

CBSE-PMT (Prelims) – 2010

PAPER HELD ON 3rd APRIL 2010

1. Which one of the following statements about all the four of *Spongilla*, Leech, Dolphin and Penguin is correct ?
- (1) *Spongilla* has special collared cells called choanocytes, not found in the remaining three
 - (2) All are bilaterally symmetrical
 - (3) Penguin is homoeothermic while the remaining three are poikilothermic
 - (4) Leech is a fresh water form while all others are marine

Ans. (1)

2. Which one of the following statements about human sperm is correct?
- (1) Acrosome serves as a sensory structure leading the sperm towards the ovum
 - (2) Acrosome serves no particular function
 - (3) Acrosome has a conical pointed structure used for piercing and penetrating the egg, resulting in fertilization
 - (4) The sperm lysins in the acrosome dissolve the egg envelope facilitating fertilization

Ans. (4)

3. The nerve centres which control the body temperature and the urge for eating are contained in :
- (1) Cerebellum
 - (2) Thalamus
 - (3) Hypothalamus
 - (4) Pons

Ans. (3)

4. What is *true* about RBCs in humans?
- (1) They transport about 80 per cent oxygen only and the rest 20 per cent of it is transported in dissolved state in blood plasma
 - (2) They do not carry CO₂ at all
 - (3) They carry about 20 – 25 per cent of CO₂
 - (4) They transport 99.5 per cent of O₂

Ans. (3)

5. Which one of the following is used as vector for cloning genes into higher organisms?
- (1) *Rhizopus nigricans*
 - (2) Retrovirus
 - (3) Baculovirus
 - (4) *Salmonella typhimurium*

Ans. (2)

6. Select the two correct statements out of the four (a - d) given below about lac operon.
- (a) Glucose or galactose may bind with the repressor and inactivate it
 - (b) In the absence of lactose the repressor binds with the operator region
 - (c) The z – gene codes for permease
 - (d) This was elucidated by Francois Jacob and Jacques Monod

The correct statements are :

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

Ans. (1)

7. The scutellum observed in a grain of wheat or maize is comparable to which part of the seed in other monocotyledons?

- (1) Aleurone layer
- (2) Plumule
- (3) Cotyledon
- (4) Endosperm

Ans. (3)

8. Ringworm in humans is caused by :
- (1) Nematodes
 - (2) Viruses
 - (3) Bacteria
 - (4) Fungi

Ans. (4)

9. The technical term used for the androecium in a flower of China rose (*Hibiscus rosasinensis*) is :
- (1) Polyandrous
 - (2) Polyadelphous
 - (3) Monadelphous
 - (4) Diadelphous

Ans. (3)

10. Which one of the following is an example of *ex – situ* conservation?
(1) Sacred grooves (2) National park
(3) Wildlife sanctuary (4) Seed bank

Ans. (4)

11. Wind pollinated flowers are :
(1) Large producing abundant nectar and pollen
(2) Small, producing nectar and dry pollen
(3) Small, brightly coloured, producing large number of pollen grains
(4) Small, producing large number of dry pollen grains

Ans. (4)

12. Keel is characteristic of the flowers of :
(1) *Calotropis* (2) Bean
(3) Gulmohur (4) *Cassia*

Ans. (2)

13. The biomass available for consumption by the herbivores and the decomposers is called :
(1) Standing crop (2) Gross primary productivity
(3) Net primary productivity (4) Secondary productivity

Ans. (3)

14. Seminal plasma in human males is rich in:
(1) DNA and testosterone (2) Ribose and potassium
(3) Fructose and calcium (4) Glucose and calcium

Ans. (3)

15. The principal nitrogenous excretory compound in humans is synthesised :
(1) In liver and also eliminated by the same through bile
(2) In the liver, but eliminated mostly through kidneys
(3) In kidney but eliminated mostly through liver
(4) In kidneys as well as eliminated by kidneys

Ans. (2)

16. Darwin's finches are a good example of :
(1) Adaptive radiation (2) Convergent evolution
(3) Industrial melanism (4) Connecting link

Ans. (1)

17. Which one of the following statements about morula in humans is correct?
(1) It has more or less equal quantity of cytoplasm and DNA as in uncleaved zygote
(2) It has more cytoplasm and more DNA than an uncleaved zygote
(3) It has almost equal quantity of cytoplasm as an uncleaved zygote but much more DNA
(4) It has far less cytoplasm as well as less DNA than in an uncleaved zygote

Ans. (3)

18. An element playing important role in nitrogen fixation is :
(1) Manganese (2) Zinc
(3) Molybdenum (4) Copper

Ans. (3)

19. The two gases making highest relative contribution to the greenhouse gases are :
(1) CFC₅ and N₂O (2) CO₂ and N₂O
(3) CO₂ and CH₄ (4) CH₄ and N₂O

Ans. (3)

20. Toxic agents present in food which interfere with thyroxine synthesis lead to the development of :
(1) Simple goitre (2) Thyrotoxicosis
(3) Toxic goitre (4) Cretinism

Ans. (1)

21. In unilocular ovary with a single ovule the placentation is :
(1) Free Central (2) Axile
(3) Marginal (4) Basal

Ans. (4)

22. Apomictic embryos in *citrus* arise from :
(1) Antipodal cells (2) Diploid egg

- (3) Synergids (4) Maternal sporophytic tissue in ovule
Ans. (4)
23. Which one of the following has its own DNA?
(1) Lysosome (2) Peroxisome
(3) Mitochondria (4) Dictyosome
Ans. (3)
24. The kind of epithelium which forms the inner walls of blood vessels is :
(1) Ciliated columnar epithelium (2) Squamous epithelium
(3) Cuboidal epithelium (4) Columnar epithelium
Ans. (2)
25. Transfer of pollen grains from the anther to the stigma of another flower of the same plant is called :
(1) Karyogamy (2) Autogamy
(3) Xenogamy (4) Geitonogamy
Ans. (4)
26. The second maturation division of the mammalian ovum occurs :
(1) Until the nucleus of the sperm has fused with that of the ovum
(2) In the Graafian follicle following the first maturation division
(3) Shortly after ovulation before the ovum makes entry into Fallopian tube
(4) Until after the ovum has been penetrated by a sperm
Ans. (4)
27. Which one of the following is not used in organic farming ?
(1) *Oscillatoria* (2) Snail
(3) *Glomus* (4) Earthworm
Ans. (2)
28. Which two of the following changes (a -d) usually tend to occur in the plain dwellers when they move to high altitudes (3, 500 m or more) ?
(a) Increase in red blood cell size (b) Increase in red blood cell production
(c) Increased breathing rate (d) Increase in thrombocyte count
Changes occurring are :
(1) (a) and (d) (2) (a) and (b)
(3) (b) and (c) (4) (c) and (d)
Ans. (3)
29. A renewable exhaustible natural resource is :
(1) Minerals (2) Forest
(3) Coal (4) Petroleum
Ans. (2)
30. Select the correct statement from the following :
(1) Biogas commonly called gobar gas, is pure methane
(2) Activated sludge sediment in settlement tanks of sewage treatment plant is a rich source of aerobic bacteria
(3) Biogas is produced by the activity of aerobic bacteria on animal waste
(4) *Methanobacterium* is an aerobic bacterium found in rumen of cattle
Ans. (2)
31. The permissible use of the technique amniocentesis is for :
(1) Transfer of embryo into the uterus of a surrogate mother
(2) Detecting any genetic abnormality
(3) Detecting sex of the unborn foetus
(4) Artificial insemination
Ans. (2)
32. The main arena of various types of activities of a cell is :
(1) Cytoplasm (2) Nucleus
(3) Plasma membrane (4) Mitochondrion
Ans. (1)
33. Phototropic curvature is the result of uneven distribution of :
(1) Cytokinins (2) Auxin
(3) Gibberellin (4) Phytochrome
Ans. (2)

34. Listed below are four respiratory capacities (a - d) and four jumbled respiratory volumes of a normal human adult :

	Respiratory capacities	Respiratory volumes
(a)	Residual volume	2500 mL
(b)	Vital capacity	3500 mL
(c)	Inspiratory reserve volume	1200 mL
(d)	Inspiratory capacity	4500 mL

Which one of the following is the correct matching of two capacities and volumes?

- (1) (d) 3500 mL (a) 1200 mL
(2) (a) 4500 mL (b) 3500 mL
(3) (b) 2500 mL (c) 4500 mL
(4) (c) 1200 mL (d) 2500 mL

Ans. (1)

35. The signals for parturition originate from :

- (1) Oxytocin released from maternal pituitary
(2) Fully developed foetus only
(3) Placenta only
(4) Placenta as well as fully developed foetus

Ans. (4)

36. Select the correct statement from the ones given below with respect to dihybrid cross.

- (1) Genes loosely linked on the same chromosome show similar recombinations as the tightly linked ones
(2) Tightly linked genes on the same chromosome show very few recombinations
(3) Tightly linked genes on the same chromosome show higher recombinations
(4) Genes far apart on the same chromosome show very few recombinations

Ans. (2)

37. Restriction endonucleases are enzymes which :

- (1) Restrict the action of the enzyme DNA polymerase
(2) Remove nucleotides from the ends of the DNA molecule
(3) Make cuts at specific positions within the DNA molecule
(4) Recognize a specific nucleotide sequence for binding of DNA ligase

Ans. (3)

38. The part of Fallopian tube closest to the ovary is :

- (1) Cervix (2) Ampulla
(3) Isthmus (4) Infundibulum

Ans. (4)

39. ABO blood groups in humans are controlled by the gene I. It has three alleles - I^A , I^B and i. Since there are three difference alleles, six different genotypes are possible. How many phenotypes can occur?

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

Ans. (1)

40. dB is a standard abbreviation used for the quantitative expression of :

- (1) The dominant Bacillus in a culture (2) A certain pesticide
(3) The density of bacteria in a medium (4) A particular pollutant

Ans. (4)

41. The one aspect which is not a salient feature of genetic code, is its being

- (1) Universal (2) Specific
(3) Degenerate (4) Ambiguous

Ans. (4)

42. The genotype of a plant showing the dominant phenotype can be determined by :

- (1) Pedigree analysis (2) Back cross
(3) Test cross (4) Dihybrid cross

Ans. (3)

43. Which one of the following does not follow the central dogma of molecular biology ?

- (1) *Chlamydomonas* (2) HIV
(3) Pea (4) *Mucor*

Ans. (2)

44. Consider the following four statements (a – d) regarding kidney transplant and select the two correct ones out of these

- (1) Even if a kidney transplant is proper the recipient may need to take immuno – suppressants for a long time
(2) The cell – mediated immune response is responsible for the graft rejection
(3) The B – lymphocytes are responsible for rejection of the graft
(4) The acceptance or rejection of a kidney transplant depends on specific interferons

The two correct statements are :

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

Ans. (2)

45. An improved variety of transgenic basmati rice :

- (1) Is completely resistant to all insect pests and diseases of paddy
(2) Gives high yield but has no characteristic aroma
(3) Does not require chemical fertilizers and growth hormones
(4) Gives high yield and is rich in vitamin A

Ans. (4)

46. Heartwood differs from sapwood in :

- (1) Having dead and non – conducting elements (2) Being susceptible to pests and pathogens
(3) Presence of rays and fibres (4) Absence of vessels and parenchyma

Ans. (1)

47. Which one of the following palindromic base sequences in DNA can be easily cut at about the middle by some particular restriction enzyme?

- (1) 5' ———GAATTC ——— 3'
3' ———CTTAAG ———5'
(2) 5' ———CACGTA ——— 3'
3' ———CTCAGT ——— 5'
(3) 5' ———CGTTCG ——— 3'
3' ———ATGGTA ——— 5'
(4) 5' ———GATATG ——— 3'
3' ———CTACTA ——— 5'

Ans. (2)

48. DNA or RNA segment tagged with a radioactive molecule is called :

- (1) Clone (2) Plasmid
(3) Vector (4) Probe

Ans. (4)

49. The first movements of the foetus and appearance of hair on its head are usually observed during which month of pregnancy?

- (1) Sixth month (2) Third month
(3) Fourth month (4) Fifth month

Ans. (4)

50. Which one of the following is not a micronutrient ?

- (1) Zinc (2) Boron
(3) Molybdenum (4) Magnesium

Ans. (4)

51. PGA as the first CO₂ fixation product was discovered in photosynthesis of :

- (1) Angiosperm (2) Alga
(3) Bryophyte (4) Gymnosperm

Ans. (2)

52. Single – celled eukaryotes are included in :

- (1) Archaea (2) Monera
(3) Protista (4) Fungi

Ans. (3)

53. Which one of the following symbols and its representation, used in human pedigree analysis is correct

- (1) \square = unaffected female (2) \blacklozenge = male affected
 (3) \square — \circ = mating between relatives (4) \circ = unaffected male

Ans. (3)

54. Which stages of cell division do the following figures A and B represent respectively?



- | | | | |
|-----|---------------|---|-----------|
| | Figure A | – | Figure B |
| (1) | Late Anaphase | – | Prophase |
| (2) | Prophase | – | Anaphase |
| (3) | Metaphase | – | Telophase |
| (4) | Telophase | – | Metaphase |

Ans. (1)

55. Study the four statements (a – d) given below and select the two correct ones out of them :

- (1) A lion eating a deer and a sparrow feeding on grain are ecologically similar in being consumers
 (2) Predator star fish *Pisaster* helps in maintaining species diversity of some invertebrates
 (3) Predators ultimately lead to the extinction of prey species
 (4) Production of chemicals such as nicotine strychnine by the plants are metabolic disorders

The two correct statements are :

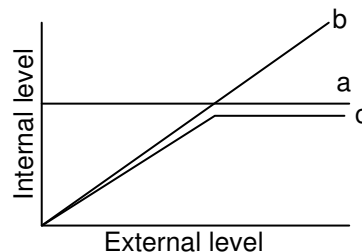
- (1) (a) and (d) (2) (a) and (b)
 (3) (b) and (c) (4) (c) and (d)

Ans. (2)

56. The figure given below is a diagrammatic representation of response of organisms to abiotic factors.

What do a, b and c represent respectively ?

- | | | | |
|-----|-------------------|-------------------|-------------------|
| | (a) | (b) | (c) |
| (1) | Partial regulator | Regulator | Conformer |
| (2) | Regulator | Conformer | Partial regulator |
| (3) | Conformer | Regulator | Partial regulator |
| (4) | Regulator | Partial regulator | conformer |



Ans. (2)

57. Ovary is half – inferior in the flowers of :

- (1) Brinjal (2) Cucumber
 (3) Guava (4) Plum

Ans. (4)

58. Male and female gametophytes are independent and free – living in :

- (1) *Pinus* (2) *Sphagnum*
 (3) Mustard (4) Castor

-
- Ans. (2)**
59. Photoperiodism was first characterised in :
(1) Tomato (2) Cotton
(3) Tobacco (4) Potato
- Ans. (3)**
60. Injury to adrenal cortex is not likely to affect the secretion of which one of the following ?
(1) Adrenaline
(2) Cortisol
(3) Aldosterone
(4) Both Androstenedione and Dehydroepiandrosterone
- Ans. (1)**
61. Coiling of garden pea tendrils around any support is an example of :
(1) Thigmotropism (2) Thermotaxis
(3) Thigmotaxis (4) Thigmonasty
- Ans. (1)**
62. Genetic engineering has been successfully used for producing :
(1) Transgenic Cow – Rosie which produces high fat milk for making ghee
(2) Animals like bulls for farm work as they have super power
(3) Transgenic mice for testing safety of polio vaccine before use in humans
(4) Transgenic models for studying new treatments for certain cardiac diseases
- Ans. (3)**
63. Which one of the following kinds of animals are *triploblastic*?
(1) Ctenophores (2) Corals
(3) Flat worms (4) Sponges
- Ans. (3)**
64. Some hyperthermophilic organisms that grow in highly acidic (pH2) habitats belong to the two groups :
(1) Protists and mosses (2) Liverworts and yeasts
(3) Eubacteria and archaea (4) Cyanobacteria and diatoms
- Ans. (3)**
65. C_4 plants are more efficient in photosynthesis than C_3 plants due to :
(1) Presence of thin cuticle
(2) Lower rate of photorespiration
(3) Higher leaf area
(4) Presence of larger number of chloroplasts in the leaf cells
- Ans. (2)**
66. The chief water conducting elements of xylem in gymnosperms are :
(1) Transfusion tissue (2) Tracheids
(3) Vessels (4) Fibres
- Ans. (2)**
67. Cu ions released from copper – releasing Intra Uterine Devices (IUDs) :
(1) Suppress sperm motility (2) Prevent ovulation
(3) Make uterus unsuitable for implantation (4) Increase phagocytosis of sperms
- Ans. (1)**
68. Sertoli cells are found in :
(1) Seminiferous tubules and provide nutrition to germ cells
(2) Pancreas and secrete cholecystokinin
(3) Ovaries and secrete progesterone
(4) Adrenal cortex and secrete adrenaline
- Ans. (1)**
69. Which one of the following structures between two adjacent cells is an effective transport pathway?
(1) Endoplasmic reticulum (2) Plasmalemma
(3) Plasmodesmata (4) Plastoquinones
- Ans. (3)**
70. The genetically – modified (GM) brinjal in India has been developed for :
(1) Enhancing mineral content (2) Drought – resistance
(3) Insect – resistance (4) Enhancing shelf life
-

-
- Ans. (3)**
71. Algae have cell wall made up of :
(1) Pectins, cellulose and proteins (2) Cellulose, hemicellulose and pectins
(3) Cellulose, galactans and mannans (4) Hemicellulose, pectins and proteins
- Ans. (2)**
72. Which one of the following is one of the characteristics of a biological community?
(1) Mortality (2) Sex – ratio
(3) Stratification (4) Natality
- Ans. (3)**
73. One example of animals having a single opening to the outside that serves both as mouth as well as anus is :
(1) *Ascidia* (2) *Fasciola*
(3) *Octopus* (4) *Asterias*
- Ans. (2)**
74. Satellite DNA is useful tool in :
(1) Forensic science (2) Genetic engineering
(3) Organ transplantation (4) Sex determination
- Ans. (1)**
75. One of the free – living, anaerobic nitrogen – fixer is :
(1) *Rhizobium* (2) *Azotobacter*
(3) *Beijernickia* (4) *Rhodospirillum*
- Ans. (4)**
76. A common biocontrol agent for the control of plant diseases is :
(1) *Glomus* (2) *Trichoderma*
(3) Baculovirus (4) *Bacillus thuringiensis*
- Ans. (2)**
77. Which one of the following cannot be explained on the basis of Mendel's Law of Dominance?
(1) Alleles do not show any blending and both the characters recover as such in F₂ generation
(2) Factors occur in pairs
(3) The discrete unit controlling a particular character is called a factor
(4) Out of one pair of factors one is dominant and the other recessive
- Ans. (1)**
78. Virus envelope is known as :
(1) Nucleoprotein (2) Core
(3) Capsid (4) Virion
- Ans. (3)**
79. If for some reason our goblet cells are non – functional, this will adversely affect :
(1) Maturation of sperms
(2) Smooth movement of food down the intestine
(3) Production of somatostatin
(4) Secretion of sebum from the sebaceous glands
- Ans. (2)**
80. Which one of the following statements about certain given animals is correct?
(1) Insects are pseudocoelomates
(2) Flat worms (Platyhelminthes) are coelomates
(3) Round worms (Aschelminthes) are pseudocoelomates
(4) Molluscs are acoelomates
- Ans. (3)**
81. Breeding of crops with high levels of minerals, vitamins and proteins is called :
(1) Biomagnification (2) Micropropagation
-

- (3) Somatic hybridization (4) Biofortification
Ans. (4)
82. Widal test is used for the diagnosis of
(1) Tuberculosis (2) Typhoid
(3) Malaria (4) Pneumonia
Ans. (2)
83. The common nitrogen – fixer in paddy fields is :
(1) *Oscillatoria* (2) *Frankia*
(3) *Rhizobium* (4) *Azospirillum*
Ans. (1)
84. The energy – releasing metabolic process in which substrate is oxidized without an external electron acceptor is called :
(1) Aerobic respiration (2) Photorespiration
(3) Glycolysis (4) Fermentation
Ans. (4)
85. Which one of the following statements is correct with respect to AIDS?
(1) AIDS patients are being fully cured cent per cent with proper care and nutrition
(2) The causative HIV retrovirus enters helper T – lymphocytes thus reducing their numbers
(3) The HIV can be transmitted through eating food together with an infected person
(4) Drug addicts are least susceptible to HIV infection
Ans. (2)
86. Which one of the following statements in regard to the excretion by the human kidneys is correct ?
(1) Nearly 99 per cent of the glomerular filtrate is reabsorbed by the renal tubules
(2) Ascending limb of Loop of Henle is impermeable to electrolytes
(3) Descending limb of Loop of Henle is impermeable to water
(4) Distal convoluted tubule is incapable of reabsorbing HCO_3^-
Ans. (1)
87. Some of the characteristics of Bt cotton are :
(1) High yield and production of toxic protein crystals which kill dipteran pests
(2) High yield and resistance to bollworms
(3) Long fibre and resistance to aphids
(4) Medium yield, long fibre and resistance to beetle pests
Ans. (1)
88. *In vitro* fertilization is a technique that involves transfer of which one of the following into the fallopian tube?
(1) Embryo of 32 cell stage
(2) Zygote only
(3) Embryo only, upto 8 cell stage
(4) Either zygote or early embryo upto 8 cell stage
Ans. (4)
89. During mitosis, ER and nucleolus begin to disappear at :
(1) Late metaphase (2) Early prophase
(3) Late prophase (4) Early metaphase
Ans. (3)
90. The plasma membrane consists mainly of :
(1) Proteins embedded in a polymer of glucose molecules
(2) Proteins embedded in a carbohydrate bilayer
(3) Phospholipids embedded in a protein bilayer
(4) Proteins embedded in a phospholipid bilayer
Ans. (4)
91. Which one of the following is not a later meristem?
(1) Phellogen (2) Intercalary meristem
(3) Intrafascicular cambium (4) Interfascicular cambium
Ans. (2)
92. Membrane – bound organelles are absent in

- (1) *Chlamydomonas* (2) *Plasmodium*
(3) *Saccharomyces* (4) *Streptococcus*

Ans. (4)

93. Infectious proteins are present in :
(1) Viroids (2) Satellite viruses
(3) Gemini viruses (4) Prions

Ans. (4)

94. Vasa efferentia are the ductules leading from :
(1) Vas deferens to epididymis (2) Epididymis to urethra
(3) Testicular lobules to rete testis (4) Rete testis to vas deferens

Ans. (4)

95. If due to some injury the chordae tendinae of the tricuspid valve of the human heart is partial non – functional, what will be the immediate effect?
(1) The blood will tend to flow back into the left atrium
(2) The flow of blood into the pulmonary artery will be reduced
(3) The flow of blood into the aorta will be slowed down
(4) The 'pacemaker' will stop working

Ans. (2)

96. Low Ca^{++} in the body fluid may be the cause of :
(1) Angina pectoris (2) Gout
(3) Tetany (4) Anaemia

Ans. (3)

97. Carrier ions like Na^+ facilitate the absorption substances like :
(1) Fatty acids and glycerol (2) Fructose and some amino acids
(3) Amino acids and glucose (4) Glucose and fatty acids

Ans. (2)

98. Select the correct statement from the ones given below :
(1) Chewing tobacco lowers blood pressure and heart rate
(2) Cocaine is given to patients after surgery as it stimulates recovery
(3) Barbiturates when given to criminal make them tell the truth
(4) Morphine is often given to person who have undergone surgery as a pain kill

Ans. (4)

99. Stirred – tank bioreactors have been designed for :
(1) Ensuring anaerobic conditions in the culture vessel
(2) Availability of oxygen throughout the process
(3) Addition of preservatives to the product
(4) Purification of the product

Ans. (2)

100. Which one of the following pairs is incorrectly matched ?
(1) Corpusluteum – Relaxin (secretion) (2) Insulin – Diabetes mellitus (disease)
(3) Glucagon – Beta cells (source) (4) Somatostatin – Delta cells (source)

Ans. (3)

101. The dimension of $\frac{1}{2} \epsilon_0 E^2$, where ϵ_0 is permittivity of free space and E is electric field is

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

Ans. (3)

Sol. $\left[\frac{1}{2} \epsilon_0 E^2 \right] = [\text{Energy Density}] = \frac{ML^2T^{-2}}{L^3} = ML^{-1}T^{-2}$

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

- (1) (velocity)^{2/3} (2) (velocity)^{3/2}
(3) (distance)² (4) (distance)⁻²

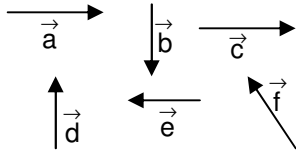
Ans. (2)

Sol. $X = \frac{1}{t+5} \Rightarrow v = \frac{dx}{dt} = -\frac{1}{(t+5)^2}$

Acceleration, $a = \frac{dv}{dt} = \frac{2}{(t+5)^3}$

$\Rightarrow a \propto (\text{velocity})^{3/2}$

103. Six vector \vec{a} through \vec{f} have the magnitudes and directions indicated the figure. Which of the following statements is true?



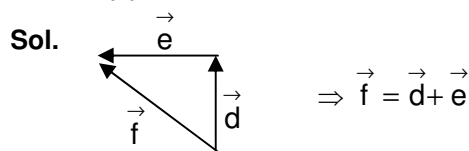
(1) $\vec{b} + \vec{e} = \vec{f}$

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

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

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

Ans. (4)



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

(1) 10 units

(2) 7 units

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

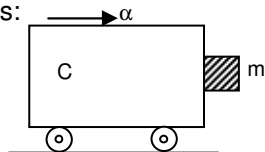
(4) 8.5 units

Ans. (3)

Sol $\vec{v} = \vec{u} + \vec{a}t = (3\hat{i} + 4\hat{j}) + (0.4\hat{i} + 0.3\hat{j})(10)$
 $= 7\hat{i} + 7\hat{j}$

So speed = $|\vec{v}| = 7\sqrt{2}\text{ms}^{-1}$

105. A block of mass m in contact with cart C as shown in the figure. The coefficient of static friction between the block and the cart is μ . The acceleration α of the cart that will prevent the block from falling satisfies:



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

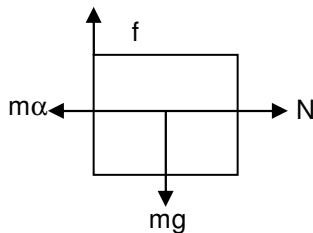
(2) $\alpha > \frac{mg}{\mu}$

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

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

Ans. (4)

Sol.



Here $f = mg$ and $N = m\alpha$ but $f \leq \mu N$

$$\text{So } mg \leq \mu m\alpha \Rightarrow \alpha \geq \frac{g}{\mu}$$

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

- (1) 20m (2) 9.9 m
(3) 10.1 m (4) 10 m

Ans. (3)

Sol. Let distance of man from the floor be $(10 + x)$ m. As centre of mass of system remains at 10m above the floor. So $50(x) = 0.5(10) \Rightarrow x = 0.1$ m
 \Rightarrow distance of the man above the floor = $10 + 0.1 = 10.1$ m

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

- (1) 800 W (2) 400 W
(3) 200 W (4) 100 W

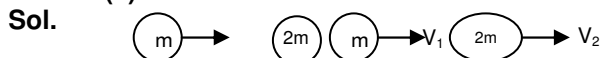
Ans. (1)

Sol. Power = $Fv = v \left(\frac{m}{t} \right) v = v^2(\rho Av)$

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

- (1) 0.2 (2) 0.1
(3) 1.1 (4) 1, 0.5

Ans. (2)



Initial condition Final condition

By conservation of linear momentum:

$$2m = mv_1 + 2mv_2 \Rightarrow v_1 + 2v_2 = 2$$

$$\text{by definition of } e : e = \frac{1}{2} = \frac{v_2 - v_1}{2 - 0}$$

$$\Rightarrow v_2 - v_1 = 1 \Rightarrow v_1 = 0 \text{ and } v_2 = 1 \text{ ms}^{-1}$$

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

- (1) $r \geq \frac{\mu g}{\omega^2}$ (2) $r = \mu g \omega^2$
(3) $r < \frac{\omega^2}{\mu g}$ (4) $r \leq \frac{\mu g}{\omega^2}$

Ans. (4)

Sol. Here friction force provides centripetal force so
 $f = m \omega^2 r$ but $f \leq \mu mg$

$$\text{so } m \omega^2 r \leq \frac{\mu g}{\omega^2}$$

$$V_p = -\frac{GM}{a/2} - \frac{GM}{a} = -\frac{3GM}{a}$$

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

- (1) 60 m/s (2) 75 m/s
(3) 55 m/s (4) 40 m/s

Ans. (2)

Sol. Let two balls meet at depth h from platform

$$\text{So } h - \frac{1}{2}g(18)^2 = v(12) + \frac{1}{2}g(12)^2$$

$$\Rightarrow v = 75 \text{ ms}^{-1}$$

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

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

Ans. (3)

Sol. $\frac{Q}{t} = \frac{kA(T_1 - T_2)}{\ell}$

$$\frac{Q'}{t} = \frac{k\left(\frac{A}{4}\right)(T_1 - T_2)}{4\ell} = \frac{1}{16} \frac{kA(T_1 - T_2)}{\ell}$$

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

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

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

Ans. (2)

Sol. Total radiant energy per unit area

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

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

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

Ans. (2)

Sol. $\Delta Q = \Delta U + \Delta W$ In adiabatic process $\Delta Q = 0$

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

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

(5) simple harmonic motion of frequency $\frac{\omega}{\pi}$

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

(7) non simple harmonic motion

Ans. (4)

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

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

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

Ans. (1)

Sol. $T = 2\pi\sqrt{\frac{M}{k}}, T' = 2\pi\sqrt{\frac{2M}{k}} = \sqrt{2}T$

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

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

(3) πA (4) $2\pi A$

Ans. (4)

Sol. Wave velocity $= n\lambda = \omega A \Rightarrow \lambda = \frac{\omega A}{\frac{\omega}{2\pi}} = 2\pi A$

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

(1) 508 Hz (2) 510 Hz

(3) 514 Hz (4) 516 Hz

Ans. (1)

Sol. The frequency of the piano string may be 508 or 516 Hz.

As frequency $\propto \sqrt{\text{Tension}}$ so answer will be 508 Hz.

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

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

(8) Both electric and magnetic field vectors attain the maxima and minima at the same place and same time

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

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

Ans. (4)

Sol. Electric and magnetic field vectors are perpendicular to each other in electromagnetic wave.

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

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

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

Ans. (4)

Sol. $f' = f$ & Intensity \propto Area so $I' = I - \frac{1}{4} = \frac{3I}{4}$

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

- (1) $\mu = 1.25$ (2) $\mu = 1.33$
 (3) $\mu = 1.40$ (4) $\mu = 1.50$

Ans. (4)

Sol. For TIR $45 \geq \theta_c \Rightarrow \sin 45 \geq \sin \theta_c$

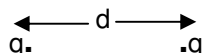
$$\Rightarrow \frac{1}{\sqrt{2}} \geq \frac{1}{\mu} \Rightarrow \mu \geq \sqrt{2}$$

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

- (1) $\frac{4\pi\epsilon_0 Fd^2}{q^2}$ (2) $\frac{4\pi\epsilon_0 Fd^2}{e^2}$
 (3) $\sqrt{\frac{4\pi\epsilon_0 Fe^2}{d^2}}$ (4) $\sqrt{\frac{4\pi\epsilon_0 Fd^2}{e^2}}$

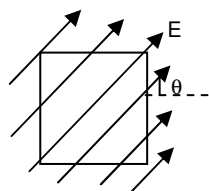
Ans. (4)

Sol.



$$f = \frac{(ne)^2}{4\pi\epsilon_0 d^2} \Rightarrow n = \sqrt{\frac{4\pi\epsilon_0 Fd^2}{e^2}}$$

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



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

Ans. (1)

Sol. Here $\vec{E} \perp$ Area Vector

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

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

Ans. (1)

Sol. $\frac{1}{2} \left(\frac{C_1}{n_1} \right) (4V)^2 = \frac{1}{2} (n_2 C_2) V^2 \Rightarrow C_2 = \frac{16C_1}{n_1 n_2}$

Ans. (3)

133. A thin ring of radius R meter has charge q coulomb uniformly spread on it. The ring rotates about its axis with a constant frequency of f revolutions/s. The value of magnetic induction in Wb/ m² at the centre of the ring is

(1) $\frac{\mu_0 q f}{2R}$ (2) $\frac{\mu_0 q f}{2\pi R}$
 (3) $\frac{\mu_0 q}{2\pi f R}$ (4) $\frac{\mu_0 q}{2f R}$

Ans. (1)

Sol. $B = \frac{\mu_0 I}{2R} = \frac{\mu_0}{2R} \left(\frac{q}{t} \right) = \frac{\mu_0 q f}{2R}$

134. Electromagnets are made of soft iron because soft iron has
 (1) High retentivity and low coercive force
 (11) Low retentivity and high coercive force
 (12) High retentivity and high coercive force
 (13) Low retentivity and low coercive force

Ans. (4)

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

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

Ans. (1)

Sol. $T = 2\pi \sqrt{\frac{I}{MB_H}}$, $T = 2\pi \sqrt{\frac{I}{M(B_H - B)}}$
 $\Rightarrow T' = 2T = 4s$

136. A conducting circular loop is placed in magnetic field, $B = .025$ T with its plane perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of 1 mm s^{-1} . The induced e.m.f. when the radius is 2 cm, is

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

Ans. (3)

$$\begin{aligned} \phi &= (B)(\pi r^2) \Rightarrow e = \frac{d\phi}{dt} = (B)(2\pi r) \left(\frac{dr}{dt} \right) \\ &= (0.025)(2\pi)(2 \times 10^{-2})(10^{-3}) \\ &= \pi \mu\text{V} \end{aligned}$$

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

Sol. $h\nu = \phi_0 + eV_0$ where $h\nu = \frac{12400}{2000} = 6.2 \text{ eV}$

$\Rightarrow V_0 = 6.2 - 5.01 = 1.19 \approx 1.20 \text{ V}$

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

- (1) $5 \log_e 2$ (2) $\log_e 2/5$
(3) $\frac{5}{\log_e 2}$ (4) $5 \log_{10} 2$

Ans. (1)

Sol. $N = N_0 e^{-\lambda t} \Rightarrow \frac{N_0}{e} = N_0 e^{-\lambda(5)} \Rightarrow \lambda = \frac{1}{5}$

Now $\frac{N_0}{2} = N_0 e^{-\lambda(1)} \Rightarrow t = \frac{1}{\lambda} \ln 2 = 5 \ln 2$

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

- (1) -6.8 eV (2) -13.6 eV
(3) -27.2 eV (4) -54.4 eV

Ans. (2)

Sol. $E_n = -13.6 \left(\frac{Z^2}{n^2} \right) = (-13.6) \left(\frac{4}{4} \right) = -13.6 \text{ eV}$

144. The mass of a ${}^7_3\text{Li}$ nucleus is 0.042 u less than the sum of the masses of all its nucleus. The binding energy per nucleus is nearly:

- (1) 23 MeV (2) 46 MeV
(3) 5.6 MeV (4) 3.9 MeV

Ans. (3)

Sol. $\frac{\text{BE}}{\text{nucleon}} = \frac{0.042 \times 931}{7} = 5.6 \text{ MeV}$

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

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

Ans. (4)

Sol. $\frac{1}{2}mv^2 = \frac{(Ze)(2e)}{4\pi \epsilon_0 d_{\min}}$ then $d_{\min} \propto \frac{1}{m}$

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

- (1) 50 (2) 500
(3) 1000 (4) 1250

Ans. (4)

Sol. Voltage gain = $\beta \left(\frac{R_{\text{out}}}{R_{\text{in}}} \right)$

$\Rightarrow \beta = \frac{50 \times 100}{200} = 25$

Power gain = $\beta(\text{voltage gain})$
 $= (25)(50) = 1250$

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

- (1) covalent bonding (2) metallic bonding
(3) van der Waal's bonding (4) ionic bonding

Ans. (2)

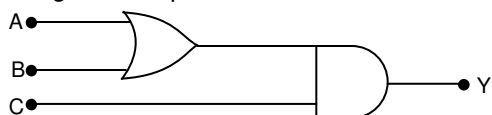
148. The device that can act as a complete electronic circuit is
(1) Zener diode (2) Junction diode
(3) Integrated circuit (4) Junction transistor

Ans. (3)

149. Which one of the following statement is FALSE?
(1) The resistance of intrinsic semiconductor decreases with increases of temperature.
(2) Pure Si doped with trivalent impurities gives a p-type semiconductor
(3) Majority carries in a semiconductor are holes
(4) Minority carriers in a p-type semiconductor are electrons

Ans. (3)

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



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

Ans. (4)

$$Y = (A + B) \cdot C$$

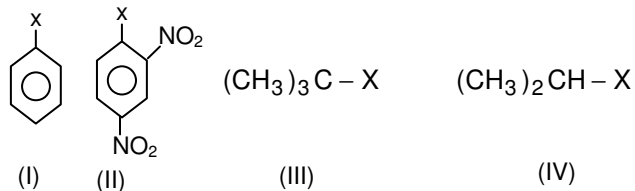
151. Which of the following statements about primary amines is 'False' ?

- (1) 'Aryl amines react with nitrous acid to produce phenols
(2) Alkyl amines are stronger bases than ammonia
(3) Alkyl amines are stronger bases than aryl amines
(4) Alkyl amines react with nitrous acid to produce alcohols

Ans. (1)

Sol. Aryl amines react with nitrous acid to gives diazonium salt.

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



- (1) $\text{IV} < \text{III} < \text{I} < \text{II}$ (2) $\text{III} < \text{II} < \text{I} < \text{IV}$
(3) $\text{I} < \text{II} < \text{IV} < \text{III}$ (4) $\text{II} < \text{III} < \text{I} < \text{IV}$

Ans. (2)

Sol. Alkylhalides, ($3^\circ > 2^\circ$) are more reactive than aryl halides towards nucleophilic substitution.

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

- (1) more than ΔH (2) equal to zero
(3) less than ΔH (4) equal to ΔH

Ans. (1)

Sol. E_a is more than ΔH .

154 Which one is most reactive towards S_N1 reaction?

- (1) $C_6H_5C(CH_3)(C_6H_5)Br$
- (2) $C_6H_5CH_2Br$
- (3) $C_6H_5CH(C_6H_5)Br$
- (4) $C_6H_5CH(CH_3)Br$

Ans. (1)

Sol. Because 3° carbocation is most stable.

155 Oxidation states of P in $H_4P_2O_5$, $H_4P_2O_6$, $H_4P_2O_7$, are respectively:

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

Ans. (2)

Sol. $H_4P_2O_5$ $2x = +6$, so $x = +3$

$H_4P_2O_6$ $2x = +8$, so $x = +4$

$H_4P_2O_7$ $2x = +10$, so $x = +5$

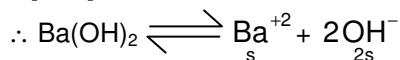
156 If pH of a saturated solution of $Ba(OH)_2$ is 12, the value of its K_{sp} is:

- (1) $5.00 \times 10^{-6} M^3$
- (2) $5.00 \times 10^{-7} M^3$
- (3) $4.00 \times 10^{-6} M^3$
- (4) $4.00 \times 10^{-7} M^3$

Ans. (2)

Sol. pH = 12, so pOH = 2

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



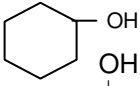
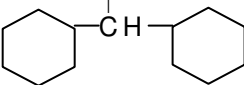
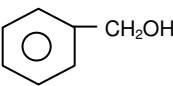
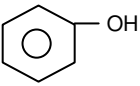
$$\therefore \text{Given } 2s = 10^{-2} \text{ so } s = \frac{10^{-2}}{2} = 5 \times 10^{-3} \text{ Mole/litre}$$

$$\therefore \text{Hence } K_{sp} = [Ba^{+2}][OH^-]^2$$

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

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

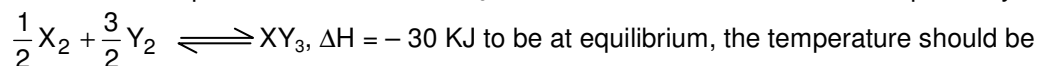
157 Which one of the following compounds has the most acidic nature?

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

Ans. (4)

Sol. Phenate ion is stabilised by resonance.

158 Standard entropies of X_2 , Y_2 and XY_3 are 60, 40 and $50 \text{ Jk}^{-1}\text{mol}^{-1}$ respectively. For the reaction



- (1) 1250K
- (2) 500 K

(3) 750 K

(4) 1000 K

Ans. (3)

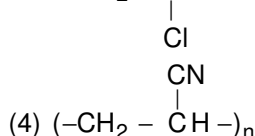
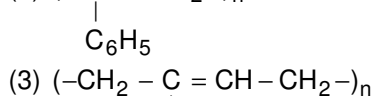
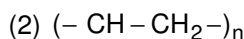
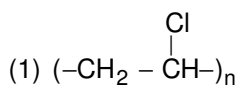
Sol. At equilibrium $\Delta G^\circ = 0$, so $\Delta H^\circ = T\Delta S^\circ$

$$\therefore \Delta S^\circ = 50 - (30+60) = -40\text{J/k/mol}$$

$$\therefore \text{Now } T = \frac{\Delta H^\circ}{\Delta S^\circ} = \frac{-30 \times 10^3 \text{ J/mol}}{-40\text{J/k/mol}}$$

$$\text{So } T = 750\text{k}$$

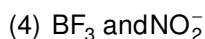
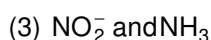
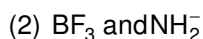
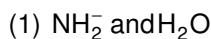
159 Which of the following structures represents Neoprene polymer?



Ans. (3)

Sol. Factual.

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



Ans. (4)

Sol. In BF_3 and NO_2^- central atoms are sp^2 hybridised.

161 Which one of the following does not exhibit the phenomenon of mutarotation?

(1) (+) Maltose

(2) (-) Fructose

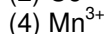
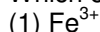
(3) (+) Sucrose

(4) (+) Lactose

Ans. (3)

Sol. (+) Sucrose, because it not has hemiacetal linkage.

162 Which one of the following ions has electronic configuration $[\text{Ar}] 3d^6$?



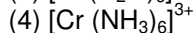
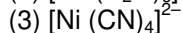
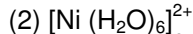
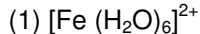
(At. nos. Mn = 25, Fe = 26, Co = 27, Ni = 28)

Ans. (2)

Sol. $\text{Co}(27) = [\text{Ar}] 3d^7 4s^2$

$\text{Co}^{3+}(27) = [\text{Ar}] 3d^6$

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



Ans. (3)

Sol. CN^- , is a strong ligand so all electrons are paired

164 Property of the alkaline earth metals that increases with their atomic number

(1) Ionization energy

(2) Electronegativity

(3) Solubility of their hydroxides in water

(4) Solubility of their sulphates in water

Ans. (3)

Sol. Down the group lattice energy decreases so solubility increases.

170 For the reaction $\text{N}_2\text{O}_5(\text{g}) \rightarrow 2\text{NO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g})$ the value of rate of disappearance of N_2O_5 given as $6.25 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$. The rate of formation of NO_2 and O_2 is given respectively as

- (1) $6.25 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$ and $3.125 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$
 (2) $1.25 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ and $6.25 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$
 (3) $6.25 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$ and $6.25 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$
 (4) $1.25 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$ and $3.125 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$

Ans. (4)

Sol.
$$-\frac{d(\text{N}_2\text{O}_5)}{dt} = +\frac{1}{2} \frac{d(\text{NO}_2)}{dt} = +2 \frac{d\text{O}_2}{dt}$$

$$6.25 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1} = +\frac{1}{2} \frac{d(\text{NO}_2)}{dt} = +2 \frac{d\text{O}_2}{dt}$$

So $+\frac{1}{2} \frac{d(\text{NO}_2)}{dt} = 6.25 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$ that is $+\frac{d(\text{NO}_2)}{dt} = 1.25 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$

and $+\frac{d\text{O}_2}{dt} = 3.125 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$

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

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

Ans. (1)

Sol. Size of isoelectronic $\propto \frac{1}{\text{Nuclear charge}}$

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

- (1) 200 pm (2) 300 pm
 (3) 335 pm (4) 250 pm

Ans. (3)

Sol. $2d = \sqrt{3} a$

$$\text{So } d = \frac{\sqrt{3}a}{2} = \frac{\sqrt{3} \times 387 \text{ pm}}{2} = 335 \text{ pm}$$

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

- (1) Lu^{3+} (z = 71) (2) Sc^{3+} (z = 21)
 (3) La^{3+} (z = 57) (4) Ti^{3+} (z = 22)

Ans. (4)

Sol. $\text{Ti}^{3+} = [\text{Ar}] 3d^1$ so it is coloured in aqueous solutions?

174 What is $[\text{H}^+]$ in mol/L of a solution that is 0.20 M in CH_3COONa and 0.10 M in CH_3COOH ? K_a for $\text{CH}_3\text{COOH} = 1.8 \times 10^{-5}$

- (1) 1.8×10^{-5} (2) 9.0×10^{-6}
 (3) 3.5×10^{-4} (4) 1.1×10^{-5}

Ans. (2)

Sol. $\text{pH} = \text{p}K_a + \log \left[\frac{\text{salt}}{\text{acid}} \right]$

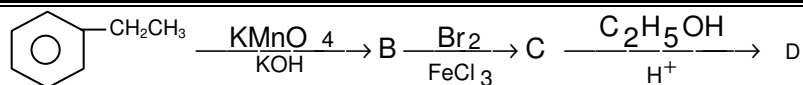
$$= -\log(1.8 \times 10^{-5}) + \log \left(\frac{0.2}{0.1} \right)$$

$$= \log \left[\frac{2}{1.8 \times 10^{-5}} \right]$$

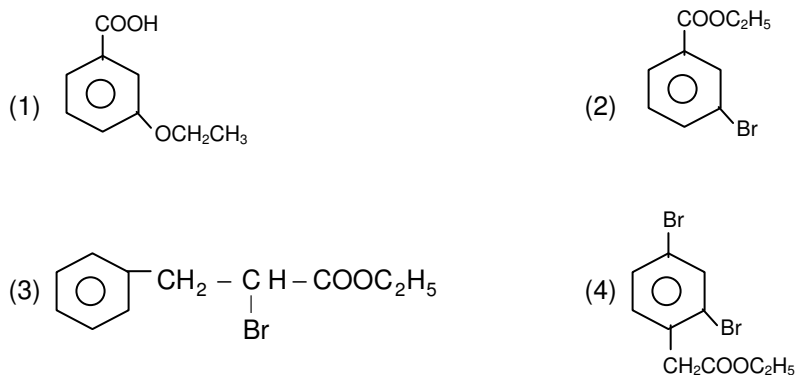
$$\text{pH} = \log \left(\frac{1}{9.0 \times 10^{-6}} \right)$$

So $[\text{H}^+] = 9.0 \times 10^{-6}$

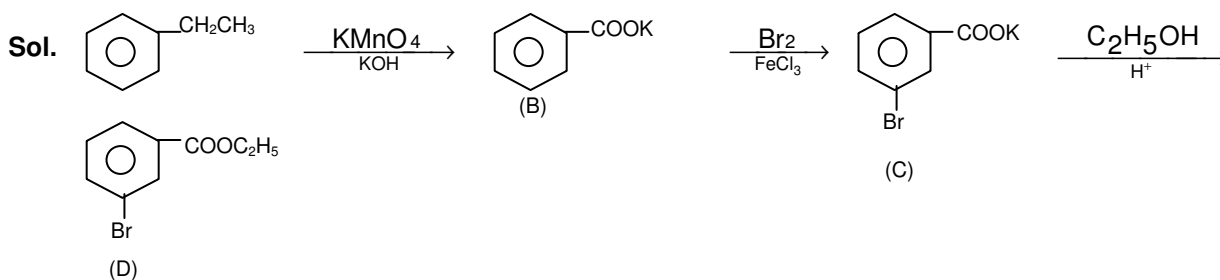
175 In a set of reactions, ethyl benzene yielded a product D.



'D' would be :



Ans. (2)



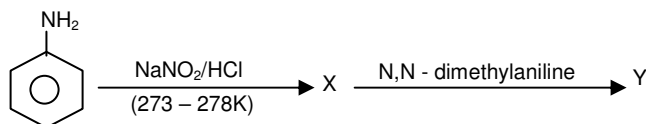
176 Which one of the following compounds is a peroxide?

- (1) MnO_2 (2) NO_2
(3) KO_2 (4) BaO_2

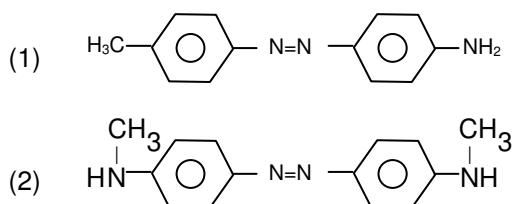
Ans. (4)

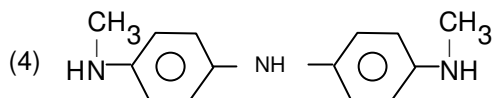
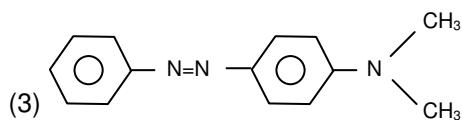
Sol. BaO_2 has peroxide ion

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



The structure of 'Y' would be:





Ans. (3)

Sol. This is a coupling reaction

178 Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is:

- (1) $\text{CH}_3\text{COOCOCH}_3$ (2) CH_3COCl
(3) $\text{CH}_3\text{COOCH}_3$ (4) CH_3CONH_2

Ans. (2)

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

179 The reaction of toluene with Cl_2 in the presence of FeCl_3 gives 'X' and reaction in the presence of light gives 'Y'. Thus, 'X' and 'Y' are:

- (1) X = o- and p- chlorotoluene Y = Trichloromethyl benzene
(2) X = Benzyl chloride, Y = m- chlorotoluene
(3) X = Benzal chloride, Y = o- chlorotoluene
(4) X = m- chlorotoluene, Y = p- chlorotoluene

Ans. (1)

Sol. Chlorine in the presence of FeCl_3 gives ortho and para chlorotoluene and in the presence of light gives trichloromethyl benzene

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

- (1) Naproxen (2) Mifepristone
(3) Promethazine (4) Valium

Ans. (4)

Sol. Factual.

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

- (1) B_2H_6 (2) CH_4
(3) NH_3 (4) H_2O

Ans. (1)

Sol. B_2H_6 is an electron deficient compound.

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

- (1) 3.600×10^{23} (2) 1.800×10^{22}
(3) 6.026×10^{22} (4) 1.806×10^{23}

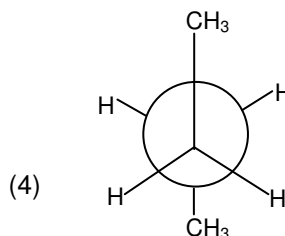
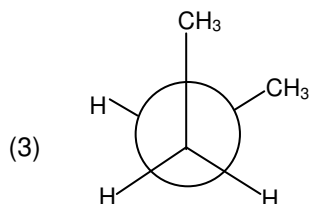
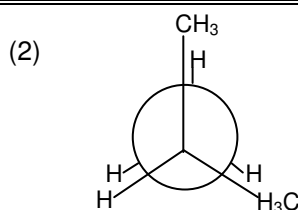
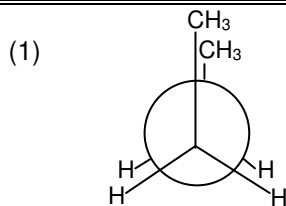
Ans. (4)

Sol. 1 mole of triatomic gas contains = 6.02×10^{23} molecules.

1 mole of triatomic gas contains = $3 \times 6.02 \times 10^{23}$ atoms

So 0.1 mole of triatomic gas contains = $0.1 \times 3 \times 6.02 \times 10^{23} = 1.806 \times 10^{23}$ atoms.

183 In the following the most stable conformation of n-butane is



Ans. (2)

Sol. It is due to the stability of anti staggered conformation.

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

- (1) Hot conc. H_2SO_4 (2) PCl_5
(3) $NaOH-Br_2$ (4) Sodalime

Ans. (3)

Sol. This is Hoffmann – Bromamide reaction

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

- (1) coordination isomerism (2) ionization isomerism
(3) linkage isomerism (4) geometrical isomerism

Ans. (4)

Sol. It is due to the cis and trans isomerism.

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

- (1) $BaSO_4$ (2) $SrSO_4$
(3) $CaSO_4$ (4) $BeSO_4$

Ans. (4)

Sol. Be^{2+} ions has smallest size.

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

- (1) - 44.5 kJ (2) 98.0 kJ
(3) - 89.0 kJ (d) - 89.0 J

Ans. (3)

Sol. $\Delta G^\circ = -nFE_{cell}^\circ$

$$= -2 \times 96500 \times 0.46 \text{ J} = -89.0 \text{ kJ}$$

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

- (1) + 0.372°C (2) - 0.570°C
(3) - 0.372°C (4) - 0.520°C

Ans. (3)

Sol. $\Delta T_f = k_f \times m$

$$= \frac{1.86 \times 68.5}{342} = 0.372^\circ\text{C}$$

So freezing point of the solution will be - 0.372°C

189 Liquid hydrocarbons can be converted to mixture of gaseous hydrocarbons by

- (1) Distillation under reduced pressure (2) Hydrolysis
(3) Oxidation (4) Cracking

Ans. (4)

Sol. This is due to cracking.

190 An increase in equivalent conductance of an electrolyte with dilution is mainly due to

- (1) increase in both i.e. number of ions, ionic mobility of ions
- (2) increase in number of ions
- (3) increase in ionic mobility of ions
- (4) 100% ionisation of electrolyte on dilution

Ans. (3)

Sol. Increase in equivalent conductance of a strong electrolyte due to the increase in ionic mobility of ions on dilution.

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

- (1) addition of 1.00 molal KI
- (2) addition of water
- (3) addition of NaCl
- (4) addition of Na₂SO₄

Ans. (2)

Sol. Vapour pressure increases with dilution.

192 The correct order of increasing bond angles the following species is

- (1) Cl₂O < ClO₂⁻ < ClO₂
- (2) ClO₂⁻ < Cl₂O < ClO
- (3) Cl₂O < ClO₂ < ClO₂⁻
- (4) ClO₂ < Cl₂O < ClO₂⁻

Ans. (1)

Sol. Factual.

193 In which of the following equilibrium K_c and K_p are not equal ?

- (1) H₂(g) + I₂(g) ⇌ 2HI(g)
- (2) 2C(s) + O₂(g) ⇌ 2CO₂(g)
- (3) 2NO(g) ⇌ N₂(g) + O₂(g)
- (d) SO₂(g) + NO₂(g) ⇌ SO₃(g) + NO(g)

Ans. (2)

Sol. $k_p = k_c (RT)^{\Delta n_g}$

194 The tendency of BF₃, BCl₃ and BBr₃ to behave as Lewis acid decreases in the sequence

- (1) BBr₃ > BF₃ > BCl₃
- (2) BF₃ > BCl₃ > BBr₃
- (3) BCl₃ > BF₃ > BBr₃
- (4) BBr₃ > BCl₃ > BF₃

Ans. (4)

Sol. It is due to the increase in the back donation from BBr₃ to BF₃.

195 Which of the following reactions will not result in the formation of carbon-carbon bonds ?

- (1) Wurtz reaction
- (2) Friedel-Crafts acylation
- (3) Reimer-Tieman reaction
- (4) Cannizaro reaction

Ans. (4)

Sol. It is a disproportionation reaction.

196 Which of the following pairs has the same size ?

- (1) Zr⁴⁺, Hf⁴⁺
- (2) Zn²⁺, Hf⁴⁺
- (3) Fe²⁺, Ni²⁺
- (4) Zr⁴⁺, Ti⁴⁺

Ans. (1)

Sol. This is due to Lanthanide contraction.

197 In a buffer solution containing equal concentration of B⁻ and HB, the K_b for B⁻ is 10⁻¹⁰. The pH of buffer solution is

- (1) 6
- (2) 4
- (3) 10
- (4) 7

Ans. (2)

Sol. $pOH = pK_b + \log \frac{[\text{salt}]}{[\text{acid}]}$

$pOH = 10$ (because concentration of [B⁻] = [HB])

Hence $pH = 14 - 10 = 4$.

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

- (1) F < S < O < Cl
- (2) S < O < Cl < F
- (3) Cl < F < O < S
- (4) O < S < F < Cl

Ans. (4)

Sol. Factual.

199 Crystal field stabilization energy of high spin d^4 octahedral complex is

(1) $-1.2 \Delta_0$

(2) $-0.6 \Delta_0$

(3) $-1.8 \Delta_0$

(4) $-1.6 \Delta_0 + P$

Ans. (2)

Sol. $CFSE = -3 \times 0.4 + 0.6 \times 1 = -0.6$

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

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

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

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

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

Ans. (1)

Sol. Factual.