NEET-UG – 2013 TEST PAPER WITH ANSWER
(HELD ON SUNDAY 05th MAY, 2013)

1. The eye of octopus and eye of cat show different patterns of structure, yet they perform similar function. This is an example of :
(1) Analogous organs that have evolved due to divergent evolution
(2) Homologous organs that have evolved due to convergent evolution
(3) Homologous organs that have evolved due to divergent evolution
(4) Analogous organs that have evolved due to convergent evolution

Ans. (4)

2. Select the correct statement with respect to locomotion in humans:
(1) The joint between adjacent vertebrae is a fibrous joint
(2) A decreased level of progesterone causes osteoporosis in old people
(3) Accumulation of uric acid crystals in joints causes their inflammation
(4) The vertebral column has 10 thoracic vertebrae

Ans. (3)

3. A phosphoglyceride is always made up of :
(1) a saturated or unsaturated fatty acid esterified to a phosphate group which is also attached to a glycerol molecule
(2) only a saturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached
(3) only a unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached
(4) a saturated or unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached

Ans. (4)

4. Perisperm differs from endosperm in:
(1) its formation by fusion of secondary nucleus with several sperms
(2) being a haploid tissue
(3) having no reserve food
(4) being a diploid tissue

Ans. (4)

5. A sedentary sea anemone gets attached to the shell lining of hermit crab. The association is :
(1) Amensalism
(2) Ectoparasitism
(3) Symboisis
(4) Commensalism

Ans. (4)

6. The cell-mediated immunity inside the human body is carried out by :
(1) Erythrocytes
(2) T-lymphocytes
(3) B-lymphocytes
(4) Thrombocytes

Ans. (2)

7. Which of the following are likely to be present in deep sea water ?
(1) Saprophytic fungi
(2) Archaebacteria
(3) Eubacteria
(4) Blue-green algae

Ans. (2)

8. One of the representatives of Phylum Arthropoda is :
(1) flying fish
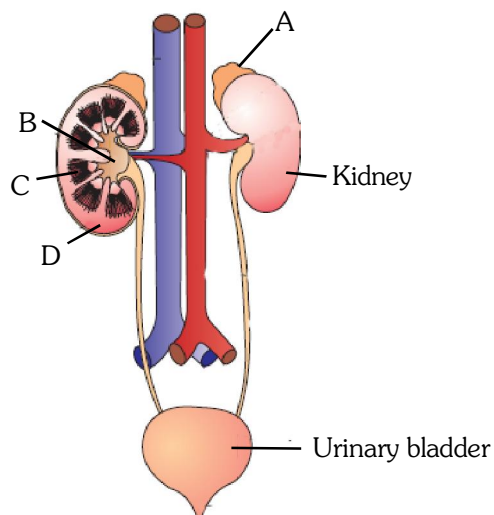(2) cuttlefish
(3) silverfish
(4) pufferfish

Ans. (3)

9. Megasporangium is equivalent to :
(1) Ovule
(2) Embryo sac
(3) Fruit
(4) Nucellus

Ans. (1)

10. Kyoto Protocol was endorsed at :
(1) CoP - 4   (2) CoP - 3
(3) CoP - 5   (4) CoP - 6

Ans. (2)

11. Figure shows human urinary system with structures labelled A to D. Select option which correctly identifies them and gives their characteristics and/or functions.

(1) D-Cortex - outer part of kidney and do not contain any part of nephrons

(2) A-Adrenal gland - located at the anterior part of kidney. Secrete Catecholamines which stimulate glycogen breakdown

(3) B-Pelvis - broad funnel shaped space inner to hilum, directly connected to loops of Henle

(4) C-Medulla-inner zone of kidney and contains complete nephrons

Ans. (2)

12. In china rose the flowers are :

(1) Zygomorphic, epigynous with twisted aestivation

(2) Actinomorphic, hypogynous with twisted aestivation

(3) Actinomorphic, epigynous with valvate aestivation

(4) Zygomorphic, hypogynous with imbricate aestivation

Ans. (2)

13. The Golgi complex plays a major role :

(1) in post translational modification of proteins and glycosidation of lipids

(2) in trapping the light and transforming it into chemical energy

(3) in digesting proteins and carbohydrates

(4) as energy transferring organelles

Ans. (1)

14. What external changes are visible after the last moult of a cockroach nymph?

(1) Labium develops

(2) Mandibles become harder

(3) Anal cerci develop

(4) Both fore wings with hind wings develop

Ans. (4)

15. Isogamous condition with non-flagallated gametes is found in :

(1) *Fucus*   (2) *Chlamydomonas*

(3) *Spirogyra*   (4) *Volvox*

Ans. (3)

16. Transition state structure of the substrate formed during an enzymatic reaction is :

(1) permanent and stable

(2) transient but stable

(3) permanent but unstable

(4) transient and unstable

Ans. (4)

17. Select the answer which correctly matches the endocrine gland with the hormone it secretes and its function/deficiency symptom :

	Endocrine gland	Hormone	Function/deficiency symptoms
(1)	Corpus luteum	Testosterone	Stimulates spermatogenesis
(2)	Anterior pituitary	Oxytocin	Stimulates uterus contraction during child birth
(3)	Posterior pituitary	Growth Hormone (GH)	Oversecretion stimulates abnormal growth
(4)	Thyroid gland	Thyroxine	Lack of iodine in diet results in goitre

Ans. (4)

18. The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of :

(1) Inactivation of glycosidase enzyme in recombinant bacteria

(2) Non-recombinant bacteria containing beta-galactosidase

(3) Insertional inactivation of alpha-galactosidase in non-recombinant bacteria

(4) Insertional inactivation of alpha-galactosidase in recombinant bacteria

Ans. (2)

19. Monoecious plant of *Chara* shows occurrence of :
(1) upper oogonium and lower antheridium on the same plant
(2) antheridiophore and archegoniophore on the same plant
(3) stamen and carpel on the same plant
(4) upper antheridium and lower oogonium on the same plant

Ans. (1)

20. Advantage of cleistogamy is :-
(1) Vivipary
(2) Higher genetic variability
(3) More vigorous offspring
(4) No dependence on pollinators

Ans. (4)

21. The H-zone in the skeletal muscle fibre is due to :
(1) extension of myosin filaments in the central portion of the A-band
(2) the absence of myofibrils in the central portion of A-band
(3) the central gap between myosin filaments in the A-band
(4) the central gap between actin filaments extending through myosin filaments in the A-band

Ans. (4)

22. Artificial insemination means :
(1) introduction of sperms of a healthy donor directly into the ovary
(2) yransfer of sperms of a healthy donor to a test tube containing ova
(3) transfer of sperms of husband to a test tube containing ova
(4) artificial introduction of sperms of a healthy donor into the vagina

Ans. (4)

23. Which group of animals belong to the same phylum?
(1) Sponge, Sea anemone, Starfish
(2) Malarial parasite, *Amoeba*, Mosquito
(3) Earthworm, Pinworm, Tapeworm
(4) Prawn, Scorpion, *Locusta*

Ans. (4)

24. Seed coat is **not** thin, membranous in :
(1) Gram   (2) Maize
(3) Coconut   (4) Groundnut

Ans. (3)

25. If two persons with 'AB' blood group marry and have sufficiently large number of children, these children could be classified as 'A' blood group : 'AB' blood group 'B' blood group in 1 : 2 : 1 ratio. Modern technique of protein electrophoresis reveals presence of both 'A' and 'B' type proteins in 'AB' blood group individuals. This is an example of :
(1) Complete dominance
(2) Codominance
(3) Incomplete dominance
(4) Partial dominance

Ans. (2)

26. Which of the following **cannot** be detected in a developing foetus by amniocentesis ?
(1) Jaundice
(2) Klinefelter syndrome
(3) Sex of the foetus
(4) Down syndrome

Ans. (1)

27. The first stable product of fixation of atmospheric nitrogen in leguminous plants is :
(1) Glutamate   (2) NO_2^-
(3) Ammonia   (4) NO_3^-

Ans. (3)

28. A biologist studied the population of rats in a barn. He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. The net increase in population is :
(1) Zero   (2) 10
(3) 15   (4) 05

Ans. (1)

29. Secondary productivity is rate of formation of new organic matter by :
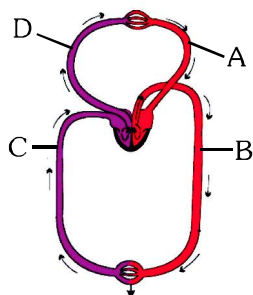(1) Decomposer
(2) Producer
(3) Parasite
(4) Consumer

Ans. (4)

30. Infection of *Ascaris* usually occurs by :
(1) mosquito bite
(2) drinking water containing eggs of *Ascaris*
(3) eating imperfectly cooked pork.
(4) Tse-tse fly

Ans. (2)

31. Figure shows schematic plan of blood circulation in humans with labels A to D, Identify the label and give its function/s.

   (1) D-Dorsal aorta-takes blood from heart to body parts, PO_2 = 95 mm Hg

   (2) A-Pulmonary vein-takes impure blood from body parts, PO_2 = 60 mm Hg

   (3) B-Pulmonary artery-takes blood from heart to lungs, PO_2 = 90 mm Hg

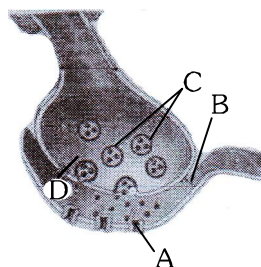   (4) C-Vena Cava-takes blood from body parts the right auricle, PCO_2 = 45 mm Hg

Ans. (4)

32. The tendency of population to remain in genetic equilibrium may be disturbed by :

   (1) lack of random mating

   (2) random mating

   (3) lack of migration

   (4) lack of mutations

Ans. (1)

33. A diagram showing axon terminal and synapse is given. Identify correctly at least two of A-D.

   (1) C-Neurotransmitter
      D-Ca++

   (2) A-Receptor
      C-Synaptic vescles

   (3) B-Synaptic connection
      D-K+

   (4) A-Neurotransmitter
      B-Synaptic cleft

Ans. (2)

34. A good producer of citric acid is :

   (1) *Saccharomyces*

   (2) *Aspergillus*

   (3) *Pseudomonas*

   (4) *Clostridium*

Ans. (2)

35. Age of a tree can be estimated by :

   (1) diameter of its heartwood

   (2) its height and girth

   (3) biomass

   (4) number of annual rings

Ans. (4)

36. The process by which organisms with different evolutionary history evolve similar phenotypic adaptation in response to a common environmental challenge, is called :

   (1) Adaptive radiation

   (2) Natural selection

   (3) Convergent evolution

   (4) Non-random evolution

Ans. (3)

37. A stage in cell division is shown in the figure. Select the answer which gives correct identification of the stage with its characterstics.
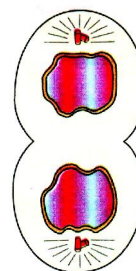
(1)	Telophase	Endoplasmic reticulum and nucleolus not reformed yet.
(2)	Telophase	Nuclear envelop reforms, golgi complex reforms.
(3)	Late anaphase	Chromosomes move a away from equatorial plate, golgi complex not present.
(4)	Cytokinesis	Cell plate formed, mitochondria distributed between two daughter cells.

Ans. (2)

38. The figure shows a diagrammatic view of human respiratory system with labels A, B, C and D. Select the option which gives correct identification and main function and/or characteristic :-
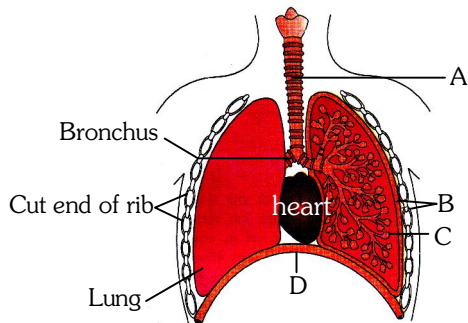
(1) D – Lower end of lungs – diaphragm pulls it down during inspiration

(2) A – trachea - long tube supported by complete cartilaginous rings for conducting inspired air

(3) B – pleural membrane - surround ribs on both sides to provide cushion against rubbing

(4) C – Alveoli - thin walled vascular bag like structures for exchange of gases

Ans. (4)

39. Interfascicular cambium develops from the cells of:
(1) Pericycle
(2) Medullary rays
(3) Xylem parenchyma
(4) Endodermis

Ans. (2)

40. During seed germination its stored food is mobilized by :
(1) Gibberellin   (2) Ethylene
(3) Cytokinin   (4) ABA

Ans. (1)

41. Meiosis takes place in :
(1) Megaspore   (2) Meiocyte
(3) Conidia   (4) Gemmule

Ans. (2)

42. According to Darwin, the organic evolution is due to :
(1) Reduced feeding efficiency in one species due to the presence of interfering species
(2) Intraspecific competition
(3) Interspecific competition
(4) Competition within closely related species

Ans. (3)

43. Which of the following criteria **does not** pertain to facillitated transport ?
(1) Uphill transport
(2) Requirement of special membrane proteins
(3) High selectivity
(4) Transport saturation

Ans. (1)

44. A major site for synthesis of lipids is :
(1) Nucleoplasm
(2) RER
(3) SER
(4) Symplast

Ans. (3)

45. Natural reservoir of phosphorus is :
(1) Fossils
(2) Sea water
(3) Animal bones
(4) Rock

Ans. (4)

46. Which of the metabolites is common to respiration-mediated breakdown of fats, carbohydrates and proteins ?
(1) Acetyl CoA
(2) Glucose–6–phosphate
(3) Fructose1,6–bisphosphate
(4) Pyruvic acid

Ans. (1)

47. Which one of the following processes during decomposition is **correctly** described ?
(1) Leaching – Water soluble inorganic nutrients rise to the top layers of soil
(2) Fragmentation – Carried out by organisms such as earthworm
(3) Humification – Leads to the accumulation of a dark coloured substance humus which undergoes microbial action at a very fast rate
(4) Catabolism – Last step in the decomposition under fully anaerobic condition

Ans. (2)

48. If both parents are carriers for thalessemia, which is an autosomal recessive disorder, what are the chances of pregnancy resulting in an affected child?
(1) 100%   (2) No chance
(3) 50%   (4) 25%

Ans. (4)

49. Which of the following statements is not true of two genes that show 50% recombination frequency ?
(1) If the genes are present on the same chromosome, they undergo more than one crossovers in every meiosis
(2) The genes may be on different chromosomes
(3) The genes are tightly linked
(4) The genes show independent assortment
Ans. (3)

50. One of the legal methods of birth control is :
(1) by a premuture ejaculation during coitus
(2) abortion by taking an appropriate medicine
(3) by abstaining from coitus from day 10 to 17 of the menstrual cycle
(4) by having coitus at the time of day break
Ans. (2)

51. Besides paddy fields, cyanobacteria are also found inside vegetative part of :
(1) *Psilotum*   (2) *Pinus*
(3) *Cycas*   (4) *Equisetum*
Ans. (3)

52. Which of the following are correctly matched with respect to their taxonomic classification ?
(1) Spiny anteater, sea urchin, sea cucumber – Echinodermata
(2) Flying fish, cuttlefish, silverfish – Pisces
(3) Centipede, millipede, spider, scorpion – Insecta
(4) House fly, butterfly, tsetsefly, silverfish – Insecta
Ans. (4)

53. Variation in gene frequencies within populations can occur by chance rather than by natural selection. This is referred to as :
(1) Genetic load   (2) Genetic flow
(3) Genetic drift   (4) Random mating
Ans. (3)

54. Select the correct match of the digested products in humans given in **column I** with their absorption site and mechanism in **column II.**

	Column I	Column II
(1)	Cholesterol, maltose	Large intestine, active absorption
(2)	Glycine, glucose	small intestine, active absorption
(3)	Fructose, Na^+	small intestine, passive absorption
(4)	Glycerol, fatty acids	duodenum, move as chilomicrons

Ans. (2)

55. Select the wrong statement :
(1) *Chlamydomonas* exhibits both isogamy and anisogamy and *Fucus* shows oogamy
(2) Isogemetes are similar in structure, function and behaviour
(3) Anisogametes differ either in structure, function or behaviour
(4) In Oomycetes female gamete is smaller and motile, while male gamete is larger and non-motile
Ans. (4)

56. Which Mendelism idea is depicted by a cross in which the F_1 generation resembles both the parents ?
(1) co-dominance
(2) incomplete dominance
(3) law of dominance
(4) inheritance of one gene
Ans. (1)

57. The diagram given here is the standard ECG of a normal person. The P- wave represents the :
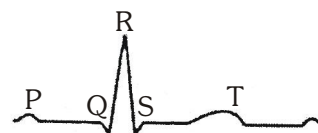
(1) End of systole
(2) Contraction of both the atria
(3) Initiation of the ventricular contraction
(4) Beginning of the systole
Ans. (2)

58. Which enzyme/s will be produced in a cell in which there is a nonsense mutation in the lac Y gene ?
(1) Lactose permease and transacetylase
(2) β-galactosidase
(3) Lactose permease
(4) Transacetylase
Ans. (2)

59. The most abundant intracellular cation is :
(1) K^+ (2) Na^+
(3) Ca^{++} (4) H^+
Ans. (1)

60. Which one of the following is **not** the function of placenta ? It :-
(1) secretes oxytocin during parturition
(2) facilitates supply of oxygen and nutrients to embyro
(3) secretes estrogen
(4) facilitates removal of carbon dioxide and waste material from embryo

Ans. (1)

61. In plant breeding programme, the entire collection (of plants/seeds) having all the diverse alleles for all genes in a given crop is called :
(1) germplasm collection
(2) selection of superior recombinants
(3) cross - hybridisation among the selected parents.
(4) evaluation and selection of parents

Ans. (1)

62. Which one of the following is **not** a correct statements ?
(1) Key is taxonomic aid for identification of specimens
(2) Herbarium houses dried, pressed and preserved plant specimens
(3) Botanical gardens have collection of living plants for reference
(4) A museum has collection of photographs of plants and animals

Ans. (4)

63. Which one of the following organelle in the figure correctly matches with its function ?
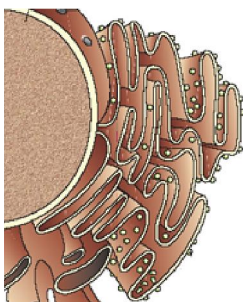
(1) Rough endoplasmic reticulum, protein synthesis
(2) Rough endoplasmic reticulum, formation of glycoproteins
(3) Golgi apparatus, protein synthesis
(4) Golgi apparatus, formation of glycolipids

Ans. (1)

64. Which of the following represents maximum number of species among global biodiversity ?
(1) Mosses and Ferns
(2) Algae
(3) Lichens
(4) Fungi

Ans. (4)

65. Which of the following Bt crops is being grown in India by the farmers ?
(1) Soyabean
(2) Maize
(3) Cotton
(4) Brinjal

Ans. (3)

66. Read the following statements (A – E) and answer the question which follows them.
(a) In liverworts, mosses and ferns gametophytes are free living
(b) Gymnosperms and some ferns are heterosporous
(c) Sexual reproduction in *Fucus*, *Volvox* and *Allbugo* is oogamous
(d) The sporophyte in liverworts is more elaborate than that in mosses
(E) Both, *Pinus* and *Marchantia* are dioecious
How many of the above statements are correct ?
(1) Four
(2) One
(3) Two
(4) Three

Ans. (4)

67. The essential chemical components of many coenzymes are :
(1) Vitamins
(2) Proteins
(3) Nucleic acids
(4) Carbohydrates

Ans. (1)

68. Parts A, B, C and D of the human eye are shown in the diagram. Select the option which gives correct identification along with its functions/characteristics:-
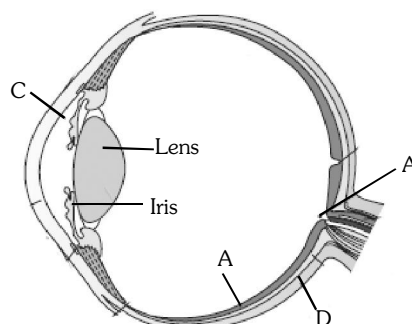
(1) D- Choroid - its anterior part forms ciliary body
(2) A - Retina - contains photo receptors–rods and cones
(3) B - Blind spot - has only a few rods and cones
(4) C - Aqueous chamber reflects the light which does not pass through the lens

Ans. (2)

69. The three boxes in this diagram represent the three major biosynthetic pathways in aerobic respiration. Arrows represent net reactants or products.
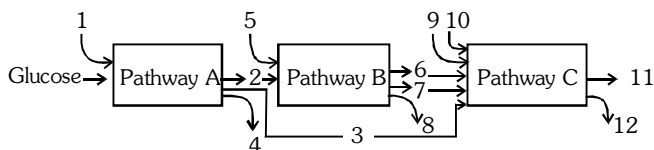
Arrow numberd 4, 8 and 12 can all be :
(1) FAD^+ or $FADH_2$ (2) NADH
(3) ATP   (4) H_2O

Ans. (3)

70. Pigment-containing membranous extensions in some cyanobacteria are :
(1) Chromatophores
(2) Heterocysts
(3) Basal bodies
(4) Pneumatophores

Ans. (1)

71. Which one of the following statements is correct ?
(1) Tapetum nourishes the developing pollen
(2) Hard outer layer of pollen is called intine
(3) Sporogenous tissue is haploid
(4) Endothecium produces the micorspores

Ans. (1)

72. The characteristics and an example of a synovial joint in humans is :-

	Characteristics	Examples
(1)	lymph filled between two bones, limited movement	gliding joint between carpals
(2)	fluid cartilage between two bones, limited movements	Knee joint
(3)	fluid filled between two joints, provides cushion	skull bones
(4)	fluid filled synovial cavity between two bones	joint between atlas and axis

Ans. (4)

73. The Air Prevention and Control of Pollution Act came into force in :
(1) 1990   (2) 1975
(3) 1981   (4) 1985

Ans. (3)

74. Product of sexual reproduction generally generates:
(1) Large biomass
(2) Longer viability of seeds
(3) Prolonged dormancy
(4) New genetic combination leading to variation

Ans. (4)

75. Among bitter gourd, mustard, brinjal, pumpkin chinarose, lupin, cucumber, sunnhemp, gram, guava, bean, chilli, plum, petunia, tomato, rose, withania, potato, onion, aloe and tulip how many plants have hypogynous flower ?
(1) Eighteen   (2) Six
(3) Ten   (4) Fifteen

Ans. (4)

76. A pregnant female delivers a baby who suffers from stunted growth, mental retardation, low intelligence quotient and abnormal skin.
This is the result of :
(1) Over secretion of pars distalis
(2) Deficiency of iodine in diet
(3) Low secretion of growth hormone
(4) Cancer of the thyroid gland

Ans. (2)

77. Which of the following is **not** correctly matched for the organism and its cell wall degrading enzyme?
(1) Fungi – Chitinase
(2) Bacteria – Lysozyme
(3) Plant cells – Cellulase
(4) Algae – Methylase

Ans. (4)

78. Menstrual flow occurs due to lack of :
(1) Vasopressin   (2) Progesteron
(3) FSH   (4) Oxytocin

Ans. (2)

79. Global warming can be controlled by :
(1) Increasing deforestation, reducing efficiency of energy usage
(2) Reducing deforestation cutting down use of fossil fuel
(3) Reducing reforestation, increasing the use of fossil fuel
(4) Increasing deforestation slowing down the growth human population

Ans. (2)

80. Which one of the following is not used for *ex situ* plant conservation ?
(1) Botanical Gardens
(2) Field gene banks
(3) Seed banks
(4) Shifting cultivation

Ans. (4)

81. During sewage treatment, biogases are produced which include :
(1) hydrogensulphide, nitrogen, methane
(2) methane, hydrogensulphide, carbon dioxide
(3) methane, oxygen, hydrogensulphide
(4) hydrogensulphide, methane, sulphur dioxide

Ans. (2)

82. The diagram shows an important concept in the genetic implication of DNA. Fill in the blanks A to C :

$$ \circlearrowright DNA \xrightarrow{A} mRNA \xrightarrow{B} protein \xrightarrow{\text{Proposed by}}{C} $$
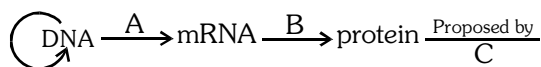
(1) A–translation B–extension C–Rosalind Franklin
(2) A–transcription B–replication C–James Watson
(3) A–translation B–transcription C–Erevin Chargaff
(4) A–transcription B–translation C–Francis Crick

Ans. (4)

83. DNA fragments generated by the restriction endonucleases in a chemical reaction can be separated by :
(1) Restriction mapping
(2) Centrifugation
(3) Polymerase chain reaction
(3) Electrophoresis

Ans. (4)

84. The complex formed by a pair of synapsed homologous chromosomes is called :
(1) Axoneme
(2) Equatorial plate
(3) Kinetochore
(4) Bivalent

Ans. (4)

85. The **incorrect** statement with regard to Haemophilia is :
(1) A single protein involved in the clotting of blood is affected
(2) It is a sex-linked disease
(3) It is a recessive disease
(4) It is a dominant disease

Ans. (4)

86. Which of the following statements is **correct** in relation to the endocrine system ?
(1) Releasing and inhibitory hormones are produced by the pituitary gland
(2) Adenohypophysis is under direct neural regulation of the hypothalamus
(3) Organs in the body like gastrointestinal tract, heart, kidney and liver do not produce any hormones
(4) Non-nutrient chemicals produced by the body in trace amount that act as intercellular messenger are known as hormones

Ans. (4)

87. Lenticels are involved in :
(1) Photosynthesis   (2) Transpiration
(3) Gaseous exchange   (4) Food transport

Ans. (3)

88. Match the name of the animal (**column I**), with one characteristics (**column II**), and the phylum/class (**column III**) to which it belongs :

	Column I	Column II	Column III
(1)	*Adamsia*	radially symmetrical	Porifera
(2)	*Petromyzon*	ectoparasite	Cyclostomata
(3)	*Ichthyophis*	terrestrial	Reptilia
(4)	*Limulus*	Body covered by chitinous exoskeleton	Pisces

Ans. (2)

89. What is the correct sequence of sperm formation?
(1) Spermatogonia, spermatocyte, spermatid, spermatozoa
(2) Spermatid, spermatocyte, spermatogonia, spermatozoa
(3) Spermatogonia, spermatocyte, spermatozoa, spermatid
(4) Spermatogonia, spermatozoa, spermatocyte, spermatid

Ans. (1)

90. Macro molecule chitin is :
(1) Simple polysaccharide
(2) Nitrogen containing polysacchairde
(3) Phosphorus containing polysaccharide
(4) Sulphur containing polysaccharide

Ans. (2)

NEET-UG – 2013 TEST PAPER WITH SOLUTIONS
(HELD ON SUNDAY 05th MAY, 2013)

91. In Young's double slit experiment, the slits are 2mm apart and are illuminated by photons of two wavelengths $\lambda_1 = 12000\text{Å}$ and $\lambda_2 = 10000\text{Å}$. At what minimum distance from the common central bright fringe on the screen 2m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other ?

(1) 3 mm (2) 8 mm (3) 6 mm (4) 4 mm

Ans. (3)

Sol. According to question $n_1\lambda_1 = n_2\lambda_2$

So $\dfrac{n_1}{n_2} = \dfrac{\lambda_2}{\lambda_1} = \dfrac{10000}{12000} = \dfrac{5}{6}$

so minimum n_1 and n_2 are 5 and 6 respectively.

X_{min} = $\dfrac{n_1\lambda_1 D}{d} = \dfrac{5(12000\times10^{-10})(2)}{2\times10^{-3}}$

$= 6\times10^{-3}$ m = 6 mm

92. In a common emitter (CE) amplifier having a voltage gain G, the transistor used has transconductance 0.03 mho and current gain 25. If the above transistor is replaced with another one with transconductance 0.02 mho and current gain 20, the voltage gain will be :

(1) $\dfrac{5}{4}G$ (2) $\dfrac{2}{3}G$ (3) 1.5 G (4) $\dfrac{1}{3}G$

Ans. (2)

Sol. Voltage gain $A_V = \dfrac{\Delta V_C}{\Delta V_B} = \dfrac{R_L\Delta I_C}{\Delta V_B} = g_m R_L$

$\dfrac{A_{V_1}}{A_{V_2}} = \dfrac{g_{m_1}}{g_{m_2}} \Rightarrow \dfrac{G}{A_{V_2}} = \dfrac{0.03}{0.02} \Rightarrow A_{V_2} = \dfrac{2}{3}G$

93. A certain mass of Hydrogen is changed to Helium by the process of fusion. The mass defect in fusion reaction is 0.02866 u. The energy liberated per u is : (given 1u = 931 MeV)

(1) 13.35 MeV (2) 2.67 MeV
(3) 26.7 MeV (4) 6.675 MeV

Ans. (4)

Sol. Energy released per u

$= \left(\dfrac{0.02866}{4}\right)(931\text{MeV}) = 6.675$ MeV

94. In the given (V – T) diagram, what is the relation between pressure P_1 and P_2 ?
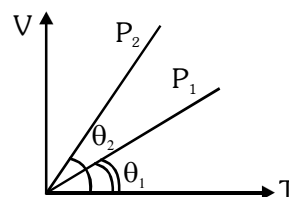
(1) Cannot be predicted
(2) $P_2 = P_1$
(3) $P_2 > P_1$
(4) $P_2 < P_1$

Ans. (4)

Sol. $PV = nRT \Rightarrow V = \left(\dfrac{nR}{P}\right)T \Rightarrow$ slope $= \dfrac{nR}{P}$

As $\theta_2 > \theta_1$ so $\dfrac{1}{P_2} > \dfrac{1}{P_1} \Rightarrow P_1 > P_2$

95. The output (X) of the logic circuit shown in figure will be :
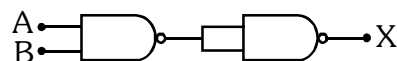
(1) $X = \overline{A+B}$ (2) $X = \overline{\overline{A}.\overline{B}}$
(3) $X = \overline{A.B}$ (4) X = A.B

Ans. (2) or (4)

Sol. $X = \overline{\overline{A.B}} = A.B$

96. Three blocks with masses m, 2m and 3m are connected by strings, as shown in the figure. After an upward force F is applied on block m, the masses move upward at constant speed v. What is the net force on the block of mass 2m?
(g is the acceleration due to gravity)
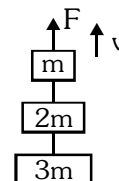
(1) 6 mg (2) zero (3) 2 mg (4) 3 mg

Ans. (2)

Sol. As block of mass 2m moves with constant velocity so net force on it is zero.

97. In a n-type semiconductor, which of the following statement is true:

(1) Holes are majority carriers and trivalent atoms are dopants.

(2) Electrons are majority carriers and trivalent atoms are dopants.

(3) Electron are minority carriers and pantavalent atoms are dopants

(4) Holes are minority carriers and pentavalent atoms are dopants.

Ans. (4)

98. The half life of a radioactive isotope 'X' is 20 years. It decays to another element 'Y' which is stable. The two elements 'X' and 'Y' were found to be in the ratio 1 : 7 in a sample of a given rock. The age of the rock is estimated to be:

(1) 100 years   (2) 40 years

(3) 60 years   (4) 80 years

Ans. (3)

Sol. X $\longrightarrow$ Y (stable)

N_x N_y

$\dfrac{N_x}{N_y} = \dfrac{1}{7} \Rightarrow \dfrac{N_x}{N_x + N_y} = \dfrac{N}{N_0} = \dfrac{1}{8}$

By using $N = N_0 e^{-\lambda t}$ we have

$\dfrac{N_0}{8} = N_0 e^{-\lambda t} \Rightarrow t = 3 \times 20$ years = 60 years

99. The molar specific heats of an ideal gas at constant pressure and volume are denoted by C_P and C_V, respectively. If $\gamma = \dfrac{C_P}{C_V}$ and R is the universal gas constant, then C_V is equal to :

(1) γR (2) $\dfrac{1+\gamma}{1-\gamma}$

(3) $\dfrac{R}{(\gamma-1)}$ (4) $\dfrac{(\gamma-1)}{R}$

Ans. (3)

Sol. $C_P - C_V = R$ and $\gamma = \dfrac{C_P}{C_V} \Rightarrow C_V = \dfrac{R}{\gamma-1}$

100. The wavelength λ_e of an electron and λ_P of a photon of same energy E are related by:

(1) $\lambda_P \propto \dfrac{1}{\sqrt{\lambda_e}}$ (2) $\lambda_P \propto \lambda_e^2$

(3) $\lambda_P \propto \lambda_e$ (4) $\lambda_P \propto \sqrt{\lambda_e}$

Ans. (2)

Sol. $\lambda_P = \dfrac{h}{p} = \dfrac{hc}{E}$ and $\lambda_e = \dfrac{h}{p} = \dfrac{h}{\sqrt{2mE}}$

$\Rightarrow \lambda_p \propto \lambda_e^2$

101. Ratio of longest wavelengths corresponding to Lyman and Balmer series in hydrogen spectrum is:-

(1) $\dfrac{9}{31}$ (2) $\dfrac{5}{27}$ (3) $\dfrac{3}{23}$ (4) $\dfrac{7}{29}$

Ans. (2)

Sol. $\left(\dfrac{\lambda_{\text{Lyman}}}{\lambda_{\text{Balmer}}}\right)_{\max} = \dfrac{\left(\dfrac{1}{2^2} - \dfrac{1}{3^2}\right)}{\left(\dfrac{1}{1^2} - \dfrac{1}{2^2}\right)} = \dfrac{5/36}{3/4} = \dfrac{5}{27}$

102. A current loop in a magnetic field :-

(1) Can be in equilibrium in two orientations, one stable while the other is unstable.

(2) Experiences a torque whether the field is uniform or non uniform in all orientations

(3) Can be in equilibrium in one orientation

(4) Can be in equilibrium in two orientations, both the euilibrium states are unstable

Ans. (1)

103. A, B and C are three points in a uniform electric field. The electric potential is :-
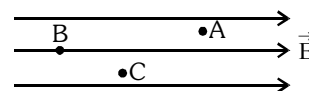
(1) Same at all the three points A,B and C

(2) Maximum at A

(3) Maximum at B

(4) Maximum at C

Ans. (3)

Sol. Electric potential decreases in the direction of electric field.

104. A rod PQ of mass M and length L is hinged at end P. The rod is kept horizontal by a massless string tied to point Q as shown in figure. When string is cut, the initial angular acceleration of the rod is :-
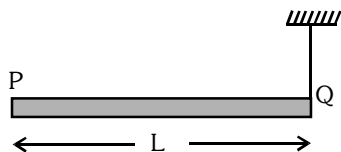
(1) $\dfrac{2g}{3L}$　　(2) $\dfrac{3g}{2L}$　　(3) g/L　　(4) 2g/L

Ans. (2)

Sol.
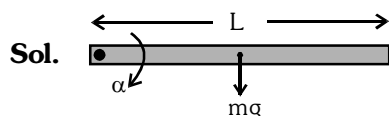
$$\tau = I\alpha \Rightarrow mg\left(\dfrac{L}{2}\right) = \left(\dfrac{m\ell^2}{3}\right)\alpha \Rightarrow \alpha = \dfrac{3g}{2L}$$
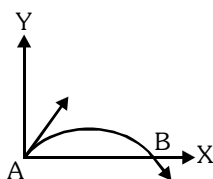
105. A wire of resistance 4Ω is stretched to twice its original length. The resistance of stretched wire would be :-

(1) 16 Ω　　(2) 2Ω　　(3) 4Ω　　(4) 8Ω

Ans. (1)

Sol. $R = \dfrac{\rho\ell}{A} = \dfrac{\rho\ell^2}{A\ell} \Rightarrow R \propto \ell^2$

106. The velocity of a projectile at the initial point A is $\left(2\hat{i} + 3\hat{j}\right)$ m/s. It's velocity (in m/s) at point B is :-

(1) $2\hat{i} + 3\hat{j}$　　　　(2) $-2\hat{i} - 3\hat{j}$

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

Ans. (4)

107. A body of mass 'm' is taken from the earth's surface to the height equal to twice the radius (R) of the earth. The change in potential energy of body will be :-

(1) $\dfrac{1}{3}$ mgR　　　　(2) mg2R

(3) $\dfrac{2}{3}$ mgR　　　　(4) 3 mgR

Ans. (3)

Sol. Change in PE = $-\dfrac{GMm}{3R} - \left(-\dfrac{GMm}{R}\right)$

$$= \dfrac{2}{3}\dfrac{GMm}{R} = \dfrac{2}{3}mgR$$

108. A stone falls freely under gravity. It covers distances h_1, h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is :-

(1) $h_1 = h_2 = h_3$

(2) $h_1 = 2h_2 = 3h_3$

(3) $h_1 = \dfrac{h_2}{3} = \dfrac{h_3}{5}$

(4) $h_2 = 3h_1$ and $h_3 = 3h_2$

Ans. (3)

Sol. $h_1 = \dfrac{1}{2}g(5)^2$, $h_2 = \dfrac{1}{2}g(10)^2$ and $h_3 = \dfrac{1}{2}g(15)^2$

$$\Rightarrow h_1 = \dfrac{h_2}{3} = \dfrac{h_3}{5}$$

109. A bar magnet of length 'ℓ' and magnetic dipole moment 'M' is bent in the form of an arc as shown in figure. The new magnetic dipole moment will be
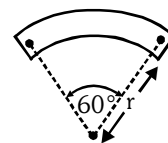
(1) $\dfrac{M}{2}$　　　　　　　　(2) M

(3) $\dfrac{3}{\pi}M$　　　　　　　(4) $\dfrac{2}{\pi}M$

Ans. (3)

Sol. Let magnetic pole strength be m then

M = mℓ

In new situation

$$M' = (m)\left(2r\sin\dfrac{60°}{2}\right) \text{ where } r\left(\dfrac{\pi}{3}\right) = \ell$$

$$M' = 2m\left(\dfrac{2\ell}{\pi}\right)\left(\dfrac{1}{2}\right) = \dfrac{3m\ell}{\pi} = \dfrac{3M}{\pi}$$

110. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is
(1) 1.0 Ω (2) 0.2 Ω
(3) 0.5 Ω (4) 0.8 Ω

Ans. (3)

Sol.
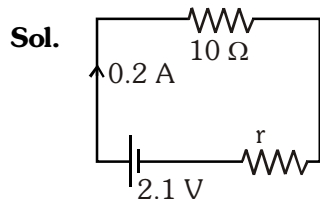
$$I = \frac{E}{r+R} \Rightarrow 0.2 = \frac{2.1}{r+10} \Rightarrow r = 0.5\Omega$$

111. For photoelectric emission from certain metal the cutoff frequency is ν. If radiation of frequency 2ν impinges on the metal plate, the maximum possible velocity of the emitted electron will be (m is the electron mass) :-
(1) $2\sqrt{h\nu/m}$ (2) $\sqrt{h\nu/(2m)}$
(3) $\sqrt{h\nu/m}$ (4) $\sqrt{2h\nu/m}$

Ans. (4)

Sol. $h(2\nu) = h\nu + \frac{1}{2}mv_{max}^2 \Rightarrow v_{max} = \sqrt{\frac{2h\nu}{m}}$

112. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its temperature. The ratio of $\frac{C_p}{C_v}$ for the gas is :-
(1) $\frac{3}{2}$ (2) $\frac{4}{3}$ (3) 2 (4) $\frac{5}{3}$

Ans. (1)
Sol. $P \propto T^3$ and $PV = nRT$ gives $PV^{3/2}$ = constant
$$\Rightarrow \gamma = \frac{C_p}{C_v} = \frac{3}{2}$$

113. The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied ?
(1) length = 300cm, diameter = 3mm
(2) length = 50 cm, diameter = 0.5 mm
(3) length = 100 cm, diameter = 1mm
(4) length = 200 cm, diameter = 2mm

Ans. (2)

Sol. $Y = \frac{F/A}{\Delta\ell/\ell} \Rightarrow \Delta\ell = \frac{F\ell}{YA} = \frac{F\ell}{Y\pi r^2} \Rightarrow \Delta\ell \propto \frac{\ell}{r^2}$
Which is maximum
for ℓ = 50 cm & diameter = 0.5 mm

114. The resistances of the four arms P,Q, R and S in a Wheatstone's bridge are 10 ohm, 30 ohm, 30 ohm and 90 ohm, respectively. The e.m.f. and internal resistance of the cell are 7 volt and 5 ohm respectively. If the galvanometer resistance is 50 ohm, the current drawn from the cell will be :-
(1) 2.0 A (2) 1.0 A
(3) 0.2 A (4) 0.1 A

Ans. (3)

Sol.
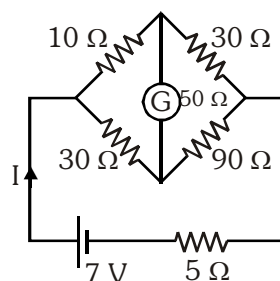
Total resistance of Wheatstone bridge
$$= \frac{(40)(120)}{40+120} = 30\Omega$$

Current through cell = $\frac{7V}{(5+30)\Omega} = \frac{1}{5}A$ = 0.2 A

115. The amount of heat energy required to raise the temperature of 1 g of Helium at NTP, from T_1 K to T_2 K is :-
(1) $\frac{3}{4} N_a k_B \left(\frac{T_2}{T_1}\right)$ (2) $\frac{3}{8} N_a k_B (T_2 - T_1)$
(3) $\frac{3}{2} N_a k_B (T_2 - T_1)$ (4) $\frac{3}{4} N_a k_B (T_2 - T_1)$

Ans. (2)

Sol. Number of moles in 1g He = $\frac{1}{4}$

Amount of heat energy required to raise its temepratre from T_1K to T_2K
$$= nC_v \Delta T$$
$$= \left(\frac{1}{4}\right)\left(\frac{3}{2}R\right)(T_2 - T_1)$$
$$= \frac{3}{8}k_B N_A(T_2 - T_1)$$

116. A piece of iron is heated in a flame. It first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observation is possible by using :-

(1) Newton's Law of cooling

(2) Stefan's Law

(3) Wien's displacement Law

(4) Kirchoff's Law

Ans. (3)

Sol. We can explain this observation by using $\lambda_m T = b$

Which is Wien's displacement law.

117. A gas is taken through the cycle A→B→C→A, as shown, What is the net work done by the gas ?
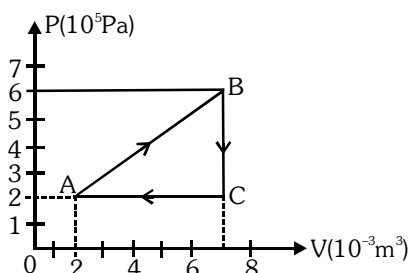
(1) −2000 J   (2) 2000 J

(3) 1000 J   (4) Zero

Ans. (3)

Sol. Net work done = Area of triangle ABC

$$= \frac{1}{2} \times [(7-2) \times 10^{-3}][(6-2) \times 10^5]$$

$$= 1000 \text{ J}$$

118. The condition under which a microwave oven heats up a food item containing water molecules most efficiently is :-

(1) Infra-red waves produce heating in a microwave oven

(2) The frequency of the microwaves must match the resonant frequency of the water molecules

(3) The frequency of the microwaves has no relation with natural frequency of water molecules

(4) Microwaves are heat waves, so always produce heating

Ans. (2)

119. An explosion breaks a rock into three parts in a horizontal plane. Two of them go off at right angles to each other. The first part of mass 1 kg moves with a speed of 12 ms^{-1} and the second part of mass 2 kg moves with 8 ms^{-1} speed. If the third part files off with 4 ms^{-1} speed, then its mass is :-

(1) 17 kg   (2) 3 kg

(3) 5 kg   (4) 7 kg

Ans. (3)

Sol.
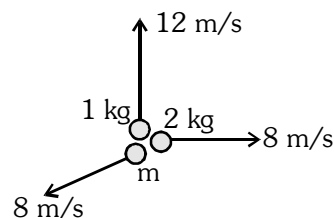
From conservation of momentum

$$m(4) = \sqrt{(1 \times 12)^2 + (2 \times 8)^2} \quad \Rightarrow \quad m = 5 \text{ kg}$$

120. In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows

$$P = \frac{a^3 b^2}{cd}$$

% error in P is :-

(1) 4%   (2) 14%

(3) 10%   (4) 7%

Ans. (2)

Sol. $P = \frac{a^3 b^2}{cd} \Rightarrow \frac{\Delta P}{P} = \pm \left(3\frac{\Delta a}{a} + 2\frac{\Delta b}{b} + \frac{\Delta c}{c} + \frac{\Delta d}{d} \right)$

$$= \pm (3 \times 1 + 2 \times 2 + 3 + 4)$$

$$= \pm 14\%$$

121. A small object of uniform density rolls up a curved surface with an initial velocity 'v'. It reaches upto a maximum height of $\frac{3v^2}{4g}$ with respect to the initial position. The object is

(1) Disc   (2) Ring

(3) Solid sphere   (4) Hollow sphere

Ans. (1)

Sol. From conservation of mechanical energy

$$\frac{1}{2}mv^2 \left(1 + \frac{K^2}{R^2} \right) = mgh$$

$$\Rightarrow \frac{1}{2}mv^2 \left(1 + \frac{K^2}{R^2} \right) = mg\left(\frac{3v^2}{4g} \right)$$

$$\Rightarrow \frac{K^2}{R^2} = \frac{1}{2} \quad \Rightarrow \text{ The object is disc}$$

122. A plano convex lens fits exactly into a plano concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of refractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then the focal length of combination is

(1) $\dfrac{2R}{(\mu_2 - \mu_1)}$ 　　　　(2) $\dfrac{R}{2(\mu_1 + \mu_2)}$

(3) $\dfrac{R}{2(\mu_1 - \mu_2)}$ 　　　　(4) $\dfrac{R}{(\mu_1 - \mu_2)}$

Ans. (4)

Sol.
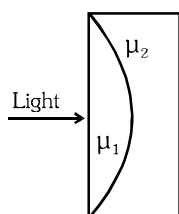
Equivalent focal length is given by $\dfrac{1}{f_{eq}} = \dfrac{1}{f_1} + \dfrac{1}{f_2}$

$\dfrac{1}{f_{eq}} = (\mu_1 - 1)\left(\dfrac{1}{\infty} - \dfrac{1}{-R}\right) + (\mu_2 - 1)\left(\dfrac{1}{-R} - \dfrac{1}{\infty}\right)$

$\Rightarrow f_{eq} = \dfrac{R}{\mu_1 - \mu_2}$

123. A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statements is correct ?
(1) The angular width of central maximum will be unaffected.
(2) Diffraction pattern is not observed on the screen in the case of electrons.
(3) The angular width of the central maximum of the diffraction pattern will increase.
(4) The angular width of the central maximum will decrease.

Ans. (4)

Sol. As speed of electrons is increased so wavelength of electrons will decreases. Therefore the angular width ($\propto \lambda$) of the central maximum of diffraction pattern will decrease.

124. For a normal eye, the cornea of eye provides a converging power of 40 D and the least converging power of the eye lens behind the cornea is 20 D. Using this information, the distance between the retina and the cornea -eye lens can be estimated to be -

(1) 1.5 cm 　　　　　(2) 5 cm

(3) 2.5 cm 　　　　　(4) 1.67 cm

Ans. (4)

Sol. For a normal eye, rays coming from infinity should go the retina without effort when we look at infinity, lens offers minimum power and hence combination gives 40D + 20D = 60D.

Distance between the retina and the cornea eye has must be equal to focal length.

$$f = \dfrac{1}{60}\,m = 1.67\ cm$$

125. The upper half of an inclinded plane of inclination θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between the block and lower half of the plane is given by:-

(1) $\mu = \tan\theta$ 　　　　(2) $\mu = \dfrac{1}{\tan\theta}$

(3) $\mu = \dfrac{2}{\tan\theta}$ 　　　　(4) $\mu = 2\tan\theta$

Ans. (4)

Sol.
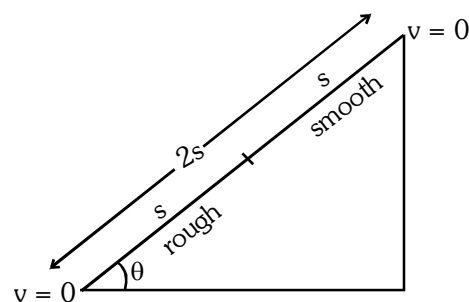
From work energy theorem ($W = \Delta KE$)

$(mg\sin\theta)(2s) - (\mu mg\cos\theta)(s) = 0 - 0 \Rightarrow \mu = 2\tan\theta$

126. A wave travelling in the +ve x-direction having displacement along y-direction as 1m, wavelength 2π m and frequency of $\dfrac{1}{\pi}$ Hz is represented by :

(1) $y = \sin (2\pi x + 2\pi t)$
(2) $y = \sin (x - 2t)$
(3) $y = \sin (2\pi x - 2\pi t)$
(4) $y = \sin (10\pi x - 20\pi t)$

Ans. (2)

Sol. $k = \dfrac{2\pi}{\lambda} = \dfrac{2\pi}{2\pi} = 1$ and $\omega = 2\pi f = (2\pi)\left(\dfrac{1}{\pi}\right) = 2$

So equation of wave $y = \sin(kx - \omega t) = \sin(x - 2t)$

127. A source of unknown frequency gives 4 beats/s, when sounded with a source of known frequency 250 Hz, The second harmonic of the source of unknown frequency gives five beats per second, when sounded with a source of frequency 513 Hz, The unknown frequency is

(1) 260 Hz   (2) 254 Hz
(3) 246 Hz   (4) 240 Hz

Ans. (2)

Sol. Frequency of unknown source = 246 Hz or 254Hz
Second harmonic of this source = 492Hz or 508 Hz
Which gives 5 beats per second, when sounded with a source of frequency 513 Hz.
Therefore unknown frequency = 254 Hz

128. A coil is self-inductance L is connected in series with a bulb B and an AC source. Brightness of the bulb decreases when :

(1) an iron rod is inserted in the coil.
(2) frequency of the AC source is decreased.
(3) number of turns in the coil is reduced.
(4) A capacitance of reactance $X_C = X_L$ is included in the same circuit.

Ans. (1)

Sol.
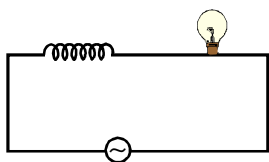
Brightness of the bulb
• decreases when an iron rod is inserted in the coil as impedance of circuit increases.
• increases when frequency of the AC source is decreased as impedance of circuit decreases.
• Increases when number of turns in the coil is reduced as impedance of circuit decreases.
• increases when a capacitance of reactance $X_C = X_L$ is included in the circuit as impedance of circuit decreases.

129. Two pith balls carrying equal charges are suspended from a common point by strings of equal length, the equilibrium separation between them is r. Now the strings are rigidly clamped at half the height. The equilibrium separation between the balls now become :
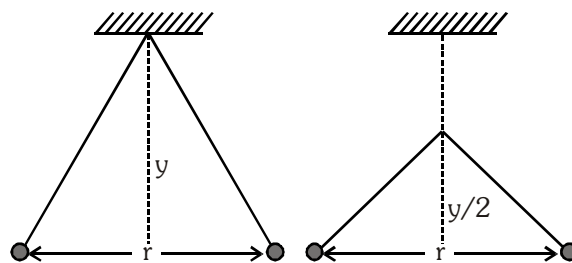
(1) $\left(\dfrac{2r}{3}\right)$ (2) $\left(\dfrac{1}{\sqrt{2}}\right)^2$

(3) $\left(\dfrac{r}{\sqrt[3]{2}}\right)$ (4) $\left(\dfrac{2r}{\sqrt{3}}\right)$

Ans. (3)

Sol.
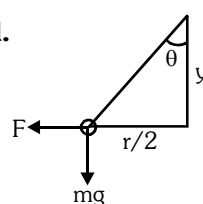
$\tan \theta = \dfrac{F}{mg}$

$\Rightarrow \dfrac{r/2}{y} = \dfrac{kq^2}{r^2 mg} \Rightarrow y \propto r^3$

Therefore $\left(\dfrac{r'}{r}\right)^3 = -\dfrac{y/2}{y} \Rightarrow r' = r\left(\dfrac{1}{2}\right)^{1/3}$

130. If we study the vibration of a pipe open at both ends, then the following statement is not true :

(1) Pressure change will be maximum at both ends

(2) Open end will be antinode

(3) Odd harmonics of the fundamental frequency will be generated

(4) All harmonics of the fundamental frequency will be generated

Ans. (1)

Sol. Pressure change will be minimum at both open ends.

131. When a proton is released from rest in a room, it starts with an initial acceleration a_0 towards west. When it is projected towards north with a speed v_0 it moves with an initial acceleration $3a_0$ towards west. The electric and magnetic fields in the room are:

(1) $\dfrac{ma_0}{e}$ east, $\dfrac{3ma_0}{ev_0}$ down

(2) $\dfrac{ma_0}{e}$ west, $\dfrac{2ma_0}{ev_0}$ up

(3) $\dfrac{ma_0}{e}$ west, $\dfrac{2ma_0}{ev_0}$ down

(4) $\dfrac{ma_0}{e}$ east, $\dfrac{3ma_0}{ev_0}$ up

Ans. (3)

Sol. Acceleration of charged particle $\vec{a} = \dfrac{q}{m}(\vec{E} + \vec{v} \times \vec{B})$

Released from rest $\Rightarrow \vec{a} = \dfrac{q}{m}\vec{E} = a_0$ (west)

$\Rightarrow \vec{E} = \dfrac{ma_0}{e}$ (west)

when it is projected towards north, acceleration due to magnetic force = $2a_0$

Therefore magnetic field = $\dfrac{2ma_0}{ev_0}$ (down)

132. A wire loop is rotated in magnetic field. The frequency of change of direction of the induced e.m.f. is :
(1) Six times per revolution
(2) Once per revolution
(3) twice per revolution
(4) four times per revolution

Ans. (3)

133. A uniform force of $(3\hat{i} + \hat{j})$ newton acts on a particle of mass 2kg. Hence the particle is displaced from position $(2\hat{i} + \hat{k})$ meter to position $(4\hat{i} + 3\hat{j} - \hat{k})$ meter. The work done by the force on the particle is :-
(1) 15 J   (2) 9 J   (3) 6 J   (4) 13 J

Ans. (2)

Sol. $W = \vec{F}.\vec{S} = (3\hat{i} + \hat{j}).[(4-2)\hat{i} + (3-0)\hat{j} + (-1-1)\hat{k}]$

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

$= 3(2) + 1(3) + 0(-2) = 9$ J

134. The wettability of a surface by a liquid depends primarily on :-
(1) angle of contact between the surface and the liquid
(2) viscosity
(3) surface tension
(4) density

Ans. (1)

135. Infinite number of bodies, each of mass 2 kg are situated on x-axis at distance 1m, 2m, 4m, 8m, ..., respectively, from the origin. The resulting gravitational potential due to this system at the origin will be :
(1) –4G   (2) –G

(3) $-\dfrac{8}{3}G$ (4) $-\dfrac{4}{3}G$

Ans. (1)

Sol. $V = -G(2)\left[\dfrac{1}{1} + \dfrac{1}{2} + \dfrac{1}{4} + \dfrac{1}{8} + ...\right]$

$= -2G\left[\dfrac{1}{1-1/2}\right] = -4G$

NEET-UG – 2013 TEST PAPER WITH SOLUTIONS
(HELD ON SUNDAY 05th MAY, 2013)

136. The value of Planck's constant is 6.63×10^{-34} Js. The speed of light is 3×10^{17} nm s^{-1}. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of 6×10^{15} s^{-1} ?

(1) 75   (2) 10

(3) 25   (4) 50

Ans. (4)

Sol. $\lambda = \dfrac{C}{v} = \dfrac{3 \times 10^{17} \, \text{nms}^{-1}}{6 \times 10^{15} \, \text{s}^{-1}} = 50$ nm

137. The radical, –CH$_2$• is aromatic because it has :-

(1) 6p–orbitals and 7 unpaired electrons

(2) 6p–orbitals and 6 unpaired electrons

(3) 7p–orbitals and 6 unpaired electrons

(4) 7p–orbitals and 7 unpaired electrons

Ans. (2)

Sol. , Benzyl free radical is aromatic as per Huckel's rule it has 6π electreons present in p-orbital of carbon atoms involved in formation of benzene ring (Aromatic nature).

, 6π electrons and 6 p orbitals
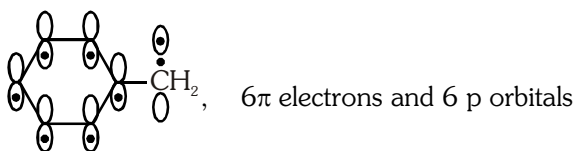
138. Which of the following is electron-deficient ?

(1) PH$_3$ (2) (CH$_3$)$_2$

(3) (SiH$_3$)$_2$ (4) (BH$_3$)$_2$

Ans. (4)

Sol. (BH$_3$)$_2$ $\longrightarrow$ B$_2$H$_6$

$\left(\dfrac{\text{3 centre-2 } e^- \text{ bond}}{\text{electron deficient}} \right)$
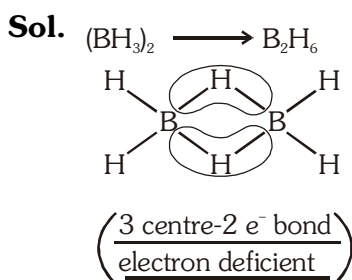
139. Which of the following statements about the interstitial compounds is **incorrect** ?

(1) They have higher melting points than the pure metal

(2) They retain metallic conductivity

(3) They are chemically reactive

(4) They are much harder than the pure metal

Ans. (3)

140. How many grams of concentrted mitric acid solution should be used to prepare 250 mL of 2.0 M HNO$_3$?

(1) 54.0 conc. HNO$_3$

(2) 45.0 conc. HNO$_3$

(3) 90.0 conc. HNO$_3$

(4) 70.0 conc. HNO$_3$

Ans. (2)

Sol. $M = \dfrac{W \times 1000}{M_w \times V_{solution}(mL)}$

$2 = \dfrac{W \times 1000}{63 \times 250}$

W = 31.5 g

70% HNO$_3$ means 70g HNO$_3$ is present in 100g solution.

$\therefore$ 31.5g HNO$_3$ will be present in $\dfrac{100}{70} \times 31.5$

= 45 g of solution

141. Which of the following lanthanoid ions is diamagnetic?

(Atoms, Ce = 58, Sm = 62, Yb = 70)

(1) Yb^{2+} (2) Ce^{2+}

(3) Sm^{2+} (4) Eu^{2+}

Ans. (1)

Sol. dimagnetic – no w.e$^-$ present

Yb^{+2} = 70 [Xe] 6s° 4f^{14} 5d° U.e$^-$ = zero.

142. Which one of the following molecules contains no π bond ?

(1) NO$_2$ (2) CO$_2$

(3) H$_2$O   (4) SO$_2$

Ans. (3)

143. Based on equation $E = -2.178 \times 10^{-18} \, J \left(\dfrac{Z^2}{n^2}\right)$ certain conclusions are written. Which of them is **not** correct ?

(1) For n = 1, the electron has a more negative energy than it does for n = 6 which means that the electron is more lossely bound in the smallest allowed orbit.

(2) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus

(3) Larger the value of n, the larger is the orbit radius

(4) Equation can be used to calculate the change in energy when the electron change orbit

Ans. (1)

Sol. Correct answer is - for n = 1 the electron has more negative energy than it does for n = 6 which means that the electron is less loosely bound in the smallest allowed orbit.

144. In the reaction

A is
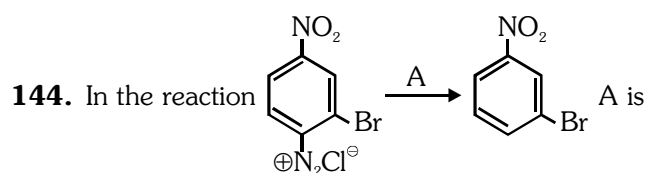
(1) H^+/H_2O (2) $HgSO_4/H_2SO_4$
(3) Cu_2Cl_2 (4) H_3PO_2 and H_2O

Ans. (4)

Sol.
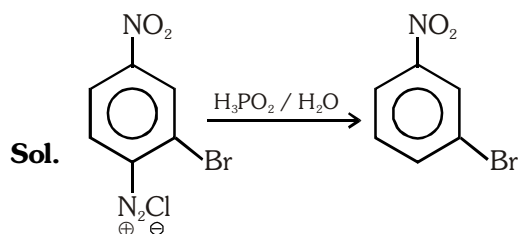
145. The order of stability of the following tautomeric compounds is :-
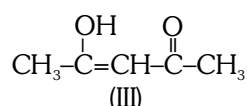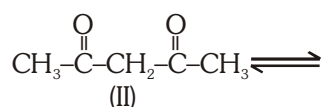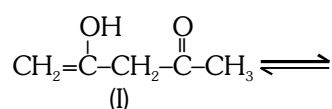
(1) II > III > I   (2) I > II > III
(3) III > II > I   (4) II > I > III

Ans. (3)

Sol. Stability order is
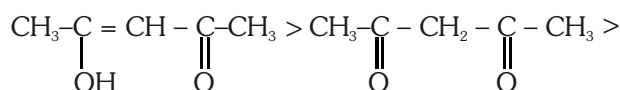
Intra molecular H-Bonding and conjugated diene and it has involved more acidic – H[–CH₂–]

(No conjugated diene)
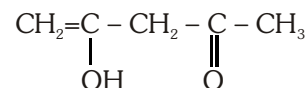
Involvement of less acidic –H in tautomerism

146. Nylon is an example of :-
(1) Polythene   (2) Polyester
(3) Polysaccharide   (4) Polymide

Ans. (4)

Sol. Nylon has polyamide linkage. It is formed by condensation reaction of amines and carboxylic acid groups.

147. XeF_2 is isostructural with :-
(1) $BaCl_2$ (2) TeF_2 (3) ICl_2^- (4) $SbCl_3$

Ans. (3)

148. The basic structural unit of silicates is :-
(1) SiO_4^{2-} (2) SiO^- (3) SiO_4^{4-} (4) SiO_3^{2-}

Ans. (3)

Sol. Silicates – Salt of silicic acid H_4SiO_4
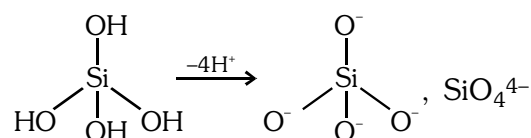
silicate ion

149. Which of the following structure is similar to graphite?
(1) B_2H_6 (2) BN   (3) B   (4) B_4C

Ans. (2)

150. The structure of isobutyl group in an organic compound is :-

(4) $CH_3–CH_2–CH_2–CH_2–$

Ans. (2)

Sol.

t-Butyl   isobutyl

$CH_3-CH-CH_2-CH_3$ $CH_3-CH_2-CH_2-CH_2-$

sec-butyl   n-Butyl
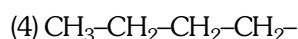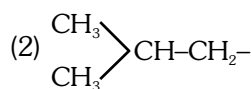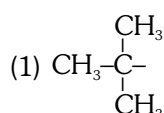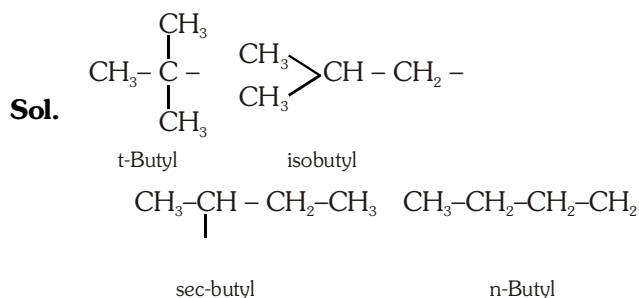
151. The number of carbon atoms per unit cell of diamond unit cell is :-

(1) 1　　(2) 4　　(3) 8　　(4) 6

Ans. (3)

Sol. In the diamond cubic unit cell, there are eight corner atoms, six face centered atoms and four more atoms inside the structure.

∴　Number of atoms present in a diamond cubic unit cell

= 1 + 3 + 4 = 8 atoms

152. An excess of $AgNO_3$ is added to 100 mL of a 0.01 M solution of dichlorotetraaquachromium(III) chloride. The number of moles of AgCl precipitated would be :-

(1) 0.01　(2) 0.001　(3) 0.002　(4) 0.003

Ans. (2)

153. What is the maximum numbers of electrons that can be associated with the following set of quantum numbers ?

n = 3, *l* = 1 and , = −1

(1) 2　　(2) 10　　(3) 6　　(4) 4

Ans. (1)

Sol. n = 3, ℓ = 1 and m = −1 represent a 3p-orbital so maximum 2 electrons can be accomodate in it.

154. Which of these is not a monomer for a high molecular mass silicone polymer ?

(1) $PbSiCl_3$　　　　(2) $MeSiCl_3$

(3) Me_2SiCl_2　　　(4) Me_3SiCl

Ans. (4)

Sol. Silicones are organo-silicon polymer

containing $\left(\!\begin{array}{c}R\\|\\Si\\|\\R\end{array}-O-\begin{array}{c}R\\|\\Si\\|\\R\end{array}\!\right)$ linkage.
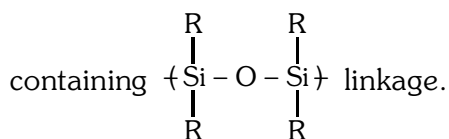
Since Me_3SiCl contain only one Cl therefore it can't form high molecular mass silicon polymer

It act a chain terminating organo silane

155. A reaction having equal energies of activation for forward and reverse reactions has :-

(1) ΔH = ΔG = ΔS = 0　(2) ΔS = 0

(4) ΔG = 0　　　　　　(4) ΔH = 0

Ans. (4)

Sol. $\Delta H = (Ea)_f - (Ea)_b$

Given : $(Ea)_f = (Ea)_b$

∴　ΔH = 0

156. At 25°C molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is $9.54\ ohm^{-1}\ cm^2\ mol^{-1}$ and at infinite dilution its molar conductance is $238\ ohm^{-1}\ cm^2\ mol^{-1}$. The degree of ionisation of ammonium hydroxide at the same concentration and temperature is :-
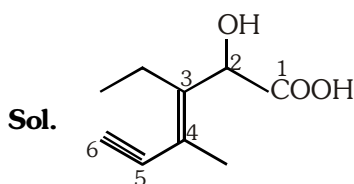
(1) 40.800%　　　(2) 2.080%

(3) 20.800%　　　(4) 4.008%

Ans. (4)

Sol. $\%\ \alpha = \dfrac{\lambda^c}{\lambda^\infty} \times 100 = \dfrac{9.54}{238} \times 100 = 4.008\%$

157. Structure of the compound whose IUPAC name is 3–Ethyl–2–hydroxy–4–methylhex–3–en–5–ynoic acid is :-

Ans. (3)

Sol.

3-Ethyl-2-hydroxy-4-methylhex-3-ex-5-ynonic acid

158. Among the following ethers, which one will produce methyl alcohol on treatement with hot concentrated HI ?

(1) CH_3–CH–CH_2–O–CH_3
$\quad\quad\;\; |$
$\quad\quad\; CH_3$

(2) CH_3–CH_2–CH_2–CH_2–O–CH_3

(3) CH_3–CH_2–CH–O–CH_3
$\quad\quad\quad\;\; |$
$\quad\quad\quad\; CH_3$

(4)
$\quad\quad\quad CH_3$
$\quad\quad\quad\; |$
$\;\; CH_3$–C–O–CH_3
$\quad\quad\quad\; |$
$\quad\quad\quad CH_3$

Ans. (4)

Sol. C–O bond cleavage of ether depends on mechanism involved in reaction which can be SN^1 or SN^2. If any one group can form stable carbocation like tertiary butyl group then reaction follow's SN^1 mechanism
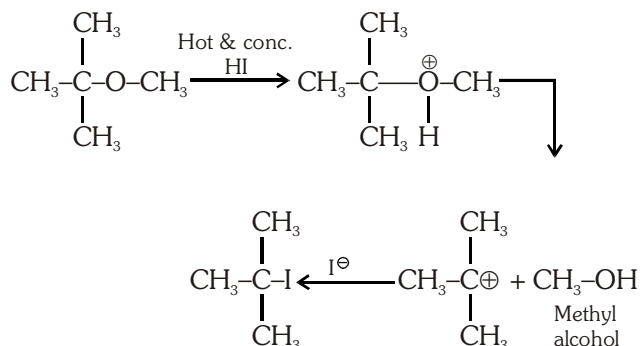
159. Antiseptics and disinfectants either kill or prevent growth of microganisms. Identify which of the following statements is **not true** :-

(1) Disinfectants harm the living tissues

(2) A 0.2% solution of phenol is an antiseptic while 1% solution acts as a disinfectant

(3) Chlorine and Iodine are used as strong disinfectants

(4) Dilute solutions of Boric acid and Hydrogen Peroxide are strong antiseptics

Ans. (4)

160. A magnetic moment of 1.73 BM will be shown by one among the following :-

(1) $[CoCl_6]^{4-}$ (2) $[Cu(NH_3)_4]^{2+}$

(3) $[Ni(CN)_4]^{2-}$ (4) $TiCl_4$

Ans. (2)

Sol. Magnetic moment 1.73 BM

$\mu = \sqrt{n(n+2)}$ B.M

n = no. of unpaired e^-

μ = 1.73

$1.73 = \sqrt{n(n+2)}$ B.M

$\quad\quad$ n = 1

* $[CoCl_6]^{4-} \quad\rightarrow\quad Co^{+2}$; d^7
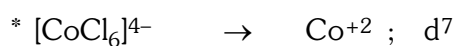
Cl^- (weak field ligand) $t_2g^5 eg^2$ unpaired $e^- = 3$

* $[Cu(NH_3)_4]^{2+}$ Cu^{+2} – d^9
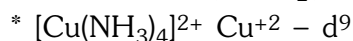
NH_3 Strong field ligand, hybridisation dsp^2

* one e^- of 3d jumps into 4p subshell.

$\quad\quad\quad$ unpaired e^- = 1

* $[Ni(CN)_4]^{2-} \quad\rightarrow\quad Ni^{+2}$ – d^8 unpaired e^- =0
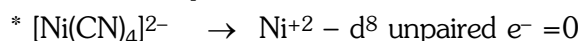
$\quad CN^-$ – Strong field ligand $\quad dsp^2$

* $TiCl_4 \rightarrow Ti^{+4}$ $d°$ unpaired e^- = zero.
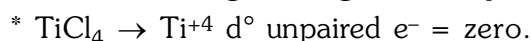
161. $KMnO_4$ can be prepared from K_2MnO_4 as per the reaction :-
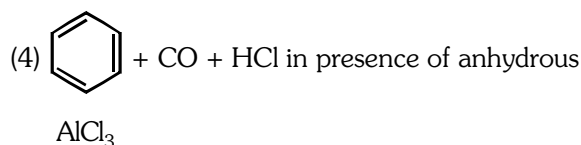
$3MnO_4^{2-} + 2H_2O \rightleftharpoons 2MnO_4^- + MnO_2 + 4OH^-$
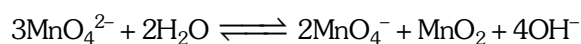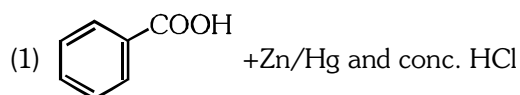
The reaction can go to compition by removing OH^- ions by addings :-

(1) SO_2 (2) HCl

(3) KOH (4) CO_2

Ans. (4)

162. Reaction by which Benzaldehyde cannot be prepared :-

(1) +Zn/Hg and conc. HCl

(2) +CrO_2Cl_2 in CS_2 followed by $H_3O^{\oplus}$

(3) + H_2 in presence of Pd+$BaSO_4$

(4) + CO + HCl in presence of anhydrous $AlCl_3$
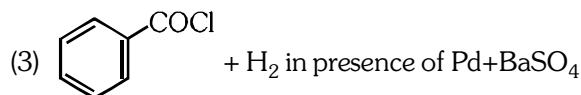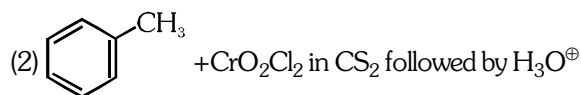
Ans. (1)

Sol. In presence of Zn – Hg and conc. HCl reduction is useful specially for aldehyde and ketone but carboxylic group remains uneffected

$\xrightarrow{\underset{\text{Etard reaction}}{CrO_2Cl_2 + CS_2/H_3O^{\oplus}}}$

$\xrightarrow{\underset{\text{Rosenmund Reaction}}{H_2 / Pd + BaSO_4}}$

$\xrightarrow{\underset{\text{Gatterman Koch Reaction}}{Co + HCl / AlCl_3}}$
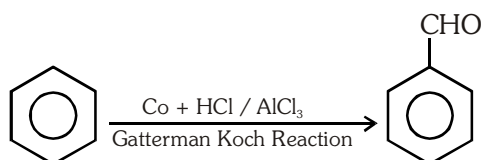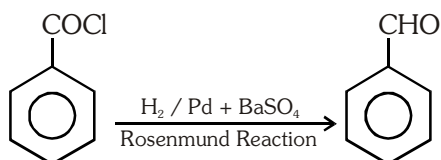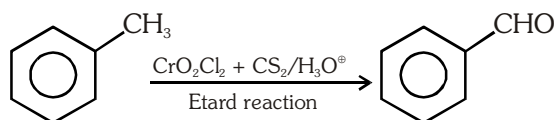
163. Which of the following does not give oxygen on heating ?
(1) $(NH_4)_2Cr_2O_7$ (2) $KClO_3$
(3) $Zn(ClO_3)_2$ (4) $K_2Cr_2O_7$

Ans. (1)

Sol. $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_3 + 4\ H_2O$
do not produces O_2.

164. A metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72 g cm^{-3}. The molar mass of the metal is :-
(1) 20 g mol^{-1} (2) 40 g mol^{-1}
(3) 30 g mol^{-1} (4) 28 g mol^{-1}

Ans. (4)

Sol. $\rho = \dfrac{Z \times M}{N_A \times a^3}$ for FCC, Z = 4

$a = 404$ pm $= 404 \times 10^{-10}$ cm.

$2.72 = \dfrac{4 \times M}{6.02 \times 10^{23} \times (404 \times 10^{-10})^3}$

M = 27 gmol^{-1}

165. Dipole induced dipoloe interactions are present in which of the following pairs :-
(1) SiF_4 and He atoms (2) H_2O and alcohol
(3) Cl_2 and CCl_4 (4) HCl and He atoms

Ans. (4)

Sol. Dipole - induced dipole occurs between polar & Non-polar molecule

HCl	He
Polar	Non-polar
$\mu \neq 0$	$\mu = 0$

166. Roasting of sulphides gives the gas X as a by product. This is colourless gas with choking smel of burnt sulphur and causes great damage to respiratory organs as a result of acid rain. It aqueous solution is acidic, acts as reducing agent and its acid has never been isolated. The gas X is :-
(1) SO_3 (2) H_2S (3) SO_2 (4) CO_2

Ans. (3)

167. Some meta-directing substituents in aromatic substitution are given. Which one is most deactivating?
(1) $-NO_2$ (2) $-C\equiv N$
(3) $-SO_3H$ (4) $-COOH$

Ans. (1)

Sol. Deactivating power :
$-NO_2 > -C \equiv N > -SO_3H > COOH$

168. Nitrobenzene on reaction with conc. HNO_3/H_2SO_4 at 80-100°C forms which one of the following products ?
(1) 1, 2, 4-Trinitrobenzene
(2) 1, 2-Dinitrobenzene
(3) 1, 3-Dinitrobenzene
(4) 1, 4-Dinitrobenzene

Ans. (3)

Sol.

$\xrightarrow{\underset{80-100^0C}{\text{conc. } HNO_3 + \text{conc. } H_2SO_4}}$
1, 3-Dinitro benzene
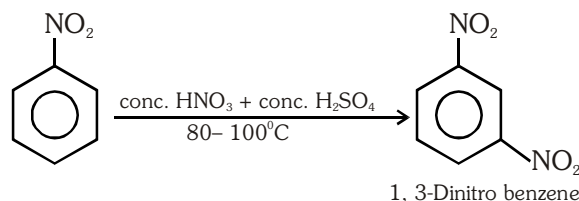
Mixture of [Conc HNO_3 conc H_2SO_4] gives $\overset{\oplus}{N}O_2$ which acts as electrophile and in nitrobenzene
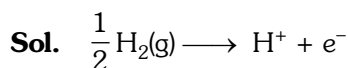
$-NO_2$ group is m–directing group so $\overset{\oplus}{N}O_2$ attacks at m–position.

169. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl of pH = 10 and by passing hydrogen gas around the platinum wire at one atm pressure. The oxidation potential of electrode would be ?
(1) 1.81 V (2) 0.059 V
(3) 0.59 V (4) 0.118 V

Ans. (3)

Sol. $\frac{1}{2}H_2(g) \longrightarrow H^+ + e^-$

$$E_{O.P.} = E^\circ_{O.P.} - \frac{0.059}{n}\log\frac{[H^+]}{(P_{H_2})^{1/2}}$$

$$E_{O.P.} = 0 - \frac{0.059}{1}\log\frac{10^{-10}}{(1)^{1/2}}$$
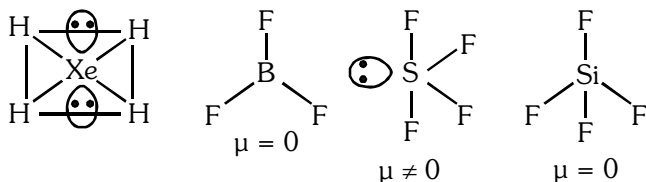
$$(pH = 10, [H^+] = 10^{-10} M)$$

$$E_{O.P.} = 0.59 V$$

170. Which of the following is a polar molecule ?

(1) XeF_4 (2) BF_3 (3) SF_4 (4) SiF_4
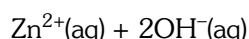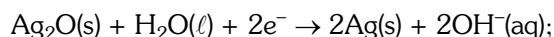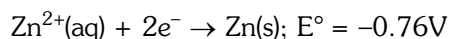
Ans. **(3)**

Sol. Unsymmetrical distribution of e^- cloud leads to the formation of polar molecule

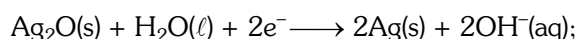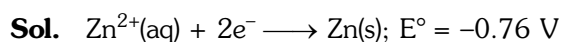**171.** A button cell used in watches function as following

$$Zn(s) + Ag_2O(s) + H_2O(\ell) \rightleftharpoons 2Ag(s) + Zn^{2+}(aq) + 2OH^-(aq)$$

If half cell potentials are

$$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s); E^\circ = -0.76V$$

$$Ag_2O(s) + H_2O(\ell) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq); E^\circ = 0.34V$$

The cell potential will be :-

(1) 1.34 V   (2) 1.10 V   (3) 0.42 V   (4) 0.84 V

Ans. **(2)**

Sol. $Zn^{2+}(aq) + 2e^- \longrightarrow Zn(s); E^\circ = -0.76 V$

$Ag_2O(s) + H_2O(\ell) + 2e^- \longrightarrow 2Ag(s) + 2OH^-(aq); E^\circ = 0.34 V$

$Zn(s) + Ag_2O(s) + H_2O(\ell) \longrightarrow 2Ag(s) + Zn^{+2}(aq) + 2OH^-(aq); E_{cell} = ?$
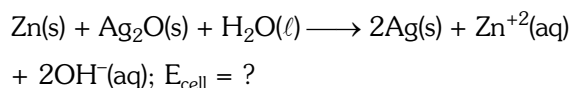
$E^\circ_{cell} = (E^\circ_{R.P.})_{cathode} - (E^\circ_{R.P.})_{anode}$

$E^\circ_{cell} = 0.34 - (-0.76) = 1.10 V$

$E_{cell} = E^\circ_{cell} = 1.10V$

172. Which of these is **least likely** to act as a Lewis base?

(1) PF_3 (2) CO   (3) F^- (4) BF_3

Ans. **(4)**

173. Which of the following compounds will not undergo Friedal-Craft's reaction easily :-

(1) Toluene   (2) Cumene

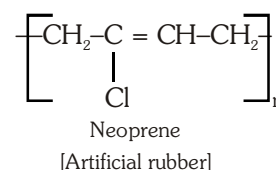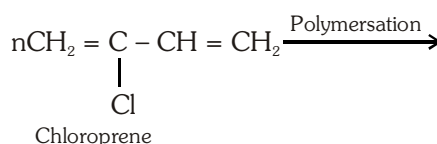(3) Xylene   (4) Nitrobenzene

Ans. **(4)**

Sol. Friedal Craft reaction fails when strong deactivating group is attached with benzene ring.

174. Which is the monomer of Neoprene in the following ?

(1) $CH_2=CH-C\equiv CH$

(2) $CH_2=CH-CH=CH_2$

(3) $CH_2=\underset{\underset{CH_3}{|}}{C}-CH=CH_2$

(4) $CH_2=\underset{\underset{Cl}{|}}{C}-CH=CH_2$

Ans. **(4)**

Sol.

$$nCH_2 = \underset{\underset{Cl}{|}}{C} - CH = CH_2 \xrightarrow{\text{Polymersation}}$$

Chloroprene

$$\left[CH_2-\underset{\underset{Cl}{|}}{C} = CH-CH_2 \right]_n$$

Neoprene
[Artificial rubber]

175. 6.02×10^{20} molecules of urea are present in 100mL of its solution. The concentration of solution is :-

(1) 0.1 M   (2) 0.02 M

(3) 0.01 M   (4) 0.001M

Ans. **(3)**

Sol. Number of moles $= \dfrac{\text{number of molecules}}{N_A}$

$$= \frac{6.02 \times 10^{20}}{6.02 \times 10^{23}} = 10^{-3} \text{ mol}$$

Molar conc. $= \dfrac{n \times 1000}{V_{solution}(mL)} = \dfrac{10^{-3} \times 1000}{100}$

Molar conc. = 0.01 M

176. Maximum deviation from ideal gas is expected from :

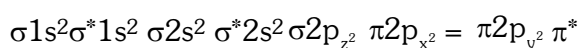(1) $NH_3(g)$ (2) $H_2(g)$ (3) $N_2(g)$ (4) $CH_4(g)$

Ans. (1)

Sol. NH_3 will show maximum deviation from ideal gas due to dipole-dipole attraction.

177. Which of the following is paramagnetic ?

(1) NO^+ (2) CO (3) O_2^- (4) CN^-

Ans. (3)

Sol. $O_2^- \rightarrow 15\ e^-$ contains one unpaired e^- in ABMO.

$\sigma 1s^2 \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2p_{z^2}\ \pi 2p_{x^2} = \pi 2p_{y^2}\ \pi^*$

178. Identify the correct order of solubility in aqueous medium :

(1) $Na_2S > ZnS > CuS$

(2) $CuS > ZnS > Na_2S$

(3) $ZnS > Na_2S > CuS$

(4) $Na_2S < CuS > ZnS$

Ans. (1)

179. What is the activation energy for a reaction it its rate doubles when the temperature is raised from 20°C to 35°C ? (R = 8.314 J mol⁻¹ K⁻¹)

(1) 15.1 kJ mol⁻¹   (2) 342 kJ mol⁻¹

(3) 269 kJ mol⁻¹   (4) 34.7 kJ mol⁻¹

Ans. (4)

Sol. $\log \dfrac{K_2}{K_1} = \dfrac{Ea}{2.303R}\left(\dfrac{1}{T_1} - \dfrac{1}{T_2}\right)$

$\dfrac{r_2}{r_1} = \dfrac{K_2}{K_1} = 2$

$\Rightarrow \log 2 = \dfrac{Ea}{2.303 \times 8.314 \times 10^{-3}}\left(\dfrac{1}{293} - \dfrac{1}{308}\right)$

$\Rightarrow Ea = 34.7\ KJ\ mol^{-1}$

180. Which is the strongest acid in the following ?

(1) H_2SO_3 (2) H_2SO_4 (3) $HClO_3$ (4) $HClO_4$

Ans. (4)