

**AIPMT 2007**  
**PRELIM EXAMINATION**

**BIOLOGY**

**Q. 1.** Biological organisation starts with:

- a. Atomic level
- b. Submicroscopic molecular level
- c. Cellular level
- d. Organismic level

**Sol.** Correct choice: (2)

**Q. 2.** About 98 percent of the mass of every living organism is composed of just six elements including carbon, hydrogen, nitrogen, oxygen and:

- a. calcium and phosphorous
- b. phosphorus and sulphur
- c. sulphur and magnesium
- d. magnesium and sodium

**Sol.** Correct choice: (1)

**Q. 3.** Which one of the following is an example of negative feed back loop in humans?

- a. Secretion of sweat glands and constriction of skin blood vessels when it is too hot.
- b. Constriction of skin blood vessels and contraction of skeletal muscles when it is too cold.
- c. Secretion of tears after falling of sand particles in to the eye
- d. Salivation of mouth at the sight of delicious food.

**Sol.** When the set point of hypothalamus is disturbed by high temperature, it stimulates vasodilation and sweating while in low temperature there is vasoconstriction and shivering. Correct choice: (2)

**Q. 4.** What is common to whale, seal and shark?

- a. Homoiothermy
- b. Seasonal migration]

- c. Thick subcutaneous fat
- d. Convergent evolution

**Sol.** Shark is poikilothermous. All three species show adaptations for aquatic life while these are not closely related. Correct choice: (4)

**Q. 5.** Which one of the following is not a constituent of cell membrane?

- a. Phospholipids
- b. Cholesterol
- c. Glycolipids
- d. Proline

**Sol.** Correct choice: (4)

**Q. 6.** Select the wrong statement from the following:

- a. The chloroplasts are generally much larger than mitochondria.
- b. Both chloroplasts and mitochondria contain an inner and an outer membrane
- c. Both chloroplasts and mitochondria have an internal compartment, the thylakoid space bounded by the thylakoid membrane
- d. Both chloroplasts and mitochondria contain DNA.

**Sol.** Correct choice: (3)

**Q. 7.** The overall goal of glycolysis, Krebs cycle and the electron transport system is the formation of:

- a. Nucleic acids
- b. ATP in small stepwise units
- c. ATP in one large oxidation reaction
- d. Sugars

**Sol.** Correct choice: (2)

**Q. 8.** If the mean and the median pertaining to a certain character of a population are of the same value, the following is most likely to occur:

- a. a skewed curve
- b. a normal distribution
- c. a bi-modal distribution
- d. a T-shaped curve

**Sol.** Correct choice: (2)

**Q. 9.** Which one of the following is a slime mould?

- a. Anabaena
- b. Rhizopus
- c. Physarum
- d. Thiobacillus

**Sol.** Physarum is an acellular slime mould. Correct choice: (3)

**Q.10.** For a critical study of secondary growth in plants, which one of the following pairs is suitable?

- a. Wheat and maiden hair fern
- b. Sugarcane and sunflower
- c. Teak and pine
- d. Deodar and fern

**Sol.** Secondary growth occurs in gymnosperms and dicots. Correct choice: (3)

**Q.11.** Which one of the following statements about Mycoplasma is wrong?

- a. They cause disease in plants
- b. They are also called PPLO
- c. They are pleomorphic
- d. They are sensitive to penicillin

**Sol.** Mycoplasma is not sensitive to penicillin due to absence of cell wall. Correct choice: (4)

**Q.12.** In the prothallus of vascular cryptogam, the antherozoids and eggs mature at different times. As a result:

- a. self fertilization is prevented
- b. there is no change in success rate of fertilization
- c. there is high degree of sterility
- d. one can conclude that the plant is apomictic

**Sol.** In vascular cryptogam i.e. in pteridophytes gametophyte is monoecious but protandrous to avoid self fertilization. Correct choice: (1)

**Q.13.** Two plants can be conclusively said to belong to the same species if they:

- a. have same number of chromosomes
- b. can reproduce freely with each other and form seeds
- c. have more than 90 per cent similar genes
- d. look similar and possess identical secondary metabolites.

**Sol.** The members of a species are inter-fertile and produce fertile offsprings. Correct choice: (2)

**Q.14.** If you are asked to classify the various algae into distinct groups, which of the following characters you should choose?

- a. Chemical composition of the cell wall
- b. Types of pigments present in the cell
- c. Nature of stored food materials in the cell
- d. Structural organization of thallus.

**Sol.** The various algae are classified mainly on the types of pigments present in their cells. Correct choice: (2)

**Q.15.** Flagellated male gametes are present in all the three of which one of the following sets?

- a. Riccia, Dryopteris and Cycas
- b. Anthoceros, Funaria and Spirogyra
- c. Zygnema, Saprolegnia and Hydrilla
- d. Fucus, Marsilea and Calotropis

**Sol.** The male gametes of bryophytes are biflagellate, and those of pteridophytes are multiflagellate, except Selaginella having biflagellate gametes. The male gametes of gymnosperms are non motile except those of Cycas having multiciliate gametes. Correct choice: (1)

**Q.16.** In gymnosperms, the pollen chamber represents:

- a. the microsporangium in which pollen grains develop
- b. a cell in the pollen grain in which the sperms formed
- c. a cavity in the ovule in which pollen grains are stored after pollination
- d. an opening in the mega gametophyte through which the pollen tube approaches the egg.

**Sol.** In gymnosperms, below micropylar beak some of the cells of nucellus of ovule disintegrate to form pollen chamber. Correct choice: (3)

**Q.17.** Spore dissemination in some liverworts is aided by:

- a. peristome teeth
- b. elaters
- c. indusium
- d. calyptra

**Sol.** In some liverworts like *Marchantia* spore dispersal is due to hydrochasy and is aided by elaters. Correct choice: (2)

**Q.18.** Which pair of the following belongs to Basidiomycetes?

- a. Morchella and Mushrooms
- b. Birds' nest fungi and Puffballs
- c. Puffballs and Claviceps
- d. Peziza and Stink horns

**Sol.** Bird's nest fungi – *Cyathus*, Puffballs – *Lycoperdon*, Both belong to the class Basidiomycetes. Correct choice: (3)

**Q.19.** ICBN stands for:

- a. Indian Code of Botanical Nomenclature
- b. Indian Congress of Biological Names
- c. International Code of Botanical Nomenclature
- d. International Congress of Biological Names

**Sol.** ICBN is one of the codes of nomenclature. It stands for International Code of Botanical Nomenclature. Correct choice: (3)

**Q. 20.** Ergot of rye is caused by a species of:

- a. Claviceps
- b. Phytophthora
- c. Uncinula
- d. Ustilago

**Sol.** Ergot of rye is caused by *Claviceps purpurea*. Correct choice: (1)

**Q. 21.** When two species of different genealogy come to resemble each other as a result of adaptation, the phenomenon is termed:

- a. Convergent evolution
- b. Divergent evolution
- c. Microevolution
- d. Co-evolution

**Sol.** Correct choice: (1)

**Q. 22.** Adaptive radiation refers to:

- a. Power of adaptation in an individual to a variety of environments
- b. Adaptations due to Geographical isolation

- c. Evolution of different species from a common ancestor
- d. Migration of members of a species to different geographical areas

**Sol.** Correct choice: (3)

**Q. 23.** The living organisms can be unexceptionally distinguished from the non-living things on the basis of their ability for:

- a. growth the movement
- b. responsiveness to touch
- c. interaction with the environment and progressive evolution
- d. reproduction

**Sol.** Correct choice: (4)

**Q. 24.** The Finches of Galapagos islands provide an evidence in favour of:

- a. Biogeographical Evolution
- b. Special Creation
- c. Evolution due to Mutation
- d. Retrogressive Evolution

**Sol.** Correct choice: (1)

**Q. 25.** One of the important consequences of geographical isolation is:

- a. Random creation of new species
- b. No change in the isolation fauna
- c. Preventing Speciation
- d. Speciation through reproductive isolation

**Sol.** Correct choice: (4)

**Q. 26.** Industrial melanism as observed in peppered moth proves that:

- a. Melanism is a pollution-generated feature
- b. The true black melanic forms arise by a recurring random mutation
- c. The melanic form of the moth has no selective advantage over lighter form in industrial area
- d. The lighter-form moth has no selective advantage either in polluted industrial area or non-polluted area.

**Sol.** It is an example of directional selection. Correct choice: (2)

**Q. 27.** The concept of chemical evolution is based on:

- a. Possible origin of life by combination of chemicals
- b. Crystallization of chemicals under suitable environmental conditions
- c. Interaction of water, air and clay under
- d. Effect of solar radiation of chemicals

**Sol.** Correct choice: (1)

**Q. 28.** Among the human ancestors the brain size was more than 1000 CC in:

- a. Homo habilis
- b. Homo neanderthalensis
- c. Homo erectus
- d. Ramapithecus

**Sol.** Homo habilis had a cranial capacity in the range of 680-720 c.c. & that of Homo erectus erectus 775-990 c.c., Homo erectus pekinensis 915-1200 c.c. Homo neanderthalensis 1300-1600 c.c. Correct choice:

**Q. 29.** Which of the following pairs are correctly matched?

- |               |                     |
|---------------|---------------------|
| a. Crocodile  | - 4-Chambered heart |
| b. Sea Urchin | - Parapodia         |
| c. Obelia     | - Metagenesis       |
| d. Lemur      | - Thecodont         |

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

**Sol.** Correct choice: (2)

**Q. 30.** Select the correct statement from the following:

- a. Mutations are random and directional
- b. Darwinian variations are small and directionless
- c. Fitness is the end result of the ability to adapt and gets selected by nature
- d. All mammals except whales and camels have seven cervical vertebrate.

**Sol.** It explains natural selection. Correct choice: (3)

**Q. 31.** Which one of the following is a matching pair of a body feature and the animal possessing it?

- a. Ventral heart - Scorpion
- b. Post-anal tail - Octopus
- c. Ventral Central nervous system - Leech
- d. Pharyngeal gill slits absent in embryo - Chamaeleon

**Sol.** Scorpion has dorsal heart. Post-anal tail is found only in chordates. Pharyngeal gill slits are present in the embryo of chameleon. Correct choice: (3)

**Q. 32.** What is common between parrot, platypus and kangaroo?

- a. Ovoparity
- b. Homiothermy
- c. Toothless jaws
- d. Functional post -anal tail

**Sol.** Only birds & mammals are homiothermous. Correct choice: (2)

**Q. 33.** What is true about Nereis, Scorpion, Cockroach and Silver fish?

- a. They all belong to the same phylum
- b. They all have jointed paired appendages
- c. They all possess dorsal heart
- d. None of them is aquatic

**Sol.** Correct choice: (3)

**Q. 34.** Which one of the following statement is correct?

- a. Ontogeny repeats phylogeny
- b. Stem cells are specialized cells
- c. There is no evidence of the existence of gills during embryogenesis of mammals
- d. All plant and animal cells are totipotent.

**Sol.** Correct choice: (1)

**Q. 35.** “Foolish Seedling” disease of rice led to the discovery of:

- a. IAA
- b. GA
- c. ABA
- d. 2, 4 – D



**Sol.** Foolish seeding disease (Bakane disease) of rice is due to a fungus *Giberella fujikuroi*. Yabuta and Sumuki obtained a chemical from the fungus and called gibberellic acid. Correct choice: (2)

**Q. 36.** Passage cells are thin-walled cells found in:

- a. central region of style through which the pollen tube grows towards the ovary.
- b. endodermis of roots facilitating rapid transport of water from cortex to pericycle.
- c. phloem elements that serve as entry points for substances for transport to other plant parts.
- d. testa of seed to enable emergence of growing embryonic axis during seed germination.

**Sol.** Passage cells also called transfusion tissue are found in the endodermis meant for rapid transport of water from cortex to pericycle. Correct choice: (2)

**Q. 37.** The first acceptor of electrons from an excited chlorophyll molecule of photosystem II is:

- a. Quinone
- b. Cytochrome
- c. Iron-sulphur protein
- d. Ferredoxin.

**Sol.** The first acceptor of electrons from an excited chlorophyll is quinone. Correct choice: (1)

**Q. 38.** All enzymes of TCA cycle are located in the mitochondrial matrix except one which is located in inner mitochondrial membranes in eukaryotes and in cytosol in prokaryotes. This enzyme is:

- a. succinate dehydrogenase
- b. lactate dehydrogenase
- c. isocitrate dehydrogenase
- d. malate dehydrogenase

**Sol.** Succinate dehydrogenase is a common enzyme for TCA and ETC. It is located on inner mitochondrial membrane. Rest of the TCA enzymes are present in mitochondrial matrix. Correct choice: (1)

**Q. 39.** The wavelength of light absorbed by Pr form of phytochrome is:

- a. 620 nm
- b. 640 nm
- c. 680 nm
- d. 720 nm

**Sol.** The Pr form of phytochrome receives red light (600-680 nm) and changes into Pfr.  
Correct choice: (3)

**Q. 40.** Opening of floral buds into flowers, is type of:

- a. Autonomic movement of growth
- b. Autonomic movement of locomotion
- c. Autonomic movement of variation
- d. Paratonic movement of growth.

**Sol.** Opening of floral bud into flowers, is due to epinasty, a type of autonomic movement of growth. Correct choice: (1)

**Q. 41.** Which one of the following pairs, is not correctly matched?

- a. IAA - Cell wall elongation
- b. Abscissic Acid - Stomatal closure
- c. Gibberellic Acid - Leaf fall
- d. Cytokinin - Cell division

**Sol.** Leaf fall is due to interaction of auxin and ethylene. Correct choice: (3)

**Q. 42.** One gene - one enzyme relationship was established for the first time in:

- a. *Diplococcus pneumoniae*
- b. *Neurospora crassa*
- c. *Salmonella typhimurium*
- d. *Escherichia Coli*

**Sol.** One gene-one enzyme hypothesis was given by Beadle and Tatum in red mould (*Neurospora crassa*). Correct choice: (2)

**Q. 43.** Male gametes in angiosperms are formed by the division of:

- a. Microspore mother cell
- b. Microspore
- c. Generative cell
- d. Vegetative cell

**Sol.** During the development of male gametophyte first of all two cells – generative cell and tube nucleus are formed from a pollen. This twocelled stage is called pollen grain. Finally the generative cell divides to form 2-male gametes. Correct choice: (3)

**Q. 44.** Two cells A and B are contiguous. Cell A has osmotic pressure 10 atm, turgor pressure - 7atm and diffusion pressure deficit 3 atm. Cell B has osmotic pressure 8 atm, turgor pressure 3 atm and diffusion pressure deficit 5 atm. The result will be:

- a. Movement of water of Cell A to B
- b. Movement of water from Cell B to A
- c. No movement of water
- d. Equilibrium between the two

**Sol.** The direction of movement of water is from low to high DPD. Correct choice: (1)

**Q. 45.** In the leaves of  $C_4$  plants, malic acid formation during  $CO_2$  fixation occurs in the cells of:

- a. Epidermis
- b. Mesophyll
- c. Bundle Sheath
- d. Phloem

**Sol.** In  $C_4$  plants,  $C_4$  cycle occurs in mesophyll cells and  $C_3$  cycle in bundle sheath cells. Correct choice: (2)

**Q. 46.** Which of the following is a flowering plant with nodules containing filamentous nitrogen-fixing microorganism?

- a. *Cicer arietinum*
- b. *Casuarina equisetifolia*
- c. *Crotalaria juncea*
- d. *Cycas revolute*

**Sol.** The filamentous nitrogen – fixing microorganism like Frankia occurs in root-nodules of non-leguminous plants like *Casuarina* and *Alnus*. Correct choice: (2)

**Q. 47.** Which one of the following is surrounded by a callose wall?

- a. Pollen grain
- b. Microspore mother cell
- c. Male gamete
- d. Egg

**Sol.** The microspore mother cells develops an internal layer of callose which breaks the plasmodesmatal connections among themselves. Correct choice: (2)

**Q. 48.** Which one of the following elements is not an essential micronutrient for plant growth?

- a. Ca
- b. Mn
- c. Zn
- d. Cu

**Sol.** Calcium is an essential macronutrient for plant growth. Correct choice: (1)

**Q. 49.** If you suspect major deficiency of antibodies in person, to which of the following would you look for confirmatory evidence?

- a. Haemocytes
- b. Serum albumins
- c. Serum globulins
- d. Fibrinogen in the plasma

**Sol.** Correct choice: (3)

**Q. 50.** Which one of the following is a fat -soluble vitamin and its related deficiency disease?

- a. Calciferol – Pellagra
- b. Ascorbic acid – Scurvy
- c. Retinol – Xerophthalmia
- d. Cobalamine – Beri-beri

**Sol.** Correct choice: (3)

**Q. 51.** Which one of the following mammalian cells is not capable of metabolising glucose to carbon-dioxide aerobically?

- a. Red blood cells
- b. White blood cells
- c. Unstriated muscle cells
- d. Liver cells

**Sol.** RBCs do not have mitochondria & thus can respire only anaerobically. Correct choice: (1)

**Q. 52.** Compared to a bull a bullock is docile because of:

- a. lower levels of adrenalin / noradrenalin in its blood
- b. higher levels of thyroxin
- c. higher levels of cortisone
- d. lower levels of blood testosterone

**Sol.** The bullock is castrated and therefore secretion of testosterone is not adequate. Correct choice: (4)

**Q. 53.** In the human female, menstruation can be deferred by the administration of:

- a. FSH only

- b. LH only
- c. Combination of FSH and LH
- d. Combination of estrogen and progesterone

**Sol.** Correct choice: (4)

**Q. 54.** In human body, which one of the following is anatomically correct?

- a. Cranial nerves - 10 pairs
- b. Floating ribs - 2 pairs
- c. Collar bones - 3 pairs
- d. Salivary glands - 1 pair

**Sol.** Correct choice: (2)

**Q. 55.** In which one of the following preparations are you likely to come across cell junctions most frequently?

- a. Hyaline cartilage
- b. Ciliated epithelium
- c. Thrombocytes
- d. Tendon

**Sol.** Correct choice: (2)

**Q. 56.** A drop of each of the following, is placed separately on four slides. Which of them will not coagulate?

- a. Whole blood from pulmonary vein
- b. Blood plasma
- c. Blood serum
- d. Sample from the thoracic duct of lymphatic system

**Sol.** Blood serum does not contain fibrinogen and few other clotting factors, thus it will not coagulate. Correct choice: (3)

**Q. 57.** Feeling the tremors of an earthquake a scared resident of seventh floor of a multistoreyed building starts climbing down the stairs rapidly. Which hormone initiated this action?

- a. Gastrin
- b. Thyroxin
- c. Adrenaline
- d. Glucagon

**Sol.** Correct choice: (3)

**Q. 58.** A person who is on a long hunger strike and is surviving only on water, will have:

- a. less urea in his urine
- b. more sodium in his urine
- c. less amino acids in his urine
- d. more glucose in his blood.

**Sol.** Correct choice: (1)

**Q. 59.** Which one of the following pairs of structures distinguishes a nerve cell from other types of cell?

- a. Nucleus and mitochondria
- b. Perikaryon and dendrites
- c. Vacuoles and fibers
- d. Flagellum and medullary sheath

**Sol.** Correct choice: (2)

**Q.60.** Which part of ovary in mammals acts as an endocrine gland after evolution?

- a. Vitelline membrane
- b. Graafian follicle
- c. Stroma
- d. Germinal epithelium

**Sol.** Correct choice: (2)

**Q. 61.** During the transmission of nerve impulse through a nerve fibre, the potential on the inner side of the plasma membrane has which type of electric charge?

- a. First positive, then negative and again back to positive
- b. First negative, then positive and again back to negative
- c. First positive, then negative and continue to be negative
- d. First negative, then positive and continue to be positive.

**Sol.** Correct choice: (2)

**Q. 62.** A person is having problems with calcium and phosphorous metabolism in his body. Which one of the following glands may not be functioning properly?

- a. Thyroid
- b. Parathyroid
- c. Parotid

d. Pancreas

**Sol.** Correct choice: (2)

**Q. 63.** Identify the odd combination of the habitat and the particular animal concerned:

- |                           |                |
|---------------------------|----------------|
| a. Rann of Kutch          | - Wild Ass     |
| b. Dachigam National Park | - Snow Leopard |
| c. Sunderbans             | -Bengal Tiger  |
| d. Periyar                | -Elephant      |

**Sol.** Dachigam National Park is for the conservation of Hangul.

Correct choice: (2)

**Q. 64.** In which one of the following the BOD (Biochemical Oxygen Demand) of sewage (S), distillery effluent (DE), paper mill effluent (PE) and sugar mill effluent (SE) have been arranged in ascending order?

- a.  $S < DE < PE < SE$
- b.  $SE < S < PE < DE$
- c.  $SE < PE < S < DE$
- d.  $PE < S < SE < DE$

**Sol.** BOD of distillery effluent is 40,000 mg / l and that of paper mill effluent and sewage is 190 mg/l and 30 mg/l, respectively. Correct choice: (2)

**Q. 65.** Which one of the following ecosystem types has the highest annual net primary productivity?

- a. Temperate deciduous forest
- b. Tropical rain forest
- c. Tropical deciduous forest
- d. Temperate evergreen forest

**Sol.** Tropical rain forest has highest annual net primary productivity (9000 K cal / m<sup>2</sup> / yr). Correct choice: (2)

**Q. 66.** Which one of the following is being utilized as a source of biodiesel in the Indian countryside?

- a. Pongamia
- b. Euphorbia
- c. Beetroot
- d. Sugarcane

**Sol.** Pongamia, Jatropha, Euphorbia are petrocrops. However, in the Indian countryside, Pongamia (Kanjara) is being utilized as a source of biodiesel. Correct choice: (1)

**Q. 67.** In a coal fires power plant electrostatic precipitators are installed to control emission of:

- a. CO
- b. SO<sub>2</sub>
- c. NO<sub>x</sub>
- d. SPM

**Sol.** Electrostatic precipitators control emission of suspended particle matter (SPM). Correct choice: (4)

**Q. 68.** Which one of the following is not a bioindicator of water pollution?

- a. Sewage fungus
- b. Sludge-worms
- c. Blood-worms
- d. Stone flies

**Sol.** Correct choice: (4)

**Q. 69.** A high density of elephant population in an area can result in:

- a. Predation on one another
- b. Mutualism
- c. Intra specific competition
- d. Inter specific competition

**Sol.** Intra-specific competition occurs between the members of the same species. Correct choice: (3)

**Q. 70.** Geometric representation of age structure is a characteristic of:

- a. Ecosystem
- b. Biotic community
- c. Population
- d. Landscape

**Sol.** Age structure is one of the characteristics of population. Correct choice: (3)

**Q. 71.** Which one of the following pairs of organisms are exotic species introduced in India?



- a. Nile perch, Ficus religiosa
- b. Ficus religiosa, Lantana camara
- c. Lantana camara, Water hyacinth
- d. Water hyacinth, Prosopis cineraria

**Sol.** Lantana camara and Eicchornia czassipes (water hyacinth) are exotic species.  
Correct choice: (3)

**Q. 72.** One of endangered species of Indian medicinal plants is that of:

- a. Nepenthes
- b. Podophyllum
- c. Ocimum
- d. Garlic

**Sol.** Podophyllum hexandrum - : (Papri), gives a drug from its rhizome; besides being stimulant and purgative and has destructive action on cancerous tissues. Correct choice: (2)

**Q. 73.** A genetically engineered micro-organism used successfully in bioremediation of oil spills is a species of:

- a. Bacillus
- b. Pseudomonas
- c. Trichoderma
- d. Xanthomonas

**Sol.** Pseudomonas putida (superbug) developed by genetic engineering by Anand Mohan Chakravorty is used to control oil spills. Correct choice: (2)

**Q. 74.** A sequential expression of a set of human genes occurs when a steroid molecule binds to the:

- a. Ribosome
- b. Transfer RNA
- c. Messenger RNA
- d. DNA sequence

**Sol.** Correct choice: (4)

**Q. 75.** The Okazaki fragments in DNA chain growth:

- a. polymerize in the  $5' - to - 3'$  direction and explain  $3' - to - 5'$  DNA replication
- b. result in transcription
- c. polymerize in the  $3' - to - 5'$  direction and forms replication fork
- d. prove semi-conservative nature of DNA replication

**Sol.** Replication occurs always in  $5' - 3'$  direction. Okazaki fragments, synthesized on  $3' - 5'$  DNA template, join to form lagging strand which grows in  $3' - 5'$  direction. Correct choice: (1)

**Q. 76.** In the hexaploid wheat, the haploid (n) and basic (x) numbers of chromosomes are:

- a.  $n = 21$  and  $x = 7$
- b.  $n = 7$  and  $x = 21$
- c.  $n = 21$  and  $x = 21$
- d.  $n = 21$  and  $x = 14$

**Sol.** The basic number (x) of wheat is 7. Thus the  $6x = 2n = 42$  and  $n = 21$ . Correct choice: (1)

**Q. 77.** Molecular basis of organ differentiation depends on the modulation in transcription by:

- a. Anticodon
- b. RNA polymerase
- c. Ribosome
- d. Transcription factor

**Sol.** Correct choice: (4)

**Q. 78.** Telomere repetitive DNA sequence control the function of eukaryote chromosomes because they:

- a. prevent chromosome loss
- b. act as replicons
- c. are RNA transcription initiator
- d. help chromosome pairing

**Sol.** Telomerase seal the ends of the chromosomes. Correct choice: (1)

**Q. 79.** Inheritance of skin colour in humans is an example of:

- a. codominance
- b. chromosomal aberration
- c. point mutation
- d. polygenic inheritance

**Sol.** Inheritance of skin colour in human is controlled by three genes, A, B and C. Correct choice: (4)

**Q. 80.** A common test to find the genotype of a hybrid is by:

- a. crossing of one  $F_1$  progeny with male parent
- b. crossing of one  $F_2$  progeny with male parent
- c. crossing of one  $F_2$  progeny with female parent
- d. studying the sexual behaviour of  $F_1$  progenies.

**Sol.** To find the genotype of hybrid, it is test crossed. Correct choice: (1)

**Q. 81.** During transcription, RNA polymerase holoenzyme binds to a gene promoter and assumes a saddle - like structure. What is its DNA-binding sequence?

- a. TATA
- b. TTAA
- c. AATT
- d. CACC

**Sol.** The DNA binding sequence for RNA polymerase is called TATA box. Correct choice: (1)

**Q. 82.** Two genes R and Y are located very close on the chromosomal linkage map of maize plant. When RRY $\bar{Y}$  and rryy genotypes are hybridized, the  $F_2$  segregation will show:

- a. Higher number of the parental types.
- b. Higher number of the recombinant types.
- c. Segregation in the expected 9: 3: 3: 1 ratio.
- d. Segregation in 3:1 ratio.

**Sol.** When the linked genes are situated quite close, the chances of crossing over are highly reduced. Due to this, large number of parental gametes are formed and only few recombinant gametes are formed. This results in higher number of parental types in  $F_2$  generation as compared to recombinants.

Correct choice: (1)

**Q. 83.** In maize, hybrid vigour is exploited by:

- a. Inducing mutations.
- b. Bombarding the seeds with DNA.
- c. Crossing of two inbred parental lines.
- d. Harvesting seeds from the most productive plants.

**Sol.** Correct choice: (3)

**Q. 84.** Differentiation of organs and tissues in a developing organism, is associated with:

- a. Deletion of genes
- b. Developmental mutations

- c. Differential expression of genes
- d. Lethal mutations

**Sol.** Correct choice: (3)

**Q. 85.** In pea plants, yellow seeds are dominant to green. If a heterozygous yellow seeded plant is crossed with a green seeded plant, what ratio of yellow and green seeded plants would you expect in F1 generation?

- a. 3 : 1
- b. 50 : 50
- c. 9 : 1
- d. 1 : 3

**Sol.** This is a monohybrid test cross. Correct choice: (2)

**Q. 86.** The length of DNA molecule greatly exceeds the dimensions of the nucleus in eukaryotic cells. How is this DNA accommodated?

- a. Through elimination of repetitive DNA.
- b. Deletion of non-essential genes.
- c. Super-coiling in nucleosomes.
- d. DNase digestion.

**Sol.** The nucleosome model explains the packaging of histone proteins and DNA in the chromatin material which forms the chromosome. Correct choice: (3)

**Q. 87.** In cloning of cattle a fertilized egg is taken out of the mother's womb and:

- a. from this upto eight identical twins can be produced
- b. the egg is divided into 4 pairs of cells which are implanted into the womb of others cows
- c. in the eight cell stage, cells are separated and cultured until small embryos are formed which are implanted into the womb other cows.
- d. in the eight cell stage the individual cells are separated under electrical field for further development in culture media.

**Sol.** As per the experiment performed by the scientist from Japan. Correct choice: (3)

**Q. 88.** Which one of the following statements is correct?

- a. At present it is not possible to grow maize without chemical fertilizers.
- b. Extensive use of chemical fertilizers may lead to eutrophication of nearby water bodies.
- c. Both Azotobacter and Rhizobium fix atmospheric nitrogen in root nodules of plants.

- d. Cyanobacteria such as Anabaena and Nostoc are important mobilizers of phosphates and potassium for plant nutrition in soil.

**Sol.** The Agricultural run off contains high concentration of chemical fertilizers. Which is discharge in near by lakes causes nutrient enrichment of lakes called eutrophication.

Correct choice: (2)

**Q. 89.** The population of an insect species shows an explosive increase in numbers during rainy season followed by its disappearance at the end of the season. What does this show?

- a. The population of its predators increases enormously.
- b. S-shaped or sigmoid growth of this insect.
- c. The food plants mature and die at the end of the rainy season.
- d. Its population growth curve is of J-type.

**Sol.** A population which grows exponentially and crashes suddenly exhibits J-type growth curve. Correct choice: (4)

**Q. 90.** The two polynucleotide chains in DNA are:

- a. semiconservative
- b. parallel
- c. discontinuous
- d. antiparallel

**Sol.** The two chains in a dsDNA run in opposite direction one  $5' \rightarrow 3'$  while other  $5' \rightarrow 3'$  in opposite direction.

$5' \rightarrow 3'$

$5' \leftarrow 3'$

Correct choice: (4)

**Q. 91.** A plant requires magnesium for:

- a. Cell wall development
- b. Holding cells together
- c. Protein synthesis
- d. Chlorophyll synthesis

**Q. 92.** Probiotics are:

- a. Live microbial food supplement
- b. Safe antibiotics
- c. Cancer inducing microbes

d. New kind of food allergens

**Sol.** Live microbial food supplements are called probiotics (e.g., curd). Correct choice: (1)

**Q. 93.** Bowman's glands are located in the:

- a. olfactory epithelium of our nose
- b. proximal end of uriniferous tubules
- c. anterior pituitary
- d. female reproductive system of cockroach

**Sol.** Correct choice: (1)

**Q. 94.** Increased asthmatic attacks in certain seasons are related to:

- a. Low temperature
- b. Hot and humid environment
- c. Eating fruits preserved in tin containers
- d. Inhalation of seasonal pollen

**Sol.** Correct choice: (4)

**Q. 95.** A human male produces sperms with genotypes AB, Ab, aB and ab pertaining to two diallelic characters in equal proportions. What is the corresponding genotype of this person?

- a. AABB
- b. AaBb
- c. AaBB
- d. AABb

**Sol.** The formula for gamete formation is  $2^n$  where  $n$  stands for number of heterozygous pairs. AaBb has 2 heterozygous pairs so it will form 4 types of gametes. Correct choice: (2)

**Q. 96.** Which one of the following pairs is wrongly matched?

- a. Coliforms
  - b. Methanogens
  - c. Yeast
  - d. Streptomyces
- Vinegar  
-Gobar gas  
-Ethanol  
-Antibiotic

**Sol.** Coliforms are bacteria found in colon e.g. E. coli. For the preparation of vinegar Acetobacter aceti is employed. Correct choice: (1)

**Q. 97.** Which one of the following pairs is mismatched?

- a. Bombyx mori                                 -silk
- b. Pila globosa                                 -pearl
- c. Apis indica                                 -honey
- d. Kenia lacca                                 -lac

**Sol.** Pinctada vulgaris is a bivalve from which pearl is obtained. Correct choice: (2)

**Q. 98.** Which one of the following is viral disease of poultry?

- a. Pasteurellosis
- b. Salmonellosis
- c. Coryza
- d. New Castle disease

**Sol.** Correct choice: (4)

**Q. 99.** Ultrasound of how much frequency is beamed into human body for sonography?

- a. 45 - 70 MHz
- b. 30 - 45 MHz
- c. 15 - 30 MHz
- d. 1 - 15 MHz

**Sol.** Correct choice: (4)

**Q. 100.** Lysozyme that is present in perspiration, saliva and tears, destroys:

- a. most virus-infected cells
- b. certain fungi
- c. certain types of bacteria
- d. all viruses

**Sol.** Correct choice: (3)

## **CHEMISTRY**

**Q. 1.** With which of the following configuration an atom has the lowest ionization enthalpy?

- a.  $1s^2 2s^2 2p^6$

- b.  $1s^2 2s^2 2p^5$
- c.  $1s^2 2s^2 2p^3$
- d.  $1s^2 2s^2 2p^5 3s^1$

**Sol.**  $1s^2 2s^2 2p^5 3s^1$  represents the excited state of a Neon atom. The energy needed to knock off an electron from the excited state of neon must be least. Correct choice is: (4)

**Q. 2.** An element, X has the following isotopic composition;  $^{200}\text{X}$ :90% ;  $^{199}\text{X}$ :8.0% ;  $^{202}\text{X}$ :2.0%

The weighted average atomic mass of the naturally occurring element X is closest to :

- a. 199 amu
- b. 200 amu
- c. 201 amu
- d. 202 amu

**Sol.** The weighted average atomic mass of element (X) =  $0.9(200) + 0.08(199) + 0.02(202) = 180 + 15.92 + 4.04 = 199.96 \approx 200$  Correct choice is: (2)

**Q. 3.** Concentrated aqueous sulphuric acid is 98%  $\text{H}_2\text{SO}_4$  by mass and has a density of  $1.80 \text{ g mL}^{-1}$ . Volume of acid required to make one litre of  $0.1 \text{ M H}_2\text{SO}_4$  is,

- a. 5.55 mL
- b. 11.10 mL
- c. 16.65 mL
- d. 22.20 mL

**Sol.** Density =  $1.80 \text{ g/ml}$

$\Rightarrow$  1 litre has  $1800 \text{ g H}_2\text{SO}_4$  (impure)

$\Rightarrow$  1 litre has  $0.98(1800) \text{ g H}_2\text{SO}_4$  (pure)

$\Rightarrow$  1 litre has  $\frac{1764}{98}$  moles  $\text{H}_2\text{SO}_4 = 18 \text{ M} \Rightarrow$  Now,  $18 \times V_1 = 0.1 \times 1$  or,  $V_1 = \frac{0.1}{18} \times 1000 = 5.55 \text{ ml}$

Correct choice: (1)

**Q.4.** Consider the following sets of quantum numbers:

	n	l	M	s
(a)	3	0	0	$+\frac{1}{2}$
(b)	2	2	1	$+\frac{1}{2}$
(c)	4	3	-2	$-\frac{1}{2}$



- (d) 1            0            -1            - 1/2  
 (e) 3            2            3            +1/2

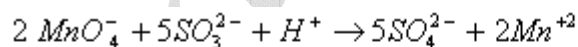
Which of the following sets of quantum number is not possible

- a. a and c  
 b. b, c and d  
 c. a, b, c and d  
 d. b, d and e

**Sol.** Choice (b), (d) and (e) are incorrect. Remember that value of 'l' ranges from (0) to (n - 1) and values of 'm' range from (-l) to (+l). Correct choice: (4)

**Q. 5.** The number of moles of  $KMnO_4$  that will be needed to react with one mole of sulphite ion in acidic solution is:

- a. 1  
 b.  $\frac{3}{5}$   
 c.  $\frac{4}{5}$   
 d.  $\frac{2}{5}$



**Sol.**  $\Rightarrow$  Number of moles of  $KMnO_4$  that react with one mole  $SO_3^{2-}$  will be  $\frac{2}{5}$

Correct choice : (4)

**Q. 6.** In a first-order reaction  $A \rightarrow B$ , if k is rate constant and initial concentration of the reactant A is 0.5 M then the half-life is :

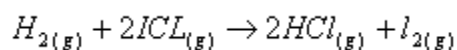
- a.  $\frac{\ln 2}{K}$   
 b.  $\frac{0.693}{0.5 K}$

- c.  $\frac{\log 2}{K}$   
 d.  $\frac{\log 2}{K \sqrt{0.5}}$

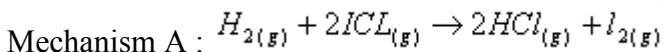
**Sol.**  $t_{1/2}$  for a first order reaction =  $\frac{0.693}{K} = \frac{2.303 \log_{10} 2}{K} = \frac{\ln 2}{K}$

Correct choice: (1)

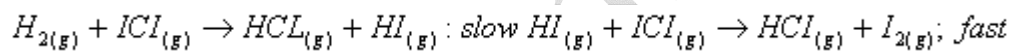
**Q. 7.** The reaction of hydrogen and iodine monochloride is given as:



This reaction is of first order with respect to  $H_{2(g)}$  and  $ICl_{(g)}$ , following mechanisms were proposed :



Mechanism B :



Which of the above mechanism (s) can be consistent with the given information about the reaction

- a. A only  
 b. B only  
 c. 1 and 2 both  
 d. Neither 1 nor 2

**Sol.** The rate law is invariably determined from the slowest step of the mechanism. Therefore mechanism (B) is consistent with the data given for order of reaction. Correct choice: (2)

**Q. 8.** If 60% of a first order reaction was completed in 60 minutes, 50% of the same reaction would be completed in approximately :

- a. 40 minutes  
 b. 50 minutes  
 c. 45 minutes  
 d. 60 minutes

( $\log 4 = 0.60, \log 5 = 0.69$ )

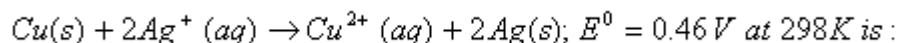
**Sol.**

$$k = \frac{2.303}{60} \log \frac{1}{0.4} = \frac{2.303}{60} \log \frac{10}{4} = \frac{2.303}{60} \log \frac{5}{2} = \frac{2.303}{60} (\log 5 - \log 2) = \frac{2.303}{60} (0.69 - 0.3) = \frac{2.303}{60} \times 0.39$$

$$t_{1/2} = \frac{2.303 \times 0.3 \times 60}{2.303 \times 0.39} = 46.15 \approx 45 \text{ min } \textit{utes}.$$

Correct choice: (3)

**Q. 9.** The equilibrium constant of the reaction :



- a.  $4.0 \times 10^{15}$
- b.  $2.4 \times 10^{10}$
- c.  $2.0 \times 10^{10}$
- d.  $4.0 \times 10^{10}$

$$\Delta G^0 = -2 \times 96500 \times 0.46 = -88780 \text{ J}$$

$$\Delta G^0 = 2.303 RT \log K_c \text{ or } -88780 = -2.303 \times 8.314 \times 298 \log K_c$$

**Sol.**  $\text{or } -88780 = -5705.84 \log K_c \text{ or } \log K_c = 15.55 \Rightarrow [K_c = 4 \times 10^{15}]$

Correct choice: (1)

**Q. 10.** 0.5 molal aqueous solution of a weak acid (HX) is 20% ionized. If  $K_f$  for water is  $1.86 \text{ K kg mol}^{-1}$ , the lowering in freezing point of the solution is

- a.  $-0.56 \text{ K}$
- b.  $-1.12 \text{ K}$
- c.  $0.56 \text{ K}$
- d.  $1.12 \text{ K}$

$$\Delta T_f = i K_f m = 1.2 \times 1.86 \times 0.5 = 1.12 \text{ K}$$

Correct choice: (4)

**Q. 11.** The efficiency of a fuel cell is given by

- a.  $\frac{\Delta S}{\Delta G}$
- b.  $\frac{\Delta H}{\Delta G}$

- c.  $\frac{\Delta G}{\Delta S}$   
 d.  $\frac{\Delta g}{\Delta H}$

**Sol.** Efficiency of a fuel cell  $(\eta) = \frac{\Delta G}{\Delta H}$  Correct choice: (4)

**Q. 12.** Consider the following reactions:

- a.  $H^+_{(aq)} + OH^-_{aq} = H_2O_{(l)}, \Delta H = -X_1 KJ mol^{-1}$   
 b.  $H_{2(g)} + \frac{1}{2} O_{2(g)} = H_2O_{(l)}, \Delta H = -X_2 KJ mol^{-1}$   
 c.  $CO_{2(g)} + H_{2(g)} = CO_{(g)} + H_2O_{(l)} - X_3 KJ mol^{-1}$   
 d.  $C_2H_{2(g)} + \frac{5}{2} O_{2(g)} = 2CO_{(g)} + H_2O_{(l)} + X_4 KJ mol^{-1}$

Enthalpy of formation of  $H_2O(l)$  is

- a.  $+X_1 KJ mol^{-1}$   
 b.  $+X_2 KJ mol^{-1}$   
 c.  $+X_3 KJ mol^{-1}$   
 d.  $+X_4 KJ mol^{-1}$

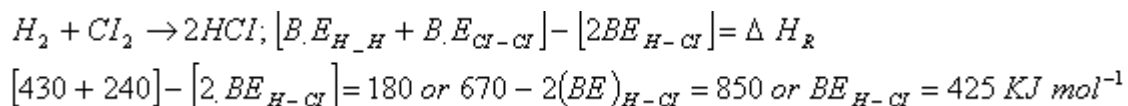
**Sol.** Heat of formation of  $H_2O(l) = -X_2 kJ / mol$  . Correct choice: (2)

**Q. 13.** Given that bond energies of

$H -$  and  $Cl - Cl$  are  $430 KJmol^{-1}$  respectively and  $\Delta_f H$  fo  $HCl$  is  $-90 KJ mol^{-1}$ ,  
 Bond enthalpy of  $HCl$  is

- a.  $245 KJ mol^{-1}$   
 b.  $2909 KJ mol^{-1}$   
 c.  $380 KJ mol^{-1}$   
 d.  $425 KJ mol^{-1}$

**Sol.**



Correct choice: (4)

**Q. 14.** The Langmuir adsorption isotherm is deduced using the assumption

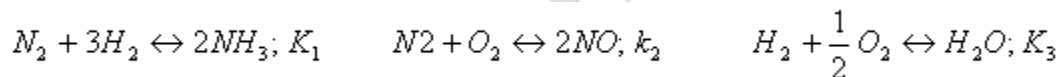
- The adsorbed molecules interact with each other
- The adsorption takes place in multilayers
- The adsorption sites are equivalent in their ability to adsorb the particles
- The heat of adsorption varies with coverage

**Sol.** Langmuir adsorption has the following postulates

- The isotherm is devised for adsorption equilibrium i.e., when rate of adsorption = rate of desorption
- Adsorption at all sites is equivalent
- Adsorption at a site is unaffected by adsorption at neighboring sites.

Correct choice: (3)

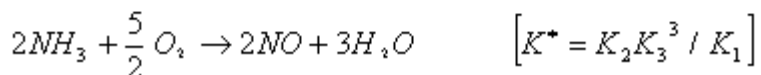
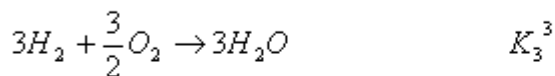
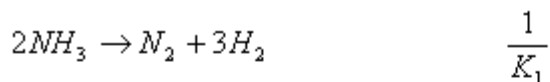
**Q. 15.** The following equilibrium constants are given



The equilibrium constant for the oxidation of  $NH_3$  by oxygen to give  $NO$  is

- $K_1 K_2 / K_3$
- $K_2 K_3^3 / K_1$
- $K_2 K_3^2 / K_1$
- $K_2^2 K_3 / K_1$

**Sol.**



Correct choice: (2)

**Q. 16.** Calculate the pOH of a solution at 25°C that contains

$1 \times 10^{-10}$  M of hydronium ions, i.e.  $H_3O^+$  :

- a. 1.000
- b. 7.000
- c. 4.000
- d. 9.000

**Sol.**  $[OH^-] = 10^{-4}$  mol/l;  $P^{OH} = 4$  Correct choice : (3)

**Q. 17.** A weak acid, HA has a  $K_a$  of  $1.00 \times 10^{-5}$ . If 0.100 mol of this acid is dissolved in one litre of water, the percentage of acid dissociated at equilibrium is closest to

- a. 0.100%
- b. 99.0%
- c. 1.00%
- d. 99.9%

**Sol.** We know that,  $K_a = C\alpha^2$  or  $\alpha = \sqrt{\frac{K_a}{C}} = \sqrt{\frac{10^{-5}}{10^{-1}}} = 10^{-2}$  Correct choice: (3)

**Q. 18.** The fraction of total volume occupied by the atoms present in a simple cube is

- a.  $\frac{\pi}{4}$
- b.  $\frac{\pi}{6}$
- c.  $\frac{\pi}{3\sqrt{2}}$