1. If the dimensions of a physical quantity are given by $M^aL^bT^c$, then the physical quantity will be
(1) Force if $a = 0$, $b = -1$, $c = -2$ (2) Pressure if $a = 1$, $b = -1$, $c = -2$
(3) Velocity if $a = 1$, $b = 0$, $c = -1$ (4) Acceleration if $a = 1$, $b = 1$, $c = -2$
Sol. Answer (2)
Pressure $[P] = [M^1L^{-1}T^{-2}]$ F
A
$\Upsilon / ' \infty = \leq f$
2. A particle starts its motion from rest under the action of a constant force. If the distance covered in first 10 seconds is S_1 and that covered in the first 20 seconds is S_2, then
(1) $S_2 = S_1$ (2) $S_2 = 2S_1$
(3) $S_2 = 3S_1$ (4) $S_2 = 4S_1$
Sol. Answer (4)
2
1
1
10 50
2
$S = a = a$
2
2
1
(20) 200
2
$S = a = a$ ® $S_2 = 4S_1$
3. A bus is moving with a speed of 10 ms^{-1} on a straight road. A scooterist wishes to overtake the bus in 100 s. If the bus is at a distance of 1 km from the scooterist, with what speed should the scooterist chase the bus?
(1) 10 ms^{-1} (2) 20 ms^{-1}
(3) 40 ms^{-1} (4) 25 ms^{-1}
Sol. Answer (2)
rel
rel
1000m
10m/s
time 100s
S
$V = = =$
® $V_S - V_B = 10$
® $V_S = V_B + 10 = 20$ m/s
4. The mass of a lift is 2000 kg. When the tension in the supporting cable is 28000 N, then its acceleration is
(1) 14 ms^{-2} upwards (2) 30 ms^{-2} downwards
(3) 4 ms^{-2} upwards (4) 4 ms^{-2} downwards
Sol. Answer (3)
$T = m(g + a)$
– 28000 – 20000 2
4 m/s
2000
a T mg
m
= = = upwards
5. An explosion blows a rock into three parts. Two parts go off at right angles to each other. These two are,
1 kg first part moving with a velocity of 12 ms^{-1} and 2 kg second part moving with a velocity of 8 ms^{-1}. If the third part flies off with a velocity of 4 ms^{-1}, its mass would be
(1) 3 kg (2) 5 kg
(3) 7 kg (4) 17 kg

Sol. Answer (2)

$P_1+P_2+P_3=0$

$, = \square\left(\quad + \right)$

$P_3\ P_1\ P_2$

®

+

=

2 2

1 2

3

3

P P

m

v

=

+ = 144 256 20

4 4

= 5 kg.

6. A block of mass *M* is attached to the lower end of a vertical spring. The spring is hung from a ceiling and

has force constant value *k*. The mass is released from rest with the spring initially unstretched. The maximum

extension produced in the length of the spring will be

(1) *Mg*/2*k* (2) *Mg*/*k*

(3) 2 *Mg*/*k* (4) 4 *Mg*/*k*

Sol. Answer (3)

Loss of gravitational potential energy = Gain of spring potential energy

Mgx = 1 2

2

kx

= *x* 2*Mg*

k

7. Two bodies of mass 1 kg and 3 kg have position vectors $\hat{i}+2\hat{j}+\hat{k}$ and $-3\hat{i}-2\hat{j}+\hat{k}$, respectively. The centre

of mass of this system has a position vector

(1) $-\hat{i}+\hat{j}+\hat{k}$ (2) $-2\hat{i}+2\hat{k}$

(3) $-2\hat{i}-\hat{j}+\hat{k}$ (4) $2\hat{i}-\hat{j}-2\hat{k}$

Sol. Answer (3)

1 1 2 2

1 2

cm

m r m r

r

m m

+

=

+

=

ˆ 2ˆ ˆ–9ˆ–6ˆ 3ˆ

4

$i+j+k\ i\ j+\ k\ \hat{}\ \hat{}\ \hat{}\ =-2i-j+k$

(3)

8. Four identical thin rods each of mass *M* and length *l*, form a square frame. Moment of inertia of this frame
about an axis through the centre of the square and perpendicular to its plane is
(1) 1 2
3
Ml (2) 4 2
3
Ml
(3) 2 2
3
Ml (4) 13 2
3
Ml
Sol. Answer (2)
A B
D C
z L/2
$I_z = 4 \times I_{AB}$
2 2 4 2
4
12 4 3
□*ML ML* □ *ML*
.□□ + □□=
□ □
9. A thin circular ring of mass *M* and radius *R* is rotating in a horizontal plane about an axis vertical to its plane
with a constant angular velocity ⎫. If two objects each of mass *m* be attached gently to the opposite ends of
a diameter of the ring, the ring will then rotate with an angular velocity
(1)
M
M m
⎫
+
(2)
(–2)
2
M m
M m
⎫
+
(3)
2
M
M m
⎫
+
(4)
(*M* 2*m*)
M
⎫+
Sol. Answer (3)
Conservation of angular momentum

$MR^2 \rceil = (M + 2m)R^2 \rceil^2$
®
2
M
M m
$\rceil^2 = \rceil$
+

10. A body, under the action of a force $= \left(\quad + \right)$
$\hat{} \hat{} \hat{}$ *F* 6*i*–8*j* 10*k*N, acquires an acceleration of 1 m/s^2. The mass of this body must be
(1) 10 2 kg (2) 2 10kg
(3) 10 kg (4) 20 kg
Sol. Answer (1)
= = + + =

$| | 6^2 8^2 10^2$
10 2 kg.
| | 1
m F
a

(4)

11. If *F*

is the force acting on a particle having position vector *r*
and |

be the torque of this force about the
origin, then
(1) *r* ⊕ | = 0
and *F* ⊕ | $\bar{0}$
(2) 0 *r* ⊕ |
and 0 *F* ⊕ | =

(3) *r* ⊕ | > 0
and *F* ⊕ | <0
(4) 0 *r* ⊕ | =
and 0 *F* ⊕ | =

Sol. Answer (4)
| =*r*.*F*

4 *r* ∞ |
and *F* ∞ |

12. The figure shows elliptical orbit of a planet *m* about the sun *S*. The shaded area *SCD* is twice the shaded
area *SAB*. If t_1 is the time for the planet to move from *C* to *D* and t_2 is the time to move from *A* to *B* then
C
D
B
A

m v
S
(1) $t_1 = t_2$ (2) $t_1 > t_2$
(3) $t_1 = 4t_2$ (4) $t_1 = 2t_2$
Sol. Answer (4)
Areal velocity is constant
$\text{Area}_{ABS} = \text{Area}_{CDS}$
® $t_1 = 2t_2$
13. An engine pumps water continuously through a hose. Water leaves the hose with a velocity *v* and *m* is the
mass per unit length of the water jet. What is the rate at which kinetic energy is imparted to water?
(1)
$\frac{1}{2} 2 2$
2
m v (2) $\frac{1}{2} 3$
2
mv
(3) mv^3 (4) $\frac{1}{2} 2$
2
mv
Sol. Answer (2)
$\frac{dK}{dt} = =$
2
$\frac{1}{2} 3$
2 2
$v \frac{dm}{dl} mv$
dt dl
14. A body of mass 1 kg is thrown upwards with a velocity 20 m/s. It momentarily comes to rest after attaining
a height of 18 m. How much energy is lost due to air friction? (g = 10 m/s^2)
(1) 10 J (2) 20 J
(3) 30 J (4) 40 J
Sol. Answer (2)
Loss of energy = Initial energy – final energy
$\frac{1}{2} 2$
–
2
= *mv mgh*
$\frac{1}{2} 2$
20 – 1 10 18
2
= . . .
= 200 – 180 = 20 J

(5)

15. The two ends of a rod of length *L* and a uniform cross-sectional area *A* are kept at two temperatures T_1 and
T_2($T_1 > T_2$). The rate of heat transfer,
$\frac{dQ}{dt}$, through the rod in a steady state is given by
(1) $\frac{dQ}{dt} = \frac{kA(T_1 - T_2)}{L}$
(2) $\frac{dQ}{dt} = \frac{kL(T_1 - T_2)}{A}$

=
(3) $\frac{dQ}{dt} = \frac{k(T_1 - T_2)}{LA}$
= (4) $\frac{dQ}{dt} = \frac{kLA}{T_1 - T_2}$
=
Sol. Answer (1)
Law of conduction $\frac{dQ}{dt} = \frac{kA(T_1 - T_2)}{L}$
16. In thermodynamic processes which of the following statements is not true?
(1) In an adiabatic process $PV^{\gamma} =$ constant
(2) In an adiabatic process the system is insulated from the surroundings
(3) In an isochoric process pressure remains constant
(4) In an isothermal process the temperature remains constant
Sol. Answer (3)
During isochoric process, volume is constant.
17. A black body at 227ºC radiates heat at the rate of 7cals/cm^{2}s. At a temperature of 727ºC, the rate of heat
radiated in the same units will be
(1) 80 (2) 60
(3) 50 (4) 112
Sol. Answer (4)
$E = \sigma T^4$
$\frac{E_1}{E_2} = \frac{T_1^4}{T_2^4}$
$\frac{E_1}{E_2} = \frac{T_1^4}{T_2^4}$
$\frac{E_1}{E_2} = \frac{(727 + 273)^4}{(227 + 273)^4}$
$E_1 = \frac{(727 + 273)^4}{(227 + 273)^4} \cdot E_2 = \frac{(1000)^4}{(500)^4} \cdot 7$
cal/cm^{2}s
= 112 cal/cm^{2}s
18. The internal energy change in a system that has absorbed 2 kcals of heat and done 500 J of work is
(1) 7900 J (2) 8900 J
(3) 6400 J (4) 5400 J
Sol. Answer (1)
$Q = \Delta U + W$
$\Delta U = Q - W = 2 \times 1000 \times 4.2 - 500$
= 8400 – 500 = 7900 J
19. The driver of a car travelling with speed 30 m/sec towards a hill sounds a horn of frequency 600 Hz. If the
velocity of sound in air is 330 m/s, the frequency of reflected sound as heard by driver is
(1) 500 Hz (2) 550 Hz
(3) 555.5 Hz (4) 720 Hz

Sol. Answer (4)

$n_2 = {}_0 330\ 30$

600

$- {}_s 330 - 30$

$v\ v$

n

$v\ v$

□ + □ □ + □ □ □= .□ □

□ □ □ □

= 720 Hz

20. A simple pendulum performs simple harmonic motion about $x = 0$ with an amplitude a and time period T. The speed of the pendulum at $x = a/2$ will be

(1) $\square a\ 3$

T

(2) 3

2

$\square a$

T

(3) $\square a$

T

(4) $3\square_2 a$

T

Sol. Answer (1)

$v = \rceil a_2 \square y_2$

=

2

$2\ _2\ 3$

4

$a\ a\ a$

$T\ T$

□ □ =□

21. Which one of the following equations of motion represents simple harmonic motion?

(1) Acceleration = kx (2) Acceleration = $k_0 x + k_1 x_2$

(3) Acceleration = $-k(x + a)$ (4) Acceleration = $k(x + a)$

where k, k_0, k_1 and a are all positive

Sol. Answer (3)

In simple harmonic motion acceleration is directly proportional to displacement and is opposite to displacement.

22. The electric field part of an electromagnetic wave in a medium is represented by $E_x = 0$;

ϒ□ □ □ □ □⁄ = ′□□. □ □ □ □ . □∞

≤□ □ □ □ f

$_6$rad $_2$rad

2.5 cos 2 10 10

y s m

$E\ N\ t\ x$

C , $E_z = 0$. The wave is

(1) Moving along $-x$ direction with frequency 10_6 Hz and wavelength 200 m

(2) Moving along y direction with frequency $2\square \times 10_6$ Hz and wavelength 200 m

(3) Moving along x direction with frequency 10_6 Hz and wavelength 100 m

(4) Moving along x direction with frequency 10_6 Hz and wavelength 200 m

Sol. Answer (4)
⎫ = 2□ × 10$_6$ rad/s
k = □ × 10$_{–2}$ rad/m
speed *c* = 2 10$_8$
k
⎫= . m/s along +ve *x*-axis
□
⎩ = □= □ =
□. 2
2 2
200 m
k 10
f = 10$_6$ Hz
2
⎫ =
□

(7)

23. A wave in a string has an amplitude of 2 cm. The wave travels in the +ve direction of x axis with a speed of
128 m/s and it is noted that 5 complete waves fit in 4 m length of the string. The equation describing the wave
is
(1) *y* = (0.02) m sin(7.85*x* – 1005*t*)
(2) *y* = (0.02) m sin(7.85*x* + 1005*t*)
(3) *y* = (0.02) m sin(15.7*x* – 2010*t*)
(4) *y* = (0.02) m sin(15.7*x* + 2010*t*)
Sol. Answer (1)
Amplitude A = 0.02 m
wavelength,
4
0.8 m
5
⎩ = =
2
k 7.85 rad/m = □=
⎩
⎫ = *vk* = 7.85 × 128 rad/s
= 1004.8 = 1005 rad/s
4 equation is *y* = (0.02) m sin(7.85x – 1005*t*)
24. Each of the two strings of length 51.6 cm and 49.1 cm are tensioned separately by 20 N force. Mass per
unit length of both the strings is same and equal to 1 g/m. When both the strings vibrate simultaneously the
number of beats is
(1) 3 (2) 5
(3) 7 (4) 8
Sol. Answer (3)
Frequency
1
2
f T
L
=

⌠
® 2 1
2 1
1 1 1
2
f f T
L L
ϒ/
□ = . ′ □ ∞ ⌠ ≤ *f*
= 3
20 1 1 1
10□ 2 49.1 51.6
ϒ/.′ □ ∞ ≤ *f*
=
1 51.6 49.1
20000
2 51.6 49.1
. ϒ □/′≤ . ∞*f*
= 6.97 = 7

25. Three capacitors each of capacitance *C* and of breakdown voltage *V* are joined in series. The capacitance and
breakdown voltage of the combination will be
(1) 3*C*, 3*V* (2) ,
3 3
C V
(3) 3 ,
3
C V (4) , 3
3
C V

Sol. Answer (4)

,
eq 3
C = *C V*2 = *V* + *V* + *V* = 3*V*

(8)

26. A wire of resistance 12 ohms per meter is bent to form a complete circle of radius 10 cm. The resistance
between its two diametrically opposite points, A and B as shown in the figure, is
A B
(1) 6 ∧ (2) 0.6 □∧
(3) 3 ∧ (4) 6 □∧

Sol. Answer (2)

A B
C
D
R_{ACB} = 1.2□ ∧
R_{ADB} = 1.2□ ∧
R_{AB} = 0.6□ ∧

27. A bar magnet having a magnetic moment of 2 × 10^{4} JT^{-1} is free to rotate in a horizontal plane. A horizontal
magnetic field *B* = 6 × 10^{-4} T exists in the space. The work done in taking the magnet slowly from a direction
parallel to the field to a direction 60° from the field is
(1) 2 J (2) 0.6 J

(3) 12 J (4) 6 J

Sol. Answer (4)

$W = MB[\cos\theta_1 - \cos\theta_2]$

$= 2 \times 10^4 \times 6 \times 10^{-4}[\cos 0 - \cos 60]$

$=$

1

12 6 J

2

. =

28. The magnetic force acting on a charged particle of charge –2 ⎡*C* in a magnetic field of 2*T* acting in y direction,

when the particle velocity is $(2\hat{i}+3\hat{j}).10^6 ms^{-1}$, is

(1) 8 N in *z* direction (2) 8 N in –*z* direction

(3) 4 N in *z* direction (4) 8 N in *y* direction

Sol. Answer (2)

F

$= q(v \times B)$

$= -2.10^{-6}[(2\hat{i}+3\hat{j})10^6 ms^{-1}].2\hat{j}$T

$= -8\hat{k}$ ®8N in –ve *z* direction

29. A conducting circular loop is placed in a uniform magnetic field 0.04 T with its plane perpendicular to the

magnetic field. The radius of the loop starts shrinking at 2 mm/s. The induced emf in the loop when the radius

is 2 cm is

(1) 1.6 □ ⎡*V* (2) 3.2 □ ⎡*V*

(3) 4.8 □ ⎡*V* (4) 0.8 □ ⎡*V*

(9)

Sol. Answer (2)

$\phi = B\pi r^2 \cos 0 = B\pi r^2$

$\left|\frac{d\phi}{dt}\right|$

$\sum = \frac{d\phi}{dt} = 2\pi B r \frac{dr}{dt}$

$= 0.04 \times \pi \times 2 \times 2 \times 10^{-2} \times 2 \times 10^{-3}$ V

$= 3.2\pi$ ⎡V

30. The electric potential at a point (*x*, *y*, *z*) is given by $V = -x^2y - xz^3 + 4$.

The electric field

E at that point os

(1) $E = \hat{i}(2xy\pi z^3) + \hat{j}xy^2 + \hat{k}3z^2x$

(2) $= \hat{}(2 + 3) + \hat{}2 + \hat{}3^2$

E i xy z jx k xz

(3) $= \hat{}2 + \hat{}(2 + 2) + \hat{}(3\pi 2)$

E i xy j x y k xz y

(4) $= \hat{}3 + \hat{} + \hat{}2$

E iz jxyz kz

Sol. Answer (2)
E

= ˆ ˆ ˆ *dVi dVj dVk*
dx dy dt
□ □ □
= *i*ˆ(2*xy*+*z*3)+*j*ˆ*x*2+*k*ˆ 3*xz*2
31. See the electrical circuit shown in this figure. Which of the following equations is a *correct* equation for it?
R
r_1
r_2
i_2
$i_1 \sum_1$
$\sum_2$
(1) $\sum_1 - (i_1 + i_2) R + i_1 r_1 = 0$ (2) $\sum_1 - (i_1 + i_2) R - i_1 r_1 = 0$
(3) $\sum_2 - i_2 r_2 - \sum_1 - i_1 r_1 = 0$ (4) $-\sum_2 - (i_1 + i_2) R + i_2 r_2 = 0$
Sol. Answer (2)
R
r_1
r_2
i_2
i_1
$\sum_1$
$\sum_2$
$i_1 + i_2$
A
E
D
B
F
C
KVL to the *ABCD*
$\sum_1 - i_1 r_1 - R (i_1 + i_2) = 0$
® $\sum_1 - (i_1 + i_2) R_1 - i_1 r_1 = 0$

(10)

32. A galvanometer having a coil resistance of 60 ∧ shows full scale deflection when a current of 1.0 amp passes
through it. It can be converted into an ammeter to read currents upto 5.0 amp by
(1) Putting in parallel a resistance of 15 ∧
(2) Putting in parallel a resistance of 240 ∧
(3) Putting in series a resistance of 15 ∧
(4) Putting in series a resistance of 240 ∧
Sol. Answer (1)
Ammeter
60
15
1 5 1
S G
n
= = = ∧
□ □

33. Under the influence of a uniform magnetic field, a charged particle moves with constant speed *V* in a circle
of a radius *R*. The time period of rotation of the particle
(1) Depends on both *V* and *R*
(2) Depends on *V* and not on *R*
(3) Depends on *R* and not on *V*
(4) Is independent of both *V* and *R*

Sol. Answer (4)

$T \; 2r \; 2 \; mv \; 2m$

$v \; v \; qB \; qB$

□ □□ □ □ = = □ □=

□ □

Independent of both *V* and *R* only depends on specific charge.

34. Power dissipated in an *LCR* series circuit connected to an a.c. source of emf ∑ is

(1)

∑

+□ ⎤□ □ □ ⎤□ □ □

2

2

2 1

R

R L

C

(2)

∑

ϒ □ □/′ +□ ⎤□ □ ∞ ′≤ □ ⎤□ ∞*f*

2

2

2 1

R

R L

C

(3)

∑ +□⎤□ □ □ ⎤□ □ □

2

2 2 1 *R L*

C

R (4)

ϒ □ □/∑′ +□⎤□ □ ∞ ′≤ □ ⎤□ ∞*f*

2

2 2 1 *R L*

C

R

Sol. Answer (2)

=∑ = ∑

+□ ⎤□ □ □ ⎤□ □ □

2 2

2 2

2 1

av

P R R

Z

R L

C

35. Three concentric spherical shells have radii *a*, *b* and *c* (*a* < *b* < *c*) and have surface charge densities ∫, – ∫

and ∫ respectively. If V_A, V_B and V_C denote the potentials of the three shells, then, for *c* = *a* + *b*, we have

(1) $V_C = V_B = V_A$ (2) $V_C = V_A \ \bar{} V_B$
(3) $V_C = V_B \ \bar{} V_A$ (4) $V_C \ \bar{} V_B \ \bar{} V_A$

(11)

Sol. Answer (2)
$V_A =$
0 0 0 0 0
2
$a\ b\ c\ (a\ b\ c)\ a$ ∫ □ ∫ + ∫ = ∫ □ + = ∫
∑ ∑ ∑ ∑ ∑
$V_B =$
2
0
$a\ b\ c$
b
∫ ϒ / ′ □ + ∞
∑ ′ ≤ ∞ f
=
2
0 0
$a\ b\ a\ b\ a(a\ b)$
$b\ b$
∫ ϒ / ∫ + ′ □ + + ∞=
∑ ′ ≤ ∞ f ∑
$V_C =$
2 2
0
$a\ b\ c$
$c\ c$
∫ ϒ / ′ □ + ∞
∑ ′ ≤ ∞ f
=
2 2 2
0
$a\ b\ c$
c
∫ ϒ □ + /
′ ∞
∑ ′ ≤ ∞ f
=
2
0
$(a\ b)(a\ b)\ (a\ b)$
$a\ b$
∫ ϒ □ + + + /
′ ∞
∑ ′ ≤ + ∞ f
=
0 0
2
[( )] $a\ b\ a\ b\ a$ ∫ □ + + = ∫
∑ ∑
36. A student measures the terminal potential difference (V) of a cell (of emf ∑ and internal resistance r) as a
function of the current (I) flowing through it. The slope and intercept of the graph between V and I, then, respectively, equal

(1) –∑ and *r* (2) ∑ and –*r*
(3) –*r* and ∑ (4) *r* and – ∑
Sol. Answer (3)
V = *E* – *Ir*
V
E
I
y = *mx* + *C* (*x* = *I*, *y* = *V*)
Slope m = –*r*, intercept *C* = ∑
37. A rectangular, a square, a circular and an elliptical loop, all in the (*x* – *y*) plane, are moving out of a uniform
magnetic field with a constant velocity = ˆ.

V vi The magnetic field is directed along the negative z axis direction.
The induced emf, during the passage of these loops, out of the field region, will not remain constant for
(1) Any of the four loops (2) The rectangular, circular and elliptical loops
(3) The circular and the elliptical loops (4) Only the elliptical loop
Sol. Answer (3)
In square loop effective length inside magnetic field remains constant.

38. If a diamagnetic substance is brought near the north or the south pole of a bar magnet, it is
(1) Attracted by both the poles
(2) Repelled by both the poles
(3) Repelled by the north pole and attracted by the south pole
(4) Attracted by the north pole and repelled by the south pole
Sol. Answer (2)
Diamagnetic substance always repeled by magnet.
39. The number of photo electrons emitted for light of a frequency ν (higher than the threshold frequency ν_0) is
proportional to
(1) Frequency of light (ν) (2) $\nu - \nu_0$
(3) Threshold frequency (ν_0) (4) Intensity of light
Sol. Answer (4)
Photoelectric current □ intensity.
40. Monochromatic light of wavelength 667 nm is produced by a helium neon laser. The power emitted is 9 mW. The number of photons arriving per sec. on the average at a target irradiated by this beam is
(1) 3×10^{19} (2) 9×10^{17}
(3) 3×10^{16} (4) 3×10^{15}
Sol. Answer (3)
–3 –9
16
–34 8
9 10 667 10
3 10
6.63 10 3 10
n p
hc
= = . . . = .
□ □ . . . □ □ □ □
41. The figure shows a plot of photo current versus anode potential for a photosensitive surface for three different
radiations. Which one of the following is a correct statement?
Retarding potential Anode potential
a

b
c
Photo current
(1) Curves (*b*) and (*c*) represent incident radiations of same frequency having same intensity
(2) Curves (*a*) and (*b*) represent incident radiations of different frequencies and different intensities
(3) Curves (*a*) and (*b*) represent incident radiations of same frequency but of different intensities
(4) Curves (*b*) and (*c*) represent incident radiations of different frequencies and different intensities
Sol. Answer (3)
Current □ intensity and Einstein photoelectric equation $eV_0 = h\nu - \phi$.
42. The number of beta particles emitted by a radioactive substance is twice the number of alpha particles emitted
by it. The resulting daughter is an
(1) Isotope of parent (2) Isobar of parent
(3) Isomer of parent (4) Isotone of parent
Sol. Answer (1)
Atomic number remains unchanged.

43. The ionization energy of the electron in the hydrogen atom in its ground state is 13.6 eV. The atoms are excited
to higher energy levels to emit radiations of 6 wavelengths. Maximum wavelength of emitted radiation corresponds to the transition between
(1) $n = 4$ to $n = 3$ states (2) $n = 3$ to $n = 2$ states
(3) $n = 3$ to $n = 1$ states (4) $n = 2$ to $n = 1$ states
Sol. Answer (1)
(–1)
6 4
2
$n\ n = ® n =$
Maximum wavelength corresponds to lowest energy.
44. In a Rutherford scattering experiment when a projectile of charge z_1 and mass M_1 approaches a target nucleus
of charge z_2 and mass M_2, the distance of closest approach is r_0. The energy of the projectile is
(1) Directly proportional of mass M_1 (2) Directly proportional of $M_1 \times M_2$
(3) Directly proportional of z_1z_2 (4) Inversely proportional to z_1
Sol. Answer (3)
2 1 2
0 0
1
2 4
q q
mV
r
=
□∑
® r_0 □ q_1q_2
® r_0 □ z_1z_2
45. In the nuclear decay given below
A A A–4 A–4
zX□z+1Y□z–1B□□z–1B
The particles emitted in the sequence are
(1) 〈, ®, © (2) ®, 〈, ©
(3) ©, ®, 〈 (4) ®, ©, 〈
Sol. Answer (2)
– A A A–4 A–4
zX z1Y z–1B z–1B ® 〈 ©

↓↓↓□+ ↓↓□ □↓↓□
46. The mean free path of electrons in a metal is 4×10^{-8} m. The electric field which can give on an average
2 eV energy to an electron in the metal will be in units of V/m
(1) 5×10^{7} (2) 8×10^{7}
(3) 5×10^{-11} (4) 8×10^{-11}
Sol. Answer (1)
$W = F.S$
® $W = qE.S$
® 2 eV = e$E \times 4 \times 10^{-8}$ m
® 7 –1
–8
2
5 10 Vm
4 10
E V
m
= = .
.

(14)

47. Sodium has body centred packing. Distance between two nearest atoms is 3.7 Å. The lattice parameter is
(1) 8.6 Å (2) 6.8 Å
(3) 4.3 Å (4) 3.0 Å
Sol. Answer (3)
In bcc
$4r = 3a$
® $2(d) = 3a$
® 2 2 3.7Å
4.3 Å
3 1.73
a d = = . =
48. A *p-n* phot2odiode is fabricated from a semiconductor with a band gap of 2.5 eV. It can detect a signal of
wavelength
(1) 4000 Å (2) 6000 Å
(3) 4000 nm (4) 6000 nm
Sol. Answer (1)
Maximum wavelength
124000eV Å
4960 Å
2.5 eV
hc
E
⌊ = = =
49. The symbolic representation of four logic gates are given below
(i) (ii)
(iii) (iv)
The logic symbols for OR, NOT and NAND gates are respectively
(1) (i), (iii), (iv) (2) (iii), (iv), (ii)
(3) (iv), (i), (iii) (4) (iv), (ii), (i)
Sol. Answer (4)
50. A transistor is operated in common-emitter configuration of $V_C = 2$ V such that a change in the base current

from 100 ⌠A to 200 ⌠A produces a change in the collector current from 5 mA to 10 mA. The current gain is
(1) 50 (2) 75
(3) 100 (4) 150
Sol. Answer (1)
⊗
® = = =
⊗ ⌠
(10 – 5)
50
(200 – 100)
C
B
I mA
I A
51. 10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. Amount of water produced in
this reaction will be
(1) 1 mol (2) 2 mol
(3) 3 mol (4) 4 mol

Sol. Answer (4)
2 2 2
5 2 4mol
2H +O □2H O
Here, limiting reagent is O_2
52. Oxidation numbers of P in PO_4^{3-}, of S in SO_4^{2-} and that of Cr in $Cr_2O_7^{2-}$ are respectively
(1) –3, +6 and +6 (2) +5, +6 and +6
(3) +3, +6 and +5 (4) +5, +3 and +6
Sol. Answer (2)
+5, +6 and +6
53. Maximum number of electrons in a subshell of an atom is determined by the following
(1) $2n^2$ (2) $4l + 2$
(3) $2l + 1$ (4) $4l – 2$
Sol. Answer (2)
$4l + 2$
54. Which of the following is **not** permissible arrangement of electrons in an atom?
(1) n = 3, l = 2, m = –2, s = –1/2 (2) n = 4, l = 0, m = 0, s = –1/2
(3) n = 5, l = 3, m = 0, s = +1/2 (4) n = 3, l = 2, m = –3, s = –1/2
Sol. Answer (4)
The value of 'm' varies from –1, 0, +1
55. From the following bond energies
H–H bond energy : 431.37 kJ mol^{-1}
C=C bond energy : 606.10 kJ mol^{-1}
C–C bond energy : 336.49 kJ mol^{-1}
C–H bond energy : 410.50 kJ mol^{-1}
Enthalpy for the reaction,
C = C + H – H □ H – C – C – H
H
H
H
H
H

H
H
H
will be
(1) 553.0 kJ mol^{-1} (2) 1523.6 kJ mol^{-1}
(3) –243.6 kJ mol^{-1} (4) –120.0 kJ mol^{-1}
Sol. Answer (4)
$\otimes H = (H_{C=C} + H_{H-H}) - (2 \times H_{C-H} + 1 \times H_{C-C})$
= (606.1 + 431.37) – (2 × 410.5 + 1 × 336.49)
= 1037.47 – 1157.49
= –120.02 kJ mol^{-1}
H –120.0 kJ mol^{-1}

(16)

56. The ionization constant of ammonium hydroxide is 1.77×10^{-5} at 298 K. Hydrolysis constant of ammonium
chloride is
(1) 5.65×10^{-12} (2) 5.65×10^{-10}
(3) 6.50×10^{-12} (4) 5.65×10^{-13}
Sol. Answer (2)
–14
w –10
H –5
b
K 10
K 5.65 10
K 1.77 10
= = = .
.
57. Given
(i) $Cu^{2+} + 2e^- \square Cu$, $E^o = 0.337$ V
(ii) $Cu^{2+} + e^- \square Cu^+$, $E^o = 0.153$ V
Electrode potential, E^o for the reaction, $Cu^+ + e^- \square Cu$, will be
(1) 0.38 V (2) 0.52 V
(3) 0.90 V (4) 0.30 V
Sol. Answer (2)
2 – o o
1 1
2 – o o
2 2
– o o
3 3
Cu 2e Cu, E 0.337 V, G – 2 F 0.337 0.674 F
Cu Cu e , E –0.153 V, G –1 F – 0.153 0.153 F
Cu e Cu, E ?, G – 0.521F
+
+ +
+
+ □ = ⊗ = . . =
□ + = ⊗ = . . =+
+ □ = ⊗ =
o
o 3
3
G –0.521F
E 0.521 V
–nF –1 F
⊗
= = =

.
58. What is the $[OH^-]$ in the final solution prepared by mixing 20.0 mL of 0.050 M HCl with 30.0 mL of 0.10 M
$Ba(OH)_2$?
(1) 0.12 M (2) 0.10 M
(3) 0.40 M (4) 0.0050 M
Sol. Answer (2)
20 ml . 0.5 N HCl
30 ml . 2 N $Ba(OH)_2$
=
=
1 meq
6 meq
5 meq
5 = 50 × N
N = 0.1 M
59. The energy absorbed by each molecule (A_2) of a substance is 4.4×10^{-19} J and bond energy per molecule
is 4.0×10^{-19} J. The kinetic energy of the molecule per atom will be
(1) 4.0×10^{-20} J (2) 2.0×10^{-20} J
(3) 2.2×10^{-19} J (4) 2.0×10^{-19} J
Sol. Answer (2)
E_k per atom = $E_{absorbed} - E_{B.E.}$
2
=
$4.4\ 10^{-19} - 4\ 10^{-19}$
2
. .
$= 2 \times 10^{-20}$

60. For the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, if $\frac{d[NH_3]}{dt} = 2 \times 10^{-4}$ mol L^{-1} s^{-1}, the value of $\frac{d[H_2]}{dt}$
would be:
(1) 1×10^{-4} mol L^{-1} s^{-1} (2) 3×10^{-4} mol L^{-1} s^{-1}
(3) 4×10^{-4} mol L^{-1} s^{-1} (4) 6×10^{-4} mol L^{-1} s^{-1}
Sol. Answer (2)
$-\frac{1}{2}\frac{d[NH_3]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt}$
$-\frac{d[H_2]}{dt} = \frac{3}{2} \times 2 \times 10^{-4}$
$-\frac{d[H_2]}{dt} = 3 \times 10^{-4}$
61. For the reaction A + B $\rightarrow$ products, it is observed that:
(a) On doubling the initial concentration of A only, the rate of reaction is also doubled and
(b) On doubling the initial concentrations of both A and B, there is a change by a factor of 8 in the rate of the reaction
The rate of this reaction is given by:
(1) rate = k [A] [B] (2) rate = k $[A]^2$ [B]
(3) rate = k [A] $[B]^2$ (4) rate = k $[A]^2$ $[B]^2$

Sol. Answer (3)
Rate □ $[A]_x$
$(2)_1$ □ $(2)_x$
Rate □ $[A]_x[B]_y$
8 □ $(2)_1$ $(2)_y$
y = 2
Hence Rate = K[A] $[B]_2$
62. The equivalent conductance of
M
32
solution of a weak monobasic acid is 8.0 mhos cm_2 and at infinite dilution is
400 mhos cm_2. The dissociation constant of this acid is
(1) $1.25 \times 10_{-4}$ (2) $1.25 \times 10_{-5}$
(3) $1.25 \times 10_{-6}$ (4) $6.25 \times 10_{-4}$
Sol. Answer (2)
8 1
0.02
400 50
〈 = = =
$_2$1 1 $_4$ $_5$
k C. 0.02 0.02 10 1.25 10
32 8
= 〈 = . . = . □ = . □
63. A 0.0020 m aqueous solution of an ionic compound $Co(NH_3)_5$ (NO_2) Cl freezes at –0.00732°C.
Number of moles
of ions which 1 mol of ionic compound produces on being dissolved in water will be (k_f = – 1.86°C/m)
(1) 1 (2) 2
(3) 3 (4) 4

Sol. Answer (2)
0.00732 = i × 1.86 × 0.002
0.00732
i 2
1.860.002
=
64. In the reaction
BrO_3(aq) 5Br (aq) 6H $3Br_2$(l) $3H_2O$(l) □ + □ + + □ +
The rate of appearance of bromine (Br_2) is related to rate of disappearance of bromide ions as following :
(1) $_2$ d(Br) 3 d(Br)
dt 5 dt
□
= (2) d(Br_2) 3 d(Br)
dt 5 dt
□
= □
(3) $_2$ d(Br) 5 d(Br)
dt 3 dt
□
= □ (4) d(Br_2) 5 d(Br)
dt 3 dt
□
=
Sol. Answer (2)
(Br_2) [Br] 1d 1d

3 dt 5 dt

$= \square$

$(Br_2)\ [Br^-]\ d\ 3\ d$

dt 5 dt

$= \square$

65. Lithium metal crystallises in a body centred cubic crystal. If the length of the side of the unit cell of lithium
is 351 pm, the atomic radius of the lithium will be:
(1) 300.5 pm (2) 240.8 pm
(3) 151.8 pm (4) 75.5 pm

Sol. Answer (3)

$4r = a\ 3$

a 3 351 1.732

r

4 4

$= = . = 151.983$ pm

66. The dissociation constants for acetic acid and HCN at 25°C are 1.5×10^{-5} and 4.5×10^{-10}, respectively. The
equilibrium constant for the equilibrium

$CN\ CH_3COOH\ HCN\ CH_3COO\ \square + \quad + \square$

would be:
(1) 3.0×10^4 (2) 3.0×10^5
(3) 3.0×10^{-5} (4) 3.0×10^{-4}

Sol. Answer (1)

$CH_3COOH \quad CH_3COO^- + H^+ \ ...(i)$

$HCN \quad H^+ + CN^- \ ...(ii)$

For

$CN^- + CH_3COOH \quad HCN + CH_3COO^- — K$

K =

1

2

K

K =

–5

–10

1.5 10

4.5 10

.

. = 1 5

10

3

. = 3×10^4 (approx)

67. The values of $\otimes H$ and $\otimes S$ for the reaction, $C_{(graphite)} + CO_{2\ (g)} \square 2CO_{(g)}$ are 170 kJ and 170 JK^{-1}, respectively.
This reaction will be spontaneous at:
(1) 510 K (2) 710 K
(3) 910 K (4) 1110 K

Sol. Answer (4)

$\otimes G = \otimes H - T. \otimes S$

$0 = 170 \times 10^3 - T \times 170$

T =

170 10^3

.
= 1000 K (at eq.)
For spontaneous, T must be greater than 1000 K i.e. 1110 K
68. Half life period of a first-order reaction is 1386 seconds. The specific rate constant of the reaction is:
(1) $5.0 \times 10^{-2}\ s^{-1}$ (2) $5.0 \times 10^{-3}\ s^{-1}$
(3) $0.5 \times 10^{-2}\ s^{-1}$ (4) $0.5 \times 10^{-3}\ s^{-1}$
Sol. Answer (4)
$K = \frac{0.693}{1386}$
$= 0.5 \times 10^{-3}\ s^{-1}$
69. In which of the following molecules/ions BF_3, NO_2,NH_2 □ □ and H_2O, the central atom is sp^2 hybridized?
(1) BF_3 and NO_2□ (2) NO_2□ and NH_2□
(3) NH_2□ and H_2O (4) NO_2□ and H_2O
Sol. Answer (1)
BF_3 & –
NO_2
70. Among the following which is the strongest oxidising agent?
(1) Cl_2 (2) F_2
(3) Br_2 (4) I_2
Sol. Answer (2)
F_2 (since its ◦
E_{Red} is highest)
71. According to MO theory which of the following lists ranks the nitrogen species in terms of increasing bond
order?
(1) 2
N_2 N_2 N_2 □< □< (2) 2
N_2 N_2 N_2 □< < □
(3) 2
N_2 N_2 N_2 □< □< (4) 2
N_2 N_2 N_2 < □< □

(20)

Sol. Answer (3)
2– –
$N_2 < N_2 < N_2$
B.O. (2) < (2.5) < (3)
72. In the case of alkali metals, the covalent character decreases in the order
(1) MI > MBr > MCl > MF (2) MCl > MI > MBr > MF
(3) MF > MCl > MBr > MI (4) MF > MCl > MI > MBr
Sol. Answer (1)
MI > MBr > MCl > MF
73. Which of the following oxides is ***not*** expected to react with sodium hydroxide?
(1) BeO (2) B_2O_3
(3) CaO (4) SiO_2
Sol. Answer (3)
CaO doesn't react with NaOH due to basic nature remaining are acidic. BeO is amphoteric.
74. Al_2O_3 is reduced by electrolysis at low potentials and high currents. If 4.0×10^4 amperes of current is passed
through molten Al_2O_3 for 6 hours, what mass of aluminium is produced? (Assume 100% current efficiency, At.
mass of Al = 27 g mol^{-1})
(1) 1.3×10^4 g (2) 9.0×10^3 g

(3) 8.1×10^4 g (4) 2.4×10^5 g

Sol. Answer (3)

$w = \frac{E}{96500} \times i \times t$

$= 9_4$

$\frac{4\ 10\ 6\ 3600}{96500}$

. . . . $= 8.05 \times 10^4$ g

75. The stability of +1 oxidation state increases in the sequence:

(1) Ga < In < Al < Tl (2) Al < Ga < In < Tl

(3) Tl < In < Ga < Al (4) In < Tl < Ga < Al

Sol. Answer (2)

Al < Ga < In < Tl

On moving down in 13 group the stability of oxidation state +1, increases due to increase of inert pair effect.

76. Copper crystallises in a face-centred cubic lattice with a unit cell length of 361 pm. What is the radius of copper

atom in pm?

(1) 108 (2) 128

(3) 157 (4) 181

Sol. Answer (2)

For FCC

$4r = a\sqrt{2}$

$r = \frac{361}{2\sqrt{2}} = \frac{361}{2 \times 1.414} = 127.65 \approx 128$ pm

.

77. What is the dominant intermolecular force or bond that must be overcome in converting liquid CH_3OH to a gas?

(1) London dispersion force (2) Hydrogen bonding

(3) Dipole-dipole interaction (4) Covalent bonds

Sol. Answer (2)

Hydrogen bonding

78. Which of the following complex ions is expected to absorb visible light?

(1) $[Zn(NH_3)_6]^{2+}$ (2) $[Sc(H_2O)_3(NH_3)_3]^{3+}$

(3) $[Ti(en)_2(NH_3)_2]^{4+}$ (4) $[Cr(NH_3)_6]^{3+}$

(At. number Zn = 30, Sc = 21, Ti = 22, Cr = 24)

Sol. Answer (4)

$[Cr(NH_3)_6]^{3+}$ (due to presence of unpaired 'd' electron d-d transition is possible)

79. Out of $_2$ $_3$

TiF_6 , COF_6 □ □ Cu_2Cl_2 and $_2$

$NiCl_4$□ (Z of Ti = 22, CO = 27, Cu = 29, Ni = 28) the colourless species

are:

(1) $_3$

COF_6 □ and $_2$

$NiCl_4$□ (2) $_2$

TiF_6 □ and $_3$

COF_6 □

(3) Cu_2Cl_2 and $_2$

$NiCl_4$ (4) $_2$
TiF_6 and Cu_2Cl_2
Sol. Answer (4)
$_2$
TiF_6 and Cu_2Cl_2 (Due to absence of unpaired e^-)
80. Which of the following ***does not*** show optical isomerism?
(1) $[CO\ (en)_3]^{3+}$ (2) $[CO\ (en)_2Cl_2]^+$
(3) $[CO\ (NH_3)_3Cl_3]^0$ (4) $[CO(en)Cl_2(NH_3)_2]^+$
(en = ethylenediamine)
Sol. Answer (3)
$[Co(NH_3)_3Cl_3]^0$
81. Which one of the elements with the following outer orbital configurations may exhibit the largest number of
oxidations states?
(1) $3d^24s^2$ (2) $3d^34s^2$
(3) $3d^54s^1$ (4) $3d^54s^2$
Sol. Answer (4)
$3d^54s^2$
82. Which of the following molecules acts as a Lewis acid?
(1) $(CH_3)_3$ N (2) $(CH_3)_3$ B
(3) $(CH_3)_2$ O (4) $(CH_3)_3$ P
Sol. Answer (2)
$(CH_3)_3$ B

83. Amongst the elements with following electronic configurations, which one of them may have the highest
ionization energy?
(1) Ne$[3s^23p^1]$ (2) Ne$[3s^23p^3]$
(3) Ne$[3s^23p^2]$ (4) Ar$[3d^{10}4s^24p^3]$
Sol. Answer (2)
$3p^3$-configuration is more stable than $4p^3$-configuration.
84. The straight chain polymer is formed by
(1) Hydrolysis of $(CH_3)_2$ $SiCl_2$ followed by condensation polymerisation
(2) Hydrolysis of $(CH_3)_3$ SiCl followed by condensation polymerisation
(3) Hydrolysis of CH_3 $SiCl_3$ followed by condensation polymerisation
(4) Hydrolysis of $(CH_3)_4$ Si by addition polymerisation
Sol. Answer (1)
Silicone formation.
85. The IUPAC name of the compound having the formula CH α C—CH = CH_2 is
(1) 1-butene-3-yne (2) 3-butene-1-yne
(3) 1-butyn-3-ene (4) but-1-yne-3-ene
Sol. Answer (1)
1-butene-3-yne.
86. Which of the following compounds will exhibit *cis-trans* (geometrical) isomerism?
(1) 2 Butenol (2) 2-Butene
(3) Butanol (4) 2-Butyne
Sol. Answer (2)
2-butene.
87. $H_2COH.CH_2OH$ on heating with periodic acid gives :
(1) 2 C O
H
H
(2) $2CO_2$
(3) 2HCOOH (4)

CHO
CHO
Sol. Answer (1)
CH OH 2
CH OH 2
HIO_4 2HCHO
88. Consider the following reaction, ethanol ↓↓PB↓r3 ↓□X↓↓alc↓. KO↓H↓□Y 2 4
2
(i) H SO room temperature
(ii) H O, heat ↓↓↓↓↓↓↓↓↓↓↓↓□Z ;
The product Z is
(1) CH_3CH_2OH (2) $CH_2 = CH_2$
(3) $CH_3CH_2—O—CH_2—CH_3$ (4) $CH_3—CH_2—O—SO_3H$

(23)

Sol. Answer (1)
PBr_3 alc. KOH H_2SO_4, 25 C
C_2H_5OH C_2H_5Br CH_2 CH_2 CH_3CH_2OH ↓↓↓↓□ ↓↓↓↓↓□ = ↓↓↓↓↓◦ ↓□
89. Benzene reacts with CH_3Cl in the presence of anhydrous $AlCl_3$ to form
(1) Xylene (2) Toluene
(3) Chlorobenzene (4) Benzylchloride
Sol. Answer (2)
CH_3
+ CH Cl 3
Anhyd.
$AlCl_3$
90. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4. In the
mixture, nitric acid acts as a/an
(1) Catalyst (2) Reducing agent
(3) Acid (4) Base
Sol. Answer (4)
Base.
91. Which of the following reactions is an example of nucleophilic substitution reaction?
(1) RX + Mg ↓□ RMgX (2) RX + KOH ↓□ ROH + KX
(3) 2RX + 2Na ↓□ R—R + 2NaX (4) RX + H_2 ↓□ RH + HX
Sol. Answer (2)
RX + KOH ↓□ ROH + KX
92. Which one of the following is employed as a tranquilizer?
(1) Chlorpheninamine (2) Equanil
(3) Naproxen (4) Tetracycline
Sol. Answer (2)
Equanil.
93. Structures of some common polymers are given. Which one is ***not*** corretly presented?
(1) Nylon 66
$—[NH(CH_2)_6NHCO(CH_2)_4 — CO—]_2$
(2) Teflon
$—(CF_2—CF_2—)_n$
(3) Neoprene
$—CH_2—C\ CH—CH_2—CH_2—$
|
Cl *n*
□ = □
□ □
□ □
□ □

(4) Terylene
COOCH — CH — O —) 2 2 n —(OC

(24)

Sol. Answer (3)
CH_2—C CH—CH_2
— | —
Cl
ϒ =/
′ ∞
′≤ ∞f
[Note : The answer will also be (1) because the structure of nylon-66 given is dimer structure not polymer structure.]
94. Predict the product : $NHCH_3$ + $NaNO_2$ + HCl Product
(1) N
OH
CH_3 (2)
N N
CH_3
O
(3) N NO_2
CH_3
(4) NO
$NHCH_3$ $NHCH_3$
+
NO
Sol. Answer (2)
$NHCH_3$ + NaNO + HCl 2 N N
CH_3
O
95. Propionic acid with Br_2 | P yields a dibromo product. Its structure would be
(1) C COOH
Br
Br
CH_3 (2) CH_2Br—CHBr—COOH
(3) C CH COOH 2
Br
Br
H (4) CH_2Br—CH_2—COBr
Sol. Answer (1)
Br_2 /P
3 2 HVZ reaction 3
Br
|
CH —CH —COOH CH — C—COOH
|
Br
↓↓↓↓↓↓□

(25)

96. Trichloroacetaldehyde, CCl_3CHO reacts with chlorobenzene in presence of sulphuric acid and produces
(1) Cl CH Cl
CCl_3
(2) Cl C Cl

CH_2Cl
Cl
(3) Cl C Cl
H
Cl
(4) Cl C Cl
Cl
OH
Sol. Answer (1)
CCl CHO + 2 Cl 3
H_2SO_4 CCl CH 3
Cl
Cl
D.D.T.
97. Consider the following reaction :
3 4
3 2
CH Cl Alkaline KMnO
Zn dust Anhydrous AlCl H O/H
Phenol X Y Z + ↓↓↓↓□ ↓↓↓↓↓↓↓□ ↓↓↓↓↓↓↓□ , the product Z is
(1) Benzene (2) Toluene
(3) Benzaldehyde (4) Benzoic acid
Sol. Answer (4)
OH
CH_3Cl
$AlCl_3$
Zn
Dust
CH_3
(i) Alkaline
(ii) H /H O +
2
COOH
98. The state of hybridization of C_2, C_3, C_5 and C_6 of the hydrocarbon,
CH C 3 CH CH CH C CH
CH_3
CH_3
CH_3
7 6 5 4 3 2 1
is in the following sequence
(1) *sp*, sp^2, sp^3 and sp^2 (2) *sp*, sp^3, sp^2 and sp^3
(3) sp^3, sp^2, sp^2 and *sp* (4) *sp*, sp^2, sp^2 and sp^3
Sol. Answer (2)
sp, sp^3, sp^2 and sp^3

99. The segment of DNA which acts as the instrumental manual for the synthesis of the protein is
(1) Nucleoside (2) Nucleotide
(3) Ribose (4) Gene
Sol. Answer (4)
Gene.
100. Which of the following hormones contains iodine?
(1) Thyroxine (2) Insulin
(3) Testosterone (4) Adrenaline
Sol. Answer (1)
Thyroxine
101. Which one of the following has haplontic life cycle?
(1) Wheat (2) *Funaria*
(3) *Polytrichum* (4) *Ustilago*

Sol. Answer (4)
Wheat – diplontic life cycle.
Funaria and *Polytrichum* – Haplodiplontic life cycle.
102. T.O. Diener discovered a
(1) Bacteriophage (2) Free infectious RNA
(3) Free infectious DNA (4) Infectious protein
Sol. Answer (2)
He discovered viroids having ssRNA and no capsid.
103. Mannitol is the stored food in
(1) *Gracillaria* (2) *Chara*
(3) *Porphyra* (4) *Fucus*
Sol. Answer (4)
Reserve food of brown algae (*Fucus*) is Laminarin and Mannitol.
104. Which one of the following is a vascular cryptogram?
(1) *Cedrus* (2) *Equisetum*
(3) *Ginkgo* (4) *Marchantia*
Sol. Answer (2)
Equisetum is a pteridophyte *i.e.,* vascular cryptogam.
105. Phylogenetic system of classification is based on
(1) Floral characters (2) Evolutionary relationships
(3) Morphological features (4) Chemical constituents
Sol. Answer (2)
Phylogeny deals with evolutionary interrelations.

106. Which one of the following groups of animals is bilaterally symmetrical and triploblastic?
(1) Sponges (2) Coelenterates (Cnidarians)
(3) Aschelminthes (round worms) (4) Ctenophores
Sol. Answer (3)
Aschelminthes are bilaterally symmetrical and triploblastic with pseudocoelom. *Sponges* are generally asymmetrical and some are radially symmetrical and diploblastic. *Coelenterates* and *Ctenophores* are radially
symmetrical and diploblastic.
107. *Peripatus* is a connecting link between
(1) Coelenterata and Porifera (2) Ctenophora and Platyhelminthis
(3) Mollusca and Echinodermata (4) Annelida and Arthropoda
Sol. Answer (4)
Peripatus is a connecting link between annelida and arthropoda. It has annelidian character like presence of
nephridia and unjointed legs and like arthopods it respires by trachea.
108. Which one of the following pairs of animals comprises ‘jawless fishes’?
(1) Guppies and hag fishes (2) Lampreys and eels
(3) Mackerals and Rohu (4) Lampreys and hag fishes
Sol. Answer (4)
'Jawless' fishes belong to the class Cyclostomata. The example of this class are *Petromyzon* (lamprey) and
Myxine (hagfish).
109. If a live earthworm is pricked with a needle on its outer surface without damaging its gut, the fluid that comes
out is
(1) Slimy mucus (2) Excretory fluid
(3) Coelomic fluid (4) Haemolymph
Sol. Answer (3)
Annelids are bilaterally symmetrical, triploblastic with a true coelom. The coelom is filled with coelomic fluid

which acts as hydraulic skeleton and even helps in locomotion.
110. Plasmodesmata are
(1) Connections between adjacent cells
(2) Lignified cemented layers between cells
(3) Locomotary structures
(4) Membranes connecting the nucleus with plasmalemma
Sol. Answer (1)
These are protoplasmic strands for communication and transport between adjacent cells.
111. Stroma in the chloroplasts of higher plant contains
(1) Chlorophyll (2) Light-independent reaction enzymes
(3) Light-dependent reaction enzymes (4) Ribosomes
Sol. Answer (2)
Dark reaction is light independent reaction and is an enzymatic process.

112. Synapsis occurs between
(1) Two homologous chromosomes (2) A male and a female gamete
(3) mRNA and ribosomes (4) Spindle fibres and centromere
Sol. Answer (1)
Synapsis (Bivalent formation) stands for pairing of homologous chromosomes.
113. Middle lamella is composed mainly of
(1) Phosphoglycerides (2) Hemicellulose
(3) Muramic acid (4) Calcium pectate
Sol. Answer (4)
Middle lamella is composed of Ca-pectate (mainly) and Mg-pectate.
114. Cytoskeleton is made up of
(1) Proteinaceous filaments (2) Calcium carbonate granules
(3) Callose deposits (4) Cellulosic microfibrils
Sol. Answer (1)
Microtubule – Tubulin protein
Microfilament – Actin protein
Intermediate filament – Acidic proteins
115. The cell junctions called tight, adhering and gap junctions are found in
(1) Neural tissue (2) Muscular tissue
(3) Connective tissue (4) Epithelial tissue
Sol. Answer (4)
The various cells in a tissue are held together by ECF (extracellular fluid), it is made up of glycoproteins and
acts as a binder. In the epithetial tissue the cells are in close contact with each other with little or no extracellular fluid. So, the cells in epithelial tissue are held together by cell junctions.
116. The kind of tissue that forms the supportive structure in our pinna (external ears) is also found in
(1) Tip of the nose (2) Vertebrae
(3) Nails (4) Ear ossicles
Sol. Answer (1)
Ear pinna has elastic cartilage, which is also present in the tip of nose; but the nasal septum has hyaline cartilarge.
117. The epithelial tissue present on the inner surface of bronchioles and fallopian tubes is
(1) Squamous (2) Cuboidal
(3) Glandular (4) Ciliated
Sol. Answer (4)
The epithelial tissue present in the bronchioles and fallopian tubes is ciliated epithelium. Ciliated epithelium
is present on the surfaces which involve movement of particles, mucous or cells.

118. Given below is a schematic break-up of the phases/stages of cell cycle
Which one of the following is the **correct** indication of the stage/phase in the cell cycle?
(1) A-Cytokinesis (2) B-Metaphase
(3) C-Karyokinesis (4) D-Synthetic phase
Sol. Answer (4)
It represents S-phase that occurs between G_1 and G_2 phase.
119. What is **not** true for genetic code?
(1) It is unambiguous
(2) A codon in mRNA is read in a non-contiguous fashion
(3) It is nearly universal
(4) It is degenerate
Sol. Answer (2)
All three bases are to be read continuously to code for an amino acid.
120. Removal of introns and joining the exons in a defined order in a transcription unit is called
(1) Capping (2) Splicing
(3) Tailing (4) Transformation
Sol. Answer (2)
Splicing is eukaryotic feature to remove introns (non coding sequences).
121. Semiconservative replication of DNA was first demonstrated in
(1) *Salmonella typhimurium* (2) *Drosophila melanogaster*
(3) *Escherichia coli* (4) *Streptococcus pneumoniae*
Sol. Answer (3)
Meselson and Stahl conducted this experiment on *E.coli.*
122. Whose experiments cracked the DNA and discovered unequivocally that a genetic code is a ‘‘triplet’’?
(1) Beadle and Tatum (2) Nirenberg and Mathaei
(3) Hershey and Chase (4) Morgan and Sturtevant
Sol. Answer (2)
Triplet code was first deciphered by Nirenberg and Matthaei using homopolymer of ‘Poly U’ nucleotides.
123. Point mutation involves
(1) Deletion (2) Insertion
(3) Change in single base pair (4) Duplication
Sol. Answer (3)
True gene mutations that may occur as transition or transversion.

124. In the case of peppered moth (*Biston betularia*) the black-coloured form became dominant over the light-coloured
form in England during industrial revolution. This is an example of
(1) Inheritance of darker colour character acquired due to the darker environment
(2) Natural selection whereby the darker forms were selected
(3) Appearance of the darker coloured individuals due to very poor sunlight
(4) Protective mimicry
Sol. Answer (2)
Natural selection selects alleles which makes an individual live and reproduce successfully. After industrial
revolution the soot was deposisted on tree trunks, so the black/melanic moth could easily camouflage and they were naturally selected.
125. Sickle cell anemia is
(1) Characterized by elongated sickle like RBCs with a nucleus
(2) An autosomal linked dominant trait
(3) Caused by substitution of valine by glutamic acid in the beta globin chain of haemoglobin
(4) Caused by a change in a single base pair of DNA
Sol. Answer (4)

Sickle cell anaemia is due to a single base change in the ®-chain of haemoglobin. Glutamic acid at position
number six is replaced by valine.
126. Study the pedigree chart given below
What does it show?
(1) Inheritance of a recessive sex-linked disease like haemophilia
(2) Inheritance of a sex-linked inborn error of metabolism like phenylketonuria
(3) Inheritance of a condition like phenylketonuria as an autosomal recessive trait
(4) The pedigree chart is wrong as this is not possible
Sol. Answer (3)
Aa Aa
Aa aa Aa Aa aa Aa
aa Aa Aa
Phenylketonuria is an autosomal recessive trait.

127. The most popularly known blood grouping is the ABO grouping. It is named ABO and not ABC because ‘‘O’’
in it refers to having
(1) No antigens A and B on RBCs
(2) Other antigens besides A and B on RBCs
(3) Overdominance of this type on the genes for A and B types
(4) One antibody only–either anti–A or anti–B on the RBCs
Sol. Answer (1)
In the ABO blood group system the blood group 'O' has no antigen on RBC but both the antibodies a and b
are present in blood plasma.
128. Select the **incorrect** statement from the following
(1) Baldness is a sex-limited trait
(2) Linkage is an exception to the principle of independent assortment in heredity
(3) Galactosemia is an inborn error of metabolism
(4) Small population size results in random genetic drift in a population
Sol. Answer (1)
Baldness is a sex influenced trait.
129. Cotyledons and testa respectively are edible parts in
(1) Cashew nut and litchi
(2) Groundnut and pomegranate
(3) Walnut and tamarind
(4) French bean and coconut
Sol. Answer (2)
Fleshy testa is edible for pomegranate and cotyledons are edible in groundnut.
130. An example of a seed with endosperm, perisperm and caruncle is
(1) Castor (2) Cotton
(3) Coffee (4) Lily
Sol. Answer (1)
Ricinus (Castor) has all three structures, where caruncle is an overgrowth of outer integument at micropyle
showing hygroscopic nature. Perisperm is persistent nucellus in seed.
131. Guard cells help in
(1) Fighting against infection (2) Protection against grazing
(3) Transpiration (4) Guttation
Sol. Answer (3)
Movement of guard cells regulate transpiration.
132. Manganese is required in
(1) Chlorophyll synthesis (2) Nucleic acid synthesis

(3) Plant cell wall formation (4) Photolysis of water during photosynthesis
Sol. Answer (4)
Mn present in OEC takes e^- from water, causing its splitting.

(32)

133. Oxygenic photosynthesis occurs in
(1) *Chlorobium* (2) *Chromatium*
(3) *Oscillatoria* (4) *Rhodospirillum*
Sol. Answer (3)
Oscillatoria is a BGA that uses water as a source of H^+ and e^-.
134. A fruit developed from hypanthodium inflorescence is called
(1) Caryopsis (2) Hesperidium
(3) Sorosis (4) Syconus
Sol. Answer (4)
Syconus is a composite fruit developing from the whole hypanthodium inflorescence, *e.g.*, *Ficus.*
135. The annular and spirally thickened conducting elements generally developed in the protoxylem when the root
or stem is
(1) Differentiating (2) Maturing
(3) Elongating (4) Widening
Sol. Answer (1)
Tracheary elements develop as a result of differentiation involving lignification and loss of protoplasm.
136. The floral formula □ $K_{(5)}\ C_{(5)}\ A_5G(2)$is that of
(1) Tobacco (2) Tulip
(3) Soybean (4) Sunnhemp
Sol. Answer (1)
This floral formula is characteristic to Solanaceae family. *e.g.* Tobacco, Potato, Tomato.
137. An example of axile placentation is
(1) Marigold (2) *Argemone*
(3) *Dianthus* (4) Lemon
Sol. Answer (4)
Marigold–Basal placentation, *Argemone* – Parietal placentation, *Dianthus* – Free central placentation.
138. In barley stem vascular bundles are
(1) Closed and radial (2) Open and scattered
(3) Closed and scattered (4) Open and in a ring
Sol. Answer (3)
Barley is a monocot.
139. Aerobic respiratory pathway is ***appropriately*** termed
(1) Anabolic (2) Catabolic
(3) Paraboilc (4) Amphibolic
Sol. Answer (4)
It supports both catabolism and anabolism.

(33)

140. Palisade parenchyma is ***absent*** in leaves of
(1) Gram (2) Sorghum
(3) Mustard (4) Soybean
Sol. Answer (2)
Mesophyll is characteristically undifferentiated in monocot leaf *e.g.*, *Sorghum.*
141. Reduction in vascular tissue, mechanical tissue and cuticle is characteristic of
(1) Hydrophytes (2) Xerophytes
(3) Mesophytes (4) Epiphytes
Sol. Answer (1)
It is characteristic to hydrophytes. These are anatomical adaptations to survive in aquatic condition.
142. Anatomically fairly old dicotyledonous root is distinguished from the dicotyledonous stem by

(1) Position of protoxylem (2) Absence of secondary xylem
(3) Absence of secondary phloem (4) Presence of cortex
Sol. Answer (1)
Dicot root in younger stages exhibit clear cut exarch condition.
143. Cyclic photophosphorylation results in the formation of
(1) ATP (2) NADPH
(3) ATP and NADPH (4) ATP, NADPH and O_2
Sol. Answer (1)
Cyclic photophosphorylation used only PS-I and releases ATP only. Both ATP and NADPH are produced during
non cyclic pathway
144. In a standard ECG which one of the following alphabets is the ***correct*** representation of the respectively activity
of the human heart?
(1) P-depolarisation of atria (2) R-repolarisation of ventricles
(3) S-start of systole (4) T-end of diastole
Sol. Answer (1)
P-wave in ECG represents depolarisation of atria; QRS wave represents depolarisation of ventricles; ST wave
depolarisation of *ventricle*. T is for repolarisation of *ventricles*.
145. Uric acid is the chief nitrogenous component of the excretory products of
(1) Frog (2) Man
(3) Earthworm (4) Cockroach
Sol. Answer (4)
Uric acid is the nitrogenous waste material excreted by cockroach. The excretory waste of frog and man is
urea. Earthworm is mainly ureotelic but when plenty of water is available it becomes ammonotelic.
146. Which one of the following pairs of food components in humans reaches the stomach totally undigested?
(1) Starch and cellulose (2) Protein and starch
(3) Starch and fat (4) Fat and cellulose
Sol. Answer (4)
30% starch is digested in the buccal cavity by ⟨-salivary amylase. Cellulose cannot be digested because it is a polymer of glucose with ®-linkage. We do not have ®-amylase, so when the food reaches the stomach
fat and cellulose are totally undigested.

147. Which one of the following is *correct* pairing of a body part and the kind of muscle tissue that moves it?
(1) Iris - Involuntary smooth muscle
(2) Heart wall - Involuntary unstriated muscle
(3) Biceps of upper arm - Smooth muscle fibres
(4) Abdominal wall - Smooth muscle
Sol. Answer (1)
Iris which controls the size of the pupil is made of involuntary smooth muscles.
Heart wall is made up of striated, involuntary cardiac muscles.
Biceps of upper arm is made up of skeletal muscles (striated).
Abdominal wall is made up of vestigeal segmental muscles.
148. Compared to blood our lymph has
(1) More RBCs and less WBCs (2) No plasma
(3) Plasma without proteins (4) More WBCs and no RBCs
Sol. Answer (4)
Lymph has WBCs and no RBCs. It has less proteins and can coagulate.
149. What will happen if the stretch receptors of the urinary bladder wall are totally removed?

(1) There will be no micturition (2) Urine will not collect in the bladder
(3) Micturition will continue (4) Urine will continue to collect normally in the bladder
Sol. Answer (3)
If the stretch receptors of the urinary bladder are totally removed the urine will collect in the bladder to the maximum; then micturition will continue drop by drop. This results in urinary incontinence.
150. Which part of human brain is concerned with the regulation of body temperature?
(1) Hypothalamus (2) Medulla oblongata
(3) Cerebellum (4) Cerebrum
Sol. Answer (1)
Hypothalamus has thermoregulatory centre.
151. A young infant may be feeding entirely on mother's milk which is white in colour but the stools which the infant
passes out is quite yellowish. What is this yellow colour due to
(1) Pancreatic juice poured into duodenum (2) Intestinal juice
(3) Bile pigments passed through bile juice (4) Undigested milk protein casein
Sol. Answer (3)
The yellow colour of the faeces in due to a pigment stercobilin. It is formed by the breakdown of bile pigments
i.e., bilirubin brought to intestine through the bile juice.
152. Globulins contained in human blood plasma are primarily involved in
(1) Clotting of blood (2) Defence mechanisms of body
(3) Osmotic balance of body fluids (4) Oxygen transport in the blood
Sol. Answer (2)
Antibodies are gamma globulins synthesised by lymph nodes.

153. Seminal plasma in humans is rich in
(1) Fructose and certain enzymes but poor in calcium
(2) Fructose, calcium and certain enzymes
(3) Fructose and calcium but has no enzymes
(4) Glucose and certain enzymes but has no calcium
Sol. Answer (2)
The male accessory glands include paired seminal vesicles, a prostate and paired bulbourethral glands; secretions of these glands constitute seminal plasma which is rich in fructose, calcium and certain enzymes.
154. Given below is a diagrammatic sketch of a portion of human male reproductive system. Select the correct set
of the names of the parts labelled A, B, C, D
A
B
C
D
A B C D
(1) Ureter Seminal vesicle Prostate Bulbourethral gland
(2) Ureter Prostate Seminal vesicle Bulbourethral gland
(3) Vas deferens Seminal vesicle Prostate Bulbourethral gland
(4) Vas deferens Seminal vesicle Bulbourethral gland Prostate
Sol. Answer (3)
A is vas deferens
B is seminal vesicle
C is prostate gland
D is bulbourethral gland
155. Which one of the following is the ***correct*** matching of three items and their grouping category?
Items Group
(1) Cytosine, uracil, thiamine - Pyrimidines

(2) Malleus, incus, cochlea - Ear ossicles
(3) Ilium, ischium, pubis - Coxal bones of pelvic girdle
(4) Actin, myosin, rhodopsin - Muscle proteins
Sol. Answer (3)
Each half of the pelvic girdle is made up of a single bone Os innominatum also called as coxal bone. Each
coxal bone is made up of 3 bones *i.e.*, Ilium, ischium and pubis.
156. Which one of the following statements is ***true*** regarding digestion and absorption of food in humans?
(1) About 60% of starch is hydrolysed by salivary amylase in our mouth
(2) Oxyntic cells in our stomach secrete the proenzyme pepsinogen
(3) Fructose and amino acids are absorbed through intestinal mucosa with the help of carrier ions like Na^+
(4) Chylomicrons are small lipoprotein particles that are transported from intestine into blood capillaries

Sol. Answer (3)
Some substances like fructose and some amino acids are absorbed with the help of the carrier ions like Na^+.
Their mechanism is called the facilitated diffusion.
157. Which one of the following ***correctly*** describes the location of some body parts in the earthworm pheretima?
(1) Two pairs of testes in 10^{th}
and 11^{th} segments
(2) Two pairs of accessory glands in 16-18 segments
(3) Four pairs of spermathecae in 4 - 7 segments
(4) One pair of ovaries attached at intersegmental septum of 14^{th} and 15^{th} segments.
Sol. Answer (1)
In earthworm there are two pairs of testes one pair in 10^{th} and one pair in 11^{th} segment. There are two pairs
of accessory glands, one pair in 17^{th} and one pair in 19^{th} segment. There are four pairs of spermathecae present in 6, 7, 8 and 9^{th} segment. One pair of ovaries attached at the intersegmental septum of 12^{th} and 13^{th} segment.
158. Elbow joint is an example of :
(1) Ball and socket joint (2) Pivot joint
(3) Hinge joint (4) Gliding joint
Sol. Answer (3)
Elbow joint is hinge joint as it involves the movement only in one plane.
159. Which one of the following is considered important in the development of seed habit?
(1) Free-living gametophyte (2) Dependent sporophyte
(3) Heterospory (4) Haplontic life cycle
Sol. Answer (3)
Development of two kinds of spores (heterospory) is marked as the primary requirement to develop the seed.
160. One of the synthetic auxin is :
(1) IBA (2) NAA
(3) IAA (4) GA
Sol. Answer (2)
IBA and IAA are naturally occurring auxins
161. Which one of the following acids is a derivative of carotenoids?
(1) Abscisic acid (2) Indole butyric acid
(3) Indole-3-acetic acid (4) Gibberellic acid
Sol. Answer (1)
Auxins are derived using tryptophan; gibberellic acid is derived using acetyl co A.
162. Vegetative propagation in mint occurs by
(1) Sucker (2) Runner
(3) Offset (4) Rhizome

Sol. Answer (1)
Suckers are used in mint to propagate profusely

(37)

163. Which one of the following plants is monoecious?
(1) Papaya (2) *Marchantia*
(3) *Pinus* (4) *Cycas*
Sol. Answer (3)
Both sex organs are present on the same plant
164. Foetal ejection reflex in human female is induced by
(1) Differentiation of mammary glands (2) Pressure exerted by amniotic fluid
(3) Release of oxytocin from pituitary (4) Fully developed foetus and placenta
Sol. Answer (4)
Parturition is induced by a complex neuroendocrine mechanism. The signals for parturition originate from the
fully developed foetus and placenta which induce mild uterine contractions called foetal ejection reflex.
165. Which one of the following is the *correct* matching of the events occurring during menstrual cycle?
(1) *Menstruation* : breakdown of myometrium and ovum not fertilised
(2) *Ovulation* : LH and FSH attain peak level and sharp fall in the
secretion of progesterone
(3) *Proliferative phase* : Rapid regeneration of myometrium and maturation of
Graafian follicle
(4) *Development of corpus luteum* : Secretory phase and increased secretion of
progesterone
Sol. Answer (4)
Myometrium does not breakdown during menstruation, so there is no regeneration of myometrium in proliferative phase. Ovulation results in the formation of corpus luteum and thus progesterone will increase.
166. Which one of the following is the most likely root cause why menstruation is not taking place in regularly cycling
human female?
(1) Retention of well-developed corpus luteum
(2) Fertilisation of the ovum
(3) Maintenance of the hypertrophical endometrial lining
(4) Maintenance of high concentration of sex-hormones in the blood stream
Sol. Answer (4)
If menstruation is not taking place in regularly cycling human female, it indicates the maintenance of high concentration of sex hormones in the blood stream.
167. The *correct* sequence of spermatogenetic stages leading to the formation of sperms in a mature human testis
is
(1) Spermatogonia-spermatid-spermatocyte-sperms
(2) Spermatocyte-spermatogonia-spermatid-sperms
(3) Spermatogonia-spermatocyte-spermatid-sperms
(4) Spermatid-spermatocyte-spermatogonia-sperms
Sol. Answer (3)
The correct sequence of spermatogenetic stages leading to the formation of sperms in mature human testes
is Spermatogonia □ Primary spermatocyte □ Secondary spermatocyte □ Spermatid □ Sperms.

(38)

168. A change in the amount of yolk and its distribution in the egg will affect:
(1) Fertilization
(2) Formation of zygote
(3) Pattern of cleavage

(4) Number of blastomeres produced

Sol. Answer (3)

The pattern of cleavage division depends on the amount and distribution of yolk in the cytoplasm. Yolk is an
inert material and retards the passage of cleavage furrow.

169. When breast feeding is replaced by less nutritive food low in proteins and calories; the infants below the age
of one year are likely to suffer from

(1) Pellagra (2) Marasmus
(3) Rickets (4) Kwashiorkor

Sol. Answer (2)

Both marasmus and kwashiorkor are PEM disorders. Marasmus occurs in infants below the age of one.

170. Which one of the following types of organisms occupy more than one trophic level in a pond ecosystem?

(1) Frog (2) Phytoplankton
(3) Fish (4) Zooplankton

Sol. Answer (3)

Larger and small fishes function at different trophic levels

171. Which one of the following has maximum genetic diversity in India?

(1) Tea (2) Teak
(3) Mango (4) Wheat

Sol. Answer (3)

About thousand varieties of mango are found in India.

172. Montreal Protocol aims at

(1) Control of CO_2 emission (2) Reduction of ozone depleting substances
(3) Biodiversity conservation (4) Control of water pollution

Sol. Answer (2)

Montreal protocol (1987) - A land mark international agreement to reduce ODS.

173. Chipko movement was launched for the protection of

(1) Wet lands (2) Grasslands
(3) Forests (4) Livestock

Sol. Answer (3)

Chipko movement (tree hugging movement).

174. The *correct* sequence of plants in a hydrosere is

(1) Oak □ *Lantana* □ *Volvox* □ *Hydrilla* □ *Pistia* □ *Scirpus*
(2) Oak □ *Lantana* □ *Scirpus* □ *Pistia* □ *Hydrilla* □ *Volvox*
(3) *Volvox* □ *Hydrilla* □ *Pistia* □ *Scirpus* □ *Lantana* □ Oak
(4) *Pistia* □ *Volvox* □ *Scirpus* □ *Hydrilla* □ Oak □ *Lantana*

Sol. Answer (3)

Volvox -Plankton stage, Hydrilla - Submerged stage
Pistia -Floating stage, *Scirpys* - Reed swamp stage
Lantana -Woodland stage, Oak - Climax stage

175. A country with a high rate of population growth took measures to reduce it. The figure below shows age-sex
pyramids of populations A and B twenty years apart. Select the *correct* interpretation about them :

Males Females
Males Females
Age
70 +
60 – 69
50 – 59
40 – 49
30 – 39
20 – 29
10 – 19
0 – 9
Age (in years)

1512 9 6 3 0 3 6 9 12 15
'A'
Age
70 +
60 – 69
50 – 59
40 – 49
30 – 39
20 – 29
10 – 19
0 – 9
Age (in years)
15 12 9 6 3 0 3 6 9 12 15
'B'
Interpretations
(1) "A" is the earlier pyramid and no change has occurred in the growth rate
(2) "A" is more recent and shows slight reduction in the growth rate
(3) "B" is earlier pyramid and shows stabilised growth rate
(4) "B" is more recent showing that population is very young

Sol. Answer (2)

The number of young individual is decreased in pyramid 'A'.

176. Steps taken by the Government of India to control air pollution include :
(1) Use of non-polluting Compressed Natural Gas (CNG) only as fuel by all buses and trucks.
(2) Compulsory mixing of 20% ethyl alcohol with petrol and 20% biodiesel with diesel
(3) Compulsory PUC (Pollution Under Control) certification of petrol driven vehicles which tests for carbon monoxide and hydrocarbons.
(4) Permission to use only pure diesel with a maximum of 500 ppm sulphur as fuel for vehicles.

(40)

Sol. Answer (3)

Presently CNG is used only in National Capital, Delhi.

177. Biochemical Oxygen Demand (BOD) in a river water
(1) Increases when sewage gets mixed with river water
(2) Remains unchanged when algal bloom occurs
(3) Has no relationship with concentration of oxygen in the water
(4) Gives a measure of *salmonella* in the water

Sol. Answer (1)

Mixing of sewage decreases DO and increases BOD, due to increased aerobic digestion of organic waste.

178. DDT residues are repidly passed through food chain causing biomagnification because DDT is
(1) Water soluble (2) Lipo soluble
(3) Moderately toxic (4) Non-toxic to aquatic animals

Sol. Answer (2)

DDT (Organochlorine) is lipophilic and accumulates in lipid bilayer of PM.

179. Global agreement in specific control strategies to reduce the release of ozone depleting substances, was
adopted by
(1) The Vienna Convention (2) Rio de Janeiro Conference
(3) The Montreal Protocol (4) The Koyoto Protocol

Sol. Answer (3)

Kyoto protocol – To mitigate climatic change and to reduce overall green house gas emission.
Rio de Janerio conference *i.e.,* Earth Summit, held in Brazil in 1992.

180. Somaclones are obtained by
(1) Genetic engineering (2) Tissue culture
(3) Plant breeding (4) Irradiation

Sol. Answer (2)

Plants regenerated from a single culture (clonal propagation) *invitro* are called somaclones.

181. Which one is the *wrong* pairing for the disease and its causal organism?
(1) Root-knot of vegetables-*Meloidogyne sp* (2) Late blight of potato - *Alternaria solani*

(3) Black rust of wheat - *Puccinia graminis* (4) Loose smut of wheat - *Ustilago nuda*
Sol. Answer (2)
Late blight of potato–*Phytophthora infestans.*
182. Which of the following is ***not*** used as a biopesticide?
(1) *Xanthomonas campestris* (2) *Bacillus thuringiensis*
(3) *Trichoderma harzianum* (4) Nuclear Polyhedrosis Virus (NPV)
Sol. Answer (1)
Xanthomonas campestris–Bacterial rot in crucifers.

183. Which of the following plant species you would select for the production of bioethanol?
(1) *Jatropha* (2) *Brassica*
(3) *Zea mays* (4) *Pongamia*
Sol. Answer (3)
Zea mays is used for bio-ethanol production.
Jatropha and *Pongamia* are biodiesel plants.
184. Which of the following is a symbiotic nitrogen fixer?
(1) *Azolla* (2) *Glomus*
(3) *Azotobacter* (4) *Frankia*
Sol. Answer (4)
Frankia is symbiotic N_2 fixing actinomycetes, forming root nodules in non legumes. *e.g., Casuarina.*
185. A health disorder that results from the deficiency of thyroxine in a adults and characterised by (i) a low metabolic
rate, (ii) increase in body weight and (iii) tendency to retain water in tissues is
(1) Cretinism (2) Hypothyroidism
(3) Simple goitre (4) Myxoedema
Sol. Answer (4)
Deficiency of thyroxine in adults results in myxoedema. The symptoms of this diseases are low metabolic rate, increases in body weight and there is retention of water in facial tissue. Thyroxine is a calorigenic hormone.
186. Which one of the following statements is *correct*?
(1) Malignant tumours may exhibit metastasis
(2) Patients who have undergone surgery are given cannabinoids to relieve pain
(3) Benign tumours show the property of metastasis
(4) Heroin accelerates body functions
Sol. Answer (1)
Malignant tumors are cancerous. Malignant neoplasms or the cancerous cells will break from the tumor and
spread through blood and lymph throughout the body. This movement is called as metastasis.
187. Which of the following is a pair of viral diseases?
(1) Typhoid, Tuberculosis (2) Ringowrm, AIDS
(3) Common Cold, AIDS (4) Dysentery, Common Cold
Sol. Answer (3)
Typhoid and tuberculosis are caused by bacteria and ringworm by fungi.
188. A person likely to develop tetanus is immunised by administering
(1) Weakened germs (2) Dead germs
(3) Preformed antibodies (4) Wide spectrum antibiotics
Sol. Answer (3)
A person likely to develop tetanus is immunised by administering preformed antibodies. This is an example
of artificially acquired passive immunity.

189. Use of anti-histamines and steroids give a quick relief from
(1) Headache (2) Allergy

(3) Nausea (4) Cough
Sol. Answer (2)
The drugs given for the treatment of allergy are anti-histamines, steroids and adrenaline hormone.
190. Alzhimer disease in humans is associated with the deficiency of
(1) Gamma aminobutyric acid (GABA) (2) Dopamine
(3) Glutamic acid (4) Acetylcholine
Sol. Answer (4)
Alzheimer's diseases is due to the deficiency of acetylcholine. This disorder is associated with loss of memory
of past events.
191. Which one of the following is commonly used in transfer of foreign DNA into crop plants?
(1) *Penicillium expansum*
(2) *Trichoderma harzianum*
(3) *Meloidogyne incognita*
(4) *Agrobacterium tumefaciens*
Sol. Answer (4)
Agrobacterium tumefaciens mediated transformation is the most common method of transformation used for
the production of transgenic plants.
192. The bacterium *Bacillus thuringiensis* is widely used in contemporary biology as
(1) Source of industrial enzyme
(2) Indicator of water pollution
(3) Insecticide
(4) Agent for production of dairy products
Sol. Answer (3)
Bacillus thuringiensis produces a protein endotoxin which acts as insecticide.
193. Which one of the following pairs is *wrongly* matched?
(1) Textile - amylase (2) Detergents - lipase
(3) Alcohol - nitrogenase (4) Fruit juice - pectinase
Sol. Answer (3)
Nitrogenase enzyme is involved in the formation of ammonia.
194. Polyethylene glycol method is used for
(1) Energy production from sewage (2) Gene transfer without a vector
(3) Biodiesel production (4) Seedless fruit production
Sol. Answer (2)

One of the method of direct/vectorless gene transfer is, chemical mediated gene transfer. This involves use
of PEG (polyethylene glycol).
195. Transgenic plants are the ones
(1) Grown in artificial medium after hybridization in the field
(2) Produced by a somatic embryo in artificial medium
(3) Generated by introducing foreign DNA in to a cell and regenerating a plant from that cell
(4) Produced after protoplast fusion in artificial medium
Sol. Answer (3)
Transgenic plants have the foreign gene called as transgene. They have had their DNA manipulated to possess
and express (foreign) gene.
196. What is *true* about Bt toxin?
(1) The concerned *Bacillus* has antitoxins
(2) The inactive protoxin gets converted into active form in the insect gut
(3) Bt protein exists as active toxin in the *Bacillus*
(4) The activated toxin enters the ovaries of the pest to sterilise it and thus prevent its multiplication
Sol. Answer (2)

Bt. toxin is produced in inactive form as protoxin but it gets converted into active form in gut of insects.
197. The genetic defect-adenosine deaminase (ADA) deficiency may be cured permanently by
(1) Enzyme replacement therapy
(2) Periodic infusion of genetically engineered lymphocytes having functional ADA cDNA
(3) Administering adenosine deaminase activators
(4) Introducing bone marrow cells producing ADA into cells at early embryonic stages
Sol. Answer (4)
Gene isolate from marrow cells producing ADA if introduced into cells at early embryonic stages, could be a permanent cure.
198. There is no DNA in
(1) Hair root (2) An enucleated ovum
(3) Mature RBCs (4) A mature spermatozoan
Sol. Answer (3)
There is no DNA in mature RBC. During the maturation of RBC there is degeneration of mitochondria, nucleus
and golgi. An enucleated ovcum has mitochondria which contains DNA.
199. The letter T in T-lymphocyte refers to
(1) Thymus (2) Thyroid
(3) Thalamus (4) Tonsil
Sol. Answer (1)
The maturation of T-lymphocytes occurs in thymus; so 'T' in T-lymphocytes represents thymus.
200. Tiger is *not* a resident in which one of the following national park?
(1) Jim Corbett (2) Ranthambhor
(3) Sunderbans (4) Gir
Sol. Answer (4)
Gir National Park–Lion.