Physics

1

_____ is not a contact force.

1	Buoyant force
2	Magnetic force
3	Friction
4	Viscous force

2

Determine the magnetic induction in air at a distance 'd' from an isolated point pole of strength 'm' unit.

1	md
2	md^2
3	$\frac{m}{d}$
4	$\frac{m}{d^2}$

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3

An electron is moving round the nucleus of a hydrogen atom in a circular orbit of radius 'r'. What is the coulomb force $\vec{F}$ between the two? (where $K = \frac{1}{4\pi\varepsilon_0}$)

1 $K\frac{e^2}{r^2}\hat{r}$

2 $-K\frac{e^2}{r^3}\vec{r}$

3 $K\frac{e^2}{r^3}\vec{r}$

4 $-K\frac{e^2}{r^3}\hat{r}$

4

An aeroplane is moving with 150 m/s. At the height 80 m, a bomb is dropped from it so as to hit a target. Calculate the distance from which the bomb should be dropped on the target. (Given: g = 10 m/s^2)

1 80 m

2 230 m

3 600 m

4 605.3 m

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5

A particle moves along a semicircle of radius 10 m in 5 seconds. What is the average velocity of the particle?

1	$4\ ms^{-1}$
2	$2\pi\ ms^{-1}$
3	$2\ ms^{-1}$
4	$4\pi\ ms^{-1}$

6

Determine the gravitational force between 2 stones of mass 1 kg each separated by a distance of 1 metre in vacuum.

1	6.675×10^{-11} newton
2	6.675×10^{-8} newton
3	6.675×10^{-5} newton
4	Zero

7

A student is standing at a distance of 50 metres from the bus. As the bus begins its motion with an acceleration of 1 ms^{-2}, the student starts running towards the bus with a

uniform velocity u. Assuming the motion to be along a straight road, evaluate minimum value of u, so that the student is able to catch the bus.

1	5 ms^{-1}
2	10 ms^{-1}
3	15 ms^{-1}
4	20 ms^{-1}

8

A scooter is going round a circular road of radius 100 m at a speed of 10 m/s. The angular speed of the scooter will be

1	10 rad/s
2	1 rad/s
3	0.1 rad/s
4	0.01 rad/s

9

Two charges q_1 and q_2 are kept in vacuum at a distance 'd' and the force acting between them is F. If a medium of dielectric constant 4 is introduced around them, then what will be the force?

1	$\frac{F}{4}$
2	$\frac{F}{2}$
3	2F
4	4F

10

When the interatomic spacing in a steel wire is 3.0 Ã... and $Y_{steel}=20\times10^{10}\ N/m^2$, then find the force constant.

1	$4\times10^{-5}\ N/\mathring{A}$
2	$6\times10^{-5}\ N/\mathring{A}$
3	$6\times10^{-2}\ N/\mathring{A}$
4	$6\times10^{-9}\ N/\mathring{A}$

11

Evaluate the work done in blowing a soap bubble of 10 cm radius. (Surface tension of the soap solution = $\frac{3}{100}N/m$)

1	75.36 Joule

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2	150.72 x 10^{-4} Joule
3	75.36 x 10^{-4} Joule
4	37.68 x 10^{-4} Joule

12

Molecular weights of O_2 and N_2 are 32 and 28. At 15°C the pressure of 1 gm O_2 will be same as that of 1 gm N_2 in the same bottle at the temperature equal to:

1	56.4°C
2	15°C
3	13°C
4	- 21°C

13

When the radius and length of a copper rod both are doubled, then evaluate the increase in the rate of flow of heat along the rod.

1	16 times
2	8 times

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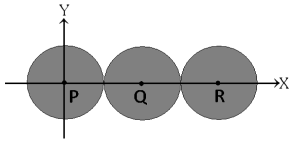
3	2 times
4	4 times

14

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



1	$\frac{PQ+QR}{3}$
2	$\frac{PR+QR}{3}$
3	$\frac{PQ+PR}{3}$
4	$\frac{PQ+PR+QR}{3}$

15

A block of mass 1 kg is placed, on the horizontal surface of a truck (μ = 0.6). If the truck is accelerating at the rate of 5m/s^2, then what will be the frictional force on the block?

1	8 N
2	6 N

3	5.88 N
4	5 N

16 What do the ozone layer absorb?

1	Y-rays
2	X-rays
3	Ultraviolet radiations
4	Infrared radiations

17 If a 50 kg man with 20 kg load on his head climbs up 20 steps of 0.25 m height each. Then how much work is done in climbing?

1	3430 J
2	350 J
3	100 J

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4	5 J

18 At NTP the mass of 1 litre of air is 1.293 gm. Find the value of specific gas constant.

1	16.5 J/K-g
2	8.3 J/K-g
3	4.2 J/K-g
4	0.29 J/K-g

19 A man is standing between 2 parallel cliffs and fires a gun. If he hears first and second echoes after 1.5 s and 3.5 s respectively, then how much distance is there between the cliffs? (Velocity of sound in air=340 ms^{-1})

1	850 m
2	510 m
3	595 m
4	1190 m

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20

If L, C and R denote the inductance, capacitance and resistance respectively, then what is the dimensional formula for C^2LR?

1 $[M^{-1}L^{-2}T^{6}I^{2}]$

2 $[M^{0}L^{0}T^{2}I^{0}]$

3 $[ML^{-2}T^{-1}I^{0}]$

4 $[M^{0}L^{0}T^{3}I^{0}]$

21

In a hydrogen atom, an electron moves in a circular orbit of radius 5.2×10^{-11} m and produces a magnetic induction of 12.56 T at its nucleus. The current produced by the motion of the electron will be (Given, $\mu_0 = 4\pi\times10^{-7}$ Wb / A – m)

1 1.04×10^{-3} ampere

2 9.6×10^{6} ampere

3 13.25×10^{-10} ampere

4 6.53×10^{-3} ampere

22

A slab consists of 2 parallel layers of 2 different materials of same thickness having thermal conductivities K_1 and K_2. Determine the equivalent conductivity of the combination.

1	$\frac{K_1+K_2}{2K_1K_2}$
2	$\frac{2K_1K_2}{K_1+K_2}$
3	$\frac{K_1+K_2}{2}$
4	K_1+K_2

23

The maximum velocity of a particle executing simple harmonic motion with an amplitude 7 mm is 4.4 m/s. What is the time period of oscillation?

1	0.1 s
2	0.01 s
3	10 s
4	100 s

24

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If μ_k is the coefficient of kinetic friction, μ_r is the coefficient of rolling friction and μ_s is the coefficient of static friction, then find the correct relation between them.

1	$\mu_s > \mu_k > \mu_r$
2	$\mu_s < \mu_k < \mu_r$
3	$\mu_s > \mu_r > \mu_k$
4	$\mu_s < \mu_r < \mu_k$

25

What should be the angle between the element and the line joining the element to the given point for the magnetic field to be maximum due to a small element of current carrying conductor at a point?

1	180°
2	90°
3	45°
4	0°

26

The radius of an air bubble at the bottom of the lake is 'r' and it becomes 2r when the air bubbles rises to the top surface of the lake. If P cm of water is the atmospheric pressure,

then find the depth of the lake.

1	8p
2	7p
3	4p
4	2p

27

The ratio of the weight of a man in a stationary lift and if it is moving downward with uniform acceleration 'a' is 3:2, then evaluate 'a'. (g = Acceleration due to gravity of the earth)

1	g
2	$\frac{g}{3}$
3	$\frac{2}{3}g$
4	$\frac{3}{2}g$

28

Three liquids of densities d, 2d and 3d are mixed in equal proportions of weights. Find the relative density of the mixture.

1 $\frac{23d}{18}$

2 $\frac{18d}{11}$

3 $\frac{13d}{9}$

4 $\frac{11d}{7}$

29 A vertical column 50 cm long at 50° C balances another column of same liquid 60 cm long at 100° C. What is the coefficient of absolute expansion of the liquid?

1 0.0002/°C

2 0.0005/°C

3 0.005/°C

4 0.002/°C

30 The free fall acceleration decreases at what height over the earth's pole, by one percent? (Take the radius of earth to be 6400 km)

1 1.253 km

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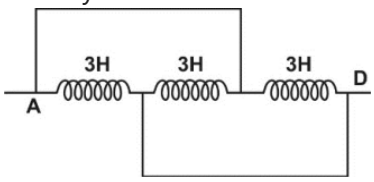
2	32 km
3	64 km
4	80 km

31

Identify the inductance between A and D as shown in figure.



1	9 H
2	1 H
3	0.66 H
4	0.99 H

32

Find the work done against gravity on lifting 10 kg mass at 1m height in 1s.

1	196 J

2	98 J
3	49 J
4	None of these

33

If R = universal gas constant, calculate the amount of heat needed to raise the temperature of 2 mole of an ideal monoatomic gas from 273 K to 373 K when no work is done.

1	500 R
2	300 R
3	150 R
4	100 R

34

Instantaneous displacement of a simple pendulum oscillator is given by $x = A\cos\left(\omega t + \frac{\pi}{4}\right)$. Determine the time at which its speed will be maximum.

1	$\frac{2\pi}{\omega}$
2	

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	$\frac{\pi}{\omega}$
3	$\frac{\pi}{2\omega}$
4	$\frac{\pi}{4\omega}$

35

A point source emits sound equally in all directions in a non-absorbing medium. Two points P and Q are at distance of 2 m and 3 m from the source. What is the ratio of the intensities of the waves at P and Q?

1	4:9
2	9:4
3	2:3
4	3:2

36

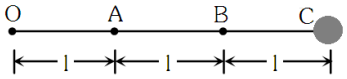
An electron (charge = 1.6Ã—10^{-19} coulomb) is moving in a circle of radius 5.1Ã—10^{-11} m at a frequency of 6.8Ã—10^{15} revolutions/s. Calculate the approximate equivalent current.

1	1.1×10^{-3} A
2	2.2×10^{-3} A

3	5.1×10^{-3} A
4	6.8×10^{-3} A

37

Following figure shows 3-identical particles joined together by a thread. All the 3-particles are moving in a horizontal plane. If the velocity of the outermost particle is v_0, then find the ratio of tensions in the 3-sections of the string.



1	3:4:5
2	3:5:6
3	3:5:7
4	7:11:6

38

What is the component of vector $A = 2\hat{i} + 3\hat{j}$ along the vector $\hat{i} + \hat{j}$?

1	10
2	$5\sqrt{2}$
3	

	$\frac{5}{\sqrt{2}}$
4	5

39

The separation between the nuclei of the two atoms is about $1.27A^0$.($A^0 = 10^{-10}$ m) in the HCl molecule. Determine the approximate location of the centre of mass of the molecule, assuming the chlorine atom is about 35.5 times massive as hydrogen.

1	1 A^0
2	1.24 A^0
3	1.5 A^0
4	2.5 A^0

40

What is the magnitude of drift velocity per unit electric field?

1	Current
2	Current density
3	Mobility

4 Resistivity

41 Match List-I with List-II and select the correct answer by using the codes given below the lists

A) Distance between earth and stars
B) Inter atomic distance in a solid
C) Size of the nucleus
D) Wave length of infrared laser
V) Kilometer

I) Micron
II) Angstrom
III) Light year
IV) Fermi

1 A-3 B-2 C-5 D-1

2 A-4 B-5 C-2 D-1

3 A-3 B-5 C-1 D-2

4 A-4 B-2 C-5 D-3

42 Temperature is a measurement of coldness or hotness of an object. This definition is based on which law?

1	Newton's law of cooling
2	Second law of thermodynamics
3	First law of thermodynamics
4	Zeroth law of thermodynamics

43

An ac source is rated at 220 V, 50 Hz. How much time is taken for voltage to change from its peak value to zero?

1	5×10^{-3} s
2	5 s
3	0.02 s
4	50 s

44

Electron starting from rest has a velocity that increases linearly with the time that is $v = kt$, where $k = 2m/s^2$. Find out the distance travelled in the first 3 seconds.

1	5 m

2	9 m
3	15 m
4	27 m

45

Temperature of a body on Kelvin scale is found to be 'x' K. When it is measured by Fahrenheit thermometer, it is found to be x°F, then what is the value of 'x'?

1	574.25
2	313
3	301.25
4	40

46

A wire of length L and radius 'r' is rigidly fixed at one end. On stretching the other end of the wire with a force F, the increase in its length is 'l'. If another wire of same material but of length 2L and radius 2r is stretched with a force of 2F, then determine the increase in its length.

1	$\frac{l}{4}$

2	$\frac{I}{2}$
3	I
4	2I

47 What is the resultant if a drop of water is dropped on oil surface?

1	It will deform
2	It will mix up with oil
3	It remains spherical
4	It spreads in the form of a film

48 A lift accelerated downward with acceleration 'a' and a boy in the lift throws a ball upward with acceleration $a_0 (a_0 < a)$. State the acceleration of ball observed by observer on earth.

1	$(a + a_0)$ upward
2	$(a + a_0)$ downward

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3	$(a - a_0)$ upward
4	$(a - a_0)$ downward

49 Name the most suitable material for making permanent magnet.

1	Nickel
2	Copper
3	Soft iron
4	Steel

50 The three vectors $\vec{A} = 3\hat{i} - 2\hat{j} + \hat{k}$, $\vec{B} = \hat{i} - 3\hat{j} + 5\hat{k}$ and $\vec{C} = 2\hat{i} + \hat{j} - 4\hat{k}$ give:

1	An isosceles triangle
2	No triangle
3	An equilateral triangle

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4	A right angled triangle

Chemistry

1

Temperature coefficient for the reaction in which food deteriorates is 2. Then food deteriorates ____ times as rapidly at $25^{\circ}C$ as it does at $5^{\circ}C$.

1	four
2	two
3	six
4	twenty

2

$$R-CH=CH_2+CO+H_2 \xrightarrow[\text{High Pressure}]{\text{High Temp}} RCH_2CH_2CHO$$

Above reaction shows

1	Oxo process
2	Sandorn's reaction
3	Mendius reaction

4	Stephen's reaction

3

Conjugate base in the given reaction $H_2SO_4 + H_2O \rightleftharpoons H_3O^+ + HSO_4^-$ is

1	SO_2
2	H_3O^+
3	HSO_4^-
4	H_2O

4

Find from the following that is not isoelectronic with others.

1	Cl^-
2	O^{2-}
3	Mg^{2+}
4	Na^+

5

Which of the following possess highest melting point?

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1 CsCl

2 RbCl

3 NaCl

4 KCl

6 Which one of the following is not a mixed ketone?

1 Acetophenone

2 Pentan-3-one

3 Benzophenone

4 Butanone

7 The 3d elements show variable oxidation states as the energies of the following sets of orbitals are almost same

1 np, $(n-1)d$

2	$(n-1)s$, nd
3	ns, nd
4	ns, $(n-1)d$

8

Which reaction occurs at anode during the electrolysis of fused NaCl

1	Sodium ions are reduced
2	Sodium ions are oxidized
3	Chloride ions are reduced
4	Chloride ions are oxidized

9

60 g of a compound on analysis gave $C = 24$ g, $H = 4$ g and O = 32 g. What is its Empirical formula?

1	C_2H_2O
2	$C_2H_4O_2$
3	CH_2O

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4	CH_2O_2

10

By donating 1 electron, hydrogen forms H^+. In this property, it resembles with

1	halogens
2	alkali metals
3	alkaline earth metals
4	transitional metals

11

The chemical formula of diammine silver (I) chloride is

1	$[Ag(NH_3)_2]Cl$
2	$[Ag(NH_4)_2]Cl$
3	$[Ag(NH_3)]Cl$
4	Non of these

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12

When H_2S reacts with halogens, the halogens

1. are reduced
2. form sulphur halides
3. are oxidized
4. none of these

13

An atom of sodium loses one electron and chlorine atom accepts one electron. This result the formation of sodium chloride molecule. The molecule is formed by _____.

1. metallic bond
2. electrovalent
3. covalent
4. coordinate

14

____ is non-electrolyte.

1 $CaCl_2$

2 NaCl

3 CH_3COOH

4 $C_{12}H_{22}O_{11}$

15 Which of the following is not fatty acid?

1 Phenyl acetic acid

2 Oleic acid

3 Palmitic acid

4 Stearic acid

16 Which of the following possess highest density?

1 Hg

2 Pb

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3	Os
4	Ir

17 Identify $\alpha-D-$ glucopyranosyl-$(1\rightarrow 2)-\beta-D-$ fructofuranoside.

1	Sucrose
2	Maltose
3	Starch
4	Lactose

18 Which of the following is Gem-dibromide?

1	CH_2BrCH_2Br
2	$CH_2(Br)CH_2CH_2$
3	$CH_3CBr_2CH_3$
4	$CH_3CH(Br)OH(Br)CH_3$

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19 During electrolysis, amount of ion discharged is not directly proportional to

1. current
2. chemical equivalent of the ion
3. time
4. resistance

20 Vinegar is

1. CH_3COOH
2. CH_3CHO
3. HCOOH
4. HCHO

21 What is the concentration if 5.0 gm of $BaCl_2$ is present in 10^6 gm solution?

1	1000 ppm
2	50 ppm
3	5 ppm
4	1 ppm

22

What will be the molarity of a solution containing 5g of sodium hydroxide in 250 ml solution?

1	2.2
2	1.0
3	0.5
4	0.1

23

In Carius method of estimation of halogen 0.15 g of an organic compound gave 0.12 g of AgBr. _____ is the percentage of bromine in the compound.

1	50%

2	34.04 %
3	42.1%
4	68.08 %

24

$SnCl_2$ gives a precipitate with a solution of $HgCl_2$. $HgCl_2$ is ____ in this process.

1	oxidized
2	reduced
3	converted into a complex compound containing both Sn and Hg
4	converted into a chloro complex of Hg

25

Complete the sentence: The efficiency of a heat engine is maximum when

1	temperature of sink is greater than that of source
2	temperature of source is greater than that of sink
3	temperature difference of source and sink is minimum

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4	temperature difference of source and sink is maximum

26 Acetonitrile is :

1	$C_6H_5CH_2CN$
2	CH_3COCN
3	CH_3CN
4	C_2H_5CN

27 Which one of following is phenolic?

1	Phthalic acid
2	Picric acid
3	Phosphoric acid
4	Phenylacetic acid

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28

_____ is zero for an isochoric process.

1	dE
2	dT
3	dV
4	dP

29

What does the atomic number of elements represents?

1	Number of neutrons in the nucleus
2	Number of protons in the nucleus
3	Number of protons and neutrons in nucleus
4	The valency of an element

30

To which of the following block, transition metals are related?

1	d-block

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2	s-block
3	p-block
4	None of these

31 Which will have the highest boiling point in in the following substances?

1	$CHCl_3$
2	NH_3
3	CsF
4	He

32 Which reaction characteristics change by the addition of a catalyst to a reaction at constant temp.
(1) Activation energy (2) Equilibrium constant
(3) Reaction entropy (4) Reaction enthalpy

1	(1) and I (2) only
2	(1) Only

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3	(3) only
4	All of these

33 Which of the following is a branched polymer?

1	Nylon
2	Low density polymer
3	Polyester
4	High density polymer

34 One liter of a gas at STP weighs 1.16 g is possible only in ____.

1	CH_4
2	O_2
3	CO
4	C_2H_2

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35 Which of the following statement is not true concerning alkanes?

1. All alkanes have a lower density than water
2. Large number alkanes are soluble in water
3. At room temperature some alkanes are liquids, some solids and some gases
4. All alkanes burn

36 Number of gram molecules of a substance present in unit volume is defined as

1. activity
2. molar concentration
3. active mass
4. both (2) & (3)

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37 Which of the following is the example of hexadentate ligand?

1	Aminodiacetate ion
2	Ethylene diammine tetra acetate ion [EDTA]
3	Dimethyl glyoxime
4	2, 2-dipyridyl

38 Find the compound, which exist in a dipolar (zwitterion) state.

1	$HOOC.CH_2CH_2COCOOH$
2	$C_6H_5CONHCH_2COOH$
3	$(CH_3)_2CH.CH(NH_2)COOH$
4	$C_6H_5CH_2CH(N=CH_2)COOH$

39 Rate at which substances react depends on their

1	active mass

2	equivalent weight
3	atomic weight
4	molecular weight

40 Which of the following reactions form $RCONH_2$?

1	$(RCO)_2O + NH_3 \longrightarrow$
2	$R - COCl + NH_3 \longrightarrow$
3	$RCOONH_4 \xrightarrow{heat}$
4	Both (2) and (3)

41 The dinegative anion which is quite common is:

1	O^{2-}
2	Te^{2-}
3	Se^{2-}

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4	S^{2-}

42 Benzyl alcohol is made from benzaldehyde by

1	Kolbe's reaction
2	Wurtz's reaction
3	Fittig's reaction
4	Cannizaro's reaction

43 Generally, the chlorobenzene is prepared from a corresponding diazonium salt by reacting it with

1	$Cu(NH_3)_4^{2+}$
2	Cu
3	$CuSO_4$
4	Cu_2Cl_2

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44

A monoprotic acid in 1.00 M solution is 0.01% ionized. What is the dissociation constant of this acid?

1	1×10^{-4}
2	10^{-5}
3	1×10^{-6}
4	1×10^{-8}

45

Which of the following is naturally occurring polymer?

1	Protein
2	Acetic acid
3	PVC
4	Polythene

46

"The resultant heat change in a reaction is the same whether it takes place in one or several stages." This statement is known as

1	Joule's law

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2	Le-chatelier's principle
3	Hess's law
4	Lavoisier and Laplace law

47 _____ is most likely to form an ionic bond.

1	H and Cl
2	H and O
3	H and N
4	Na and Cl

48 Find from the following that shows only one brominated compound.

1	2, 2-dimethylpropane
2	Butene-2

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3	Butyne-1
4	Butanol-3

49 The telluric helix was proposed by

1	Newlands
2	de Chancourtois
3	L. Meyer
4	Mendeleev

50 A mixture of 0.3 mole of H_2 and 0.3 mole of I_2 is allowed to react in a 10 litre evacuated flask at $500^{\circ}C$. The reaction is $H_2 + I_2 \rightleftharpoons 2HI$, the K is found to be 64. Find the amount of unreacted I_2 at equilibrium.

1	0.03 mole
2	0.06 mole
3	0.15 mole

4	0.2 mole

Botany

1 In _____, all cells of sex organs are produced gametes.

1	bryophyta
2	algae
3	pteridophyta
4	gymnosperm

2 In Ipomoea batatas/Sweet potato the food is stored in_____.

1	root tuber
2	stem tuber
3	leaves
4	bud

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3

In which plant, roots play insignificant role in absorption of water?

1. Pea
2. Wheat
3. Pistia
4. Sunflower

4

Which one of the following does not require carrier molecules during transport through cell membranes?

1. Facilitated diffusion
2. Simple diffusion
3. Na^{+} -K^{+} transport
4. Active transport of sugars and amino acids

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5

Which of the following is absolutely essential for germination?

1	Light
2	Water
3	Mineral salts
4	Low temperature

6

Some pure black mice were mistakenly mixed with hybrid black mice. Find the quickest way to discover whether one individual black mouse is pure.

1	To cross it with a known hybrid black mouse and all the offsprings must be black or brown mice in equal numbers
2	To cross it with a pure brown mouse and all the offsprings must be black or brown in equal numbers
3	To cross it with a brown mouse and all the offsprings must be black
4	To cross it with pure black mouse and all the offsprings must be black

7

Eukaryotic cells differ from prokaryotic cells in having_____

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1 nuclear membrane

2 cell wall

3 ribosome

4 none of these

8 Which one of the following represents the correct sequence of relative sizes in descending order?

1 Cell, nucleus, water molecule, chromosome, oxygen atom

2 Chromosome, cell, nucleus, water molecule, oxygen atom

3 Cell, nucleus, water molecule, oxygen atom, chromosome

4 Cell, nucleus, chromosome, water molecule, oxygen atom

9 Which organism are PPLO?

1 Bacteria

2	Mycoplasma-like
3	Viroid
4	Virus

10

Read the following four statements (A-D).
(a) Colostrum is recommended for the new born because it is rich in antigens
(b) Chikungunya is caused by a Gram negative bacterium
(c) Tissue culture has proved useful in obtaining virus-free plants
(d) Beer is manufactured by distillations of fermented grape juice.
What is the count of wrong statements?

1	Two
2	Three
3	One
4	Four

11

Match the following columns.

A. Chlorophyll a (i) yellow

B. Chlorophyll b (ii) bright or blue green

C. Xanthophyll (iii) deep orange

D. carotene (iv) yellow green

1	A-(ii), B-(iv), C-(i), D-(iii)
2	A-(iii), B-(iv), C-(ii), D-(i)
3	A-(iv), B-(ii), C-(i), D-(iii)
4	A-(iv), B-(iii), C-(ii), D-(i)

12 In ____, fertilization cannot occur in absence of surface water.

1	Funaria
2	Marsilea
3	Fucus
4	All of these

13 In fermentation, yeast secrets _____ enzyme.

1	anolase

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2	invertase
3	zymase
4	dehydrogenase

14 Which of the following structure is not found in the leaves of a bean plant?

1	Chloroplast
2	Guard cell
3	Phloem
4	Lenticel

15 Membrane protein

1	Works as recipient for informal moelcules
2	Works as recipient for transportation

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3	Helps in cell recognisation
4	Does all the above works

16 Where does the asexual reproduction take place?

1	In plants
2	In higher animals
3	In lower animals
4	All the above

17 Characteristic of _____ is pigment phycoerythrin.

1	green algae
2	brown algae
3	red algae
4	blue green algae

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18 Primary growth of a tree occurs

1. Through the activities of apical meristems
2. Through the activity of a vascular cambium
3. Only in the first year of the tree's life
4. Through the activity of the root cap

19 Roots produced from plant parts other than radicle are

1. Epicaulous
2. Epiphyllous
3. Adventitious
4. Fibrous

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20 Meristematic activity takes place at

1. Bud
2. Stem apex
3. Root hair
4. Leaf

21 If plant (producers) of an ecosystem die, then what will be the effect on the system?

1. Is not much affected
2. Is seriously affected
3. Can have more producers
4. Cannot produce food

22 Amoeba is eukaryotic as it possesses _____.

1. plasmalemma

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2	plasmid
3	nucleus
4	DNA

23 By which of the following double fertilization is exhibited?

1	Algae
2	Angiosperms
3	Fungi
4	Gymnosperms

24 Naked DNA is _____.

1	not associated with histone proteins
2	associated with histone proteins

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3	present in cytoplasm
4	not covered by nuclear envelope

25 In DNA molecule, which one of the following base pair is present

1	Cytosine and thymine
2	Adenine and guanine
3	Adenine and thymine
4	Cytosine and adenine

26 Collenchyma tissue is represented by

1	Elongated cells with thickening at the corners
2	Isodiametric cells with thickening all over the walls
3	Elongated cells with deposits of cellulose and pectin all over the walls
4	Isodiametric cells with deposits of cellulose and pectin at the corners

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27

Constancy of the chromosome number in successive generations is brought by which of the following process?

1. Meiosis
2. Mitosis
3. Conjugation
4. None of these

28

In photosynthesis, oxygen is liberated because of

1. Hydrolysis of carbohydrate
2. Reduction of carbon dioxide
3. Photolysis of water
4. Breakdown of chlorophyll

National Testing Platform

29 Chromonemata start associating into bivalent chromosomes during

1	Leptotene
2	Zygotene
3	Pachytene
4	Diplotene

30 What is the function of ABA?

1	Apical dominance
2	Growth inhibition
3	Seed germination
4	Cell division

31 Point out the correct statement.

1	Chromosomes are arranged along the equator during prophase of mitosis.

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2 During mitosis endoplasmic reticulum and nucleus disappear completely at early prophase.

3 Chromosome is made up of two sister chromatids at anaphase of mitosis.

4 Small disc shaped structures at the surface of the centromeres that appear during metaphase are kinetochores.

---

32 The distribution of species diversity on earth is may be best described by which of he following way?

1 It is highest in polar regions

2 It is highest in tropics

3 It is uniformally distributed

4 It is highest in Southern hemisphere and lowest in Northern hemisphere

---

33 Zygotic meiosis is a characteristic of:

1 Marchantia

2	Fucus
3	Funaria
4	Chalmydomonas

34 Anther wall contains four wall layers where ____.

1	tapetum lies just inner to endothecium
2	middle layers lie between endothecium and tapetum
3	tapetum lies next to epidermis
4	endothecium lies inner to middle layers

35 Which of the following is not true for nutrition in Amoeba?

1	Photoautotroph
2	Holozoic nutrition
3	Omnivorous

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4	Pseudopodia feeder

36 _____ is used for crop improvement.

1	Inbreeding
2	Hybridization
3	Introduction
4	All of these

37 _____ is iron porphyrin coenzyme or cofactor.

1	FAD
2	Cytochrome
3	CoA
4	NAD

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38 The spindle fibre contracts in which phase?

1. Anaphase II
2. Metaphase I
3. Prophase II
4. Telophase II

39 In which of the following plant root cap is largest?

1. Banyan
2. Pandanus
3. Maize
4. Jussiaea

40 The energy currency of the cell is

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1	AMP
2	ADP
3	Phosphate
4	ATP

41

The chemiosmotic coupling hypothesis of oxidative phosphorylation proposes that adenosine triphosphate (ATP) is formed as

1	a proton gradient forms across the inner mitochondrial membrane
2	there is change in the permeability of the inner mitochondrial membrane towards adenosine diphosphate (ADP)
3	ADP is pumped out of the matrix into the intermembrane space
4	high energy bonds are formed in mitochondrial proteins

42

Cells in which phase of cell cycle are least susceptible to radiation damage?

1	G_2

2	M
3	G_1
4	S

43 Anaerobic respiration occur in the

1	ER
2	Lysosomes
3	Mitochondria
4	Cytoplasm

44 Methyl guanosine triphosphate is associated with which of the following event?

1	Okazaki fragments
2	Tautomerism
3	Capping

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4	Point mutation

45 Sexual reproduction in Spirogyra is morphologically characterised by _____.

1	isogamy and oogamy both
2	isogamy
3	asnisogamy
4	oogamy

46 Kew, London is famous for which of the following?

1	Herbarium
2	Diverse flora and fauna
3	Being the largest biological reserve
4	Being the largest botanical garden

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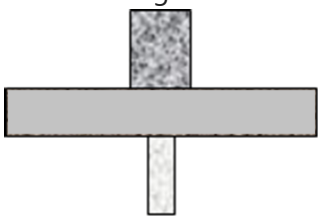
47

The below figure shows one of the types of ecological pyramids. This type represents



1	pyramid of numbers in a grassland
2	energy pyramid in a spring
3	pyramid of biomass in a lake
4	pyramid of biomass in a fallow land

48

The first experiment on photosynthesis in flashing light were invented by

1	Robert Hill
2	Melvin Calvin
3	F. F. Blackman
4	Robert Emerson and Arnold

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49 _____ remains unchanged at the end of growth.

1. Hormones
2. Enzymes
3. Nucleotides
4. Vitamins

50 A double heterozygous tall plant with yellow colour (colour of cotyledon) is selfed the ratio of dwarf plants with green cotyledon is

1. $\frac{1}{4}$
2. $\frac{1}{6}$
3. $\frac{1}{16}$
4. $\frac{2}{16}$

Zoology

1 Choose the correct option: Fight -or - flight reactions cause activation of

1	the kidney, leading to suppression of renin- angiotensin-aldosterone pathway
2	the parathyroid glands, leading to increased metabolic rate
3	the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine
4	the pancreas leading to a reduction in the blood sugar levels.

2 Which of the following is activated by a fall in glomerular filtration rate?

1	Adrenal medulla to release adrenaline
2	Juxtaglomerular cells to release renin
3	Adrenal cortex to release aldosterone
4	Posterior pituitary to release vasopressin

3 The valve prevent between right auricle and right ventricle is

1	tricuspid valve
2	bicuspid valve
3	eustachian valve
4	semilunar valve

4

Find the wrong statement.

1	The genetically modified Bacillus thuringiensis is used as biopesticide on the commercial scale.
2	Human insulin is being commercially produced from a transgenic species of Escherichia coli.
3	Human protein, alpha -1-antitrypsin is used to treat emphysema.
4	Bt toxin genes cryIAc control the corn borer.

5

_____ part of the human ear plays no role in hearing as such but is otherwise very much required.

1	Organ or Corti

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2	Eustachian tube
3	Vestibular apparatus
4	Ear ossicles

6

_____ is/are the part of a nephron which opens into the collecting duct.

1	DCT
2	DCT and PCT
3	Glomerulus
4	Henle's loop

7

Which of the following is entirely made of cartilages

1	nasal septum
2	larynx

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3	trachea
4	glottis

8 In immunity, skin and mucous membrane acts as

1	barrier
2	remedy
3	anatomical barrier
4	physiological barrier

9 Define carrying capacity.

1	Minimum number of individuals which an environment can sustain
2	Maximum number of individuals which an environment can sustain
3	Both (1) and (2)
4	None of these

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10

Who introduced the theory of spontaneous generation?

1. Empedoeles
2. Anaximus
3. Anaximander
4. Spallanzani

11

By using which of the following biofertilizer, farmers have reported over 50% higher yields of rice?

1. legume-Rhizobium symbiosis
2. cyanobacteria
3. azolla pinnata
4. mycorrhiza

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12

'Verhulst-Pearl' is associated with which of the following equation?

1 $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$

2 $\frac{dN}{dt} = tN\left(\frac{K-N}{N}\right)$

3 $\frac{dN}{dt} = tN\left(\frac{K-N}{K}\right)$

4 $\frac{dN}{dt} = rN\left(\frac{K-N}{N}\right)$

13

Hypersecretion of growth hormone in adults does not cause further increase in height, due to

1 epiphyseal plates close after adolescence

2 bones loose their sensitivity to growth hormone in adults

3 growth hormone becomes inactive in adults.

4 muscle fibres do not grow in size after birth

14

Which of the following is involved in dark adaptation in human eye?

1. Conversion of 11 cis retinene to trans retinene
2. Conversion of trans retinene into 11 cis retinene
3. Decomposition of rhodopsin to scotopsin
4. Decomposition of rhodopsin into retinene

15

The Leydig cells found in the human body are the secretory source of which of the following hormone?

1. Intestinal mucus
2. Androgens
3. Progesterone
4. Glucagon

16

_____ carbohydrates is considered non- reducing in acidic medium.

1 Fructose

2 Sucrose

3 Lactose

4 Maltose

---

17 Coacervates were _____.

1 microbes

2 first living cells

3 organic molecules

4 large colloidal aggregates

---

18 Identify the contraceptive which is implanted under the skin.

1

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2

3

4

19

Where cardiac muscle is found?

1 Myocardium

2 Endocardium

3 Epicardium

4 All of these

20

Excretion of nitrogenous waste products in semisolid form takes place in

1 Ammonotelic animals

2	Ureotelic animals
3	Uricotelic animals
4	Amniotes

21

A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using ____ enzyme.

1	Taq polymerase
2	EcoRI
3	polymerase III
4	ligase

22

With the help of _____, saliva and tears achieve immunity status.

1	ribosome
2	lysosome

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3	dictyosome
4	nucleosome

23 In human female, ovulation does not occur during pregnancy as _____.

1	the corpus luteum generates as luteinising hormone is no longer produced
2	the follicles are not influenced by the level of progesterone in the blood
3	the corpus luteum and later the placenta produce large amounts of progesterone
4	the embryo produces hormones which retard the production of maternal follicle stimulating hormones

24 Lung ventilation movements are because of ____.

1	diaphragm
2	wall of the lungs
3	costal muscles

4 costal muscles and diaphragm

25 On which day, world environment day is celeberated?

1 15th April

2 15th March

3 4th May

4 5th June

26 The testes of a great majority of mammals are typically enclosed in an extra abdominal sac, the scrotum. The temperature inside the scrotum is lower than that in the abdomen. If the temperature of the scrotum is artificially maintained to the level of abdominal temperature what will happen?

1 The germinal epithelium of the testes will divide faster, thus producing more sperms

2 The germinal epithelium will produce a large quantity of androgen secretion

3 The germinal epithelium of the testes will degenerate, resulting in sterility

4	The germinal epithelium will carry out normal spermatogenesis

27 What is the pH of blood?

1	Greater than 7
2	Less than 7
3	Ranges between 7-8
4	None of these

28 Point out the mismatched pair from the following.

1	Insulin - Gluconeogenesis
2	Glucagon - Glycogenolysis
3	Prolactin - Milk production in mammary glands.
4	Oxytocin -Contraction of uterine muscles

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29 Cockroach is a ___ animal and development is ___.

1 viviparous, direct

2 oviparous, direct

3 oviparous, indirect

4 ovoviviparous, direct

30 Which of the following enzyme is used in the polymerase chain reaction?

1 Ligase

2 Restriction enzyme

3 Reverse transcriptase

4 Taq DNA polymerase

31 In the resting muscle fibre tropomyosin partially covers which of the following site?

1	Ca binding sites on actin
2	Actin binding sites on myosin
3	Myosin binding sites on actin
4	Ca binding sites on troponin

32 Find the incorrect statement about human female.

1	Menopause occur at 45-55 years
2	Menstrual cycle takes 28 days
3	Menstruation takes 4 days
4	The ovulated egg released during pregnancy die

33 Atmosphere of earth at the time of origin of life was ____.

1	reducing
2	oxidizing

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3	aerobic
4	both (1) and (2)

34 ____ is used for staining of lipids.

1	Iodine
2	Rhodamine
3	Oil red O
4	Ethidium bromide

35 Which of the following gland/s is often referred in relation with AIDS?

1	Thyroid
2	Thymus
3	Adrenal

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4	Pancreas

36 Pentoses and hexoses are the most common _____.

1	monosaccharides
2	disaccharides
3	oligosaccharides
4	polysaccharides

37 Mushrooms are fruiting bodies of

1	ascomycetes
2	lichens
3	zygomycetes
4	basidiomycetes

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38

Contraction of involuntary muscles, secretion of digestive glands and rate of heart beats are under the control of which system

1	Cranial system
2	Central nervous system
3	Autonomic nervous system
4	Reflex system

39

In cockroach, first pair of wings are called as ____.

1	sterna
2	elytra
3	terga
4	halters

40

_____ is not a function of the skeletal system.

1 Production of body heat

2 Locomotion

3 Storage of minerals

4 Production of erythrocytes

41 Aquatic reptiles are _____.

1 ureotelic

2 ammonotelic

3 ureotelic over land

4 ureotelic in water

42 Which is the infective stage in primary attack of Plasmodium?

1 Schizozoite

2 Sporozoite

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3	Trophozoite
4	Merozoite

43 _____ part of human brain is connected with the regulation of body temperature.

1	Cerebrum
2	Cerebellum
3	Hypothalamus
4	Medulla oblongata

44 Which of the following mediates the action of peptide hormone on a target cell.

1	Cyclic AMP
2	A cytoplasmic receptor
3	Epinephrin

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4	ATP

45 Gene amplification using primers can be done by _____ process.

1	ELISA
2	Microinjection
3	Polymerase chain reaction
4	Gene gun

46 Deficiency of which of the following causes obesity, low plasma N, high K and increased blood pressure

1	Adrenaline
2	Growth hormone
3	Cortisol
4	Thyroxine

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47

Determine the correct statement regarding HIV, hepatitis B, gonorrhoea, trichomoniasis?

1	Hepatitis B is eradicated completely whereas others are not
2	HIV is a pathogen whereas others are diseases
3	Gonorrhoea is a viral disease whereas others are bacterial
4	Trichomoniasis is an STD whereas others are not

48

Mark the wrong statements.

1	Cellulose is a polysaccharide
2	Glycine is a sulphur containing amino acid
3	Sucrose is a disaccharide
4	Uracil is a pyrimidine

49

Rh factor is related to _____.

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1	blood clotting
2	blood groups
3	carbohydrate metabolism
4	eugenics

50 Ball and socket joint is present between _____.

1	ribs and vertebral
2	humerus and pectoral girdle
3	femur and tibio-fibula
4	humerus and olecranon fossa

Physics - Answer keys

1	2
2	4
3	2

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4	4
5	1
6	1
7	2
8	1
9	1
10	4
11	3
12	4
13	3
14	3
15	4
16	3
17	1
18	4
19	1
20	4
21	1
22	3
23	2
24	1
25	2
26	2
27	2
28	2

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

Chemistry - Answer keys

1	1

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2	1
3	3
4	1
5	3
6	2
7	4
8	4
9	3
10	2
11	1
12	1
13	2
14	4
15	1
16	3
17	1
18	3
19	4
20	1
21	3
22	3
23	2
24	2
25	4
26	3

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

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Botany - Answer keys

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

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

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49	2
50	3

Zoology - Answer keys

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

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22	2
23	3
24	4
25	4
26	3
27	3
28	1
29	3
30	4
31	3
32	4
33	1
34	3
35	2
36	1
37	4
38	3
39	2
40	1
41	1
42	2
43	3
44	1
45	3
46	3

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47 2

48 2

49 2

50 2

Physics - Solutions

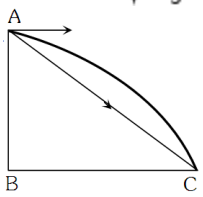
1 Magnetic force

2 In C.G.S. system, $B = \frac{m}{d^2}$.

3 Here, $\vec{F} = -k\frac{e^2}{r^2}\hat{r} = -k.\frac{e^2}{r^3}\vec{r}$ $\left(\text{Since } \hat{r} = \frac{\vec{r}}{r}\right)$

4 Form the figure given below, the horizontal distance covered by bomb,

$BC = v_H \times \sqrt{\frac{2h}{g}} = 150\sqrt{\frac{2\times 80}{10}} = 660 \text{ m}$



Thus, the distance of target from dropping point of bomb,

$AC = \sqrt{AB^2 + BC^2} = \sqrt{(80)^2 + (600)^2} = 605.3 \text{ m}$

5 $\text{Velocity of particle} = \frac{\text{Total diplacement}}{\text{Total time}}$

$\Rightarrow \frac{\text{Diameter of circle}}{5} = \frac{2\times 10}{5} = 4 \text{ m/s}$

6 Gravitational force, $F = G\frac{m_1 m_2}{r^2}$

$\Rightarrow 6.675 \times \frac{1\times 1}{1^2} \times 10^{-11} = 6.675 \times 10^{-11} \text{ N}$

7 Student is going to catch the bus after 't' second. Hence, it will cover distance uxt.

And distance travelled by the bus will be $\frac{1}{2}at^2$, for the given condition.

Thus, $ut = 50 + \frac{1}{2}at^2 = 50 + \frac{t^2}{2}$ $[a = 1 \text{ m/s}^2]$

$\Rightarrow u = \frac{50}{t} + \frac{t}{2}$

To find the minimum value of u, $\frac{du}{dt}=0$,

So, we get, $t=10$ s, and $u=10$ m/s

8

Angular speed, $\omega=\frac{v}{r}=\frac{100}{10} \therefore \omega=10 \text{ rad/s}$

9

As we know, force becomes $\frac{1}{K}$ times in the presence of medium.

10

Here, force constant,

$K=Yr_0=20\times10^{10}\times3\times10^{-10}=60 \text{ N/m}$

$\Rightarrow 6\times10^{-9} \text{ N/Å}$

11

The work done,

$W=8\pi R^2T=8\times3.14\times(10\times10^{-2})\times\frac{3}{100}$

$\Rightarrow 7.536\times10^{-3} \text{ J}$

12

For 1 gm gas, $PV=rT=\left(\frac{R}{M}\right).T$

As P and V are constant, $\therefore T\propto M \Rightarrow \frac{T_{N_2}}{T_{O_2}}=\frac{M_{N_2}}{M_{O_2}}$

$\Rightarrow \frac{T_{N_2}}{(273+15)}=\frac{28}{32} \Rightarrow T_{N_2}=252 \text{ K}=-21°C$

13

As we know, $Q\propto\frac{A}{l}\propto\frac{r^2}{l}$

$\Rightarrow \frac{Q_2}{Q_1}=\frac{r_2^2}{r_1^2}\times\frac{l_1}{l_2}$

$\Rightarrow \frac{Q_2}{Q_1}=\frac{4}{1}\times\frac{1}{2} \Rightarrow Q_2=2Q_1$

14

Here, the distance of centre of mass of the system is given as,

$x_{cm}=\frac{1\times0+1\times PQ+1\times PR}{1+1+1}=\frac{PQ+PR}{3}$ and $y_{cm}=0$.

15

As we know, $F_l=\mu mg=0.6\times1\times9.8=5.88$ N

$\therefore$ Pseudo force on the block $=ma=1\times5=5$ N

Pseudo is less, then limiting friction hence static force of friction = 5 N.

16

Ozone layer absorb most of the ultraviolet rays emitted by sun.

17

As per given in problem,

Total mass = (50 + 20) = 70 kg and

Total height = 20Ã—0.25 = 5 m

∴Work done = mgh = 70Ã—9.8Ã—5 = 3430 J

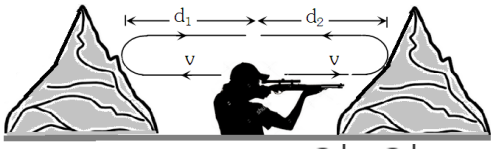
18

We know that, for 'm' gm of gas, $PV = mrT$

Now substituting the given and known values,

$$r = \frac{1.015 \times 10^5 \times 10^{-3}}{1.293 \times 273} = 0.29\ J/K-g$$

19



From the problem given, $2d_1 + 2d_2 = v \times t_1 + v \times t_2$

$\Rightarrow 2(d_1 + d_2) = v(t_1 + t_2)$

$$\Rightarrow d_1 + d_2 = \frac{v(t_1 + t_2)}{2} = \frac{340 \times (1.5 + 3.5)}{2} = 850\ m$$

20

$$C^2LR = [C^2L^2] \times \left[\frac{R}{L}\right] = [T^4] \times \left[\frac{1}{T}\right] = [T^3]$$

As $\left[\frac{L}{R}\right] = T$ and $\sqrt{LC} = T$

21

We know, $B = \frac{\mu_0}{4\pi} \cdot \frac{2\pi i}{r}$

$$\Rightarrow 12.56 = 10^{-7} \times \frac{2\pi \times i}{5.2 \times 10^{-11}} \Rightarrow i = 1.04 \times 10^{-3}\ A$$

22

For parallel combination, equivalent conductivity is given as,

$$K = \frac{K_1A_1 + K_2A_2}{A_1 + A_2} = \frac{K_1 + K_2}{2} \quad (\because A_1 = A_2)$$

23

Maximum velocity, $v_m = A\omega = A\left(\frac{2\pi}{T}\right)$

$$\Rightarrow T = \frac{2\pi A}{v_m} = 2 \times \frac{22}{7} \times \frac{7 \times 10^{-3}}{4.4} = 10^{-2}\ s = 0.01\ s$$

24

Rolling friction is always less than sliding friction, that is why it is easy to move a heavy load from one place to another by rolling it over the surface instead of sliding it over the same surface.

Moreover, it is quite obvious that static friction is always greater than kinetic friction.

25

The magnetic field because of small element of conductor of length is given by,

$$dB = \frac{\mu_0}{4\pi} \frac{Idl \sin\theta}{r^2}$$

This value will be maximum, when $\sin\theta = 1 = \sin 90° \Rightarrow \theta = 90°$

26

7p

27

Here given that, $\frac{mg}{m(g-a)} = \frac{3}{2} \Rightarrow a = g/3$

28

Here, $\rho_{mix} = \frac{3m}{V_1+V_2+V_3}$

$\Rightarrow \frac{3m}{\frac{m}{d}+\frac{m}{2d}+\frac{m}{3d}} = \frac{3\times 6}{11}d = \frac{18}{11}d$

29

Here, $\frac{h_1}{h_2} = \frac{\rho_1}{\rho_2} = \frac{(1+\gamma\theta_1)}{(1+\gamma\theta_2)}$ $\left[\text{As } \rho = \frac{\rho_0}{(1+\gamma\theta)}\right]$

$\Rightarrow \frac{50}{60} = \frac{1+\gamma\times 50}{1+\gamma\times 100} \Rightarrow \gamma = 0.005/°C$

30

As we know, $g \propto \frac{GM}{r^2}$. $\therefore g \propto \frac{1}{r^2}$ or $r \propto \frac{1}{\sqrt{g}}$.

$\therefore$ If 'g' decreases by one percent, then 'r' should increase by $\frac{1}{2}\%$ means R = $\frac{1}{2\times 100}\times 6400 = 32$ km.

31

The three coils are in parallel.

$\therefore \frac{1}{L_P} = \frac{1}{L_1}+\frac{1}{L_2}+\frac{1}{L_3} = \frac{1}{3}+\frac{1}{3}+\frac{1}{3} = 1$ or $L_P = 1$ H

32

Here, Work done $= mgh = 10\times 9.8\times 1 = 98$ J

33

Here, $\Delta Q = \Delta U + \Delta W$ and as $\Delta W = 0$

$\Rightarrow \Delta Q = \Delta U = \frac{f}{2}\mu R\Delta T$

$\Rightarrow \frac{3}{2}\times 2R(373-273) = 300\ R$

34

Given, $x = A\cos\left(\omega t + \frac{\pi}{4}\right)$ and we know, $v = \frac{dx}{dt} = -A\omega\sin\left(\omega t + \frac{\pi}{4}\right)$

Thus, for maximum speed, $\sin\left(\omega t + \frac{\pi}{4}\right) = 1$

$\Rightarrow \omega t + \frac{\pi}{4} = \frac{\pi}{2}$ or $\omega t = \frac{\pi}{2} - \frac{\pi}{4} \Rightarrow t = \frac{\pi}{4\omega}$

35

We know, Intensity $\propto \frac{1}{(\text{Distance})^2}$

$\Rightarrow \frac{I_1}{I_2} = \left(\frac{d_2}{d_1}\right)^2 = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

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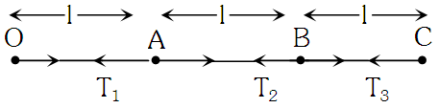
36

Here, $i = ev = 1.6 \times 10^{-19} \times 6.8 \times 10^{15}$

$\Rightarrow i = 1.1 \times 10^{-3}\ A$

37

Suppose, 'ω' be the angular speed of revolution.



$\therefore T_3 = m\omega^2 3l$

$T_2 - T_3 = m\omega^2 2l \Rightarrow T_2 = m\omega^2 5l$

$T_1 - T_2 = m\omega^2 l \Rightarrow T_1 = m\omega^2 6l$

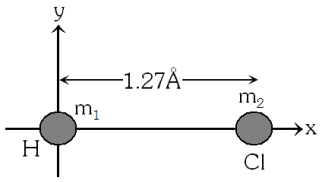
$\therefore T_3 : T_2 : T_1 = 3:5:6$

38

$$\frac{\vec{A}.\vec{B}}{|\vec{i}+\vec{j}|} = \frac{(2\hat{i}+3\hat{j})(\hat{i}+\hat{j})}{\sqrt{2}}$$

$$\Rightarrow \frac{\vec{A}.\vec{B}}{|\vec{i}+\vec{j}|} = \frac{2+3}{\sqrt{2}} = \frac{5}{\sqrt{2}}$$

39



Here, given that,

$m_1 = 1, m_2 = 35.5, \vec{r}_1 = 0, \vec{r}_2 = 1.27\hat{i}$

$$\therefore \vec{r} = \frac{m_1\vec{r}_1 + m_2\vec{r}_2}{m_1 + m_2} \Rightarrow \vec{r} = \frac{35.5 \times 1.27}{1 + 35.5}\hat{i}$$

$$\Rightarrow \vec{r} = \frac{35.5}{36.5} \times 1.27\hat{i} = 1.24\hat{i}$$

40

Mobility is defined as the magnitude of drift velocity per unit electric field.

Mobility, $\mu = \frac{|v_d|}{E}$

41

A-3 B-2 C-5 D-1

42

Zeroth law of thermodynamics.

43

Required time, $t = T/4 = \frac{1}{4 \times 50}$

$\Rightarrow t = 5 \times 10^{-3}\ s$

44

$$S = \int_0^3 v\,dt = \int_0^3 kt\,dt = \left[\frac{1}{2}kt^2\right]_0^3$$

$$\Rightarrow S = \frac{1}{2} \times 2 \times 9 = 9\ m$$

45

Here, $\frac{F-32}{9}=\frac{K-273}{5}$

$\Rightarrow \frac{x-32}{9}=\frac{x-273}{5} \Rightarrow x=574.25$

46

Here, $l=\frac{FL}{AY}=\frac{FL}{\pi r^2 Y}, \therefore l \propto \frac{FL}{r^2}$ (Y = constant)

$\therefore \frac{l_2}{l_1}=\frac{F_2}{F_1}\times\frac{L_2}{L_1}\left(\frac{r_1}{r_2}\right)^2=2\times2\times\left(\frac{1}{2}\right)^2=1$

$\therefore l_2=l_1$ means increment in its length will be 'l'.

47

As surface tension of water is greater than surface tension of oil.

48

Effective acceleration of ball observed by observer on earth = $(a - a_0)$

As $a_0 < a$, means net acceleration is in downward direction.

49

Steel

50

$|\vec{A}|=\sqrt{3^2+(-2)^2+1^2}=\sqrt{9+4+1}=\sqrt{14}$

$|\vec{B}|=\sqrt{1^2+(-3)^2+5^2}=\sqrt{1+9+25}=\sqrt{35}$

$|\vec{C}|=\sqrt{2^2+1^2+(-4)^2}=\sqrt{4+1+16}=\sqrt{21}$

As $B=\sqrt{A^2+C^2}$, $\therefore$ ABC will be right angled triangle.

Chemistry - Solutions

1

We know, $\frac{K_t+10}{K_t}=\frac{r_t+10}{r_t}=2$

For an increase of temperature to $20°C$ i.e. 2 times, the rate increase by 2^2 times means 4 times.

2

Oxo process.

3

$\underbrace{H_2SO_4+H_2O \rightleftharpoons H_3O^+ + HSO_4^-}_{\text{Conjugate acid and base pair}}$

Conjugate base is HSO_4^-.

4

Here, $Cl^- = 1s^2\,2s^2\,2p^6 3s^2 3p^6$

$O^{2-} = 1s^2\,2s^2\,2p^6$

$Mg^{++} = 1s^2\,2s^2\,2p^6$

$Na^+ = 1s^2\,2s^2\,2p^6$

5

NaCl

6

Pentan-3-one

7

ns, $(n-1)d$

8

Chloride ions are oxidized at anode in fused NaCl and it is known as oxidation.

9

Element	No. of Moles	Simple ratio
C = 24	24/12 = 2	1
H = 4	4/1 = 4	2
O = 32	32/16 = 2	1

i.e. CH_2O

10

Because alkali metals have tendency to loose e^-.

11

It is clear from the chemical formulae that Ag is central metal atom and ligands are 2 ammonia molecule. Thus, the compound is $[Ag(NH_3)_2]Cl$.

12

$H_2S + X_2(Cl, Br, I = X) \rightarrow 2HX + S$ i.e. the halogen are reduced here.

13

The $NaCl$ molecule is formed by electrovalent bonding.

14

$C_{12}H_{22}O_{11}$ is a sugar which is non-electrolyte.

15

All acids are fatty acid except phenyl acetic acid.

16

Os. It is the densest metal with density 22.6g cm^{-3}

17

Sucrose

18

Gem-dihalides are having two halogen atoms attached on the same carbon atom.

19

As, $w = zit \Rightarrow Q = it$

20

Vinegar is the diluted solution of acetic acid (CH_3COOH). It is produced by the fermentation of ethyl alcohol in the presence of enzyme acetobacter.

21

Here, Concentration $= \frac{5 \times 10^6}{10^6}$ = 5 ppm

22

$$M = \frac{W}{m.wt.} \times \frac{1000}{\text{Volume in ml.}}$$
$$\Rightarrow M = \frac{5 \times 1000}{40 \times 250} = 0.5\ M$$

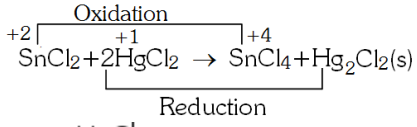
23

Molar mass of AgBr= $108 + 80 = 188\,g\,mol^{-1}$

Hence, the percentage of Br_2 $= \frac{80}{188} \times \frac{0.12}{0.15} \times 100 = 34.04\%$

24

Consider the reaction,



Here, $HgCl_2$ is reduced in Hg.

25

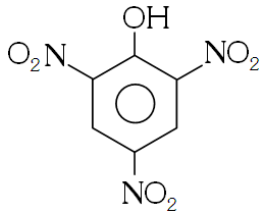
$$\eta = \frac{T_2 - T_1}{T_2}$$

Therefore, efficiency is maximum when $T_2 - T_1$ is maximum.

26

CH_3CN is known as acetonitrile.

27



i.e. Picric acid is phenolic whereas others are non phenolic.

28

For an isochoric process, $dV = 0$.

29

Number of protons in the nucleus.

30

d-block elements are called as transition elements. These exhibit variable valency because their incomplete d-subshell.

31

Since CsF is an electrovalent compound.

32

Catalyst affects only activation energy. It reduces the activation energy of reaction.

33

Low density polymer

34

As 1 L of gas at S.T.P. weighs 1.16 gm,

$\therefore$22.4 L of gas at S.T.P. weight 22.4x1.16 = 25.984 = 26

This molecular weight indicates that given compound is C_2H_2.

35

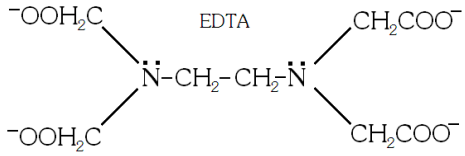
Large number alkanes are soluble in water.

36

Both (2) & (3)

37

It is given below,



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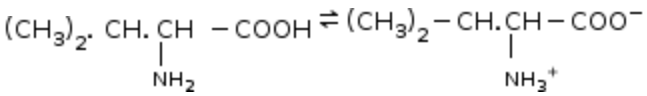


39

Active mass

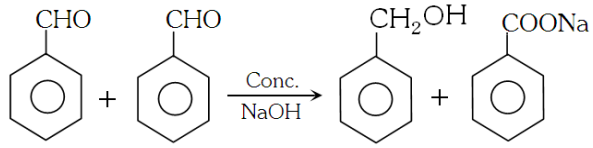
40

Both (2) and (3)

41

Because of its vacant p-orbital.

42



43

Cu_2Cl_2

44

We know, $K = \frac{\alpha^2 C}{1-\alpha}$; $\alpha = \frac{0.01}{100} \approx 1$

$\therefore K = \alpha^2 C = \left[\frac{0.01}{100}\right]^2 \times 1$

Dissociation constant $\Rightarrow K = 1 \times 10^{-8}$

45

Protein is a natural polymer of $\alpha-$amino acids.

46

Hess's law

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47

Na and Cl is most likely to form an ionic bond. Hydrogen bonding takes place only when in a hydrogen compound, hydrogen is bonded to a highly electronegative atom (such as F, O, N) by a covalent bond.

48

2, 2-dimethylpropane

49

de Chancourtois proposed the telluric helix.

50

$$K_c = \frac{[HI]^2}{[H_2]\,[I_2]} \Rightarrow 64 = \frac{x^2}{0.03 \times 0.03}$$
$$\Rightarrow x^2 = 64 \times 9 \times 10^{-4}$$
$$\Rightarrow x = 8 \times 3 \times 10^{-2} = 0.24$$

x is the amount of HI at equilibriumof I_2 at equilibrium will be,

Amount of unreacted I_2 at equilibrium$= 0.30 - 0.24 = 0.06$

Botany - Solutions

1

Algae

2

Some of the adventitious roots store food materials and become swollen. They arise singly and do not attain a definite shape such as sweet potato (Ipomoea batata).

3

In Pistia, roots play insignificant role in absorption of water. Pistia (water lettuce) is a floating aquatic plant. In aquatic plants, roots are poorly developed and do not take part in absorption of water. Water is absorbed by the general body surface in these plants.

4

Simple diffusion

5

As water provides medium for enzymatic activity.

6

To cross it with a pure brown mouse and all the offsprings must be black or brown in equal numbers

7

The prokaryotic cells do not have nuclear membrane while eukaryotic cell have well organised nuclear membrane.

8

Cell, nucleus, chromosome, water molecule, oxygen atom

9

Mycoplasma is also termed as pleuropneumonia like organisms (PPLO)

10

Chikungunya virus causes the chikungunya. Colostrum is the first breast milk of mother which contains antibodies (especially IgA) which protect the infant by the age of three months. Beer is manufactured by fermentation of barley malt by yeast species.
Tissue culture can be used to obtain virus- free healthy plants from diseased plants.

11

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

12

Fertilization can not take place in absence of surface water in Funaria, Fucus and Marsilea. In these organisms fertilization occurs outside the body of female. A large number of gametes are released in surrounding medium where fertilization takes place. Water is essential, so that gametes can swim in water. This type of fertilization is known as external fertilization.

13

In yeast fermentation, the enzymatic reactions are

(1) $C_{12}H_{22}O_{11} + H_2O \xrightarrow[\text{in yeast}]{\text{Invertase}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$

(2) $C_6H_{12}O_6 \xrightarrow[\text{Yeast}]{\text{Zymase}} 2C_2H_5OH + 2CO_2 + 21 \text{ kcal energy}$

14

Lenticels are some loosely arranged areas in the periderm. Lenticels are characteristics of woody stem. These are not found in leaves.

15

Does all the above works

16

Asexual reproduction takes place in a single individual without production of gametes (in lower animals).

17

In red algae or Rhodophyceae colour is red due to presence of a red pigment (r-phycoerythrin) and a blue pigment (r-phycocyanin) in chromatophores.

18

Occurs through the activities of apical meristems

19

In monocotyledonous plants the radicle dies immediately after germination of seeds and after that these roots arise from any other portion (stem, leaves etc.) of the plant.

20

Stem apex

21

As plants are first trophic level (producers) of every food chain.

22

Nucleus

23

Double fertilization is the characteristic feature of angiosperms. Here, two male gametes are released in the embryo sac or female gametophyte. One male gamete fuses with the egg cell to form zygote which gives rise to embryo whereas the other male gamete fuses with the secondary nucleus to form primary endosperm nucleus (PEN) that gives rise to endosperm.

24

Naked DNA is surrounded by some typical proteins (polyamines) but not histone proteins.

25

Adenine and thymine; as C always attaches with G and A attaches with T.

26

Elongated cells with thickening at the corners

27

Meiosis

28

Photolysis of water

29

The pairing between the homologous chromosomes occur in zygotene stage of prophase-I

30

Abscisic acid is a growth hormone. It functions as a general growth inhibitor by counteracting other hormones (auxin, gibberellins, cytokinins) or reactions mediated by them. It is also known as stress hormone as the production of hormone is stimulated by drought, water logging and other adverse environmental conditions. Abscisic acid is known as dormin as it induces dormancy in buds, underground stems and seeds.

31

At metaphase each chromosomes is made up of two sister chromatids held together by the centromere in the centre. During this phase, kinetochores; disc shaped structures are present at the surface of each centromere which help in the attachment of spindle fibres to the chromosomes. The chromosomes organize themselves at the equator in one equatorial plane known as metaphase plate. Nucleolus, nuclear envelope, Golgi complex, endoplasmic reticulum disappear during late prophase. Cell plate formation begins during the late anaphase or early telophase of M- phase.

32

The diversity of plants and animals is an uneven distribution throughout the world. In general, species diversity decreases as we move away from the equator towards the poles. With very few exceptions, tropics harbour more species than temperate or polar areas. It means biodiversity is more at equator than at poles.

33

Chalmydomonas

34

Middle layers lie between endothecium and tapetum

35

Amoeba is omnivorous and holozoic nutrition. It feeds by phagocytosis. Amoeba captures and engulfs its prey by means of pseudopodia.

36

All of these

37

Cytochrome

38

Anaphase II

39

Pandanus

40

ATP (adenosine triphosphate) is known as energy currency of cells. ATP is energy rich compound where energy is present in terminal pyrophosphate bonds.

41

The chemiosmotic coupling hypothesis of oxidative phosphorylation proposed by Mitchell, explains the process of ATP formation. It implies that it is linked to development of a proton gradient across the mitochondrial membrane. ATP synthase, required for ATP synthesis is located in F_1 particles present in the inner mitochondrial membrane and becomes active only when there is high concentration of proton on F_o side as compared to F_1 side. The flow of proton though F_o channel induces F_1 particle to function as ATP synthase and the energy of proton gradient produces ATP by attaching a phosphate radical to ADP.

42

Cells are least radiation sensitive when it is present in the S phase, then in the G_1 phase, then in the G_2 phase and most sensitive in the M phase of the cell cycle. This is described by the €˜ law of Bergonic and Tribondeau, formulated in 1906. As per this law, radiosensitivity of a tissue is directly proportional to its reproductive capacity and inversely proportional to its degree of differentiation.

43

In anaerobic respiration only glycolysis is found. In this, there is no need of mitochondria so that the above mechanism happens in cell cytoplasm.

44

capping

45

In Spirogyra, gametes are morphologically similar but physiologically dissimilar.

46

Herbarium

47

Pyramid of biomass in a lake

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48

Emerson and Arnold proved the existence of light as well as dark reaction by flashing of light experiment in photosynthesis.

49

Enzymes

50

In F_2 gen. of dihybrid cross, the expected genotypic proportion of individuals having both the dominant alleles in homozygous condition is 1/16 while genotypic proportion of individual having both recessive alleles in homozygous condition is 1/16.

Zoology - Solutions

1

Fight -or - flight reactions cause activation of the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine. The adrenal medulla secretes two hormones known as adrenaline or epinephrine and noradrenaline or norepinephrine. These are commonly called as catecholamines. Adrenaline and noradrenaline are rapidly secreted in response to stress of any kind and during emergency situations and are called emergency hormones or hormones of Fight of Flight and these hormones increase alertness, pupillary dilation, piloerection (raising of hairs), sweating etc. Both are hormones increase the rate of heart beat, the strength of heart contraction and the rate of respiration. In addition, they also stimulate the breakdown of lipids and proteins.

2

The kidneys have built-in mechanisms for the regulation of glomerular filtration rate. One such efficient mechanism is carried out by JGA (juxtaglomerular apparatus) which is a special sensitive region formed by cellular modifications in the distal convoluted tubule and the afferent arteriole at the location of their contract. A fall in GFR can activate the JG cells to release renin which can stimulate the glomerular blood flow and thereby the GFR come back to normal.

3

Tricuspid valve (right atrioventricular valve) consisting of three flaps, situated between the right atrium and the right ventricle of the mammalian heart.
When the right ventricle contracts, forcing blood into the pulmonary artery, the tricuspid valve closes the aperture to the atrium, thereby preventing any backflow of blood and the valve reopens to allow blood to flow from the atrium into the ventricle.

4

Using genetic engineering Bt toxin genes were isolated from Bacillus thuringiensis and integrated into several crop plants. The choice of gene depends upon the crop and targeted pest, as most Bt toxins are insect group specific. The toxin is coded by a gene cry. cryIAc and cryIIAb protect against cotton bollworm and cryIAb introduced in Bt corn protect from corn borer.

5

Vestibular apparatus is a part of inner ear, present above the cochlea. It comprises of three semicircular canals, which detect movements of the head, and the utriculus and sacculus which

detect the position of head. It does not play any role in hearing but is responsible for maintaining the balance of the body and posture, thus necessary.

6

A nephron i.e. uriniferous tubule is a structural and functional unit of in a kidney. A kidney contains near about a million nephrons, each approximately 3 cm long. A nephron is a long tubule differentiated into four regions having different anatomical features and physiological role: Bowman's capsule, proximal convoluted tubule (PCT), loop of Henle, and distal convoluted tubule (DCT). The latter opens into one of the collecting ducts.

7

larynx

8

anatomical barrier

9

Carrying capacity is maximum number of individuals which the environment can sustain.

10

The theory of spontaneous generation was initially forwarded by Greek philosopher €" Anaximander.

11

Cyanobacteria

12

The logistic growth show sigmoid curve and is also known as Verhulst -Pearl logistic growth. It is calculated by following formula -

$$dN/dt = rN\left(\frac{K-N}{K}\right)$$

where, N is population density at time t, K is carrying capacity and r is intrinsic rate of natural increases.

13

Hypersecretion of growth hormone in adults does not cause further increase in height, due to epiphyseal plates close after adolescence. Epiphyseal plate is a hyaline cartilage plate in the metaphysis at each end of long bone and it is part of long bone where new bone growth takes place. In adults, elevated levels of GH results in acromegaly where no increase in height occurs due to ossified epiphyseal plate.

14

Dark adaptation is the habituation of eyes to see in darkness which involves the conversion of retinal (retinene) and opsins into the light sensitive pigments. In the process 11-trans retinene is converted to 11-cis retinene that binds with scotopsin to reform rhodopsin or visual purple perceives light and facilitates vision.

15

Leydig's cells are present in testis and are endocrine in nature and secrete androgens (e.g., testosterone) responsible for secondary sexual characters of male.

16

Sucrose carbohydrates is considered non- reducing in acidic medium. Reducing sugars are those in which have a free aldehyde (-CHO) or ketonic group (-CO) is present e.g., maltose and

lactose. The sugars without a free aldehyde or ketonic group are non- reducing sugars e.g., sucrose. They do not reduce cupric ions of Benedict's or Fehling's solution to cuprous ions.

17

A large colloidal aggregate formed during chemical evolution are called coacervates that is believed to be pre cell stage of life.

18

Option (1) shows hormone implants. These are six matchstick-sized capsules that contain synthetic progesterone. These are implanted subcutaneously under the skin of the inner arm above the elbow. For about five years these capsules slowly release the progesterone. This blocks ovulation (by inhibiting the release of FSH and LH from pituitary) and thickens the cervical mucus to prevent sperm transport.

19

The wall of the heart consist of three layers those are the outer of external covering layer (epicardium); intermediate cardia muscular tissue (myocardium) and internal layer (endocardium) that is in contact with blood. The myocardium is composed of specialized muscle tissue known as cardiac muscular tissue.

20

Uricotelic animals

21

A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using ligase enzyme. Ligases are important in the synthesis and repair of many biological molecules, including DNA ligase and it is used in genetic engineering to insert foreign DNA into cloning vectors.

22

lysosome

23

The corpus luteum and later the placenta produce large amounts of progesterone

24

Costal muscles and diaphragm

25

5^{th} June

26

The germinal epithelium of testes needs a low temperature for their normal functioning.

27

The pH of blood is ranges between 7-8. Blood is a slightly alkaline fluid having pH 7.4. pH of blood in arteries is more than in veins.

28

Gluconeogenesis is the process of glucose synthesis from noncarbohydrate sources, eg. fat and protein. It meets the needs of the body for glucose when carbohydrate is not available in sufficient amounts in the diet. Insulin (a hormone) promotes the uptake of glucose by body cell, and thereby controls its concentration in the blood.

29

Oviparous, indirect

30

Taq DNA polymerase

31

Tropomyosin is a protein present in the actin filaments in muscles. The molecule consists of two elongated strands that run along the length of the filament. When the muscle is at rest, the tropomyosin molecule covers the binding site of the actin molecule, where interaction with myosin occurs. On contraction of the muscle, the tropomyosin is displaced by another protein, troponin, allowing the interaction of actin with myosin.

32

The ovulated egg released during pregnancy die

33

At the time of origin of earth, the atmosphere was in the form of hot gases vapours without oxygen and hydrogen atoms were more and active. Hence the atmosphere was reducing.

34

Oil red O a fat soluble dye, used for staining of lipids.

35

Thymus

36

Pentoses as well as hexoses are the example of monosaccharides.

37

Basidiomycetes

38

Autonomic nervous system

39

Elytra

40

Production of body heat

41

Ureotelic animals include mainly amphibion as well as mammals besides its annelids (earthworm) elasmo branch fishes (shark) and aquatic animals are ureotelic.

42

Sporozoite

43

Hypothalamus part of human brain is connected with the regulation of body temperature.

44

According to the second messenger theory by Sutherland the I messenger is hormone itself while the II messenger is cyclic AMP.

45

Polymerase chain reaction is effectively used in amplification of a small DNA fragment to obtain its large quantity. PCR is helpful in DNA fingerprinting in such cases where the culprit has to be identified from a very small blood, semen or other cell sample from a crime scene. RFLP (Restriction fragment length polymorphism) corresponds to the occurrence of different cleavage sites for restriction enzymes in the DNA of different individuals of the same species. RFLPs have provided geneticists with a powerful set of genetic markers for gene mapping and gene tracking.

46

Cortisol

47

HIV is Human Immuno deficiency Virus that causes AIDS. Hepatitis-B is a viral disease and it has not been eradicated yet. Gonorrhoea is a bacterial disease. Trichomoniasis is a protozoan disease.

48

Glycine is a neutral amino acid. Sulphur is present in cysteine and methionine amino acid.

49

Blood groups

50

Ball is at the end of humerus while socket is in the pectoral girdle.

National Testing Platform