

- Q.1 Zika virus disease is:  
(A) An airborne disease (B) A waterborne disease  
(C) Transmitted by mosquitoes (D) Transmitted by ticks
- Q.2 Which of the following is **NOT** a prion disease?  
(A) Creutzfeldt Jacob disease  
(B) Fatal Familial Insomnia  
(C) Gerstmann Straussler – Scheinker syndrome  
(D) Crouzon syndrome
- Q.3 Which of the following is **NOT** a feature of Horner’s syndrome?  
(A) Ptosis (B) Miosis (C) Anhidrosis (D) Exophthalmos
- Q.4 Shield ulcers are classically associated with which of the following conditions?  
(A) Vernal keratoconjunctivitis (B) Angle closure glaucoma  
(C) Diabetic retinopathy (D) Retinoblastoma
- Q.5 Which of the following is **NOT** a disease protected by vaccines provided under the Universal Immunization Programme (Ministry of Health and Family Welfare, India)?  
(A) Hepatitis B (B) Japanese encephalitis  
(C) Pneumococcal pneumonia (D) Measles
- Q.6 One of the following **DOES NOT** take part in the anastomosis to form Kiesselbach’s plexus  
(A) Anterior ethmoidal artery (B) Sphenopalatine artery  
(C) Greater palatine artery (D) Alar branch of the Superior labial artery
- Q.7 A 50 years old woman was diagnosed with breast cancer. Analysis revealed elevated HER1 levels at both protein and mRNA levels. Further analysis revealed that although the rate of transcription was unaltered, the mRNA stability was increased. Subsequently a microRNA expression profiling study showed decrease in expression of a particular microRNA. What is the likely function of this microRNA?  
(A) Inhibits transcription of mRNA (B) Inhibits translation of mRNA  
(C) Promotes degradation of mRNA (D) Promotes enhanced splicing
- Q.8 The medial meniscus is more vulnerable to injury primarily because of:  
(A) Fixity to tibial collateral ligament (B) Semicircular structure  
(C) Action of the adductor magnus muscle (D) Attachment to fibrous capsule
- Q.9 Koebner’s phenomenon is seen in all of the following, **EXCEPT**:  
(A) Psoriasis (B) Lichen planus (C) Lichen nitidus (D) Acne rosacea

- Q.10 Which of the following is **NOT** a cause of rib notching on a chest xray?  
(A) Blalock Taussig shunt (B) Coarctation of aorta  
(C) Inferior vena cava occlusion (D) Pulmonary arterio-venous malformation
- Q.11 Which of the following **DOES NOT** use ionizing radiation?  
(A) Radiography (B) Thermography  
(C) Computed tomography (D) Positron emission tomography (PET)
- Q.12 Philadelphia translocation is a specific type of genetic abnormality wherein there is reciprocal translocation of genetic material between:  
(A) Chromosome 9 and chromosome 22 (B) Chromosome 9 and chromosome 21  
(C) Chromosome 8 and chromosome 22 (D) Chromosome 8 and chromosome 21
- Q.13 One of the following is an inhibitory neurotransmitter:  
(A) Acetyl choline (B) Glutamate  
(C) Aspartate (D) Gamma amino butyrate (GABA)
- Q.14 The technique used by molecular biologists to study gene expression by detection of RNA is known as:  
(A) Northern blotting (B) Southern blotting (C) Eastern blotting (D) Western blotting
- Q.15 Which of the following is **NOT** an aldose sugar?  
(A) Glucose (B) Fructose (C) Galactose (D) Mannose
- Q.16 In chronic obstructive lung disease the following pattern would be expected:  
(A) ↓RV ↓FVC ↑FEV<sub>1</sub>  
(B) ↑RV ↓FVC ↓FEV<sub>1</sub>  
(C) ↑RV ↑FVC ↑FEV<sub>1</sub>  
(D) ↓RV ↓FVC ↓FEV<sub>1</sub>
- Q.17 Nonsteroidal anti-inflammatory drugs (NSAID) can cause acute kidney injury by decreasing prostaglandin synthesis resulting in:  
(A) Afferent arteriole constriction resulting in decreased glomerular filtration rate  
(B) Afferent arteriole dilation and resulting in increased glomerular filtration rate  
(C) Efferent arteriole constriction resulting in decreased glomerular filtration rate  
(D) Efferent arteriole dilation resulting in increased glomerular filtration rate
- Q.18 Parathyroid hormone acts on the kidney by:  
(A) Decreasing calcium reabsorption in the proximal convoluted tubule  
(B) Increasing phosphorus reabsorption in the proximal convoluted tubule  
(C) Increasing calcium reabsorption in the distal convoluted tubule  
(D) Decreasing phosphorus reabsorption in the vasa recta

Q.19 A positive Babinski sign is:

- (A) Abnormal in the first year of life
- (B) Indicative of a lower motor neuron disease
- (C) Indicative of upper motor neuron disease
- (D) Caused by a lesion in the L3 nerve root

Q.20 Dorsal columns or medial lemniscal pathway carry:

- (A) Ascending pain fibers
- (B) Temperature sensation
- (C) Descending voluntary movement for contralateral limbs
- (D) Vibration, touch and proprioception sense

Q.21 Poliomyelitis leads to destruction of cells in:

- (A) Anterior horn of the spinal cord
- (B) Dorsal roots and dorsal columns
- (C) Demyelination of lateral corticospinal tracts
- (D) Spinothalamic tract

Q.22 Wernicke-Korsakoff syndrome is caused by:

- (A) Iron deficiency
- (B) Thiamine deficiency
- (C) Folic acid deficiency
- (D) Vitamin C deficiency

Q.23 Acanthosis nigricans is associated with:

- (A) Hyperinsulinism
- (B) Hypoinsulinism
- (C) Sun exposure
- (D) Hepatitis C

Q.24 Monosodium urate crystals are:

- (A) Positively birefringent and needle shaped under parallel light
- (B) Star shaped and positively birefringent under parallel light
- (C) Needle shaped yellow and negatively birefringent under parallel light
- (D) Blue under parallel light

Q.25 The muscles that make up the rotator cuff are as follows:

- (A) Supraspinatus, infraspinatus, teres minor, subscapularis
- (B) Biceps, triceps, deltoid, teres minor
- (C) Deltoid, supraspinatus, biceps, teres minor
- (D) Subscapularis, deltoid, biceps, teres minor

- Q.26 The following vitamins/minerals are absorbed in the following areas:
- (A) Iron in ileum, folate in duodenum, B12 in jejunum
  - (B) Iron in duodenum, folate in jejunum, and B12 in ileum
  - (C) Iron in jejunum, folate in ileum, B12 in duodenum
  - (D) Iron in duodenum, folate in ileum, B12 in jejunum
- Q.27 Asymptomatic elevated unconjugated bilirubin without hemolysis associated with stress is seen in:
- (A) Crigler Najjar syndrome type I
  - (B) Gilbert Syndrome
  - (C) Dubin Johnson Syndrome
  - (D) Wilsons Disease
- Q.28 Neonates require which vitamin in the delivery room:
- (A) Vitamin A
  - (B) Vitamin K
  - (C) Vitamin C
  - (D) Vitamin B12
- Q.29 The three structures in the carotid sheath are:
- (A) Internal jugular vein, common carotid artery, and vagus nerve
  - (B) External jugular vein, internal carotid artery, and vagus nerve
  - (C) Internal jugular vein, internal carotid artery, and laryngeal nerve
  - (D) External jugular vein, common carotid artery, and laryngeal nerve
- Q.30 Thymic aplasia or DiGeorge syndrome is associated with:
- (A) Coarse facies, recurrent staphylococcal infections, retained primary teeth
  - (B) Elevated IgE, eczema, inability of neutrophils to respond to chemotactic stimuli
  - (C) Disseminated mycobacterial infections, coarse facies, elevated IgE
  - (D) Hypocalcemia, congenital heart and great vessel defects, T cell deficiency
- Q.31 In cutaneous disorders associated with gastric malignancy which one represents metastatic spread?
- (A) Acanthosis nigricans
  - (B) Tripe palms
  - (C) Leser-Trelat sign
  - (D) Sister Mary Joseph nodule
- Q.32 Drug X has a rapid one compartment distribution and follows first order elimination kinetics and is administered intravenously. What percentage of the drug is expected to be eliminated after 4  $t_{1/2}$  ( $t_{1/2}$  = half life)?
- (A) 75%
  - (B) 87.5%
  - (C) 93.75%
  - (D) 96.875%
- Q.33 Jarisch-Herxheimer reaction, fever rigors and hypotension is seen:
- (A) Shortly after infusion of vancomycin for MRSA
  - (B) Shortly after starting antimicrobials for spirochete infections
  - (C) A week after starting amphotericin for fungal infections
  - (D) Right after starting antiretroviral therapy for HIV

- Q.34 In measles affected malnourished infants up to 6 months of age which vitamin is recommended  
(A) Vitamin D (B) Vitamin E (C) Vitamin A (D) Vitamin K
- Q.35 In a patient suffering from hyperprolactinaemia all of the following drugs should be avoided, **EXCEPT**:  
(A) Metoclopramide (B) Haloperidol (C) Ondansetron (D) Domperidone
- Q.36 In haemochromatosis which one is **NOT TRUE**:  
(A) Women are more affected by this disorder  
(B) It is diagnosed by serum ferritin levels and Transferrin saturation  
(C) Serum ferritin level has a low specificity for diagnosis  
(D) Hereditary haemochromatosis is an autosomal recessive disorder
- Q.37 In which of the following conditions is liver transplantation **NOT** indicated in adults:  
(A) Hepatic adenomas (B) Alcoholic cirrhosis  
(C) Cryptogenic cirrhosis (D) Active alcohol abuse
- Q.38 In Crohn's disease which part of the intestine is most commonly involved:  
(A) Proximal ileum (B) Terminal ileum  
(C) Ascending colon (D) Descending colon
- Q.39 Henoch-Schonlein purpura:  
(A) Affects large arteries  
(B) Associated with tobacco use  
(C) Associated with coronary artery aneurysms  
(D) Associated with small vessels and IgA immune complexes
- Q.40 NMR is useful in:  
(A) Characterization of a phytomedicine  
(B) Isolation of a phytomedicine  
(C) Production of a phytomedicine  
(D) Determination of molecular weight of a phytomedicine
- Q.41 The term multi drug resistant tuberculosis refers to an isolate of *Mycobacterium tuberculosis* that is resistant to:  
(A) Methicillin and clindamycin  
(B) Vancomycin and penicillin  
(C) Isoniazid and rifampin  
(D) Ciprofloxacin and pyrazinamide
- Q.42 Treatment of malignant hyperthermia may comprise of all of the following, **EXCEPT**:  
(A) Procainamide (B) Dantrolene sodium  
(C) Succinyl choline (D) Withdrawal of anesthetic agent if any

- Q.43 Schizophrenia is associated with:
- (A) Increased dopaminergic activity, decreased dendritic branching
  - (B) Decreased dopaminergic activity, increased dendritic branching
  - (C) Increased serotonin uptake
  - (D) Decreased release of norepinephrine
- Q.44 Late sequela of rheumatic heart disease include:
- (A) Coronary artery disease
  - (B) Mitral valve stenosis
  - (C) Dementia
  - (D) Coronary artery aneurysms
- Q.45 Ligamentum teres is a remnant of:
- (A) Umbilical artery
  - (B) Umbilical vein
  - (C) Ductus arteriosus
  - (D) Ductus venosus
- Q.46 All are true about asymptomatic bacteriuria, **EXCEPT**:
- (A) There is actively multiplying bacteria within the urinary tract in asymptomatic women
  - (B) A clean voided specimen containing > 1,00,000 organisms/ml is diagnostic
  - (C) If not treated, 50% of infected women will develop symptomatic infection during pregnancy
  - (D) Empirical oral treatment for 10 days with Nitrofurantoin is usually effective
- Q.47 All are true in polycystic ovary syndrome (PCOS), **EXCEPT**:
- (A) It affects 5-10% of women worldwide
  - (B) Obesity occurs in >50% of patients with PCOS
  - (C) The ovaries are the most consistent contributors of androgens
  - (D) The serum total testosterone levels are usually >200 ng/dl
- Q.48 About polypeptide chains of hemoglobin which one is **NOT TRUE**:
- (A) HbA-  $\alpha 2\beta 2$
  - (B) HbA2-  $\alpha 2\delta 2$
  - (C) HbF-  $\alpha 2\gamma 2$
  - (D) HbH-  $\gamma 4$
- Q.49 Nuchal translucency (NT) for aneuploidy screening is done between:
- (A) 16-18 weeks
  - (B) 11-14 weeks
  - (C) 6-9 weeks
  - (D) 20-24 weeks
- Q.50 Pregnancy with fetal Down's syndrome is characterized by all, **EXCEPT**:
- (A) Lower maternal serum AFP levels (0.7 MOM)
  - (B) Higher HCG levels (2 MOM)
  - (C) Lower unconjugated estriol levels (0.8 MOM)
  - (D) Triple test can detect 80-90% of Down's syndrome cases
- Q.51 Most common site of Rhabdomyosarcoma in children is:
- (A) Head and Neck
  - (B) Genito-urinary tract
  - (C) Trunk
  - (D) Extremities
- Q.52 The gold standard for diagnosis of Hirschprung disease is:
- (A) Rectal manometry
  - (B) Rectal biopsy
  - (C) Contrast enema
  - (D) Colonoscopy

- Q.53 All are true about ureteric colic, **EXCEPT**:
- (A) Radiates to the groin, penis, scrotum or labium as the stone progresses down the ureter
  - (B) The severity of the colic is related to the size of the stone
  - (C) Haematuria is very common
  - (D) There may be few physical signs
- Q.54 Which one is **NOT TRUE** in Carpal-Tunnel syndrome?
- (A) Majority of the cases are idiopathic
  - (B) There is hypothenar wasting
  - (C) Night pain is common
  - (D) Tinel's and Phalen's test are useful
- Q.55 Plain X-ray of abdomen shows double-bubble sign in:
- (A) Duodenal atresia
  - (B) Ileal atresia
  - (C) Meconium ileus
  - (D) Malrotation and mid-gut volvulus
- Q.56 In topical treatment of deep burns which of the following has been shown to boost cell-mediated immunity:
- (A) Silver sulfadiazine cream (1%)
  - (B) Silver sulfadiazine and Cerium nitrate
  - (C) Silver nitrate solution (0.5%)
  - (D) Mafenide acetate cream
- Q.57 Which is **NOT TRUE** regarding BRCA mutations in breast cancers?
- (A) BRCA1 tumours are high grade as compared to BRCA2
  - (B) BRCA1 breast cancers are hormone receptor positive
  - (C) BRCA1 breast tumours are aneuploid
  - (D) BRCA1 breast cancers have an increased S-phase fraction
- Q.58 In supplying the uterus, the uterine artery first divides into:
- (A) Radial arteries
  - (B) Arcuate arteries
  - (C) Spiral arteries
  - (D) Basal arteries
- Q.59 The phrenic nerve innervates the:
- (A) Diaphragm
  - (B) Diaphragm and parietal pleura
  - (C) Diaphragm, parietal pleura and pericardium
  - (D) Diaphragm and intercostal muscles
- Q.60 Most common complication of laryngeal mask airway (LMA):
- (A) Arytenoid dislocation
  - (B) Airway oedema
  - (C) Recurrent laryngeal nerve injury
  - (D) Sore throat

- Q.61 Trendelenberg sign is found due to injury of:  
(A) Superior gluteal nerve (B) Inferior gluteal nerve  
(C) Obturator nerve (D) Tibial nerve
- Q.62 Which one is **NOT TRUE** about tympanic reflex:  
(A) It is reflex contraction of tensor tympani and stapedius muscles  
(B) Its function is protective  
(C) The reaction time for this reflex is 40-160 milliseconds  
(D) It protects against brief intense stimulation such as that produced by gunshots
- Q.63 The current serologic profile of a 35-year old man who had contracted hepatitis B virus infection revealed the following: HBsAg(+), Anti-HBc IgG(+), HBeAg(+) and Anti-HBe(-). Which of the following can be said about this man?  
(A) Suffering from acute hepatitis B  
(B) Has recovered from hepatitis B  
(C) Chronic hepatitis B with active viral replication  
(D) Chronic hepatitis B with low viral replication
- Q.64 The term “nutritional wasting” for young children refers to:  
(A) Low height-for-age (B) Low weight-for-height  
(C) Low weight-for-age (D) Chronic malnutrition state
- Q.65 Fluorine is an essential element for bones and teeth. The most important source of fluorine for human beings is:  
(A) Drinking water (B) Sweetwater fish  
(C) Green leafy vegetables (D) Milk
- Q.66 Which of the following insecticide can be used as a fumigant?  
(A) Diazinon (B) Propoxur  
(C) Hydrogen cyanide (D) Lindane
- Q.67 “Snow storm” appearance in chest X-ray can be seen in the following type of pneumoconiosis:  
(A) Anthracosis (B) Bagassosis (C) Farmer’s lung (D) Silicosis
- Q.68 A chi-square test was used to understand the association between prevalence of diabetes (yes / no / borderline) and people in four age groups. The degree of freedom for this test was:  
(A) 3 (B) 4 (C) 5 (D) 6
- Q.69 The recommended maximum number of *E. coli* that can be present in 100 ml of drinking water is:  
(A) 0 (B) 1 (C) 2 (D) 3

- Q.70 Which of the following **DOES NOT** constitute a risk group for HIV infection?
- (A) Antenatal care attendees (B) Patients with tuberculosis  
(C) Migrant labours (D) Sex workers
- Q.71 All of the following are characteristics of drug resistance caused by bacterial genetic mutation, **EXCEPT**:
- (A) Combination of two or more drugs may prevent such mutation  
(B) Resistance to only one drug occurs at a time  
(C) Resistance may spread to different species  
(D) Virulence of the bacteria may become low
- Q.72 Cell-mediated immunity is **NOT** involved in which of the following events:
- (A) Pathogenesis of autoimmune diseases  
(B) Providing immunity against most extracellular bacteria  
(C) Providing immunity against facultative intracellular parasites  
(D) Delayed hypersensitivity reactions
- Q.73 Cancer of uterine cervix has been found to be strongly associated with:
- (A) Human papilloma virus type 18 (B) Herpes simplex virus type 1  
(C) Herpes simplex virus type 8 (D) Epstein-Barr virus
- Q.74 The cysts of *E. histolytica* are characterized by:
- (A) Capable of living for only a short time outside human body  
(B) Not an important form of transmission of the disease  
(C) Can be readily killed by simple drying  
(D) Not infective to man
- Q.75 Man is an “accidental” host for which of the following parasite?
- (A) *Taenia solium* (B) Guineaworm  
(C) Hookworm (D) *Echinococcus granulosus*
- Q.76 Let  $\omega$  denote the complex 7<sup>th</sup> root of unity. Then the value of  $\frac{2(\omega^6 + \omega^4 + \omega^2)}{(1 + \omega + \omega^3 + \omega^5)}$  =
- (A) -2 (B) -1 (C) 1 (D) 2
- Q.77 If  $\alpha, \beta$  are the roots of the quadratic equation  $x^2 + bx + c = 0$ . Then  $\alpha^4\beta^7 + \alpha^7\beta^4 =$
- (A)  $b^4c(3c - b^2)$  (B)  $bc^4(b^2 - 3c)$  (C)  $b^4c(b^2 - 3c)$  (D)  $bc^4(3c - b^2)$
- Q.78 If the complex number  $3 + 2i$  is a root of the quadratic equation  $x^2 - ax + b = 0$ , where  $a, b$  are real numbers. Then
- (A)  $a = -6, b = 13$  (B)  $a = 6, b = -13$   
(C)  $a = 6, b = 13$  (D)  $a = -6, b = -13$

- Q.79 In an arithmetic progression the 5<sup>th</sup> term is 7 and the 7<sup>th</sup> term is 5. Then its 12<sup>th</sup> term is  
 (A) -1 (B) 0 (C) 1 (D) 3
- Q.80 The equation of the line passing through the point (-1, 3) and parallel to the line  $2x - 3y + 7 = 0$  is  
 (A)  $2x - 3y + 20 = 0$  (B)  $2x - 3y + 11 = 0$   
 (C)  $2x + 3y + 11 = 0$  (D)  $2x + 3y + 21 = 0$
- Q.81 The perpendicular distance from the point (3, 5) to the line  $4x - 3y + k = 0$  is 4, where  $k$  is a positive real number. Then  $k =$   
 (A) 23 (B) 10 (C) 7 (D) 5
- Q.82 The acute angle between the lines  $4x - y + 8 = 0$ ,  $25x + 15y + 23 = 0$  is  
 (A)  $\frac{\pi}{2}$  (B)  $\frac{\pi}{3}$  (C)  $\frac{\pi}{4}$  (D)  $\frac{\pi}{6}$
- Q.83 The line  $2x - 3y + c = 0$  intersects the line  $x + y - 3 = 0$  at the point (1, 2). Then the value of  $c$  is  
 (A) 2 (B) 6 (C) 3 (D) 4
- Q.84  $\lim_{x \rightarrow 0} \frac{2x}{\sqrt{1 + 3x + x^2} - 1} =$   
 (A) 0 (B)  $\frac{2}{3}$  (C)  $\frac{4}{3}$  (D)  $-\frac{5}{3}$
- Q.85 Let  $\mathbb{R}$  denote the set of real numbers. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be the function defined by  

$$f(x) = \begin{cases} x, & \text{for } x \leq 1 \\ 2 - x, & \text{for } 1 < x \leq 4 \\ -3, & \text{for } x > 4 \end{cases}$$
 Then  $f$  is continuous at  
 (A)  $x = 1$   
 (B)  $x = 4$   
 (C) both the points  $x = 1$  and  $x = 4$   
 (D) none of above
- Q.86 If  $y = \frac{\cos(x^3)}{x^3+5}$  then  $\frac{dy}{dx} =$   
 (A)  $-\frac{[(3x^5+15x^2)\sin(x^3)+3x^2\cos(x^3)]}{(x^3+5)^2}$   
 (B)  $\frac{[(3x^5-15x^2)\sin(x^3)+3x^2\cos(x^3)]}{(x^3+5)^2}$   
 (C)  $\frac{[(3x^5-15x^2)\sin(x^3)-3x^2\cos(x^3)]}{(x^3+5)^2}$   
 (D)  $-\frac{[(3x^5+15x^2)\cos(x^3)+3x^2\sin(x^3)]}{(x^3+5)^2}$

- Q.87 If  $y = (2x^3 - 5)a^x \sin x$ , (where  $a > 0$ ) then  $\frac{dy}{dx} =$
- (A)  $a^x((6x^2 - \log_e a) \sin x - (2x^3 - 5) \cos x)$   
 (B)  $a^x((6x^2 + (2x^3 - 5) \log_e a) \sin x + (2x^3 - 5) \cos x)$   
 (C)  $a^x((6x^2 + 1) \sin x - (2x^3 - 5) \cos x)$   
 (D)  $a^x((6x^2 + 1) \sin x + (2x^3 + 5) \cos x)$
- Q.88 The value of the integral  $\int_1^3 \frac{x}{[x]} dx$ , where  $[x]$  denote the largest integer less than or equal to  $x$ , is
- (A)  $\frac{13}{4}$  (B)  $\frac{15}{4}$  (C) 0 (D)  $\frac{11}{4}$
- Q.89 The value of the integral  $\int_0^{\pi/2} x^2 \cos x dx$  is
- (A)  $\frac{\pi^2 - 8}{4}$  (B)  $\frac{\pi^2 + 8}{4}$  (C) 0 (D)  $\frac{\pi^2}{4}$
- Q.90 The value of the integral  $\int \sin^5(2x) \cos(2x) dx$  is
- (A)  $\frac{\sin^6(2x)}{12} + c$   
 (B)  $-\frac{\sin^6(2x)}{12} + c$   
 (C)  $\frac{\sin^6(2x)}{6} + c$   
 (D)  $\frac{\cos^6(2x)}{6} + c$
- Q.91 The primary structure of a protein is the result of
- (A) Ionic bonding  
 (B) Covalent bonding  
 (C) Hydrogen bonding  
 (D) Electrostatic interaction
- Q.92 The base sequence of four different double strands of oligonucleotides is shown below:
- |                        |                        |                        |                         |
|------------------------|------------------------|------------------------|-------------------------|
| $5' \text{TTAATAT} 3'$ | $5' \text{AGCCCTT} 3'$ | $5' \text{GGAATTT} 3'$ | $5' \text{GGGGCCCC} 3'$ |
| $3' \text{AATTATA} 5'$ | $3' \text{TCGGGAA} 5'$ | $3' \text{CCTTAAA} 5'$ | $3' \text{CCCCGGGG} 5'$ |
| <b>I</b>               | <b>II</b>              | <b>III</b>             | <b>IV</b>               |
- Their relative ease of thermal denaturation into single strands follows the order
- (A) **IV>II>III>I**  
 (B) **II>IV>III>I**  
 (C) **IV>III>II>I**  
 (D) **I>III>II>IV**

Q.93 Consider the following statements regarding the pH of a solution obtained by mixing 50.0 mL of 0.10 M HCl and 25 mL of 0.20 N of a base B.

**I.** The solution is neutral if B is a strong base

**II.** The solution is basic if B is a strong base

**III.** The solution is acidic if B is a weak base

The correct statement(s) is (are)

(A) **I** only

(B) **II** only

(C) **I** and **III**

(D) **II** and **III**

Q.94 The conversion of A to B has a reaction enthalpy of  $-50 \text{ KJ mol}^{-1}$  and activation energy of  $15 \text{ KJ mol}^{-1}$ . The activation energy for the reverse process B to A is

(A)  $15 \text{ KJ mol}^{-1}$

(B)  $45 \text{ KJ mol}^{-1}$

(C)  $50 \text{ KJ mol}^{-1}$

(D)  $65 \text{ KJ mol}^{-1}$

Q.95 Amongst the following complexes, the one which exhibits geometrical isomerism is

(A)  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$

(B)  $[\text{Zn}(\text{NH}_3)_2\text{Cl}_2]$

(C)  $[\text{Cu}(\text{NH}_3)_4]^{2+}$

(D)  $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$

Q.96 An enzyme catalyzed reaction was carried out with a substrate concentration 1000 fold greater than the  $K_m$  for the substrate. After 12 minutes, the amount of product formed was found to be 10  $\mu\text{moles}$ . The time that would be required to obtain same amount of product if the enzyme concentration is reduced by one-third and the substrate concentration is doubled keeping the other parameters like temperature, pH constant

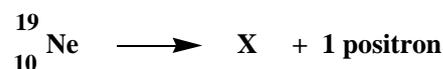
(A) 4 minutes

(B) 6 minutes

(C) 12 minutes

(D) 36 minutes

Q.97 The element **X** in the following nuclear reaction is



(A)  ${}_{9}^{19}\text{F}$

(B)  ${}_{8}^{18}\text{Ne}$

(C)  ${}_{9}^{18}\text{F}$

(D)  ${}_{11}^{23}\text{Na}$

Q.98 The compound that gives Cannizzaro reaction is

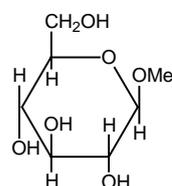
(A)  $\text{PhCH}_2\text{CHO}$

(B)  $\text{PhCHO}$

(C)  $\text{CH}_3\text{CHO}$

(D)  $\text{CH}_3\text{CH}_2\text{CHO}$

Q.99 The following compound is an example of a/an

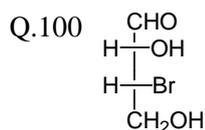


(A) acetal

(B) hemiacetal

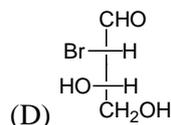
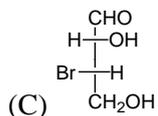
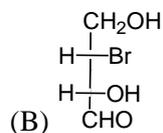
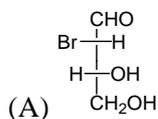
(C) ketal

(D) hemiketal

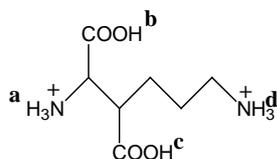


**P**

Amongst the following structures, the one which is an enantiomer of P is



Q.101 The most acidic hydrogen in the following molecule is



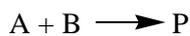
(A) H<sub>a</sub>

(B) H<sub>b</sub>

(C) H<sub>c</sub>

(D) H<sub>d</sub>

Q.102 Consider the following reaction



The mechanism for the reaction is:



The molecularity of the reaction is

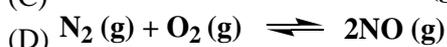
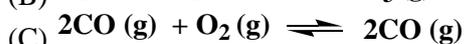
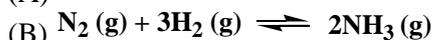
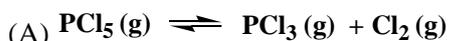
(A) 1

(B) 1.5

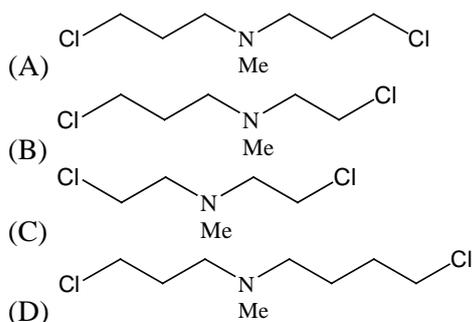
(C) 2

(D) 3

Q.103 The reaction in which K<sub>p</sub> and K<sub>c</sub> have equal magnitude is



Q.104 Amongst the following compounds, the most reactive one towards double alkylation of DNA is



Q.105 The active site of carbonic anhydrases contains

- (A)  $Mg^{2+}$  (B)  $Zn^{2+}$  (C)  $Co^{2+}$  (D)  $Ca^{2+}$

Q.106 A car travelling at 40 m/s accelerates steadily at  $10 \text{ m/s}^2$  for a distance of 45 m. What is the final velocity of the car?

- (A) 45 m/s (B) 50 m/s (C) 55 m/s (D) 65 m/s

Q.107 Two pieces of glass plate placed one upon other with a little water in between them can't be separated easily because of

- (A) pressure (B) inertia (C) surface tension (D) viscosity

Q.108 What is the final temperature if 500 calories are applied to 40 gm of copper at  $20^\circ\text{C}$ ? The specific heat capacity of copper is  $0.092 \text{ cal/gm}^\circ\text{C}$ .

- (A)  $70.03^\circ\text{C}$  (B)  $112.17^\circ\text{C}$  (C)  $136.7^\circ\text{C}$  (D)  $155.86^\circ\text{C}$

Q.109 Find the pressure in kilo Pascal (kPa) due to a column of mercury 60 cm high (Density of mercury is  $13.56 \text{ gm/cc}$ , acceleration due to gravity is  $980 \text{ cm/s}^2$ )

- (A) 66 kPa (B) 80 kPa (C) 107 kPa (D) 140 kPa

Q.110 What is the force experienced by a negative charge of  $2.5 \times 10^{-9}$  Coulomb placed in an electric field of  $4.0 \times 10^6$  Volts/m

- (A) 10 mN (B) -10 mN (C) 10 N (D) -10N

Q.111 Calculate the total random kinetic energy of one gram molecule of oxygen at 300 K (given gas constant (R) =  $8.31 \text{ J mol}^{-1}\text{K}^{-1}$ )

- (A) 2347 J (B) 3739 J (C) 4051 J (D) 6039 J

Q.112 A spring of negligible mass, suspended vertically from one end, is stretched a distance of 30 cm when a 15 gm mass is attached to the other end. Considering  $g=9.80 \text{ m/s}^2$  find the spring constant in dyne/cm

- (A) 245 (B) 0.55 (C) 490 (D) 23.4

- Q.113 A 1.0 kg cube is attached to a spring and then totally submerged in water with buoyant force 0.7N. What is the tension in the spring? ( $g=9.80 \text{ m/s}^2$ )  
 (A) 10.3 N (B) 9.1 N (C) 1.4 N (D) 0.7 N
- Q.114 A bulb draws 0.5 A current when it connects to 200 V supply. How much energy is consumed in half an hour? ( $1 \text{ kWh} = 3.60 \times 10^6 \text{ J}$ )  
 (A) 5 kWh (B) 0.5 kWh (C) 0.05 kWh (D) 1 kWh
- Q.115 In a homogeneous isotropic medium two points A and B are situated on opposite side but at the same distance from a light source. The phase difference between the light waves passing through A and B is  
 (A) zero (B)  $\pi/4$  (C)  $\pi/2$  (D)  $\pi$
- Q.116 An X-ray tube produces a continuous spectrum of radiation with its short wavelength at 0.45 Angstrom. What is the maximum energy of a photon? (Planck constant ( $h$ ) =  $6.63 \times 10^{-34} \text{ J-s}$ , Velocity of light ( $c$ ) =  $3.0 \times 10^8 \text{ m/s}$ )  
 (A) 2.8 keV (B) 5.87 keV (C) 13.45 keV (D) 27.6 keV
- Q.117 A convex lens of focal length  $f$  produces an image  $(1/N)$  times the size of the object. The distance of the object from the lens is  
 (A)  $(N-1)f$  (B)  $(N+1)f$  (C)  $((N-1)/N)f$  (D)  $(N+1)/f$
- Q.118 An observer starts moving from a stationary sound source. The observer increases its speed from a very low speed to a speed much greater than that of the sound waves. Which of the following statement correctly describes frequency of the sound heard by the observer?  
 (A) It first decreases, becomes zero and then increases.  
 (B) It continuously decreases and eventually no sound will be heard.  
 (C) It continuously decreases and eventually acquires a very low constant value  
 (D) It first decreases, becomes zero and then increases and eventually no signal will be heard.
- Q.119 Magnetic field  $d\vec{B}$  in free space at a distance 'r' from an infinitesimal length  $d\vec{l}$  of a wire carrying current  $I$  is given by the equation

$$(A) d\vec{B} = \frac{\mu_0}{4\pi} \frac{Id\vec{l} \times \vec{r}}{r^3}$$

$$(B) d\vec{B} = \frac{\mu_0}{2\pi} \frac{Id\vec{l} \times \vec{r}}{r^3}$$

$$(C) d\vec{B} = \frac{\mu_0}{2\pi} \frac{Id\vec{l} \times \vec{r}}{r}$$

$$(D) d\vec{B} = \frac{\mu_0}{4\pi} \frac{Id\vec{l} \times \vec{r}}{r}$$

Q.120 Consider two identical balloons and two identical cylinders of gas. One cylinder contains helium, a mono atomic gas of molecular mass 4 gm/mol. The other contains nitrogen, a di-atomic gas of molecular mass 28 gm/mol. Both gases may be assumed ideal, and both cylinders weigh the same amount. Which balloon will be inflated faster when the cylinders are opened and why?

(A) The nitrogen balloon will be inflated faster because nitrogen is heavier element and so the molecules of nitrogen have greater momentum and force the balloon to expand at a greater rate.

(B) The helium balloon will be inflated faster, because helium is a lighter element and so its atoms move faster and can get into the balloon at a greater rate

(C) The helium balloon will be inflated faster because the helium must be at higher pressure and hence the gas will be forced into the balloon at a greater rate.

(D) It will depend on whether the gases have to flow up or down to reach the balloon; helium is lighter than air and will rise faster so if the balloons are at the tops of the cylinders then the helium balloon will be inflated faster but if they are at the bottoms then the nitrogen balloon will be inflated faster.

**END OF THE QUESTION PAPER**

## Space for Rough Work

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