ANSWER KEY

NATIONAL STANDARD EXAMINATION IN JUNIOR SCIENCE
NSEJS-2025 [23-11-2025]

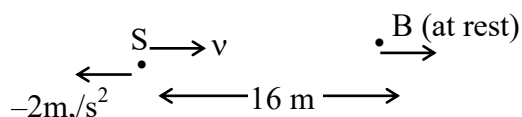| Code	51	52	53	54	Code	51	52	53	54	Code	51	52	53	54
Q.No.	Ans.	Ans.	Ans.	Ans.	Q.No.	Ans.	Ans.	Ans.	Ans.	Q.No.	Ans.	Ans.	Ans.	Ans.
1	b	d	c	b	21	c	b	b	b	41	c	b	c	c
2	b	d	b	b	22	c	d	c	d	42	d	a	b	b
3	d	d	d	d	23	d	b	b	b	43	d	c	d	d
4	c	c	a	c	24	b	c	c	c	44	b	b	c	c
5	b	c	b	b	25	c	c	a	c	45	c	c	a	a
6	a	c	b	a	26	b	d	a	d	46	b	b	d	d
7	b	d	d	b	27	d	d	c	d	47	b	c	c	c
8	c	b	c	c	28	c	c	c	b	48	c	c	c	c
9	a	c	c	a	29	a	b	b	b	49	b,d	b,c,d	b,c,d	b,d
10	a	b	d	a	30	d	b	c	c	50	b,c	b,c	a,b,c	b,c
11	c	d	d	c	31	c	b	c	b	51	b,c	a,d	a,b,c,d	b,c
12	b	c	b	b	32	c	c	b	c	52	c,d	c,d	a,c,d	c,d
13	c	a	c	c	33	c	b	d	d	53	b,c,d	b,c,d	b,d	b,c,d
14	b	d	b	b	34	b	b	d	d	54	b,c	a,b,c,d	b,c	a,b,c,d
15	c	c	b	c	35	d	d	d	d	55	a,d	a,b,c	b,c	a,b,c
16	c	c	c	c	36	a	c	c	c	56	c,d	a,c,d	c,d	a,c,d
17	d	c	b	c	37	b	b	c	c	57	b,c,d	b,d	b,c,d	b,c,d
18	d	b	b	b	38	d	a	c	c	58	a,b,c	b,c	b,c	b,c
19	d	d	d	d	39	b	c	d	d	59	a,b,c,d	b,c	a,d	a,d
20	c	a	a	a	40	c	a	b	b	60	a,c,d	c,d	c,d	c,d

B = Bonus

SOLUTIONS

1. A student, intending to catch a bus on the bus stand, finds that the bus starts and accelerates away from him/her with uniform acceleration $a = 2ms^{-2}$ when he is 16 m far from the bus. he runs fast enough with a uniform speed so as just to catch the bus. The minimum speed with which the student must run, is

(a) $2.0\ ms^{-1}$　　　(b) $4.0\ ms^{-1}$　　　(c) $8.0\ ms^{-1}$　　　(d) $16.0\ ms^{-1}$
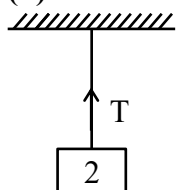
Ans. (c)

Sol.

$S \xrightarrow{} v$　　　$B \xrightarrow{} u = 0$
$\xleftarrow{\text{16 m}}\rightarrow$　　$a = 2m/s^2$

motion of student w.r.t. Bus $\rightarrow$

$S \xrightarrow{} v$　　　B (at rest)

$-2m,/s^2$　$\xleftarrow{\text{16 m}}\rightarrow$

$16 = \dfrac{v^2}{2 \times 2} \Rightarrow v = \sqrt{64} = 8\dfrac{m}{s}$

2. A block of mass 2.0 kg is suspended from the ceiling by a massless string. The string is taut bearing a definite tension when the block is stationary. Suddenly, the string breaks and the block start falling freely. The difference in the tension in string just before and after it breaks is

(a) 9.8 N　　　(b) 19.6 N　　　(c) 4.9 N　　　(d) zero

Ans. (b)

Sol.

$T_1 = mg = 2 \times 9.8 = 19.6\ N$
after breaking $\rightarrow$
　　　$T_2 = 0$
　　　$\Delta T = T_1 - T_2 = 19.6\ N$

3. Having been paddled continuously on a horizontally road, the speed of a bicycle is increasing, the force of friction exerted by the ground on the wheels is

(a) in the backward direction on both the wheels
(b) in the forwards direction on both the wheels
(c) in the forward direction on the front when and in backward direction on the rea wheel.
(d) in the backward direction on the front wheel and in forward direction on the rear wheel.

Ans. (d)

Sol. During paddling relative motion of point of contact of rear wheel is backward so friction on it will be forwards. While on front wheel it is backward.

® NSEJS-2025 (IJSO STAGE-I)
Date of Examination : 23th November, 2025
PAPER CODE - 53

ALLEN
CAREER INSTITUTE
KOTA (RAJASTHAN)
path to success

4. A current i = 2 amp is established through the long straight conductors which are the arms of a hairpin like structure placed in the plane of paper as shown in the figure. Knowing that a current carrying conductor produces magnetic field represented by the liens of force, analyze the situations described.
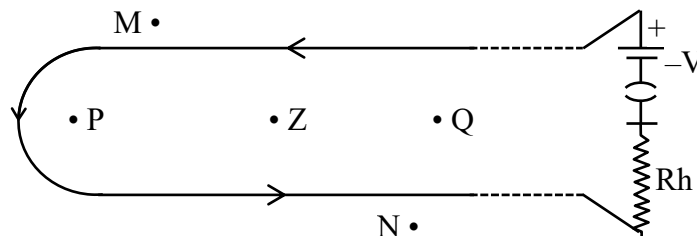
The correct option
(a) The magnetic field at point P is directed outward, normal to the plane of paper
(b) The magnetic field at point Q is directed inward, normal to the plane of paper
(c) The magnetic field at point Z is directed normal to the line PQ in the plane of paper
(d) No magnetic field is produced outside the hair pin that is at points M & N

Ans. (a)

Sol. By right hand thumb rule → magnetic field at P, Z, Q will be perpendicular out of the page.

5. A certain water pump rated 500 watt lifts water from ground level to height h = 10 meter at a rate of 240kg/minute. Ignoring the kinetic energy gained by water, the efficiency of water pump is.
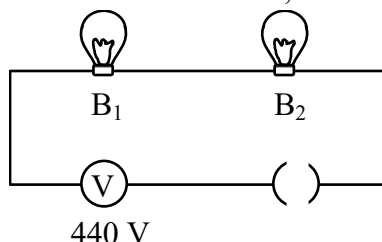(a) 74.8 %   (b) 78.4%   (c) 84.7%   (d) 87.4%

Ans. (b)

Sol. $P_{o/p} = \dfrac{dw}{dt} = \left(\dfrac{dm}{dt}\right)gh$

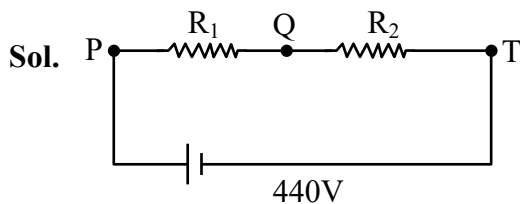$P_{o/p} = \left(\dfrac{240}{60}\right) \times 9.8 \times 10$

$\eta = \dfrac{P_{O/P}}{P_{I/P}} = \dfrac{392}{500} \times 100 = 78.4\%$

6. Two filament bulb B_1(100 W, 220V) and B_2 (60W, 220V) are connected in series with a 440V supply voltage source as shown. When switched on, the bulb.

(a) B_1 will fuse : B_2 will not fuse
(b) B_1 will not fuse: B_2 will fuse
(c) B_1 and B_2 both will fuse at the same instant
(d) B_1 and B_2 both will not fuse

Ans. (b)

Sol.

$$R_1 : R_2 = \frac{(220)^2}{100} : \frac{(220)^2}{60} = 3 : 5$$

$$V_{PQ} = \frac{3}{8} \times 440 = 165 \text{ V}$$

$$V_{QT} = \frac{5}{8} \times 440 = 275 \text{ V}$$

B_2 will get fused

7. An electric kettle consists of two filaments F_1 and F_2 of different resistances R_1 and R_2 respectively, connected in parallel with separate switches. With a certain fixed amount of water in the kettle pot to prepare the tea, when only F_1 is switched on, it takes 4 minute to boil the water. When F_1 and F_2 both are switched on simultaneously, it takes 3 minute to boil the same amount of water up to the same temperature. The time taken to boil the same amount of water when only F_2 is witcheds on (assume that entire heat radiated by filaments is used in boiling the water starting from the same room temperature in each case) is

(a) 7.0 min   (b) 8.4 min   (c) 9.6 min   (d) 12.0 min

Ans. (d)

Sol. When only F_1, is switched on $\rightarrow$

$$H = \left(\frac{V^2}{R_1}\right) \times 4 \times 60 \qquad \dots (1)$$

When both switches on

$$H = \frac{V^2}{R_1 R_2}(R_1 + R_2) \times 3 \times 60 \qquad \dots (2)$$

(1) = (2)

$$R_2 = 3R_1 \qquad \dots (3)$$

When only F_2 is switched on

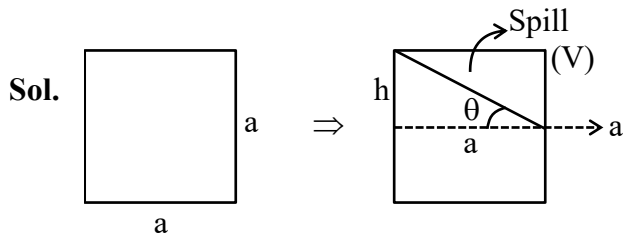$$H = \left(\frac{V^2}{R_2}\right)t \qquad \dots (4)$$

(1) = (4)

$$\frac{V^2}{R_1} \times 4 \times 60 = \left(\frac{V^2}{R_2}\right)t = \left(\frac{V^2}{3R_1}\right)t$$

$t = 12 \times 60$ sec

$= 12$ min

8. The volume of water, spilled out of a completely filled cubic container of side 4 m when the container has been accelerated horizontally with 1.96 m/s^2, is

    (a) 0   (b) 12.8 m^3 (c) 6.4 m^3 (d) 3.2m^3

Ans. (c)

Sol.

$$\tan\theta = \frac{a}{g}, \qquad V = \frac{1}{2}ah.a$$

$$V = \frac{1}{2}a^2h, \qquad \tan\theta = \frac{h}{a}$$

$$h = a\tan\theta$$

$$V = \frac{1}{2}a^2 . a t \tan\theta = \frac{1}{2}a^3 \tan\theta$$

$$V = \frac{1}{2}\times 4^3 \times \left(\frac{1.96}{9.8}\right)$$

$$= 6.4 \text{ m}^3$$

9. Two athletes, A and B, run in the ground on an oval track of length L (say) at 8.0 m/s and 6.0 m/s respectively in the same direction starting from same initial point. How many laps (rounds) will the athlete. A complete on the track before overtaking athletes B for the first time.

    (a) 2   (b) 3   (c) 4   (d) 5

Ans. (c)

Sol. $L + S = 8 \times t$
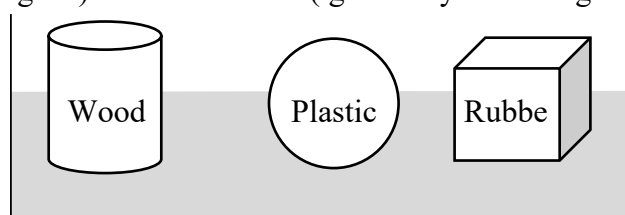
$\Rightarrow$ $S = 6 \times t$

$\Rightarrow$ $L = 2t, t = \dfrac{L}{2}$

$\Rightarrow$ $S = 3L$

$\Rightarrow$ $L + S = 4 L$

$\Rightarrow$ A will cover 4 Rounds.

10. A wooden solid cylinder (density 8.80 kg/m^3), a plastic ball (density 0.90 kg/m^3) and a rubber cube (density 0.95 kg/m^3) all of equal mass M float partly immersed in a through containing water (density 1.00 kg/m^3) as shown below (ignore any tilt during floatation)

You may conclude that

(a) The buoyant force is largest on the wooden cylinder

(b) The buoyant force is largest on the Plastic ball

(c) The buoyant force is largest on the rubber cube

(d) The buoyant force is equal on all the three

Ans. (d)

Sol. Theoretical

11. A stone in thrown vertically down into a well, the splash is heard after a time t_1. If the stone is thrown vertically up with the same speed from the same point, the splash is heard after a time t_2. The common initial speed (u) of the stone in both the cases is given by (the time taken by the splash sound to reach the observer is ignored).

(a) $u = g(t_2 - t_1)$ (b) $u = g(t_2 + t_1)$ (c) $u = \dfrac{1}{2} g(t_2 + t_1)$ (d) $u = \dfrac{1}{2} g(t_2 - t_1)$

Ans. (d)

Sol. $h = ut_1 + \dfrac{1}{2} gt_1^2$ … (1)

$\Rightarrow$ $h = -ut_2 + \dfrac{1}{2} gt_2^2$ … (2)

$\Rightarrow$ $ut_1 + \dfrac{1}{2} gt_1^2 = -ut_2 + \dfrac{1}{2} gt_2^2$ … (3)
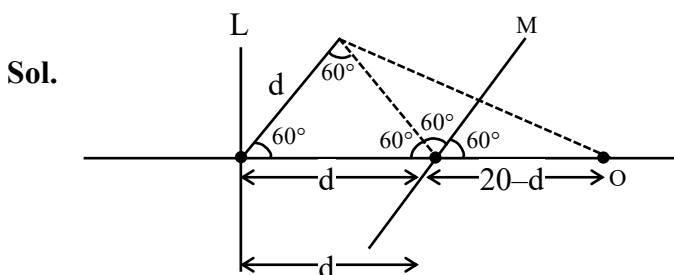
$\Rightarrow$ $u = \dfrac{1}{2} g(t_2 - t_1)$

12. A beam of light is incident parallel to principal axis on a convex lens (L) of focal length f = 20 cm. A plane mirror PQ (See figure), inclined at 60° with the principal axis, is placed a distance 'd' behind the lens so as to form a real image I of the distance 'd' from the optical center of the lens as shown in the figure. The value of 'd' is
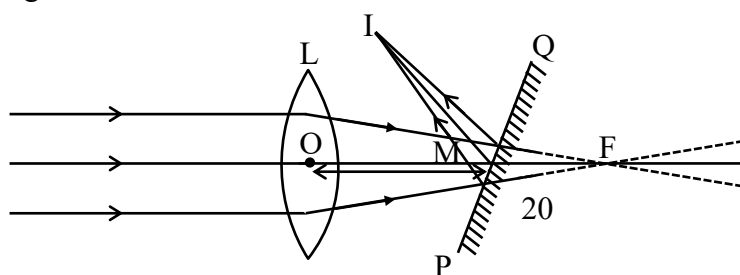
(a) 5 cm   (b) 10 cm   (c) 15 cm   (d) 20 cm

Ans. (b)

Sol.

$20 - d = d$

$d = 10$ cm.

13. A 80 kg man skating with a speed of 10 m/s on a smooth horizontal surface collides with a 20 kg skater at rest, as a result the two cling to each other. What percentage of initial kinetic energy of skaters is lost during the collision? (Ignore any friction)

(a) 12 %   (b) 18%   (c) 20%   (d) 25%

Ans. (c)

Sol. Applying momentum conservation:

$\Rightarrow$ $80 \times 10 + 20 \times 10 = (100)V$

$\Rightarrow$ $V = 8$ m/s

$\Rightarrow$ $\Delta loss = \dfrac{\dfrac{1}{2} \times 80 \times 10^2 - \dfrac{1}{2} \times 100 \times 8^2}{\dfrac{1}{2} \times 80 \times 10^2}$

$= .20$

$\Rightarrow$ % loss = 20%

14. Two cylindrical vessels V_1 and V_2 placed same horizontal level. Each vessel contains the same liquid of density ρ. Initially the vessels are not connected (valve closed). the height of liquid in vessel v_1 is h_1 and that in vessel V_2 is h_2. The diameter of vessels V_1 and V_2 are 2d and d respectively. When vessels are interconnected (valve opened) at the bottom, the height h of liquid in each vessel (neglecting the volume of liquid in connecting tube) will be
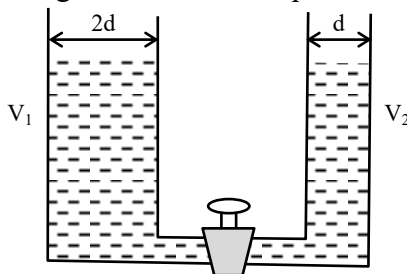
(a) $\dfrac{2h_1 + h_2}{3}$ (b) $\dfrac{4h_1 + h_2}{5}$

(c) $\dfrac{h_1 + h_2}{2}$ (d) $\dfrac{h_1 + 2h_2}{4}$

Ans. (b)

Sol. $\Rightarrow h_1 . \pi \dfrac{(2d)^2}{4} + h_2 \pi \dfrac{d^2}{4}$

$= h . \pi \dfrac{(2d)^2}{4} + h . \pi \dfrac{d^2}{4}$

$\Rightarrow 4h_1 + h_2 = 5h$

$\Rightarrow h = \dfrac{4h_1 + h_2}{5}$

15. Two vertical object pins are located on the principal axis of a thin lens at distance of $x_1 = 9.0$ cm and $x_2 = 18.0$ cm from the lens on the two sides of the lens. the image of the two pins formed by the lens are at the same positions (overlap. the focal length and the nature of the lens are

(a) 15 cm, convex   (b) 12 cm, convex   (c) 15 cm, concave   (d) 12 cm, concave

Ans. (b)

Sol. One image will be real, other will be virtual.

$$\Rightarrow \frac{1}{v} + \frac{1}{18} = \frac{1}{f} \quad .....(1)$$

$$\Rightarrow \frac{1}{v} - \frac{1}{9} = \frac{1}{-f} \quad .....(2)$$

$\Rightarrow$ Solving we get $f = 12$ cm and the mirror must be convex.

16. A steam boat goes across a lake up to a distance of 1200 meter and comes back. There is a uniform wind blowing with velocity v so as to help the onward journey and to impede the journey back . If the uniform speed of launch of the boat is 5 ms^{-1} and total time take by the boat in going and coming back is 500 s, the velocity v of the wind blow is

(a) 0.6 ms^{-1} (b) 0.8 ms^{-1} (c) 1.0 ms^{-1} (d) 1.2 ms^{-1}

Ans. (c)

Sol. $(v + 5)t_1 = 1200$ ......(1)

$(5 - v)t_2 = 1200$ ......(2)

$t_1 + t_2 = 500$ ....(3)

solving we get

$v = 1$ m/s

17. Which Nation Park derives its name from the abundance of Red Silk Cotton Trees?

(a) Keoladeo   (b) Simlipal   (c) Sunderban   (d) Kazirange

Ans. (b)

Sol. Simlipal

18. Some algae live as endophytes in sea-weeds. Which of the following alga is endophytic to the aquatic fern, Azolla?

(a) Sarcodia   (b) Anabaena   (c) Nostoc   (d) Chondrus

Ans. (b)

Sol. Anabaena

19. St. Anthony's Fire disease is caused by consumption of infected grains of rye. Which of the following is responsible for this disease?

(a) Candida   (b) Aspergillus   (c) Russula   (d) Claviceps
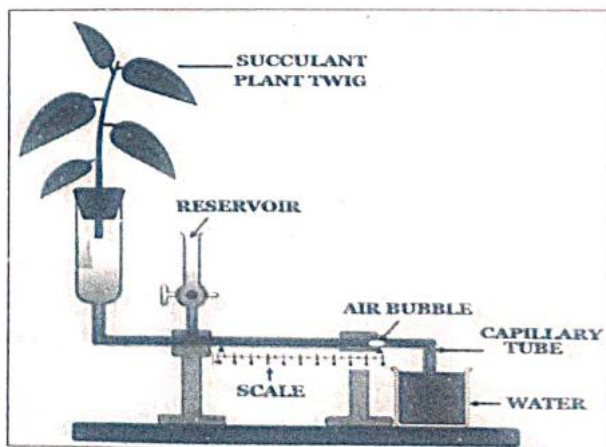
Ans. (d)

Sol. Claviceps

20. Which of the following is often referred to as the Old Man of the Jungle?

(a) Orangutan   (b) Gibbon   (c) Gorilla   (d) Chimpanzee

Ans. (a)

Sol. Orangutan

21. In the following experimental set-up, a twig of a succulent plant (*Crassula*) was inserted in the glass tube. The apparatus was kept in sun light for 6 hours. The inserted bubble will :

(a) Move very fast to show high rate of transpiration.
(b) Move slowly to show lower rate of transpiration.
(c) Note move at all.
(d) Move according to temperature of water.

Ans. (c)

Sol. Move slowly to show lower rate of transpiration.

22. Given below are two statements, one labeled as assertion (A) and the other labeled as Reason (R). Choose the correct option from the codes given below.

Assertion (A) : Each of the two strands of the original DNA molecule serves as a template for the synthesis of a new complementary strand. The result is two DNA molecules, each composed of one old (parental) strand and one new (daughter) strand.

Reason (R) : During replication, the original DNA molecule is broken into fragments and each fragment is replicated. The newly synthesized DNA fragments and the original fragments are then interspersed, resulting in both strands of the daughter DNA containing a mix of old (parental) and new (daughter) DNA segments.

Code :
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false
(d) R is true but A is false

Ans. (c)

Sol. A is true but R is false

23. Who among the following is the launching leader of the Human Genome Project?
(a) Alec Jeffreys
(b) Francis Collins
(c) Craig Venter
(d) John Sulston and Bob Waterstone

Ans. (b)

Sol. Francis Collins

8

24. Make the correct matches of the items M,N,O & P with (i) – (iv) :

[M] International Day of Forests	(i) 22, May
[N] International Day of Biological Diversity	(ii) 29, July
[O] World Nature Conservation Day	(iii) 21, March
[P] International Tiger Day	(iv) 28, July

Choose the option showing correct matches :
(a) M – (ii), N – (iii), O – (i), P – (iv)
(b) M – (iv), N – (iii), O – (ii), P – (i)
(c) M – (iii), N – (i), O – (iv), P – (ii)
(d) M – (i), N – (iii), O – (ii), P – (iv)

Ans. (c)

Sol. M – (iii), N – (i), O – (iv), P – (ii)

25. Singly or in combination with other nucleotides, which of the following produce co-enzymes for oxidation-reduction reactions?
(a) Vitamin B2 and B5   (b) Vitamin B1 and B3
(c) Vitamin B2 and B6   (d) Vitamin B7 and B9

Ans. (a)

Sol. Vitamin B2 and B5

26. Match the characterstics (V-Z) listed in Column I with the groups (i-v) listed under Column-II:

(V) Presence of gelatinous mesoglea.	(i) Nematoda
(W) Presence of syncytial epidermis	(ii) Platyhelminthes
(X) Presence of parapodia.	(iii) Cnidaria
(Y) Presence of parenchymatous tissue	(iv) Mollusca
(Z) Presence of Radula.	(v) Annelida

Choose the option showing the correct matches :
(a) V-iii, W-I, X-v, Y-ii & Z-iv   (b) V-iv, W-iii, X-ii, Y-i & Z-v
(c) V-i, W-i, X-iv, Y-v & Z-iii   (d) V-v, W-iv, X-iii, Y-ii & Z-i

Ans. (a)

Sol. V-iii, W-I, X-v, Y-ii & Z-iv

27. In the animal kingdom some examples of structures (internal or external) with similar name and function are found in distantly related animals. This is a fascination example of convergent evolution. Choose the correct option exhibition such similarity by prossessing an organ called 'CROP' :
(a) *Taenia*, Prawn and Toad   (b) Earthworm, *Nereis* and *Balanoglossus*
(c) Leech, Cockroach and Bird   (d) *Ascaris*, Crab Fish

Ans. (c)

Sol. Leech, Cockroach and Bird

28. Which of the following is not only the most abundant biopolymer on earth but a Nitrogenous Polysaccharide, too?
(a) Inulin   (b) Hyaluronic acid   (c) Chitin   (d) Trehalose

Ans. (c)

Sol. Chitin

29. The mathematical relationship called 'Fibonacci Series' is commonly observed in the arrangement of :

(a) Stipules on twig

(b) Leaves

(c) Stamens

(d) Flowers in an inflorescence

Ans. (b)

**Sol.** Leaves

30. Santalin, Red Brasilin and Haemotoxylin dyes are naturally found in :

(a) Alburnum   (b) Rhytidome   (c) Duramen   (d) Phelloderm

Ans. (c)

Sol. Duramen

31. Although, profiles of different types of soil differ markedly with respect to their physico-chemical and biological properties; the following diagram shows a typical hypothetical soil profile with its 5 principal horizons [O to R].
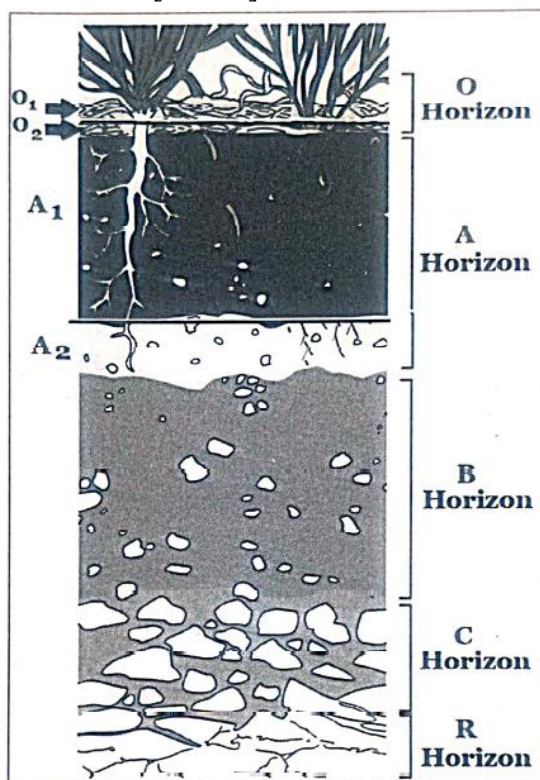
Study the given diagram. The characteristics [Q to U] related to various horizons and the names of horizons [i to v] are tabulated below :

Characteristics	Horizons
(Q) Solum	(i) O2
(R) Podsolic Zone	(ii) Al
(S) Fairly decomposed mater – 'Duff'	(iii) A + B
(T) Melanized Region	(iv) A
(U) Zone of Eluviation	(v) A2

Make the correct matches of the characteristics [Q to U] with the horizons [i to v] and choose the correct option :

(a) Q-i, R-iv, S-v, T-iii, U-ii   (b) Q-v, R-ii, S-iv, T-iii, U-i

(c) Q-iii, R-v, S-i, T-ii, U-iv   (d) Q-ii, R-iv, S-iii, T-i, U-v

Ans. (c)

Sol. Q-iii, R-v, S-i, T-ii, U-iv

32. Identify the animals X and Y :
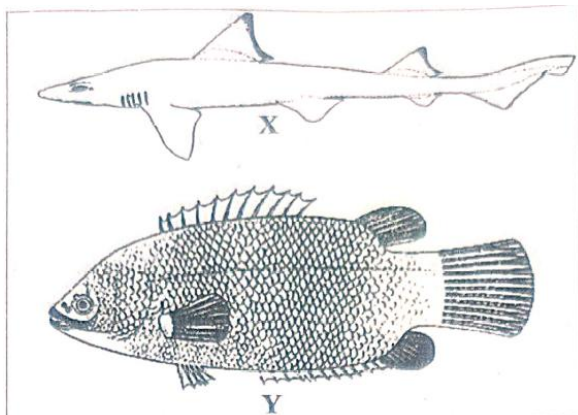
Choose the correct option showing their diagnostic characteristic of scales :

(a) X-Ctenoid Scale; Y-Cycloid Scale   (b) X- Placoid Scale; Y-Cycloid Scale

(c) X-Ganoid Scale; Y-Cosmoid Scale   (d) X-Elasmoid Scale; Y-Placoid Scale

Ans. (b)

Sol. X- Placoid Scale; Y-Cycloid Scale

33. A mixture of hydrogen and chlorine kept in a closed flask at a constant temperature was irradiated with scattered light. After a certain time the chlorine content decreased by 20% compared with that of the starting mixture and the resulting mixture had the composition as follows : 60 volume % of chlorine, 10 volume % of hydrogen, and 30 volume % of hydrogen chloride. Determine the composition of the initial gaseous mixture

(a) $Cl_2 = 60\%$, $H_2 = 40\%$

(b) $H_2 = 60\%$, $Cl_2 = 40\%$

(c) $Cl_2 = 45\%$, $H_2 = 55\%$

(d) $H_2 = 25\%$, $Cl_2 = 75\%$

Ans. (d)

Sol. $$H_2 \quad + \quad Cl_2 \longrightarrow 2HCl$$

Initial :   m   a

Final :   m–0.2a   0.8a   0.4a

$$\frac{V_{H_2}}{V_{Cl_2}} = \frac{m-0.2a}{0.8a} = \frac{10}{60}$$

$6m - 1.2a = 0.8a$

$6m = 2a$

$3m = a$

$a(Cl_2) = 75\%$, $m(H_2) = 25\%$

34. A research scholar requires 50 mL aqueous $NaNO_3$ solution containing 70.0 mg Na^+ per mL. The amount of $NaNO_3$ required is

(a) 0.350 g   (b) 0.161 g   (c) 29.75 g   (d) 12.93 g

Ans. (d)

Sol. Mass of Na^+ ion = 50 ml × 70.0 mg/ml = 3500 mg

$= \dfrac{3500}{1000} = \mathbf{3}.5$ g

M.M of $NaNO_3$ = 85 g/mol

23 g Na^+ ion produce = 85 g $NaNO_3$

1g Na^+ ion ion produce = $\dfrac{85}{23}$

3.5g Na^+ ion ion produce = $\dfrac{85}{23}$ × 3.5g = 12.93 g

35. A sample of crystalline soda (A) with a mass of 1.287 g was allowed to react with an excess of hydrochloric acid and 100.8 mL of a gas was liberated (measured at STP). How many molecules of water in relation to one molecule of Na_2CO_3 are contained in the sample of soda?

(Relative atomic masses are : Na = 23; H = 1; C = 12; O = 16)

(a) 5   (b) 6   (c) 4   (d) 10

Ans. (d)

Sol. $Na_2CO_3.xH_2O(s) + 2HCl(aq) \longrightarrow 2NaCl(aq) + CO_2(g) + xH_2O(l)$

Crystalline soda

(V_{CO_2}) = 100.8 ml

$= 0.1008\ l$

Moles of $CO_2 = \dfrac{0.1008}{22.4} = 0.0045$ mol

By using stoichiometry

$\dfrac{1.287}{106+18x} = 0.0045$ mol

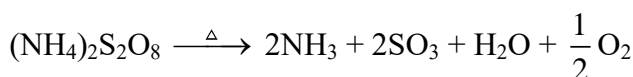$\boxed{x = 10}$

Molecules of water in crystalline soda is 10.

36. Which of the following ammonium salt, release SO_3 gas on thermal decomposition :

(I) $(NH_4)_2SO_4 \xrightarrow{\ \Delta\ }$

(II) $(NH_4)_2S_2O_8 \xrightarrow{\ \Delta\ }$
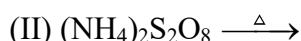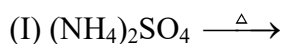
(a) I only   (b) II only   (c) Both I and II   (d) None of these

Ans. (c)

Sol. $(NH_4)_2SO_4 \xrightarrow{\ \Delta\ } 2NH_3 + SO_3 + H_2O$

$(NH_4)_2S_2O_8 \xrightarrow{\ \Delta\ } 2NH_3 + 2SO_3 + H_2O + \dfrac{1}{2}O_2$

37. Which of the following group contains solid compounds at 10°C?

(a) H_2O, NH_3 CH_4 (b) F_2, Cl_2, Br_2 (c) SO_3, I_2, NaCl   (d) Si, S_8, CH_3COCH_3

Ans. (c)

Sol. melting point of SO_3 = 16.8°C

melting point of I_2 = 113.7°C

melting point of NaCl = 801°C

38. How many 1°-amine are possible for $C_5H_{13}N$?

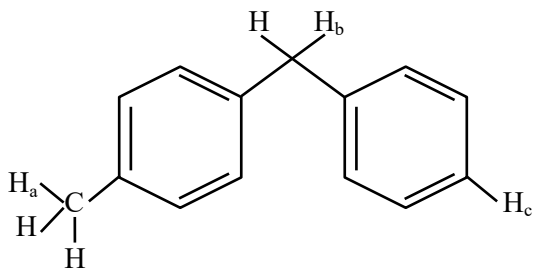(a) 6   (b) 7   (c) 8   (d) 9

Ans. (C)

Sol. $C_5H_{13}N \rightarrow$ DOU = 0

$\underline{C_5H_{11}} - NH_2$ (1° amine)

8 alkyl structures

Total 8 structures are possible

(excluding stereoisomers)

39. For the compound given below, the correct increasing order of C-H bond strength is

(a) C-H_a > C-H_b > C-H_c (b) C-H_a > C-H_c > C-H_b

(c) C-H_b > C-H_a > C-H_c (d) C-H_c > C-H_a > C-H_b

Ans. (d)

Sol. Stability of radical formed on dissociation of C–H bond is

    b   >   a   >   c

more   resonance   no
resonance   resonance

∴ Bond strength is C–H_c > C–H_a > C–H_b

40. Consider the C-O bonds x, y and z present in the compound given below

The increasing order of C–O bond length is
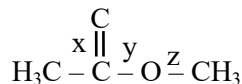
(a) x = y = z   (b) x < y < z   (c) x < z < y   (d) y < x < z
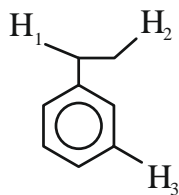
Ans. (b)

Sol. Bond order of

    z   <   y   <   x

Pure   bond   bond
single   order   order
bond   <1.5   >1.5

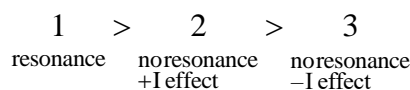∴ Bond length z > y > x

41. The correct order of the bond energy of different C–H bonds in the given compound is

(a) $C–H_1 > C – H_2 > C – H_3$ (b) $C–H_2 > C – H_1 > C – H_3$

(c) $C–H_3 > C – H_2 > C – H_1$ (d) $C–H_3 > C – H_1 > C – H_2$

Ans. (c)

Sol. Stability of radical formed on dissociation of C–H bond is,

$$\underset{\substack{\text{resonance}}}{1} > \underset{\substack{\text{no resonance}\\ +I\,\text{effect}}}{2} > \underset{\substack{\text{no resonance}\\ -I\,\text{effect}}}{3}$$

∴ Bond strength is $C–H_3 > C–H_2 > C–H_1$

42. The total number of moles of $NaHCO_3$ consumed during the given reaction is x.
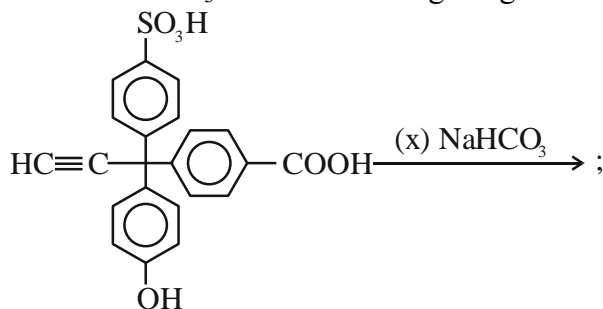
The value of x is

(a) 1   (b) 2   (c) 3   (d) 4

Ans. (b)

Sol. Only $–SO_3H$ & $–COOH$ groups react with $NaHCO_3$ to give brisk effervescence of CO_2.

43. If 1 mL of water contains 20 drops, the number of water molecules, in each drop of water, is (A is Avogadro number)

(a) $\dfrac{0.5}{18}A$ (b) 0.05 A   (c) 0.5 A   (d) $\dfrac{0.05}{18}A$

Ans. (d)

Sol. $d_{H_2O} = 1\,g/m\ell$

$M.M_{H_2O} = 18\,g/mole$

The mass of 1 mL of H_2O is 1g

The number of moles in 1 mL is

$$Mole = \frac{mass}{molar\ mass} = \frac{1}{18}$$

$$Moles\ per\ drop = \frac{1/18}{20}$$

No. of water molecule = mole × A
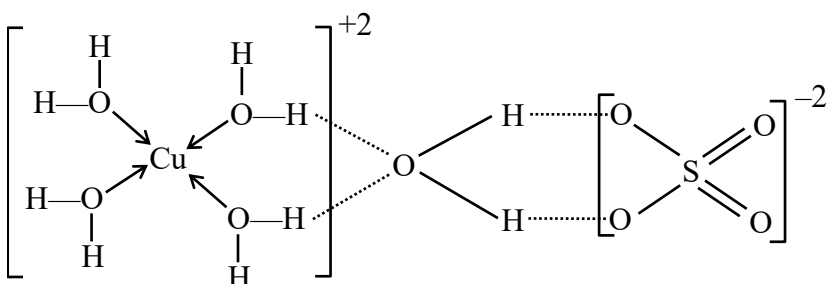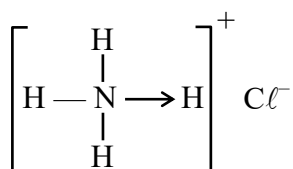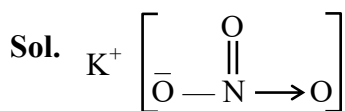
$$= \frac{1}{20 \times 18} \times A$$

$$= \frac{0.05 \, A}{18}$$

44. In which of the below given sets, all types of bonds (ionic, covalent and coordinate) are present in all the molecules?

(a) HCN, HNO_3, O_3

(b) KNO_3, HNO_3, $CuSO_4$, $5H_2O$

(c) NH_4Cl, KNO_3, $CuSO_4 . 5H_2O$

(d) Both (b) and (c)

Ans. (c)

Sol.

45. Which of the following C–H bonds has lowest bond dissociation energy?

(a) 3° C–H bond

(b) 2° C–H bond

(c) 1° C–H bond

(d) All have same bond dissociation energy

Ans. (a)

Sol. 3° C–H bond dissociates to give most stable radical.

∵ it has lowest bond energy.

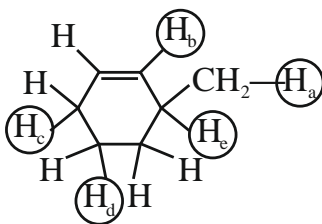**46.** The total number of loan pair of electron in I_3^- is

(a) 2 (b) 3 (c) 6 (d) 9

Ans. (d)

Sol. Total no. of lone pair of e^- is 9

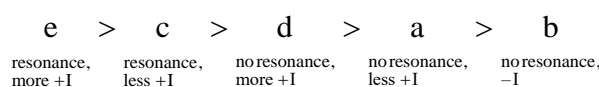$$[\ddot{\ddot{I}} - \ddot{\ddot{I}} - \ddot{\ddot{I}}]^-$$
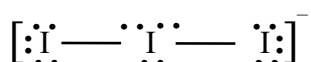
47. The correct order of abstraction of hydrogen from the below given compound when treated with halogen is

(a) e > b > c > a > d   (b) b > e = c > a > d   (c) e > c > d > a > b   (d) b > c > e > d > a

Ans. (c)

Sol. It is free radical substitution reaction. Stability of radical formed on dissociation of C–H bond is,

$$\underset{\substack{\text{resonance,}\\ \text{more +I}}}{e} > \underset{\substack{\text{resonance,}\\ \text{less +I}}}{c} > \underset{\substack{\text{no resonance,}\\ \text{more +I}}}{d} > \underset{\substack{\text{no resonance,}\\ \text{less +I}}}{a} > \underset{\substack{\text{no resonance,}\\ \text{−I}}}{b}$$

∴ Ease of abstraction e > c > d > a > b.

48. Which of the following will form foam in water containing Ca^{2+} and Mg^{2+} ions?

(a) Ba-stearate   (b) Na-palmitate

(c) Potassium n-dodecyl benzene sulphonate   (d) All of these

Ans. (c)

Sol. Potassium n-dodecyl benzene sulphonate.

49. A trolley of mass 240 kg is initially at rest on the frictionless horizontal straight rails lying in east-west direction. The length of the trolley is 20 meter. A man of mass 60 kg is standing at the eastern end of the trolley. The man starts moving on the trolley from eastern end towards west with velocity 1.0 m/s relative to the trolley. Assume the displacement and the velocity in eastward direction to be positive.

(a) The velocity of man relative to ground is –1 ms^{-1}

(b) The recoil velocity of the trolley relative to ground is + 0.2 ms^{-1}

(c) The man reaches from one end of trolley to other end in time t = 20 s

(d) Displacement of trolley over the ground when the man reaches the other end of trolley is + 4.0 m.

Ans. (b,c,d)

Sol.
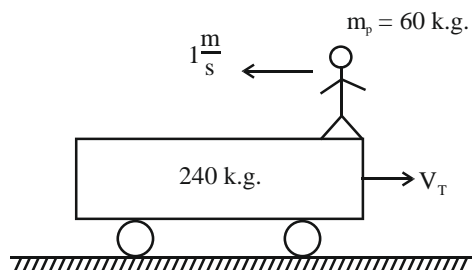
$$\vec{v}_{m/T} = -1\ \frac{m}{s}$$

$$\vec{v}_{T/g} = v_T$$

$$\vec{v}_{m/g} = \vec{v}_{m/T} + \vec{v}_{T/g}$$

$$= \left(-1 + v_T\right) \frac{m}{s}$$

$$= -\left(1 - v_T\right) \frac{m}{s}$$

By COLM : → $60(1 - V_T) = 240 \times V_T$

$$V_T = 0.2 \frac{m}{s}$$

$$\vec{v}_{m/g} = -(1 - 0.2) = -0.8 \frac{m}{s}$$

Time taken by man = $\dfrac{20}{(1)} = 20$ sec

$\Delta x_{T/g} = v_T \times 20 = 0.2 \times 20 = 4$m

Option → b,c,d

50. In an experiment performed using a cloud chamber (a device that can show the tracks of subatomic particle) the nature of a particle can be analysed. Under the influence of a strong perpendicular magnetic field B directed into the plane of paper, a particle track like the one shown beside as p q was obtained. The track shown may depict
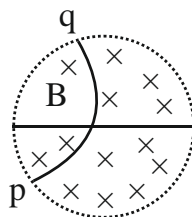

(a) a proton (charge + e) moving from point p to q
(b) an alpha (particle (charge + 2e) moving from point p to q
(c) an electron (charge – e) moving from point q to p
(d) a neutron (charge zero) moving from point p to q

Ans. (a,b,c)

Sol. (a) ✔
   (b) ✔
   (c) ✔
   (d) ×

51. A homogenous column of water $\left({}_a\mu_w = \dfrac{4}{3}\right)$ of height 8.0 cm fills the space above a 9.0 cm thick glass $\left({}_a\mu_g = \dfrac{3}{2}\right)$ slab. Observers A and B are in air just outside the top and the bottom whereas the observers C and D are inside just below the top and above the bottom. The total thickness of glass plus water observed by these observers are
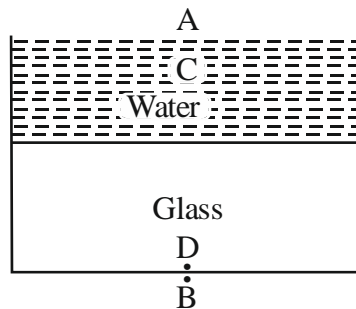
(a) Observer A measures it as 12.0 cm   (b) Observer B measures it as 12.0 cm

(c) Observer C measures it as 16.0 cm   (d) Observer D measures it as 18.0 cm

Ans. **(a,b,c,d)**

Sol. (a) $\left(9 \cdot \dfrac{\mu_w}{\mu_g} + 8\right) \times \dfrac{1}{\mu_w}$

$= \dfrac{9}{\mu_g} + \dfrac{8}{\mu_w} = \dfrac{9}{3/2} + \dfrac{8}{4/3}$

$= 6 + 6 = 12$ cm

(b) $\left(8 \cdot \dfrac{\mu_g}{\mu_w} + 9\right) \times \dfrac{1}{\mu_g}$

$= \dfrac{8}{\mu_w} + \dfrac{9}{\mu_g} = 12$cm

(c) $9 \cdot \dfrac{\mu_w}{\mu_g} + 8 = 9 \times \dfrac{4/3}{3/2} + 8$

$= 16$ cm

(d) $8 \times \dfrac{\mu_g}{\mu_w} + 9 = 8 \times \dfrac{3/2}{4/3} + 9$

$= 18$ cm

52. Several resistances of 2Ω and 3Ω are used to form a typical electric network as shown in the figure below. A dc supply of emf 18 volt and negligible internal resistance has been connected between points A and B.
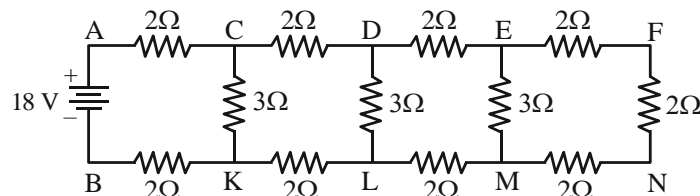
Choose the correct option(s)

(a) Total resistance between A and B is 6 Ω

(b) The power consumed in the network is 60 W

(c) The current through resistance of 2Ω on the branch AC is 3A

(d) The current through resistance of 3Ω in the branch CK is 2A

Ans. (a, c, d)

Sol. (a) $R_{eq} = 6\Omega$

Simple series and parallel.

(b) Power $= \dfrac{V^2}{R_{eq}} = \dfrac{18^2}{6} = 54\omega$

(c) $I_{AC} = \dfrac{18}{6} = 3A$
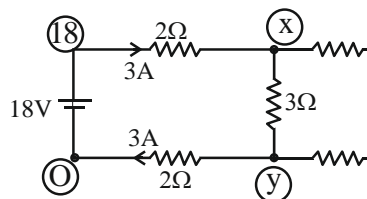
(d) $18 - x = 2 \times 3$

$x = 12$

$y - 0 = 3 \times 2$

$y = 6$

$\Rightarrow I_{3\Omega} = \dfrac{12-6}{3} = 2A$

53. Fine structure of striated muscle fibres has been elucidated with the help of electron microscope. Study the following statements and choose the incorrect ones:

(a) The dark and light bands of myofibrils have been respectively, named as 'A' [Anisotropic under polarized light] and 'l' [Isotropic under polarized light] bands.

(b) The 'A' bands contain about 120 Å thick and 18 Å long actin filaments.

(c) Each 'I' band is divided into two equal halves by a thin, fibrous and transverse zig-zag partition called 'Z' band.

(d) The major middle lighter region of 'A' band is called 'M zone

Ans. (b,d)

Sol. The 'A' bands contain about 120 Å thick and 18 Å long actin filaments,

The major middle lighter region of 'A' band is called 'M zone

54. The autonomic nervous system is divided into two parts- [A] Sympathetic and [B] Parasympathetic. Some effects of these systems are given below, respectively. Choose the correct option(s)

(a) Pupil constricts; Glycogen converted into glucose

(b) Salivation decreases; Bladder constricts

(c) Adrenaline released; Glucose converted into glycogen

(d) Bronchii constrict; Gastric activity stimulated

Ans. (b,c)

Sol. Salivation decreases; Bladder constricts,

Adrenaline released; Glucose converted into glycogen

55. Study the following statements regarding Haemophilia and choose the incorrect option(s)

(a) It follows criss-cross pattern of inheritance

(b) It is a Y-linked dominant trait

(c) It is common in women but rare in man

(d) It is also called royal disease

Ans. (b,c)

Sol. It is a Y-linked dominant trait,

It is common in women but rare in man

56. Which of the following trees does/do not show cheiropterophily?

(a) Sausage tree (b) Kadamb (c) Coral tree (d) Silk Cotton

Ans. (c,d)

Sol. Coral tree and Silk Cotton

57. The pair(s) of elements which has/have equal number of electrons in the outer most shell is/are

(a) Na, Sr (b) Se, Te (c) Mn, Fe (d) As, Bi

Ans. (b, d)

Sol. Se, Te and As, Bi contain 6 electrons as well as 5 electron in their outer most shell.

58. The correct statement(s) is/are

(a) pH of 10^{-8} NaOH is 8

(b) pH of 10^{-8} HCl is < 7

(c) Aqueous solution of $FeCl_3$ is acidic

(d) NaH_2PO_2 will react with NaOH to form Na_2HPO_2

Ans. (b, c, d)

Sol. pH of 10^{-8} HCl is in between 6 to 7

Aqueous solution of $FeCl_3$ is acidic because the salt of strong acid and weak base.

59. Considering the H-spectrum series, select the correctly matched pair(s)

(a) Balmer: $n_2 > 2$

(b) Pfund: $\dfrac{1}{\lambda} = R\left[\dfrac{1}{3^2} - \dfrac{1}{n^2}\right]$

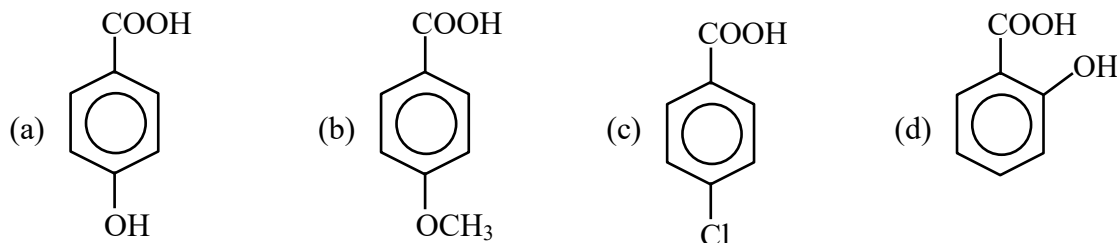(c) Humphery: $n_1 > 6$

(d) Paschen: IR region

Ans. (a, d)

Sol. Balmer : $n_1 = 2$, $n_2 = 3, 4, 5$ …..

Pfund : $n_1 = 5$, $n_2 = 6, 7, 8$ …..

Humphery : $n_1 = 6$, $n_2 = 7, 8, 9$ …..

Paschen: IR region

60. Which of the following acids are stronger than benzoic acid?

(a) [benzene ring with COOH at top and OH at bottom (para-hydroxybenzoic acid)]
(b) [benzene ring with COOH at top and OCH_3 at bottom (para-methoxybenzoic acid)]
(c) [benzene ring with COOH at top and Cl at bottom (para-chlorobenzoic acid)]
(d) [benzene ring with COOH and OH at ortho position (salicylic acid)]

Ans. (c,d)

Sol. (A) +M of –OH ∴ less acidic

(B) +M of –OCH_3 ∴ less acidic

(C) –I of –Cl ∴ more acidic

(D) ortho effect ∴ more acidic