

Time : 3 hrs.

Max. Marks: 480

Solutions

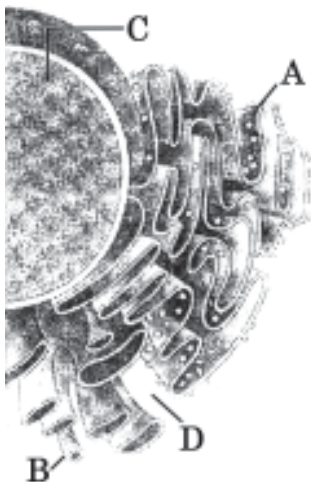
for

CBSE Final Exam. 2010

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

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

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



Components:

- (i) Cristae of mitochondria
- (ii) Inner membrane of mitochondria
- (iii) Cytoplasm
- (iv) Smooth endoplasmic reticulum
- (v) Rough endoplasmic reticulum
- (vi) Mitochondrial matrix
- (vii) Cell vacuole
- (viii) Nucleus

The correct components are :

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

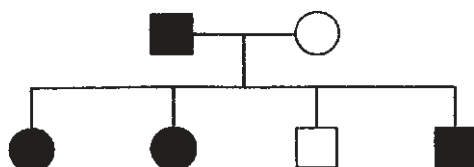
3. Fastest distribution of some injectible material/ medicine and with no risk of any kind can be achieved by injecting it into the

- (1) Muscles
- (2) Arteries
- (3) Veins
- (4) Lymph vessels

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

- (1) *Centromere* is found in animal cells, which produces aster during cell division
- (2) The *gene for producing insulin* is present in every body cell
- (3) *Nucleosome* is formed of nucleotides
- (4) *DNA* consists of a core of eight histones

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



- (1) The female parent is heterozygous
- (2) The parents could not have had a normal daughter for this character
- (3) The trait under study could not be colour-blindness
- (4) The male parent is homozygous dominant

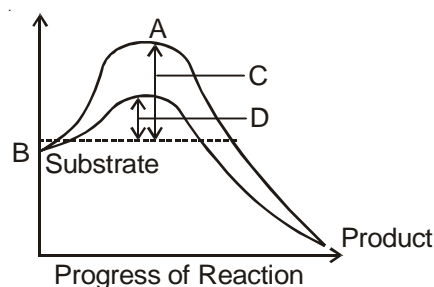
6. Leguminous plants are able to fix atmospheric nitrogen through the process of symbiotic nitrogen fixation. Which one of the following statements is **not** correct during this process of nitrogen fixation?

- (1) Leghaemoglobin scavenges oxygen and is pinkish in colour
- (2) Nodules act as sites for nitrogen fixation
- (3) The enzyme nitrogenase catalyses the conversion of atmospheric N_2 to NH_3
- (4) Nitrogenase is insensitive to oxygen

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

- (1) *Opuntia*
- (2) *Casuarina*
- (3) *Hydrilla*
- (4) *Acacia*

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



Options:

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

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

- (1) Nucleoids
- (2) Lomasomes
- (3) Mesosomes
- (4) Plasmids

10. When domestic sewage mixes with river water

- (1) Small animals like rats will die after drinking river water
- (2) The increased microbial activity releases micro-nutrients such as iron
- (3) The increased microbial activity uses up dissolved oxygen
- (4) The river water is still suitable for drinking as impurities are only about 0.1%

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

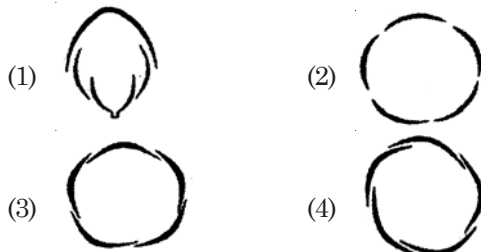
Statements:

- (A) Wings of butterfly and birds look alike and are the results of (i), evolution.
 (B) Miller showed that CH_4 , H_2 , NH_3 and (i), when exposed to electric discharge in a flask resulted in formation of (ii).
 (C) Vermiform appendix is a (i) organ and an (ii) evidence of evolution.
 (D) According to Darwin evolution took place due to (i) and (ii) of the fittest.

Options :

- (1) (D) – (i) Small variations, (ii) Survival,
 (A) – (i) Convergent
 (2) (A) – (i) Convergent,
 (B) – (i) Oxygen, (ii) nucleosides
 (2) (B) – (i) Water vapour, (ii) Amino acids
 (C) – (i) Rudimentary, (ii) Anatomical
 (4) (C) – (i) Vestigial, (ii) Anatomical
 (D) – (i) Mutations, (ii) Multiplication

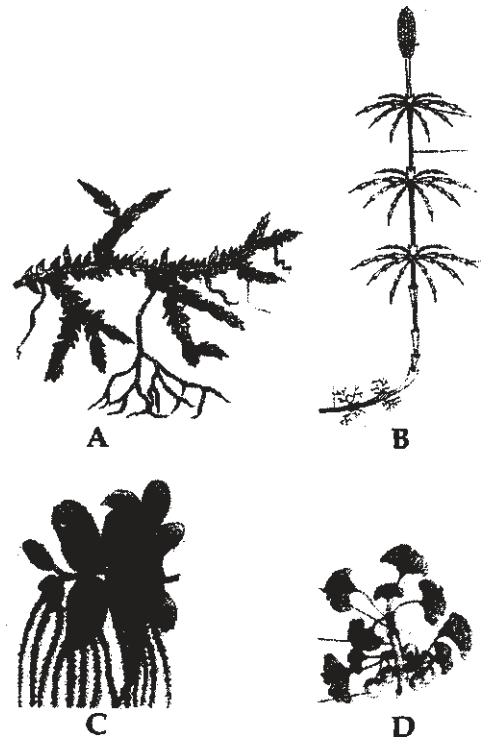
12. Aestivation of petals in the flower of cotton is correctly shown in 1



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

- (1) Humans – Kidneys, sebaceous glands and tear glands
 (2) Earthworm – Pharyngeal, integumentary and septal nephridia
 (3) Cockroach – Malpighian tubules and enteric caeca
 (4) Frog – Kidneys, skin and buccal epithelium

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



Options:

| | A | B | C | D |
|-----|--------------------|-------------------|--------------------|-------------------|
| (1) | <i>Chara</i> | <i>Marchantia</i> | <i>Fucus</i> | <i>Pinus</i> |
| (2) | <i>Equisetum</i> | <i>Ginkgo</i> | <i>Selaginella</i> | <i>Lycopodium</i> |
| (3) | <i>Selaginella</i> | <i>Equisetum</i> | <i>Salvinia</i> | <i>Ginkgo</i> |
| (4) | <i>Funaria</i> | <i>Adiantum</i> | <i>Salvinia</i> | <i>Riccia</i> |

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

- (1) Loss of body hair
 (2) Walking upright
 (3) Shortening of the jaws
 (4) Remarkable increase in the brain size

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

- (1) Nicotine (2) Morphine
 (3) Quinine (4) Insulin

17. The correct floral formula of soybean is

- (1) $\% \text{ } \overline{\text{K}}_{(5)} \text{ } C_{1+(2)+2} \text{ } A_{(9)+1} \text{ } G_{\overline{1}}$
 (2) $\% \text{ } \overline{\text{K}}_5 \text{ } C_{1+(2)+2} \text{ } A_{(9)+1} \text{ } G_{\overline{1}}$
 (3) $\% \text{ } \overline{\text{K}}_{(5)} \text{ } C_{1+2+(2)} \text{ } A_{(9)+1} \text{ } G_{\overline{1}}$
 (4) $\% \text{ } \overline{\text{K}}_{(5)} \text{ } C_{1+2+(2)} \text{ } A_{1+(9)} \text{ } G_{\overline{1}}$

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

- (1) The pancreatic enzymes and specially the trypsin and lipase will not work efficiently
 (2) The pH of stomach will fall abruptly
 (3) Steapsin will be more effective
 (4) Proteins will not be adequately hydrolysed by pepsin into proteoses and peptones

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

- (1) Host is an organism which provides food to another organism
 (2) *Amensalism* is a relationship in which one species is benefited whereas the other is unaffected
 (3) *Predator* is an organism that catches and kills other organism for food
 (4) *Parasite* is an organism which always lives inside the body of other organism and may kill it

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

STATEMENTS :

- (A) Z scheme of light reaction takes place in presence of PSI only.
 (B) Only PS I is functional in cyclic photophosphorylation.
 (C) Cyclic photophosphorylation results into synthesis of ATP and NADPH_2
 (D) Stroma lamellae lack PS II as well as NADP.

Options :

- (1) B and D (2) A and B
 (3) B and C (4) C and D

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

- (1) Magnetic resonance imaging (MRI)
 (2) Radiography (X-ray)
 (3) Computed tomography (CT)
 (4) Histopathological studies

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

- (1) Estrogen from placenta
 (2) Oxytocin from maternal pituitary
 (3) Oxytocin from foetal pituitary
 (4) Relaxin from placenta

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

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

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

- (1) Ribosomes (2) Nucleus
 (3) Dictyosomes (4) ER

25. Given below are four statements (a-d) regarding human blood circulatory system
- Arteries are thick-walled and have narrow lumen as compared to veins
 - Angina is acute chest pain when the blood circulation to the brain is reduced
 - Persons with blood group AB can donate blood to any person with any blood group under ABO system
 - Calcium ions play a very important role in blood clotting

Which two of the above statements are correct?

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

26. In human female the *blastocyst*

- Forms placenta even before implantation
- Gets implanted into uterus 3 days after ovulation
- Gets nutrition from uterine endometrial secretion only after implantation
- Gets implanted in endometrium by the trophoblast cells

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

- (1) 5 - 11 g
- (2) 25 - 30 g
- (3) 17 - 20 g
- (4) 12 - 16 g

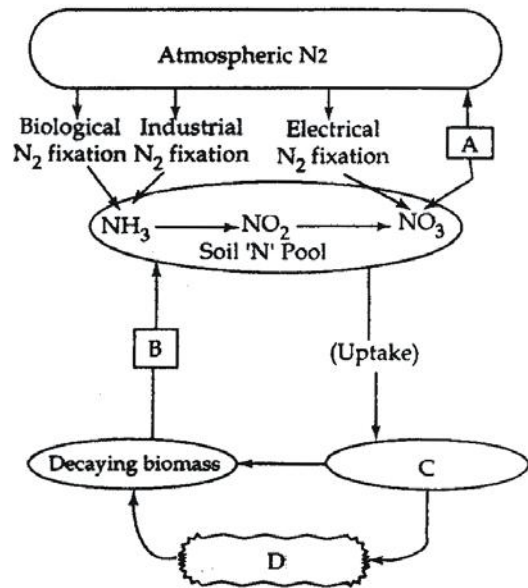
28. An example of endomycorrhiza is

- (1) *Nostoc*
- (2) *Glomus*
- (3) *Agaricus*
- (4) *Rhizobium*

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

- Ethylene
- Abscisic acid
- Zeatin
- Indole - 3 - acetic acid

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



Options:

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

31. Jaundice is a disorder of

- Excretory system
- Skin and eyes
- Digestive system
- Circulatory system

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

- (1) Potato
- (2) Wheat
- (3) Sugarcane
- (4) Mustard

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

- (1) $rrrr$ (2) RR
(3) Rr (4) rr

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

- (1) Companion cells (2) Transfusion tissue
(3) Tracheids (4) Sieve elements

35. Which one of the following is monoecious?

- (1) *Marchantia* (2) *Cycas*
(3) *Pinus* (4) *Date palm*

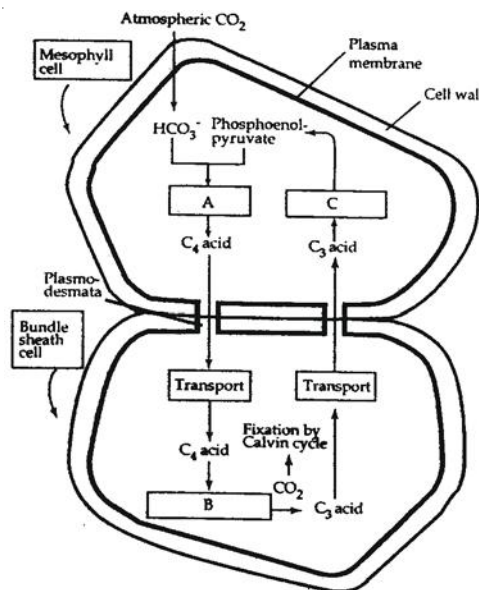
36. A cross in which an organism showing a dominant phenotype is crossed with the recessive parent in order to know its genotype is called :

- (1) Monohybrid cross (2) Back cross
(3) Test cross (4) Dihybrid cross

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

- (1) Uttarakhand (2) Uttar Pradesh
(3) Himachal Pradesh (4) Assam

38. Study the pathway given below :



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

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

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

- (1) *Alternaria solani* (2) *Ustilago nuda*
(3) *Puccinia graminis* (4) *Xanthomonas oryzae*

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

- (1) Male accessory glands
(2) Liver
(3) Pancreas
(4) Salivary glands

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

- (1) The sporozoites released from RBCs are being rapidly killed and broken down inside spleen
- (2) The trophozoites reach maximum growth and give out certain toxins
- (3) The parasite after its rapid multiplication inside RBCs ruptures them, releasing the stage to enter fresh RBCs
- (4) The microgametocytes and megagametocytes are being destroyed by the WBCs

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

- (1) Six
- (2) Three
- (3) Four
- (4) Five

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

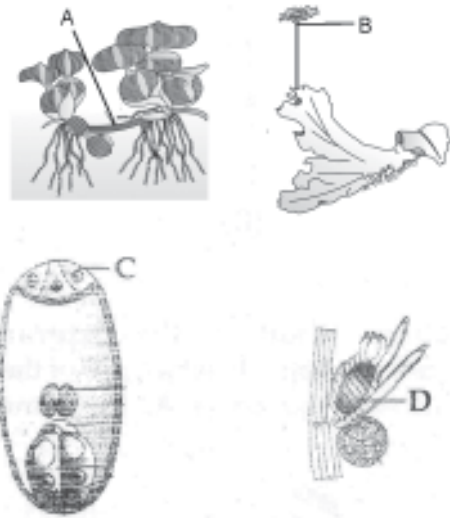
- (1) Enzymes require optimum pH for maximal activity
- (2) Enzymes are denatured at high temperature but in certain exceptional organisms they are effective even at temperatures 80°-90°C
- (3) Enzymes are highly specific
- (4) Most enzymes are proteins but some are lipids

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

- (1) Thylakoid
- (2) Endoplasmic Reticulum
- (3) Plasmalemma
- (4) Cytoskeleton

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

Structures :



Options :

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

46. Root development is promoted by

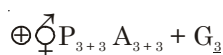
- (1) Abscissic acid
- (2) Auxin
- (3) Gibberellin
- (4) Ethylene

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

Statements

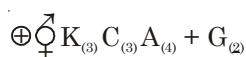
- (A) In vexillary aestivation, the large posterior petal is called - *standard*, two lateral ones are *wings* and two small anterior petals are termed *keel*

(B) The floral formula for Liliaceae is



(C) In pea flower the stamens are monadelphous

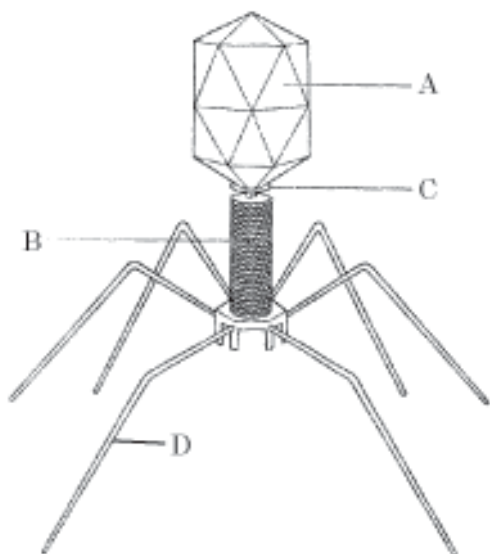
(D) The floral formula for Solanaceae is



The correct statements are

- (1) (A) and (C)
- (2) (A) and (B)
- (3) (B) and (C)
- (4) (C) and (D)

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



Options :

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

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

Statements

- (A) A bacterium (B) Plasmid
(C) Plasmodium (D) Bacteriophage

Options :

- (1) (A), (B) and (D) only (2) (A) only
(3) (A) and (C) only (4) (B) and (D) only

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

- (1) Formalin-inactivated suspensions of virulent bacteria
- (2) Avirulent live bacteria
- (3) Synthetic capsular polysaccharide material
- (4) Heat-killed suspensions of virulent bacteria

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

- (1) It reproduces parthenogenetically
- (2) A single mating produces two young flies
- (3) Smaller female is easily recognisable from larger male
- (4) It completes life cycle in about two weeks

52. The *lac* operon consists of
- (1) Four regulatory genes only
 - (2) One regulatory gene and three structural genes
 - (3) Two regulatory genes and two structural genes
 - (4) Three regulatory genes and three structural genes
53. Crocodile and penguin are similar to Whale and Dogfish in which one of the following features?
- (1) Possess a solid single stranded central nervous system
 - (2) Lay eggs and guard them till they hatch
 - (3) Possess bony skeleton.
 - (4) Have gill slits at some stage
54. Select the answer with *correct matching* of the structure, its location and function

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

55. Select the correct combination of the statements (a-d) regarding the *characteristics* of certain organisms
- (a) Methanogens are Archaeobacteria which produce methane in marshy areas
 - (b) *Nostoc* is a filamentous blue-green alga which fixes atmospheric nitrogen
 - (c) Chemosynthetic autotrophic bacteria synthesize cellulose from glucose
 - (d) Mycoplasma lack a cell wall and can survive without oxygen

The correct statement are

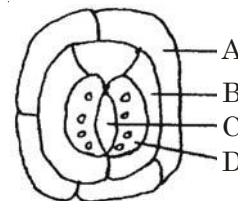
- (1) (b), (c)
- (2) (a), (b), (c)
- (3) (b), (c), (d)
- (4) (a), (b), (d)

56. Which one of the following is the *correct description* of a certain part of a normal human skeleton?
- (1) Parietal bone and the temporal bone of the skull are joined by fibrous joint
 - (2) First vertebra is axis which articulates with the occipital condyles
 - (3) The 9th and 10th pairs of ribs are called the floating ribs
 - (4) Glenoid cavity is a depression to which the thigh bone articulates

57. Vegetative propagation in *Pistia* occurs by

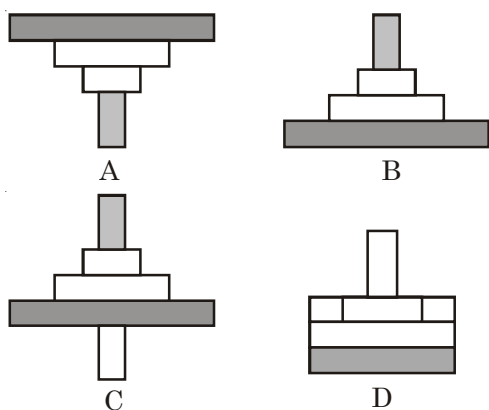
- (1) Stolon
- (2) Offset
- (3) Runner
- (4) Sucker

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



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

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



- (1) D
(3) B

- (2) A
(4) C

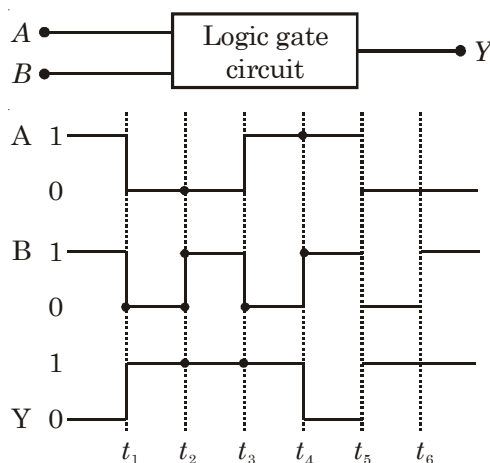
60. The 3'-5' phosphodiester linkages inside a polynucleotide chain serve to join

- (1) One DNA strand with the other DNA strand
(2) One nucleoside with another nucleoside
(3) One nucleotide with another nucleotide
(4) One nitrogenous base with pentose sugar

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

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

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



The logic gate is

- (1) NOR gate (2) OR gate
(3) AND gate (4) NAND gate

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

- (1) Become zero (2) Increase
(3) Decrease (4) Remain same

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

- (1) Zero (2) E
(3) $\frac{E}{2}$ (4) $\frac{E}{3}$

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

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

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

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

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

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

- (a) The wavelength λ is 188.4 m
(b) The wave number k is 0.33 rad/m
(c) The wave amplitude is 10 V/m
(d) The wave is propagating along $+x$ direction

Which one of the following pairs of statements is correct?

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

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

- (1) Equal to $\sin^{-1}\left(\frac{2}{3}\right)$
(2) Equal to or less than $\sin^{-1}\left(\frac{3}{5}\right)$
(3) Equal to or greater than $\sin^{-1}\left(\frac{3}{4}\right)$
(4) Less than $\sin^{-1}\left(\frac{2}{3}\right)$

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

- (1) Zero (2) 30°
(3) 45° (4) 60°

70. For transistor action

- (a) Base, emitter and collector regions should have similar size and doping concentrations.
(b) The base region must be very thin and lightly doped.
(c) The emitter-base junction is forward biased and base-collector junction is reverse biased.
(d) Both the emitter-base junction as well as the base collector junction are forward biased.

Which one of the following pairs of statements is correct?

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

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

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

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

- (1) 60° (2) 15°
(3) 30° (4) 45°

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

- (1) $\frac{40}{9}MR^2$ (2) MR^2
(3) $4MR^2$ (4) $\frac{4}{9}MR^2$

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

- (1) An elliptical path
(2) A circular path
(3) A parabolic path
(4) A straight line path inclined equally to x and y -axes

75. A closely wound solenoid of 2000 turns and area of cross-section $1.5 \times 10^{-4} \text{ m}^2$ carries a current of 2.0 A. It is suspended through its centre and perpendicular to its length, allowing it to turn in a horizontal plane in a uniform magnetic field 5×10^{-2} tesla making an angle of 30° with the axis of the solenoid. The torque on the solenoid will be
- (1) $3 \times 10^{-3} \text{ N.m}$ (2) $1.5 \times 10^{-3} \text{ N.m}$
 (3) $1.5 \times 10^{-2} \text{ N.m}$ (4) $3 \times 10^{-2} \text{ N.m}$

76. The decay constant of a radio isotope is λ . If A_1 and A_2 are its activities at times t_1 and t_2 respectively, the number of nuclei which have decayed during the time $(t_1 - t_2)$
- (1) $A_1 t_1 - A_2 t_2$ (2) $A_1 - A_2$
 (3) $(A_1 - A_2)/\lambda$ (4) $\lambda(A_1 - A_2)$

77. A particle having a mass of 10^{-2} kg carries a charge of $5 \times 10^{-8} \text{ C}$. The particle is given an initial horizontal velocity of 10^5 ms^{-1} in the presence of electric field \vec{E} and magnetic field \vec{B} . To keep the particle moving in a horizontal direction, it is necessary that
- (a) \vec{B} should be perpendicular to the direction of velocity and \vec{E} should be along the direction of velocity
 (b) Both \vec{B} and \vec{E} should be along the direction of velocity
 (c) Both \vec{B} and \vec{E} are mutually perpendicular and perpendicular to the direction of velocity
 (d) \vec{B} should be along the direction of velocity and \vec{E} should be perpendicular to the direction of velocity

Which one of the following pairs of statements is possible?

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

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

- (1) 23.6 MeV (2) 2.2 MeV
 (3) 28.0 MeV (4) 30.2 MeV

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

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

- (1) 5.1 V (2) 12.1 V
 (3) 17.2 V (4) 7 V

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

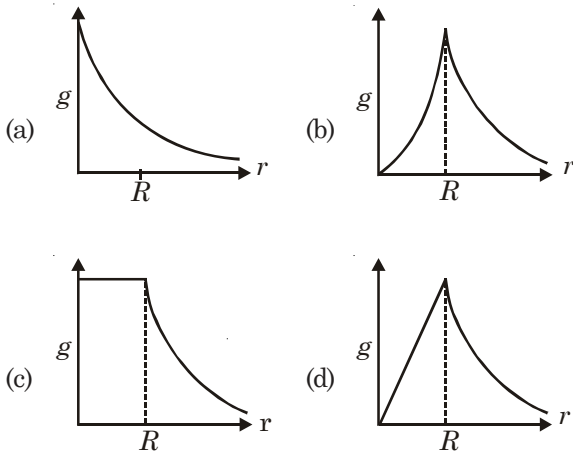
- (1) $C_p - C_v = R/M^2$ (2) $C_p - C_v = R$
 (3) $C_p - C_v = R/M$ (4) $C_p - C_v = MR$

where R is the molar gas constant

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

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

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



The correct figure is

- (1) (d) (2) (a)
(3) (b) (4) (c)
83. A solid cylinder and a hollow cylinder, both of the same mass and same external diameter are released from the same height at the same time on a inclined plane. Both roll down without slipping. Which one will reach the bottom first?
- (1) Both together only when angle of inclination of plane is 45°
(2) Both together
(3) Hollow cylinder
(4) Solid cylinder

84. The thermo e.m.f. E in volts of a certain thermo-couple is found to vary with temperature difference θ in $^\circ\text{C}$ between the two junctions according to the relation

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

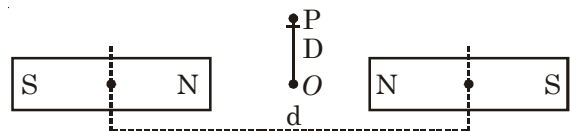
The neutral temperature for the thermo-couple will be

- (1) 450°C (2) 400°C
(3) 225°C (4) 30°C

85. (a) Centre of gravity (C.G.) of a body is the point at which the weight of the body acts
(b) Centre of mass coincides with the centre of gravity if the earth is assumed to have infinitely large radius
(c) To evaluate the gravitational field intensity due to any body at an external point, the entire mass of the body can be considered to be concentrated at its C.G.
(d) The radius of gyration of any body rotating about an axis is the length of the perpendicular dropped from the C.G. of the body to the axis

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

- (1) (d) and (a) (2) (a) and (b)
(3) (b) and (c) (4) (c) and (d)
86. The magnetic moment of a diamagnetic atom is
- (1) Much greater than one
(2) 1
(3) Between zero and one
(4) Equal to zero
87. Two identical bar magnets are fixed with their centres at a distance d apart. A stationary charge Q is placed at P in between the gap of the two magnets at a distance D from the centre O as shown in the figure



The force on the charge Q is

- (1) Zero
(2) Directed along OP
(3) Directed along PO
(4) Directed perpendicular to the plane of paper

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

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

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

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

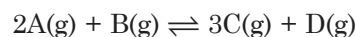
90. A monoatomic gas at pressure P_1 and V_1 is compressed adiabatically to $\frac{1}{8}$ th its original volume. What is the final pressure of the gas?

(1) $64 P_1$ (2) P_1
 (3) $16 P_1$ (4) $32 P_1$

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

(1) $Mg < Ca < Cl < P$ (2) $Cl < P < Mg < Ca$
 (3) $P < Cl < Ca < Mg$ (4) $Ca < Mg < P < Cl$

92. The reaction



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

(1) $[(0.75)^3(0.25)] \div [(1.00)^2(1.00)]$
 (2) $[(0.75)^3(0.25)] \div [(0.50)^2(0.75)]$
 (3) $[(0.75)^3(0.25)] \div [(0.50)^2(0.25)]$
 (4) $[(0.75)^3(0.25)] \div [(0.75)^2(0.25)]$

93. Which of the following expressions correctly represents the equivalent conductance at infinite dilution of $Al_2(SO_4)_3$. Given that $\Lambda_{Al^{3+}}^0$ and $\Lambda_{SO_4^{2-}}^0$ are the equivalent conductances at infinite dilution of the respective ions?

(1) $2\Lambda_{Al^{3+}}^0 + 3\Lambda_{SO_4^{2-}}^0$ (2) $\Lambda_{Al^{3+}}^0 + \Lambda_{SO_4^{2-}}^0$
 (3) $(\Lambda_{Al^{3+}}^0 + \Lambda_{SO_4^{2-}}^0) \times 6$ (4) $\frac{1}{3} \Lambda_{Al^{3+}}^0 + \frac{1}{2} \Lambda_{SO_4^{2-}}^0$

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

(1) 215216 Pa (2) 13409 Pa
 (3) 41648 Pa (4) 31684 Pa

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

| List-I Equations | List-II Type of processes |
|------------------------------------|-----------------------------------|
| a. $K_p > Q$ | (i) Non-spontaneous |
| b. $\Delta G^\circ < RT \ln Q$ | (ii) Equilibrium |
| c. $K_p = Q$ | (iii) Spontaneous and endothermic |
| d. $T > \frac{\Delta H}{\Delta S}$ | (iv) Spontaneous |
| (1) a(i), b(ii), c(iii), d(iv) | (2) a(iii), b(iv), c(ii), d(i) |
| (3) a(iv), b(i), c(ii), d(iii) | (4) a(ii), b(i), c(iv), d(iii) |

96. Among the following four compounds

| | |
|--------------------|--------------------|
| a. Phenol | b. Methyl phenol |
| c. Metanitrophenol | d. Paranitrophenol |

The acidity order is

- (1) $d > c > a > b$ (2) $c > d > a > b$
 (3) $a > d > c > b$ (4) $b > a > c > d$

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

- (1) CsI (2) CsF
 (3) LiF (4) NaF

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

- (1) Infinite (2) 3 Joules
 (3) 9 Joules (4) Zero

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

- (1) $\overset{\oplus}{\text{C}}\text{I}$ (2) BH_3
 (3) $\text{H}_3\overset{\oplus}{\text{O}}$ (4) $\overset{\oplus}{\text{N}}\text{O}_2$

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

($h = 6.6 \times 10^{-34}$ Js)

- (1) 6.6×10^{-32} m (2) 6.6×10^{-34} m
 (3) 1.0×10^{-35} m (4) 1.0×10^{-32} m

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

- (a) $\text{emf of cell} = (\text{Oxidation potential of anode}) - (\text{Reduction potential of cathode})$
 (b) $\text{emf of cell} = (\text{Oxidation potential of anode}) + (\text{Reduction potential of cathode})$
 (c) $\text{emf of cell} = (\text{Reductional potential of anode}) + (\text{Reduction potential of cathode})$
 (d) $\text{emf of cell} = (\text{Oxidation potential of anode}) - (\text{Oxidation potential of cathode})$

Which of the above relations are correct?

Options:

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

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

- (1) CH_4 (2) SF_4
(3) BF_4^- (4) NH_4^+

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

- (1) 273.4 K (2) 393.4 K
(3) 373.4 K (4) 293.4 K

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

| List-I Substances | List-II Processes |
|--------------------------------|--------------------------------|
| a. Sulphuric acid | (i) Haber's Process |
| b. Steel | (ii) Bessemer's Process |
| c. Sodium hydroxide | (iii) Leblanc Process |
| d. Ammonia | (iv) Contact Process |
| (1) a(i), b(iv), c(ii), d(iii) | (2) a(i), b(ii), c(iii), d(iv) |
| (3) a(iv), b(iii), c(ii), d(i) | (4) a(iv), b(ii), c(iii), d(i) |

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

- (1) 2-iodopropane (2) Allyl iodide
(3) Propene (4) Glycerol triiodide

106. Some statements about heavy water are given below

- a. Heavy water is used as a moderator in nuclear reactors
b. Heavy water is more associated than ordinary water
c. Heavy water is more effective solvent than ordinary water

Which of the above statements are correct?

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

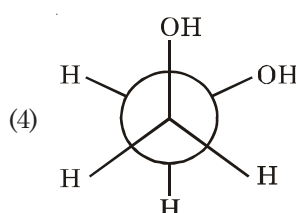
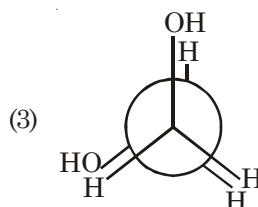
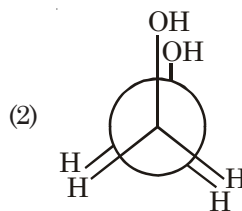
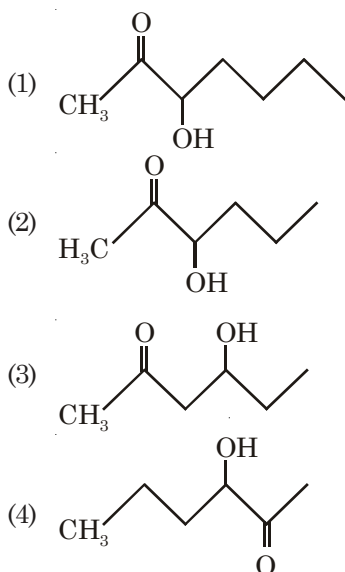
107. The compound A on heating gives a colourless gas and a residue that is dissolved in water to obtain B. Excess of CO_2 is bubbled through aqueous solution of B, C is formed which is recovered in the solid form. Solid C on gentle heating gives back A. The compound is

- (1) CaCO_3 (2) Na_2CO_3
(3) K_2CO_3 (4) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

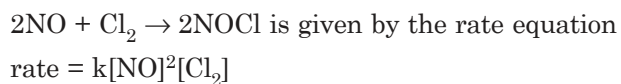
108. Match the compounds given in List-I with their characteristic reactions given in List-II. Select the correct option

| List-I (Compounds) | List-II (Reactions) |
|--|--|
| a. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ | (i) Alkaline hydrolysis |
| b. $\text{CH}_3\text{C}\equiv\text{CH}$ | (ii) With KOH (alcohol) and CHCl_3 produces bad smell |
| c. $\text{CH}_3\text{CH}_2\text{COOCH}_3$ | (iii) Gives white ppt. with ammoniacal AgNO_3 |
| d. $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ | (iv) With Lucas reagent cloudiness appears after 5 minutes |
| (1) a(ii), b(i), c(iv), d(iii) | |
| (2) a(iii), b(ii), c(i), d(iv) | |
| (3) a(ii), b(iii), c(i), d(iv) | |
| (4) a(iv), b(ii), c(iii), d(i) | |

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



110. The rate of the reaction



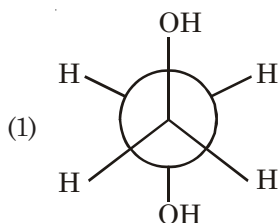
The value of the rate constant can be increased by

- (1) Increasing the temperature
- (2) Increasing the concentration of NO
- (3) Increasing the concentration of the Cl_2
- (4) Doing all of these

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

- (1) $[\text{Ni}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}$
- (2) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
- (3) $[\text{Ni}(\text{NH}_3)_2\text{Cl}_2]$
- (4) $[\text{Ni}(\text{en})_3]^{2+}$

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



113. The IUPAC name of the compound $\text{CH}_3\text{CH}=\text{CHC}\equiv\text{CH}$ is

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

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

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

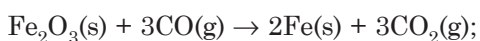
115. How many bridging oxygen atoms are present in P_4O_{10} ?

- (1) 6
- (2) 4
- (3) 2
- (4) 5

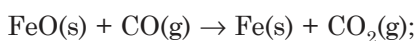
116. Some of the properties of the two species, NO_3^- and H_3O^+ are described below. Which one of them is correct?

- (1) Dissimilar in hybridization for the central atom with different structures
- (2) Isostructural with same hybridization for the central atom
- (3) Isostructural with different hybridization for the central atom
- (4) Similar in hybridization for the central atom with different structures

117. The following two reactions are known :

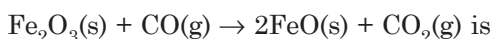


$$\Delta H = -26.8 \text{ kJ}$$



$$\Delta H = -16.5 \text{ kJ}$$

The value of ΔH for the following reaction



- | | |
|--------------|--------------|
| (1) +10.3 kJ | (2) -43.3 kJ |
| (3) -10.3 kJ | (4) +6.2 kJ |

118. Following compounds are given

- a. $\text{CH}_3\text{CH}_2\text{OH}$
- b. CH_3COCH_3
- c. $\begin{array}{c} \text{CH}_3-\text{CHOH} \\ | \\ \text{CH}_3 \end{array}$
- d. CH_3OH

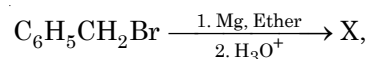
Which of the above compound(s), on being warmed with iodine solution and NaOH, will give iodoform?

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

119. Fructose reduces Tollen's reagent due to

- (1) Asymmetric carbons
- (2) Primary alcoholic group
- (3) Secondary alcoholic group
- (4) Enolisation of fructose followed by conversion to aldehyde by base

120. In the following reaction



the product 'X' is

- (1) $\text{C}_6\text{H}_5\text{CH}_2\text{OCH}_2\text{C}_6\text{H}_5$
- (2) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
- (3) $\text{C}_6\text{H}_5\text{CH}_3$
- (4) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{C}_6\text{H}_5$

