ALL INDIA INSTITUTE OF SPEECH AND HEARING
MANASAGANGOTHRI, MYSORE 570 006

ENTRANCE EXAMINATION 2012

Entrance Examination for Admission to B.Sc. (Speech and Hearing)

Time: 50 minutes **Max. Marks 50**

CHEMISTRY

1. The mass of _____ of a substance in grams is called its molar mass
   a) 1 mole
   b) 12 moles
   c) 1 molecule
   d) 12 molecules

2. What will be the wavelength of the ball of mass 0.01 kg moving with a velocity of 10 m/s?
   a) 6.626×10^{-30} m
   b) 6.626×10^{-32} m
   c) 6.626×10^{-34} m
   d) 6.626×10^{-33} m

3. Which of the following set of orbitals is arranged in the correct order of increasing energy?
   a) 3d < 4s < 4p < 6s < 4d
   b) 2s < 3d < 4p < 4f < 1s
   c) 4s < 3d < 4p < 5s < 4d
   d) 1s < 2s < 2p < 4d < 3f

4. Real gases approach ideal gas behavior at
   a) Low temperature and low pressure
   b) High temperature and low pressure
   c) Low temperature and high pressure
   d) High temperature and high pressure

5. The molecule with zero dipole moment is
   a) H_2O
   b) NH_3
   c) BF_3
   d) NF_3

6. A species with bond order two, that consists of both pi bonds is
   a) C_2
   b) O_2
   c) O_2^{2-}
   d) CO

7. Among Si, Mg, Na and P, the increasing order of metallic character is
   a) Si < Mg < Na < P
   b) Na < Mg < Si < P
   c) P < Na < Mg < Si
   d) P < Si < Mg < Na

8. A reaction A + B → C + D + q, is found to have a positive entropy change. The reaction will be
   a) Possible only at high temperature
   b) Possible only at low temperature
   c) Not possible at any temperature
   d) Possible at any temperature

9. The internal energy change (ΔU) of a process does not depend on
   a) Amount of the substance
   b) Temperature
   c) Path of the process
   d) Nature of the substance

10. In which of the following equilibrium reactions, the equilibrium would shift to the right, if the total pressure is increased
    a) $N_2 + 3\,H_2 \rightleftharpoons 2\,NH_3$
    b) $H_2 + I_2 \rightleftharpoons 2HI$
    c) $H_2 + Cl_2 \rightleftharpoons 2\,HCl$
    d) $N_2O_4 \rightleftharpoons 2\,NO_2$

11. If the equilibrium constant for the reaction, $N_2 + 3\,H_2 \rightleftharpoons 2\,NH_3$ is K, then the equilibrium constant for the reaction, $2N_2 + 6H_2 \rightleftharpoons 4\,NH_3$ would be equal to
    a) K^2
    b) $\sqrt{K}$
    c) $1 / \sqrt{K}$
    d) $1 / K^2$

12. Oxidation number of bromine in Br_3O_8 is
a) 8/3 c) 3/8
b) 16/3 d) 3/16

13. The composition of water gas is
a) CO (g) + O_2 (g) c) CO (g) + N_2 (g)
b) CO (g) + H_2O (g) d) CO (g) + H_2 (g)

14. Which one of the alkaline earth metal carbonates is thermally the most stable?
a) $BaCO_3$ c) $CaCO_3$
b) $SrCO_3$ d) $MgCO_3$

15. The chemical formula of 'Inorganic benzene' is
a) $C_3N_3H_6$ c) $B_3N_3H_6$
b) B_2H_6 d) C_6H_6

16. In the reaction $CH_3CONH_2 \xrightarrow{P_2O_5, \Delta} CH_3CN$, the hybridization state of the carbon atom changes from
a) sp^3 to sp^2 c) sp to sp^2
b) sp^2 to sp d) sp^3 to sp

17. In the Lassaigne's test for nitrogen in an organic compound, the Prussian blue colour is obtained due to the formation of
a) $Fe_4[Fe(CN)_6]$ c) $Fe_3[Fe(CN)_6]_4$
b) $Fe_2[Fe(CN)_6]$ d) $Fe_4[Fe(CN)_6]_3$

18. The number of sigma and pi bonds in benzene is
a) 3,12 c) 6,6
b) 12,3 d) 6,3

19. A functional group which activates benzene in monosubstituted benzene is
a) - CHO c) - OCH_3
b) - COOH d) - COOR

20. The prescribed upper limit concentration of lead in drinking water is about
a) 50 ppb c) 100 ppm
b) 100 ppb d) 50 ppm

21. An fcc cubic cell contains eight X atoms at the corners of the cell and six Y atoms at the faces. What is the empirical formula of the solid?
a) X_3Y_4 c) XY_3
b) X_3Y d) X_4Y_3

22. According to Raoult's law, the relative lowering of vapour pressure of a solution of a non-volatile solute is
a) Equal to mole fraction of the solvent c) Directly proportional to the mole fraction of the solute
b) Equal to mole fraction of the solute d) Equal to the normality of the solution

23. The azeotropic mixture of water and HCl boils at 108.5^{0}c. When this mixture is distilled, it is possible to obtain
a) Pure HCl c) Neither pure HCl nor pure water
b) Pure water d) Both pure HCl and pure water

24. The amount of electricity that can deposit 108 g. of silver from $AgNO_3$ solution is
a) 1 Ampere
b) 1 Coulomb
c) 2 Ampere
d) 1 Faraday

25. In which cell, the free energy of a chemical reaction is directly converted in electricity
a) Lechlanche cell
b) Concentration cell
c) Fuel cell
d) Lead storage battery

26. For a first-order reaction, the time required for 99.9% of the reaction to take place is nearly
a) 10 times that required for the half the reaction
b) 100 times that required for the half the reaction
c) 10 times that required for one – fourth of the reaction
d) 100 times that required for one – fourth of the reaction

27. A Colloidal solution is subjected to an electric field. The particles move towards anode. The coagulation of same sol is studied using NaCl, $BaCl_2$ and $AlCl_3$ solutions. Their coagulating power should be
a) $NaCl > BaCl_2 > AlCl_3$
b) $AlCl_3 > BaCl_2 > NaCl$
c) $BaCl_2 > AlCl_3 > NaCl$
d) $BaCl_2 > NaCl > AlCl_3$

28. In the metallurgy of copper, the solidified copper obtained has a blistered appearance due to the evolution of _____
a) CO_2
b) O_2
c) CO
d) SO_2

29. Covalence of nitrogen in N_2O_5
a) 4
b) 5
c) 3
d) 2

30. Which among the following is neutral oxide?
a) Al_2O_3
b) N_2O_5
c) N_2O
d) CO_2

31. Name the gas liberated when chlorine gas react with excess ammonia
a) H_2
b) HCl
c) NCl_3
d) N_2

32. A metal ion has a spin magnetic moment of 3.87 B.M. The number of unpaired electrons present is
a) 2
b) 3
c) 4
d) 5

33. Which of the following has maximum number of unpaired electrons?
a) Co^{3+}
b) Ti^{3+}
c) Mn^{2+}
d) Fe^{2+}

34. Hybridisation of Co in $[Co(C_2O_4)_3]^{3-}$ is _____
a) $d^2 sp^3$
b) sp^2d^3
c) sp^3
d) sp^3d^2

35. The mixture of two organic chlorine compounds, on treating with sodium metal in dry ether gives isobutane as one of the products. The reactants are
a) Methyl chloride and propyl chloride
b) Methyl chloride and ethyl chloride
c) Isopropyl chloride and ethyl chloride
d) Isopropyl chloride and methyl chloride

36. In the reaction
$CH_3CH(Br)CH_3 \xrightarrow{\text{alc.KOH}} A \xrightarrow{HBr/peroxide} B \xrightarrow{NaI/acetone} C$
Product C is
a) Iodopropane
b) 2-iodopropane
c) 1,2-diiodopropane
d) 1-iodopropene

37. The boiling points of methyl bromide (I), ethyl bromide (II), n-propyl bromide (III), n-butyl bromide (IV) decrease in the order
a) I > II > III > IV
b) IV > III > II > I
c) I > III > II > IV
d) I > II = III > IV

38. Arrange the following in order of decreasing acidic strength.
2,4,6-trinitrophenol (I), 2,4-dinitrophenol (II), 4-nitrophenol (III), phenol (IV)
a) I > II > III > IV
b) IV > III > II > I
c) III > II > I > IV
d) II > III > IV > I

39. Hydration of propene in the presence of dilute sulphuric acid
a) Propan-1-ol
b) Propane-1,2-diol
c) Propan-2-ol
d) Propanone

40. The product obtained when a primary alcohol is heated with copper at 573 K is _____
a) Alkene
b) Carboxylic acid
c) Ketone
d) Aldehyde

41. The reagent used in the conversion of $CH_3CH=CHCHO$ to $CH_3CH=CHCOOH$ is
a) Alkaline $KMnO_4$
b) Acidified $KMnO_4$
c) Ammoniacal $AgNO_3$
d) CrO_3

42. IUPAC name of the compound $CH_3CH_2CH_2CH(Br)CH(CH_3)CH_2CHO$ is
a) 3-bromo-4-methylheptanal
b) 4-bromo-3-methylheptanal
c) 4-bromo-3-methylheptanone
d) 3-bromo-4-methylheptanone

43. Products obtained when formaldehyde is heated with concentrated KOH are
a) Methanol and salt of formic acid
b) Methanal and salt of formic acid
c) Ethanol and salt of formic acid
d) Ethanal and salt of formic acid

44. Ethyl isocyanide is prepared by the reaction between
a) C_2H_5Br and KCN
b) C_2H_5Br and AgCN
c) C_2H_5Br and HCN
d) C_2H_5Br and NH_3

45. Among the following, the strongest base is _____
a) N-methylaniline
b) Methanamine
c) N,N-dimethylaniline
d) Phenylmethanamine

46. Gabriel phthalimide synthesis is used for the preparation of
a) Primary aromatic amine
b) Secondary aromatic amine
c) Tertiary aliphatic amine
d) Primary aliphatic amine

47. 'Scurvy' is a disease caused due to the deficiency of _____
a) Vitamin A
b) Vitamin B
c) Vitamin C
d) Vitamin D

48. A base which is not present in DNA is _____
a) Uracil
b) Adenine
c) Guanine
d) Thymine

49. Dacron is the polymer of ethylene glycol and
a) Caproic acid
b) Ethylenediamine
c) Phthalic acid
d) Terephthalic acid

50. A drug used in cancer chemotherapy is
a) Cisplatin
b) Zantac
c) Seldane
d) Dimetapp

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BIOLOGY

1. The asexual reproductive structure of sponge is
   a) Conidia
   b) Buds
   c) Gemmules
   d) Basidia

2. What is the other name of pollensac ?
   a) Microsporangia
   b) Microsporangiophore
   c) Microspores
   d) None of the above

3. Name the hormone which maintains endometrium
   a) Oestrogen
   b) Progesterone
   c) HCG
   d) Relaxin

4. The Central Drug Research Institute (CDRI)is located in _____
   a) New Delhi
   b) Bangalore
   c) Mumbai
   d) Lucknow

5. Progestasert belongs to which category of contraceptive measures?
   a) Periodic abstinence
   b) Natural method
   c) Barrier method
   d) IUD's

6. How many linkage groups are found in man?
   a) 46
   b) 23
   c) 7
   d) None of the above

7. Name the multiple expression of a gene _____
   a) Multi allelism
   b) Pleiotropy
   c) Epistasis
   d) Co-dominance

8. Find the distance between two nucleotide of a DNA helix
   a) 0.34 nm
   b) 0.43 nm
   c) 0.034 nm
   d) 34 nm

9. The total number of base pairs present in an E.coli cell
   a) $4.6X10^6$ bp
   b) $66X10^9$ bp
   c) $6.6X10^9$ bp
   d) $46X10^6$ bp

10. What are the gases were present on Earth about 4.5 billion years back?
    a) Water vapour, Oxygen, Methane
    b) Water vapour, Methane, Carbondioxide
    c) Water vapour, Methane, Carbondioxide and Ammonia
    d) Water vapour, Methane, Carbondioxide and Oxygen

11. Trichophyton is a fungal genera, which causes a disease called
    a) Worm trouble
    b) Ringworm
    c) Botulism
    d) Taeniasis

12. For how long inbreeding is done without causing inbreeding depression
    a) At least 4-7 generations
    b) At least 4-6 generations
    c) At least 2-3 generations
    d) At least more than 8 generations

13. What does following organisms are related aphids & mosquitoes, lady bird & Dragonfly. Butterfly catterpillar & Bacillus thuringiensis
    a) Biological control of insect pest
    b) Animal breeding programmes
    c) Endangered species
    d) Chemical control of insect pests

14. Select the name of micro organism which produce an enzyme ?
    a) Aspergillius niger
    b) Acetobactor aceti
    c) Clostridium botulinum
    d) Strepto coccus

15. Name a sugar cane variety that is native to South India
    a) Saccharum barberi
    b) Saccharum Saccharum
    c) Saccharum officinarum
    d) none of the above

16. Which technique is employed to separate the DNA fragment after treating with restriction enzyme?
    a) Polymorase chain reaction (PCR)
    b) X-Ray
    c) Autoradiography
    d) Agarose gel electrophoresis

17. How is a transgenic tobacco plant protected against meloidegyne incognitia
    a) By the principle of DNA profile
    b) By the principle of RNA-interferase
    c) By the principle of mutation
    d) None of the above

18. Give the term for Recombinant DNA technology, PCR and ELISA have common value
    a) Gene amplification
    b) Gene therapy
    c) As tools of molecular diagnosis
    d) Genetic engineering

19. DNA fragments are stained with
    a) Ethidium bromide
    b) Cesium chloride
    c) Meyhylene blue stain
    d) Ethidium chloride

20. What is the role of gene cry Ab
    a) Control Aphids
    b) Control cotton bollworm
    c) Control corn borer
    d) Control cotton bollworm & corn borer

21. Which of the following is a regulator with respect to homeostasis
    a) Earth worm
    b) Fish
    c) Cat
    d) Frog

22. Name an annelid that act as detrivore
    a) Neris
    b) Leech
    c) Earth worm
    d) Peacock worm

23. How many Biosphere reserves have been notified in India
    a) 89
    b) 492
    c) 115
    d) 14

24. What is the forest area for plains as per NFP?
    a) 36%
    b) 30%
    c) 33%
    d) 67%

25. Which of the following metals used in catalytic converter to reduce automobile pollution
    a) Platinum, Palladium, Rhodium
    b) Platinum, Chromium, Radium
    c) Chromium, Tungston, Iron
    d) Palladium, Chromium, Copper

26. The first step of taxanomy is
    a) Naming
    b) Identification
    c) Description
    d) Classification

27. The bacterial cell wall made up of a non-cellulosic material called as _____
    a) Manitol
    b) Peptidoglycan \ murein
    c) Laminarin
    d) Starch

28. Bryophytes are dependent on water because
    a) Archegonium has to remain filled with water for fertilization
    b) Water is essential for fertilization for their homosporous nature
    c) Water is essential for their vegetative propagation
    d) The sperms can easily reach upto egg in the archogonium

29. A common trait in earth worm, Leech and cockroach
    a) Lack of legs
    b) Hermaphroditism
    c) Ventral nerve cord
    d) Malpighian tubules

30. Animals without respiratory, circulatory and excretory systems are
    a) Planaria
    b) Ascaris
    c) Sponges
    d) Tapeworm

31. In which of the following plant oil is stored in endosperm?
    a) Groundnut
    b) Seasame
    c) Coconut
    d) Soyabean

32. A band around each endodermal cell in which the radial and transverse cell walls are impregnated with suberin.
    a) Bordered pit
    b) Annual ring
    c) Plasmodesmata
    d) Casparian strip

33. How many segments are present in the abdomen of cockroach?
    a) 10
    b) 12
    c) 11
    d) 15

34. The property of a plant cell to develop into a full plant is called
    a) Tissue culture
    b) Totipotency
    c) Pluripotency
    d) Gene cloning

35. Name the most abundant components of cell/tissue/organism
    a) Proteins
    b) carbohydrates
    c) Lipids
    d) Water

36. Crossing over in a diploid organism is responsible for
    a) Dominance of genes
    b) Linkage between genes
    c) Segregation of alleles
    d) Recombinations of linked genes

37. Chromosome counting is best done during
    a) Late anaphase
    b) Late prophase
    c) Metaphase
    d) Telophase

38. Name a competitive inhibitor of succinic dehydrogenase is:
a) Malonate
b) Malate
c) Oxaloacetate
d) L-Ketoglutavate

39. Name an animal, in which, Hemoglobin is found dissolved in plasma
a) Planaria
b) Cockroach
c) Sepia
d) Earth worm (Pheretima)

40. The parts of the periderm,
a) Phellem, cortex, and cambium
b) Phelloderm, phloem and Xylem
c) Phellogen, phellem and pith
d) Phellem, phellogen and phelloderm

41. A cell when placed in a solution gets plasmolysed. What is largely present in between the cellwall and the plamolysed content?
a) Cell sap
b) Hypotonic solution
c) Hypertonic solution
d) Water

42. Name the mineral required for pollen germination
a) Boron
b) Manganese
c) Calcium
d) Iron

43. Wavelength of PAR
a) 340-450 nm
b) 400-700nm
c) 500-600 nm
d) 450-950nm

44. Name an ETC poison which prevents transfer of electrons from cytochrome a3 to oxygen
a) Phosphide
b) Carbide
c) Cyanide
d) Endosulphon

45. Name a natural plant hormone isolated from corn kernel and coconut milk
a) Florigen
b) GA3
c) Auxin
d) Zeatin

46. Which ones are sister cells
a) Tracheids and vessels
b) Xylem paren chyma and xylem fibres
c) Sieve tube cells & companion cells
d) Phloem parenchyma and companion cells

47. Active sites are part of _____ structure of protein
a) Primary
b) Secondary
c) Tertiary
d) Quarternary

48. An enzyme is made up of a protein and a non-protein part. The protein portion of the enzymes is called the _____
a) Prosthetic group
b) Co-enzyme
c) Apoenzyme
d) Cofactor

49. Papilionaceous corolla is seen in the following plants
a) Sweet pea
b) Ashwagandha
c) Asparagus
d) Tobacco

50. Bioluminescence is the characteristic feature of
a) Cnidaria
b) Ctenophora
c) Platyhelminthesis
d) Sponges

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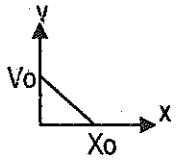
PHYSICS

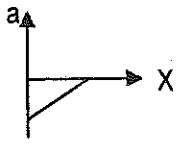
1. The dimension of surface tension is
   a) $[MLT^{-2}]$ c) $[ML^0T^{-2}]$
   b) $[ML^{-1}T^{-2}]$ d) $[M^0LT^{-1}]$

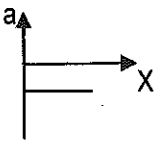
2. The ratio of 1 light year to 1 astronomical unit in metre is
   a) 6.32×10^6 c) 632
   b) 0.632×10^4 d) 6.32×10^4

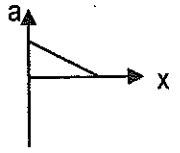
3. There are two forces, one 6 N due east and other 8 N due north. Find the magnitude of resultant of two forces in N.
   a) 1 c) 100
   b) 10 d) 0.1

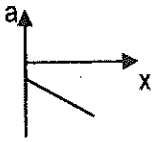
4. The given graph shows the variation of velocity with displacement. Which one of the given graph represents the variation of acceleration with displacement?



a) 

c) 

b) 

d) 

5. A body of mass *'m'* moves along X - axis such that its position coordinate at any instant *'t'* is $x = at^4 - bt^3 + ct$, where *a, b* and *c* are constants. The force acting on the particle at any instant *'t'* is,
   a) $m(6at^2 - 12bt)$ c) $m(6bt^2 - 12at)$
   b) $m / (12at^2 - 6bt)$ d) $m(12at^2 - 6bt)$

6. A ball moving with a momentum of 5 $kgms^{-1}$ strikes against a wall at an angle of 45^o and is reflected at the same angle. Calculate the change in momentum.
   a) 7.07 $kgms^{-1}$ c) - 7.07 $kgms^{-1}$
   b) 70.7 $kgms^{-1}$ d) 0.707 $kgms^{-1}$

7. A ball of mass m is dropped from a height 'h' on a platform fixed at the top of a vertical spring. The platform is depressed by a distance x. The spring constant 'k' is

a) $\frac{2mgx^2}{h+x}$ c) $\frac{(h+x)x^2}{2mg}$

b) $\frac{2mg}{(h+x)x^2}$ d) $\frac{(h+x)}{2mgx^2}$

8. A man skating on the ground gets straight up and stand. The force of reaction of the ground on the man during the process is,

a) Constant and equal to *mg* in magnitude
c) Constant and greater than *mg* in magnitude
b) Variable but always greater than *mg*
d) At first greater than *mg* and later becomes equal to mg

9. Calculate the angle through which a cyclist bends from the vertical, when he crosses a circular path of circumference 34.3 m in $\sqrt{22}$ s. Take g = 9.8 ms^{-2}

a) 30°
c) 45°
b) 60°
d) 90°

10. When a disk rotates with uniform angular velocity, which of the following is not true?

a) The sense of rotation remains the same
c) The speed of rotation is non-zero and remains the same
b) The orientation of the axis of rotation remains the same
d) The angular acceleration in non-zero and remains the same

11. A satellite is moving with a constant speed 'v' in a circular orbit about the earth. An object of mass 'm' is ejected from the satellite such that it just escapes from the gravitational pull of the earth. At the time of its ejection, the kinetic energy of the object is,

a) $\frac{1}{2}mv^2$ c) $\frac{3}{2}mv^2$

b) mv^2 d) $2mv^2$

12. The escape velocity of a projectile on the earth's surface is 11.2 kms^{-1}. A body is projected out with thrice the speed. What is the speed of the body far away from the earth? Ignore the presence of sun and other planets.

a) 31.68 ms^{-1}
c) 31.68 kms^{-1}
b) 3168 kms^{-1}
d) 316.8 kms^{-1}

13. Boyle's law is applicable for an

a) Adiabatic process
c) Isobaric process
b) Isothermal process
d) Isochoric process

14. A vessel 'A' contains hydrogen and another vessel 'B' whose volume is twice of 'A' contains same mass of oxygen at the same temperature. Compare the root mean square speeds of the molecules. Given: molecular weights of hydrogen and oxygen are 2 and 32 respectively.

a) 1:4
c) 4:1
b) 1:2
d) 2:1

15. The temperature of a wire is doubled. The Young's modulus of elasticity

a) Will also double
c) Will remain same
b) Will become four times
d) Will decrease

16. An ideal fluid flows through a pipe of circular cross-section made of two sections with diameters 2.5 cm and 3.75 cm. the ratio of the velocities in the two pipes is

a) 9:4 c) $\sqrt{3}:\sqrt{2}$

b) 3:2 d) $\sqrt{2}:\sqrt{3}$

17. In a given process of an ideal gas, dW = 0 and dQ < 0. Then for the gas,

a) The temperature will decrease c) The pressure will remain constant

b) The volume will decrease d) The temperature will increase

18. The source temperature of a Carnot engine is 127 °C. It takes 500 cal of heat from the source and rejects 400 cal to the sink during each cycle. What is the temperature of the sink?

a) 47 K c) 400 K

b) 320 °C d) 47 °C

19. Motion of an oscillating liquid column in a U-tube is

a) Periodic but not simple harmonic c) Simple harmonic and time period is independent of the density of the liquid

b) Non-periodic d) Simple harmonic and time period is directly proportional to the density of the liquid

20. A string of mass 2.5 kg is under the tension of 200 N. The length of the stretched string is 20.0 m. If the transverse jerk is struck at one end of the string, the disturbance will reach the other end in

a) 1.0 s c) 2.0 s

b) 0.5 s d) 0.1 s

21. A parallel capacitor of capacitance C is connected to a battery and is charged to a potential difference V. Another capacitor of capacitance 2C is similarly charged to a potential difference 2V. The charging battery is now disconnected and the capacitors are connected in parallel to each other in such a way that the positive terminal of one is connected to the negative terminal of the other. The final energy of the configuration is

a) Zero c) $\frac{25}{6}CV^2$

b) $\frac{3}{2}CV^2$ d) $\frac{9}{2}CV^2$

22. An α-particle is situated in an electric field of 1.5×10^5 NC^{-1}. The force exerted on it in newton is

a) 2.4×10^{-14} c) 4.8×10^{-14}

b) 4.8×10^{14} d) 2.4×10^{14}

23. The unit of permittivity of free space (ε_0) is

a) $CN^{-1}m^{-1}$ c) $C^2N^{-1}m^{-2}$

b) $C^{-1}Nm^2$ d) $C^2N^{-2}m^{-2}$

24. The physical quantity having the dimensions of $[M^{-1}L^{-3}T^3A^2]$ is

a) Resistance c) Electrical conductivity

b) Resistivity d) Electromotive force

25. A piece of copper (Cu) and another of germanium (Ge) are cooled from room temperature to 80 K. The resistance of

a) Each of them increases c) Cu increases and Ge decreases

b) Each of them decreases d) Cu decreases and Ge increases

26. A resistance of 2 Ω is connected across one gap of a metre – bridge and an unknown resistance greater than 2 Ω is connected across another gap. When these resistances are interchanged, the balance point shifts by 20 cm. The unknown resistance is

a) 3 Ω
b) 4 Ω
c) 5 Ω
d) 6 Ω

27. A proton, deuteron and an α-particle having the same kinetic energy are moving in a circular trajectories in a constant magnetic field. If r_p, r_d and r_α denote respectively the radii of the trajectories of these particles then

a) $r_\alpha = r_p < r_d$
b) $r_\alpha > r_d > r_p$
c) $r_\alpha = r_d > r_p$
d) $r_\alpha = r_p = r_d$

28. A circular coil of wire consisting of 100 turns each of radius 8.0 cm carries a current of 0.40 A. The magnitude of magnetic field in tesla (T) at the centre of the coil is

a) 3.1×10^{-2}
b) 3.1×10^{-4}
c) 3.1×10^{2}
d) 3.1×10^{4}

29. The magnetic needle of a tangent galvanometer is deflected at an angle 30° due to a magnet. The horizontal component of earth's magnetic field 0.34×10^{-4} T is along the plane of the coil. The magnetic field intensity in tesla (T) is

a) 1.96×10^{-4}
b) 1.96×10^{4}
c) 1.96×10^{-5}
d) 1.96×10^{5}

30. In a coil when current changes from 10 A to 2 A in time 0.1 s, induced *emf* is 3.28 V. The self-inductance of the coil in H (Henry) is

a) 4
b) 0.4
c) 0.04
d) 5

31. Transformer is a device which is used to change the magnitude of

a) D C voltage
b) A C voltage
c) Both (a) and (b)
d) None of these

32. In a series LCR circuit, the voltage across 'R' is 100 V, R = 1 kΩ and C = 2 μF. The resonant frequency ω is 200 rads^{-1}. At resonance, the voltage in V across 'L' is

a) 40
b) 250
c) 4×10^{-3}
d) 2.5×10^{-2}

33. Electromagnetic waves are produced by

a) Accelerated charged particle
b) Charge at rest
c) Charge in uniform motion
d)) Both (a) and (c)

34. Earth's atmosphere is richest in which one of the following radiation

a) Ultraviolet
b) Infrared
c) X – rays
d) Microwaves

35. Two beams of red and violet colours are made to pass separately through a prism (angle of the prism is 60°). In the position of minimum deviation, the angle of refraction will be

a) 30° for both the colours
b) Greater for the violet colour
c) Greater for the red colour
d) Equal but not 30° for both the colours

36. A slit of 4.0 cm wide is irradiated with microwaves of 2.0 cm. Find the angular spread of the central maximum, assuming incidence normal to the plane of the slit.

a) 45°
b) 60°
c) 30°
d) 90°

37. Spherical aberration, in a thin lens can be reduced by
    a) Using a monochromatic light
    b) Using a doublet combination
    c) Using a circular annular mask over the lens
    d) Increasing the size of the lens

38. In Young's double slit experiment, the separation between the slits in halved and distance between the slits and screen is doubled. The fringe width is
    a) Unchanged
    b) Halved
    c) Doubled
    d) Quadrupled

39. Two coherent monochromatic light beams of intensities I and 4I are superposed. The maximum and minimum possible intensities in the resulting beams are
    a) 5I and I
    b) 9I and I
    c) 5I and 3I
    d) 9I and 3I

40. The work function of a substance is 4 eV. The longest wavelength (in nm) of light that can cause photoelectron emission from this substance is approximately,
    a) 540
    b) 400
    c) 310
    d) 220

41. Particle nature of light is exhibited by
    a) Polarization
    b) Interference
    c) Refraction
    d) Photoelectric effect

42. If 13.6 eV energy is required to ionize the hydrogen atom, then energy (in eV) required to remove an electron from n = 2 state is,
    a) 10.2
    b) 0
    c) 3.4
    d) 6.8

43. The hydrogen atom can give spectral lines in the Lyman, Balmer and Paschen series. Which of the following statement is correct?
    a) Lyman series is in the infra-red region
    b) Balmer series is in the visible region (partly)
    c) Paschen series is in the visible region
    d) Balmer series is in the ultra violet region

44. Tritium has a half-life of 12.5 years undergoing β - decay. What fraction of a sample of pure tritium will remain undecayed after 25 years
    a) 1/8
    b) 1/2
    c) 1/4
    d) 1/32

45. The energy band gap is maximum in
    a) Metals
    b) Superconductors
    c) Insulators
    d) Semiconductors

46. In a common-base mode of a transistor, the collector current is 5.488 mA for an emitter current of 5.60 mA. The value of the base current amplification factor (β) will be
    a) 49
    b) 50
    c) 51
    d) 48

47. An oscillator is nothing but an amplifier with
    a) Negative feed back
    b) Large gain
    c) No feed back
    d) Positive feed back

48. Three resistors of 2 Ω each are connected in a triangle. The resistance in ohm, between two vertices is

a) 3 Ω
b) 4 Ω
c) 6 Ω
d) 4/3 Ω

49. The waves used by artificial satellite for communication purposes are

a) Microwaves
b) AM radio waves
c) FM radio waves
d) X - rays

50. Which one of the following is used in optical fibres

a) Diffraction
b) Scattering
c) Total internal reflection
d) Refraction

ALL INDIA INSTITUTE OF SPEECH AND HEARING
MANASAGANGOTHRI, MYSORE 570 006

ENTRANCE EXAMINATION 2012

Entrance Examination for Admission to B.Sc. (Speech and Hearing)

Max. Marks 50

Time: 50 minutes

MATHEMATICS

1. For any three sets A, B and C, $A\times(B^c \cup C^c)^c$ is equal to
   a) $(A\times B^c) \cup (A \times C^c)$
   b) $(A\times B) \cup (A \times C)$
   c) $(A\times B^c) \cap (A \times C^c)$
   d) $(A\times B) \cap (A \times C)$

2. The domain of the function $f(x) = \frac{1}{\sqrt{x-3}}$ is
   a) R
   b) $[0, \infty)$
   c) $(3, \infty)$
   d) $[3, \infty)$

3. The value of $\sin 15^\circ$ is
   a) $\frac{\sqrt{6}+\sqrt{2}}{4}$
   b) $\frac{\sqrt{6}-\sqrt{2}}{4}$
   c) $\frac{\sqrt{3}+\sqrt{2}}{4}$
   d) $\frac{\sqrt{3}-\sqrt{2}}{4}$

4. The function $f: [0, \infty) \to R$ given by $f(x) = \frac{x}{x+1}$ is
   a) One-one and on to
   b) Onto but not one-one
   c) One-one but not onto
   d) Neither one-one nor onto

5. If $z = \frac{2-3i}{4-i}$, then $Re(z)$ is
   a) $\frac{11}{17}$
   b) $\frac{-11}{17}$
   c) $\frac{10}{17}$
   d) $\frac{-10}{17}$

6. The polar form of the complex number $Z = 1 + i\sqrt{3}$ is
   a) $2(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3})$
   b) $2(\cos\frac{\pi}{3} - i\sin\frac{\pi}{3})$
   c) $4(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3})$
   d) $4(\cos\frac{\pi}{3} - i\sin\frac{\pi}{3})$

7. Divya obtained 70 and 75 marks in first two unit tests. The minimum marks she should get in the third test to have an average of atleast 60 marks is
   a) 25
   b) 30
   c) 35
   d) 60

8. The number of ways can the letters of the word "PERMUTATIONS" be arranged such that vowels are together is
   a) $7 \times 4! \times 5!$
   b) $4 \times 7! \times 5i$
   c) $4! \times 7! \times 5!$
   d) $4 \times 7 \times 5$

9. $If\ f(x) = (a - x^n)^{\frac{1}{n}}, then\ fof(x) is$

a) x
b) x^2
c) x^n
d) $\frac{1}{x^n}$

10. $If\ A = \begin{bmatrix} cosx & -sinx \\ sinx & cosx \end{bmatrix}\ then\ A \cdot A^T\ is$

a) $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$
b) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
c) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

11. In a single throw of three dice, find the probability of not showing the same number on all the dice is

a) $\frac{25}{36}$
b) $\frac{35}{36}$
c) $\frac{1}{6}$
d) $\frac{5}{6}$

12. $If\ \alpha, \beta, \gamma\ are\ the\ direction\ angles\ of\ a\ line, then\ the\ value\ of\ sin^2\alpha + sin^2\beta + sin^2\gamma\ is$

a) 1
b) 2
c) 3
d) 4

13. $How\ many\ diagonals\ are\ there\ in\ a\ polygon\ of\ n\ sides?$

a) $n(n-1)$
b) $\frac{n(n-1)}{2}$
c) $n(n-3)$
d) $\frac{n(n-3)}{2}$

14. $The\ value\ of\ lim_{x\to 0} \frac{1-cos4x}{1-cos6x}\ is$

a) $\frac{2}{3}$
b) $\frac{4}{9}$
c) 1
d) 0

15. $If\ A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}\ and\ B = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}\ and\ X be\ a\ matrix\ such\ that\ X\ is\ equal\ to$

a) $\frac{1}{2}\begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$
b) $\frac{1}{2}\begin{bmatrix} -2 & 4 \\ 4 & 5 \end{bmatrix}$
c) $\begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$
d) $\begin{bmatrix} -2 & 4 \\ 3 & 5 \end{bmatrix}$

16. $\int_0^1 x(1-x)^{99}\ dx\ is\ equal\ to$

a) $\frac{1}{10100}$
b) $\frac{11}{10100}$
c) $\frac{1}{10010}$
d) $\frac{11}{11100}$

17. If $\overrightarrow{OA} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k}, \overrightarrow{OB} = 3\hat{\imath} + \hat{\jmath} - 2\hat{k}$ and $\overrightarrow{OC} = 2\hat{\imath} - 3\hat{\jmath} + \hat{k}$ then $\overrightarrow{AB} \cdot \overrightarrow{AC}$ is equal to

a) 25
b) 15
c) 7
d) 17

18. The probability that a student will pass the final examination in both Mathematics and Physics is 0.5 and the probability of passing neither is 0.1. If the probability of passing Mathematics examination is 0.75, the probability of passing Physics examination is

a) 0.5
b) 0.6
c) 0.65
d) 0.75

19. The $co-ordinate\ of\ the\ foot\ of\ perpendicular\ from\ the\ point\ (2,3) on\ the\ line\ y = 3x + 4\ is$

a) $\left(\frac{37}{10}, \frac{-1}{10}\right)$
b) $\left(\frac{-1}{10}, \frac{37}{10}\right)$
c) $\left(\frac{10}{37}, -10\right)$
d) $\left(\frac{2}{3}, \frac{-1}{3}\right)$

20. The eccentricity of the ellipse $16x^2 + 25y^2 = 400$ is

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

21. The value of k if $f(x) = \begin{cases} kx + 1, & x \leq 5 \\ 3x - 5, & x > 5 \end{cases}$ is continuos at $x = 5$ is

a) $\frac{3}{5}$
b) $\frac{5}{9}$
c) $\frac{5}{3}$
d) $\frac{9}{5}$

22. If $y = sec(tan^{-1} x)$ then $\frac{dy}{dx}$ is

a) $\frac{1}{1 + x^2}$
b) $x\sqrt{1 + x^2}$
c) $\frac{1}{\sqrt{1 + x^2}}$
d) $\frac{x}{\sqrt{1 + x^2}}$

23. The middle term in the expansion of $(x - \frac{1}{2y})^{10}$ is

a) $\frac{-63}{8}\frac{x^5}{y^5}$
b) $\frac{63}{8}\frac{x^5}{y^5}$
c) $\frac{105}{8}\frac{x^6}{y^4}$
d) $\frac{-105}{8}\frac{x^6}{y^4}$

24. $\int e^{3logx} \cdot x^4\, dx$ is equal to

a) $\frac{x^7}{7} + c$
b) x^8
c) $x^3 \cdot e^x + c$
d) $x^4 + logx + c$

25. The solution of the differential equation $(e^{x+y})\frac{dy}{dx} = 1$ is

a) $e^x + e^y = c$
b) $e^{-x} + e^y = c$
c) $e^x + e^{-y} = c$
d) $e^{-x} + e^{-y} = c$

26. The range of the principal branch of $sec^{-1}x$ defined on the domain $R - (-1,1)$ is

a) $\left[0, \frac{\pi}{2}\right]$
b) $\left(0, \frac{\pi}{2}\right)$
c) $\left(0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right)$
d) $[0, \frac{\pi}{2}) \cup (\frac{\pi}{2}, \pi]$

27. Two numbers whose arithmetic mean is 34 and the geometric mean is 16 are

a) 17 and 8
b) 25 and 4
c) 64 and 4
d) 18 and 2

28. The sum of n terms of the series $1.2 + 2.3 + 3.4 + \cdots$ is

a) $\frac{n(n+1)}{3}$
b) $\frac{n(n+1)(n+2)}{6}$
c) $\frac{n(n+1)(n+2)}{3}$
d) $\frac{n(n+1)(2n+1)}{6}$

29. If $\sigma^2 x$ is the variance of the observations $x_1, x_2, x_3, \ldots\ldots\ldots x_n$, then the variance of $5x_1 + 3, 5x_2 + 3, 5x_3 + 3, \ldots\ldots\ldots 5x_n + 3$ is

a) $5\sigma^2 x + 3$
b) $25\sigma^2 x + 3$
c) $25\sigma x$
d) $25\sigma^2 x$

30. Three bags contain 5 white, 8 red, 7 white, 6 red and 6 white, 5 red balls respectively. one ball is drawn from each bag at random. the probability that all the three balls drawn are of the same colour is

a) $\frac{410}{1859}$
b) $\frac{240}{1859}$
c) $\frac{250}{1859}$
d) $\frac{450}{1859}$

31. The radius of the circle which passes through the center of the circle $x^2 + y^2 + 8x + 10y - 7 = 0$ and is concentric with the circle $2x^2 + 2y^2 - 8x - 12y - 9 = 0$ is

a) 10
b) 5
c) 4
d) 8

32. The value of $\sin 420° \cos 390° + \cos(-660°) \sin(-390°)$ is

a) 0
b) $\frac{1}{4}$
c) $\frac{1}{2}$
d) 1

33. The slope of the normal to the curve $x = 1 - a\sin\theta, y = b\cos^2\theta$ at $\theta = \frac{\pi}{2}$ is

a) $\frac{2b}{a}$
b) $\frac{2a}{b}$
c) $\frac{-a}{2b}$
d) $\frac{-b}{2a}$

34. The maximum value of the function $\sin x + \cos x$ is

a) 2

b) $\sqrt{2}$

c) $\frac{\sqrt{3}}{2}$

d) $\sqrt{3}$

35. If A is a square matrix of order 3 and $|A| = 2$, then $A(adjA)$ is

a) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

c) $\begin{bmatrix} 2 & 2 & 2 \\ 2 & 2 & 2 \\ 2 & 2 & 2 \end{bmatrix}$

d) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

36. A and B are two events such that $P(A) > 0$ and $P(B) \neq 1$, then $P(A^c/B^c)$ is equal to

a) $\frac{P(A^C)}{P(B^C)}$

b) $\frac{1 - P(A \cup B)}{P(B^C)}$

c) $1 - P(A/B)$

d) $1 - P(A^c/B)$

37. The lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-k}$ and $\frac{x-1}{k} = \frac{y-4}{2} = \frac{z-5}{1}$ are coplanar if

a) $k = 3$ or -3

b) $k = 1$ or -1

c) $k = 0$ or -1

d) $k = 0$ or 3

38. The unit vector perpendicular to both $\vec{a} = 3\hat{\imath} + \hat{\jmath} - 2\hat{k}$ and $\vec{b} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ is

a) $\frac{1}{5\sqrt{3}}(-5\hat{\imath} - \hat{\jmath} + 7\hat{k})$

b) $\frac{1}{5\sqrt{3}}(5\hat{\imath} - \hat{\jmath} + 7\hat{k})$

c) $\frac{1}{5\sqrt{3}}(5\hat{\imath} + \hat{\jmath} + 7\hat{k})$

d) $\frac{1}{5\sqrt{3}}(5\hat{\imath} + \hat{\jmath} - 7\hat{k})$

39. The differential equation representing the parabolas having vertex at the origin and axis along positive direction of $x-$axis is

a) $2x\frac{dy}{dx} + y = 0$

b) $2x\frac{dy}{dx} - y = 0$

c) $x\frac{dy}{dx} + y = 0$

d) $x\frac{dy}{dx} - y = 0$

40. The area enclosed between the curve $y^2 = 4x$ and the line $y = x$ is

a) $\frac{8}{3}$

b) $\frac{4}{3}$

c) $\frac{2}{3}$

d) $\frac{1}{2}$

41. If d is the determinant of a square matrix A of order n, then the determinent of its adjoint is

a) d^n

b) d^{n-1}

c) d^{n+1}

d) d

42. The value of $sin(cot^{-1} x)$ is equal to

a) $\frac{x}{1+x^2}$

b) $\frac{1}{1+x^2}$

c) $\frac{1}{\sqrt{1+x^2}}$

d) $\frac{x}{\sqrt{1+x^2}}$

43. The value of $|\vec{a} \times \hat{i}|^2 + |\vec{a} \times \hat{j}|^2 + |\vec{a} \times \hat{k}|^2$ is

a) $\overrightarrow{|a|}^2$

b) $2\overrightarrow{|a|}^2$

c) $3\overrightarrow{|a|}^2$

d) $4\overrightarrow{|a|}^2$

44. The derivative of x^x with respect to x is

a) x^x

b) $x^x(1 + log\, x)$

c) $x^x \log x$

d) $log(x^x)$

45. The angle between the planes $2x + 3z = 4$ and $3x - y - 2z = 0$ is

a) $\frac{\pi}{4}$

b) $\frac{\pi}{2}$

c) $\frac{\pi}{3}$

d) $\frac{\pi}{6}$

46. If sets A and B are defined as $A = \left\{(x, y) : y = \frac{1}{x}, 0 \neq x \in R\right\}$, $B = \{(x, y) : y = x, x \in R\}$ then

a) $A \cap B = A$

b) $A \cap B = B$

c) $A \cap B = \emptyset$

d) $A \cup B = A$

47. If $\int_0^1 f(x)dx = 1$, $\int_0^1 xf(x)dx = a$, $\int_0^1 x^2 f(x)dx = a^2$ then $\int_0^1 (a - x)^2 f(x)dx$ is equal to

a) $4a^2$

b) 0

c) $2a^2$

d) $3a^2$

48. If A and B are symmetric matrices then ABA is

a) Symmetric matrix

b) Skew − symmetric matrix

c) Diagonal matrix

d) Scalar matrix

49. The angle made by the line $xcos30° + ysin30° + sin120° = 0$ with positive direction of x − axis is

a) $30°$

b) $60°$

c) $90°$

d) $120°$

50. The contrapositive of the statement 'if 7 is greater than 5, then 8 is greater than 6" is

a) If 8 is greater than 6, then 7 is greater than 5

b) If 8 is not greater than 6, then 7 is greater than 5

c) If 8 is not greater than 6, then 7 is not greater than 5

d) If 8 is greater than 6, then 7 is not greater than 5