CBSE Final Examination - 2010

Answers by
Aakash Institute

TEST BOOKLET CODE - B

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
001.	1	031.	4	061.	2	091.	2
002.	2	032.	1	062.	2	092.	1
003.	2	033.	3	063.	1	093.	1
004.	2	034.	2	064.	1	094.	3
005.	1	035.	2	065.	4	095.	3
006.	3	036.	3	066.	2	096.	2
007.	1	037.	4	067.	2	097.	1
008.	2	038.	1	068.	4	098.	3
009.	3	039.	3	069.	3	099.	4
010.	3	040.	2	070.	1	100.	2
011.	3	041.	2	071.	2	101.	2
012.	4	042.	2	072.	4	102.	3
013.	1	043.	4	073.	2	103.	2
014.	2	044.	3	074.	2	104.	3
015.	4	045.	1	075.	1	105.	3
016.	2	046.	2	076.	1	106.	4
017.	1	047.	2	077.	2	107.	4
018.	2	048.	2	078.	2	108.	1
019.	3	049.	3	079.	2	109.	2
020.	1	050.	1	080.	1	110.	4
021.	1	051.	1	081.	1	111.	1
022.	4	052.	1	082.	1	112.	2
023.	1	053.	3	083.	4	113.	1
024.	3	054.	4	084.	4	114.	1
025.	1	055.	3	085.	1	115.	3
026.	4	056.	1	086.	4	116.	2
027.	4	057.	1	087.	1	117.	2
028.	1	058.	1	088.	4	118.	3
029.	2	059.	2	089.	4	119.	2
030.	4	060.	3	090.	4	120.	1

TEST BOOKLET CODE - C

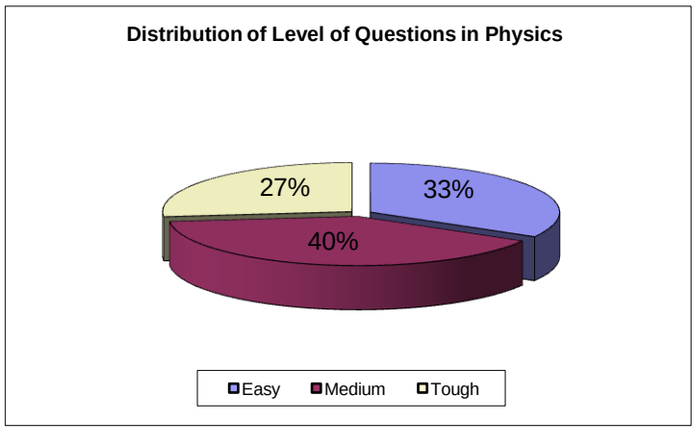
Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
001.	2	031.	3	061.	1	091.	2
002.	1	032.	3	062.	4	092.	2
003.	3	033.	3	063.	3	093.	2
004.	2	034.	4	064.	1	094.	3
005.	1	035.	3	065.	2	095.	3
006.	4	036.	3	066.	2	096.	1
007.	1	037.	4	067.	4	097.	2
008.	2	038.	3	068.	3	098.	4
009.	4	039.	3	069.	2	099.	3
010.	3	040.	1	070.	3	100.	3
011.	1	041.	3	071.	4	101.	4
012.	4	042.	3	072.	1	102.	2
013.	2	043.	4	073.	1	103.	3
014.	3	044.	4	074.	2	104.	4
015.	4	045.	3	075.	3	105.	1
016.	4	046.	4	076.	3	106.	1
017.	3	047.	2	077.	3	107.	1
018.	4	048.	3	078.	1	108.	3
019.	3	049.	4	079.	4	109.	3
020.	1	050.	3	080.	3	110.	1
021.	1	051.	4	081.	4	111.	3
022.	2	052.	2	082.	1	112.	4
023.	2	053.	4	083.	4	113.	2
024.	2	054.	3	084.	3	114.	4
025.	1	055.	4	085.	1	115.	1
026.	4	056.	1	086.	4	116.	1
027.	4	057.	2	087.	1	117.	4
028.	2	058.	4	088.	4	118.	3
029.	4	059.	3	089.	4	119.	4
030.	2	060.	3	090.	4	120.	3

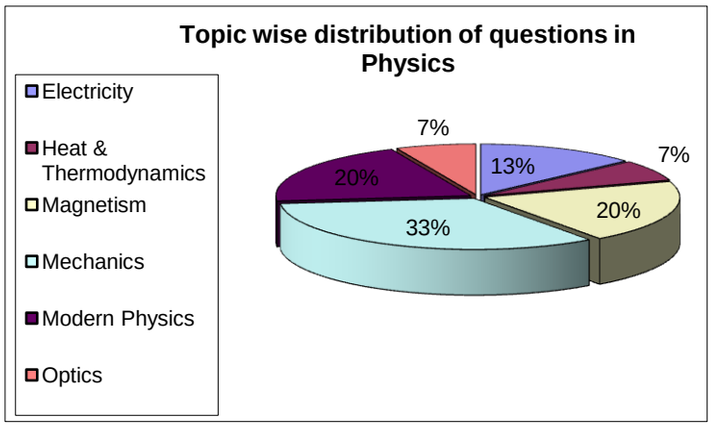
Though every care has been taken to provide the answers correctly but the Institute shall not be responsible for error, if any.

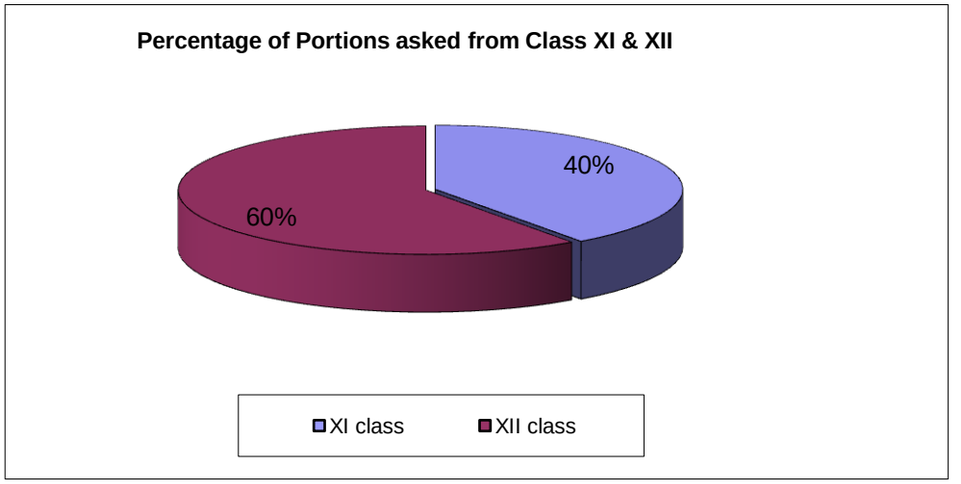
ANALYSIS OF PHYSICS PORTION OF AIPMT FINAL EXAM 2010

	XII Electricity	XI Heat & Thermodynamics	XII Magnetism	XI Mechanics	XII Modern Physics	XII Optics	*Total*
Easy	3	0	1	4	1	1	*10*
Medium	0	1	3	3	4	1	*12*
Tough	1	1	2	3	1	0	*8*
Total	*4*	*2*	*6*	*10*	*6*	*2*	***30***

XI class	**12**	**XII class**	**18**



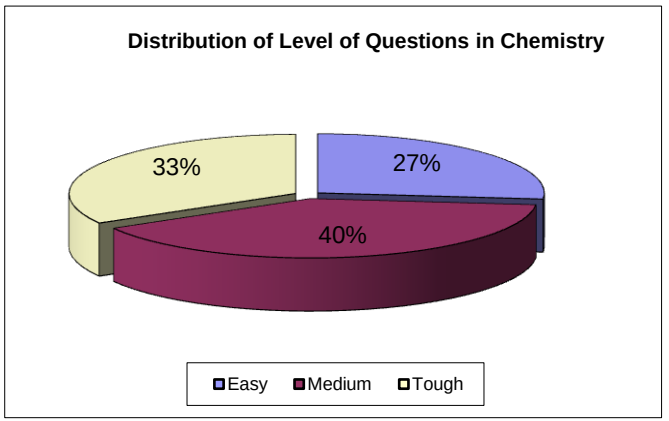


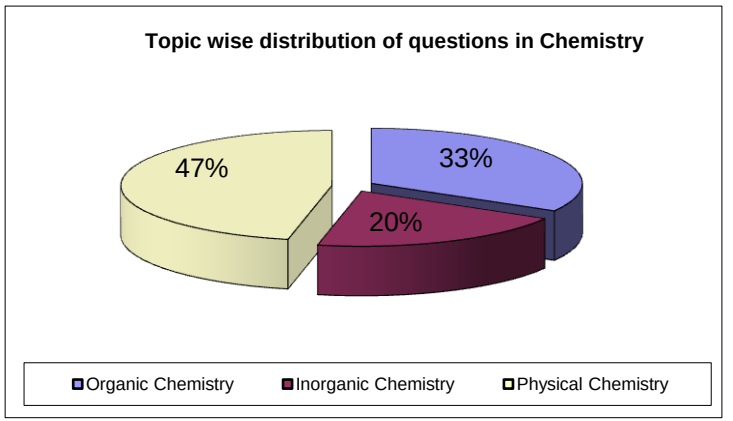


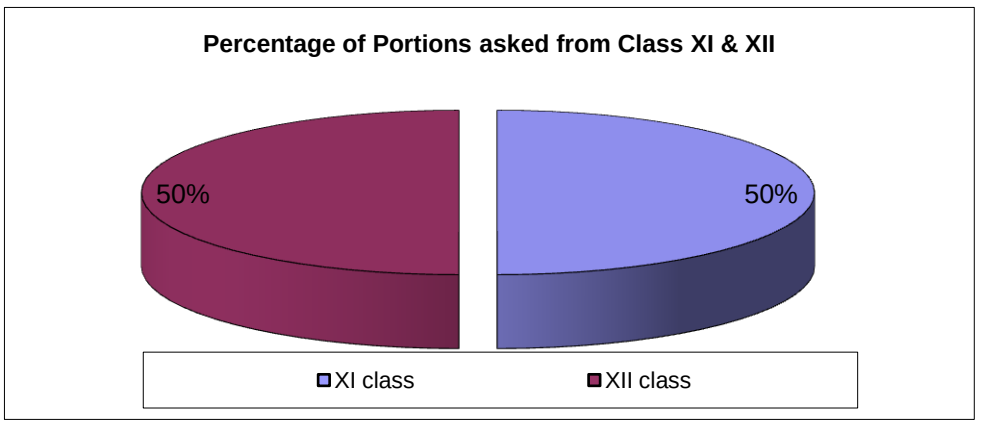
ANALYSIS OF CHEMISTRY PORTION OF AIPMT FINAL EXAM 2010

	Organic Chemistry	Inorganic Chemistry	Physical Chemistry	*Total*
Easy	2	1	5	*8*
Medium	4	2	6	*12*
Tough	4	3	3	*10*
Total	*10*	*6*	*14*	**30**

XI class	**15**	**XII class**	**15**



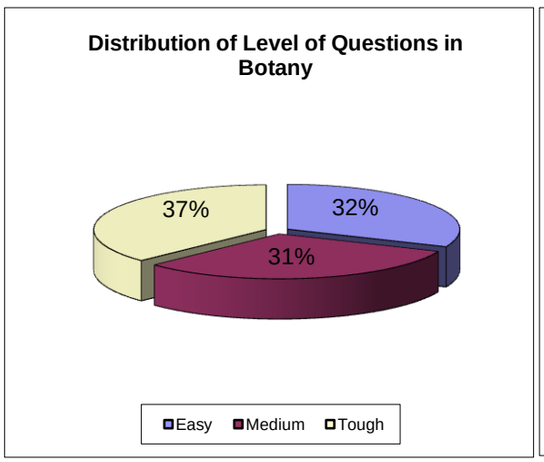


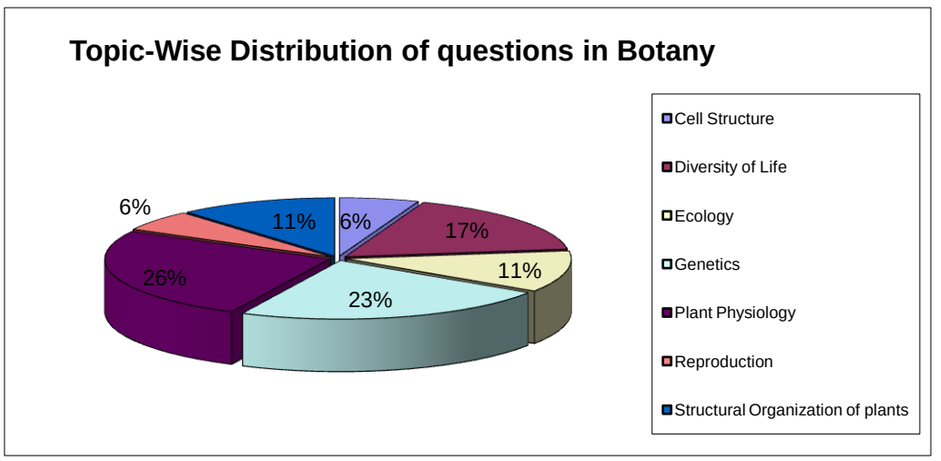


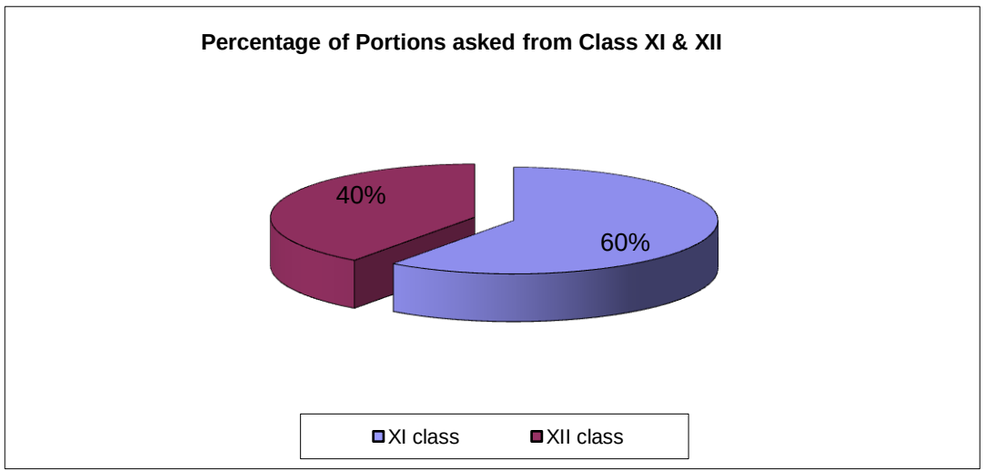
ANALYSIS OF BOTANY PORTION OF AIPMT FINAL EXAM 2010

	XI	XI	XII	XII	XI	XII	XI	
	Cell Structure	**Diversity of Life**	**Ecology**	**Genetics**	**Plant Physiology**	**Reproduction**	**Structural Organization of plants**	**Total**
Easy	0	3	1	2	4	0	1	*11*
Medium	1	1	1	4	1	0	3	*11*
Tough	1	2	2	2	4	2	0	*13*
Total	*2*	*6*	*4*	*8*	*9*	*2*	*4*	***35***

XI class	**21**	**XII class**	**14**



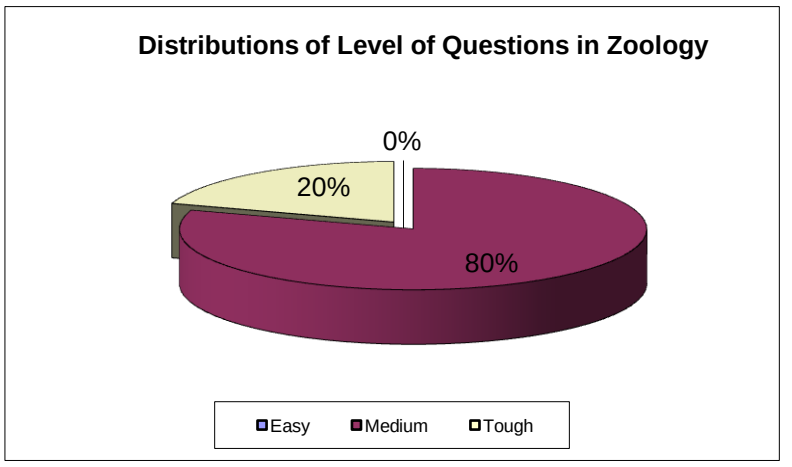


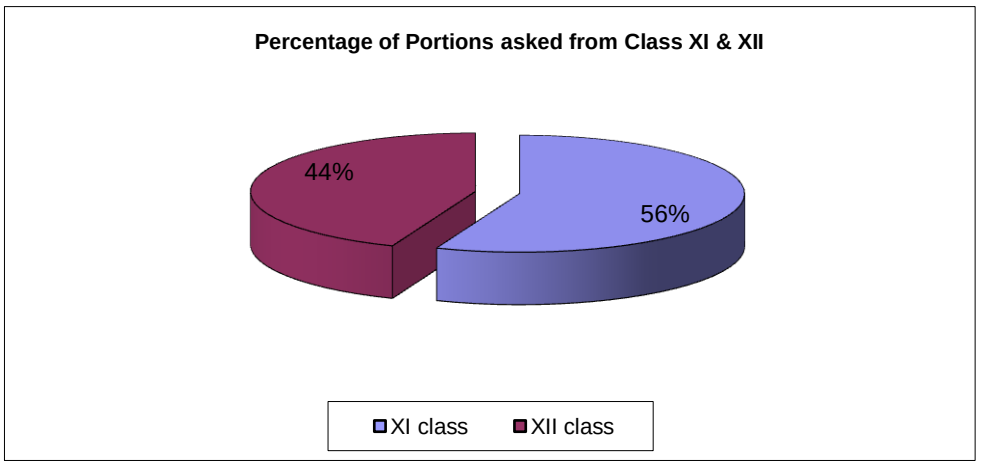


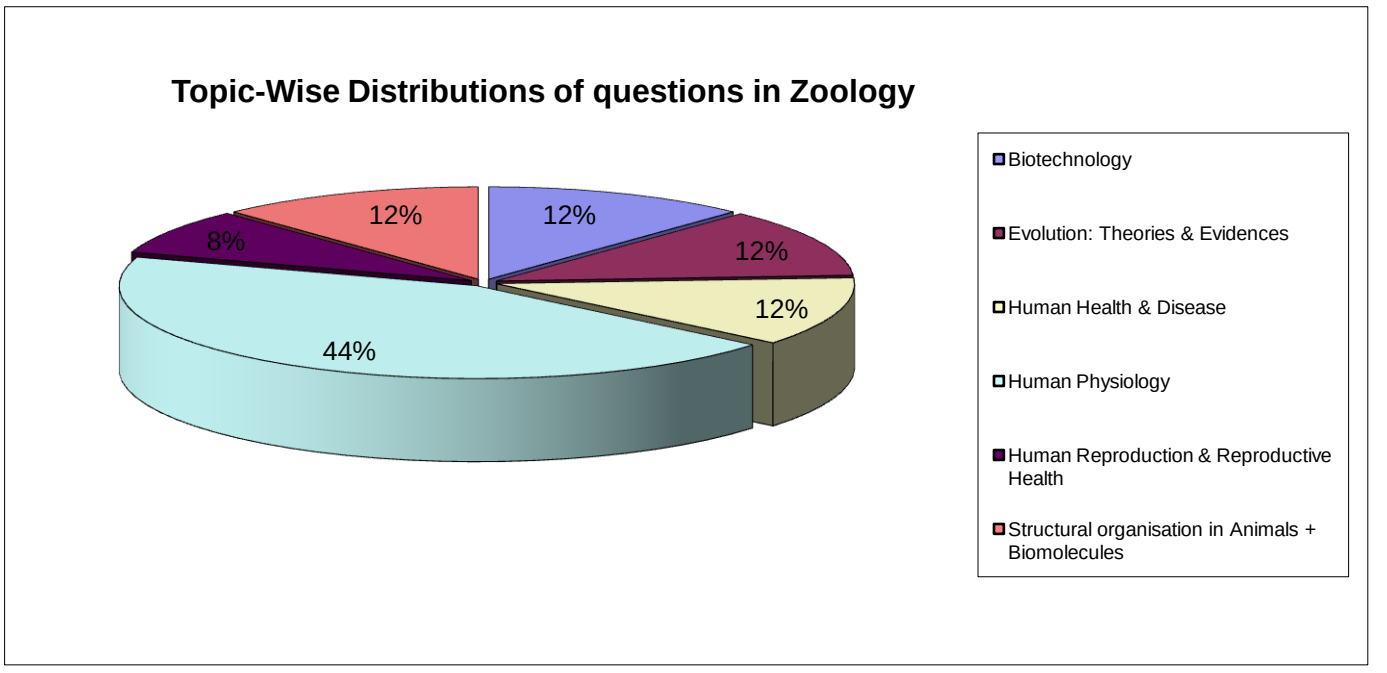
ANALYSIS OF ZOOLOGY PORTION OF AIPMT FINAL EXAM 2010

	XII	XII	XII	XI	XII	XI	
	Biotechnology	**Evolution: Theories & Evidences**	**Human Health & Disease**	**Human Physiology**	**Human Reproduction & Reproductive Health**	**Structural organisation in Animals + Biomolecules**	**Total**
Easy	0	0	0	0	0	0	***0***
Medium	2	3	2	10	1	2	***20***
Tough	1	0	1	1	1	1	***5***
Total	*3*	*3*	*3*	*11*	*2*	*3*	***25***

XI class	**14**	**XII class**	**11**







DATE : 16/05/2010

Code - C

Aakash Institute
Premier Institute in India for Medical Entrance Exams.
(Division of Aakash Educational Services Ltd.)
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Ph.: 011-47623456 Fax : 011-47623472

Time : 3 hrs. Max. Marks: 480

Solutions

for

CBSE Final Exam. 2010

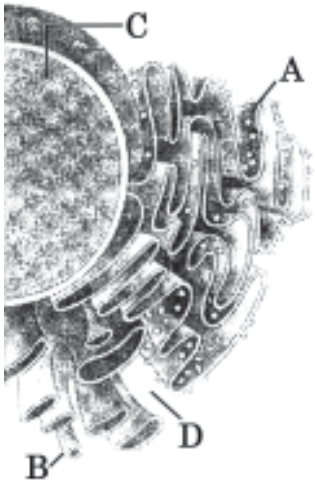
1. Which one of the following pairs of structures is correctly matched with their correct description?

	Structures		Description
(1)	Tibia and fibula	–	Both form parts of knee joint
(2)	Cartilage and cornea	–	No blood supply but do require oxygen for respiratory need
(3)	Shoulder joint and elbow joint	–	Ball and socket type of joint
(4)	Premolars and molars	–	20 in all and 3– rooted

Ans. (2)

Sol. Cartilage is avascular, as the blood vessels innervate only perichondrium. In the formation of knee joint, tibia is involved with femur.

2. Identify the components labelled A, B, C and D in the diagram below from the list (i) to (viii) given along with



Components:

(i) Cristae of mitochondria

(ii) Inner membrane of mitochondria

(iii) Cytoplasm

(iv) Smooth endoplasmic reticulum

(v) Rough endoplasmic reticulum

(vi) Mitochondrial matrix

(vii) Cell vacuole

(viii) Nucleus

The correct components are :

	A	B	C	D
(1)	(v)	(iv)	(viii)	(iii)
(2)	(i)	(iv)	(viii)	(vi)
(3)	(vi)	(v)	(iv)	(vii)
(4)	(v)	(i)	(iii)	(ii)

Ans. (1)

Sol. Golgi and ER are often found associated to nuclear membrane.

3. Fastest distribution of some injectible material/ medicine and with no risk of any kind can be achieved by injecting it into the

(1) Muscles (2) Arteries

(3) Veins (4) Lymph vessels

Ans. (3)

Sol. Intravenous injection is given for rapid distribution of drugs/substance. Intramuscular injection is given for producing local effect.

4. Which one of the following statements about the particular entity is true?

(1) *Centromere* is found in animal cells, which produces aster during cell division

(2) The *gene for producing insulin* is present in every body cell

(3) *Nucleosome* is formed of nucleotides

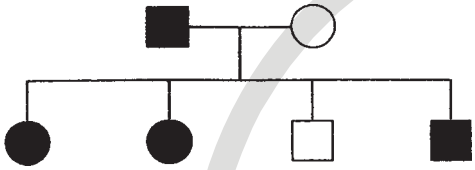
(4) *DNA* consists of a core of eight histones

Ans. (2)

Sol. 'Centromere' is found in chromosomes where two chromatids are attached.

'Insulin' gene is found in every body cell but is not expressed in all cells.

5. Study the pedigree chart of a certain family given below and select the **correct** conclusion which can be drawn for the character



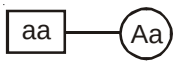
(1) The female parent is heterozygous

(2) The parents could not have had a normal daughter for this character

(3) The trait under study could not be colour-blindness

(4) The male parent is homozygous dominant

Ans. (1)

Sol. 

6. Leguminous plants are able to fix atmospheric nitrogen through the process of symbiotic nitrogen fixation. Which one of the following statements is **not** correct during this process of nitrogen fixation?

(1) Leghae moglobin scavenges oxygen and is pinkish in colour

(2) Nodules act as sites for nitrogen fixation

(3) The enzyme nitrogenase catalyses the conversion of atmospheric N_2 to NH_3

(4) Nitrogenase is insensitive to oxygen

Ans. (4)

Sol. Nitrogenase is sensitive against O_2.

7. Which one of the following is a xerophytic plant in which the stem is modified into the flat green and succulent structure?

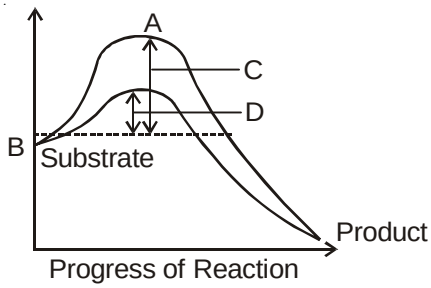
(1) *Opuntia* (2) *Casuarina*

(3) *Hydrilla* (4) *Acacia*

Ans. (1)

Sol. *Opuntia* – Phylloclade

8. The figure given below shows the conversion of a substrate into product by an enzyme. In which one of the four options (1–4) the components of reaction labelled as A, B, C and D are identified correctly?



Options:

	A	B	C	D
(1)	Potential energy	Transition state	Activation energy with enzyme	Activation energy *without* enzyme
(2)	Transition state	Potential energy	Activation energy *without* enzyme	Activation energy *with* enzyme
(3)	Potential energy	Transition state	Activation energy *with* enzyme	Activation energy *without* enzyme
(4)	Activation energy *with* enzyme	Transition state	Activation energy *without* enzyme	Potential energy

Ans. (2)

Sol. Activation energy is required for overcoming the energy barrier which gets reduced in the presence of enzyme.

9. Which of the following are used in gene cloning?

(1) Nucleoids (2) Lomasomes

(3) Mesosomes (4) Plasmids

Ans. (4)

Sol. Plasmids are used as the vector in gene cloning.

10. When domestic sewage mixes with river water

(1) Small animals like rats will die after drinking river water

(2) The increased microbial activity releases micro-nutrients such as iron

(3) The increased microbial activity uses up dissolved oxygen

(4) The river water is still suitable for drinking as impurities are only about 0.1%

Ans. (3)

Sol. Any mixing of sewage will increase BOD and decrease of DO due to decomposing activity of microbes.

11. Given below are four statements (A-D) each with one or two blanks. Select the option which **correctly** fills up the blanks in two statements

Statements:

(A) Wings of butterfly and birds look alike and are the results of ___(i)___, evolution.

(B) Miller showed that CH_4, H_2, NH_3 and ___(i)___, when exposed to electric discharge in a flask resulted in formation of ___(ii)___.

(C) Vermiform appendix is a ___(i)___ organ and an ___(ii)___ evidence of evolution.

(D) According to Darwin evolution took place due to ___(i)___ and ___(ii)___ of the fittest.

Options :

(1) (D) – (i) Small variations, (ii) Survival,
(A) – (i) Convergent

(2) (A) – (i) Convergent,
(B) – (i) Oxygen, (ii) nucleosides

(2) (B) – (i) Water vapour, (ii) Amino acids
(C) – (i) Rudimentary, (ii) Anatomical

(4) (C) – (i) Vestigial, (ii) Anatomical
(D) – (i) Mutations, (ii) Multiplication

Ans. (1)

Sol. According to Darwin, evolution took place due to small variations & survival of the fittest. Wings of butterfly & birds are analogous or convergent. Vermiform appendix is vestigial organ.

12. Aestivation of petals in the flower of cotton is correctly shown in1

(1) 

(2) 

(3) 

(4) 

Ans. (4)

Sol. Lady's finger, cotton and china rose, all shows twisted aestivation.

13. In which one of the following organisms its *excretory organs* are **correctly** stated?

(1) Humans – Kidneys, sebaceous glands and tear glands

(2) Earthworm – Pharyngeal, integumentary and septal nephridia

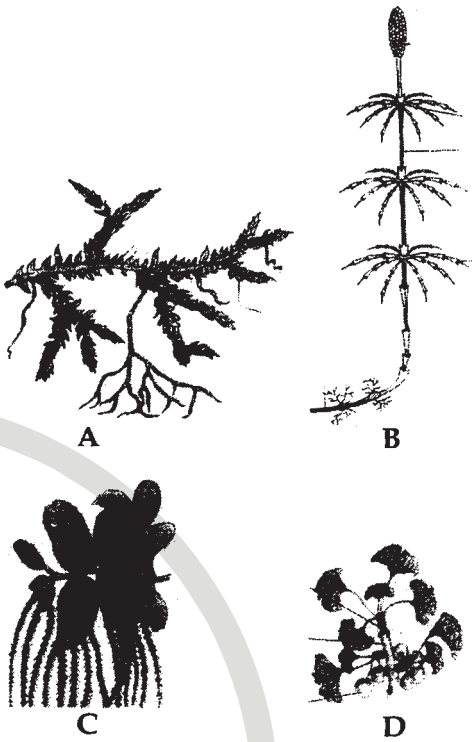
(3) Cockroach – Malpighian tubules and enteric caeca

(4) Frog – Kidneys, skin and buccal epithelium

Ans. (2)

Sol. Earthworm has 3 types of nephridia.

14. Examine the figures A, B, C and D. In which one of the four options all the items A, B, C and D are correct?



Options:

	A	B	C	D
(1)	*Chara*	*Marchantia*	*Fucus*	*Pinus*
(2)	*Equisetum*	*Ginkgo*	*Selaginella*	*Lycopodium*
(3)	*Selaginella*	*Equisetum*	*Salvinia*	*Ginkgo*
(4)	*Funaria*	*Adiantum*	*Salvinia*	*Riccia*

Ans. (3)

Sol. A – *Selaginella*, B – *Equisetum*, C – *Salvinia*, D – *Ginkgo*

15. The most apparent change during the evolutionary history of *Homo sapiens* is traced in

(1) Loss of body hair

(2) Walking upright

(3) Shortening of the jaws

(4) Remarkable increase in the brain size

Ans. (4)

Sol. Brain size or cranial capacity shows gradual increases in history of *Homo sapiens.*

16. Which one of the following is now being commercially produced by biotechnological procedures?

(1) Nicotine (2) Morphine

(3) Quinine (4) Insulin

Ans. (4)

Sol. Insulin is produced by synthesizing the polypeptide A and polypeptide B separately and then linking them.

17. The correct floral formula of soybean is

(1) % ♀ $K_{(5)}\ C_{1+(2)+2}\ A_{(9)+1}\ \underline{G_1}$

(2) % ♀ $K_5\ C_{1+(2)+2}\ A_{(9)+1}\ \underline{G_1}$

(3) % ♀ $K_{(5)}\ C_{1+2+(2)}\ A_{(9)+1}\ \underline{G_1}$

(4) % ♀ $K_{(5)}\ C_{1+2+(2)}\ A_{1+(9)}\ \underline{G_1}$

Ans. (3)

Sol. % ♀ $K_{(5)}\ C_{1+2+(2)}\ A_{(9)+1}\ \underline{G_1}$ (w.r.t. NCERT)

18. If for some reason the parietal cells of the gut epithelium become partially non-functional, what is likely to happen?

(1) The pancreatic enzymes and specially the trypsin and lipase will not work efficiently

(2) The pH of stomach will fall abruptly

(3) Steapsin will be more effective

(4) Proteins will not be adequately hydrolysed by pepsin into proteoses and peptones

Ans. (4)

Sol. Parietal or oxyntic cells release HCl required for the activation of pepsin.

19. Which one of the following is *most appropriately* defined?

(1) Host is an organism which provides food to another organism

(2) *Amensalism* is a relationship in which one species is benefited whereas the other is unaffected

(3) *Predator* is an organism that catches and kills other organism for food

(4) *Parasite* is an organism which always lives inside the body of other organism and may kill it

Ans. (3)

Sol. Term 'Host' is specific to parasitic relation only.

20. Read the following four statements, A, B, C and D and select the right option having both correct statements.

STATEMENTS :

(A) Z scheme of light reaction takes place in presence of PSI only.

(B) Only PS I is functional in cyclic photophosphorylation.

(C) Cyclic photophosphorylation results into synthesis of ATP and $NADPH_2$

(D) Stroma lamellae lack PS II as well as NADP.

Options :

(1) B and D (2) A and B

(3) B and C (4) C and D

Ans. (1)

Sol. It requires both PS-II and PS-I, where PS-II is more important. Stroma lamella contains PS-I only.

21. Which one of the following techniques is safest for the detection of cancers?

(1) Magnetic resonance imaging (MRI)

(2) Radiography (X-ray)

(3) Computed tomography (CT)

(4) Histopathological studies

Ans. (1)

Sol. Histopathological study is the invasive technique. Radiography and CT involves X-rays which are harmful.

22. Signals from fully developed foetus and placenta ultimately lead to parturition which requires the release of

(1) Estrogen from placenta

(2) Oxytocin from maternal pituitary

(3) Oxytocin from foetal pituitary

(4) Relaxin from placenta

Ans. (2)

Sol. Oxytocin or Pitocin released from maternal pituitary causes contractions in the uterine muscles to help in parturition.

23. Select the *correct* matching of a hormone, its source and function.

	Hormone	Source	Function
(1)	Vasopressin	Posterior pituitary	Increases loss of water through urine
(2)	Norepinephrine	Adrenal medulla	Increases heart beat, rate of respiration and alertness
(3)	Glucagon	Beta-cells of Islets of langerhans	Stimulates glycogenolysis
(4)	Prolactin	Posterior Pituitary	Regulates growth of mammary glands and milk formation in females

Ans. (2)

Sol. Vasopressin decreases loss of water through urine. Glucagon is released from α-cells. Prolactin is released from anterior pituitary.

24. In eukaryotic cell transcription, RNA splicing and RNA capping take place inside the

(1) Ribosomes (2) Nucleus

(3) Dictyosomes (4) ER

Ans. (2)

Sol. Mature mRNA comes out in cytoplasm only after completion of splicing, capping and tailing.

25. Given below are four statements (a-d) regarding human blood circulatory system

(a) Arteries are thick-walled and have narrow lumen as compared to veins

(b) Angina is acute chest pain when the blood circulation to the brain is reduced

(c) Persons with blood group AB can donate blood to any person with any blood group under ABO system

(d) Calcium ions play a very important role in blood clotting

Which two of the above statements are correct?

(1) (a) & (d) (2) (a) & (b)

(3) (b) & (c) (4) (c) & (d)

Ans. (1)

Sol. Angina is due to reduced blood supply to heart wall. Person with blood group AB is universal recepient.

26. In human female the *blastocyst*

(1) Forms placenta even before implantation

(2) Gets implanted into uterus 3 days after ovulation

(3) Gets nutrition from uterine endometrial secretion only after implantation

(4) Gets implanted in endometrium by the trophoblast cells

Ans. (4)

Sol. Blastocyst starts getting nutrition before implantation.

27. The haemoglobin content per 100 ml of blood of a normal healthy human adult is

(1) 5 - 11 g (2) 25 - 30 g

(3) 17 - 20 g (4) 12 - 16 g

Ans. (4)

28. An example of endomycorrhiza is

(1) *Nostoc* (2) *Glomus*

(3) *Agaricus* (4) *Rhizobium*

Ans. (2)

Sol. *Nostoc* -BGA, *Agaricus*- Basidiomycetes, *Rhizobium* - Eubacteria

29. One of the commonly used plant growth hormone is tea plantations is

(1) Ethylene

(2) Abscisic acid

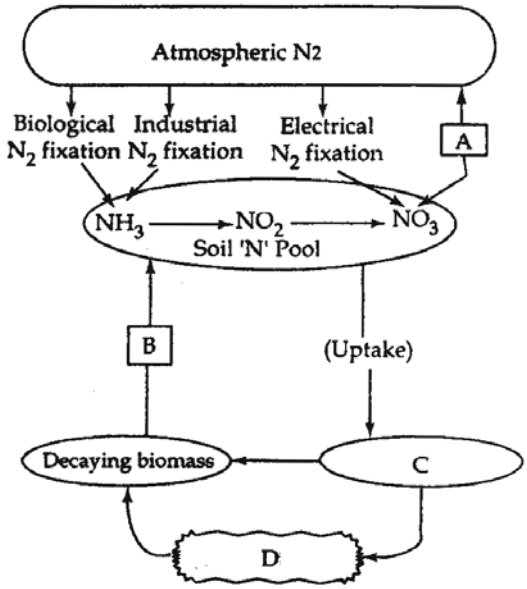
(3) Zeatin

(4) Indole - 3 - acetic acid

Ans. (4)

Sol. Auxins are commonly used in stem cutting.

30. Study the cycle shown below and select the option which gives correct words for all the four blanks A, B, C and D.



Options:

	A	B	C	D
(1)	Nitrification	Ammonification	Animals	Plants
(2)	Denitrification	Ammonification	Plants	Animals
(3)	Nitrification	Denitrification	Animals	Plants
(4)	Denitrification	Nitrification	Plants	Animals

Ans. (2)

Sol. A – Denitrification, B – Ammonification, C – Plants, D-Animals

31. Jaundice is a disorder of

(1) Excretory system

(2) Skin and eyes

(3) Digestive system

(4) Circulatoy system

Ans. (3)

Sol. Jaundice can be due to blockage/inflammation of bile duct.

32. Kranz anatomy is one of the characteristics of the leaves of

(1) Potato (2) Wheat

(3) Sugarcane (4) Mustard

Ans. (3)

Sol. Sugarcane – C_4 plant

33. In *Antirrhinum* two plants with pink flowers were hybridized. The F_1 plants produced red, pink and white flowers in the proportion of 1 red, 2 pink and 1 white. What could be the genotype of the two plants used for hybridization? Red flower colour is determined by *RR*, and white by *rr* genes.

(1) *rrrr* (2) *RR*

(3) *Rr* (4) *rr*

Ans. (3)

Sol. Parents (Pink) ♀ Rr × ♂ Rr (Pink)

Gametes R r R r

	R	r
R	RR	Rr
r	Rr	rr

1 : 2 : 1
Red : Pink : White

34. Transport of food material in higher plants takes place through

(1) Companion cells (2) Transfusion tissue

(3) Tracheids (4) Sieve elements

Ans. (4)

Sol. Sieve elements – Major transporting element of food.

Transfusion tissue – In place of lateral viens in gymnosperm leaves.

35. Which one of the following is manoecious?

(1) *Marchantia* (2) *Cycas*

(3) *Pinus* (4) *Date palm*

Ans. (3)

Sol. Both male and female cones occur or same plant in *Pinus.*

36. A cross in which an organism showing a dominant phenotype in crossed with the recessive parent in order to know its genotype is called :

(1) Monohybrid cross (2) Back cross

(3) Test cross (4) Dihybrid cross

Ans. (3)

Sol. Back cross include cross of F_1 with any of the parents *i.e.,* (Tt × tt) or (Tt × TT).

37. The Indian Rhinoceros is a natural inhabitant of which one of the Indian states?

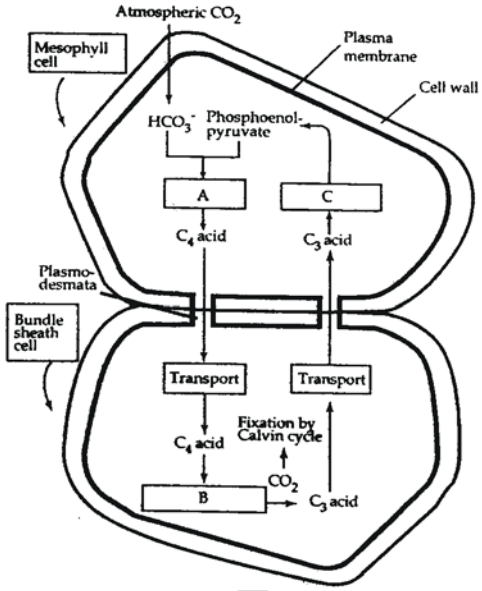
(1) Uttarakhand (2) Uttar Pradesh

(3) Himachal Pradesh (4) Assam

Ans. (4)

Sol. Kaziranga National Park is famous for rhinoceros.

38. Study the pathway given below :



In which of the following options correct words for all the three blanks A, B and C are indicated?

	A	B	C
(1)	Decarboxylation	Reduction	Regeneration
(2)	Fixation	Transamination	Regencration
(3)	Fixation	Decarboxylation	Regeneration
(4)	Carboxylation	Decarboxylation	Reduction

Ans. (3)

Sol. A – Fixation of CO_2 by PEPCO

B – Decarboxylation

C – Regeneration

39. Black (stem) rust of wheat is caused by :

(1) *Alternaria solani* (2) *Ustilago nuda*

(3) *Puccinia graminis* (4) *Xanthomonas oryzae*

Ans. (3)

Sol. *Puccinia graminis tritici* - Black stem rust of wheat.

40. Secretions from which one of the following are rich in fructose, calcium and some enzymes?

(1) Male accessory glands

(2) Liver

(3) Pancreas

(4) Salivary glands

Ans. (1)

Sol. Male accessory glands include a pair of seminal vesicles, a prostate gland, and pair of bulbourethral glands. Their secretions is called as seminal plasma, which is rich in fructose, has calcium and some enzymes.

41. A person suffering from a disease caused by *Plasmodium*, experiences recurring chill and fever at the time when?

(1) The sporozoites released from RBCs are being rapidly killed and broken down inside spleen

(2) The trophozoites reach maximum growth and give out certain toxins

(3) The parasite after its rapid multiplication inside RBCs ruptures them, releasing the stage to enter fresh RBCs

(4) The microgametocytes and megagametocytes are being destroyed by the WBCs

Ans. (3)

Sol. In malaria chill and fever is due to the release of haemozoin, a toxic substance formed by breakdown of haemoglobin present in RBC. It will be released after the rupture of RBC, in erythrocytic schizogamy.

42. ABO blood grouping is controlled by gene I which has three alleles and show co-dominance. There are six genotypes. How many phenotypes in all are possible?

(1) Six (2) Three

(3) Four (4) Five

Ans. (3)

Sol. A, B, AB and O.

43. Three of the following statements about enzymes are correct and one is wrong. Which one is wrong?

(1) Enzymes require optimum pH for maximal activity

(2) Enzymes are denatured at high temperature but in certain exceptional organisms they are effective even at temperatures 80°-90°C

(3) Enzymes are highly specific

(4) Most enzymes are proteins but some are lipids

Ans. (4)

Sol. Most enzymes are proteins but some are RNA enzymes.

44. An elaborate network of filamentous proteinaceous structures present in the cytoplasm which helps in the maintenance of cell shape is called :

(1) Thylakoid

(2) Endoplasmic Reticulum

(3) Plasmalemma

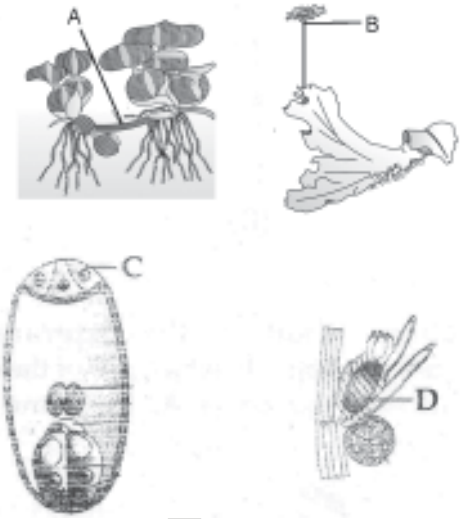
(4) Cytoskeleton

Ans. (4)

Sol. Cytoskelcton-Microtubule, Microfilament and Intermediate filaments.

45. Examine the figures (A-D) given below and select the right option out of 1-4, in which all the four structures A, B, C and D are identified correctly

Structures :



Options :

	A	B	C	D
(1)	Rhizome	Sporangiophore	Polar cell	Globule
(2)	Runner	Archegoniophore	Synergid	Antheridium
(3)	Offset	Antheridiophore	Antipodals	Oogonium
(4)	Sucker	Seta	Megaspore mother cell	Gemma cup

Ans. (3)

Sol. A – Offset of Eichhornia

B – Antheridiophore of *Marchantia*

C – Antipodals

D – Oogonium (Nucule) of *Chara*

46. Root development is promoted by

(1) Abscisic acid

(2) Auxin

(3) Gibberellin

(4) Ethylene

Ans. (4)

Sol. Root development and root hair formation C_2H_4.

47. Consider the following four statements A, B, C and D and select the right option for two **correct** statements.

Statements

(A) In vexillary aestivation, the large posterior petal is called - *standard*, two lateral ones are *wings* and two small anterior petals are termed *keel*

(B) The floral formula for Liliaceae is

$\oplus \mathrm{P}_{3+3}\, \mathrm{A}_{3+3} + \underline{\mathrm{G}_{3}}$

(C) In pea flower the stamens are monadelphous

(D) The floral formula for Solanaceae is

$\oplus \mathrm{K}_{(3)}\, \mathrm{C}_{(3)}\, \mathrm{A}_{(4)} + \underline{\mathrm{G}_{(2)}}$

The correct statements are

(1) (A) and (C)

(2) (A) and (B)

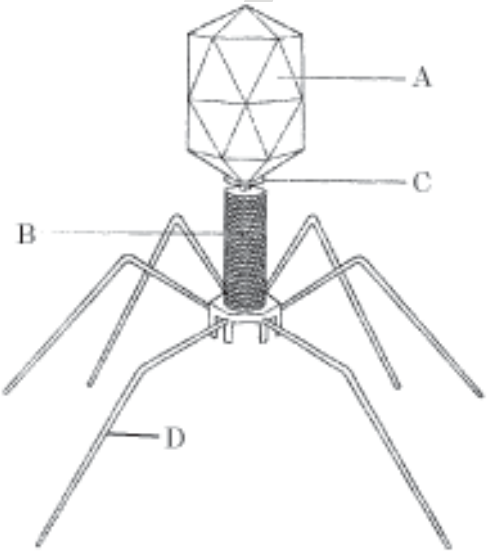
(3) (B) and (C)

(4) (C) and (D)

Ans. (2)

Sol. Pea-Diadelphous.

48. Given below is the diagram of a bacteriophage. In which one of the options all the four parts A, B, C and D are correct?



Options :

	A	B	C	D
(1)	Tail fibres	Head	Sheath	Collar
(2)	Sheath	Collar	Head	Tail fibres
(3)	Head	Sheath	Collar	Tail fibres
(4)	Collar	Tail fibres	Head	Sheath

Ans. (3)

Sol. A - Head

B - Sheath

C - Collar

D - Tail fibre

49. In genetic engineering, a DNA segment (gene) of interest, is transferred to the host cell through a vector. Consider the following four agents (A-D) in this regard and select the correct option about which one or more of these can be used as a vector/ vectors

Statements

(A) A bacterium (B) Plasmid

(C) Plasmodium (D) Bacteriophage

Options :

(1) (A), (B) and (D) only (2) (A) only

(3) (A) and (C) only (4) (B) and (D) only

Ans. (4)

Sol. Plasmids and bacteriophages are used as vectors in genetic engineering.

50. Which one of the following can **not** be used for preparation of vaccines against plague?

(1) Formalin-inactivated suspensions of virulent bacteria

(2) Avirulent live bacteria

(3) Synthetic capsular polysaccharide material

(4) Heat-killed suspensions of virulent bacteria

Ans. (3)

Sol. Synthetic capsular polysaccharide vaccines are available for treatment of pneumonia caused by

Streptococcus pneumoniae

Hemophilus influenza

and for meningtidis caused by *Neisseria meningitids.*

They are not available for plague.

51. The fruit fly *Drosophila melanogaster* was found to be very suitable for experimental verification of chromosomal theory of inheritance by Morgan and his colleagues because :

(1) It reproduces parthenogenetically

(2) A single mating produces two young flies

(3) Smaller female is easily recognisable from larger male

(4) It completes life cycle in about two weeks

Ans. (4)

Sol. Female is larger. Many offsprings are produced from single mating.

52. The *lac* operon consists of

(1) Four regulatory genes only

(2) One regulatory gene and three structural genes

(3) Two regulatory genes and two structural genes

(4) Three regulatory genes and three structural genes

Ans. (2)

Sol. Regulatory gene - 'i', structural genes - z, y, a

53. Crocodile and penguin are similar to Whale and Dogfish in which one of the following features?

(1) Possess a solid single stranded central nervous system

(2) Lay eggs and guard them till they hatch

(3) Possess bony skeleton.

(4) Have gill slits at some stage

Ans. (4)

Sol. Crocodile, Penguin, Whale and Dogfish all are chordates. So, all have gill slits at some stage of development.

54. Select the answer with *correct matching* of the structure, its location and function

	Structure	Location	Function
(1)	Eustachian tube	Anterior part of internal ear	Equalizes air pressure on either sides of tympanic membrane
(2)	Cerebellum	Mid brain	Controls respiration and gastric secretions
(3)	Hypothalamus	Fore brain	Controls body temperature, urge for eating and drinking
(4)	Blind spot	Near the place where optic nerve leaves the eye	Rods and cones are present but inactive here

Ans. (3)

Sol. Hypothalamus is the floor of diencephalon which is the part of fore brain. It has thermoregulatory centre, hunger and thirst centre.

55. Select the correct combination of the statements (*a-d*) regarding the *characteristics* of certain organisms

(a) Methanogens are Archaebacteria which produce methane in marshy areas

(b) *Nostoc* is a filamentous blue-green alga which fixes atmospheric nitrogen

(c) Chemosynthetic autotrophic bacteria synthesize cellulose from glucose

(d) Mycoplasma lack a cell wall and can survive without oxygen

The correct statement are

(1) (b), (c) (2) (a), (b), (c)

(3) (b), (c), (d) (4) (a), (b), (d)

Ans. (4)

Sol. Chemosynthetic autotrophs oxidize inorganic substances to produce energy and helps cycling of minerals.

56. Which one of the following is the *correct description* of a certain part of a normal human skeleton?

(1) Parietal bone and the temporal bone of the skull are joined by fibrous joint

(2) First vertebra is axis which articulates with the occipital condyles

(3) The 9^{th} and 10^{th} pairs of ribs are called the floating ribs

(4) Glenoid cavity is a depression to which the thigh bone articulates

Ans. (1)

Sol. Immovable/fixed/fibrous joint are present between the skull bones. So, between parietal bone and the temporal bone of the skull are joined by fibrous joint.

57. Vegetative propagation is *Pistia* occurs by

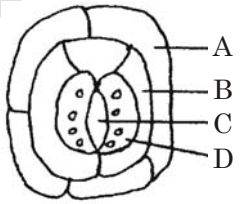
(1) Stolen (2) Offset

(3) Runner (4) Sucker

Ans. (2)

Sol. *Lemna, Pistia, Eichhornia* - Offset

58. Given below is the diagram of a stomatal apparatus. In which of the following all the four parts labelled as A, B, C and D are correctly identified?

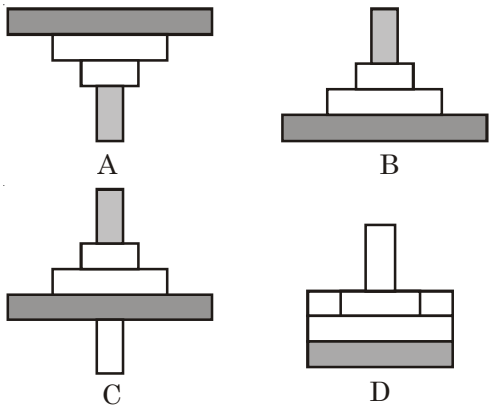


	A	B	C	D
(1)	Subsidiary cell	Epidermal cell	Guard cell	Stomatal aperture
(2)	Guard cell	Stomatal aperture	Subsidiary cell	Epidermal cell
(3)	Epidermal cell	Guard cell	Stomatal aperture	Subsidiary cell
(4)	Epidermal cell	Subsidiary cell	Stomatal aperture	Guard cell

Ans. (4)

Sol. A-Epidermal cell, B-Subsidiary cell, C-Stomatal aperture, D-Guard cell

59. Which of the following representations shows the pyramid of numbers in a forest ecosystem?



(1) D (2) A

(3) B (4) C

Ans. (3)

Sol. Pyramid of number is inverted in single tree ecosystem only.

60. The 3′-5′ phosphodiester linkages inside a polynucleotide chain serve to join

(1) One DNA strand with the other DNA strand

(2) One nucleoside with another nucleoside

(3) One nucleotide with another nucleotide

(4) One nitrogenous base with pentose sugar

Ans. (3)

Sol. 3′-5′ phosphodiester bond is formed between carbon 3 of one nucleotide and carbon 5 of the other nucleotide.

61. A current loop consists of two identical semicircular parts each of radius R, one lying in the x-y plane and the other in x-z plane. If the current in the loop is i. The resultant magnetic field due to the two semicircular parts at their common centre is

(1) $\frac{\mu_0 i}{2\sqrt{2}R}$ (2) $\frac{\mu_0 i}{2R}$

(3) $\frac{\mu_0 i}{4R}$ (4) $\frac{\mu_0 i}{\sqrt{2}R}$

Ans. (1)

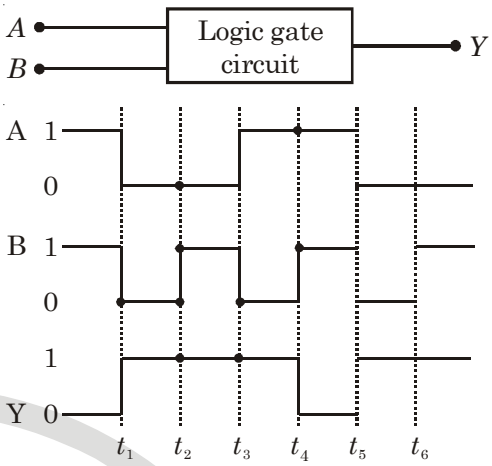
Sol. $\vec{B} = \vec{B_1} + \vec{B_2}$

$$|\vec{B_1}| = |\vec{B_2}| = \frac{\mu_0 i}{4R}$$

$$|\vec{B}| = \sqrt{B_1^2 + B_2^2}$$

$$|\vec{B}| = \frac{\mu_0 i}{4R}\sqrt{2} = \frac{\mu_0 i}{2\sqrt{2}\,R}$$

62. The following figure shows a logic gate circuit with two inputs A and B and the output Y. The voltage waveforms of A, B and Y are as given



The logic gate is

(1) NOR gate (2) OR gate

(3) AND gate (4) NAND gate

Ans. (4)

Sol.

A	B	Y
1	1	0
0	0	1
0	1	1
1	0	1

63. Two parallel metal plates having charges $+Q$ and $-Q$ face each other at a certain distance between them. If the plates are now dipped in kerosene oil tank, the electric field between the plates will

(1) Become zero (2) Increase

(3) Decrease (4) Remain same

Ans. (3)

Sol. Electric field in vacuum

$$E_0 = \frac{\sigma}{\varepsilon_0}$$

In medium

$$E = \frac{\sigma}{\varepsilon_0 K}$$

$K > 1$

$E < E_0$

64. The electric field at a distance $\frac{3R}{2}$ from the centre of a charged conducting spherical shell of radius R is E. The electric field at a distance $\frac{R}{2}$ from the centre of the sphere is

(1) Zero (2) E

(3) $\frac{E}{2}$ (4) $\frac{E}{3}$

Ans. (1)

Sol. Electric field inside shell is zero.

65. A student measures the distance traversed in free fall of a body, initially at rest in a given time. He uses this data to estimate g, the acceleration due to gravity. If the maximum percentage errors in measurement of the distance and the time are e_1 and e_2 respectively, the percentage error in the estimation of g is

(1) $e_2 - e_1$ (2) $e_1 + 2e_2$

(3) $e_1 + e_2$ (4) $e_1 - 2e_2$

Ans. (2)

Sol. $\ln g = \ln h - 2 \ln t$

$$\left(\frac{\Delta g}{g} \times 100\right)_{\max} = \frac{\Delta h}{h} \times 100 + 2\frac{\Delta t}{t} \times 100$$

$$= e_1 + 2e_2$$

66. When monochromatic radiation of intensity I falls on a metal surface, the number of photoelectron and their maximum kinetic energy are N and T respectively. If the intensity of radiation is $2I$, the number of emitted electrons and their maximum kinetic energy are respectively

(1) N and $2T$ (2) $2N$ and T

(3) $2N$ and $2T$ (4) N and T

Ans. (2)

Sol. Number of photoelectrons $\propto$ Intensity

Maximum kinetic energy is independent of intensity

67. The electric field of an electromagnetic wave in free space is given by

$\vec{E} = 10\cos(10^7 t + kx)\hat{j}$ V/m, where t and x are in seconds and metres respectively. It can be inferred that

(a) The wavelength λ is 188.4 m

(b) The wave number k is 0.33 rad/m

(c) The wave amplitude is 10 V/m

(d) The wave is propagating along $+x$ direction

Which one of the following pairs of statements is correct?

(1) (c) & (d) (2) (a) and (b)

(3) (b) & (c) (4) (a) & (c)

Ans. (4)

Sol. Amplitude = $10\frac{V}{m}$

$$C = \frac{\omega}{k}$$

$$3 \times 10^8 = \frac{10^7}{k}$$

$$k = \frac{1}{30}$$

$$\frac{2\pi}{\lambda} = \frac{1}{30}$$

λ = 188.4 m

68. The speed of light in media M_1 and M_2 is 1.5×10^8 m/s and 2.0×10^8 m/s respectively. A ray of light enters from medium M_1 to M_2 at an incidence angle i. If the ray suffers total internal reflection, the value of i is

(1) Equal to $\sin^{-1}\left(\frac{2}{3}\right)$

(2) Equal to or less than $\sin^{-1}\left(\frac{3}{5}\right)$

(3) Equal to or greater than $\sin^{-1}\left(\frac{3}{4}\right)$

(4) Less than $\sin^{-1}\left(\frac{2}{3}\right)$

Ans. (3)

Sol. $\mu_1 = 2$

$$\mu_2 = \frac{3}{2}$$

$$2\sin i \geq \frac{3}{2}\sin 90$$

$$\sin i \geq \frac{3}{4}$$

$$i \geq \sin^{-1}\left(\frac{3}{4}\right)$$

69. A ray of light is incident on a 60° prism at the minimum deviation position. The angle of refraction at the first face (i.e., incident face) of the prism is

(1) Zero (2) 30°

(3) 45° (4) 60°

Ans. (2)

Sol. In minimum deviation

$r_1 = r_2 = r$

$A = 2r$

$$r = \frac{60}{2} = 30^\circ$$

70. For transistor action

(a) Base, emitter and collector regions should have similar size and doping concentrations.

(b) The base region must be very thin and lightly doped.

(c) The emitter-base junction is forward biased and base-collector junction is reverse baised.

(d) Both the emitter-base junction as well as the base collector junction are forward biased.

Which one of the following pairs of statements is correct?

(1) (d), (a) (2) (a), (b)

(3) (b), (c) (4) (c), (d)

Ans. (3)

71. The additional kinetic energy to be provided to a satellite of mass m revolving around a planet of mass M, to transfer it from a circular orbit of radius R_1 to another of radius R_2 $(R_2 > R_1)$ is

(1) $GmM\left(\frac{1}{R_1^2} - \frac{1}{R_2^2}\right)$ (2) $GmM\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

(3) $2GmM\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ (4) $\frac{1}{2}GmM\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

Ans. (4)

Sol. $$-\frac{GMm}{2R_1} + \text{KE} = -\frac{GMm}{2R_2}$$

$$\text{KE} = \frac{GMm}{2}\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$$

72. The speed of a projectile at its maximum height is half of its initial speed. The angle of projection is

(1) 60° (2) 15°

(3) 30° (4) 45°

Ans. (1)

Sol. $v' = v_0\cos\theta$

$$\frac{v_0}{2} = v_0\cos\theta$$

$$\cos\theta = \frac{1}{2}$$

$\theta = 60^\circ$

73. From a circular disc of radius R and mass $9M$, a small disc of mass M and radius $\frac{R}{3}$ is removed concentrically. The moment of inertia of the remaining disc about an axis perpendicular to the plane of the disc and passing through its centre is

(1) $\frac{40}{9}MR^2$ (2) MR^2

(3) $4\ MR^2$ (4) $\frac{4}{9}MR^2$

Ans. (1)

Sol. $I = I_1 - I_2$

$$= \frac{9MR^2}{2} - \frac{MR^2}{18}$$

$$= \frac{81MR^2 - MR^2}{18}$$

$$= \frac{40\ MR^2}{9}$$

74. A particle moves in x-y plane according to rule $x = a\sin\omega t$ and $y = a\cos\omega t$. The particle follows

(1) An elliptical path

(2) A circular path

(3) A parabolic path

(4) A straight line path inclined equally to x and y-axes

Ans. (2)

Sol. $$\frac{x}{a} = \sin\omega t$$

$$\frac{y}{a} = \cos\omega t$$

$$\frac{y^2}{a^2} + \frac{x^2}{a^2} = 1$$

$y^2 + x^2 = a^2$

75. A closely wound solenoid of 2000 turns and area of cross-section 1.5×10^{-4} m^2 carries a current of 2.0 A. It is suspended through its centre and perpendicular to its length, allowing it to turn in a horizontal plane in a uniform magnetic field 5×10^{-2} tesla making an angle of 30° with the axis of the solenoid. The torque on the solenoid will be

(1) 3×10^{-3} N.m (2) 1.5×10^{-3} N.m

(3) 1.5×10^{-2} N.m (4) 3×10^{-2} N.m

Ans. (3)

Sol. $M = 2000 \times 1.5 \times 10^{-4} \times 2$

$= 6 \times 10^{-1}$

$\tau = MB\sin 30$

$= 0.6 \times 5 \times 10^{-2} \times \frac{1}{2}$

$\tau = 1.5 \times 10^{-2}$ Nm

76. The decay constant of a radio isotope is λ. If A_1 and A_2 are its activities at times t_1 and t_2 respectively, the number of nuclei which have decayed during the time $(t_1 - t_2)$

(1) $A_1t_1 - A_2t_2$ (2) $A_1 - A_2$

(3) $(A_1 - A_2)/\lambda$ (4) $\lambda(A_1 - A_2)$

Ans. (3)

Sol. $A_1 = \lambda N_1$

$A_2 = \lambda N_2$

$N_1 - N_2 = \left[\frac{A_1 - A_2}{\lambda}\right]$

77. A particle having a mass of 10^{-2} kg carries a charge of 5×10^{-8} C. The particle is given an initial horizontal velocity of 10^5 ms^{-1} in the presence of electric field $\vec{E}$ and magnetic field $\vec{B}$. To keep the particle moving in a horizontal direction, it is necessary that

(a) $\vec{B}$ should be perpendicular to the direction of velocity and $\vec{E}$ should be along the direction of velocity

(b) Both $\vec{B}$ and $\vec{E}$ should be along the direction of velocity

(c) Both $\vec{B}$ and $\vec{E}$ are mutually perpendicular and perpendicular to the direction of velocity

(d) $\vec{B}$ should be along the direction of velocity and $\vec{E}$ should be perpendicular to the direction of velocity

Which one of the following pairs of statements is possible?

(1) (a) and (c) (2) (c) and (d)

(3) (b) and (c) (4) (b) and (d)

Ans. (3)

78. The binding energy per nucleon in deuterium and helium nuclei are 1.1 MeV and 7.0 MeV, respectively. When two deuterium nuclei fuse to form a helium nucleus the energy released in the fusion is

(1) 23.6 MeV (2) 2.2 MeV

(3) 28.0 MeV (4) 30.2 MeV

Ans. (1)

Sol. $\Delta E = (28 - 4.4)$ MeV

$\Delta E = 23.6$ MeV

79. The electron in the hydrogen atom jumps from excited state ($n = 3$) to its ground state ($n = 1$) and the photons thus emitted irradiate a photosensitive material. If the work function of the material is 5.1 eV, the stopping potential is estimated to be (the energy of the electron in n^{th} state $E_n = -\frac{13.6}{n^2} eV$)

(1) 5.1 V (2) 12.1 V

(3) 17.2 V (4) 7 V

Ans. (4)

Sol. $V = (12.1 - 5.1)$ volt

$V_{stopping} = 7$ V

80. If c_p and c_v denote the specific heats (per unit mass) of an ideal gas of molecular weight M

(1) $C_p - C_v = R/M^2$ (2) $C_p - C_v = R$

(3) $C_p - C_v = R/M$ (4) $C_p - C_v = MR$

where R is the molar gas constant

Ans. (3)

Sol. $C_p - C_v = R$

$MC_p - MC_v = R$

$C_p - C_v = \frac{R}{M}$

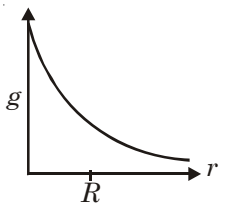
81. A condenser of capacity C is charged to a potential difference of V_1. The plates of the condenser are then connected to an ideal inductor of inductance L. The current through the inductor when the potential difference across the condenser reduces to V_2 is

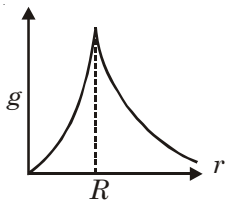
(1) $\left(\frac{C(V_1 - V_2)^2}{L}\right)^{\frac{1}{2}}$ (2) $\frac{C(V_1^2 - V_2^2)}{L}$

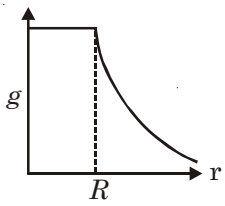
(3) $\frac{C(V_1^2 + V_2^2)}{L}$ (4) $\left(\frac{C(V_1^2 - V_2^2)}{L}\right)^{\frac{1}{2}}$

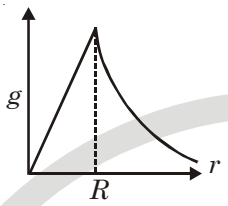
Ans. (4)

82. The dependence of acceleration due to gravity g on the distance r from the centre of the earth, assumed to be a sphere of radius R of uniform density is as shown in figures below

(a) 

(b) 

(c) 

(d) 

The correct figure is

(1) (d) (2) (a)

(3) (b) (4) (c)

Ans. (1)

83. A solid cylinder and a hollow cylinder, both of the same mass and same external diameter are released from the same height at the same time on a inclined plane. Both roll down without slipping. Which one will reach the bottom first?

(1) Both together only when angle of inclination of plane is 45°

(2) Both together

(3) Hollow cylinder

(4) Solid cylinder

Ans. (4)

Sol. $t = \sqrt{\dfrac{2\ell\left(1+\dfrac{k^2}{R^2}\right)}{g\sin\theta}}$

ℓ = length of incline plane

84. The thermo e.m.f. E in volts of a certain thermo-couple is found to vary with temperature difference θ in °C between the two junctions according to the relation

$$E = 30\theta - \frac{\theta^2}{15}$$

The neutral temperature for the thermo-couple will be

(1) 450°C (2) 400°C

(3) 225°C (4) 30°C

Ans. (3)

Sol. At neutral temperature

$$\frac{dE}{d\theta} = 0$$

$$30 - \frac{2\theta}{15} = 0$$

$$\theta = 225\ °C$$

85. (a) Centre of gravity (C.G.) of a body is the point at which the weight of the body acts

(b) Centre of mass coincides with the centre of gravity if the earth is assumed to have infinitely large radius

(c) To evaluate the gravitational field intensity due to any body at an external point, the entire mass of the body can be considered to be concentrated at its C.G.

(d) The radius of gyration of any body rotating about an axis is the length of the perpendicular dropped from the C.G. of the body to the axis

Which one of the following pairs of statements is **correct**?

(1) (d) and (a) (2) (a) and (b)

(3) (b) and (c) (4) (c) and (d)

Ans. (1)

86. The magnetic moment of a diamagnetic atom is

(1) Much greater than one

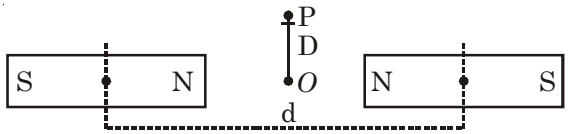
(2) 1

(3) Between zero and one

(4) Equal to zero

Ans. (4)

87. Two identical bar magnets are fixed with their centres at a distance d apart. A stationary charge Q is placed at P in between the gap of the two magnets at a distance D from the centre O as shown in the figure



The force on the charge Q is

(1) Zero

(2) Directed along OP

(3) Directed along PO

(4) Directed perpendicular to the plane of paper

Ans. (1)

88. A particle of mass M starting from rest undergoes uniform acceleration. If the speed acquired in time T is V, the power delivered to the particle is

(1) $\frac{MV^2}{T}$ (2) $\frac{1}{2}\frac{MV^2}{T^2}$

(3) $\frac{MV^2}{T^2}$ (4) $\frac{1}{2}\frac{MV^2}{T}$

Ans. (4)

89. A thin circular ring of mass M and radius r is rotating about its axis with constant angular velocity ω. Two objects each of mass m are attached gently to the opposite ends of a diameter of the ring. The ring now rotates with angular velocity given by

(1) $\frac{(M+2m)\omega}{2m}$ (2) $\frac{2M\omega}{M+2m}$

(3) $\frac{(M+2m)\omega}{M}$ (4) $\frac{M\omega}{M+2m}$

Ans. (4)

Sol. $MR^2\omega = (M + 2m)R^2\omega'$

$$\boxed{\omega' = \frac{m\omega}{(M+2m)}}$$

90. A monoatomic gas at pressure P_1 and V_1 is compressed adiabatically to $\frac{1}{8}$th its original volume. What is the final pressure of the gas?

(1) 64 P_1 (2) P_1

(3) 16 P_1 (4) 32 P_1

Ans. (4)

Sol. $PV^{5/3} = P'\left(\frac{V}{8}\right)^{5/3}$

$P' = P(8)^{5/3}$

$= P \times 2^5$

$P' = 32P$

91. Among the elements Ca, Mg, P and Cl, the order of increasing atomic radii is

(1) Mg < Ca < Cl < P (2) Cl < P < Mg < Ca

(3) P < Cl < Ca < Mg (4) Ca < Mg < P < Cl

Ans. (2)

Sol. In a period size decreases from left to right.

92. The reaction

$$2A(g) + B(g) \rightleftharpoons 3C(g) + D(g)$$

is begun with the concentrations of A and B both at an initial value of 1.00 M. When equilibrium is reached, the concentration of D is measured and found to be 0.25 M. The value for the equilibrium constant for this reaction is given by the expression

(1) $[(0.75)^3(0.25)] \div [(1.00)^2(1.00)]$

(2) $[(0.75)^3(0.25)] \div [(0.50)^2(0.75)]$

(3) $[(0.75)^3(0.25)] \div [(0.50)^2(0.25)]$

(4) $[(0.75)^3(0.25)] \div [(0.75)^2(0.25)]$

Ans. (2)

Sol.

	$2A$	+ B $\rightleftharpoons$	$3C$	+ D
Initial	1	1	0	0
Eq.	1 – 0.50	1 – 0.25	0.75	0.25

$$K = \frac{(0.75)^3(0.25)}{(0.50)^2(0.75)}$$

93. Which of the following expressions correctly represents the equivalent conductance at infinite dilution of $Al_2(SO_4)_3$. Given that $\Lambda^o_{Al^{3+}}$ and $\Lambda^o_{SO_4^{2-}}$ are the equivalent conductances at infinite dilution of the respective ions?

(1) $2\Lambda^o_{Al^{3+}} + 3\Lambda^o_{SO_4^{2-}}$ (2) $\Lambda^o_{Al^{3+}} + \Lambda^o_{SO_4^{2-}}$

(3) $(\Lambda^o_{Al^{3+}} + \Lambda^o_{SO_4^{2-}}) \times 6$ (4) $\frac{1}{3}\Lambda^o_{Al^{3+}} + \frac{1}{2}\Lambda^o_{SO_4^{2-}}$

Ans. (2)

Sol. As equivalent conductance are given for ions.

94. The pressure exerted by 6.0 g of methane gas in a 0.03 m^3 vessel at 129°C is (Atomic masses : C = 12.01, H = 1.01 and R = 8.314 JK^{-1} mol^{-1})

(1) 215216 Pa (2) 13409 Pa

(3) 41648 Pa (4) 31684 Pa

Ans. (3)

Sol. PV = nRT

$$P = \frac{6}{16.05} \times \frac{8.314 \times 402}{0.03} \simeq 41648 \text{ Pa}$$

95. Match List-I (Equations) with List-II (Type of process) and select the correct option

List-I Equations	List-II Type of processes
a. $K_p > Q$	(i) Non-spontaneous
b. $\Delta G° < RT \ln Q$	(ii) Equilibrium
c. $K_p = Q$	(iii) Spontaneous and endothermic
d. $T > \frac{\Delta H}{\Delta S}$	(iv) Spontaneous

(1) a(i), b(ii), c(iii), d(iv) (2) a(iii), b(iv), c(ii), d(i)

(3) a(iv), b(i), c(ii), d(iii) (4) a(ii), b(i), c(iv), d(iii)

Ans. (3)

Sol. $K_p > Q \rightarrow$ Reaction moves in forward direction.

$\Delta G < RT\ln Q$, ΔG = +ve = reaction non-spontaneous

$K_p = Q$ = Reaction is equilibrium

$T > \frac{\Delta H}{\Delta S} = \Delta H$ = +ve, endothermic

Thus, $\Delta H < T\Delta S$ spontaneous

96. Among the following four compounds

a. Phenol b. Methyl phenol

c. Metanitrophenol d. Paranitrophenol

The acidity order is

(1) d > c > a > b (2) c > d > a > b

(3) a > d > c > b (4) b > a > c > d

Ans. (1)

Sol. Withdrawing group increasing the acidic character and electron donating group decreases the acidic characters.

97. Among the following which one has the highest cation to anion size ratio?

(1) CsI (2) CsF

(3) LiF (4) NaF

Ans. (2)

Sol. $Cs^+ > Li^+ \rightarrow$ atomic radii

$I^- > F^- \rightarrow$ atomic radii

$\therefore$ CsF has highest cation to anion size ratio

98. Three moles of an ideal gas expanded spontaneously into vacuum. The work done will be

(1) Infinite (2) 3 Joules

(3) 9 Joules (4) Zero

Ans. (4)

Sol. In vacuum, $P_{ext} = 0$

$W = 0$

99. Which of the following species is not electrophilic in nature?

(1) $\overset{\oplus}{C}l$ (2) BH_3

(3) $H_3\overset{\oplus}{O}$ (4) $\overset{\oplus}{N}O_2$

Ans. (3)

Sol. Cl^+, BH_3, $\overset{\oplus}{N}O_2$ are electron deficient.

100. A 0.66 kg ball is moving with a speed of 100 m/s. The associated wavelength will be

(h = 6.6 × 10^{-34} Js)

(1) 6.6×10^{-32} m (2) 6.6×10^{-34} m

(3) 1.0×10^{-35} m (4) 1.0×10^{-32} m

Ans. (3)

Sol. $\lambda = \frac{h}{mv}$

$= \frac{6.6\times10^{-34}}{0.66\times100} = 10^{-35}$ m

101. Consider the following relations for emf of a electrochemical cell

(a) emf of cell = (Oxidation potential of anode) – (Reduction potential of cathode)

(b) emf of cell = (Oxidation potential of anode) + (Reduction potential of cathode)

(c) emf of cell = (Reductional potential of anode) + (Reduction potential of cathode)

(d) emf of cell = (Oxidation potential of anode) – (Oxidation potential of cathode)

Which of the above relations are correct?

Options:

(1) (c) and (a) (2) (a) and (b)

(3) (c) and (d) (4) (b) and (d)

Ans. (4)

Sol. $E_{cell} = E^o_{cathode\ (Red)} - E^o_{Anode\ (Red)}$

or

$E_{cell} = E^o_{cathode\ (Red)} - E^o_{Anode\ (oxid)}$

or

$E_{cell} = E^o_{Anode\ (oxid)} - E^o_{cathode\ (oxid)}$

102. In which of the following molecules the central atom does not have sp^3 hybridization?

(1) CH_4 (2) SF_4

(3) BF_4^- (4) NH_4^+

Ans. (2)

Sol. $SF_4 = sp^3d$

103. For vaporization of water at 1 atmospheric pressure, the values of ΔH and ΔS are 40.63 kJ mol^{-1} and 108.8 JK^{-1} mol^{-1}, respectively. The temperature when Gibbs energy change (ΔG) for this transformation will be zero, is

(1) 273.4 K (2) 393.4 K

(3) 373.4 K (4) 293.4 K

Ans. (3)

Sol. $\Delta G = \Delta H - T\Delta S$

$\Delta G = 0$

$\Delta H = T\Delta S$,

$$T = \frac{40.63 \times 10^3}{108.8} = 373.4\,K$$

104. Match List-I (substances) with List-II (process) employed in the manufacture of the substances and select the correct option

	List-I **Substances**		**List-II** **Processes**
a.	Sulphuric acid	(i)	Haber's Process
b.	Steel	(ii)	Bessemer's Process
c.	Sodium hydroxide	(iii)	Leblanc Process
d.	Ammonia	(iv)	Contact Process

(1) a(i), b(iv), c(ii), d(iii) (2) a(i), b(ii), c(iii), d(iv)

(3) a(iv), b(iii), c(ii), d(i) (4) a(iv), b(ii), c(iii), d(i)

Ans. (4)

Sol. Fact.

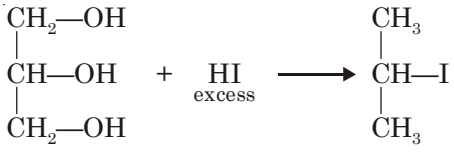
105. When glycerol is treated with excess of HI, it produces

(1) 2-iodopropane (2) Allyl iodide

(3) Propene (4) Glycerol triiodide

Ans. (1)

Sol.



106. Some statements about heavy water are given below

a. Heavy water is used as a moderator in nuclear reactors

b. Heavy water is more associated than ordinary water

c. Heavy water is more effective solvent than ordinary water

Which of the above statements are correct?

(1) a and b (2) a, b and c

(3) b and c (4) a and c

Ans. (1)

Sol. Dielectric constant of $H_2O > D_2O$. Therefore, H_2O is more effective solvent.

B.P. of D_2O > B.P. of H_2O.

107. The compound A on heating gives a colourless gas and a residue that is dissolved in water to obtain B. Excess of CO_2 is bubbled through aqueous solution of B, C is formed which is recovered in the solid form. Solid C on gentle heating gives back A. The compound is

(1) $CaCO_3$ (2) Na_2CO_3

(3) K_2CO_3 (4) $CaSO_4.2H_2O$

Ans. (1)

Sol. A $\rightarrow$ $CaCO_3$

B $\rightarrow$ $Ca(OH)_2$

C $\rightarrow$ $Ca(HCO_3)_2$

108. Match the compounds given in List-I with their characteristic reactions given in List-II. Select the correct option

List-I **(Compounds)**	**List-II** **(Reactions)**
a. $CH_3CH_2CH_2CH_2NH_2$	(i) Alkaline hydrolysis
b. $CH_3C{\equiv}CH$	(ii) With KOH (alcohol) and $CHCl_3$ produces bad smell
c. $CH_3CH_2COOCH_3$	(iii) Gives white ppt. with ammoniacal $AgNO_3$
d. $CH_3CH(OH)CH_3$	(iv) With Lucas reagent cloudiness appears after 5 minutes

(1) a(ii), b(i), c(iv), d(iii)

(2) a(iii), b(ii), c(i), d(iv)

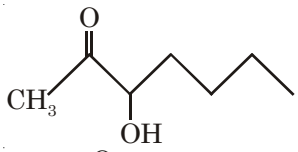
(3) a(ii), b(iii), c(i), d(iv)

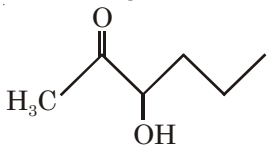
(4) a(iv), b(ii), c(iii), d(i)

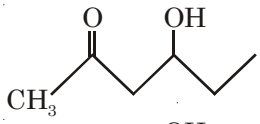
Ans. (3)

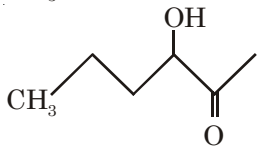
Sol. Fact.

109. Which one of the following compounds will be most readily dehydrated?

(1) 

(2) 

(3) 

(4) 

Ans. **(3)**

Sol. As carbocation intermediate, more the stability of carbocation, faster the rate of dehydration.

110. The rate of the reaction

$2NO + Cl_2 \rightarrow 2NOCl$ is given by the rate equation

rate = $k[NO]^2[Cl_2]$

The value of the rate constant can be increased by

(1) Increasing the temperature

(2) Increasing the concentration of NO

(3) Increasing the concentration of the Cl_2

(4) Doing all of these

Ans. **(1)**

Sol. Concentration do not affect rate constant.

111. Which one of the following complexes is **not** expected to exhibit isomerism?

(1) $[Ni(NH_3)_4 (H_2O)_2]^{2+}$

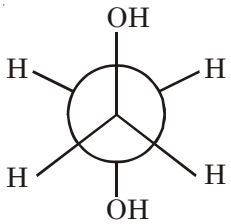
(2) $[Pt (NH_3)_2 Cl_2]$

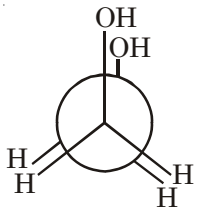
(3) $[Ni (NH_3)_2 Cl_2]$

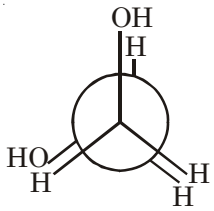
(4) $[Ni (en)_3]^{2+}$

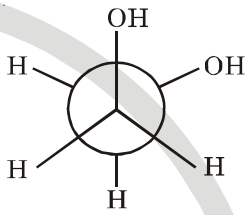
Ans. **(3)**

112. Which of the following conformers for ethylene glycol is most stable?

(1) 

(2) 

(3) 

(4) 

Ans. **(4)**

Sol. Intramolecular H-bonding.

113. The IUPAC name of the compound $CH_3CH{=}CHC{\equiv}CH$ is

(1) Pent-4-yn-2-ene (2) Pent-3-en-1-yne

(3) Pent-2-en-4-yne (4) Pent-1-yn-3-ene

Ans. **(2)**

Sol. Fact.

114. Which of the following oxidation states is the most common among the lanthanoids?

(1) 4 (2) 2

(3) 5 (4) 3

Ans. **(4)**

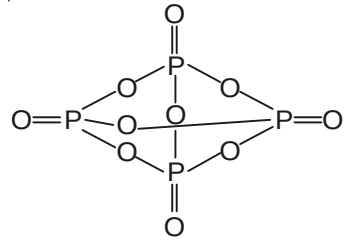
Sol. Fact

115. How many bridging oxygen atoms are present in P_4O_{10}?

(1) 6 (2) 4

(3) 2 (4) 5

Ans. **(1)**

Sol. 

116. Some of the properties of the two species, NO_3^- and H_3O^+ are described below. Which one of them is correct?

(1) Dissimilar in hybridization for the central atom with different structures

(2) Isostructural with same hybridization for the central atom

(3) Isostructural with different hybridization for the central atom

(4) Similar in hybridization for the central atom with different structures

Ans. **(1)**

Sol. $NO_3^{\ominus} = sp^2$

$H_3O^+ = sp^3$

117. The following two reactions are known :

$Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$;

$\Delta H = -26.8$ kJ

$FeO(s) + CO(g) \rightarrow Fe(s) + CO_2(g)$;

$\Delta H = -16.5$ kJ

The value of ΔH for the following reaction

$Fe_2O_3(s) + CO(g) \rightarrow 2FeO(s) + CO_2(g)$ is

(1) +10.3 kJ (2) – 43.3 kJ

(3) –10.3 kJ (4) +6.2 kJ

Ans. (4)

Sol. (1) – 2(2)

i.e. $-26.8 - (2)(-16.5)$

$= 6.2$ kJ

118. Following compounds are given

a. CH_3CH_2OH

b. CH_3COCH_3

c. $CH_3-\underset{\displaystyle CH_3}{\overset{}{|}}CHOH$

d. CH_3OH

Which of the above compound(s), on being warmed with iodine solution and NaOH, will give iodoform?

(1) a, c and d

(2) Only b

(3) a, b and c

(4) a and b

Ans. **(3)**

Sol. Terminal $CH_3-\overset{\displaystyle O}{\overset{\|}{C}}-$ or $CH_3-\underset{\displaystyle H}{\overset{\displaystyle OH}{\overset{|}{\underset{|}{C}}}}-$ show positive iodoform test.

119. Fructose reduces Tollen's reagent due to

(1) Asymmetric carbons

(2) Primary alcoholic group

(3) Secondary alcoholic group

(4) Enolisation of fructose followed by conversion to aldehyde by base

Ans. **(4)**

Sol. Fact.

120. In the following reaction

$$C_6H_5CH_2Br \xrightarrow[2.\ H_3O^+]{1.\ Mg,\ Ether} X,$$

the product 'X' is

(1) $C_6H_5CH_2OCH_2C_6H_5$

(2) $C_6H_5CH_2OH$

(3) $C_6H_5CH_3$

(4) $C_6H_5CH_2CH_2C_6H_5$

Ans. **(3)**

Sol. $C_6H_5CH_2Br \xrightarrow{Mg,\ ether} C_6H_5CH_2MgBr \xrightarrow{H_3O^+} C_6H_5CH_3 + Mg\begin{matrix}Br\\OH\end{matrix}$

❑ ❑ ❑

CBSE All India Pre-Medical/ Pre-Dental Ent. Exam. 2010

Answers by

Aakash Institute

Q.N.	CODE A	B	C	D
001	3	2	1	3
002	2	2	4	4
003	4	2	3	4
004	3	1	3	4
005	4	2	2	1
006	3	1	1	2
007	1	1	3	1
008	2	4	4	2
009	4	3	3	2
010	1	2	4	1
011	3	4	4	2
012	3	4	2	1
013	2	3	3	1
014	2	1	3	1
015	3	1	2	3
016	2	4	1	3
017	2	2	3	2
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Q.N.	CODE A	B	C	D
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Q.N.	CODE A	B	C	D
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Though every care has been taken to provide the answers correctly but the Institute shall not be responsible for error, if any.

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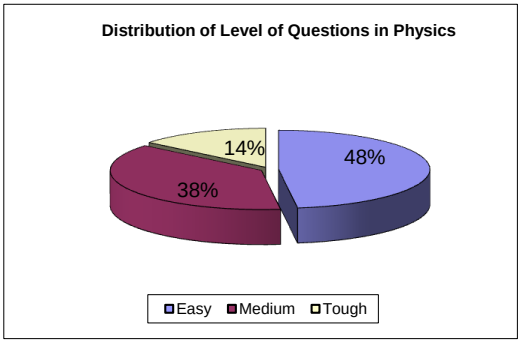
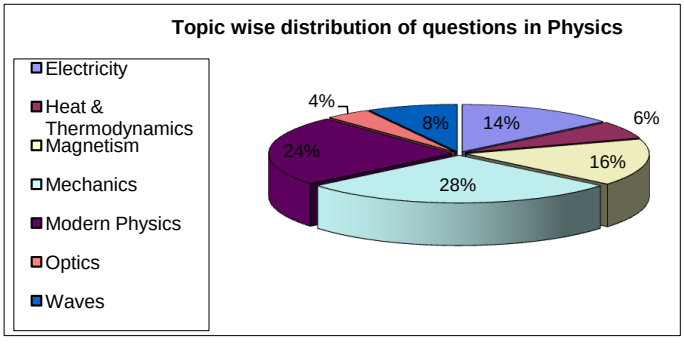
TOP RANKERS ALWAYS FROM AAKASH

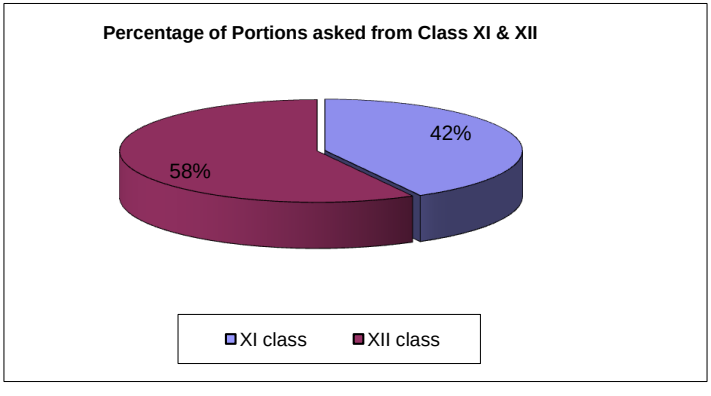
ANALYSIS OF PHYSICS PORTION OF AIPMT PRELIM 2010

	XII	XI	XII	XI	XII	XII	XI	
	Electricity	**Heat & Thermodynamics**	**Magnetism**	**Mechanics**	**Modern Physics**	**Optics**	**Waves**	***Total***
Easy	4	2	3	7	6	0	2	*24*
Medium	2	0	4	7	4	1	1	*19*
Tough	1	1	1	0	2	1	1	*7*
Total	*7*	*3*	*8*	*14*	*12*	*2*	*4*	***50***

XI class	**21**	**XII class**	**29**



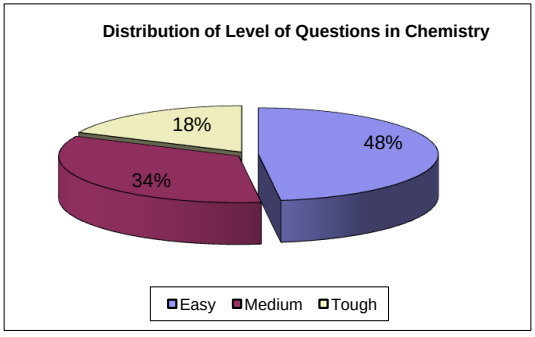


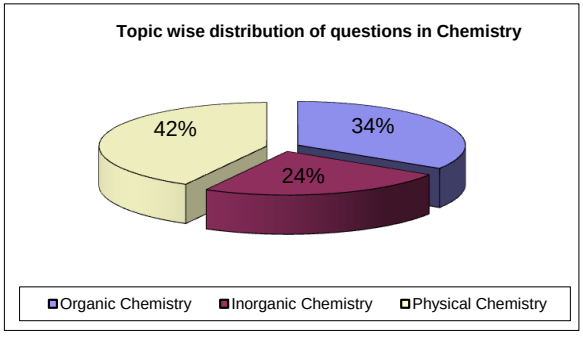


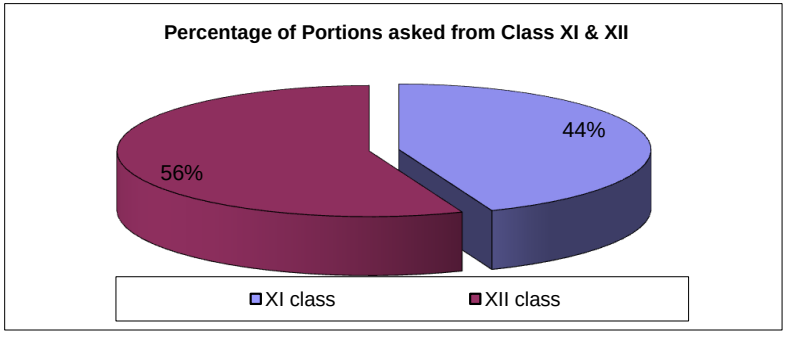
ANALYSIS OF CHEMISTRY PORTION OF AIPMT PRELIM 2010

	Organic Chemistry	Inorganic Chemistry	Physical Chemistry	*Total*
Easy	7	7	10	*24*
Medium	6	4	7	*17*
Tough	4	1	4	*9*
Total	*17*	*12*	*21*	**50**

XI class	**22**	**XII class**	**28**



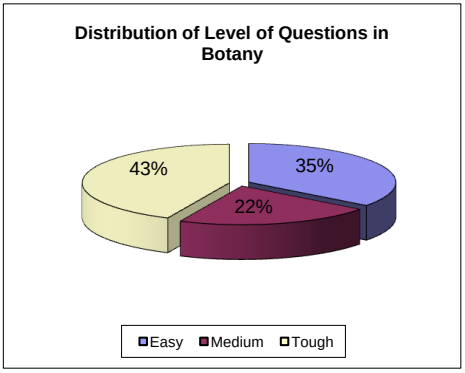


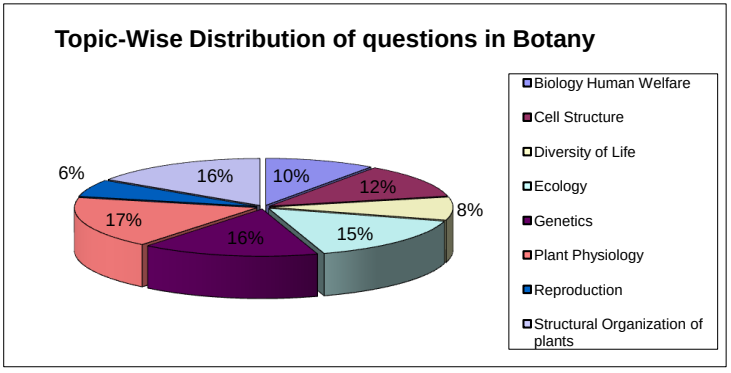


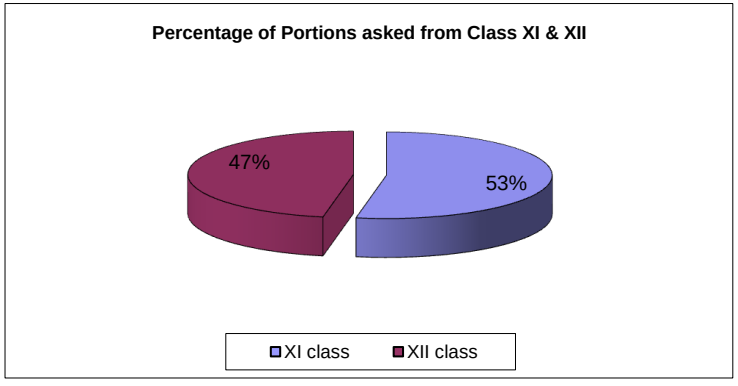
ANALYSIS OF BOTANY PORTION OF AIPMT PRELIM 2010

	XII Biology Human Welfare	XI Cell Structure	XI Diversity of Life	XII Ecology	XII Genetics	XI Plant Physiology	XII Reproduction	XI Structural Organization of plants	Total
Easy	1	3	1	3	3	0	1	6	*18*
Medium	0	2	1	1	2	3	0	2	*11*
Tough	4	1	2	4	3	6	2	0	*22*
Total	*5*	*6*	*4*	*8*	*8*	*9*	*3*	*8*	***51***

XI class	**27**	**XII class**	**24**



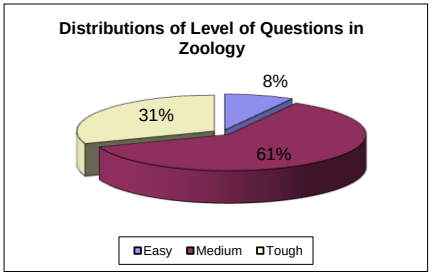


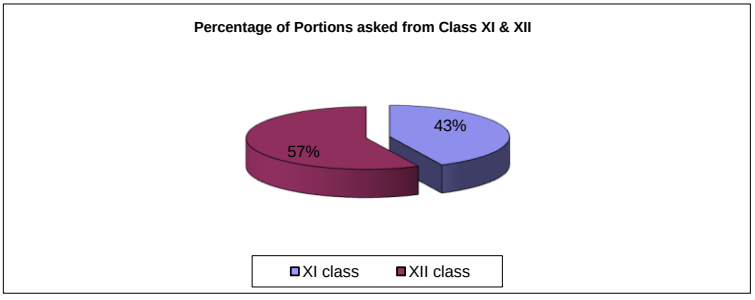


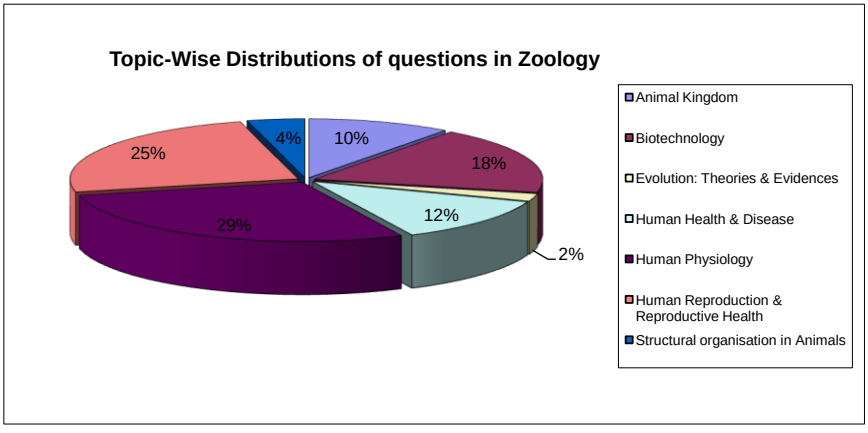
ANALYSIS OF ZOOLOGY PORTION OF AIPMT PRELIM 2010

	XI Animal Kingdom	XII Biotechnology	XII Evolution: Theories & Evidences	XII Human Health & Disease	XI Human Physiology	XII Human Reproduction & Reproductive Health	XI Structural organisation in Animals	Total
Easy	1	1	0	2	0	0	0	***4***
Medium	4	6	1	1	7	9	2	***30***
Tough	0	2	0	3	7	3	0	***15***
Total	*5*	*9*	*1*	*6*	*14*	*12*	*2*	***49***

XI class	**21**	**XII class**	**28**







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Ph.: 011-47623456 Fax : 011-47623472

Code - A

HINTS & SOLUTIONS
for
CBSE Preliminary 2010
by Aakash Institute

1. The dimension of $\frac{1}{2}\varepsilon_0 E^2$, where ε_0 is permittivity of free space and E is electric field, is

(1) MLT^{-1} (2) ML^2T^{-2}

(3) $ML^{-1}T^{-2}$ (4) ML^2T^{-1}

Sol. Answer (3)

Energy density = $\frac{M^1L^2T^{-2}}{L^3}$

$= M^1L^{-1}T^{-2}$

2. A particle moves a distance x in time t according to equation $x = (t + 5)^{-1}$. The acceleration of particle is proportional to

(1) (Velocity)$^{2/3}$ (2) (Velocity)$^{3/2}$

(3) (Distance)^2 (4) (Distance)$^{-2}$

Sol. Answer (2)

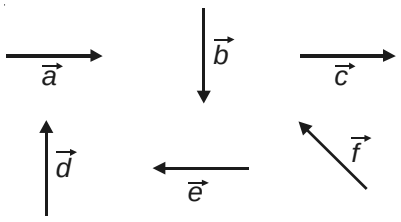
$x = (t + 5)^{-1}$

$v = -(t + 5)^{-2}$

$a = 2(t + 5)^{-3}$

$= 2v^{3/2}$

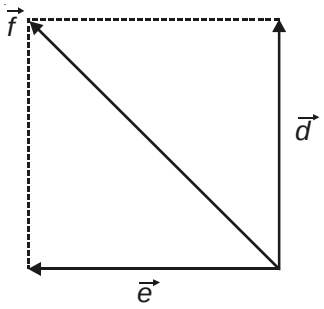
3. Six vectors, $\vec{a}$ through $\vec{f}$ have the magnitudes and directions indicated in the figure. Which of the following statements is true?



(1) $\vec{b} + \vec{e} = \vec{f}$ (2) $\vec{b} + \vec{c} = \vec{f}$

(3) $\vec{d} + \vec{c} = \vec{f}$ (4) $\vec{d} + \vec{e} = \vec{f}$

Sol. Answer (4)



4. A particle has initial velocity $(3\hat{i} + 4\hat{j})$ and has acceleration $(0.4\hat{i} + 0.3\hat{j})$. Its speed after 10 s is

(1) 10 units (2) 7 units

(3) $7\sqrt{2}$ units (4) 8.5 units

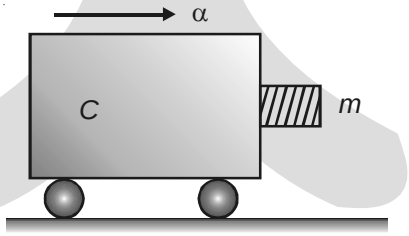
Sol. Answer (3)

$\vec{v} = \vec{u} + \vec{a}t$

$= 7\hat{i} + 7\hat{j}$

$v = 7\sqrt{2}$

5. A block of mass *m* is in contact with the cart *C* as shown in the figure.



The coefficient of static friction between the block and the cart is μ. The acceleration α of the cart that will prevent the block from falling satisfies

(1) $\alpha < \frac{g}{\mu}$ (2) $\alpha > \frac{mg}{\mu}$

(3) $\alpha > \frac{g}{\mu m}$ (4) $\alpha \geq \frac{g}{\mu}$

Sol. Answer (4)

$\mu m\alpha \geq mg$

$\alpha \geq \frac{g}{\mu}$

6. A man of 50 kg mass is standing in a gravity free space at a height of 10 m above the floor. He throws a stone of 0.5 kg mass downwards with a speed 2 m/s. When the stone reaches the floor, the distance of the man above the floor will be

(1) 20 m (2) 9.9 m

(3) 10.1 m (4) 10 m

Sol. Answer (3)

$m_1x_1 = m_2x_2$

$\Rightarrow \quad x_2 = \dfrac{m_1x_1}{m_2} = \dfrac{0.5 \times 10}{50} = 0.1$

Total height = 10 + 0.1 = 10.1 m

7. An engine pumps water through a hose pipe. Water passes through the pipe and leaves it with a velocity of 2 m/s. The mass per unit length of water in the pipe is 100 kg/m. What is the power of the engine?

(1) 800 W (2) 400 W

(3) 200 W (4) 100 W

Sol. Answer (1)

$P = dv^3\rho$

$= \mu v^3$

$= 100 \times 8 = 800$ W

8. A ball moving with velocity 2 m/s collides head on with another stationary ball of double the mass. If the coefficient of restitution is 0.5 then their velocities (in m/s) after collision will be

(1) 0, 2 (2) 0, 1

(3) 1, 1 (4) 1, 0.5

Sol. Answer (2)

$m \times 2 = m \times v_1 + 2mv_2$

$2 = v_1 + 2v_2$

$0.5 \times 2 = v_2 - v_1$

Adding $v_2 = 1$, $v_1 = 0$

9. A gramophone record is revolving with an angular velocity ω. A coin is placed at a distance r from the centre of the record. The static coefficient of friction is μ. The coin will revolve with the record if

(1) $r \geq \dfrac{\mu g}{\omega^2}$ (2) $r = \mu g\omega^2$

(3) $r < \dfrac{\omega^2}{\mu g}$ (4) $r \leq \dfrac{\mu g}{\omega^2}$

Sol. Answer (4)

$\mu mg \geq mr\omega^2$

$\Rightarrow \quad r \leq \dfrac{\mu g}{\omega^2}$

10. A circular disk of moment of inertia I_t is rotating in a horizontal plane, about its symmetry axis, with a constant angular speed ω_i. Another disk of moment of inertia I_b is dropped coaxially onto the rotating disk. Initially the second disk has zero angular speed. Eventually both the disks rotate with a constant angular speed ω_f. The energy lost by the initially rotating disc to friction is

(1) $\dfrac{1}{2}\dfrac{I_bI_t}{(I_t + I_b)}\omega_i^2$ (2) $\dfrac{1}{2}\dfrac{I_b^2}{(I_t + I_b)}\omega_i^2$

(3) $\dfrac{1}{2}\dfrac{I_t^2}{(I_t + I_b)}\omega_i^2$ (4) $\dfrac{I_b - I_t}{(I_t + I_b)}\omega_i^2$

Sol. Answer (1)

Loss of energy,

$$\Delta E = \frac{1}{2} I_t \omega_i^2 - \frac{I_t^2 \omega_i^2}{2(I_t + I_b)}$$

$$= \frac{I_b I_t \omega_i^2}{2(I_t + I_b)}$$

11. Two particles which are initially at rest, move towards each other under the action of their internal attraction. If their speeds are v and $2v$ at any instant, then the speed of centre of mass of the system will be

(1) v (2) $2v$

(3) Zero (4) $1.5\ v$

Sol. Answer (3)

12. The radii of circular orbits of two satellites A and B of the earth, are $4R$ and R, respectively. If the speed of satellite A is $3\ V$, then the speed of satellite B will be

(1) $\frac{3V}{2}$ (2) $\frac{3V}{4}$

(3) $6\ V$ (4) $12\ V$

Sol. Answer (3)

$$V \propto \frac{1}{\sqrt{r}}$$

$$\Rightarrow \frac{V_2}{V_1} = \sqrt{\frac{r_1}{r_2}}$$

$$\Rightarrow V_2 = 2\ V_1$$

$$= 6\ V$$

13. A particle of mass M is situated at the centre of a spherical shell of same mass and radius a. The gravitational potential at a point situated at $\frac{a}{2}$ distance from the centre, will be

(1) $-\frac{4GM}{a}$ (2) $-\frac{3GM}{a}$

(3) $-\frac{2GM}{a}$ (4) $-\frac{GM}{a}$

Sol. Answer (2)

$$\frac{-GM}{a} - \frac{GM}{\frac{a}{2}}$$

$$= \frac{-3GM}{a}$$

14. A ball is dropped from a high rise platform at $t = 0$ starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at $t = 18$ s. What is the value of v? (Take $g = 10$ m/s^2)

(1) 60 m/s (2) 75 m/s

(3) 55 m/s (4) 40 m/s

Sol. Answer (2)

$$\frac{1}{2}g \times 18^2 = v \times 12 + \frac{1}{2}g \times 12^2$$

$v = 75$ m/s

15. A cylindrical metallic rod in thermal contact with two reservoirs of heat at its two ends conducts an amount of heat Q in time t. The metallic rod is melted and the material is formed into a rod of half the radius of the original rod. What is the amount of heat conducted by the new rod, when placed in thermal contact with the two reservoirs in time t?

(1) $\frac{Q}{2}$ (2) $\frac{Q}{4}$

(3) $\frac{Q}{16}$ (4) $2Q$

Sol. Answer (3)

$$A' = \frac{A}{4}$$

$$\Rightarrow L' = 4L$$

$$\Rightarrow \frac{Q'}{Q} = \frac{A'}{A}\frac{L}{L'} = \frac{1}{16}$$

$$\Rightarrow Q' = \frac{Q}{16}$$

16. The total radiant energy per unit area, normal to the direction of incidence, received at a distance R from the centre of a star of radius r, whose outer surface radiates as a black body at a temperature T K is given by

(1) $\frac{4\pi\sigma r^2 T^4}{R^2}$ (2) $\frac{\sigma r^2 T^4}{R^2}$

(3) $\frac{\sigma r^2 T^4}{4\pi r^2}$ (4) $\frac{\sigma r^4 T^4}{r^4}$

(Where σ is Stefan's Constant)

Sol. Answer (2)

17. If ΔU and ΔW represent the increase in internal energy and work done by the system respectively in a thermodynamical process, which of the following is true?

(1) $\Delta U = -\Delta W$, in a isothermal process (2) $\Delta U = -\Delta W$, in a adiabatic process

(3) $\Delta U = \Delta W$, in a isothermal process (4) $\Delta U = \Delta W$, in a adiabatic process

Sol. Answer (2)

18. The displacement of a particle along the x-axis is given by $x = a\sin^2\omega t$. The motion of the particle corresponds to

(1) Simple harmonic motion of frequency $\frac{\omega}{2\pi}$ (2) Simple harmonic motion of frequency $\frac{\omega}{\pi}$

(3) Simple harmonic motion of frequency $\frac{3\omega}{2\pi}$ (4) Non simple harmonic motion

Sol. Answer (4)

$\frac{d^2x}{dt^2} = -\omega^2 x$, for S.H.M. is not satisfied.

19. The period of oscillation of a mass M suspended from a spring of negligible mass is T. If along with it another mass M is also suspended, the period of oscillation will now be

(1) $\sqrt{2}T$ (2) T

(3) $\frac{T}{\sqrt{2}}$ (4) $2\,T$

Sol. Answer (1)

$T \propto \sqrt{M}$

$\frac{T_2}{T_1} = \sqrt{\frac{M+M}{M}}$

$T_2 = \sqrt{2}T_1$

20. A transverse wave is represented by $y = A\sin(\omega t - kx)$. For what value of the wavelength is the wave velocity equal to the maximum particle velocity?

(1) A (2) $\frac{\pi A}{2}$

(3) πA (4) $2\pi A$

Sol. Answer (4)

$\frac{\omega}{k} = A\omega$

$\Rightarrow \frac{\lambda}{2\pi} = A$

$\Rightarrow \lambda = 2\pi A$

21. A tuning fork of frequency 512 Hz makes 4 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per sec when the tension in the piano string is slightly increased. The frequency of the piano string before increasing the tension was

(1) 508 Hz (2) 510 Hz

(3) 514 Hz (4) 516 Hz

Sol. Answer (1)

Number of beats decreases so frequency of unknow $f = 512 - 4$

$= 508$ Hz

22. Which of the following statement is false for the properties of electromagnetic waves?

(1) These waves do not require any material medium for propagation

(2) Both electric and magnetic field vectors attains the maxima and minima at the same place and same time

(3) The energy in electromagnetic wave is divided equally between electric and magnetic vectors

(4) Both electric and magnetic field vectors are parallel to each other and perpendicular to the direction of propagation of wave

Sol. Answer (4)

23. A lens having focal length f and aperture of diameter d forms an image of intensity I. Aperture of diameter $\frac{d}{2}$ in central region of lens is covered by a black paper. Focal length of lens and intensity of image now will be respectively

(1) $\frac{f}{2}$ and $\frac{I}{2}$

(2) f and $\frac{I}{4}$

(3) $\frac{3f}{4}$ and $\frac{I}{2}$

(4) f and $\frac{3I}{4}$

Sol. Answer (4)

Focal length remains same $I \propto d^2$, Intensity of image will be $I - \frac{I}{4} = \frac{3I}{4}$.

24. A ray of light travelling in a transparent medium of refractive index μ, falls on a surface separating the medium from air at an angle of incidence of 45º. For which of the following value of μ the ray can undergo total internal reflection?

(1) $\mu = 1.25$

(2) $\mu = 1.33$

(3) $\mu = 1.40$

(4) $\mu = 1.50$

Sol. Answer (4)

$\mu > \sqrt{2}$

25. Two positive ions, each carrying a charge q, are separated by a distance d. If F is the force of repulsion between the ions, the number of electrons missing from each ion will be (e being the charge on an electron)

(1) $\frac{4\pi\varepsilon_0 Fd^2}{q^2}$

(2) $\frac{4\pi\varepsilon_0 Fd^2}{e^2}$

(3) $\sqrt{\frac{4\pi\varepsilon_0 Fe^2}{d^2}}$

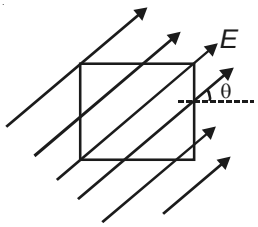
(4) $\sqrt{\frac{4\pi\varepsilon_0 Fd^2}{e^2}}$

Sol. Answer (4)

$F = \frac{1}{4\pi\varepsilon_0} \times \frac{e^2 n^2}{d^2}$

$n = \sqrt{\frac{4\pi\varepsilon_0 Fd^2}{e^2}}$

26. A square surface of side L meter in the plane of the paper is placed in a uniform electric field E (volt/m) acting along the same plane at an angle θ with the horizontal side of the square as shown in figure. The electric flux linked to the surface, in units of volt-m, is



(1) Zero (2) EL^2

(3) $EL^2 \cos\theta$ (4) $EL^2 \sin\theta$

Sol. Answer (1)

$\phi = \vec{E} . \vec{S}$, here $\vec{E} \perp \vec{S} \Rightarrow \phi = 0$

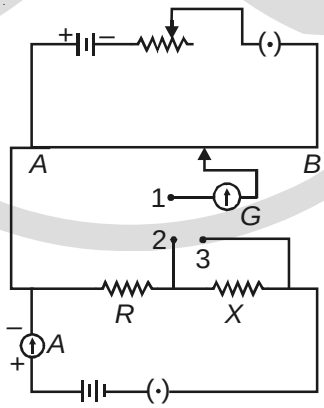
27. A series combination of n_1 capacitors, each of value C_1, is charged by a source of potential difference 4 V. When another parallel combination of n_2 capacitors, each of value C_2, is charged by a source of potential difference V, it has the same (total) energy stored in it, as the first combination has. The value of C_2, in terms of C_1, is then

(1) $\frac{16C_1}{n_1n_2}$ (2) $\frac{2C_1}{n_1n_2}$

(3) $16\frac{n_2}{n_1}C_1$ (4) $2\frac{n_2}{n_1}C_1$

Sol. Answer (1)

28. A potentiometer circuit is set up as shown. The potential gradient, across the potentiometer wire, is k volt/cm and the ammeter, present in the circuit, reads 1.0 A when two way key is switched off. The balance points, when the key between the terminals (i) 1 and 2 (ii) 1 and 3, is plugged in, are found to be at lengths l_1 cm and l_2 cm respectively. The magnitudes, of the resistors R and X, in ohms, are then, equal, respectively, to



(1) kl_1 and kl_2 (2) $k(l_2 - l_1)$ and kl_2

(3) kl_1 and $k(l_2 - l_1)$ (4) $k(l_2 - l_1)$ and kl_1

Sol. Answer (3)

Resistance per unit length = $k\frac{\Omega}{cm}$

$R \propto l_1$

$\Rightarrow R = kl_1$

$\Rightarrow x \propto (l_2 - l_1)$

$\Rightarrow x = k(l_2 - l_1)$

29. A galvanometer has a coil of resistance 100 ohm and gives a full scale deflection for 30 mA current. If it is to work as a voltmeter of 30 volt range, the resistance required to be added will be

(1) 1000 Ω (2) 900 Ω

(3) 1800 Ω (4) 500 Ω

Sol. Answer (2)

$$R = \frac{V}{I_g} - G$$

30. Consider the following two statements

(A) Kirchhoff's junction law follows from the conservation of charge.

(B) Kirchhoff's loop law follows from the conservation of energy.

Which of the following is correct?

(1) Both (A) and (B) are correct

(2) Both (A) and (B) are wrong

(3) (A) is correct and (B) is wrong

(4) (A) is wrong and (B) is correct

Sol. Answer (1)

31. In producing chlorine by electrolysis 100 kW power at 125 V is being consumed. How much chlorine per minute is liberated (E.C.E. of chlorine is 0.367×10^{-6} kg/C)

(1) 3.67×10^{-3} kg (2) 1.76×10^{-3} kg

(3) 9.67×10^{-3} kg (4) 17.61×10^{-3} kg

Sol. Answer (4)

$$I = \frac{P}{V}$$

$m = ZIt$

32. A square current carrying loop is suspended in a uniform magnetic field acting in the plane of the loop . If the force on one arm of the loop is $\vec{F}$, the net force on the remaining three arms of the loop is

(1) $\vec{F}$ (2) $3\vec{F}$

(3) $-\vec{F}$ (4) $-3\vec{F}$

Sol. Answer (3)

$$\vec{F}_1 + \vec{F}_2 = 0$$

$$\vec{F}_1 = -\vec{F}_2$$

33. A thin ring of radius R meter has charge q coulomb uniformly spread on it. The ring rotates about its axis with a constant frequency of f revolutions/s. The value of magnetic induction in Wb/m^2 at the centre of the ring is

(1) $\frac{\mu_0 qf}{2R}$ (2) $\frac{\mu_0 qf}{2\pi R}$

(3) $\frac{\mu_0 q}{2\pi fR}$ (4) $\frac{\mu_0 q}{2fR}$

Sol. Answer (1)

$I = qf$

$$B = \frac{\mu_0 I}{2R} = \frac{\mu_0 qf}{2R}$$

34. Electromagnets are made of soft iron because soft iron has

(1) High retentivity and low coercive force
(2) Low retentivity and high coercive force
(3) High retentivity and high coercive force
(4) Low retentivity and low coercive force

Sol. Answer (4)

35. A vibration magnetometer placed in magnetic meridian has a small bar magnet., The magnet executes oscillations with a time period of 2 sec in earth's horizontal magnetic field of 24 microtesla. When a horizontal field of 18 microtesla is produced opposite to the earth's field by placing a current carrying wire, the new time period of magnet will be

(1) 4 s
(2) 1 s
(3) 2 s
(4) 3 s

Sol. Answer (1)

$$T \propto \frac{1}{\sqrt{B}}$$

$$\frac{T_2}{T_1} = \sqrt{\frac{B_1}{B_2}} = \sqrt{\frac{24}{6}} = 2$$

36. A conducting circular loop is placed in a uniform magnetic field, B = 0.025 T with its plane perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of 1 mms^{-1}. The induced emf when the radius is 2 cm is

(1) 2 μV
(2) 2 $\pi\mu V$
(3) $\pi\mu V$
(4) $\frac{\pi}{2}\mu V$

Sol. Answer (3)

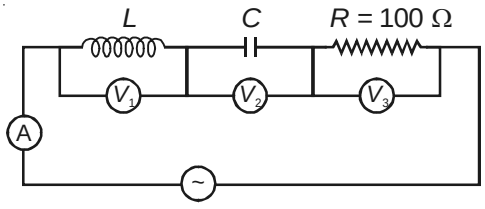
$\phi = B\pi r^2$

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

$= 0.025 \times \pi \times 2 \times 10^{-2} \times 1 \times 10^{-3}$

$= \pi\mu V$

37. In the given circuit the reading of voltmeter V_1 and V_2 are 300 volts each. The reading of the voltmeter V_3 and ammeter A are respectively



220V, 50 Hz

(1) 100 V, 2.0 A
(2) 150 V, 2.2 A
(3) 220 V, 2.2 A
(4) 220 V, 2.0 A

Sol. Answer (3)

38. A 220-volt input is supplied to a transformer. The output circuit draws a current of 2.0 ampere at 440 volts. If the efficiency of the transformer is 80%, the current drawn by the primary windings of the transformer is

(1) 5.0 ampere (2) 3.6 ampere

(3) 2.8 ampere (4) 2.5 ampere

Sol. Answer (1)

$$I_1 = \frac{E_2 I_2}{\eta E_1}$$

$$= \frac{440 \times 2}{220} \times \frac{100}{80}$$

$$= 5 \text{ A}$$

39. A source S_1 is producing 10^{15} photons per second of wavelength 5000 Å. Another source S_2 is producing 1.02×10^{15} photons per second of wavelength 5100 Å

Then (power of S_2)/(power of S_1) is equal to

(1) 0.98 (2) 1.00

(3) 1.02 (4) 1.04

Sol. Answer (2)

$$\frac{P_1}{P_2} = \frac{n_1 \frac{hc}{\lambda_1}}{n_2 \frac{hc}{\lambda_2}}$$

$$\frac{P_2}{P_1} = \frac{n_2 \lambda_1}{n_1 \lambda_2} = \frac{1.02 \times 10^{15} \times 5000 \text{Å}}{10^{15} \times 5100 \text{ Å}} = 1$$

40. A beam of cathode rays is subjected to crossed Electric (E) and Magnetic field (B). The fields are adjusted such that the beam is not deffected. The specific charge of the cathode rays is given by (where V is the potential difference between cathode and anode)

(1) $\frac{E^2}{2VB^2}$ (2) $\frac{B^2}{2VE^2}$

(3) $\frac{2VB^2}{E^2}$ (4) $\frac{2VE^2}{B^2}$

Sol. Answer (1)

$$qV = \frac{1}{2}mv^2$$

$$\Rightarrow \frac{q}{m} = \frac{v^2}{2V}, \; v = \frac{E}{B}$$

$$= \frac{E^2}{2VB^2}$$

41. The potential difference that must be applied to stop the fastest photo electrons emitted by a nickel surface, having work function 5.01 eV, when ultraviolet light of 200 nm falls on it, must be

(1) 1.2 V (2) 2.4 V

(3) –1.2 V (4) –2.4 V

Sol. Answer (3)

$$eV_0 = \frac{hc}{\lambda} - \phi$$

$$= \frac{1240\,evnm}{200\,nm} - 5.01\,\text{eV}$$

= (6.2 – 5.01) eV = 1.2 eV

42. The activity of a radioactive sample is measured as N_0 counts per minute at t = 0 and N_0/e counts per minute at t = 5 minutes. The time (in minutes) at which the activity reduces to half its value is

(1) $5 \log_e 2$ (2) $\log_e \frac{2}{5}$

(3) $\frac{5}{\log_e 2}$ (4) $5 \log_{10} 5$

Sol. Answer (1)

Mean life = T_{av} = 5 minute

$$\Rightarrow \quad \lambda = \frac{1}{5}/\text{minute}$$

$$T_{1/2} = \frac{\log_e 2}{\lambda} = 5 \log_e 2$$

43. The energy of a hydrogen atom in the ground state is –13.6 eV. The energy of a He^+ ion in the first excited state will be

(1) –6.8 eV (2) –13.6 eV

(3) –27.2 eV (4) –54.4 eV

Sol. Answer (2)

$$E_n = \frac{z^2}{n^2}(-13.6\text{ eV})$$

$$= \frac{4}{4}(-13.6\text{ eV})$$

= –13.6 eV

44. The mass of a ^7_3Li nucleus is 0.042 u less than the sum of the masses of all its nucleons. The binding energy per nucleon of ^7_3Li nucleus is nearly

(1) 23 MeV (2) 46 MeV

(3) 5.6 MeV (4) 3.9 MeV

Sol. Answer (3)

$BE = \Delta Mc^2$

$= 0.042 \times 931$ MeV

$\frac{BE}{A} = \frac{0.042 \times 931}{7}$ MeV

$= 5.6$ MeV

45. A alpha nucleus of energy $\frac{1}{2}mv^2$ bombards a heavy nuclear target of charge Ze. Then the distance of closest approach for the alpha nucleus will be proportional to

(1) $\frac{1}{v^4}$ (2) $\frac{1}{Ze}$

(3) v^2 (4) $\frac{1}{m}$

Sol. Answer (4)

$r_0 = \frac{1}{4\pi\varepsilon_0}\frac{ze^2}{\frac{1}{2}mv^2}$

46. A common emitter amplifier has a voltage gain of 50, an input impedance of 100 Ω and an output impedance of 200 Ω. The power gain of the amplifier is

(1) 50 (2) 500

(3) 1000 (4) 1250

Sol. Answer (4)

$A_V = \frac{I_C R_{out}}{R_{in}} \Rightarrow \frac{I_C}{I_B} = \frac{50 \times 100}{200} = 25$

$P_{out} = \frac{V_{out}}{V_{in}}\left(\frac{I_C}{I_B}\right)$

47. Which one of the following bonds produces a solid that reflects light in the visible region and whose electrical conductivity decreases with temperature and has high melting point?

(1) Covalent bonding

(2) Metallic bonding

(3) van der Waal's bonding

(4) Ionic bonding

Sol. Answer (2)

48. The device that can act as a complete electronic circuit is

(1) Zener diode

(2) Junction diode

(3) Integrated circuit

(4) Junction transistor

Sol. Answer (3)

49. Which of the following statement is False?

(1) The resistance of intrinisic semiconductor decreases with increase of temperature

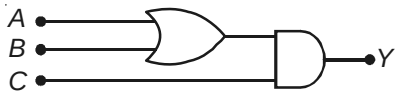
(2) Pure Si doped with trivalent impurities gives a p-type semiconductor

(3) Majority carries in a n-type semiconductors are holes

(4) Minority carries in a p-type semiconductor are electrons

Sol. Answer (3)

50. To get an output $Y = 1$ from the circuit shown below, the input must be



	A	B	C
(1)	1	0	0
(2)	0	1	0
(3)	0	0	1
(4)	1	0	1

Sol. Answer (4)

51. An increase in equivalent conductance of a strong electrolyte with dilution is mainly due to

(1) Increase in number of ions

(2) Increase in ionic mobility of ions

(3) 100% ionisation of electrolyte at normal dilution

(4) Increase in both i.e. number of ions and ionic mobility of ions

Sol. Answer (2)

In strong electrolyte, number of ions remains constant so equivalent conductance increases due to increase in ionic mobility

52. 25.3 g of sodium carbonate, Na_2CO_3 is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ion, Na^+ and carbonate ions, CO_3^{2-} are respectively (Molar mass of Na_2CO_3 = 106 g mol^{-1})

(1) 0.477 M and 0.477 M (2) 0.955 M and 1.910 M

(3) 1.910 M and 0.955 M (4) 1.90 M and 1.910 M

Sol. Answer (3)

$$\text{Molarity} = \frac{25.3 \times 1000}{106 \times 250} = 0.955 \text{ M}$$

$$Na_2CO_3 \rightarrow 2Na^+ + CO_3^{-2}$$

= 2 × 0.955 0.955 M

= 1.910 M

53. Property of the alkaline earth metals that increase with their atomic number

(1) Electronegativity (2) Solubility of their hydroxides in water

(3) Solubility of their sulphates in water (4) Ionization energy

Sol. Answer (2)

Solubility of alkaline earth metals increases with increase in atomic number

54. Which of the following pairs has the same size?

(1) Zn^{2+}, Hf^{4+} (2) Fe^{2+}, Ni^{2+}

(3) Zr^{4+}, Ti^{4+} (4) Zr^{4+}, Hf^{4+}

Sol. Answer (4)

Zr^{+4} and Hf^{+4} has similar ionic radii due to lanthanoid contraction

55. In a buffer solution containing equal concentration of B^- and HB, the K_b for B^- is 10^{-10}. The pH of buffer solution is

(1) 4 (2) 10

(3) 7 (4) 6

Sol. Answer (1)

$$pOH = pK_b + \log\frac{[B^-]}{[HB]}$$

pOH = 10 ($\because$ concentration of $[B^-]$ = [HB])

$\therefore$ pH = 14 – 10 = 4

56. An aqueous solution is 1.00 molal in KI. Which change will cause the vapour pressure of the solution to increase?

(1) Addition of water (2) Addition of NaCl

(3) Addition of Na_2SO_4 (4) Addition of 1.00 molal KI

Sol. Answer (1)

With addition of water, concentration decreases thus vapour pressure increases

57. What is $[H^+]$ in mol/L of a solution that is 0.20 M in CH_3COONa and 0.10 M in CH_3COOH? K_a for $CH_3COOH = 1.8 \times 10^{-5}$.

(1) 9.0×10^{-6} (2) 3.5×10^{-4}

(3) 1.1×10^{-5} (4) 1.8×10^{-5}

Sol. Answer (1)

$$\underset{C-x}{CH_3COOH} \rightleftharpoons \underset{x}{CH_3COO^-} + \underset{x}{H^+}$$

$$\underset{0.2}{CH_3COONa} \longrightarrow \underset{0.2M}{CH_3COO^-} + \underset{0.2M}{Na^+}$$

$$K_a = \frac{[CH_3COO^-][H^+]}{[CH_3COOH]}$$

$[CH_3COOH] = C - x \approx C = 0.1$ M

$[CH_3COO^-] = 0.2 + x \approx 0.2$ M

$\therefore \quad [H^+] = \dfrac{K_a[CH_3COOH]}{[CH_3COO^-]}$

$= \dfrac{1.8\times10^{-5}\times0.1}{0.2}$

$[H^+] = 9 \times 10^{-6}$

58. For the reaction $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ the value of rate of disappearance of N_2O_5 is given as 6.25×10^{-3}mol $L^{-1}s^{-1}$. The rate of formation of NO_2 and O_2 is given respectively as:

(1) 1.25×10^{-2} mol $L^{-1}s^{-1}$ and 6.25×10^{-3} mol $L^{-1}s^{-1}$

(2) 6.25×10^{-3} mol $L^{-1}s^{-1}$ and 6.25×10^{-3} mol $L^{-1}s^{-1}$

(3) 1.25×10^{-2} mol $L^{-1}s^{-1}$ and 3.125×10^{-3} mol $L^{-1}s^{-1}$

(4) 6.25×10^{-3} mol $L^{-1}s^{-1}$ and 3.125×10^{-3} mol $L^{-1}s^{-1}$

Sol. Answer (3)

$N_2O_5(g) \longrightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$

$-\dfrac{d[N_2O_5]}{dt} = \dfrac{1}{2}\dfrac{d[NO_2]}{dt} = \dfrac{2d[O_2]}{dt}$

$\dfrac{d[NO_2]}{dt} = \dfrac{-2d[N_2O_5]}{dt} = 2\times6.25\times10^{-3}$

$= 1.25 \times 10^{-2}$ mol $L^{-1}s^{-1}$

$\dfrac{d[O_2]}{dt} = -\dfrac{1}{2}\dfrac{d[N_2O_5]}{dt}$

$= \dfrac{1}{2}\times6.25\times10^{-3}$

$= 3.125 \times 10^{-3}$ mol $L^{-1}s^{-1}$

59. Standard entropies of X_2, Y_2 and XY_3 are 60, 40 and 50 $JK^{-1}mol^{-1}$ respectively. For the reaction $\frac{1}{2}X_2 + \frac{3}{2}Y_2 \rightleftharpoons XY_3$, $\Delta H = -30kJ$ to be at equilibrium, the temperature should be

(1) 500 K (2) 750 K

(3) 1000 K (4) 1250 K

Sol. Answer (2)

$\frac{1}{2}X_2 + \frac{3}{2}Y_2 \rightleftharpoons XY_3$

$\Delta S^o = \sum S_P^o - \sum S_R^o$

$= 50 - (30 + 60)$

$\Delta S° = -40\ JK^{-1}\ mol^{-1}$

$T = \frac{\Delta H^o}{\Delta S^o} = \frac{-30 \times 10^3\ J\ mol^{-1}}{-40\ JK^{-1} mol^{-1}} = 750K$

60. During the kinetic study of the reaction $2A + B \rightarrow C + D$, following results were obtained

Run	[A] / mol L^{-1}	[B] / mol L^{-1}	Initial rate of formation of D/mol $L^{-1}min^{-1}$
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

Based on the above data which one of the following is correct?

(1) rate = $k[A][B]^2$ (2) rate = $k[A]^2[B]$

(3) rate = $k[A][B]$ (4) rate = $k[A]^2[B]^2$

Sol. Answer (1)

$\frac{7.2 \times 10^{-2}}{2.88 \times 10^{-1}} = \frac{[0.2]^b [0.3]^a}{[0.4]^b [0.3]^a}$

$\therefore \frac{1}{4} = \frac{1}{2^b}$

$2^2 = 2^b$

$b = 2$

$\frac{6 \times 10^{-3}}{2.4 \times 10^{-2}} = \frac{[0.1]^a [0.1]^b}{[0.4]^a [0.1]^b}$

$\frac{1}{4} = \frac{1}{4^a}$

$4^1 = 4^a$

$a = 1$

61. For the reduction of silver ions with copper metal, the standard cell potential was found to be +0.46 V at 25°C. The value of standard Gibbs energy, ΔG^0 will be (F = 96500 C mol^{-1})

(1) –98.0 kJ (2) –89.0 kJ

(3) –89.0 J (4) –44.5 kJ

Sol. Answer (2)

$Cu + 2Ag^+ \rightarrow Cu^{+2} + 2Ag$

$\Delta G° = -nFE° = -2 \times 96500 \times 0.46$

$= -88780$ J

≈ -89 kJ

62. Which one of the following species does not exist under normal conditions?

(1) Li_2 (2) Be_2^+

(3) Be_2 (4) B_2

Sol. Answer (3)

Bond order of Be_2 is zero so, does not exist.

63. AB crystallizes in a body centred cubic lattice with edge length 'a' equal to 387 pm. The distance between two oppositively charged ions in the lattice is

(1) 300 pm (2) 335 pm

(3) 250 pm (4) 200 pm

Sol. Answer (2)

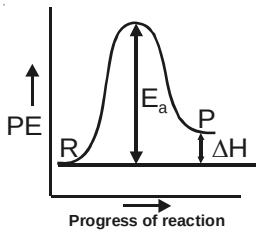
$2(r^+ + r^-) = \sqrt{3}a$

64. For an endothermic reaction, energy of activation is E_a and enthalpy of reaction is ΔH (both of these in kJ/mol). Minimum value of E_a will be

(1) Equal to zero (2) Less than ΔH

(3) Equal to ΔH (4) More than ΔH

Sol. Answer (4)



65. Which one of the following ions has electronic configuration $[Ar]3d^6$?

(1) Co^{3+} (2) Ni^{3+}

(3) Mn^{3+} (4) Fe^{3+}

(At. nos. Mn = 25, Fe = 26, Co = 27, Ni = 28)

Sol. Answer (1)

$Co = [Ar]3d^7 4s^2$

$\therefore \quad Co^{+3} = [Ar]3d^6$

66. In which of the following equilibrium K_C and K_P are not equal?

(1) $2C_{(s)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)}$ (2) $2NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$

(3) $SO_{2(g)} + NO_{2(g)} \rightleftharpoons SO_{3(g)} + NO_{(g)}$ (4) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

Sol. Answer (1)

$K_P = K_C (RT)^{\Delta n_g}$

$\Delta n_g = 0$ for the reaction $2C(g) + O_2(g) \rightleftharpoons 2CO_2(g)$

Thus $K_P = K_C$

67. If pH of a saturated solution of $Ba(OH)_2$ is 12, the value of its $K_{(SP)}$ is

(1) $5.00 \times 10^{-7}\ M^3$ (2) $4.00 \times 10^{-6}\ M^3$

(3) $4.00 \times 10^{-7}\ M^3$ (4) $5.00 \times 10^{-6}\ M^3$

Sol. Answer (1)

pH = 12, so pOH = 2

$\therefore [OH^-] = 10^{-2}$

$$Ba(OH)_2 \rightleftharpoons \underset{S}{Ba^{+2}} + \underset{2S}{2OH^-}$$

$2S = 10^{-2}$

$$S = \frac{10^{-2}}{2} = 5 \times 10^{-3} M$$

$K_{SP} = [Ba^{+2}]\ [OH^-]^2$

$= [5 \times 10^{-3}]\ [10^{-2}]^2$

$K_{SP} = 5 \times 10^{-7} M^3$

68. Which of the following ions will exhibit colour in aqueous solutions?

(1) Sc^{3+} (z = 21) (2) La^{3+} (z = 57)

(3) Ti^{3+} (z = 22) (4) Lu^{3+} (z = 71)

Sol. Answer (3)

$Ti^{+3} = 3d^1$, Ti^{+3} contains an unpaired electron so will exhibit colour in aqueous solution

69. The correct order of increasing bond angles in the following species is

(1) $ClO_2^- < Cl_2O < ClO_2$ (2) $Cl_2O < ClO_2 < ClO_2^-$

(3) $ClO_2 < Cl_2O < ClO_2^-$ (4) $Cl_2O < ClO_2^- < ClO_2$

Sol. Answer (1)

Fact

70. Which one of the following compounds is a peroxide?

(1) NO_2 (2) KO_2

(3) BaO_2 (4) MnO_2

Sol. Answer (3)

BaO_2 has peroxide linkage

71. In which of the following pairs of molecules/ions, the central atoms have sp^2 hybridization?

(1) BF_3 and NH_2^- (2) NO_2^- and NH_3

(3) BF_3 and NO_2^- (4) NH_2^- and H_2O

Sol. Answer (3)

BF_3 and NO_2^- are sp^2 while NH_2^-, NH_3 and H_2O are sp^3 hybridised

72. The correct order of the decreasing ionic radii among the following isoelectronic species is

(1) $K^+ > Ca^{2+} > Cl^- > S^{2-}$ (2) $Ca^{2+} > K^+ > S^{2-} > Cl^-$

(3) $Cl^- > S^{2-} > Ca^{2+} > K^+$ (4) $S^{2-} > Cl^- > K^+ > Ca^{2+}$

Sol. Answer (4)

Among isoelectronic species, ionic radii increases with increase in negative charge as Z_{eff} decreases and ionic radii decreases with increase in positive charge as Z_{eff} increases.

73. The number of atoms in 0.1 mol of a triatomic gas is ($N_A = 6.02 \times 10^{23}$ mol^{-1})

(1) 1.800×10^{22} (2) 6.026×10^{22}

(3) 1.806×10^{23} (4) 3.600×10^{23}

Sol. Answer (3)

Number of atoms $= N_A \times \text{mole} \times 3$

$= 6.023 \times 10^{23} \times 0.1 \times 3$

$= 1.806 \times 10^{23}$

74. Which of the following complex ion is not expected to absorb visible light?

(1) $[Ni(H_2O_6)]^{2+}$ (2) $[Ni(CN)_4]^{2-}$

(3) $[Cr(NH_3)_6]^{3+}$ (4) $[Fe(H_2O)_6]^{2+}$

Sol. Answer (2)

$[Ni(CN)_4]^{-2}$ do not contain unpaired electrons so cannot absorb visible light.

75. Which of the following alkaline earth metal sulphates has hydration enthalpy higher than the lattice enthalpy?

(1) $SrSO_4$ (2) $CaSO_4$

(3) $BeSO_4$ (4) $BaSO_4$

Sol. Answer (3)

Hydration energy decreases down the group, whereas lattice energy remains almost constant.

76. The existence of two different coloured complexes with the composition of $[Co(NH_3)_4Cl_2]^+$ is due to

(1) Ionization isomerism (2) Linkage isomerism

(3) Geometrical isomerism (4) Cooridnation isomerism

Sol. Answer (3)

As cis and trans forms present

77. Oxidation states of P in $H_4P_2O_5$, $H_4P_2O_6$, $H_4P_2O_7$, are respectively

(1) + 3, + 4, + 5 (2) + 3, + 5, + 4

(3) + 5, + 3, + 4 (4) + 5, + 4, + 3

Sol. Answer (1)

$H_4P_2O_5$ $2x = 6$
$x = 3$

$H_4P_2O_6$ $2x = 8$
$x = 4$

$H_4P_2O_7$ $2x = 10$
$x = 5$

78. The tendency of BF_3, BCl_3 and BBr_3 to behave as Lewis acid decreases in the sequence

(1) $BF_3 > BCl_3 > BBr_3$ (2) $BCl_3 > BF_3 > BBr_3$

(3) $BBr_3 > BCl_3 > BF_3$ (4) $BBr_3 > BF_3 > BCl_3$

Sol. Answer (3)

$p\pi$ back bonding decreases in the order $BBr_3 > BCl_3 > BF_3$

79. Which of the following represents the correct order of increasing electron gain enthalpy with negative sign for the elements O, S, F and Cl?

(1) S < O < Cl < F (2) Cl < F < O < S

(3) O < S < F < Cl (4) F < S < O < Cl

Sol. Answer (3)

Group 17 > Group 16

Group 17 $\rightarrow$ Cl > F > Br > I

Group 16 $\rightarrow$ S > Se > Te > Po > O

80. Crystal field stabilization energy for high spin d^4 octahedral complex is

(1) $-0.6\ \Delta_0$ (2) $-1.8\ \Delta_0$

(3) $-1.6\ \Delta_0 + P$ (4) $-1.2\ \Delta_0$

Sol. Answer (1)

$3(-0.4) + 1(0.6)$

$= -0.6\ \Delta_0$

81. In which one of the following species the central atom has the type of hybridisation which is not the same as that present in the other three?

(1) PCl_5 (2) SF_4

(3) I_3^- (4) $SbCl_5^{2-}$

Sol. Answer (4)

$SbCl_5^{2-} - sp^3d^2$

82. Which one of the following molecular hydrides acts as a Lewis acid?

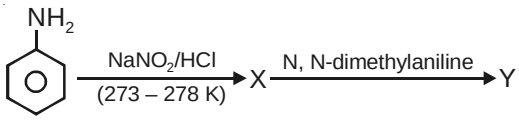
(1) CH_4 (2) NH_3

(3) H_2O (4) B_2H_6

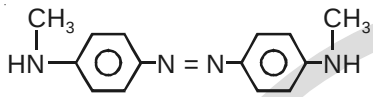
Sol. Answer (4)

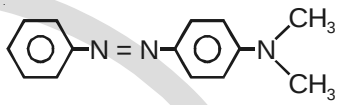
B_2H_6 is e^- deficient

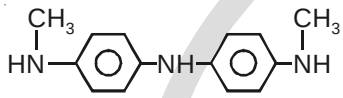
83. Aniline in a set of the following reactions yielded a coloured product Y

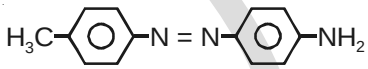


The structure of Y would be

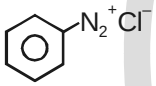
(1) 

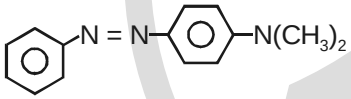
(2) 

(3) 

(4) 

Sol. Answer (2)

X = 

Y = 

84. The reaction of toluence with Cl_2 in presence of $FeCl_3$ gives X and reaction in presence of light gives Y. Thus, X and Y are

(1) X = Benzyl chloride, Y = m-chlorotoluene

(2) X = Benzal chloride, Y = o-chlorotoluene

(3) X = m-chlorotoluene, Y = p-chlorotoluene

(4) Y = o-and p-chlorotoluene, Y = Trichloromethyl benzene

Sol. Answer (4)

Cl_2 in presence of $FeCl_3 \rightarrow$ Ring substitution.

Cl_2 in presence of light $\rightarrow$ Side chain substitution.

85. Liquid hydrocarbons can be converted to a mixture gaseous hydrocarbons by

(1) Hydrolysis (2) Oxidation

(3) Cracking (4) Distillation under reduced pressure

Sol. Answer (3)

Due to cracking.

86. Which one of the following is employed as a Tranquilizer drug?

(1) Mifepristone (2) Promethazine

(3) Valium (4) Naproxen

Sol. Answer (3)

Fact.

87. Which one of the following does *not* exhibit the phenomenon of mutarotation?

(1) (–) Fructose (2) (+) Sucrose

(3) (+) Lactose (4) (+) Maltose

Sol. Answer (2)

Due to absence of hemiacetal linkage.

88. Which of the following structures represents Neoprene polymer?

(1) $-(CH(C_6H_5)-CH_2)_n-$ (2) $-(CH_2-C(Cl)=CH-CH_2)_n-$

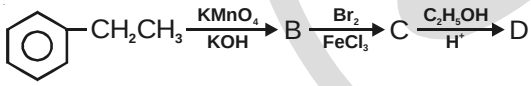
(3) $-(CH_2-CH(CN))_n-$ (4) $-(CH_2-CH(Cl))_n-$

Sol. Answer (2)

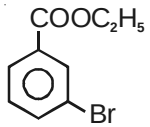
Polymer is neoprene.

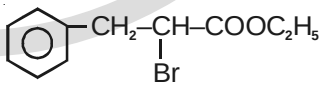
Chloroprene is monomer = $-(CH_2-C(Cl)=CH-CH_2)_n-$

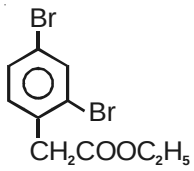
89. In a set of reactions, ethyl benzene yielded a product D.

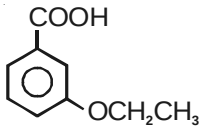


'D' would be

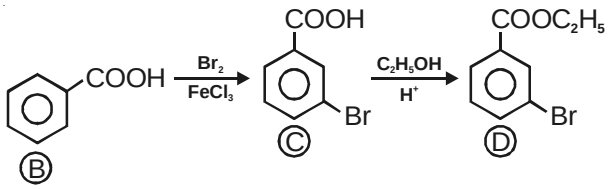
(1) 

(2) 

(3) 

(4) 

Sol. Answer (1)

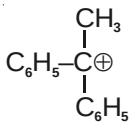


90. Which one is most reactive towards S_N1 reaction?

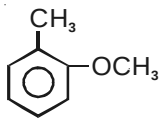
(1) $C_6H_5CH_2Br$ (2) $C_6H_5CH(C_6H_5)Br$

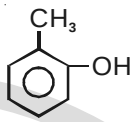
(3) $C_6H_5CH(CH_3)Br$ (4) $C_6H_5C(CH_3)(C_6H_5)Br$

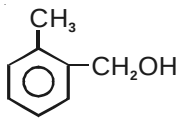
Sol. Answer (4)

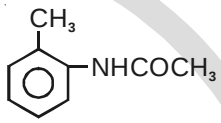
As  carbocation most stable.

91. Which one is most reactive towards electrophilic reagent?

(1) 

(2) 

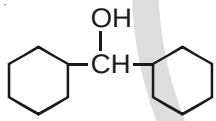
(3) 

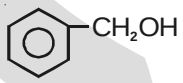
(4) 

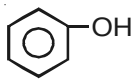
Sol. Answer (2)

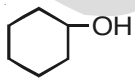
Due to greater e^- releasing effect.

92. Which one of the following compounds has the most acidic nature?

(1) 

(2) 

(3) 

(4) 

Sol. Answer (3)

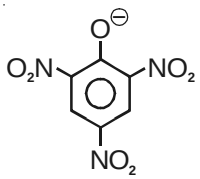
Phenoxide ions more resonance stabilized, therefore more acidic.

93. Given are cyclohexanol (I), acetic acid (II), 2, 4, 6-trinitrophenol (III) and phenol (IV). In these the order of decreasing acidic character will be

(1) III > IV > II > I (2) III > II > IV > I

(3) II > III > I > IV (4) II > III > IV > I

Sol. Answer (2)



Maximum resonance stabilized and maximum-I and –M effect due to three $–NO_2$ groups, therefore more acidic than CH_3COOH.

94. Which of the following statements about primary amines is 'False'?

(1) Alkyl amines are stronger bases than ammonia

(2) Alkyl amines are stronger bases than aryl amines

(3) Alkyl amines react with nitrous acid to produce alcohols

(4) Aryl amines react with nitrous acid to produce phenols

Sol. Answer (4)

Aryl amines react with nitrous acid to form diazonium salt.

95. Acetamide is treated with the following reagents separately. Which one of these would yield methyl amine?

(1) PCl_5 (2) $NaOH\text{-}Br_2$

(3) Sodalime (4) Hot conc. H_2SO_4

Sol. Answer (2)

Hofmann-Bromide reaction.

96. Which of the following reactions will *not* result in the formation of carbon-carbon bonds?

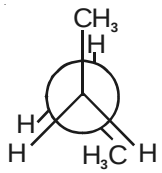
(1) Friedel-Crafts acylation (2) Reimer-Tieman reaction

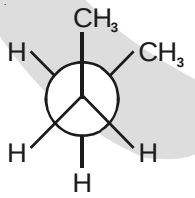
(3) Cannizzaro reaction (4) Wurtz reaction

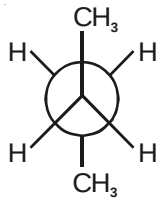
Sol. Answer (3)

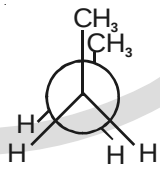
Cannizzaro reaction involves disproportionation.

97. In the following the most stable conformation of *n*-butane is

(1) 

(2) 

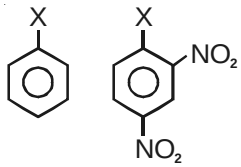
(3) 

(4) 

Sol. Answer (3)

Anti-staggered conformation is most stable.

98. The correct order of increasing reactivity of C-X bond towards nucleophile in the following compound is



$(CH_3)_3C\text{–}X$ $(CH_3)_2CH\text{–}X$

(I) (II) (III) (IV)

(1) III < II < I < IV (2) I < II < IV < III

(3) II < III < I < IV (4) IV < III < I < II

Sol. Answer (2)

Based on carbocation stability.

Alkyhalides (3° > 2°) are more reactive than aryl halides towards nucleophilic substitution.

99. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is

(1) CH_3COCl (2) CH_3COOCH_3

(3) CH_3CONH_2 (4) $CH_3COOCOCH_3$

Sol. Answer (1)

Cl^- is a weakest base, therefore good leaving group.

100. A solution of sucrose (molar mass = 342 g mol^{-1}) has been prepared by dissolving 68.5 g of sucrose in 1000 g of water. The freezing point of the solution obtained will be (K_f for water = 1.86 K kg mol^{-1})

(1) –0.570°C (2) –0.372°C

(3) –0.520°C (4) +0.372°C

Sol. Answer (2)

$\Delta T_f = K_f m$

$\Delta T_f = T_o - T_s$

101. Virus envelope is known as

(1) Core (2) Capsid

(3) Virion (4) Nucleoprotein

Sol. Answer (2)

Proteinaceous coat is capsid.

102. Some hyperthermophilic organisms that grow in highly acidic (pH2) habitats belong to the two groups

(1) Liverworts and yeasts (2) Eubacteria and archaea

(3) Cyanobacteria and diatoms (4) Protists and mosses

Sol. Answer (2)

Eubacteria like BGA (*Synechococcus*, *Phormidium)* and Thermoacidophiles (Archaebacteria).

103. Infectious proteins are present in

(1) Satellite viruses (2) Gemini viruses

(3) Prions (4) Viroids

Sol. Answer (3)

Infectious proteins are present in prions. Prions contain only the protein coat of the virus and are responsible for diseases in human beings. Example, prions cause Kuru's disease, CJD, Scrapie and Bovine spongiform encephalopathy.

104. Male and female gametophytes are independent and free-living in

(1) *Sphagnum* (2) Mustard

(3) Castor (4) *Pinus*

Sol. Answer (1)

Gametophytes (♂ and ♀) are highly reduced in gymnosperms and angiosperms.

105. Single-celled eukaryotes are included in

(1) Monera (2) Protista

(3) Fungi (4) Archaea

Sol. Answer (2)

Single celled eukaryotes are included in Protista.

106. One example of animals having a single opening to the outside that serves both as mouth as well as anus is

(1) *Fasciola* (2) *Octopus*

(3) *Asterias* (4) *Ascidia*

Sol. Answer (1)

Fasciola belongs to phylum platyhelminthes. These worms have incomplete alimentary canal, there is a single opening both for ingestion and egestion. This is also called as blind sac body plan. Whereas, in *Octopus*, *Asterias*, the alimentary canal is complete.

107. Which one of the following statements about all the four of *Spongilla*, Leech, Dolphin and Penguin is *correct* ?

(1) All are bilaterally symmetrical

(2) Penguin is homoiothermic while the remaining three are poikilothermic

(3) Leech is a fresh water form while all others are marine

(4) *Spongilla* has special collared cells called choanocytes, not found in the remaining three

Sol. Answer (4)

Spongilla belongs to phylum porifera, in which the characteristic cells are choanocytes, these are absent in Leech, Dolphin and Penguin.

108. Which one of the following kinds of animals are *triploblastic*?

(1) Corals (2) Flat worms

(3) Sponges (4) Ctenophores

Sol. Answer (2)

Flatworms are triploblastic and acoelomate. Whereas, sponges have cell aggregate type of body plan and ctenophores and corals are diploblastic.

109. Which one of the following statements about certain given animals is *correct* ?

(1) Flat worms (Platyhelminthes) are coelomates

(2) Round worms (Aschelminthes) are pseudocoelomates

(3) Molluses are acoelomates

(4) Insects are pseudocoelomates

Sol. Answer (2)

Roundworms are (Aschelminthes) and pseudocoelomate. Whereas, flatworms are acoelomate, molluscs and insects are coelomate.

110. The plasma membrane consists mainly of

(1) Proteins embedded in a carbohydrate bilayer

(2) Phospholipids embedded in a protein bilayer

(3) Proteins embedded in a phospholipid bilayer

(4) Proteins embedded in a polymer of glucose molecules

Sol. Answer (3)

Explained by fluid mosaic model.

111. Which one of the following structures between two adjacent cells is an effective transport pathway?

(1) Plasmalemma (2) Plasmodesmata

(3) Plastoquinones (4) Endoplasmic reticulum

Sol. Answer (2)

Plasmodesmata is a category of gap junction in plants.

112. Which one of the following has its own DNA?

(1) Peroxisome (2) Mitochondria

(3) Dictyosome (4) Lysosome

Sol. Answer (2)

Semiautonomous organelle due to ds circular DNA and 70 S ribosomes.

113. The main arena of various types of activities of a cell is

(1) Nucleus (2) Plasma membrane

(3) Mitochondrian (4) Cytoplasm

Sol. Answer (4)

Centre of all vital or metabolic activities.

114. During mitosis ER and nucleolus begin to disappear at

(1) Early prophase (2) Late prophase

(3) Early metaphase (4) Late metaphase

Sol. Answer (1)

Disappearance begins in early prophase and these are not observed in late prophase.

115. Algae have cell wall made up of

(1) Cellulose, hemicellulose and pectins

(2) Cellulose, galactans and mannans

(3) Hemicellulose, pectins and proteins

(4) Pectins, cellulose and proteins

Sol. Answer (2)

116. Membrane-bound organelles are *absent* in

(1) *Plasmodium* (2) *Saccharomyces*

(3) *Streptococcus* (4) *Chlamydomonas*

Sol. Answer (3)

No membrane bound organelles in prokaryotes.

117. The kind of epithelium which forms the inner walls of blood vessels is

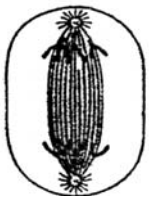
(1) Squamous epithelium (2) Cuboidal epithelium

(3) Columnar epithelium (4) Ciliated columnar epithelium

Sol. Answer (1)

Blood vessels are lined with simple squamous epithelium. This epithelium is present, where diffusion and filtration takes place.

118. Which stages of cell division do the following figures A and B represent respectively?



A

B

	Fig. A		*Fig. B*
(1)	Prophase	—	Anaphase
(2)	Metaphase	—	Telophase
(3)	Telophase	—	Metaphase
(4)	Late Anaphase	—	Prophase

Sol. Answer (4)

Centrioles separation in prophase and chromatids at both poles in anaphase.

119. Which one of the following cannot be explained on the basis of Mendel's Law of Dominance?

(1) Factors occur in pairs

(2) The discrete unit controlling a particular character is called a factor

(3) Out of one pair of factors one is dominant, and the other recessive

(4) Alleles do not show any blending and both the characters recover as such in F_2 generation

Sol. Answer (4)

No mixing of alleles.

120. The genotype of a plant showing the dominant phenotype can be determined by

(1) Back cross (2) Test cross

(3) Dihybrid cross (4) Pedigree analysis

Sol. Answer (2)

Test cross is preferred to determine genotype of F_1.

121. The one aspect which is *not* a salient feature of genetic code, is its being

(1) Specific (2) Degenerate

(3) Ambiguous (4) Universal

Sol. Answer (3)

Codons are nonambiguous except GUG.

122. Satellite DNA is useful tool in

(1) Genetic engineering (2) Organ transplantation

(3) Sex determination (4) Forensic science

Sol. Answer (4)

Satellite DNA regions like VNTR/RFLP are basis of DNA fingerprinting.

123. Which one of the following *does* not follow the central dogma of molecular biology?

(1) HIV (2) Pea

(3) *Mucor* (4) *Chlamydomonas*

Sol. Answer (1)

HIV belongs to Retrovirus group which show reverse central dogma or reverse transcription.

124. ABO blood groups in humans are controlled by the gene *I*. It has three alleles–I^A, I^B and *i*. Since there are three different alleles, six different genotypes are possible. How many phenotypes can occur?

(1) Two (2) Three

(3) One (4) Four

Sol. Answer (4)

ABO blood group system is an example of multiple alleles but we will inherit only two alleles of a genes. So, the total number of phenotypes will be four.

125. Select the *correct* statement from the ones given below with respect to dihybrid cross

(1) Tightly linked genes on the same chromosome show very few recombinations

(2) Tightly linked genes on the same chromosome show higher recombinations

(3) Genes far apart on the same chromosome show very few recombinations

(4) Genes loosely linked on the same chromosome show similar recombinations as the tightly linked ones

Sol. Answer (1)

About 1.3% recombination in *Drosophila* w.r.t. body colour and eye colour genes.

126. Select the *two correct* statements out of the four (a–d) given below about lac operon.

(a) Glucose or galactose may bind with the repressor and inactivate it

(b) In the absence of lactose the repressor binds with the operator region

(c) The z-gene codes for permease

(d) This was elucidated by Francois Jacob and Jacque Monod

The correct statement are

(1) (a) and (b) (2) (b) and (c)

(3) (a) and (c) (4) (b) and (d)

Sol. Answer (4)

Lactose binds repressor protein and exerts negative control.

127. Which one of the following symbols and its representation, used in human pedigree analysis is *correct*?

(1) ◆ = male affected (2)  = mating between relatives

(3) ○ = unaffected male (4) □ = unaffected female

Sol. Answer (2)

(1) Unspecified sex.

(3) Unaffected female.

(4) Unaffected male.

128. Darwin's finches are a good example of

(1) Convergent evolution (2) Industrial melanism

(3) Connecting link (4) Adaptive radiation

Sol. Answer (4)

Darwin's finches are good example of adaptive radiation. It is an evolutionary process starting from a point in a geographical area, giving rise to new species depending upon habitat. Main Darwin finch was in South America, some flew to Galapagas islands and some variations got selected and gave rise to new species.

129. The scutellum observed in a grain of wheat or maize is comparable to which part of the seed in other monocotyledons?

(1) Plumule (2) Cotyledon

(3) Endosperm (4) Aleurone layer

Sol. Answer (2)

Single shield-shaped cotyledon in monocots.

130. Which one of the following is *not* a micronutrient?

(1) Boron (2) Molybdenum

(3) Magnesium (4) Zinc

Sol. Answer (3)

Mg is macronutrient.

131. An element playing important role in nitrogen fixation is

(1) Zinc (2) Molybdenum

(3) Copper (4) Manganese

Sol. Answer (2)

Component of nitrogenase enzyme.

132. Which one of the following is *not* a lateral meristem?

(1) Intercalary meristem (2) Intrafascicular cambium

(3) Interfascicular cambium (4) Phellogen

Sol. Answer (1)

Apical and intercalary meristems are primary meristems.

133. C_4 plants are more efficient in photosynthesis than C_3 plants due to

(1) Lower rate of photorespiration

(2) Higher leaf area

(3) Presence of larger number of chloroplasts in the leaf cells

(4) Presence of thin cuticle

Sol. Answer (3)

Photorespiration does not occur in C_4 plants. Oxygenase activity of Rubisco is nil due to CO_2 conc. effect in bundle sheath cells.

134. In unilocular ovary with a single ovule the placentation is

(1) Axile (2) Marginal

(3) Basal (4) Free Central

Sol. Answer (3)

Advanced type of placentation with single ovule in Asteraceae and Poaceae.

135. The chief water conducting elements of xylem in gymnosperms are

(1) Tracheids (2) Vessels

(3) Fibers (4) Transfusion tissue

Sol. Answer (1)

Vessels are absent in pteridophytes and gymnosperms.

136. The technical term used for the androecium in a flower of China rose (*Hibiscus rosasinensis*) is

(1) Polyadelphous (2) Monadelphous

(3) Diadelphous (4) Polyandrous

Sol. Answer (2)

China rose family shows cohesion of stamens by union of filaments into single bundle, known as monadelphous.

137. Ovary is half-inferior in the flowers of

(1) Cucumber (2) Guava

(3) Plum (4) Brinjal

Sol. Answer (3)

Perigynous flower in rose and plum family.

138. Heartwood differs from sapwood in

(1) Being susceptible to pests and pathogens

(2) Presence of rays and fibres

(3) Absence of vessels and parenchyma

(4) Having dead and non-conducting elements

Sol. Answer (4)

Non-functional wood due to tylose formation and deposition of secondary metabolites.

139. Keel is characteristic of the flowers of

(1) Bean (2) Gulmohur

(3) *Cassia* (4) *Calotropis*

Sol. Answer (1)

Anterior shortest petal in Fabaceae

140. One of the free-living anaerobic nitrogen-fixer is

(1) *Azotobacter* (2) *Beijernickia*

(3) *Rhodospirillum* (4) *Rhizobium*

Sol. Answer (3)

Others are aerobic nitrogen fixers.

141. PGA as the first CO_2 fixation product was discovered in photosynthesis of

(1) Alga (2) Bryophyte

(3) Gymnosperm (4) Angiosperm

Sol. Answer (1)

Chlorella and *Scenedesmus.*

142. The energy releasing metabolic process in which substrate is oxidised without an external electron acceptor is called

(1) Photorespiration (2) Glycolysis

(3) Fermentation (4) Aerobic respiration

Sol. Answer (3)

$NADH_2$ produced during glycolysis in used in reduction of pyruvate in fermentation

143. Photoperiodism was first characterised in

(1) Cotton (2) Tobacco

(3) Potato (4) Tomato

Sol. Answer (2)

Maryland mammoth variety of tobacco.

144. Listed below are four respiratory capacities (a - c) and four jumbled respiratory volumes of a normal human adult

Respiratory capacities	Respiratory volumes
(a) Residual volume	2500 mL
(b) Vital capacity	3500 mL
(c) Inspiratory reserve volume	1200 mL
(d) Inspiratory capacity	4500 mL

Which one of the following is the **correct** matching of two capacities and volumes?

(1) (a) 4500 mL, (b) 3500 mL (2) (b) 2500 mL, (c) 4500 mL

(3) (c) 1200 mL, (d) 2500 mL (4) (d) 3500 mL, (a) 1200 mL

Sol. Answer (4)

Inspiratory capacity is TV + IRV = 3500 ml and residual volume is 1200 ml

145. What is **true** about RBCs in humans?

(1) They do not carry CO_2 at all

(2) They carry about 20-25 percent of CO_2

(3) They transport 99.5 percent of O_2

(4) They transport about 80 percent oxygen only and the rest 20 percent of it is transported in dissolved state in blood plasma

Sol. Answer (2)

About 97 percent of O_2 is transported by RBCs in the blood. The remaining 3 percent of O_2 is carried in dissolved state through the plasma. Nearly 20-25 percent of CO_2 is transported by RBCs, whereas, 70 percent of it is carried as bicarbonates.

146. If due to some injury the chordae tendinae of the tricuspid valve of the human heart is partially non-functional, what will be the immediate effect?

(1) The flow of blood into the pulmonary artery will be reduced

(2) The flow of blood into the aorta will be slowed down

(3) The pacemaker will stop working

(4) The blood will tend to flow back into the left atrium

Sol. Answer (1)

If due to injury the chordae tendinae of the tricuspid valves of human heart is partially non-functional, the flow of blood into the pulmonary artery is reduced due to backflow of blood into right atrium

147. Which one of the following statements in regard to the excretion by the human kidneys is **correct**?

(1) Ascending limb of Loop of Henle is impermeable to electrolytes

(2) Descending limb of Loop of Henle is impermeable to water

(3) Distal convoluted tubule is incapable of reabsorbing HCO_3

(4) Nearly 99 percent of the glomerular filtrate is reabsorbed by the renal tubules

Sol. Answer (4)

A comparison of the volume of filtrate formed per day (180 litre) with urine released (1.5 litre), suggests that nearly 99 percent of the filtrate is reabsorbed by the renal tubules

148. Low Ca^{++} in the body fluid may be the cause of

(1) Gout (2) Tetany

(3) Anaemia (4) Angina pectoris

Sol. Answer (2)

Tetany is rapid spasms (wild contraction) in muscle due to low Ca^{2+} in the body fluid

149. If for some reason our goblet cells are non-functional this will adversely affect

(1) Smooth movement of food down the intestine

(2) Production of somatostatin

(3) Secretion of sebum from the sebaceous glands

(4) Maturation of sperms

Sol. Answer (1)

Goblet cells present in intestine secrete mucous. Mucous will help in smooth movement of food down the intestine.

150. The nerve centres which control the body temperature and the urge for eating are contained in

(1) Thalamus (2) Hypothalamus

(3) Pons (4) Cerebellum

Sol. Answer (2)

Hypothalamus is the thermoregulatory centre. It also contains hunger and thirst centre.

151. Vasa efferentia are the ductules leading from

(1) Epididymis to urethra

(2) Testicular lobules to rete testis

(3) Rete testis to vas deferens

(4) Vas deferens to epididymis

Sol. Answer (3)

Vasa efferentia are ducts which carry the sperms outside the testis *i.e.,* from rete testis to vas deferens.

152. The first movements of the foetus and appearance of hair on its head are usually observed during which month of pregnancy?

(1) Third month (2) Fourth month

(3) Fifth month (4) Sixth month

Sol. Answer (3)

The first movement of the foetus and appearance of hair are observed during fifth month of pregnancy

153. Cu ions released from copper- releasing Intra Uterine Devices (IUDs)

(1) Prevent ovulation
(2) Make uterus unsuitable for implantation
(3) Increase phagocytosis sperms
(4) Suppress sperm motility

Sol. Answer (4)

The copper ions released from copper releasing IUDs, suppress sperms motility and the fertilising capacity of the sperms.

154. Carrier ions like Na^+ facilitate the absorption of substances like

(1) Fructose and some amino acids
(2) Amino acids and glucose
(3) Glucose and fatty acids
(4) Fatty acids and glycerol

Sol. Answer (1)

Substance like fructose and some amino acids are absorbed with help of the carrier ions like Na^+. This mechanism is called the facilitated transport.

155. Which one of the following pairs is **incorrectly** matched?

(1) Insulin–Diabetes mellitus (disease)
(2) Glucagon – Beta cells (source)
(3) Somatostatin – Delta cells (source)
(4) Corpus luteum – Relaxin (secretion)

Sol. Answer (2)

Glucose hormone is secreted by alpha cells of pancreas.

156. The principal nitrogenous excretory compound in humans is synthesised

(1) In the liver but eliminated mostly through kidneys
(2) In kidneys but eliminated mostly through liver
(3) In kidneys as well as eliminated by kidneys
(4) In liver and also eliminated by the same through bile

Sol. Answer (1)

The principal nitrogenous compound in humans is urea, synthesized in liver and eliminated by kidneys.

157. Injury to adrenal cortex is not likely to affect the secretion of which one of the following?

(1) Cortisol
(2) Aldosterone
(3) Both Androstenedione and Dehydroepiandrosterone
(4) Adrenaline

Sol. Answer (4)

If the adrenal cortex is injured it will not affect the secretion of adrenaline, because it is secreted by adrenal medulla.

158. Which one of the following statements about human sperm is **correct**?

(1) Acrosome serves no particular function

(2) Acrosome has a conical pointed structure used for piercing and penetrating the egg resulting in fertilization

(3) The sperm lysins in the acrosome dissolve the egg envelope facilitating fertilization

(4) Acrosome serves as a sensory structure leading the sperm towards the ovum

Sol. Answer (3)

Acrosome is a caplike structure present in sperm head. It is modified golgi apparatus and secretes sperm lysins, these are enzymatic in nature.

159. Coiling of garden pea tendrils around any support is an example of

(1) Thermotaxis (2) Thigmotaxis

(3) Thigmonasty (4) Thigmotropism

Sol. Answer (4)

Paratonic growth movement due to touch stimulus.

160. Apomictic embryos in *citrus* arise from

(1) Diploid egg (2) Synergids

(3) Maternal sporophytic tissue in ovule (4) Antipodal cells

Sol. Answer (3)

Sporophytic budding or adventitive embryony in *Citrus*.

161. Wind pollinated flowers are

(1) Small, producing nectar and dry pollen

(2) Small, brightly coloured, producing large number of pollen grains

(3) Small, producing large number of dry pollen grains

(4) Large, producing abundant nectar and pollen

Sol. Answer (3)

Colourless, odourless and nectarless flowers in anemophily.

162. Phototropic curvature is the result of uneven distribution of

(1) Auxin (2) Gibberellin

(3) Phytochrome (4) Cytokinins

Sol. Answer (1)

Cell elongation on darker side.

163. Transfer of pollen grains from the anther to the stigma of another flower of the same plant is called

(1) Autogamy (2) Xenogamy

(3) Geitonogamy (4) Karyogamy

Sol. Answer (3)

Genetically self and functionally cross pollination.

164. Seminal plasma in human males is rich in

(1) Ribose and potassium (2) Fructose and calcium

(3) Glucose and calcium (4) DNA and testosterone

Sol. Answer (2)

Seminal plasma in humans is secretion of accessory glands, rich in fruclose, calcium and some enzymes.

165. Sertoli cells are found in

(1) Pancreas and secrete cholecystokinin

(2) Ovaries and secrete progesterone

(3) Adrenal cortex and secrete adrenaline

(4) Seminiferous tubules and provide nutrition of germ cells

Sol. Answer (4)

Sertoli cells are also called as nurse cells present in seminiferous tubules, they provide nourishment to the developing sperms.

166. The part of Fallopian tube closest to the ovary is

(1) Ampulla (2) Isthmus

(3) Infundibulum (4) Cervix

Sol. Answer (3)

The part of fallopian tube closest to the ovary is fimbriated funnel. It is to take up the developing ovum from abdominal cavity released by ovaries.

167. *In vitro* fertilisation is a technique that involves transfer of which one of the following into the fallopian tube?

(1) Zygote only

(2) Embryo only, upto 8 cell stage

(3) Either zygote or early embryo upto 8 cell stage

(4) Embryo of 32 cell stage

Sol. Answer (3)

ZIFT is an example IVF in this the zygote or early embryo's upto 8 blastomeres are transferred into the fallopian tube. If the embryo is more than 8 blastomeres then it is transferred into uterus called as IUT.

168. The permissible use of the technique amniocentesis is for

(1) Detecting any genetic abnormality

(2) Detecting sex of the unborn foetus

(3) Artificial insemination

(4) Transfer of embryo into the uterus of a surrogate mother

Sol. Answer (1)

Amniocentesis is prenatal diagnostic technique for detecting any genetic disorder. The misuse of amniocentesis is to detect the sex of the foetus.

169. The signals for parturition originate from

(1) Fully developed foetus only

(2) Placenta only

(3) Placenta as well as fully developed foet

(4) Oxytocin released from maternal pituita

Sol. Answer (3)

The signals for parturition originates from the foetus and placenta, leading to mild uterine contractions called as foetal ejection reflex.

170. The biomass available for consumption by the herbivores and the decomposers is called

(1) Gross primary productivity

(2) Net primary productivity

(3) Secondary productivity

(4) Standing crop

Sol. Answer (2)

Stored biomass which is transferred from one trophic level to another trophic level is NPP.

171. Which one of the following is one of the characteristics of a biological community?

(1) Sex-ratio (2) Stratification

(3) Natality (4) Mortality

Sol. Answer (2)

Others are population characteristics. Stratification is structural component of biological community.

172. Which one of the following is an example *ex-situ* conservation?

(1) National park (2) Wildlife sanctuary

(3) Seed bank (4) Sacred groves

Sol. Answer (3)

Others are *in-situ* /on site conservation strategies, except seed bank.

173. A renewable exhaustible natural resource is

(1) Forest (2) Coal

(3) Petroleum (4) Minerals

Sol. Answer (1)

Coal and petroleum — Non-renewable and exhaustible.

Minerals — Renewable and inexhaustible.

174. The two gases making highest relative contribution to the greenhouse gases are

(1) CO_2 and N_2O (2) CO_2 and CH_4

(3) CH_4 and N_2O (4) CFC_5 and N_2O

Sol. Answer (2)

CO_2 — 60% global warming/greenhouse effect.

CH_4 — 20% global warming/greenhouse effect.

175. Select the **correct** statement from the following

(1) Activated sludge-sediment in settlement tanks of sewage treatment plant is a rich source of aerobic bacteria

(2) Biogas is produced by the activity of aerobic bacteria on animal waste

(3) *Methanobacterium* is an aerobic bacterium found in rumen of cattle

(4) Biogas, commonly called gobar gas, is *pure* methane

Sol. Answer (1)

Methanobacteria are anaerobic.

176. Which two of the following changes (a–d) usually tend to occur inthe plain dwellers when they move to high altitudes (3,500 m or more)?

(a) Increase in red blood cell size

(b) Increase in red blood cell production

(c) Increased breathing rate

(d) Increase in thrombocyte count

Changes occurring are

(1) (a) and (b) (2) (b) and (c)

(3) (c) and (d) (4) (a) and (d)

Sol. Answer (2)

When a person moves to higher altitudes the pO_2 and total atmospheric pressure decreases. Hypoxia stimulates the JG-cells of the kidneys to release erythropoietin hormone which stimulates erythropoesis in bone marrow causing polycythemia. Hypoxia will also increasing breathing rate. Initially, the size of RBCs will also increase, but will increase in number of RBC the size of RBCs becomes normal.

177. dB is a standard abbreviation used for the quantitative expression of

(1) A certain pesticide (2) The density of bacteria in a medium

(3) A particular pollutant (4) The dominant *Bacillus* in a culture

Sol. Answer (3)

Decibel (dB) is unit of noise pollution measurement.

178. Study the four statements (a–d) given below and select the two **correct** ones outo of them

(a) A lion eating a deer and a sparrow feeding on grain are ecologically similar in being consumers

(b) Predator star fish *Pisaster* helps in maintaining species diversity of some invertebrates

(c) Predators ultimately lead to the extinction of prey species

(d) Production of chemicals such as nicotine, strychnine by the plants are metabolic disorders

The two correct statements are:

(1) (a) and (b) (2) (b) and (c)

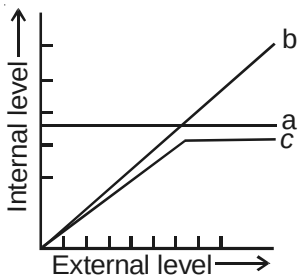
(3) (c) and (d) (4) (a) and (d)

Sol. Answer (1)

Carnivores (Lion) and herbivores (sparrow) are consumers.

Pisaster controls prey population and reduces competition among prey species.

179. The figure given below is a diagrammatic representation of response of organisms to abiotic factors. What do a, b and c represent respectively?



	(a)	(b)	(c)
(1)	Regulator	Conformer	Partial regulator
(2)	Conformer	Regulator	Partial regulator
(3)	Regulator	Partial regulator	Conformer
(4)	Partial regulator	Regulator	Conformer

Sol. Answer (1)

Regulators — Mammals and Birds

Conformer — All plants and 99% animals

180. Widal test is used for the diagnosis of

(1) Typhoid (2) Malaria

(3) Pneumonia (4) Tubercolosis

Sol. Answer (1)

The test for typhoid is widal test.

181. Ringworm in humans is caused by

(1) Viruses (2) Bacteria

(3) Fungi (4) Nematodes

Sol. Answer (3)

Ringworm in humans is called by fungi.

182. Which one of the following is **not** used in organic farming?

(1) Snail (2) *Glomus*

(3) Earthworm (4) *Oscillatoria*

Sol. Answer (1)

Glomus — Endomycorrhiza

Oscillatoria — BGA

Earthworm

All are biofertilizers and help in organic farming.

183. A common biocontrol agent for the control of plant diseases is

(1) *Trichoderma* (2) Baculovirus

(3) *Bacillus thuringiensis* (4) *Glomus*

Sol. Answer (1)

Trichoderma — Effective biocontrol agent for several plant pathogens.

184. The common nitrogen-fixer in paddy fields is

(1) *Frankia* (2) *Rhizobium*

(3) *Azospirillum* (4) *Oscillatoria*

Sol. Answer (3)

Azospirillum as N_2-fixer in graminaceous plants root.

185. Consider the following four statements (a–d) regarding kidney transplant and select the **two correct** ones out of these.

a. Even if a kidney transplant is proper the recipient may need to take immunosuppressants for a long time

b. The cell-mediated immune response is responsible for the graft rejection

c. The B-lymphocytes are responsible for rejection of the graft

d. The acceptance or rejection of a kidney transplant depends on specific interferons

The two **correct** statements are

(1) a & b (2) b & c

(3) c & d (4) a & c

Sol. Answer (1)

Kidney transplant is allograft. As no two individuals have same HLA alleles or MHC proteins, except identical twins the person requires immunosuppressant drug like cyclosporin throughout his life. CMI, *i.e.*, the T-cell mediated immunity is responsible for graft rejection.

186. Which one of the following statements is **correct** with respect to AIDS?

(1) The causative HIV retrovirus enters helper T-lymphocytes thus reducing their numbers

(2) The HIV can be transmitted through eating food together with an infected person

(3) Drug addicts are least susceptible to HIV infection

(4) AIDS patients are being fully cured cent per cent with proper care and nutrition

Sol. Answer (1)

AIDS virus mounts a direct attack on T_4-cells. They are macrophages and T_H-cells. Macrophages are HIV factory. The number of helper T-cells is depleted.

187. Select the **correct** statement from the ones given below

(1) Cocaine is given to patients after surgery as it stimulates recovery

(2) Barbiturates when given to criminals make them tell the truth

(3) Morphine is often given to persons who have undergone surgery as a pain killer

(4) Chewing tobacco lowers blood pressure and heart rate

Sol. Answer (3)

Morphine is a narcotic drug. It is a good sedative, as well as a pain killer, given to patients after surgery.

188. Toxic agents present in food which interfere with thyroxine synthesis lead to the development of

(1) Thyrotoxicosis (2) Toxic goitre

(3) Cretinism (4) Simple goitre

Sol. Answer (4)

Toxic agents in food which interfere with thyroxine synthesis will lead to simple goitre.

Thyrotoxicosis and toxic goitre are under the category of hyperthyroidism.

189. The second maturation division of the mammalian ovum occurs

(1) In the Graafian follicle following the first maturation division

(2) Shortly after ovulation before the ovum makes entry into the Fallopian tube

(3) Until after the ovum has been penetrated by a sperm

(4) Until the nucleus of the sperm has fused with that of the ovum

Sol. Answer (3)

The second maturation division of the mammalian ovum occurs that is completed after the sperm has penetrated the ovum.

190. Which one of the following statements about morula in humans is **correct**?

(1) It has more cytoplasm and more DNA than an uncleaved zygote

(2) It has almost equal quantity of cytoplasm as an uncleaved zygote but much more DNA

(3) It has far **less** cytoplasm as well as **less** DNA than in an uncleaved zygote

(4) It has more or less equal quantity of cytoplasm and DNA as in uncleaved zygote

Sol. Answer (2)

Cleavage divisions are mitotic divisions, in which the single-celled zygote is converted into a multicellular morula. But during cleavage divisions there is no growth of resultant daughter cells/blastomeres. So, the DNA content will increase, but there is no increase or insignificant increase in amount of protoplasm.

191. Stirred-tank bioreactors have been designed for

(1) Availability of oxygen throughout the process

(2) Addition of preservatives to the product

(3) Purification of the product

(4) Ensuring anaerobic conditions in the culture vessel

Sol. Answer (1)

The stirrer used in stirred tank bioreactor is to mix oxygen in the contents.

192. Breeding of crops with high levels of minerals, vitamins and proteins is called

(1) Micropropagation (2) Somatic hybridisation

(3) Biofortification (4) Biomagnification

Sol. Answer (3)

Breeding for improved nutritional quality is the objective of biofortification.

193. DNA or RNA segment tagged with a radioactive molecule is called

(1) Plasmid (2) Vector

(3) Probe (4) Clone

Sol. Answer (3)

DNA/RNA segment tagged with radioactive molecule is called probe.

194. Which one of the following is used as vector for cloning genes into higher organisms?

(1) Retrovirus (2) Baculovirus

(3) *Salmonella typhimurium* (4) *Rhizopus nigricans*

Sol. Answer (1)

Retroviruses disarmed of its pathogenic qualities are used as vectors.

195. The genetically-modified (GM) brinjal in India has been developed for

(1) Drought-resistance (2) Insect-resistance

(3) Enhancing shelf life (4) Enhancing mineral content

Sol. Answer (2)

GM-brinjal has been developed for insect resistance. It is actually Bt-brinjal with Bt toxin gene for the production of Bt toxins.

196. Genetic engineering has been successfully used for producing

(1) Animals like bulls for farm work as they have super power

(2) Transgenic mice for testing safety of polio vaccine before use in humans

(3) Transgenic models for studying new treatments for certain cardiac diseases

(4) Transgenic Cow-Rosie which produces high fat milk for making ghee

Sol. Answer (2)

Transgenic animals are being produced as they can act as models for chemical safety testing and vaccine safety testing.

197. Restriction endonucleases are enzymes which

(1) Remove nucleotides from the ends of the DNA molecule

(2) Make cuts at specific positions within the DNA molecule

(3) Recognize a specific nucleotide sequence for binding of DNA ligase

(4) Restrict the action of the enzyme DNA polymerase

Sol. Answer (2)

Restriction endonucleases cuts the DNA at specific position within the DNA molecule.

198. Some of the characteristics of Bt cotton are

(1) High yield and resistance to bollworms

(2) Long fibre and resistance to aphids

(3) Medium yield, long fibre and resistance to beetle pests

(4) High yield and production of toxic protein crystals which kill dipteran pests

Sol. Answer (1)

Bt-cotton, shows resistance to cotton bollworms. The proteins encoded by cryIIAb and cryIAc are used to control cotton bollworms not dipterans. Dipterans include mosquitoes and flies they do not attack cotton plant.

199. An improved variety of transgenic basmati rice

(1) Give high yield but has no characteristic aroma

(2) Does not require chemical fertilizers and growth hormones

(3) Gives high yield and is rich in vitamin A

(4) Is completely resistant to all insect pests and diseases of paddy

Sol. Answer (3)

Transgenic basmati rice, called as golden rice is nutritionally enriched in vitamin A.

200. Which one of the following palindromic base sequences in DNA can be easily cut at about the middle by some particular restriction enzyme?

(1) 5′ CACGTA 3′; 3′ CTCAGT 5′

(2) 5′ CGTTCG 3′; 3′ ATGGTA 5′

(3) 5′ GATATG 3′; 3′ CTACTA 5′

(4) 5′ GAATTC 3′; 3′ CTTAAG 5′

Sol. Answer (4)

In DNA palindromic seuqnce is a sequence of base pairs which would read the same, provided that the orientation of reading is kept the same.

Example: 5′ GAATTC 3′

3′ CTTAAG 5′

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