

NEET 2020

Biology, Chemistry and Physics

Questions and Solutions

1. Name the enzyme that facilitates opening of DNA helix during transcription.

- | | |
|--------------------|--------------------|
| (1) DNA polymerase | (2) RNA polymerase |
| (3) DNA ligase | (4) DNA helicase |

Ans. (2)

RNA polymerase. This enzyme helps in opening of DNA helix during transcription. It forms RNA from DNA.

2. Which of the following would help in prevention of diuresis?

- (1) Atrial natriuretic factor causes vasoconstriction
- (2) Decrease in secretion of renin by JG cells
- (3) More water reabsorption due to undersecretion of ADH
- (4) Reabsorption of Na^+ and water

Ans. (4)

3. Meiotic division of the secondary oocyte is completed

- (1) After zygote formation
- (2) At the time of fusion of a sperm with an ovum
- (3) Prior to ovulation
- (4) At the time of copulation

Ans. (2)

4. Match the following concerning essential elements and their functions in plants

- | | |
|---------------|---------------------------------------------|
| (a) Iron | (i) Photolysis of water |
| (b) Zinc | (ii) Pollen germination |
| (c) Boron | (iii) Required for chlorophyll biosynthesis |
| (d) Manganese | (iv) IAA biosynthesis |

Select the correct option

- | | | | | |
|-----|-------|-------|------|-------|
| | (a) | (b) | (c) | (d) |
| (1) | (iii) | (iv) | (ii) | (i) |
| (2) | (iv) | (i) | (ii) | (iii) |
| (3) | (ii) | (i) | (iv) | (iii) |
| (4) | (iv) | (iii) | (ii) | (i) |

Ans. (1)

Iron is required for chlorophyll biosynthesis. In centre of chlorophyll molecule, Magnesium is present.

Zinc helps in IAA = Indole Acetic acid – Auxin hormone biosynthesis. Boron helps in pollen tube formation Manganese helps in photolysis splitting of water during Light Reaction in Photosynthesis.

5. Which of the following pairs is of unicellular algae?

- | | |
|-------------------------------------------|-------------------------------------------|
| (1) <i>Anabaena</i> and <i>Volvox</i> | (2) <i>Chlorella</i> and <i>Spirulina</i> |
| (3) <i>Laminaria</i> and <i>Sargassum</i> | (4) <i>Gelidium</i> and <i>Gracilaria</i> |

Ans. (2)

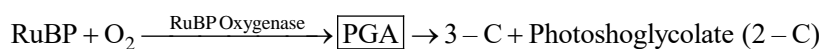
They are unicellular-single celled algae. They are also good source of protein, also used by space travellers.

6. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of

- (1) 1 molecule of 6-C compound
- (2) 1 molecule of 4-C compound and 1 molecule of 2-C compound
- (3) 2 molecules of 3-C compound
- (4) 1 molecule of 3-C compound

Ans. (4)

In high light intensity RuBisCo act as oxygenase enzyme.



7. Match the following columns and select the correct option.

- | Column – I | Column - II |
|-----------------|------------------------------------------------|
| (a) Eosinophils | (i) Immune response |
| (b) Basophils | (ii) Phagocytosis |
| (c) Neutrophils | (iii) Release histaminase, destructive enzymes |
| (d) Lymphocytes | (iv) Release granules containing histamine |

- | | | | | |
|-----|-------|------|-------|-------|
| | (a) | (b) | (c) | (d) |
| (1) | (i) | (ii) | (iv) | (iii) |
| (2) | (ii) | (i) | (iii) | (iv) |
| (3) | (iii) | (iv) | (ii) | (i) |
| (4) | (iv) | (i) | (ii) | (iii) |

Ans. (3)

8. Match the following columns and select the correct option.

Column-I

- (a) Placenta
 - (b) Zona pellucida
 - (c) Bulbo-urethral glands
 - (d) Leydig cells
- (a) (b) (c) (d)
- (1) (iii) (ii) (iv) (i)
- (2) (ii) (iii) (iv) (i)
- (3) (iv) (iii) (i) (ii)
- (4) (i) (iv) (ii) (iii)

Column-II

- (i) Androgens
- (ii) Human Chorionic Gonadotropin (hCG)
- (iii) Layer of the ovum
- (iv) Lubrication of the Penis

Ans. (2)

Placenta releases so many hormone like HCG, progesterone, HCS, relaxin

Zona pellucida is present outside the oocyte So it is a primary layer recreated by oocyte and glycoproteineceous in nature.

9. The plant parts which consist of two generations - one within the other

- (a) Pollen grains inside the anther
 - (b) Germinated pollen grain with two male gametes
 - (c) Seed inside the fruit
 - (d) Embryo sac inside the ovule
- (1) (c) and (d) (2) (a) and (d)
- (3) (a) only (4) (a), (b) and (c)

Ans. (2)

(a) Pollen grains inside the anther

(d) Embryo sac inside the ovule. These consists of two generations one within the other.

10. Which of the following statements about inclusion bodies is incorrect?

- (1) They lie free in the cytoplasm
- (2) These represent reserve material in cytoplasm
- (3) They are not bound by any membrane
- (4) These are involved in ingestion of food particles

Ans. (4)

Inclusion bodies like glycogen, volutin granules are reserve food materials in cytoplasm.

11. Strobili or cones are found in

- (1) *Marchantia* (2) *Equisetum*
- (3) *Salvinia* (4) *Pteris*

Ans. (2)

Strobili/cones are found in – *Equisetum* → Pteridophyte

- 12.** Montreal protocol was signed in 1987 for control of
- (1) Release of Green House gases
 - (2) Disposal of e-wastes
 - (3) Transport of Genetically modified organisms from one country to another
 - (4) Emission of ozone depleting substances

Ans. (4)

Montreal protocol was signed in 1987 for control of emission of ozone depleting substances.

- 13.** Which of the following statements is correct?
- (1) Adenine pairs with thymine through three H-bonds
 - (2) Adenine does not pair with thymine
 - (3) Adenine pairs with thymine through two H-bonds
 - (4) Adenine pairs with thymine through one H-bond

Ans. (3)

Adenine binds with thymine by two hydrogen bond

A = T, C ≡ G

Cytosine binds with guanine by three hydrogen bond.

A = T Adenine always pairs with thymine through 2 hydrogen bond Chargaff's rule.

- 14.** The body of the ovule is fused within the funicle at
- | | |
|--------------|---------------|
| (1) Nucellus | (2) Chalaza |
| (3) Hilum | (4) Micropyle |

Ans. (3)

The body of ovule is fused with funicle at Hilum-neck like region.

- 15.** The sequence that controls the copy number of the linked DNA in the vector, is termed
- | | |
|--------------------------|----------------------|
| (1) Palindromic sequence | (2) Recognition site |
| (3) Selectable marker | (4) Ori site |

Ans. (4)

Ori site controls the copy number; high ori give high copy number.

- 16.** Identify the wrong statement with regard to Restriction Enzymes.
- (1) They are useful in genetic engineering.
 - (2) Sticky ends can be joined by using DNA ligases.
 - (3) Each restriction enzyme functions by inspecting the length of a DNA sequence.
 - (4) They cut the strand of DNA at palindromic sites.

Ans. (3)

Restriction enzyme produces sticky site and cut DNA strand at palindromic site but does not cut DNA strand inspecting the length

17. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are

- (1) Ammonia and oxygen (2) Ammonia and hydrogen
(3) Ammonia alone (4) Nitrate alone

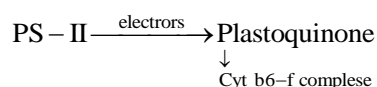
Ans. (2)

$\text{NH}_3 + \text{H}_2$ are products of reaction catalyzed by Nitrogenase enzyme in root nodules of leguminous plants like fenugreek. Nitrogenase works in an anaerobic environment inside nodules.

18. In light reaction, plastoquinone facilitates the transfer of electrons from

- (1) PS-I to NADP^+ (2) PS-I to ATP synthase
(3) PS-II to Cyt b_6/f complex (4) Cyt b_6/f complex to PS-I

Ans. (3)



So Plastoquinone facilitates.

During Light Reaction – Photosynthesis.

19. Which of the following hormone levels will cause release of ovum (ovulation) from the Graffian follicle?

- (1) Low concentration of LH
(2) Low concentration of FSH
(3) High concentration of Estrogen
(4) High concentration of Progesterone

Ans. (3)

High LH leads to ovulation but it is not mentioned in option So high estrogen concentration will be answer as it is responsible for increasing the LH concentration by giving positive feedback to hypothalamus.

20. The first phase of translation is

- (1) Aminoacylation of tRNA
(2) Recognition of an anti-codon
(3) Binding of mRNA to ribosome
(4) Recognition of DNA molecule

Ans. (1)

Binding of m-RNA to ribosome is first phase translation. During translation process, proteins are formed from RNA.

21. The roots that originate from the base of the stem are

- (1) Prop roots (2) Lateral roots
(3) Fibrous roots (4) Primary roots

Ans. (3)

Fibrous roots originate from the base of the stem e.g. in Monocots – Wheat, rice.

22. Identify the wrong statement with reference to transport of oxygen

- (1) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin
- (2) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin
- (3) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2
- (4) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin

Ans. (1)

Higher H^+ concentration \propto PCO_2 which do not favour the formation of oxyhemoglobin and in alveoli H^+ concentration is not high. So it's a wrong statement

23. In gel electrophoresis, separated DNA fragments can be visualized with the help of

- (1) Acetocarmine in UV radiation
- (2) Ethidium bromide in infrared radiation
- (3) Acetocarmine in bright blue light
- (4) Ethidium bromide in UV radiation

Ans. (4)

Ethidium bromide and UV radiation is used for making the DNA strand Visible.

24. The enzyme enterokinase helps in conversion of

- (1) caseinogen into casein
- (2) pepsinogen into pepsin
- (3) protein into polypeptides
- (4) trypsinogen into trypsin

Ans. (4)

Enterokinase present in small intestine



25. Experimental verification of the chromosomal theory of inheritance was done by

- (1) Boveri
- (2) Morgan
- (3) Mendel
- (4) Sutton

Ans. (2)

Experiment proof of chromosomal theory of inheritance by Morgan. Boveri and Sutton gave only theoretical explanation.

26. According to Robert May, the global species diversity is about

- (1) 50 million
- (2) 7 million
- (3) 1.5 million
- (4) 20 million

Ans. (2)

According Robert May around seven million is global species diversity.

27. Match the organism with its use in biotechnology.

- | | |
|--------------------------------------|------------------------------------------|
| (a) <i>Bacillus thuringiensis</i> | (i) Cloning vector |
| (b) <i>Thermus aquaticus</i> | (ii) Construction of first rDNA molecule |
| (c) <i>Agrobacterium tumefaciens</i> | (iii) DNA polymerase |
| (d) <i>Salmonella typhimurium</i> | (iv) Cry proteins |

Select the correct option from the following:

- | | | | |
|-----------|-------|-------|------|
| (a) | (b) | (c) | (d) |
| (1) (iii) | (ii) | (iv) | (i) |
| (2) (iii) | (iv) | (i) | (ii) |
| (3) (ii) | (iv) | (iii) | (i) |
| (4) (iv) | (iii) | (i) | (ii) |

Ans. (4)

Bacillus thuringiensis is bacteria from where cry gene is obtained for the formation of cry protein.

Salmonella typhimurium is used for formation of first r – DNA molecule.

Thermus aquaticus is DNA polymerase used in PCR.

28. Identify the correct statement with regard to G_1 phase (Gap 1) of interphase.

- (1) Cell is metabolically active, grows but does not replicate its DNA.
- (2) Nuclear Division takes place.
- (3) DNA synthesis or replication takes place.
- (4) Reorganisation of all cell components takes place.

Ans. (1)

In G_1 phase, most of the cell organelles are formed again.

29. Which of the following is correct about viroids?

- (1) They have DNA with protein coat
- (2) They have free DNA without protein coat
- (3) They have RNA with protein coat
- (4) They have free RNA without protein coat

Ans. (4)

Viroids have low mol weight RNA without protein coat.

30. The transverse section of a plant shows following anatomical features :

- (a) Large number of scattered vascular bundles surrounded by bundle sheath
- (b) Large conspicuous parenchymatous ground tissue
- (c) Vascular bundles conjoint and closed
- (d) Phloem parenchyma absent Identify the category of plant and its part :

- (1) Dicotyledonous stem (2) Dicotyledonous root
(3) Monocotyledonous stem (4) Monocotyledonous root

Ans. (3)

These are all characteristic features of monocot stem Secondary growth is absent in monocot stem.

31. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask

- (1) CH₄, H₂, NH₃ and water vapour at 600°C
(2) CH₃, H₂, NH₃ and water vapour at 600°C
(3) CH₄, H₂, NH₃ and water vapour at 800°C
(4) CH₃, H₂, NH₄ and water vapour at 800°C

Ans. (3)

S.L miller used CH₄, H₂, NH₃ for production of amino acid at 800°C.

32. Identify the basic amino acid from the following.

- (1) Lysine (2) Valine
(3) Tyrosine (4) Glutamic Acid

Ans. (1)

33. Snow-blindness in Antarctic region is due to

- (1) High reflection of light from snow
(2) Damage to retina caused by infra-red rays
(3) Freezing of fluids in the eye by low temperature
(4) Inflammation of cornea due to high dose of UV-B radiation

Ans. (4)

Snow – blindness is inflammation of cornea due to high dose of UV – B radiation.

34. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G₀). This process occurs at the end of

- (1) S phase (2) G₂ phase
(3) M phase (4) G₁ phase

Ans. (4)

Go stage occurs at the end of G₁, stage. E.g. Nerve cell enters in permanent G₀ stage and do no divide further.

35. Which of the following regions of the globe exhibits highest species diversity?

- (1) Himalayas (2) Amazon forests
(3) Western Ghats of India (4) Madagascar

Ans. (2)

Amazon forests have highest species diversity. They are called as lungs of the planet.

36. Identify the incorrect statement.

- (1) Sapwood is the innermost secondary xylem and is lighter in colour
- (2) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour
- (3) Heart wood does not conduct water but gives mechanical support
- (4) Sapwood is involved in conduction of water and minerals from root to leaf

Ans. (1)

Sapwood is present on outer side and heart wood on the inner side of wood.

37. Floridean starch has structure similar to

- (1) Mannitol and algin
- (2) Laminarin and cellulose
- (3) Starch and cellulose
- (4) Amylopectin and glycogen

Ans. (4)

Floridean starch has structure similar to Amylopectin and glycogen.

38. Which of the following is not an attribute of a population?

- (1) Mortality
- (2) Species interaction
- (3) Sex ratio
- (4) Natality

Ans. (2)

Species interaction is not an attribute.

39. The number of substrate level phosphorylations in one turn of citric acid cycle is

- (1) Two
- (2) Three
- (3) Zero
- (4) One

Ans. (4)

In one turn of citric – TCA cycle in one step GTP or ATP is formed.

40. Identify the correct statement with reference to human digestive system.

- (1) Ileum is a highly coiled part
- (2) Vermiform appendix arises from duodenum
- (3) Ileum opens into small intestine
- (4) Serosa is the innermost layer of the alimentary canal

Ans. (1)

Ileum is the part of small intestine and it is highly coiled part which open into caecum with the help of ileo - caecal valve

41. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive?

- (1) ICSI and ZIFT
- (2) GIFT and ICSI
- (3) ZIFT and IUT
- (4) GIFT and ZIFT

Ans. (3)

IUT → transfer of embryo with more than 8 blastomere

ZIFT → Transfer of embryo less than 8 blastomere in fallopian tube.

42. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is correct?

- (1) Gross primary productivity and Net primary productivity are one and same
- (2) There is no relationship between Gross primary productivity and Net primary productivity
- (3) Gross primary productivity is always less than net primary productivity
- (4) Gross primary productivity is always more than net primary productivity

Ans. (4)

GPP is always more than NPP.

$NPP = GPP - \text{Respiratory loss.}$

43. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

- (1) Ethylene
- (2) Abscisic acid
- (3) Cytokinin
- (4) Gibberellin

Ans. (4)

Gibberellin increases internode length.

44. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their

- (1) Defence action
- (2) Effect on reproduction
- (3) Nutritive value
- (4) Growth response

Ans. (1)

45. Select the correct match

- (1) Sickle cell anaemia – Autosomal recessive trait, chromosome-11
- (2) Thalassemia – X linked
- (3) Haemophilia – Y linked
- (4) Phenylketonuria – Autosomal dominant trait

Ans. (1)

SCA is Autosomal Recessive disorder.

Thalassemia is also Autosomal Recessive disorder.

Haemophilia is X-linked recessive disorder.

Phenyl ketonuria is Autosomal Recessive disorder.

46. Select the correct statement.

- (1) Insulin acts on pancreatic cells and adipocytes.
- (2) Insulin is associated with hyperglycemia.
- (3) Glucocorticoids stimulate gluconeogenesis.
- (4) Glucagon is associated with hypoglycemia.

Ans. (3)

Insulin produce by cell of pancreas and act on glucose; it decreases glucose concentration in blood.

Glucocorticoids stimulate the formation of glucose by new substrates like fat So it is known as gluconeogenesis.

Glucagon increases glucose concentration in blood.

47. Which of the following refer to correct example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action?

- (a) Darwin's Finches of Galapagos islands.
 - (b) Herbicide resistant weeds.
 - (c) Drug resistant eukaryotes.
 - (d) Man-created breeds of domesticated animals like dogs.
- (1) (b), (c) and (d) (2) only (d)
(3) only (a) (4) (a) and (c)

Ans. (1)

b, c, d is correct as anthropogenic actions are manmade evolution which is due to the contribution of human is nature.

48. Choose the correct pair from the following

- (1) Nucleases - Separate the two strands of DNA
- (2) Exonucleases - Make cuts at specific positions within DNA
- (3) Ligases - Join the two DNA molecules
- (4) Polymerases - Break the DNA into fragments

Ans. (3)

Ligase join the two DNA molecule.

Ligases joins DNA piece g, joins okazaki fragments during DNA Replication.

49. Embryological support for evolution was disapproved by

- (1) Charles Darwin (2) Oparin
- (3) Karl Ernst von Baer (4) Alfred Wallace

Ans. (3)

Von Baer

50. Goblet cells of alimentary canal are modified from

- (1) Chondrocytes (2) Compound epithelial cells
- (3) Squamous epithelial cells (4) Columnar epithelial cells

Ans. (4)

Goblet cells are modification of columnar epithelium.

51. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to

- (1) Plant nematodes (2) Insect predators
(3) Insect pests (4) Fungal diseases

Ans. (3)

Bt cotton was resistant against insect pest

52. Which of the following statements are true for the phylum-Chordata?

- (a) In Urochordata notochord extends from head to tail and it is present throughout their life.
(b) In Vertebrata notochord is present during the embryonic period only.
(c) Central nervous system is dorsal and hollow.
(d) Chordata is divided into 3 subphyla: Hemichordata, Tunicata and Cephalochordata.
- (1) (a) and (b) (2) (b) and (c)
(3) (d) and (c) (4) (c) and (a)

Ans. (2)

b, c is correct as in vertebrate's notochord is only present in embryonic stage and CNS is hollow and dorsal

53. Which of the following is put into Anaerobic sludge digester for further sewage treatment?

- (1) Effluents of primary treatment
(2) Activated sludge
(3) Primary sludge
(4) Floating debris

Ans. (2)

Activated sludge is put into anaerobic sludge digester for further sewage treatment.

54. Identify the substances having glycosidic bond and peptide bond, respectively in their structure

- (1) Cellulose, lecithin (2) Inulin, insulin
(3) Chitin, cholesterol (4) Glycerol, trypsin

Ans. (2)

Inulin is a homopolysaccharide so consist glycosidic bond and Insulin is a proteinaceous hormone contain peptide bond.

55. Match the following diseases with the causative organism and select the correct option.

- | Column-I | Column-II |
|----------------|------------------|
| (a) Typhoid | (i) Wuchereria |
| (b) Pneumonia | (ii) Plasmodium |
| (c) Filariasis | (iii) Salmonella |
| (d) Malaria | (iv) Haemophilus |

- | | | | | |
|-----|-------|-------|-------|-------|
| | (a) | (b) | (c) | (d) |
| (1) | (ii) | (i) | (iii) | (iv) |
| (2) | (iv) | (i) | (ii) | (iii) |
| (3) | (i) | (iii) | (ii) | (iv) |
| (4) | (iii) | (iv) | (i) | (ii) |

Ans. (4)

- | | | |
|------------|---|------------------|
| Typhoid | → | Salmonella typhi |
| Pneumonia | → | Haemophilus |
| Filariasis | → | Wuchereria |
| Malaria | → | Plasmodium |

56. Match the following columns and select the correct option.

- | Column-I | | Column-II | |
|----------|-------------------|-----------|----------------------------------|
| (a) | Clostridium | (i) | Cyclosporin-A butylicum |
| (b) | Trichoderma | (ii) | Butyric Acid polysporum |
| (c) | Monascus | (iii) | Citric Acid purpureus |
| (d) | Aspergillus niger | (iv) | Blood cholesterol lowering agent |

- | | | | | |
|-----|-------|-------|------|-------|
| | (a) | (b) | (c) | (d) |
| (1) | (i) | (ii) | (iv) | (iii) |
| (2) | (iv) | (iii) | (ii) | (i) |
| (3) | (iii) | (iv) | (ii) | (i) |
| (4) | (ii) | (i) | (iv) | (iii) |

Ans. (4)

These all are the bioactive molecules and produced by these microorganisms.

57. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams?

- | | |
|--------------------|-------------------------|
| (1) Cross breeding | (2) Inbreeding |
| (3) Out crossing | (4) Mutational breeding |

Ans. (1)

Cross breeding

58. Select the correct events that occur during inspiration.

- | | |
|--------------------------------------------------|-----------------|
| (a) Contraction of diaphragm | |
| (b) Contraction of external inter-costal muscles | |
| (c) Pulmonary volume decreases | |
| (d) Intra pulmonary pressure increases | |
| (1) (a), (b) and (d) | (2) only (d) |
| (3) (a) and (b) | (4) (c) and (d) |

Ans. (3)

During inspiration contraction occurs in diaphragm as well as EICM and volume increases pulmonary pressure decreases.

59. Match the following columns and select the correct option.

Column-I	Column-II
(a) Gregarious, polyphagous pest	(i) Asterias
(b) Adult with radial symmetry and larva with bilateral symmetry	(ii) Scorpion
(c) Book lungs	(iii) Ctenophora
(d) Bioluminescence	(iv) Locusta

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

Ans. (4)

Book lung → scorpion

Adult with radial symmetry → Asterias

Bioluminescence & Ctenophora

Gregarious pest → Locust

60. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells?

- (1) Golgi bodies (2) Polysomes
(3) Endoplasmic reticulum (4) Peroxisomes

Ans. (1)

Glycoproteins and glycolipids are formed by Golgi bodies.

61. The specific palindromic sequence which is recognized by EcoRI is

- (1) 5' - CTTAAG - 3'
3' - GAATTC - 5'
(2) 5' - GGATCC - 3'
3' - CCTAGG - 5'
(3) 5' - GAATTC - 3'
3' - CTTAAG - 5'
(4) 5' - GGAACC - 3'
3' - CCTTGG - 5'

Ans. (3)

62. Dissolution of the synaptonemal complex occurs during
- | | |
|---------------|---------------|
| (1) Diplotene | (2) Leptotene |
| (3) Pachytene | (4) Zygotene |

Ans. (1)

Synaptonemal complex dissolution occurs at Diplotene stage.

63. Match the trophic levels with their correct species examples in grassland ecosystem.

- | | |
|--------------------------|--------------|
| (a) Fourth trophic level | (i) Crow |
| (b) Second trophic level | (ii) Vulture |
| (c) First trophic level | (iii) Rabbit |
| (d) Third trophic level | (iv) Grass |

Select the correct option

- | | | | |
|-----------|-------|-------|------|
| (a) | (b) | (c) | (d) |
| (1) (iv) | (iii) | (ii) | (i) |
| (2) (i) | (ii) | (iii) | (iv) |
| (3) (ii) | (iii) | (iv) | (i) |
| (4) (iii) | (ii) | (i) | (iv) |

Ans. (1)

Synaptonemal complex dissolution occurs at Diplotene stage.

64. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits?

- | | |
|--------|-------|
| (1) 14 | (2) 8 |
| (3) 4 | (4) 2 |

Ans. (1)

Fourteen true breeding plant varieties were selected by Mendel.

65. Match the following columns and select the correct option.

- | Column-I | Column-II |
|------------------------------------|----------------------------------|
| (a) Bt cotton | (i) Gene therapy |
| (b) Adenosine deaminase deficiency | (ii) Cellular defence |
| (c) RNAi | (iii) Detection of HIV infection |
| (d) PCR | (iv) Bacillus thuringiensis |

- | | | | |
|-----------|-------|-------|-------|
| (a) | (b) | (c) | (d) |
| (1) (ii) | (iii) | (iv) | (i) |
| (2) (i) | (ii) | (iii) | (iv) |
| (3) (iv) | (i) | (ii) | (iii) |
| (4) (iii) | (ii) | (i) | (iv) |

Ans. (3)

Bt Cotton → B. thuringensis

Adenosine deaminase → Gene therapy

RNAi → Cellular Defence

PCR → HFV infection detection

66. Match the following columns and select the correct option.

Column-I				Column-II			
(a)	6-15 pairs of gill slits	(i)	Trygon	(i)	Trygon		
(b)	Heterocercal caudal fin	(ii)	Cyclostomes	(ii)	Cyclostomes		
(c)	Air Bladder	(iii)	Chondrichthyes	(iii)	Chondrichthyes		
(d)	Poison sting	(iv)	Osteichthyes	(iv)	Osteichthyes		
(a)	(b)	(c)	(d)				
(1)	(iv)	(ii)	(iii)	(i)			
(2)	(i)	(iv)	(iii)	(ii)			
(3)	(ii)	(iii)	(iv)	(i)			
(4)	(iii)	(iv)	(i)	(ii)			

Ans. (3)

6 – 15 pair gill slit – cyclostomes

Heterocercal caudal fin → chondrichthyes

Air Bladder → Osteichthyes

Poison sting → Trygon

67. The process of growth is maximum during

- | | |
|----------------|---------------|
| (1) Senescence | (2) Dormancy |
| (3) Log phase | (4) Lag phase |

Ans. (3)

Process of growth is maximum during log phase. During lag phase slow growth occurs.

68. Identify the wrong statement with reference to immunity.

- (1) Active immunity is quick and gives full response.
- (2) Foetus receives some antibodies from mother, it is an example for passive immunity.
- (3) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".
- (4) When ready-made antibodies are directly given, it is called "Passive immunity".

Ans. (1)

Active immunity takes time so it is slow not quick so the first statement is incorrect.

69. Match the following columns and select the correct option.

Column-I					Column-II				
(a)	Floating Ribs				(i)	Located between second and seventh ribs			
(b)	Acromion				(ii)	Head of the Humerus			
(c)	Scapula				(iii)	Clavicle			
(d)	Glenoid cavity				(iv)	Do not connect with the sternum			
(a)	(b)	(c)	(d)						
(1)	(iii)	(ii)	(iv)	(i)					
(2)	(iv)	(iii)	(i)	(ii)					
(3)	(ii)	(iv)	(i)	(iii)					
(4)	(i)	(iii)	(ii)	(iv)					

Ans. (2)

Floating ribs → Do not attach to the sternum

Acromion → Present on scapula, clavicle get attach to it

Scapula → Present between 2nd and 7th rib

Glenoid Cavity → Head of the scapula.

70. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately

- | | | | |
|-----|------------|-----|------------|
| (1) | 2.2 meters | (2) | 2.7 meters |
| (3) | 2.0 meters | (4) | 2.5 meters |

Ans. (1)

It is 2.2 meters distance between two bp = $0.34 \text{ nm} = 0.34 \times 10^{-9} \text{ m}$

∴ for → $6.6 \times 10^9 \times 0.34 \times 10^{-9} = 2.2 \text{m}$.

71. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus?

- (1) Ketonuria and Glycosuria
- (2) Renal calculi and Hyperglycaemia
- (3) Uremia and Ketonuria
- (4) Uremia and Renal Calculi

Ans. (1)

Presence of ketone body and glucose indicate the diabetes mellitus

72. Bilaterally symmetrical and acoelomate animals are exemplified by

- | | | | |
|-----|---------------|-----|-----------------|
| (1) | Aschelminthes | (2) | Annelida |
| (3) | Ctenophora | (4) | Platyhelminthes |

Ans. (4)

Platyhelminthes – First time bilateral symmetry came in this phylum with 3 germ layer but not coelom.

73. Ray florets have

- (1) Hypogynous ovary (2) Half inferior ovary
(3) Inferior ovary (4) Superior ovary

Ans. (3)

Ray florets of sunflower have inferior ovary [Epigynous]

74. The infectious stage of Plasmodium that enters the human body is

- (1) Female gametocytes (2) Male gametocytes
(3) Trophozoites (4) Sporozoites

Ans. (4)

Sporozoites infectious stage in human.

75. Which of the following statements is not correct?

- (1) The functional insulin has A and B chains linked together by hydrogen bonds.
(2) Genetically engineered insulin is produced in E.Coli.
(3) In man insulin is synthesised as a proinsulin
(4) The proinsulin has an extra peptide called C-peptide.

Ans. (1)

A and B chain linked by disulphide bond not by hydrogen bond

76. In water hyacinth and water lily, pollination takes place by :

- (1) Wind and water (2) Insects and water
(3) Insects or wind (4) Water currents only

Ans. (3)

Water hyacinth and water lily have highly attractive flower which attracts insects for pollination.

77. Cuboidal epithelium with brush border of microvilli is found in

- (1) Proximal convoluted tubule of nephron
(2) Eustachian tube
(3) Lining of intestine
(4) Ducts of salivary gland

Ans. (1)

In PCT cuboidal epithelium is present with microvilli to increase the absorption so that $\approx 70\%$ of reabsorption takes place in PCT

78. Match the following columns and select the correct option.

- | Column-I | Column-II |
|---------------------|--------------------------|
| (a) Pituitary gland | (i) Grave's disease |
| (b) Thyroid gland | (ii) Diabetes mellitus |
| (c) Adrenal gland | (iii) Diabetes insipidus |
| (d) Pancreas | (iv) Addison's disease |

- | | | | | |
|-----|-------|-------|------|-------|
| | (a) | (b) | (c) | (d) |
| (1) | (iii) | (i) | (iv) | (ii) |
| (2) | (ii) | (i) | (iv) | (iii) |
| (3) | (iv) | (iii) | (i) | (ii) |
| (4) | (iii) | (ii) | (i) | (iv) |

Ans. (1)

Pituitary gland → posterior pituitary releases two hormone oxytocin and vasopressin so vasopressin (ADH); if releases in less amount leads to Diabetes insipidus

Thyroid gland → Grave's disease

Adrenal gland → Addison's disease

Pancrease → Diabetes Mellitus

79. Which one of the following is the most abundant protein in the animals?

- | | |
|-----------------|--------------|
| (1) Lectin | (2) Insulin |
| (3) Haemoglobin | (4) Collagen |

Ans. (4)

Collagen

80. If the head of cockroach is removed, it may live for few days because

- (1) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.
- (2) the head holds a 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.
- (3) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.
- (4) the cockroach does not have nervous system.

Ans. (2)

Head holds 1/3 part of nervous system while rest is situated along the dorsal part of the body.

81. Flippers of Penguins and Dolphins are examples of

- | | |
|-------------------------|--------------------------|
| (1) Industrial melanism | (2) Natural selection |
| (3) Adaptive radiation | (4) Convergent evolution |

Ans. (4)

Flippers of penguins and dolphin are analogous structures which is example of convergent evolution.

82. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is

- | | |
|-------------------|-------------------|
| (1) Imbibition | (2) Plasmolysis |
| (3) Transpiration | (4) Root pressure |

Ans. (4)

This is due to power of Guttation due to root pressure.

83. Match the following with respect to meiosis

- | | |
|----------------|---------------------|
| (a) Zygotene | (i) Terminalization |
| (b) Pachytene | (ii) Chiasmata |
| (c) Diplotene | (iii) Crossing over |
| (d) Diakinesis | (iv) Synapsis |

Select the correct option from the following

- | | | | |
|-------------------------|-----|-----|-----|
| (a) | (b) | (c) | (d) |
| (1) (i) (ii) (iv) (iii) | | | |
| (2) (ii) (iv) (iii) (i) | | | |
| (3) (iii) (iv) (i) (ii) | | | |
| (4) (iv) (iii) (ii) (i) | | | |

Ans. (4)

These are various stages of meiosis. During pachytene stage, crossing over between the homologous chromosomes occurs.

84. The QRS complex in a standard ECG represents

- | | |
|----------------------------------|----------------------------------|
| (1) Depolarisation of ventricles | (2) Repolarisation of ventricles |
| (3) Repolarisation of auricles | (4) Depolarisation of auricles |

Ans. (1)

QRs – ventricular systole means depolarization of ventricles.

85. Select the option including all sexually transmitted diseases.

- | |
|------------------------------------------|
| (1) AIDS, Malaria, Filaria |
| (2) Cancer, AIDS, Syphilis |
| (3) Gonorrhoea, Syphilis, Genital herpes |
| (4) Gonorrhoea, Malaria, Genital herpes |

Ans. (3)

STDs →
Gonorrhoea
Syphilis
Genital herpes
Genital warts
AIDS
Hepatitis B

86. Identify the wrong statement with reference to the gene 'I' that controls ABO blood groups.

- | |
|---------------------------------------------------------------------------------|
| (1) When I^A and I^B are present together, they express same type of sugar. |
| (2) Allele 'i' does not produce any sugar. |
| (3) The gene (I) has three alleles. |
| (4) A person will have only two of the three alleles. |

Ans. (1)

I^A & I^B produces different types of sugar

They produce different types of organs when present together.

87. Which of the following is not an inhibitory substance governing seed dormancy?

- | | |
|----------------------|------------------------|
| (1) Phenolic acid | (2) Para-ascorbic acid |
| (3) Gibberellic acid | (4) Abscisic acid |

Ans. (3)

88. Match the following columns and select the correct option.

- | Column-I | | | | Column-II | | | |
|----------|-----------------|-------|------|-----------|---------------------------------|--|--|
| (a) | Organ of Corti | | | (i) | Connects middle ear and pharynx | | |
| (b) | Cochlea | | | (ii) | Coiled part of the labyrinth | | |
| (c) | Eustachian tube | | | (iii) | Attached to the oval window | | |
| (d) | Stapes | | | (iv) | Located on the basilar membrane | | |
| (a) | (b) | (c) | (d) | | | | |
| (1) | (iv) | (ii) | (i) | (iii) | | | |
| (2) | (i) | (ii) | (iv) | (iii) | | | |
| (3) | (ii) | (iii) | (i) | (iv) | | | |
| (4) | (iii) | (i) | (iv) | (ii) | | | |

Ans. (1)

Organ of Corti present on basilar membrane Cochlea is coiled part, Eustachian tube.

Cochlea – middle ear and pharynx.

Stapes – smallest bone attached to the oval window.

89. The ovary is half inferior in : Easy & Effective

- | | |
|---------------|-------------|
| (1) Sunflower | (2) Plum |
| (3) Brinjal | (4) Mustard |

Ans. (2)

Plums – Perigynous ovary.

90. Match the following

- | | | | |
|-----|---------------------------------|-------|----------|
| (a) | Inhibitor of catalytic activity | (i) | Ricin |
| (b) | Possess peptide bonds | (ii) | Malonate |
| (c) | Cell wall material in fungi | (iii) | Chitin |
| (d) | Secondary metabolite | (iv) | Collagen |

Choose the correct option from the following

- | | | | | | | | |
|-----|-------|-------|-------|------|--|--|--|
| (a) | (b) | (c) | (d) | | | | |
| (1) | (iii) | (iv) | (i) | (ii) | | | |
| (2) | (ii) | (iii) | (i) | (iv) | | | |
| (3) | (ii) | (iv) | (iii) | (i) | | | |
| (4) | (iii) | (i) | (iv) | (ii) | | | |

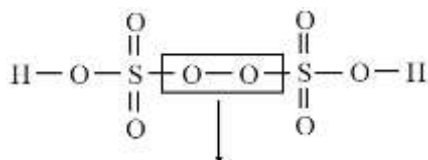
Ans. (3)

Chitin is present in C.W. of fungi Ricin is secondary metabolite collagen contain peptide bond. Malonate is inhibitor of catalytic activity.

91. Which of the following oxoacid of sulphur has –O–O– linkage?

- (1) $\text{H}_2\text{S}_2\text{O}_8$, peroxodisulphuric acid (2) $\text{H}_2\text{S}_2\text{O}_7$, pyrosulphuric acid
(3) H_2SO_3 , sulphurous acid (4) H_2SO_4 , sulphuric acid

Ans. (1)



92. An increase in the concentration of the reactants of a reaction leads to change in

- (1) threshold energy (2) collision frequency
(3) activation energy (4) heat of reaction

Ans. (4)

$Z_{12} \propto$ number of reactant molecules per unit volume.

93. Identify the **incorrect** match.

Name **IUPAC Official Name**

- (a) Unnilunium (i) Mendeleevium
(b) Unniltrium (ii) Lawrencium
(c) Unnilhexium (iii) Seaborgium
(d) Unununnium (iv) Darmstadtium

- (1) (c) - (iii) (2) (d) - (iv)
(3) (a) - (i) (4) (b) - (ii)

Ans. (2)

Unnunium ($Z = 111$) it is Rontgenium (Rg) not darmstadtium.

94. A mixture of N_2 and Ar gases in a cylinder contains 7g of N_2 and 8g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is

[Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]

- (1) 15 bar (2) 18 bar
(3) 9 bar (4) 12 bar

Ans. (1)

N_2 Ar

7 gram 8 gram

Moles $\frac{7}{28} = \frac{1}{4}$ $\frac{8}{40} = \frac{1}{5}$

(partial pressure) $\text{N}_2 = \text{PT} \times (\text{mole fraction}) \text{N}_2$

$$= 27 \times \frac{1/4}{1/4 + 1/5}$$

$$= 27 \times \frac{1/4}{9/20}$$

$$= 27 \times \frac{20}{4 \times 9}$$

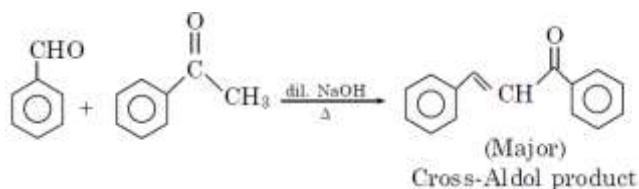
$$= 3 \times 5$$

$$= 15 \text{ bar}$$

95. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as

- (1) Cross Cannizzaro's reaction (2) Cross Aldol condensation
 (3) Aldol condensation (4) Cannizzaro's reaction

Ans. (2)



96. Which one of the followings has maximum number of atoms?

- (1) 1g of O₂(g) [Atomic mass of O = 16]
 (2) 1g of Li(s) [Atomic mass of Li = 7]
 (3) 1g of Ag(s) [Atomic mass of Ag=108]
 (4) 1g of Mg(s) [Atomic mass of Mg=24]

Ans. (2) Education Made Easy & Effective

Number of atoms

$$= \frac{w}{\text{molar mass}} \times N_A \times \text{atomicity}$$

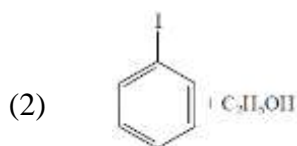
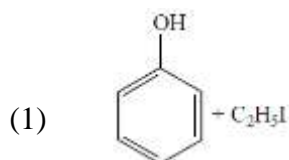
$$(1) \frac{1}{7} \times N_A \times 1$$

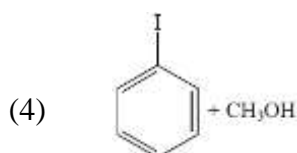
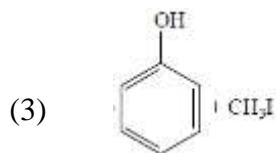
$$(2) \frac{1}{108} \times N_A \times 1$$

$$(3) \frac{1}{24} \times N_A \times 1$$

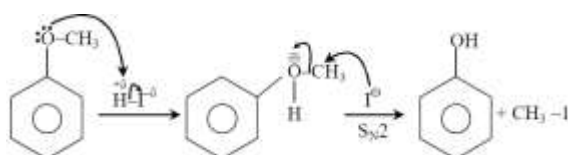
$$(4) \frac{1}{32} \times N_A \times 2$$

97. Anisole on cleavage with HI gives:

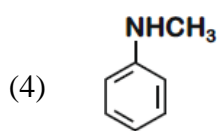
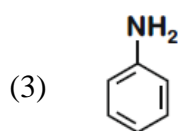
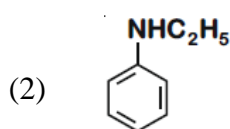
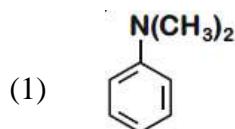




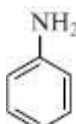
Ans. (3)



98. Which of the following amine will give the carbylamine test?



Ans. (3)

Since  is primary amine it gives carbylamine test (isocyanide test)

99. Identify the incorrect statement.

- (1) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
- (2) The oxidation states of chromium in CrO_4^{2-} and $\text{Cr}_2\text{O}_7^{2-}$ are not the same.
- (3) Cr^{2+} (d^4) is a stronger reducing agent than Fe^{2+} (d^6) in water.
- (4) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

Ans. (2)

chromate (CrO_4^{2-}) \Rightarrow oxidation state = +6

dichromate ($\text{Cr}_2\text{O}_7^{2-}$) \Rightarrow oxidation state = +6

oxidation state are same.

100. Which of the following is a basic amino acid?

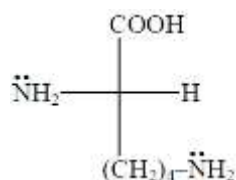
(1) Tyrosine

(2) Lysine

(3) Serine

(4) Alanine

Ans. (2)



Since it contains more number of -NH_2 groups as compared to -COOH groups hence it is basic amino acid.

101. Which of the following is a natural polymer?

- (1) polybutadiene (2) poly (Butadiene-acrylonitrile)
 (3) cis-1, 4-polyisoprene (4) poly (Butadiene-styrene)

Ans. (3)

12th NCERT (15.2.4)

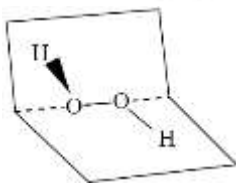
102. Match the following and identify the correct option.

- (a) $\text{CO(g)} + \text{H}_2\text{(g)}$ (i) $\text{Mg(HCO}_3)_2 + \text{Ca(HCO}_3)_2$
 (b) Temporary Hardness of Water (ii) An electron deficient hydride
 (c) B_2H_6 (iii) Synthesis gas
 (d) H_2O_2 (iv) Non-planar Structure

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

Ans. (3)

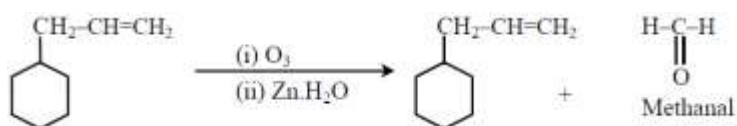
- (a) $\text{CO} + \text{H}_2$... (iii) synthesis gas
 (b) Temporary Hardness ...
 (i) $\text{Mg(HCO}_3)_2 + \text{Ca(HCO}_3)_2$
 (c) B_2H_6 ... (ii) Electron deficient ($6e^-$)
 (d) H_2O_2 ... (iv) Non-planar structure



103. An alkene on ozonolysis gives methanol as one of the product. Its structure is

- (1) (2)
 (3) (4)

Ans. (1)



104. The rate constant for a first order reaction is $4.606 \times 10^{-3} \text{ s}^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is
- (1) 500 s (2) 1000 s
 (3) 100 s (4) 200 s

Ans. [1]

$$k = 4.606 \times 10^{-3} \text{ s}^{-1}$$

$$kt = 2.303 \log_{10} \frac{2}{0.2}$$

$$4.606 \times 10^{-3} \times t = 2.303 \times \log 10$$

$$t = \frac{1000}{2} = 500 \text{ s}$$

105. On electrolysis of dil. Sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be
- (1) H_2S gas (2) SO_2 gas
 (3) Hydrogen gas (4) Oxygen gas

Ans. (4)



At Anode : $2\text{H}_2\text{O} \rightarrow \text{O}_2(\text{g}) + 4\text{H}^+(\text{aq}) + 4\text{e}^-$ Oxygen gas will liberate at anode.

106. An element has a body centred cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is
- (1) $\frac{4}{\sqrt{3}} \times 288 \text{ pm}$ (2) $\frac{4}{\sqrt{2}} \times 288 \text{ pm}$
 (3) $\frac{\sqrt{3}}{4} \times 288 \text{ pm}$ (4) $\frac{\sqrt{2}}{4} \times 288 \text{ pm}$

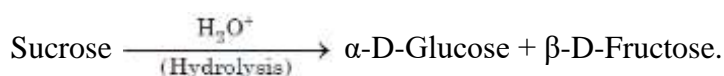
Ans. (3)

$$\sqrt{3}a = 4r \text{ (for bcc lattice)}$$

$$r = \frac{\sqrt{3}}{4} \times 288 \text{ pm}$$

107. Sucrose on hydrolysis gives:
- (1) α -D-Glucose + β -D-Fructose (2) α -D-Fructose + β -D-Fructose
 (3) β -D-Glucose + α -D-Fructose (1) α -D-Glucose + β -D-Glucose

Ans. (1)



108. Which of the following is not correct about carbon monoxide?
- (1) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin
 (2) It is produced due to incomplete combustion

- (3) It forms carboxyhaemoglobin
 (4) It reduces oxygen carrying ability of blood

Ans. (1)

Not correct

Carboxyhaemoglobin (haemoglobin bound to CO) is more stable than oxyhaemoglobin.

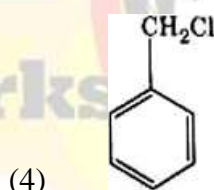
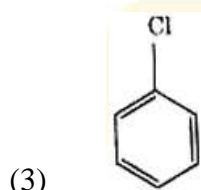
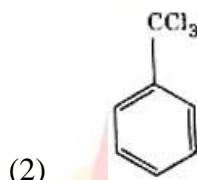
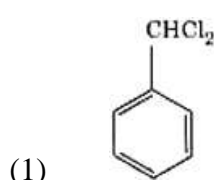
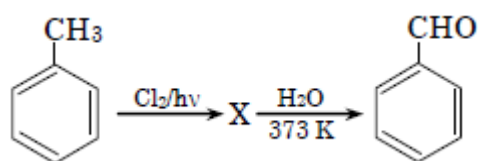
109. The mixture which shows positive deviation from Raoult's law is

- (1) Acetone + Chloroform (2) Chloroethane + Bromoethane
 (3) Ethanol + Acetone (4) Benzene + Toluene

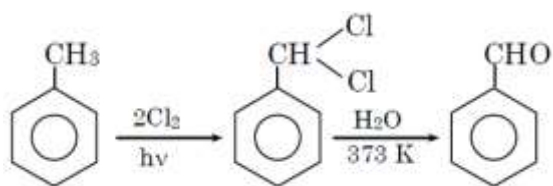
Ans. (3)

Hydrogen bond of ethanol gets weakened by addition of acetone.

110. Identify compound X in the following sequence of reactions:



Ans. (1)



111. The freezing point depression constant (K_f) of benzene is $5.12\text{ K kg mol}^{-1}$. The freezing point depression for the solution of molality of 0.078 m containing a non-electrolyte solute in benzene is (rounded off up to two decimal places):

- (1) 0.40 K (2) 0.60 K
 (3) 0.20 K (4) 0.80 K

Ans. (1)

$$\begin{aligned} \Delta T_f &= K_f \times m \\ &= 5.12 \times 0.078 \\ \Delta T_f &= 0.40\text{ K} \end{aligned}$$

112. Which of the following is a cationic detergent?

- (1) Cetyltrimethyl ammonium bromide (2) Sodium dodecylbenzene sulphonate
 (3) Sodium lauryl sulphate (4) Sodium stearate

Ans. (1)

$C_{19}H_{42}N^+Br^-$ (cationic detergent)

12th NCERT (16.5.2)

Synthetic detergents.

113. Paper chromatography is an example of

- (1) Thin layer chromatography (2) Column chromatography
 (3) Adsorption chromatography (4) Partition chromatography

Ans. (4)

11th NCERT (12.8.5) chromatography.

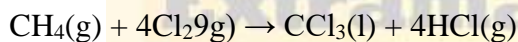
114. Identify the **correct** statement from the following:

- (1) Vapour phase refining is carried out for Nickel by Van Arkel method.
 (2) Pig iron can be moulded into a variety of shapes.
 (3) Wrought iron is impure iron with 4% carbon.
 (4) Blister copper has blistered appearance due to evolution of CO_2 .

Ans. (2)

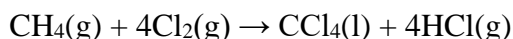
Pig iron contains impurities (C, S, Si, P etc) having malleable nature that's why can be moulded.

115. What is the change in oxidation number of carbon in the following reaction?



- (1) -4 to +4 (2) 0 to
 (3) +4 to +4 (4) 0 to +4

Ans. (1)



C $H_4(-4)$

C $Cl_4(+4)$

-4 to +4

116. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is

- (a) β -Elimination reaction
 (b) Follows Zaitsev rule
 (c) Dehydrohalogenation reaction
 (d) Dehydration reaction
 (1) (b), (c), (d) (2) (a), (b), (d)
 (3) (a), (b), (c) (4) (a), (c), (d)

(3)

This reaction is an example of β -elimination.

Hydrogen is removed from β -carbon and halogen from α -carbon, hence dehydrohalogenation reaction.

Generally, in E2 reaction Zaitsev alkene is formed as major product (more stable alkene).

117. Hydrolysis of sucrose is given by the following reaction.



If the equilibrium constant (K_C) is 2×10^{13} at 300 K, the value of $\Delta_r G^\circ$ at the same temperature will be

- (1) $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$
- (2) $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$
- (3) $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- (4) $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$

Ans. (3)

$$K_C = 2 \times 10^{13}$$

$$T = 300\text{K}$$

$$\Delta G^\circ = -RT \ln K_{eq}$$

$$\Delta G^\circ = -8.314 \text{ JK}^{-1} \text{ mol}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$$

118. Match the following:

	Oxide		Nature
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al ₂ O ₃	(iii)	Acidic
(d)	Cl ₂ O ₇	(iv)	Amphoteric

Which of the following is **correct** option?

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

Ans. (4)

- (a) CO (ii) Neutral
- (b) BaO (i) Basic
- (c) Al₂O₃ (iv) Amphoteric
- (d) Cl₂O₇ (iii) Acidic

119. Identify a molecule which does **not** exist.

- (1) C₂
- (2) O₂
- (3) He₂
- (4) Li₂

Ans. (3)

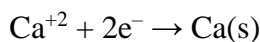
$$\text{He}_2 = \text{Total electron} = 4$$

$$= \sigma_{1s}^2 \sigma_{1s}^{*2} \Rightarrow \text{B.O.} = \frac{1}{2} [\text{Nb} - \text{Na}] = \frac{1}{2} [2 - 2] = 0 \text{ Bond order} = 0, \text{ so He}_2 \text{ does not exist.}$$

120. The number of Faradays(F) required to produce 20g of calcium from molten CaCl_2 (Atomic mass of $\text{Ca} = 40\text{g mol}^{-1}$) is

- (1) 3 (2) 4
(3) 1 (4) 2

Ans. (3)



$$\text{v.f.} = 2$$

As per faraday's 1st law

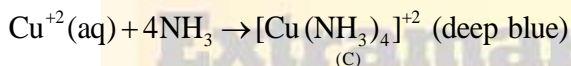
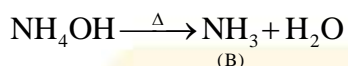
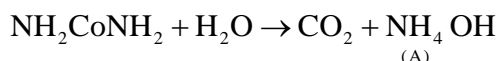
Charge passed in faraday = g. eq of product

$$= \frac{20}{40} \times 2 = 1\text{F}$$

121. Urea reacts with water to form A which will decompose to form B. B when passed through Cu^{2+} (aq), deep blue colour solution C is formed. What is the formula of C from the following?

- (1) Cu(OH)_2 (2) $\text{CuCO}_3 \cdot \text{Cu(OH)}_2$
(3) CuSO_4 (4) $[\text{Cu(NH}_3)_4]^{2+}$

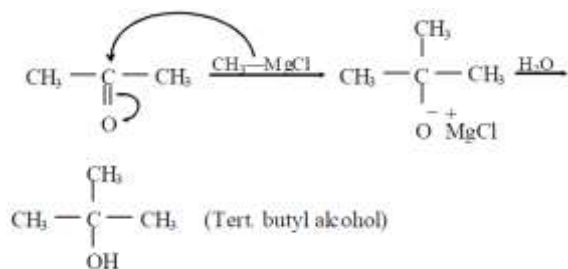
Ans. (4)



122. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give:

- (1) Tert.-Butyl alcohol (2) Isobutyl alcohol
(3) Isopropyl alcohol (4) Sec. butyl alcohol

Ans. [1]



123. The number of protons, neutrons and electrons in $^{175}_{71}\text{Lu}$, respectively, are :

- (1) 71, 71 and 104 (2) 175, 104 and 71
(3) 71, 104 and 71 (4) 104, 71 and 71

Ans. [3] $^{175}_{71}\text{Lu}$,

$$p^+ = 71$$

$$n^0 = 175 - 71 = 104$$

$$e^- = 71$$

124. Which of the following alkane cannot be made in good yield by Wurtz reaction?

- (1) n-Heptane (2) n-Butane
(3) n-Hexane (4) 2, 3-Dimethylbutane

Ans. (1)

n-Heptane cannot be made in good yield using Wurtz reaction since it is unsymmetrical alkane.

125. HCl was passed through a solution of CaCl_2 , MgCl_2 and NaCl . Which of the following compound(s) crystallize(s)?

- (1) Only MgCl_2 (2) NaCl , MgCl_2 and CaCl_2
(3) Both MgCl_2 and CaCl_2 (4) Only NaCl

Ans. (4)

When HCl is passed through the mixture Cl^- ion concentration increase. Hence ionic product $[\text{Na}^+][\text{Cl}^-]$ becomes more than solubility product.

So, NaCl will precipitated out

Filtrate $\xrightarrow{\text{HCl gas passed}}$ pure NaCl precipitation (common ion effect)

126. Measuring Zeta potential is useful in determining which property of colloidal solution?

- (1) Stability of the colloidal particles (2) Size of the colloidal particles
(3) Viscosity (4) Solubility

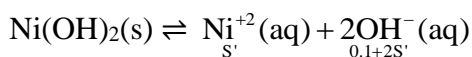
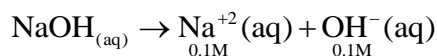
Ans. (1)

Greater the Zeta potential more will be the stability of colloidal particles.

127. Find out the solubility of $\text{Ni}(\text{OH})_2$ in 0.1 M NaOH . Given that the ionic product of $\text{Ni}(\text{OH})_2$ is 2×10^{-15}

- (1) 1×10^{-13} M (2) 1×10^8 M
(3) 2×10^{-13} M (4) 2×10^{-8} M

Ans. (1) $\alpha = 1$ for NaOH



$$\text{Ionic product} = (S')(0.1 + 2S')^2$$

$$2 \times 10^{-15} = S'(0.1)^2$$

$$S' = 2 \times 10^{-13} \text{ M}$$

128. For the reaction, $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$, the correct option is

- (1) $\Delta_r H < 0$ and $\Delta_r S > 0$ (2) $\Delta_r H < 0$ and $\Delta_r S < 0$
(3) $\Delta_r H > 0$ and $\Delta_r S > 0$ (4) $\Delta_r H > 0$ and $\Delta_r S < 0$

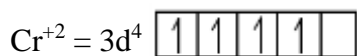
(2)

Sol. $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$

$$\Delta_r S < 0 \text{ and } \Delta_r H < 0$$

129. The calculated spin only magnetic moment of Cr^{2+} ion is
- (1) 5.92 BM (2) 2.84 BM
 (3) 3.87 BM (4) 4.90 BM

Ans. (4)



$$n = 4$$

$$\mu = \sqrt{n(n+2)} \text{ B.M.} = \sqrt{4(6)} = \sqrt{24} \text{ B.M.}$$

$$= 4.90 \text{ B.M.}$$

130. Identify the **correct** statements from the following:

- (a) $\text{CO}_2(\text{g})$ is used as refrigerant for ice-cream and frozen food.
 (b) The structure of C_{60} contains twelve six carbon rings and twenty-five carbon rings.
 (c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.
 (d) CO is colorless and odourless gas.
- (1) (b) and (c) only (2) (c) and (d) only
 (3) (a), (b) and (c) only (4) (a) and (c) only

Ans. [2]

Correct statement are (c) and (d)

(c) use of zeolite (3d-silicate)

(d) CO-neutral, colourless & odourless gas.

131. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.

- (1) Calcium (2) Potassium
 (3) Iron (4) Copper

Ans. [2]

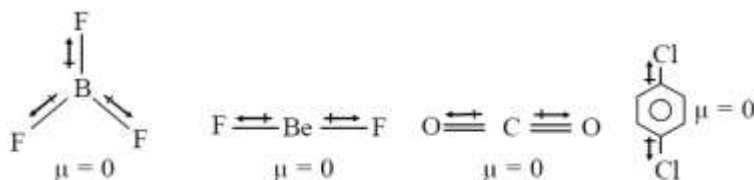
Biological importance of sodium & potassium.

132. Which of the following set of molecules will have zero dipole moment?

- (1) Nitrogen trifluoride, beryllium difluoride, water, 1, 3-dichlorobenzene
 (2) Boron trifluoride, beryllium difluoride, carbon dioxide, 1, 4-dichlorobenzene
 (3) Ammonia, beryllium difluoride, water 1, 4-dichlorobenzene
 (4) Boron trifluoride hydrogen fluoride, carbon dioxide, 1, 3-dichlorobenzene

Ans. (2)

BF_3 , BeF_2 , CO_2 and 1, 4-dichloro benzene all are symmetrical structure.



133. The correct option for free expansion of an ideal gas under adiabatic condition is

- (1) $q < 0, \Delta T = 0$ and $w = 0$ (2) $q > 0, \Delta T > 0$ and $w > 0$
 (3) $q = 0, \Delta T = 0$ and $w = 0$ (4) $q = 0, \Delta T < 0$ and $w > 0$

Ans. (3)

Free expansion of ideal gas

$$P_{\text{ext}} = 0$$

$$W_{\text{pv}} = 0$$

$$q = 0 \text{ (adiabatic process)}$$

$$\Delta E = q + w$$

$$\Delta E = 0$$

$$\Delta E = nC_{\text{vm}} \Delta T = 0$$

$$q = 0, \Delta T = 0, w = 0$$

134. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds?

- (1) $F^- < SCN^- < C_2O_4^{2-} < CN^-$ (2) $CN^- < C_2O_4^{2-} < SCN^- < F^-$
 (3) $SCN^- < F^- < C_2O_4^{2-} < CN^-$ (4) $SCN^- < F^- < CN^- < C_2O_4^{2-}$

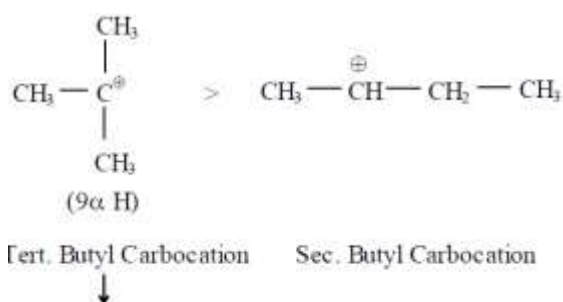
Ans. (3)

According to spectrochemical series.

135. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following?

- (1) -R effect of -CH₃ groups (2) Hyperconjugation
 (3) -I effect of -CH₃ groups & Effecti (4) +R effect of -CH₃ groups

Ans. (2)

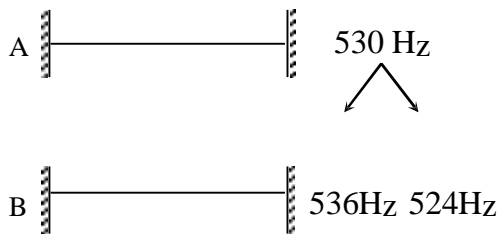


136. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be:

- (1) 536 Hz (4) 537 Hz
 (2) 523 Hz (4) 524 Hz

Ans. (4)

Guitar string i.e. is fixed from both ends



$$\text{Frequency} \propto \sqrt{\text{Tension}}$$

If tension in B slightly decrease, then frequency of B decrease.

If B is 536 Hz, as the frequency decreases, beats with A

also decreases. If B is 524 Hz, as the frequency

decreases, beats with A increases

∴ Original frequency of B will be 524 Hz.

137. The increase in the width of the depletion region in a p-n junction diode is due to :

- (1) both forward bias and reverse bias (2) increase in forward current
 (3) forward bias only (4) reverse bias only

Ans. (4)

In reverse bias external battery attract majority charge carriers. So, width of the depletion region increases

138. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5 r_2$) through 1 K are in the ratio:

- (1) $\frac{3}{2}$ (2) $\frac{5}{3}$
 (3) $\frac{27}{8}$ (4) $\frac{9}{4}$

Ans. (3)

$$\text{Heat supplied } \Delta Q = Ms\Delta T$$

For same Material 's' same.

$$\Delta Q \propto M \text{ and } M = \frac{4}{3} \pi r^3 \rho$$

$$\Delta Q \propto r^3$$

$$\frac{\Delta Q_1}{\Delta Q_2} = \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{1.5}{1}\right)^3 = \frac{27}{8}$$

139. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from

the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is

- (1) 1.0 (2) -1.0
 (3) zero (4) 0.5

Ans. (1)

$$\text{When } L \text{ removed } \tan \phi = \frac{X_C}{R}$$

$$\text{When } L \text{ removed } \tan \phi = \frac{X_L}{R}$$

$$\frac{X_C}{R} = \frac{X_L}{R} \Rightarrow \text{Resonance}$$

$$\cos \phi = \frac{R}{Z} = \frac{R}{R} = 1$$

140. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is: ($g = 10 \text{ m/s}^2$)

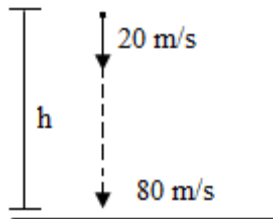
(1) 320 m

(2) 300 m

(3) 360 m

(4) 340 m

Ans. (2)



$$v^2 = u^2 + 2gh$$

$$80^2 = 20^2 + 2 \times 10h$$

$$h = 300 \text{ m}$$

141. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes:

(1) four times

(2) one-fourth

(3) double

(4) half

Ans. (1)

$$\beta = \frac{\lambda D}{d}$$

$$\beta' = \frac{\lambda D'}{d'}$$

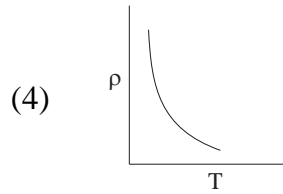
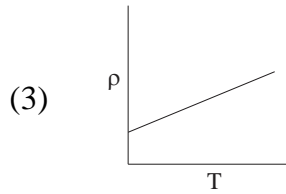
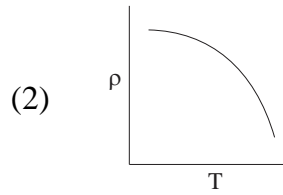
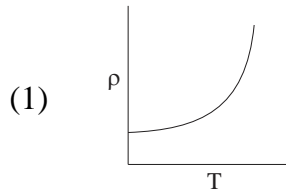
$$D' = 2D, d' = \frac{d}{2}$$

$$\beta' = \frac{\lambda \times 2D}{d/2} = \frac{4\lambda D}{d}$$

$$\beta' = 4\beta$$

Fringe width becomes 4 times

142. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper?



Ans. (1)

For some metal like copper, resistivity is nearly proportional to temperature although a nonlinear region always exists at very low temperature.

143. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is: ($\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$)

(1) $6.28 \times 10^{-5} \text{ T}$

(2) $3.14 \times 10^{-5} \text{ T}$

(3) $6.28 \times 10^{-4} \text{ T}$

(4) $3.14 \times 10^{-4} \text{ T}$

Ans. (3)

$$B = \mu_0 \frac{N}{l} I$$

$$= 4\pi \times 10^{-7} \times \frac{100}{(0.5)} \times 2.5$$

$$= 6.28 \times 10^{-4} \text{ T}$$

144. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled?

(1) one-fourth

(2) zero

(3) doubled

(4) four times

Ans. (2)

$$K_1 = 1.5 hv_0 - \Phi_0 = 0.5 hv_0$$

$$K_2 = \frac{1.5}{2} hv_0 - hv_0 = -0.25 hv_0$$

\therefore Kinetic energy can never be negative

So, no emission and $i = 0$

OR

In second case the incident frequency is halved

$$\text{Incident frequency} = \frac{1.5}{2} v_0 = 0.75 v_0$$

Now the incident frequency is less than threshold frequency, so no emission of electron take place therefore no current. ($i = 0$)

145. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is:

(1) 0.5 mm

(2) 1.0 mm

(3) 0.01 mm

(4) 0.25 mm

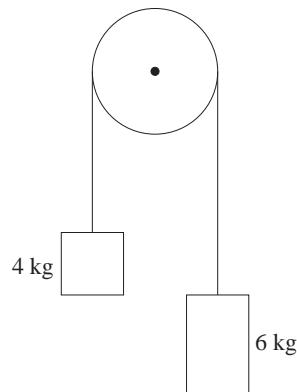
Ans. (1)

$$\text{L.C.} = \frac{\text{Pitch}}{\text{Number of division on circular scale}}$$

$$\Rightarrow 0.01 \text{ mm} = \frac{\text{Pitch}}{50}$$

$$\Rightarrow \text{Pitch} = 0.5 \text{ mm}$$

146. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is:



(1) $g/5$

(2) $g/10$

(3) g

(4) $g/2$

Ans. (1)

$$a = \frac{(m_2 - m_1)g}{m_1 + m_2}$$

$$a = \frac{(6 - 4)g}{6 + 4} = \frac{2g}{10}$$

$$a = \frac{g}{5}$$

147. For transistor action, which of the following statements is correct?

- (1) Both emitter junction as well as the collector junction are forward biased.
- (2) The base region must be very thin and lightly doped.
- (3) Base, emitter and collector regions should have same doping concentrations.
- (4) Base, emitter and collector regions should have same size.

Ans. (2)

Base region is very thin and lightly doped.

148. For which one of the following, Bohr model is not valid?

- (1) Deuteron atom
- (2) Singly ionized neon atom (Ne^+)
- (3) Hydrogen atom
- (4) Singly ionized helium atom (He^+)

Ans. (2)

Bohr model is applicable for only single electron species

149. A capillary tube of radius r is immersed in water and water rises in it to a height h . The mass of the water in the capillary is 5 g. Another capillary tube of radius $2r$ is immersed in water. The mass of water that will rise in this tube is:

- (1) 10.0 g (2) 20.0 g
(3) 2.5 g (4) 5.0 g

Ans. (1)

$$m \propto r$$

$$\frac{m_2}{m_1} = \frac{r_2}{r_1}$$

$$\frac{m_2}{5} = \frac{2r}{r}$$

$$m_2 = 10 \text{ g}$$

150. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

- (1) $1 : c$ (2) $1 : c^2$
(3) $c : 1$ (4) $1 : 1$

Ans. (4)

In EMW, electric field and magnetic field have same energy density and same intensities.

151. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 Am^{-1} . The permeability of the material of the rod is:

$$(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$$

- (1) $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$ (2) $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$
(3) $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$ (4) $8.0 \times 10^{-5} \text{ T m A}^{-1}$

Ans. (3)

$$\mu_r = \chi_m + 1 = 599 + 1 = 600$$

$$\mu = \mu_0 \mu_r = 4\pi \times 10^{-7} \times 600$$

$$= 2.4\pi \times 10^{-4} \frac{\text{Tm}}{\text{A}}$$

152. The Brewster's angle i_b for an interface should be

- (1) $45^\circ < i_b < 90^\circ$ (2) $i_b = 90^\circ$
(3) $0^\circ < i_b < 30^\circ$ (4) $30^\circ < i_b < 45^\circ$

Ans. (1)

$$\tan i_b = \frac{\mu_2}{\mu_1} = \frac{\mu_1}{1}$$

$$\mu_2 > 1$$

$$\therefore \tan i_b > 1$$

$$\therefore 90^\circ > i_b > 45^\circ$$

153. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is:

- (1) $\frac{\pi}{2}$ rad (2) zero
 (3) π rad (4) $\frac{3\pi}{2}$ rad

Ans. (3)

Displacement (x) equation of SHM

$$x = A \sin(\omega t + \Phi) \dots(i)$$

$$\frac{dx}{dt} = A\omega \cos(\omega t + \phi)$$

$$\text{Acceleration (a)} = \frac{d^2x}{dt^2}$$

$$a = -\omega^2 A \sin(\omega t + \Phi)$$

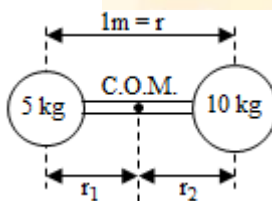
$$a = \omega^2 A \sin(\omega t + \Phi + \pi) \dots(ii)$$

from (i) & (ii), phase difference between displacement and acceleration is π .

154. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass. The center of mass of the system from the 5 kg particle is nearly at a distance of:

- (1) 67 cm (2) 80 cm
 (3) 33 cm (4) 50 cm

Ans. (1)



$$mr = \text{constant} \Rightarrow r \propto \frac{1}{m}$$

$$\frac{r_1}{r_2} = \frac{m_2}{m_1} = \frac{10}{5} = \frac{2}{1}$$

$$r_1 = \frac{2}{3}r = \frac{2}{3} \times 1\text{m} = 67\text{ cm}$$

155. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere?

$$\left(\frac{1}{4\pi \epsilon_0} = 9 \times 10^9 \text{ Nm}^2 / \text{C}^2 \right)$$

- (1) 1.28×10^6 N/C (2) 1.28×10^7 N/C
 (3) 1.28×10^4 N/C (4) 1.28×10^5 N/C

Ans. (4)

$$E = \frac{kQ}{r^2} = \frac{9 \times 10^9 \times 3.2 \times 10^{-7}}{(15 \times 10^{-2})^2}$$

$$E = 1.28 \times 10^5 \text{ N/C}$$

156. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

- (1) 7.32×10^{-7} rad (2) 6.00×10^{-7} rad
 (3) 3.66×10^{-7} rad (4) 1.83×10^{-7} rad

Ans. (3)

$$\text{Limit of resolution} = \frac{1.22\lambda}{a}$$

$$= \frac{1.22 \times 6 \times 10^{-7}}{2}$$

$$= 3.66 \times 10^{-7} \text{ rad}$$

157. A charged particle having drift velocity of $7.5 \times 10^{-4} \text{ m s}^{-1}$ in an electric field of $3 \times 10^{-10} \text{ Vm}^{-1}$, has a mobility in $\text{m}^2 \text{ V}^{-1} \text{ s}^{-1}$ of:

- (1) 2.5×10^{-6} (2) 2.25×10^{-15}
 (3) 2.25×10^{15} (4) 2.5×10^6

Ans. (4)

$$\mu = \frac{v_d}{E} = \frac{7.5 \times 10^{-4}}{3 \times 10^{-10}}$$

$$= 2.5 \times 10^6$$

158. Taking into account of the significant figures, what is the value of $9.99 \text{ m} - 0.0099 \text{ m}$?

- (1) 9.980 m (2) 9.9 m
 (3) 9.9801 m (4) 9.98 m

Ans. (4)

In subtraction the number of decimal places in the result should be equal to the number of decimal places of that term in the operation which contain lesser number of decimal places.

$$9.99$$

$$\underline{-0.0099}$$

$$9.98 \rightarrow 3 \text{ significant figures}$$

159. The energy equivalent of 0.5 g of a substance is:

- (1) $1.5 \times 10^{13} \text{ J}$ (2) $0.5 \times 10^{13} \text{ J}$
 (3) $4.5 \times 10^{16} \text{ J}$ (4) $4.5 \times 10^{13} \text{ J}$

Ans. (4)

$$E = mc^2$$

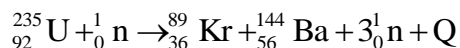
$$= 0.5 \times 10^{-3} \times 9 \times 10^{16}$$

$$= 4.5 \times 10^{13} \text{ J}$$

160. When a uranium isotope ${}_{92}^{235}\text{U}$ is bombarded with a neutron, it generates ${}_{36}^{89}\text{U}$ three neutrons and :

- (1) ${}_{36}^{101}\text{Kr}$ (2) ${}_{36}^{103}\text{Kr}$
 (3) ${}_{56}^{144}\text{Ba}$ (4) ${}_{40}^{91}\text{Zr}$

Ans. (3)



161. A short electric dipole has a dipole moment of $16 \times 10^{-9} \text{ C m}$. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is:

$$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2 / \text{C}^2 \right)$$

- (1) 400 V (2) zero
 (3) 50 V (4) 200 V

Ans. (4)

$$V = \frac{kP \cos \theta}{r^2} = \frac{9 \times 10^9 \times 16 \times 10^{-9}}{(0.6)^2} \times \frac{1}{2}$$

$$V = 200 \text{ V}$$

162. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C . Its density is: ($R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$)

- (1) 0.1 kg/m^3 (2) 0.02 kg/m^3
 (3) 0.5 kg/m^3 (4) 0.2 kg/m^3

Ans. (4)

For an ideal gas sample

$$\frac{P}{\rho} = \frac{RT}{Mw}$$

$$\rho = \frac{PMw}{RT} = \frac{249 \times 10^3 \times 2 \times 10^{-3}}{8.314 \times 300} = 0.199$$

$$\rho = 0.2 \text{ kg/m}^3$$

163. The average thermal energy for a mono-atomic gas is: (k_B is Boltzmann constant and T, absolute temperature)

- (1) $\frac{5}{2}k_B T$ (2) $\frac{7}{2}k_B T$
 (3) $\frac{1}{2}k_B T$ (4) $\frac{3}{2}k_B T$

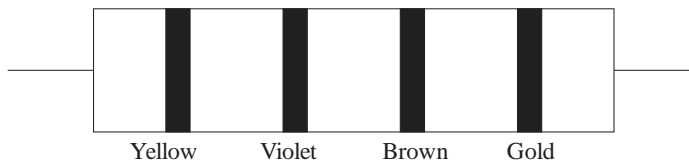
Ans. (4)

$$\text{Average thermal energy} = \frac{3}{2}k_B T$$

where 3 is translational degree of freedom

For monoatomic gas total degree of freedom $f = 3$ (translational degree of freedom)

164. The colour code of a resistance is given below



The values of resistance and tolerance, respectively, are

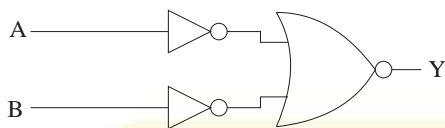
- (1) 4.7 kΩ, 5% (2) 470 Ω, 5%
 (3) 470 kΩ, 5% (4) 47 kΩ, 10%

Ans. (2)

$$R = 47 \times 10^1 \pm 5\%$$

$$R = 470 \Omega, 5\%$$

165. For the logic circuit shown, the truth table is:



- | | | | | | | | |
|-----|---|---|---|-----|---|---|---|
| (1) | A | B | Y | (2) | A | B | Y |
| | 0 | 0 | 1 | | 0 | 0 | 1 |
| | 0 | 1 | 1 | | 0 | 1 | 0 |
| | 1 | 0 | 1 | | 1 | 0 | 0 |
| | 1 | 1 | 0 | | 1 | 1 | 0 |
-
- | | | | | | | | |
|-----|---|---|---|-----|---|---|---|
| (3) | A | B | Y | (4) | A | B | Y |
| | 0 | 0 | 0 | | 0 | 0 | 0 |
| | 0 | 1 | 0 | | 0 | 1 | 1 |
| | 1 | 0 | 0 | | 1 | 0 | 1 |
| | 1 | 1 | 1 | | 1 | 1 | 1 |

Ans. (3)

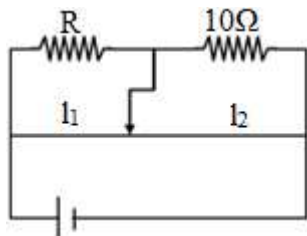
$$Y = \overline{\overline{A} + \overline{B}} = \overline{\overline{A} \cdot \overline{B}} = A \cdot B = \text{AND gates}$$

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

166. A resistance wire connected in the left gap of a metre bridge balances a $10\ \Omega$ resistance in the right gap at a point which divides the bridge wire in the ratio $3 : 2$. If the length of the resistance wire is $1.5\ \text{m}$, then the length of $1\ \Omega$ of the resistance wire is :

- (1) $1.5 \times 10^{-1}\ \text{m}$ (2) $1.5 \times 10^{-2}\ \text{m}$
(3) $1.0 \times 10^{-2}\ \text{m}$ (4) $1.0 \times 10^{-1}\ \text{m}$

Ans. (4)



$$\frac{R}{10} = \frac{l_1}{l_2}$$

$$\frac{R}{10} = \frac{3}{2}$$

$$R = 15\ \Omega$$

Length of $15\ \Omega$ resistance wire is $1.5\ \text{m}$

$$\therefore \text{length of } 1\ \Omega \text{ resistance wire} = \frac{1.5}{15} = 0.1$$

$$= 1.0 \times 10^{-1}\ \text{m}$$

167. Find the torque about the origin when a force of $3\hat{j}\ \text{N}$ acts on a particle whose position vector is $2\hat{k}\ \text{m}$.

- (1) $-6\hat{i}\ \text{Nm}$ (2) $6\hat{k}\ \text{Nm}$
(3) $6\hat{i}\ \text{Nm}$ (4) $6\hat{j}\ \text{Nm}$

Ans. (1)

$$\vec{F} = 3\hat{j}\ \text{N}, \vec{r} = 2\hat{k}$$

$$\vec{\tau} = \vec{r} \times \vec{F} = 2\hat{k} \times 3\hat{j} = 6(\hat{k} \times \hat{j})$$

$$= 6(-\hat{i})$$

$$\vec{\tau} = -6\hat{i}\ \text{Nm}$$

168. A wire of length L , area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is:

- (1) $\frac{MgL}{AL_1}$ (2) $\frac{MgL}{A(L_1 - L)}$
(3) $\frac{MgL_1}{AL}$ (4) $\frac{Mg(L_1 - L)}{AL}$

Ans. (2)

$$Y = \frac{FL}{A\Delta L} = \frac{MgL}{A(L_1 - L)}$$

169. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly:

- (1) 2.5 A (2) 25.1 A
(3) 1.7 A (4) 2.05 A

Ans. (1)

$$I = \frac{V}{X_C} = \frac{V}{1/C\omega} = VC\omega$$

$$= 200 \times 40 \times 10^{-6} \times 2\pi \times 50$$

$$= 2.5 \text{ A}$$

170. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth?

- (1) 30 N (2) 24 N
(3) 48 N (4) 32 N

Ans. (4)

Sol. $W_s = mg_s = 72 \text{ N}$

$$W_h = mg_h = \frac{mg_s}{\left(1 + \frac{h}{R}\right)^2} = \frac{72\text{N}}{\left(1 + \frac{R/2}{R}\right)^2} = \frac{72}{9/4}$$

$$W_h = 32 \text{ N}$$

171. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is $1.227 \times 10^{-2} \text{ nm}$, the potential difference is

- (1) 10^3 V (2) 10^4 V
(3) 10 V (4) 10^2 V

Ans. (2)

Sol. $\lambda = 1.227 \times 10^{-2} \text{ nm}$

$$= 0.1227 \text{ \AA}$$

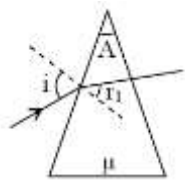
$$\lambda = \frac{12.27}{\sqrt{v}} \text{ \AA}$$

$$\sqrt{v} = 10^2 \Rightarrow v = 10^4 \text{ volt}$$

172. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ , then the angle of incidence is nearly equal to

- (1) μA (2) $\mu A/2$
(3) $A/2\mu$ (4) $2A/\mu$

Ans. (1)



$$r_2 = 0$$

$$r_1 = A$$

Apply Snell's law

$$\sin i = \mu \sin r_1$$

for small angle ($r_1 = A$)

$$i = \mu A$$

173. The solids which have the negative temperature coefficient of resistance are

- | | |
|-------------------------|-----------------------------------|
| (1) semiconductors only | (2) insulators and semiconductors |
| (3) metals | (4) insulators only |

Ans. (2)

174. In a certain region of space with volume 0.2 m^3 , the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is

- | | |
|---------------------|-----------------------|
| (1) 1 N/C | (2) 5 N/C |
| (3) zero | (4) 0.5 N/C |

Ans. (3)

Potential is constant throughout the volume

\therefore Electric field is zero.

175. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2 . The energy received by the surface during time span of 1 minute is

- | | |
|--------------------------------|--------------------------------|
| (1) $24 \times 10^3 \text{ J}$ | (2) $48 \times 10^3 \text{ J}$ |
| (3) $10 \times 10^3 \text{ J}$ | (4) $12 \times 10^3 \text{ J}$ |

Ans. (1)

$$I = \frac{E}{At}$$

$$E = IAt$$

$$= \frac{20}{10^{-4}} \times 20 \times 10^{-4} \times 60$$

$$= 24 \times 10^3 \text{ J}$$

176. 113. The capacitance of a parallel plate capacitor with air as medium is $6\mu\text{F}$. With the introduction of a dielectric medium, the capacitance becomes $30\mu\text{F}$. The permittivity of the medium is

$$(\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2})$$

- | | |
|----------------------------------------------------------------------|----------------------------------------------------------------------|
| (1) $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ | (2) $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ |
| (3) $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ | (4) $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ |

Ans. (1)

$$C_m = \epsilon_r C_0$$

$$\epsilon_r = \frac{30}{6} = 5$$

$$\epsilon = \epsilon_0, \epsilon_r = 8.85 \times 10^{-12} \times 5$$

177. The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly

(1) 0.06 (2) 0.006

(3) 6 (4) 0.6

Ans. (1)

$$E = \frac{10^{-20}}{1.6 \times 10^{-19}} \text{ eV}$$

$$= 0.625 \times 10^{-1} = 0.0625 \text{ eV}$$

178. Dimensions of stress are

(1) $[ML^0T^{-2}]$ (2) $[ML^{-1}T^{-2}]$

(3) $[MLT^{-2}]$ (4) $[ML^2T^{-2}]$

Ans. (2)

$$\text{stress} = \frac{\text{Force}}{\text{Area}}$$

$$= \frac{MLT^{-2}}{L^2} = [M^{-1}L^{-1}T^{-2}]$$

179. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is

(1) isochoric (2) isobaric

(3) isothermal (4) adiabatic

Ans. (4) $\Delta U = 0$. Hence $U_i = U_f \Rightarrow \Delta T = 0$

180. The mean free path for a gas, with molecular diameter d and number density n can be expressed as

(1) $\frac{1}{\sqrt{2}n^2\pi d^2}$ (2) $\frac{1}{\sqrt{2}n^2\pi^2 d^2}$

(3) $\frac{1}{\sqrt{2}n\pi d}$ (4) $\frac{1}{\sqrt{2}n\pi d^2}$

Ans. (4)

Mean free path for a gas sample

$$\lambda_m = \frac{1}{\sqrt{2}n\pi d^2}$$

where d is diameter of a gas molecule and n is molecular density.

