

PHYSICS

Q.1 Which one of the following represent the correct dimensions of the coefficient of viscosity?

- (a) $ML^{-1}T^{-2}$
 (b) MLT^{-1}
 (c) $ML^{-1}T^{-1}$
 (d) $ML^{-2}T^{-2}$

Ans. (c)

Q.2 A student uses a simple pendulum of exactly 1 m length to determine g , the acceleration due to gravity. He uses a stop watch with the least count of 1 sec for this and records 40 seconds for 20 oscillations. For this observation, which of the following statements is true?

- (a) Error ΔT in measuring T , the time period, is 0.15 seconds
 (b) Error ΔT in measuring T , the time period, is 1 second
 (c) Percentage error in the determination of g is 5%
 (d) Percentage error in the determination of g is 2.5%

Ans. (c)

Q.3 An object moving with a speed of 6.25 m s^{-1} , is decelerated at a rate given by $\frac{dv}{dt} = -2.5\sqrt{v}$, where v is the instantaneous speed. This time taken by the object, to come to rest would be-

- (a) 1 s
 (b) 2 s
 (c) 4 s
 (d) 8 s

Ans. (b)

Q.4 A car moving with a speed of 50 km/h can be stopped by brakes after at least 6m. If the same car is moving at the speed of 100km/h, the minimum stopping distance is

- (a) 12 m
 (b) 18 m
 (c) 24 m
 (d) 6 m

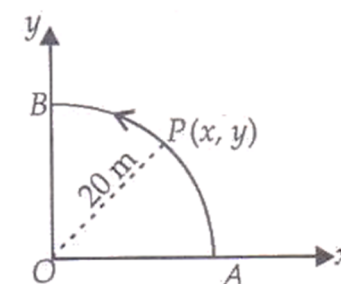
Ans. (c)

Q.5 From a tower of height H , a particle is thrown vertically upwards with a speed u . The time taken by the particle, to hit the ground, is n times that taken by it to reach the highest point of its path. The relation between H, u and n is :-

- (a) $gH = (n - 2)u^2$
 (b) $2gH = n^2u^2$
 (c) $gH = (n - 2)^2u^2$
 (d) $2gH = nu^2(n - 2)$

Ans. (d)

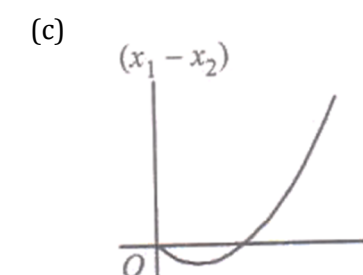
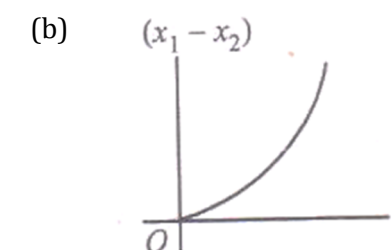
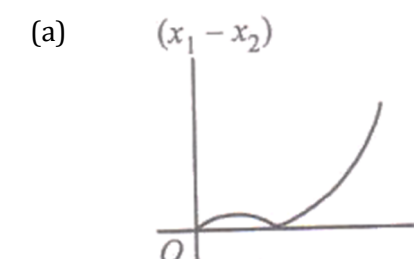
Q.6 A point P moves in counter-clockwise direction on a circular path as shown in the figure. The movement of P is such that it sweeps out a length $s = t^3 + 5$, where s is in metres and t is in seconds. The radius of path is 20 m. The acceleration of P when $t = 2$ s is nearly

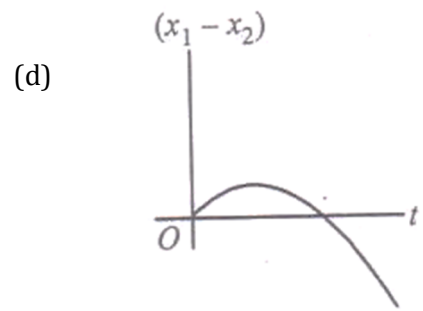


- (a) 14 m s^{-2}
 (b) 13 m s^{-2}
 (c) 12 m s^{-2}
 (d) 7.2 m s^{-2}

Ans. (a)

Q.7 A body is at rest at $x = 0$. At $t = 0$, it starts moving in the positive x -direction with a constant acceleration. At the same instant another body passes through $x = 0$ moving in the positive x -direction with a constant speed. The position of the first body is given by $x_1(t)$ after time t and that of the second body by $x_2(t)$ after the same time interval. Which of the following graphs correctly describes $(x_1 - x_2)$ as a function of time t ?





Ans. (c)

Q.8 A particle is moving eastwards with a velocity of $5m/s$. In $10s$ the velocity changes to $5m/s$ northwards. The average acceleration in this time is

- (a) Zero
- (b) $\frac{1}{\sqrt{2}}ms^{-2}$ towards north-west
- (c) $\frac{1}{\sqrt{2}}ms^{-2}$ towards north-east
- (d) $\frac{1}{2}ms^{-2}$ towards north

Ans. (b)

Q.9 Which of the following statements is false for a particle moving in a circle with a constant angular speed?

- (a) The velocity vector is tangent to the circle

- (b) The acceleration vector is tangent to the circle
- (c) The acceleration vector points to the centre of the circle
- (d) The velocity and acceleration vectors are perpendicular to each other

Ans. (b)

Q.10 A person starts his journey at 9:00 am from Nahan to Chandigarh. Its position varies w.r.t. time as $s = \alpha t^2$. It crosses Kala-amb at 9:20 am. What will be its velocity and distance at 9:20 am ($\alpha = 0.02 m/s^2$).

- (a) 28.8 m/s, 48 km
- (b) 48 m/s, 28.8 km
- (c) 28.8 m/s, 28.8 km
- (d) 48 m/s, 48 km.

Ans. (b)

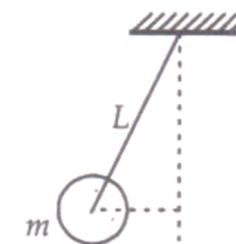
Q.11 The relation between time t and distance x is $t = ax^2 + bx$ where a and b are constants. The acceleration is

- (a) $-2av^3$
- (b) $2av^2$
- (c) $-2av^2$
- (d) $2bv^3$

Ans. (a)

Q.12 A ball of mass (m) $0.5kg$ is attached to the end of a string having length (L) $0.5m$. The ball is rotated on a horizontal circular path about vertical axis. The maximum tension that the string can bear is $324 N$. The maximum possible value of angular velocity of ball (in radian/s) is

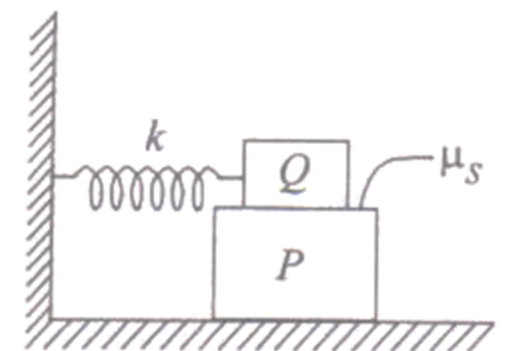
- (a) 9
- (b) 18
- (c) 27
- (d) 36



Ans. (d)

Q.13 A block P of mass m is placed on a horizontal frictionless plane. A second block of same mass m is placed on it and

is connected to a spring of spring constant k . The two blocks are pulled by distance A . Block Q oscillates without slipping. What is the maximum value of frictional force between the two blocks?



- (a) $kA/2$
- (b) kA
- (c) $\mu_s mg$
- (d) zero

Ans. (a)

Q.14 A force $\vec{F} = (5\hat{i} + 3\hat{j} + 2\hat{k})N$ is applied over a particle which displaces it from its origin to the point $\vec{r} = (2\hat{i} - \hat{j})m$. The work done on the particle in joule is-

- (a) -7
- (b) $+7$

(c) +10

(d) +13

Ans. (b)

Q.15 A particle of mass 100 g is thrown

vertically upwards with a speed of 5m/s.

The work done by the force of gravity

during the time the particle goes up is

(a) 0.5 J

(b) -0.5 J

(c) -1.25 J

(d) 1.25 J

Ans. (c)

CHEMISTRY

Q.16 The equivalent weight of an element is 4.

Its chloride has a vapour density 59.25.

Then the valency of the element is

(a) 4

(b) 3

(c) 2

(d) 1

Ans. (b)Q.17 6.02×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of solution is

(a) 0.02

(b) 0.01

(c) 0.001

(d) 0.1.

Ans. (b)Q.18 The energies E_1 and E_2 of two radiations are 25 eV, and 50eV, respectively. The relation between their wavelengths, i.e, λ_1 and λ_2 will be(a) $\lambda_1 = \frac{1}{2}\lambda_2$ (b) $\lambda_1 = \lambda_2$ (c) $\lambda_1 = 2\lambda_2$ (d) $\lambda_1 = 4\lambda_2$.**Ans. (c)**

Q.19 The total number of nodes are given by

(a) $(n + 1)$ (b) $(n - l - 1)$ (c) $(n - 1)$ (d) $(n - l + 1)$ **Ans. (b)**

Q.20 The first ionisation potential of Na is

5.1 eV. The value of electron gain enthalpy of Na^+ will be

(a) -2.55 eV

(b) - 5.1 eV

(c) -10.2 eV

(d)+2.55 eV.

Ans. (b)

Q.21 Match the Column I with Column II and select the correct answer using given codes.

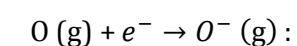
Column I (Elements)	Column II (Properties)
A. $Li^+ < Al^{3+} < Mg^{2+} < K^+$	1. EA (Electron affinity)
B. $Li^+ > Al^{3+} > Mg^{2+} > K^+$	2. Ionic radii
C. $Cl > F > Br > I$	3. EN (Electronegativity)
D. $F > Cl > Br > I$	4. ENC (Effective nuclear charge)

Codes

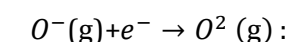
	A	B	C	D
(a)	2	4	3	1
(b)	2	4	1	3
(c)	4	2	3	1
(d)	4	2	1	3

Ans. (b)

Q.22 The electronic configuration of gadolinium (atomic number = 64) is

(a) $[Xe] 4f^3 5d^5 6s^2$ (b) $[Xe] 4f^7 5d^2 6s^1$ (c) $[Xe] 4f^7 5d^1 6s^2$ (d) $[Xe] 4f^8 5d^6 6s^2$.**Ans. (c)**Q.23 The formation of oxide ion $O^{2-}(g)$, from oxygen atom requires first an exothermic and then an endothermic step as shown below.

$$\Delta H^- = -141 \text{ kJ mol}^{-1}$$



$$\Delta H^- = +780 \text{ kJ mol}^{-1}$$

Thus, process of formation of O^{2-} in gas phase is unfavorable even though O^{2-} is isoelectronic with neon. It is due to the fact that

(a) Oxygen is more electronegative

(b) Addition of electron in oxygen results in larger size of the ion

(c) Electron repulsion outweighs the stability gained by achieving noble gas configuration

(d) O^- ion has comparatively smaller size than O-atom**Ans. (c)**

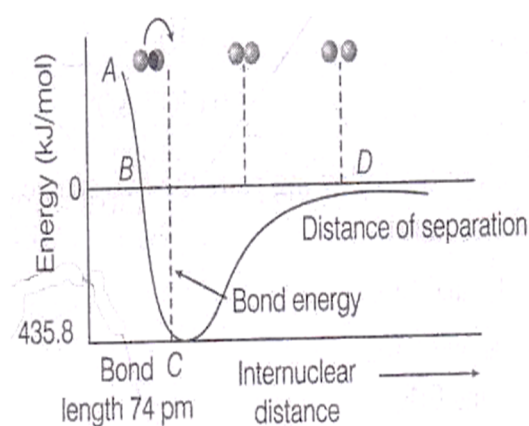
Q.24 Isostructural species are those which have the same shape and hybridisation.

Among the given species identify the isostructural pairs

- (a) $[NF_3 \text{ and } BF_3]$
 (b) $[BF_4^- \text{ and } NH_4^+]$
 (c) $BCl_3 \text{ and } BrCl_3$
 (d) $[NH_3 \text{ and } NO_3^-]$

Ans. (b)

Q.25



The above potential energy curve is given for the formation of H_2 molecules as a function of internuclear distance of H-atoms. At what point in the curve H_2 is found in the most stable state?

- (a) A
 (b) B

(c) C

(d) D

Ans. (c)

Q.26 If Z is a compressibility factor, van der Waals' equation at low pressure can be written as

- (a) $Z = 1 + \frac{RT}{pb}$
 (b) $Z = 1 - \frac{a}{VRT}$
 (c) $Z = 1 - \frac{pb}{RT}$
 (d) $Z = 1 + \frac{pb}{RT}$

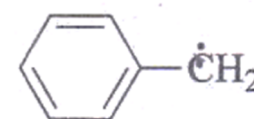
Ans. (b)

Q.27 Which of the following set of variable gives a straight line with a negative slope when plotted? (p = vapour pressure and T = Temperature in Kelvin)

- | y-axis | x-axis |
|-------------------|-------------------------|
| (a) p | T |
| (b) $\log_{10} P$ | T |
| (c) $\log_{10} P$ | $\frac{1}{T}$ |
| (d) $\log_{10} P$ | $\log_{10} \frac{1}{T}$ |

Ans. (c)

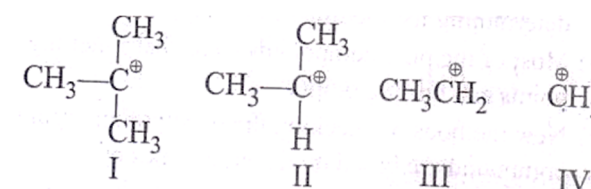
Q.28 The radical is aromatic because it has



- (a) $6p$ - orbitals and 6 unpaired electrons
 (b) $7p$ - orbitals and 6 unpaired electrons
 (c) $7p$ - orbitals and 7 unpaired electrons
 (d) $6p$ - orbitals and 7 unpaired electrons

Ans. (c)

Q.29 Choose the correct order of stability of carbocation using the concept of hyperconjugation



- (a) $I < II < III < IV$
 (b) $IV < III < II < I$
 (c) $III < IV < II < I$
 (d) None of these

Ans. (b)

Q.30 Which of the following compounds will exhibit geometrical isomerism?

- (a) 1-phenyl-2-butene
 (b) 3-phenyl-1-butene
 (c) 2-phenyl-1-butene
 (d) 1, 1-diphenyl-1-propane

Ans. (a)

BIOLOGY

Q.31 The wall of alimentary canal from oesophagus to rectum possess four layers. The sequence of these layers is –

- (a) Serosa → Mucosa → Submucosa → Muscularis
 (b) Muscularis → Serosa → Mucosa → Submucosa
 (c) Serosa → Muscularis → Mucosa → Submucosa
 (d) Serosa → Muscularis → Submucosa → Mucosa

Ans. (d)

Q.32 Match the following –

Column I	Column II
1. Tidal Volume	A. 2500 – 3000 ml of air
2. Inspiratory reserve	B. 1000 ml of air

volume	
3. Expiratory reserve volume	C. 500 ml of air
4. Residual volume	D. 3400 – 4800 ml of air
5. Vital capacity	E. 1200 ml of air.

- (a) 1 – C, 2 – D, 3 – B, 4 – A, 5 – E
- (b) 1 – C, 2- A, 3- B, 4- E, 5 – D
- (c) 1 – C, 2- A, 3- D, 4- E, 5- B
- (d) 1 – E, 2 – A, 3- B, 4- C, 5- D.

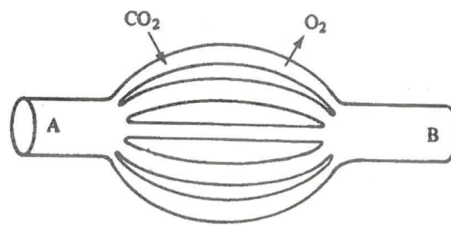
Ans. (b)

Q.33 During ventricular systole-

- (a) Oxygenated blood is pumped into the aorta and deoxygenated blood is pumped into the pulmonary artery
- (b) Oxygenated blood is pumped into the pulmonary artery and deoxygenated blood is pumped into the artery
- (c) Oxygenated blood is pumped into aorta and deoxygenated blood is pumped into the pulmonary vein
- (d) Oxygenated blood is pumped into pulmonary vein and deoxygenated blood is pumped into pulmonary artery

Ans. (a)

Q.34 Go through the following diagram of two mammalian blood vessels (A and B) connected by a capillary bed, Blood pressure is higher in B than in A. The arrows indicate the direction of net diffusion for O_2 and CO_2 .



Capillary bed is part of	Vein	Blood flow from
(a) Systemic circuit	A	B to A
(b) Pulmonary circuit	B	A to B
(c) Either Systemic circuit or Pulmonary circuit	A	B to A
(d) Either Systemic circuit or Pulmonary circuit	B	A to B

Ans. (a)

Q.35 The outline of principle event of urination is given below in unordered manner –

- I. Stretch receptors on the wall of urinary bladder send signal to the CNS
- II. The bladder fills with of urine and becomes distended
- III. Micturition

IV. CNS passes on motor messages to initiate the contraction of smooth muscles of bladder and simultaneous relaxation of urethral Sphincter.

The correct order of steps for urination is –

- (a) I → II → III → IV
- (b) IV → III → II → I
- (c) II → I → IV → III
- (d) III → II → I → IV.

Ans. (c)

Q.36 Read the given statements each with one or two blanks.

A. Repeated activation of the muscles can lead to the accumulation of I due to anaerobic breakdown of glycogen in them, causing fatigue.

B. The globular head of meromyosin is an active ATPase enzyme and has binding sites for II and active sites for III.

C. The central part of thick filament, not overtapped by thin filaments is called IV. Which of the following options correctly fills the blanks in the given statements?

- (a) I – Pyruvic acid, II- ATP, III-n Myosin, IV – A band

(b) I – Pyruvic acid, II- Troponin, III- Myosin, IV- H band

(c) I- Lactic acid, II – ATP, III – Actin, IV- H band

(d) I – Lactic acid, II – ATP, III- Troponin, IV- Band.

Ans. (c)

Q.37 Match the following structures of human eye with their respective functions?

Column I	Column II
A. Cornea	I. Provides opening for light to enter
B. Iris	II. Transduces blue, green and red light
C. Lens	III. Control has amount of light that enters
D. Optic nerves	IV. Alters the shape of lens
E. Pupil	V. Transmit information to the CNS
F. Ciliary muscles	VI. Focus light directly on retina

G. Fovea	VII. Bends light and protects inner eye.
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- (a) A- VII, B- III, C- VI, D- V- E- I, F – IV, G- II
 (b) A- I, B- II, C- III, D- IV, E- V, F- VI, G- VII
 (c) A- VII, B- VI, C- V, D- IV, E- III, F- II, G- I
 (d) A- VII, B- IV, C- VI, D- V, E- I, F- III, G- II.

Ans. (a)

Q. 38 Match Column I with Column II

Column I	Column II
A. Pinna	I. Collects vibration in the air which produces sound
B. Ear canal	II. Passage for sound wave from pinna to ear drum
C. Tympanic membrane	III. Transfers sound wave to ear ossicles
D. Ear Ossicles	IV. Increases the efficiency of transmission of sound waves to the inner ear
E. Cochlea	V. Has hearing receptors
F. Eustachian tube	VI. Equalizes the pressure on both sides of ear drum
G. Auditory nerves	VII. Impulse transfer from organ of Corti to auditory cortex in temporal lobe of cerebrum

- (a) A- I, B- II, C- III, D- IV, E- V, F- VI, G- VII
 (b) A- VII, B- VI, C- V, D- IV, E- III, F- II, G- I
 (c) A- I, B- II, C- IV, D- III, E- V, F- VI, G- VII
 (d) A- I, B- II, C- III, D- IV, E- V, F- VII, G- VI.

Ans. (a)

Q. 39 Hormones produces their effect on target tissue by binding to specific __ A __ called hormone receptors located in the target tissues only. __ B __ soluble hormones usually need __ C __ receptor that generate __ D __ messengers for regulating cellular metabolism. __ E __ soluble hormones can pass through cell membrane and bind to F receptors, mostly G receptors. The hormone receptor complex enter the __ H __ and mostly regulate gene expression or chromosome function by interaction of hormone – receptor complex with the __ I __.

- (a) A – Protein , B- Water, C- Membrane bound, D- Second, E- Lipid, F- intracellular, G- Nuclear, H_ Nucleus, I- Genome
 (b) A- Lipid B – Water, C- Membrane bound, D- Second, E- Water, F – intracellular, G- Nuclear, H_ Nucleus, I- Genome

- (c) A – Protein , B- Water, C- Intracellular, D- Second, E- Lipid, F- Extracellular, G- Nuclear, H_ Nucleus, I- Genome
 (d) A – Protein , B- Water, C- Membrane bound, D- Primary, E- Lipid, F- intracellular, G- Nuclear, H_ Nucleus, I- Genome

Ans. (a)

Q.40 Match diseases with hormone deficiency.

Diseases	Hormone deficiency
I. Dwarfism	A. Thyroxine
II. Acromegaly	B. GH
III. Simple goitre	C. Aldosterone and cortisol
IV. Exophthalmic goiter	D. Corticosteroid
V. Addison's diseases	E. Mineralocorticoids (Aldosterone)
VI. Conn's disease	
VII. Cushing disease	

- (a) I- B; II – B; III- A ; IV- C; VI- E ; VI- D
 (b) I- B; II- A; IV- B; V- E; VI- D; VII-C
 (c) I- A; II- B; III- IV- A; V- C; VI- E; VII- D
 (d) I- A; II- A; III- B; IV- B; V- C; VI- D; VII- E.

Ans. (a)

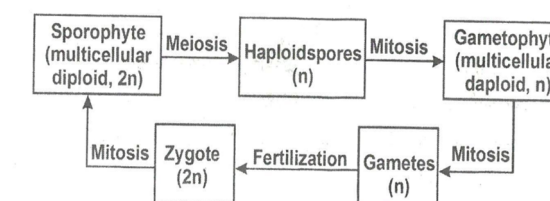
Q. 41

Column I (classes)	Column II Examples
A. Psilotopsida	I. Dryopteris, Pteris, Adiantum
B. Lycopsidea	II. Equisetum
C. Sphenopsida	III. Selaginella
D. Pteropsida	IV. Lycopodium
	V. Psilotum

The correct combination is –
 (a) A- V, B- III, IV, C- II, D-I
 (b) A- I, B- II, C- III, D- IV
 (c) A- IV, B- III, C- II, D- I
 (d) A- III, IV, B- V, C- I, D- II.

Ans. (a)

Q. 42 This is the figure showing life cycle of a plant if this belongs to life cycle of bryophytes, pteridophytes and gymnosperms. What will be respective A and B in their life cycle-



A	B
(a) Bryophytes :	Sporangium, capsule
Peridophytes:	strobili, sporangia
Gymnosperms:	flowers, cones
Bryophytes:	
(b) Bryophytes:	Capsule, protonema

Pteridophytes:	(gametophores)
Gymnosperms:	sporangia, cones, sporophyll
(c) Bryophytes :	Protonema, gametophores
Pteridophytes:	strobili, sporangia
Gymnosperms:	flowers, cones
(d) Bryophytes :	Strobili, capsule
Pteridophytes:	cones, sporangia
Gymnosperms:	flowers, cones.
Bryophytes:	

Ans. (b)

Q.43 One student of Career Academy asks to his class mate that do you know which hormone is responsible for leaf falling

- (a) Auxin
- (b) Abscisic acid
- (c) Cytokinin
- (d) Ethylene.

Ans. (b)

Q.44 In which one of the following the genus name, its two characters and its phylum are not correctly matched, whereas the remaining three are correct?

	Genus name	Two characters	Phylum
(a)	Pila	(i) Body Segmented; (ii) Mouth with Radula	Mollusca
(b)	Asterias	(i) Spiny Skinned; Water vascular system	Echinodermata
(c)	Sycon	(i) Pore bearing; (ii) Canal system	Porifera
(d)	Periplaneta	(i) Jointed appendages;	Arthropoda.

	(ii) Chitinous exoskeleton	
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Ans. (a)

Q.45 In which one of the following the genus name, its two characters and its class/phylum are correctly matched?

	Genus name	Two characters	Class/Phylum
(a)	Ascaris	(i) Body segmented (ii) males and females distinct	Annelid
(b)	Salamandra	(i) A tympanum represents ear (ii) fertilization is external	Amphibia
(c)	Pteropus	(i) Skin possesses hair. (ii) oviparous	Mammalia
(d)	Aurelia	(i) Cnidoblasts. (ii) organ level of organization	Coelenterate

Ans. (b)