenthes

3

Delonix

4

Ceratophyllum

15

_____ kingdom incorporates photoautotrophs, chemoautotrophs and heterotrophs.

1

Protista

2

Plantae

3

Monera

4

Both (1) and (2)

16

If one strand of DNA has the nitrogenous base sequence as ATCTG, the complementary RNA strand sequence would be

1

ATCGU

2

UAGAC

3

AACTG

4

TTAGU

17

Which of the following roots grow from branches of Banyan tree?

1

Climbing roots

2

Breathing roots

3

Hanging roots

4

Prop roots

18

Chlamydomonas are not present in:

1

Ocean

2

River

3

Pond and Lake

4

Fresh water

19

Anoxygenic photosynthesis is a feature of

1

Ulva

2

Rhodospirillum

3

Spirogyra

4

Chlamydomonas

20

The division of _____, resulted in the increase in length of petiole.

1

lateral meristem

2

apical meristem

3

intercalary meristem

4

phellogen

21

Generally the pollen grains of monocots and dicots are _____.

1

biporate and triporate

2

uniporate and biporate

3

uniporate and triporate

4

triporate and tetraporate

22

A haploid plant produces male or female gametes by which of the following process?

1

Binary fission

2

Mitosis

3

Amitosis

4

Meiosis

23

Lateral roots arise from primordia produced by division of:

1

Pericycle cells in between two protoxylem points

2

Endodermis cells in between two protoxylem points

3

Pericycle cells opposite protoxylem points

4

Endodermis opposite protoxylem points

24

The germ pores in the pollen grain are

1

the regions that can withstand high temperature and strong acids and alkalies

2

the regions which are made up of lignin and suberin

3

the regions which lack sporopollenin

4

the regions through which sperms are released into the female gametophyte

25

Where would you look for an active cell division in a plant?

1

In cortex

2

In the internodal region

3

At tip of the stem

4

In pith

26

Find the photosynthetic protozoan from the following.

1

Plasmodium

2

Paramecium

3

Amoeba

4

Euglena

27

In which of the following the solar energy is converted into ATP.

1

Mitochondria

2

Chloroplasts

3

Peroxisomes

4

Ribosomes

28

Which one of the following forms more than half of cell?

1

Mineral

2

Water

3

Protein

4

Carbohydrate

29

The active component of photosystem -I is consist of

1

chlorophyll a with absorption peak at 680 nm

2

chlorophyll a with absorption peak at 700 nm

3

chlorophyll a and h with absorption peak at 700 nm

4

chlorophyll h with absorption peak at 680 nm

30

Which of the following statement is not true for anaphase?

1

Chromosomes move to opposite poles

2

Golgi body and ER are reformed

3

Spindle poles move farther apart

4

Centromeres split and chromatids separate

31

New crop Triticale has been evolved by intergeneric hybridization between _____ and _____.

1

wheat and maize

2

wheat and rice

3

rice and maize

4

wheat and rye

32

When 2 genetic loci produce identical phenotypes in cis as well as in trans position, they are known as ____.

1

pseudo alleles

2

the parts of the same gene

3

multiple alleles

4

different genes

33

Haustoria or sucking roots present in ____.

1

Orchids

2

Betel

3

Cuscuta

4

Tinospora

34

Pasteur effect is concerned with the shifting of environmental conditions from _____.

1

aerobic to anaerobic

2

light to dark

3

anaerobic to aerobic

4

light to anaerobic

35

Standing crops means

1

all the crop plants in an area

2

all the living forms in an area

3

the amount of living matter in a component population of an ecosystem at any time

4

all the photosynthetic living forms in an area

36

Tissue is called

1

Third level of plant organisation

2

Second level of plant organisation

3

First level of plant organisation

4

Last level of plant organisation

37

_____ pigments are present in all algae.

1

Chlorophyll-d

2

Chlorophyll-c

3

Chlorophyll-b

4

Chlorophyll-a

38

'Cell' was invented by and given the term

1

Darwin

2

Robert Hooke

3

Brown

4

Grew

39

Which tuberculin is produced by the bacterium causing tuberculosis?

1

Endotoxin

2

Exotoxin

3

Enzyme

4

Hormone

40

Which of the following is a prokaryote?

1

Bacteriophage

2

Green algae

3

Salmonella

4

Agaricus

41

The process of growth is determined by increase in _____.

1

size

2

weight only

3

dry weight

4

size and dry weight

42

Cross between F_1 plant and recessive female plant is termed as _____.

1

test cross

2

back cross

3

out cross

4

mutation

43

The excess amount of CO_2 _____.

1

retards growth

2

accelerates growth

3

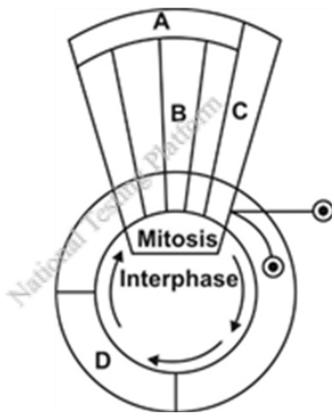
does not affect growth

4

affects the growth slowly

44

The given figure is a schematic break-up of the phases/stages of cell cycle. Identify the correct indication of the stage/phase in the cell cycle?



1	C-Karyokinesis
2	D-Synthetic phase
3	B-Metaphase
4	A-Cytokinesis

45

Plants manufacturing their own food are known as:

1	Autotrophs
2	Saprophytes
3	Parasites
4	Epiphytes

46

Triticale is an example of_____

1

Aneuploidy

2

Allopolyploidy

3

Autopolyploidy

4

None of these

47

In a given ecosystem number of individuals in species remain more or less constant over a period of time. Which one maintain the constancy of number?

1

Predators

2

Parasite

3

Man

4

Available food

48

How many number of chromosome pairs present at the equatorial plate in metaphase-I of meiosis in a plant with $2n=50$?

1	25
2	30
3	50
4	100

49

The pineapple which under natural condition is difficult to blossom has been made to produce fruits throughout the year, is possible by applying _____.

1	NAA, 2, 4-D
2	Cytokinin
3	IAA, IBA
4	Phenyl acetic acid

50

Where the chlorophyll molecules are located?

1

Thylakoid membrane

2

Thylakoid lumen

3

Inner chloroplast membrane

4

Stroma

Zoology

1

Polar bodies are composed during ____.

1

oogenesis

2

gametogenesis

3

spermateleosis

4

spermatogenesis

2

Which of the following does not favour the formation of large quantities of dilute urine?

1

Alcohol

2

Caffeine

3

Renin

4

Atrial-natriuretic factor

3

Which one of the following takes place in a myofibril when skeletal muscle contract?

1

Light band Dark band H-zone
Shortens Unchanged Disappears

2

Light band Dark band H-zone
Unchanged Shortens Shortens

3

Light band Dark band H-zone
Shortens Unchanged Unchanged

4

Light band Dark band H-zone
Shortens Shortens Shortens

4

Choose a correct statement about an organism and its classification.

1

Sea lily is a kind of echninoderm

2

Maiden hair tree is a kind of angiosperm

3

Sea horse is closely related to dolphim

4

Blue green alga is kind of fungus

5

In human being neural stimulation in visceral organ is done by

1

Sympathetic and parasympathetic nerves and is under involuntary action

2

Sympathetic nerves and is under voluntary action

3

Parasympathetic nerves and is under voluntary action

4

Sympathetic and parasympathetic nerves and is under voluntary action

6

_____ causes Syphilis.

1

Virus

2

Treponema pallidum

3

Nostoc

4

All the above

7

Choose the correct option: In cockroach, the arthroal membrane

1

covers the compound eyes

2

forms the hind wings

3

forms the hypopharynx

4

joins the sclerites

8

Choose from the following pairs of animal which is correctly matched with the kind of their body symmetry.

1

Jellyfish and starfish - Radial symmetry

2

Amoeba and sea urchin - Asymmetry

3

Tapeworm and octopus - Radial symmetry

4

Hydra and shark - Bilateral symmetry

9

Universal donors have no antigens in RBC and have both a and b antibodies. They belong to which blood group?

1

O

2

A

3

B

4

AB

10

In gymnosperms the **male** and the **female gametophytes** do not have an independent free-living existence

1

Pteris

2

Funaria

3

Polytrichum

4

Cedrus

11

Effect of different hormones on body can be best said to bring about ____.

1

proper growth

2

co-ordination of functions

3

release of inherent capacities

4

stimulation of organs

12

Rheumatoid arthritis is an example of

1

active immune response

2

auto immune response

3

immune response

4

passive immune response

13

_____ enzyme helps in removing oil stains from clothes.

1

Trypsin

2

Streptokinase

3

Lipase

4

Amylase

14

Who discovered the abiogenesis?

1

Spallanzani

2

Louis Pasteur

3

Francisco Redi

4

All of these

15

Find the incorrect statement from the following.

1

Hormone produced in thyroid is T - 4

2

Hormone produced by adenohipophysis is FSH

3

Hormone produced in placenta is URF

4

Hormone synthesized by neurohypophysis is ADH

16

Plants in comparison to animals are more rapidly manipulated by genetic engineering. What is the most probable reason for this?

1

Single somatic cell can regenerate a whole plant body

2

Totipotency shown by plant cells

3

Genetic engineering is supplemented with plant tissue culture techniques

4

All of the above

17

Actin filament is made up of _____.

1

actin, troponin and tropomyosin

2

actin, troponin

3

actin, tropomyosin

4

myosin, troponin

18

Nitrogenous waste produced in the Malpighian tubule of cockroach flows into _____.

1

vacuole

2

haemocoel

3

intestine

4

duodenum

19

Chitin is polymerised form of _____ which is a structural polysaccharide.

1

ribose

2

glucose

3

deoxyribose

4

none of these

20

A decrease in plasma albumin levels is likely to affect:

1

clot formation

2

Oxygenation of Heaglobin

3

Osmatic balance

4

immune functions

21

Kidney stones are produced because of deposition of uric acid and

1

Minerals

2

Silicates

3

Calcium carbonate

4

Calcium oxalate

22

Reasons for population explosion is/are:

- i) Increased health facilities
- ii) Rapid increase in MMR

- iii) Rapid increase in IMR
- iv) Rapid decrease in MMR
- v) Decrease in number of people reaching reproductive age

1	iii and v
2	i and iv
3	i and v
4	ii and iv

23

_____ is a baker yeast.

1	S. ludwingai
2	S. cerevisiae
3	S. octosporus
4	Schizosaccharomyces

24

Which of the following forms the labium in cockroach?

1	first maxillae
---	----------------

2

second maxillae

3

mentum

4

submentum

25

The animals has separate circulatory pathways is

1

Whale

2

Shark

3

Lizard

4

Frog

26

What is innominate?

1

Muscle

2

Nerve

3

Animal

4

Part of skeleton

27

The excretory waste of birds and reptiles are

1

Urea and uric acid

2

Urea

3

Uric acid

4

Ammonia and uric acid

28

_____ is the sweetest sugar.

1

Sucrose

2

Galactose

3

Glucose

4

Fructose

29

Cross section at midpoint of middle piece of a human sperm will show ____.

1

centriole and mitochondria

2

mitochondria and 9+2 arrangement of microtubules

3

9+2 arrangement of microtubules only

4

centriole, mitochondria and 9+2 arrangement of microtubules

30

The alphas helices and beta sheets are the example of ____ level of protein organization.

1

quaternary structures

2

tertiary structure

3

secondary structures

4

primary structure

31

Vital capacity of lung signifies volume of air:

1

breathed out with forcible expiration

2

with deep inspiration and forcible expiration

3

breathed in with forcible inspiration

4

breathed in during normal inspiration

32

Determine incorrect statements?

1

Sea-anemone on hermit-crab is an example of protocoooperation

2

Lichen, an association of fungus and algae is an example of Mutualism

3

Mutualism, protocoooperation, commensalism cannot be included under Symbiosis

4

Those Epiphytes which use other plants for support only and not for water or food supply are examples of Commensation

33

_____ causes meningitis a disease is responsible for membrane damage of the brain.

1

Bordetella

2

Neisseria

3

Bacillus

4

A fungus

34

Even though a donor X and a recipient Y belongs to the same blood group, transfusion of blood leads to agglutination because of ____.

1

X is Rh⁺ and Y is Rh⁻

2

X is Rh⁻ and Y is Rh⁻

3

Haemoglobin of X and Y is different

4

Both are Rh⁺

35

Asthma may lead to

1

accumulation of fluid in the lungs

2

inflammation of the trachea

3

bacterial infection of the lungs

4

allergic reaction of the mast cells in the lungs

36

_____ is/are removed during hemodialysis.

1

Glucose

2

Urea

3

Amino acids

4

All the above

37

Inulin is a polymer of _____ unit.

1

glucose

2

arabinose

3

fructose

4

galactose

38

_____ is not the function of insulin.

1

Initiates the formation of hepatic glycogen from excess of glucose.

2

Increases the oxidation of glucose in the cells

3

Initiates the conversion of glycogen to glucose

4

Increases the permeability of cell membrane to glucose

39

The spinal cord terminates in _____terminale.

1

Coput

2

Corpus

3

Cauda

4

Filum

40

The process of exchange of O_2 from the atmosphere with CO_2 produced by the cells is known as

1

photosynthesis

2

photorespiration

3

biological assimilation

4

gaseous exchange

41

In prokaryotes, the predominant site for control of gene expression is the:

1

transcription initiation

2

processing level

3

transport of mRNA

4

translation level

42

How many bones, face have?

1	14
2	30
3	40
4	12

43

Aggregation of some complex inorganic and organic compounds in hot sea were known as ____.

1	eobiont
2	pre cells
3	coacervate
4	protocell

44

Find the correct statement for respiration in humans.

1	Neural signals from pneumotoxic centre in pons region of brain can increase the duration of inspiration.
---	--

2

Cigarette smoking may lead to inflammation of bronchi

3

Workers in grinding and stone- breaking industries may suffer, from lung fibrosis.

4

About 90% of carbon dioxide (CO_2) is carried by haemoglobin as carbaminohaemoglobin.

45

Which membrane is investing ovum just outside the membrana granulosa?

1

Zona pellucida

2

Theca interna

3

Discus proligerous

4

Vitelline membrane

46

Neutrophils promote adhesion of neutrophils to endothelium, attract other neutrophils, monocytes and eosinophils and dilate capillaries by secreting which one of the following biomolecule?

1

Cytokines

2

Leucotrienes

3

Monokines

4

Lymphokines

47

Choose the correct option: Most of our cells are surrounded by

1

blood

2

fluid equivalent to seawater in salt composition

3

interstitial fluid

4

pure water

48

The cilia of a trachea transfers ____.

1

mucous into pharynx

2

air into pharynx

3

air into lungs

4

mucous into lungs

49

Which is the primary neurotransmitter at the neuromuscular junction?

1

Adrenaline

2

Dopamine

3

Acetylcholine

4

Acetaldehyde

50

Where are the nissl's granules found?

1

In liver cells

2

In nerve cells

3

In kidney

4

In intestinal cells

Physics - Answer keys

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

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

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48

1

49

1

50

2

Chemistry - Answer keys

1

2

2

1

3

4

4

2

5

4

6

1

7

3

8

3

9

3

10

1

11

2

12

4

13

4

14

1

15

1

16

1

17

2

18

4

19

1

20

2

21	1
22	2
23	3
24	1
25	4
26	4
27	1
28	2
29	2
30	3
31	4
32	2
33	2
34	1
35	3
36	2
37	4
38	1
39	4
40	2
41	1
42	4
43	4
44	4
45	3

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National Testing Platform

46	2
47	2
48	1
49	4
50	1

Botany - Answer keys

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

19	2
20	3
21	3
22	2
23	1
24	3
25	3
26	4
27	2
28	2
29	2
30	2
31	4
32	2
33	3
34	3
35	3
36	2
37	4
38	2
39	1
40	3
41	4
42	1
43	2

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44	2
45	1
46	2
47	4
48	1
49	1
50	1

Zoology - Answer keys

1	1
2	3
3	4
4	1
5	1
6	2
7	4
8	1
9	1
10	4
11	2
12	2
13	3
14	4
15	3
16	4

17	1
18	3
19	4
20	3
21	4
22	2
23	2
24	2
25	1
26	4
27	3
28	4
29	2
30	3
31	2
32	3
33	2
34	1
35	4
36	2
37	3
38	3
39	4
40	4
41	1

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42

1

43

3

44

3

45

2

46

1

47

3

48

1

49

3

50

2

Physics - Solutions

1

Closed vessel means volume is constant.

$$\begin{aligned} \therefore \frac{P_1}{P_2} &= \frac{T_1}{T_2} \\ \Rightarrow \frac{P}{P + \left(\frac{0.4}{100}\right)P} &= \frac{T}{T+1} \Rightarrow T = 250 \text{ K} \end{aligned}$$

2

We know that, $F \propto \frac{1}{r^2}$, therefore if 'r' becomes double, then F reduces to $\frac{F}{4}$.

3

As per given in the problem,

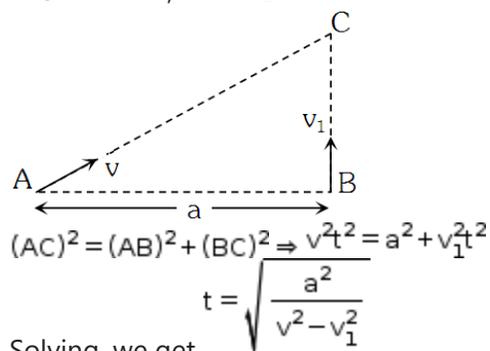
$$x = a \sin\left(\omega t + \frac{\pi}{6}\right) \text{ and } x' = a \cos \omega t = a \sin\left(\omega t + \frac{\pi}{2}\right)$$

$$\therefore \Delta\phi = \left(\omega t + \frac{\pi}{2}\right) - \left(\omega t + \frac{\pi}{6}\right) = \frac{\pi}{3}$$

4

Consider, two boys meet at point C after time 't' from the starting as shown in fig.

Then $AC = vt$, $BC = v_1 t$



Solving, we get

5

$$\text{As, } \frac{v_A}{v_B} = \frac{\tan\theta_A}{\tan\theta_B} = \frac{\tan 30^\circ}{\tan 60^\circ} \Rightarrow \frac{v_A}{v_B} = \frac{1/\sqrt{3}}{\sqrt{3}} = \frac{1}{3}$$

6

As a piece of glass is heated, it does not conduct heat fast because of low thermal conductivity. Therefore unequal expansion of its layers crack the glass.

7

Here, K.E. acquired by the body = Work done on the body

$\therefore \text{K.E.} = \frac{1}{2}mv^2 = Fs$ i.e. it does not depend upon the mass of the body, although velocity depends upon the mass.

If F and s are constant, $v^2 \propto \frac{1}{m}$.

8

$$\text{Temperature of interface is given by, } T = \frac{K_1\theta_1 + K_2\theta_2}{K_1 + K_2}$$

$$\Rightarrow T = \frac{300 \times 100 + 200 \times 0}{300 + 200} = 60^\circ\text{C}$$

9

$$\vec{p} = \frac{1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{j}, \therefore |\vec{p}| = \sqrt{\left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2} = 1$$

Hence, it is a unit vector.

10

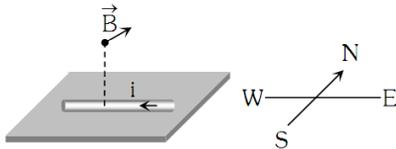
Fractional change in period is given by,

$$\frac{\Delta T}{T} = \frac{1}{2}\alpha\Delta\theta = \frac{1}{2} \times 2 \times 10^{-6} \times 10 = 10^{-5}$$

$$\therefore \% \text{ change} = \frac{\Delta T}{T} \times 100 = 10^{-5} \times 100 = 10^{-3}\%$$

11

As shown in the following figure,



12

If a large force F acts for a short time dt , the impulse imparted I is
or $I = dp =$ change in momentum

$$I = Fdt = \frac{dp}{dt} dt$$

13

$$L \propto v^x A^y F^z \Rightarrow L = kv^x A^y F^z$$

Substituting the dimensions in this relation,

$$[ML^2T^{-1}] = k[LT^{-1}]^x [L^2]^{-y} [MLT^{-2}]^z$$

$$[ML^2T^{-1}] = k[M^z L^{x+y+2z} T^{-x-2y-2z}]$$

By comparing the powers of M , L and T

$$z = 1 \quad \text{€(i)}$$

$$x + y + z = 2 \quad \text{€(ii)}$$

$$-x - 2y - 2z = -1 \text{ (iii)}$$

By solving (i), (ii) and (iii); $x = 3, y = -2, z = 1$

So dimension of L in terms of v, A and f is,

$$[L] = [Fv^3A^{-2}]$$

14

As soon as the ball is released from the top of tower, then ratio of distances covered by the ball in first, second and third second is as,

$$h_I : h_{II} : h_{III} = 1 : 3 : 5 \quad (\because h_n \propto (2n - 1))$$

Thus, ratio of work done, $mgh_I : mgh_{II} : mgh_{III} = 1 : 3 : 5$

15

Here, Distance covered in 'n' revolutions = $n2\pi r = n\pi D$

$$2000\pi D = 9500 \quad [\because n = 2000, \text{ distance} = 9500 \text{ m}]$$

$$D = \frac{9500}{2000 \times \pi} = 1.5 \text{ m}$$

16

$$\text{Velocity, } v = \sqrt{\frac{\gamma RT}{M}} \Rightarrow \frac{T_N}{T_0} = \frac{M_N}{M_0}$$

$$\Rightarrow \frac{T_N}{273 + 55} = \frac{14}{16} = \frac{7}{8} \quad (\text{Given})$$

$$\therefore T_N = 287 \text{ K} = 14^\circ \text{C}$$

17

Velocity of centre of mass is,

$$\vec{v}_{\text{cm}} = \frac{m_1\vec{v}_1 + m_2\vec{v}_2}{m_1 + m_2} = \frac{2 \times 3 + 3 \times 2}{2 + 3} = \frac{12}{5} = 2.4 \text{ m/s}$$

18

Total pressure at (near) bottom of the liquid is, $P = P_0 + h\rho g$.

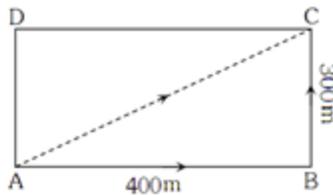
As air is continuously pumped out from jar (container), P_0 decreases and so P decreases.

19

$$\text{Young's modulus, } \gamma = \frac{MgL}{Al} = \frac{250 \times 9.8 \times 2}{50 \times 10^{-6} \times 0.5 \times 10^{-3}}$$

$$\Rightarrow \gamma = 19.6 \times 10^{10} \text{ N/m}^2$$

20



Displacement $\overline{AC} = \overline{AB} + \overline{BC}$

$$\Rightarrow AC = \sqrt{(AB)^2 + (BC)^2} = \sqrt{(400)^2 + (300)^2} = 500 \text{ m}$$

$$\text{Distance} = AB + BC = 400 + 300 = 700 \text{ m}$$

21

Here, $R_t = R_0(1 + \alpha t)$

$$\Rightarrow 4.2 = R_0(1 + 0.004 \times 100) = 1.4R_0 \Rightarrow R_0 = 3 \Omega$$

22

Elasticity as well as inertia.

23

$$\text{As } l = \frac{FL}{AY}, \therefore l \propto \frac{1}{r^2} \text{ (as } F, L \text{ and } Y \text{ are same)}$$

$$\text{Thus, } \frac{l_A}{l_B} = \left(\frac{r_B}{r_A}\right)^2$$

$$\Rightarrow \left(\frac{r_B}{2r_B}\right)^2 = \frac{1}{4} \Rightarrow l_A = 4l_B \text{ or } l_B = \frac{l_A}{4}$$

24

Since, weight of the body at equator = $\frac{3}{5}$ of initial weight

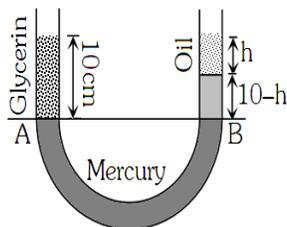
$$\therefore g' = \frac{3}{5}g \text{ (}\because \text{Mass remains constant)}$$

$$g' = g - \omega^2 R \cos^2 \lambda \Rightarrow \frac{3}{5}g = g - \omega^2 R \cos^2(0)$$

$$\Rightarrow \omega^2 = \frac{2g}{5R} \Rightarrow \omega = \sqrt{\frac{2g}{5R}} = \sqrt{\frac{2 \times 10}{5 \times 6400 \times 10^3}}$$

$$= 7.8 \times 10^{-4} \frac{\text{rad}}{\text{s}}$$

25



From the above figure,

At the condition of equilibrium,

Pressure at point A = Pressure at point B

$$P_A = P_B \Rightarrow 10 \times 1.3 \times g = h \times 0.8 \times g + (10 - h) \times 13.6 \times g$$

Solving, we get, $h = 9.7 \text{ cm}$

26

$$V_{\text{rms}} = \frac{200}{\sqrt{2}} \Rightarrow V_0 = \sqrt{2} V_{\text{rms}} = \sqrt{2} \times \frac{200}{\sqrt{2}} = 200 \text{ V}$$

$$\therefore V = V_0 \sin 2\pi vt = 200 \sin 2\pi \times 50 \times \frac{1}{600} = 200 \sin \frac{\pi}{6} = 100 \text{ V}$$

27

Work

28

$$X_{\text{CM}} = \frac{(M_P)(0) + (M_Q)(PQ) + (M_R)(PR)}{M_P + M_Q + M_R} = \frac{1 \times 0 + 1 \times PQ + 1 \times PR}{1 + 1 + 1} = \frac{PQ + PR}{3}$$

29

$$\text{Since, } q = \frac{N}{R} d\phi \therefore q \propto d\phi$$

30

$$\text{Here, } \tau = MB \sin \theta$$

$$\Rightarrow \tau = 200 \times 0.25 \times \sin 30^\circ \Rightarrow \tau = 25 \text{ N-m}$$

31

Astronomical unit of distance.

32

Using, $Q = ne \Rightarrow Q = 10^{19} \times 1.6 \times 10^{-19}$
 $\Rightarrow Q = +1.6 \text{ C}$

33

Given conditions are, $u = 0$, $S = 250 \text{ m}$, $t = 10 \text{ s}$
 $\therefore S = ut + \frac{1}{2}at^2 \Rightarrow 250 = \frac{1}{2}a[10]^2 \Rightarrow a = 5 \text{ m/s}^2$
 And, $F = ma = 0.9 \times 5 = 4.5 \text{ N}$

34

As we know, $v_{\gamma\text{-rays}} > v_{\text{UV-rays}} > v_{\text{Blue light}} > v_{\text{Infrared rays}}$.

35

Here, $P = P_0(1 + \gamma t)$ and $V = V_0(1 + \gamma t)$
 and $\gamma = (1/273)/^\circ\text{C}$ for $t = -273^\circ\text{C}$, we have $P = 0$ and $V = 0$.
 Therefore, at absolute zero, both the volume and pressure of the gas become zero.

36

According to first law of thermodynamics, $\Delta Q = \Delta U + \Delta W$
 At constant pressure, $\Delta Q = nC_p\Delta T$, $\Delta U = \Delta U_1$, $\Delta W = P\Delta V = nR\Delta T$
 $\therefore nC_p\Delta T = \Delta U + nR\Delta T$ or $n(C_p - R)\Delta T = \Delta U_1$
 At constant volume, $\Delta Q = nC_v\Delta T$, $\Delta W = 0$
 $\therefore nC_v\Delta T = \Delta U_2$
 Therefore, $\frac{\Delta U_1}{\Delta U_2} = \frac{C_p - R}{C_v} = \frac{C_p}{C_v} = \gamma$

37

If a is the acceleration of the system, then

$$a = \frac{\text{net force}}{\text{total mass}} = \frac{20 - 10}{6 + 4} = 1 \text{ m s}^{-2}$$

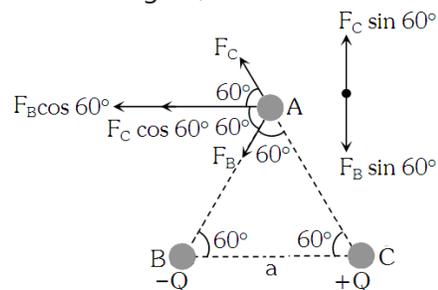
It is along the direction of \vec{F} .

If R is the reading of the dynamometer, then

$$R + Ma = F \text{ or } R = F - Ma = 20 - 6 \times 1 = 14 \text{ N}$$

38

From the figure, $|\vec{F}_B| = |\vec{F}_C| = k \cdot \frac{Q^2}{a^2}$



Therefore force experienced by the charge at A in the direction normal to BC is zero.

39

Consider T be the tension in the rope.

When monkey climbs up with acceleration a,

$$T - m_1g = m_1a \quad \dots(i)$$

When another monkey climbs down with same acceleration a, $m_2g - T = m_2a \quad \dots(ii)$

By adding (i) and (ii), we get $(m_2 - m_1)g = (m_1 + m_2)a$ or $\left(1 - \frac{m_1}{m_2}\right)g = \left[\frac{m_1}{m_2} + 1\right]a$

$$\text{or } \left(1 - \frac{2}{3}\right)g = \left[\frac{2}{3} + 1\right]a \text{ or } \frac{1}{3}g = \frac{5}{3}a \text{ or } a = \frac{g}{5}$$

40

As particles of cream are lighter, thus they get deposited near the centre of circular path.

41

Given, Applied force = 2.5 N and

$$\text{Limiting friction} = \mu mg = 0.4 \times 2 \times 9.8 = 7.84 \text{ N}$$

For the given condition in the problem, applied force is very smaller than limiting friction.

∴ Static friction on a body = Applied force = 2.5 N

42

Surface tension is due to cohesive forces between molecules.

43

$$\begin{aligned} \text{As, } P \propto T &\Rightarrow \frac{P_2}{P_1} = \frac{T_2}{T_1} = \frac{(273 + 100)}{(273 + 0)} = \frac{373}{273} \\ \Rightarrow P_2 &= \frac{760 \times 373}{273} = 1038 \text{ mm} \end{aligned}$$

44

We know that, work done,

$$\begin{aligned} W &= 4\pi R^2 T (r^{1/3} - 1) \\ &= 4\pi R^2 T (8^{1/3} - 1) = 4\pi R^2 T \end{aligned}$$

45

Elasticity

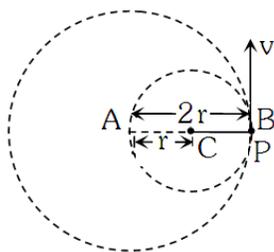
46

$$\text{Here, } m = 60 \text{ kg, } \mu = \frac{1}{3}, g = 9.8 \text{ m/s}^2$$

Maximum horizontal force required to move the cart = force of friction

$$= \mu R = \mu mg = \frac{1}{3} \times 60 \times 9.8 = 196 \text{ N}$$

47



From the above figure,

Angular velocity of particle P about point A,

$$\omega_A = \frac{v}{r_{AB}} = \frac{v}{2r}$$

Angular velocity of particle P about point C,

$$\omega_C = \frac{v}{r_{BC}} = \frac{v}{r}$$

$$\frac{\omega_A}{\omega_C} = \frac{v/2r}{v/r} = \frac{1}{2}$$

By solving,

48

They do not intersect at all.

49

By using Right hand palm rule or Maxwell's Cork screw rule.

50

$$\text{Resistance, } R = \rho \frac{l}{A}$$

$$\Rightarrow \frac{R_1}{R_2} = \frac{\rho_1}{\rho_2} \times \frac{l_1}{l_2} \times \frac{A_2}{A_1} = \frac{2}{3} \times \frac{3}{4} \times \frac{5}{4} = \frac{5}{8}$$

Chemistry - Solutions

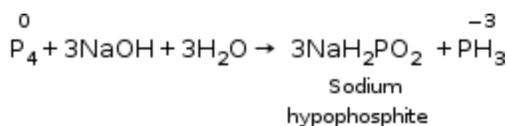
1

In electrolysis process, oxidation occurs at anode whereas reduction occurs at cathode.

2

$\text{CH}_3\text{CH}_2-\text{O}-\text{N}=\text{O}$ is a nitrite derivative, thus it is not nitro derivative.

3



It implies Disproportionation.

4

Decrease

5

Ketones.

6

Terylene

7

Both (a) and (b)

8

The equilibrium constant remains unchanged when concentration of reactant is changed as the concentration of product also get changed accordingly.

9

If a system can exchange only energy with the surrounding but not matter, it is known as a closed system. e.g., water placed in a closed vessel.

10

Discharged

11

Gammexane.

12

 $K_4[Ni(CN)_2(Ox)_2]$ by IUPAC rule.

13

Elements	No. of moles	Simple ratio
C = 83.7%	$83.7/12 = 6.9$	$6.9/6.9 = 1 \times 3 = 3$
H = 16.3%	$16.3/1 = 16.3$	$16.3/0.9 = 2.3 \times 3 = 7$

\therefore Empirical formula = C_3H_7

14

SO_2 bleaches by reduction and chlorine bleaches colour of flowers by oxidation.

15

Because nitrogen equivalent weight is variable

16

Cr^{+3} because of the presence of unpaired electrons.

17

$25^\circ C$ and 1 atm

18

Fructose being ketohexose can not be oxidised by bromine water.

19

Paramagnetic

20

Law of multiple proportions

21

Resins are either amorphous organic solids or semi solids which usually uses a typical luster and are often transparent or translucent.

22

Volume strength of hydrogen peroxide is defined as the term which is used to express the concentration of H_2O_2 with respect to the volumes of oxygen gas based on its decomposition to form water and oxygen.

Normality (N) = 1.5

Equivalent weight of H_2O_2 is 17

Strength of H_2O_2 = Normality \times Equivalent weight

= $1.5 \times 17 = 25.5$

$2H_2O_2 \rightarrow 2H_2O + O_2$

(2×34 g) (22.4 L)

Since 68 grams of H_2O_2 produces 22.4 litres of oxygen at NTP,

therefore, 25.5 grams of H_2O_2 will produce

$$= 22.4/68 \times 25.5 = 8.4 \text{ litre of oxygen}$$

Thus, volume strength of given H_2O_2 solution is 8.4.

23 Ag^+ possess two coordination number and forms complex with excess of CN^- $\text{Ag}(\text{CN})_2$.

24 Thus, the rate is proportional to square of concentration of 'A' as $2^2 = 4$ and $3^2 = 9$

25 Urea acts as a monoacidic base and reacts with nitric acid to form sparingly soluble nitrate.

26 16

27 As the chloride of a metal is MCl_2 , therefore metal 'M' must be divalent means M^{2+} . That's why the formula of its phosphate is $\text{M}_3(\text{PO}_4)_2$.

28 $1s^2 2s^2 2p^2$ It means there are $4e^-$ in valence shell, so it goes to IV- group.

29 Tetraethyl lead is anti-knocking agent and it increases the octane number of the fuel.

30 Reciprocal proportions

31 The element with atomic number 43 is Tc and the element just above this element is $43 - 18 = 25$ which is $\text{Mn}[\text{Ar}]3d^5 4s^2$

32 More neutrons minimize the coulomb repulsion

33 Plot of $[\text{R}]$ vs time is a straight line

34 Enzyme are shape selective specific biological catalyst, normally functioning effectively at body temperature.

35 As we know, $\alpha \propto$ dilution of solution

36

Carbon atom is sp^2 hybridised

37

100% pure ethanol

38

Henry's Law

39

Atomic Number

40

d-block because the last e^- enters in d-subshell.

41

Because it is a weak electrolyte since slightly ionized.

42

Reaction is said to be in equilibrium, when rate of the forward reaction is equal to rate of the backward reaction.

43

Formula of acetamide is CH_3CONH_2 which has single oxygen atom.

44

Ionic compounds being good conductors of heat and electricity are good electrolyte.

45

Element	No. of Moles	Simple ratio
C = 38.8	$38.8/12 = 3.2$	1
H = 16	$16/1 = 16$	5
N = 45.2	$45.2/14 = 3.2$	1

\therefore Empirical formula = CH_5N or CH_3NH_2

46

$Br - CH_2 - CH_2Br$

47

The acid is dibasic.

Molecular weight of $H_3PO_3 = 3 + 31 + 48 = 82$

Thus, Equivalent weight = $\frac{\text{Molecular weight}}{\text{Basicity}} = \frac{82}{2} = 41$.

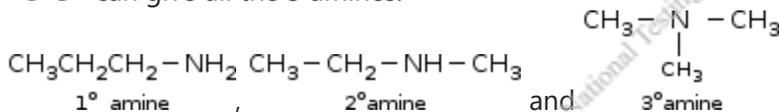
48

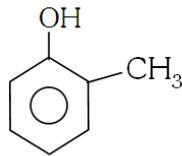
C - Cl bond contains maximum ionic character due to electronegativity difference so it is most stable and have maximum bond energy.

Therefore, order of bond energy is $C - Cl > C - Br > C - I$.

49

C_3H_9N can give all the 3 amines.





Hydroxy toluene

Botany - Solutions

1

Citric acid cycle or tricarboxylic acid (TCA) cycle is also called as Krebs cycle (name given on person who discovered it). Krebs cycle is stepwise oxidative and cyclic degradation of acetyl CoA derived from pyruvate. Dehydrogenase enzyme mediate the conversion of citric acid to α - ketoglutaric acid, succinic acid to Fumaric acid and malic acid to oxaloacetic acid. Oxaloacetate converts into citrate in presence of citrate synthase.

2

Specialised organelles

3

Anaerobic respiration is toxic as accumulation of end product, insufficient amount of available energy and cause stoppage of many active process.

4

Zygote

5

Without chloroplast

6

This happens for the exchange of genetic material during crossing over.

7

It facilitates less expenditure of energy and helps cell to store extra nutrients for rapid embryo development

8

Velamen is a dead spongy tissue of empty cells, which absorbs water present on the surface of these roots.

9

In hydrophytes, sclerenchyma and collenchyma are usually absent.

10

Aerenchyma is one of the characteristics of hydrophytes.

11

Final step required to complete synthesis of lagging strand is for okazaki fragments to be joined together by phosphodiester bond which is carried out by a DNA ligase.

12

Prophase I of meiosis comprises of 5 stages: leptotene, zygotene, pachytene, diplotene and diakinesis. Leptotene is the initial stage of prophase. In this, chromosomes become gradually

visible under the light microscope due to condensation. In zygotene, pairing of homologous chromosomes occur by formation of synaptonemal complexes. Then, pachytene is characterized by occurrence of crossing over. Bivalent chromosomes now clearly appear as tetrads. Diplotene follows pachytene and involves dissolution of synaptonemal complex. Terminalisation of chiasmata is observed in diakinesis.

13 Species diversity on earth is unevenly distributed but shows interesting patterns. It is generally highest in the tropics and decreases towards the poles. Important explanations for the species richness of the tropics are: tropics had more evolutionary time they provide a relatively constant environment and they receive more solar energy which contributes to greater productivity.

14 Nepenthes

15 As monera includes bacteria in which a few are photoautotrophs e.g., green sulphur bacteria, a few are chemoautotrophs e.g., Nitrosomonas and rest are heterotrophs e.g., Bacillus sp.

16 In RNA thymine is substituted with uracil so the RNA strand complementary to DNA strand ATCTG will be UAGAC.

17 Prop roots of Banyan tree helped it spread in an area of 200 acre in Indian Botanic Garden, Sibpur, Harwarach. A single Banyan tree had 1600 prop roots.

18 Ocean

19 NA

20 Intercalary meristems present at leaf bases and above or below the nodes and help in increase in the length of leaves and internodes besides allowing the prostrate stems to become erect. Apical meristems are present at the tips of stems and roots and take part in initial growth or elongation of roots and stems.

Lateral meristems occur on the sides and help in increasing girth of stem and root.

Phellogen is responsible of periderm development.

21 Pollen grains are mostly uniporate with single germ pore in monocots and triporate with three germ pores in dicots.

22 A haploid plant produces male or female gametes by the process of mitosis. In this process, the chromosomal number remains same. Meiosis is not possible because in meiosis chromosome number reduces to half. And in haploid plant $N/2$ chromosome number in gametes will be not feasible.

23

Lateral roots arise endogenously. It means from the cells inside the endodermis. They arise from pericycle cells outside the protoxylem patches, which become meristematic.

- 24 The outer layer of a mature pollen grain is known as exine (which is made up of sporopollenin) and inner to it is intine (made up of pecto-cellulose) respectively. At certain places, exine remains thin and lacks sporopollenin and these areas are termed as germ pores. In pollen germination, pollen tube come out through these pores.
- 25 At tip of the stem
- 26 Euglena
- 27 The main function of chloroplast is photosynthesis, in which radiant energy of sun is converted into chemical form of energy (ATP) and it is utilized by all living organisms to perform their life activities.
- 28 In all living cells water forms 50–80% of total cell contents.
- 29 A photosynthetic unit or photosystem is the smallest group of pigments molecules that take part in a photochemical act or conversion of light energy into chemical energy. It has a photocentre or reaction centre which is fed by about 200 harvesting pigments molecules. The photocentre consists of a dimer of special chlorophyll a molecules. Photosystem I has a chlorophyll reaction centre of maximum absorption (absorption peak) at 700 nm.
- 30 Golgi body and ER are reformed
- 31 Wheat and rye
- 32 Parts of the same gene
- 33 Cuscuta
- 34 Anaerobic to aerobic
- 35 Standing crop refers to the total amount of living material in a specified population at a particular time, expressed as biomass (standing biomass) or its equivalent in terms of energy. The standing crop may vary at different times of the year; for eg. in a population of deciduous trees between summer and winter.
- 36 Second level of plant organisation

- 37 Chlorophyll-a
- 38 Cell was invented by Robert Hooke in 1665, as he observed tiny cavities bounded by definite walls in the sections of cork.
- 39 Endotoxin
- 40 Salmonella
- 41 Growth is a physiological process of irreversible increase in size, dry weight as well as volume of an organism.
- 42 Test cross
- 43 Accelerates growth
- 44 D-Synthetic phase
- 45 Plants are autotrophs because they can synthesize their own food material in presence of light.
- 46 Allopolyploidy has triticale is an example. Polyploidy is the phenomenon of having more than two sets of chromosomes or genomes. Allopolyploidy has developed through hybridization between two species followed by doubling of chromosomes. Triticale is the first man-made allopolyploid developed by crossing wheat (*Triticum turgidum*) and rye (*Secale cereal*).
- 47 Available food
- 48 One chromosome forms one chromosome group in metaphase-I after splitting of tetravalent condition.
- 49 NAA (α -Naphthalene acetic acid) and 2, 4 D (2, 4 dichlorophenoxy acetic acid) are synthetic auxins. Usually, auxins inhibit flowering. In lettuce, it delays flowering and the plants can be kept in their vegetative phase for longer periods of time. In litchi and pineapple, so, application of auxin promotes flowering.
- 50 The chloroplasts are the most common type of plastids and are biologically important organ as they provide food to all organisms by the process of photosynthesis. Chlorophyll are the pigments located on thylakoid membranes of chloroplast and take part in absorption of light energy to carryout the process of photosynthesis.

Zoology - Solutions

1

Polar bodies are smaller cells produced during oogenesis which do not develop into egg cells.

2

Renin

3

The actin filament slides over the myosin filament by reducing 'A' band and 'H' zone.

4

Sea lily belongs to class crinoidea of phylum echinodermata. Echinoderms possess both endoskeleton and exoskeleton. The endoskeleton contains calcareous plates or ossicles while exoskeleton contains spines and pedicellariae.

5

Sympathetic and parasympathetic nerves and is under involuntary action

6

Treponema pallidum

7

joins the sclerites

8

Jellyfish and starfish - Radial symmetry

9

O individuals produce neither A nor B antigen, but have both type of antibodies. Hence, their blood can be transfused into any recipient.

10

Cedrus

11

Endocrine system achieves co-ordination as well as integration for slow and persistent responses of body by transmitting information through chemical messenger (Hormone). These are released in blood circulate in whole body and regulate such persistent activities as metabolism, growth etc.

12

auto immune response

13

Lipase enzyme helps in removing oil stains from clothes. A large number of microorganisms are capable of using natural oils and fats as carbon source for their growth. Some microorganisms like *Candida cylindracea*, *Candida rugose*, *Aspergillus niger* etc. have been reported for extracellular lipase production. This microbial lipases are used to remove oil stains from clothes.

14

The hypothesis of abiogenesis was experimentally disproved by the supporters of biogenesis like F. Redi, Spallanzani, L. Pasteur etc.

15

Hormone produced in placenta is URF

16

Totipotency is ability to develop into a complete plant. Plants in comparison to animals are rapidly manipulated by genetic engineering methods due to this totipotency shown by the plants and also because that these genetic engineering methods are supplemented with PTC techniques either to increase their efficiency or to be able to achieve to objective, which is not possible through the conventional methods.

17

One thin filament probably has 300–400 actin molecules about 50 tropomyosin and 50 troponin. Tropomyosin plays a vital role in sensitizing the contractile proteins (actin and myosin) to calcium ions.

18

Nitrogenous waste in the Malpighian tubule flows into intestine. Malpighian tubules are long very fine unbranched and yellow coloured blind tubules attached at the junction of mid and hind-gut. These tubules extract metabolic wastes such as potassium and sodium urate, water and carbon dioxide from the blood which are carried to the alimentary canal (intestine) of the insect and are finally passed out through anus.

19

None of these

20

Osmotic balance

21

Deposition of crystallized chemical lead to kidney stone such as uric acid, calcium oxalate and calcium phosphate.

22

Population explosion is rapid increase in population over a relatively short period of time. Option 2 is correct as reasons for population explosion are increased health facilities, decrease in MMR (Maternal Mortality Rate), and IMR (Infant Mortality Rate) and increase in number of people reaching reproductive age.

23

S. cerevisiae is Baker's / brewer's yeast.

24

Second maxillae

25

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

26

Half of the vertebrate pelvic girdle contains 3 bones ilium, ischium and pubis which fuse together in adult to be termed in nominate bone (hip bone).

- 27 Uric acid
- 28 Fructose is the most common form of sugar and is the sweetest among naturally occurring sugars. It has sweetening index of 170 (where as the sweetening index of glucose is 70).
- 29 Mitochondria and 9+2 arrangement of microtubules
- 30 Secondary structures
- 31 With deep inspiration and forcible expiration
- 32 Mutualism, protocooperation, commensalism cannot be included under Symbiosis
- 33 Neisseria
- 34 Corresponding antibodies which are normally absent in human blood, develops when Rh⁺ blood is transfused to Rh⁻ recipient, leading to agglutination and even may lead to death.
- 35 Asthma may lead to allergic reaction of the mast cells in the lungs. It is an allergic condition in which the tissue surroundings the bronchioles of the lungs swell up and compress the bronchioles thus causing difficulty in breathing and this allergy mainly involves IgE antibodies and chemicals like histamine and serotonin from the mast cells.
- 36 Haemodialysis is a treatment for those patients whose kidneys cannot function anymore and it is the process of diffusion across a semi-permeable membrane to remove unwanted substances from the blood while adding desirable components. It helps in removal of waste products such as free water, urea, creatinine from blood.
- 37 Inulin is a polymer of fructose unit. It is a storage polysaccharide of roots and tubers of Dahlia and related plants.
- 38 Initiates the conversion of glycogen to glucose is not the function of insulin. Insulin is a protein hormone, secreted in pancreas by the beta cells of the islets of Langerhans that is important for regulating the amount of glucose in the blood. Insulin converts glucose into glycogen in the liver and muscles. Deficiency of insulin is responsible for causes diabetes mellitus.
- 39 Filum terminale

40

The process of exchange of O_2 from the atmosphere with CO_2 produced by the cells is known as gaseous exchange. The diffusion of gases from an area of higher concentration to an area of lower concentration, especially the exchange of O_2 and CO_2 between the living cells of an organism and its environment, is known as gaseous exchange. In plants, gaseous exchange occurs during photosynthesis and respiration whereas in animals, gaseous exchange occurs during respiration.

41

transcription initiation

42

Nasal = 2
 Maxillae = 2
 Zygomatic = 2
 Mandible = 1
 Lacrimal = 2
 Palatines = 2
 Inferior chonchae = 2
 Vomer = 1
 i.e. Total no. of bones = 14

43

Coacervate

44

In specific industries, especially those involving grinding or stone breaking so much dust is produced that the defense mechanism of the body cannot fully defended with the situation. Long exposure can give rise to inflammation leading to fibrosis (proliferation of fibrous tissues) and thus causing serious lung damage. Workers in such industries should wear protective masks.

45

Theca interna

46

cytokines

47

All the fluids outside the cells are collectively termed the extracellular fluid. The extracellular fluid is mainly present as interstitial fluid and plasma and the interstitial fluid surrounds each cell. The plasma is the noncellular part of the blood and communicates continuously with the interstitial fluid through the pores of the capillary membranes.

48

Trachea is lined with a pseudo stratified ciliated epithelium that helps in pushing mucus out.

49

Acetylcholine is the primary neurotransmitter at the neuromuscular junction. As a nerve impulse reaches the terminal end of the axon, small sacs known as synaptic vesicles fuse with the axon membrane and release a chemical transmitter, acetylcholine. Acetylcholine diffuses across the

synaptic cleft (the space between the axon membrane and the motor end plate) and binds to receptor sites of the motor end plate.

50

Nissl's granules are found only in cyton as well as Dendron of nerve cell.