ALL INDIA INSTITUTE OF SPEECH AND HEARING
MANASAGANGOTHRI
MYSURU 570 006
ENTRANCE EXAMINATION 2018
PHYSICS – SET 2

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

Instructions: Answer all the questions
Each question carries one mark
Use ball point pen with black ink
Do not overwrite

Select the most appropriate answer from among the four alternatives given and indicate it by marking an 'X' in the box adjacent to the correct answer (in the answer sheet). For example, if c) is the correct answer for a given question, then indicate your answer as shown below:

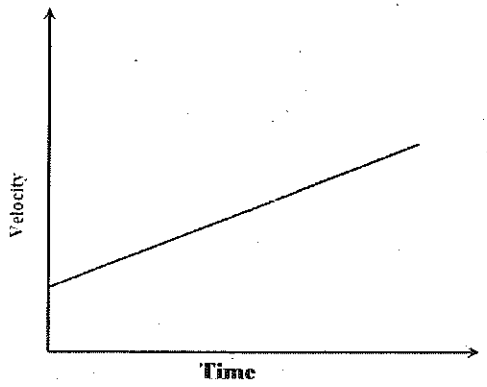
a) ☐ b) ☐ c) ☒ d) ☐

**

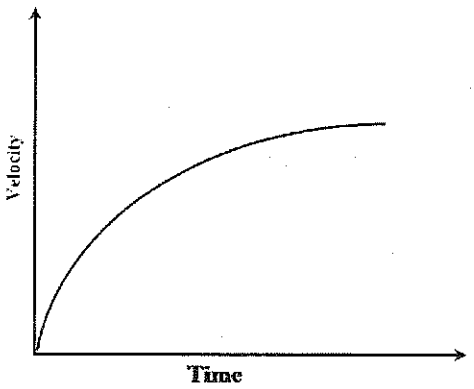
1. Identify the dimensional formula of Power
   a) $[M^1L^1T^{-3}]$ b) $[M^1L^1T^{-2}]$
   c) $[M^1L^2T^{-2}]$ d) $[M^1L^2T^{-3}]$

2. A car is moving along a straight line towards north and travels a distance of 360m in 12s. It returns along the same path to the initial point and travels further to a point which is 120m southward of the starting point. The total return journey takes 16s. Find the average speed of the car.
   a) $\frac{30}{7}$ m/s b) 20 m/s
   c) 30 m/s d) $\frac{20}{7}$ m/s

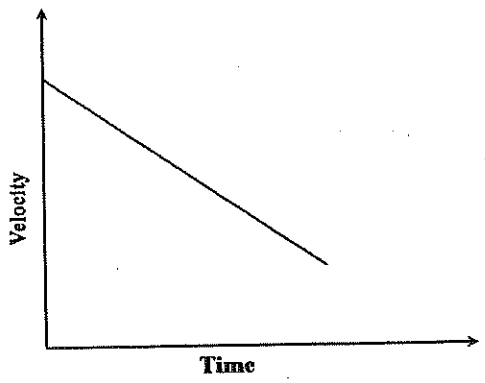
3. Identify the graph corresponding to an object moving in positive direction with negative acceleration.
   a)



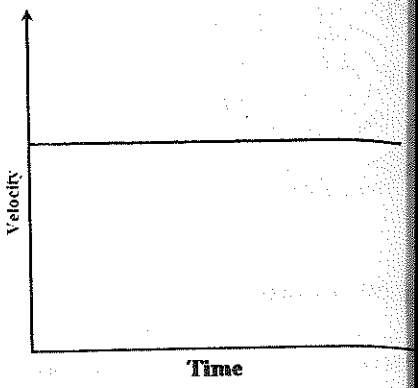
   b)



c)



d)

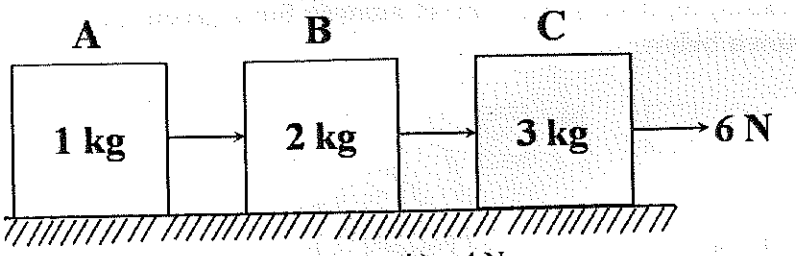


4. If angle of friction is θ and angle of repose is λ, then the criterion for an object just to slide

a) $\theta>\lambda$ b) $\theta<\lambda$

c) $\theta=\lambda$ d) $\theta=2\lambda$

5. Find the tension in the string connected between B and C.



a) 3 N b) 4 N

c) 6 N d) 1 N

6. A bullet of mass *m* moving with a velocity *v* hits and embedded in a solid block of mass *M* resting on a horizontal frictionless table. What is the final kinetic energy of the compound system?

a) $\frac{m^2v^2}{2M}$ b) $\frac{m^2v^2}{(M+m)}$

c) $\frac{m^2v^2}{2m}$ d) $\frac{m^2v^2}{2(M+m)}$

7. A body is moved along a straight line by a machine delivering constant power. The distance moved by the body in time t is proportional to,

a) $t^{3/2}$ b) t^4

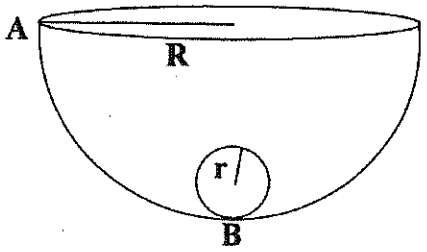
c) t^2 d) $t^{3/4}$

8. Find the torque of a force $5\hat{i}+3\hat{j}-5\hat{k}$ about the origin. The force acts on a particle whose position vector is $-\hat{i}+\hat{j}+\hat{k}$

a) $-8\hat{i}+8\hat{j}-8\hat{k}$ b) $8\hat{i}+0\hat{j}-8\hat{k}$

c) $-8\hat{i}+0\hat{j}-8\hat{k}$ d) $-8\hat{i}+10\hat{j}-8\hat{k}$

9. A ball of radius r starts from rest from the point A and rolls inside a hemispherical vessel of radius R as shown in the figure. The angular velocity of the ball in the position B about the centre of this vessel is,



a) $2\sqrt{\frac{g}{5(R-r)}}$

b) $\sqrt{\frac{10g}{7(R-r)}}$

c) $\sqrt{\frac{5g}{2(R-r)}}$

d) $\sqrt{\frac{2g}{5(R-r)}}$

10. The moment of inertia of the square of side a and mass M about any side is,

a) $\frac{Ma^2}{3}$

b) $\frac{Ma^2}{6}$

c) $\frac{Ma^2}{12}$

d) $\frac{3Ma^2}{4}$

11. Kepler's second law is also known as

a) Law of orbits

b) Law of areas

c) Law of periods

d) Law of gravitation

12. The potential energy of a system of four identical particles of masses, 1 kg each, placed at the vertices of a square of side $\sqrt{2}$ m is approximately,

a) $-4G$

b) $-\frac{G}{2}$

c) $-4\sqrt{2}G$

d) $-2\sqrt{2}G$

13. The ratio of the radii of two planets A and B is 3:9 and the ratio of their densities is 3:2, respectively. What would be the ratio of the acceleration due to gravity at the surfaces of these planets ($g_A : g_B$)?

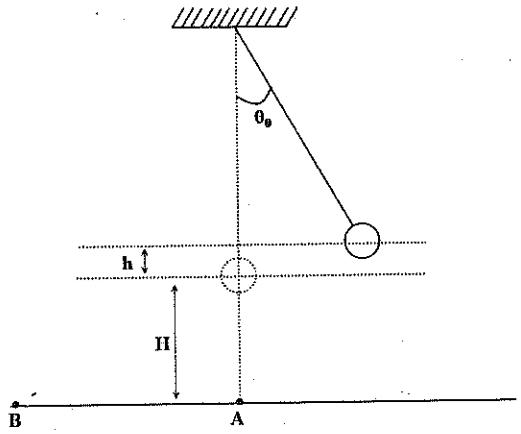
a) 2:1

b) 3:1

c) 1:3

d) 1:2

14. The mass of a simple pendulum is slowly increased so that its thread just breaks at the point of the maximum tension. After breaking the bob falls to a point B. Find the distance AB. (θ_0 is the amplitude)



a) $\sqrt{2Hh}$ b) $2\sqrt{Hh}$

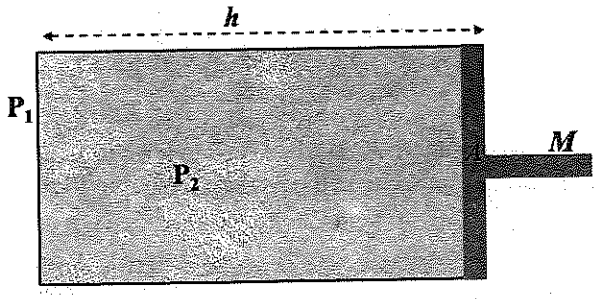
c) $\sqrt{Hh}$ d) $\sqrt{3Hh}$

15. A string of length L is stretched by $\frac{L}{20}$ and the speed of transverse wave along it is v. The speed of the wave when it is stretched by $\frac{L}{10}$ will be,(assume that Hooke's law is applicable)

a) $2v$ b) $\frac{v}{\sqrt{2}}$

c) $\sqrt{2}v$ d) $4v$

16. A cylindrical piston of mass M slides smoothly inside a long cylinder closed at one end, enclosing a certain mass of gas. The cylinder is kept with its axis horizontal. If the piston is disturbed from its equilibrium position, it oscillates simple harmonically. The period of oscillation will be,



a) $T = 2\pi\sqrt{\frac{Mh}{P_1 A}}$ b) $T = 2\pi\sqrt{\frac{MA}{P_1 h}}$

c) $T = 2\pi\sqrt{\frac{M}{P_1 Ah}}$ d) $T = 2\pi\sqrt{MP_1 hA}$

17. In an isothermal process,

a) Volume remains constant b) Pressure remains constant

c) Temperature remains constant d) Entropy remains constant

18. Calculate the efficiency of a Carnot's engine operating between temperatures of 900 K and 300 K.

a) 67 %
b) 33 %
c) 76 %
d) 24 %

19. The work done in increasing the length of a spring, with spring constant K, from l_1 to l_2 will be,

a) $K(l_2 - l_1)$
b) $K(l_2 + l_1)$
c) $K(l_2^2 - l_1^2)$
d) $\frac{K}{2}(l_2^2 - l_1^2)$

20. The surface tension of a liquid,

a) Increases with area
b) Decreases with area
c) Increases with temperature
d) Decreases with temperature

21. The root mean square (r. m. s.) velocity of oxygen molecule at 1600 K will be,

a) $10\sqrt{3R}$
b) $\frac{10}{\sqrt{3R}}$
c) $\frac{\sqrt{3R}}{10}$
d) $30\sqrt{R}$

22. Two walls of thickness d_1 and d_2 and thermal conductivity K_1 and K_2 are in contact with each other. In the steady state, if the temperature of the outer surfaces are T_1 and T_2, the temperature at the common wall is,

a) $\frac{K_1T_1d_2 + K_2T_2d_1}{K_1d_2 + K_2d_1}$
b) $\frac{K_1T_1 + K_2T_2}{d_1 + d_2}$
c) $\left(\frac{K_1d_1 + K_2d_2}{T_1 + T_2}\right)T_1T_2$
d) $\frac{K_1T_1d_1 + K_2T_2d_2}{K_1d_1 + K_2d_2}$

23. A perfect gas is at 27^0C is heated at constant pressure, so as to triple its volume. The temperature of gas will be

a) 81^0C
b) 900^0C
c) 627^0C
d) 450^0C

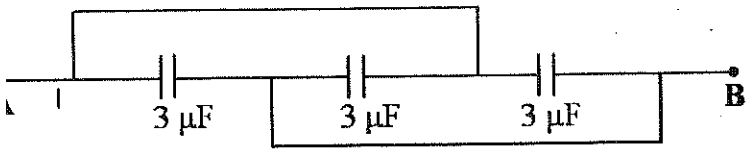
24. The SI unit of Coefficient of Viscosity is

a) Pascal
b) Poiseiulle
c) poise
d) Newton

25. Which of the following statement is correct

a) If electric field is zero then the electric potential must be zero
b) If electric field is non zero then the electric potential must be zero
c) If electric potential is zero then the electric field must be zero
d) If electric potential is zero then nothing can be predicted about the electric field

26. Find the capacitance between A and B as shown in diagram.



a) 1μF
b) 3μF
c) 6μF
d) 9μF

27. Two identical thin rings, each of radiuses R are coaxially placed at a distance R apart. If Q_1 a Q_2 are respectively the charges uniformly spread on the two rings. The work done in moving charge q from the centre of one ring to that of the second ring is

a) zero
b) $\frac{q(Q_1 - Q_2)(\sqrt{2}-1)}{\sqrt{2}(4\pi\varepsilon_0 R)}$
c) $\frac{q\sqrt{2}(Q+Q_2)}{4\pi\varepsilon_0 R}$
d) $\frac{q(Q_1 + Q_2)(\sqrt{2}-1)}{\sqrt{2}(4\pi\varepsilon_0 R)}$

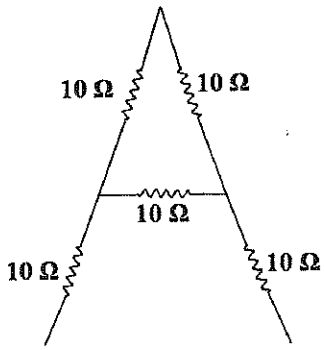
28. Which of the following is a correct statement?

a) Resistivity of metals increases with temperature
b) Resistivity of metals decreases with temperature
c) Resistivity of semiconductors increases with temperature
d) Resistivity of insulator increases with temperature

29. What would be the equivalent e.m.f. and resistance of the following arrangement.

a) $E_{eq} = E_1 - E_2;\ r_{eq} = r_1 + r_2$
b) $E_{eq} = E_1 + E_2;\ r_{eq} = r_1 + r_2$
c) $E_{eq} = E_1 + E_2;\ r_{eq} = \frac{r_1 r_2}{r_1 + r_2}$
d) $E_{eq} = \frac{E_1 E_2}{E_1 + E_2};\ r_{eq} = \frac{r_1 r_2}{r_1 + r_2}$

30. A letter A is made with five resistors of 10Ω each. What would be the net resistance betwee the two feet?



a) $\frac{30}{23}\Omega$
b) $\frac{80}{3}\Omega$

c) $\frac{25}{3}\Omega$ d) $\frac{50}{3}\Omega$

31 To radiate signals of wavelength λ with high efficiency, the antenna should have a size at least
a) λ b) $\frac{\lambda}{2}$
c) $\frac{\lambda}{3}$ d) $\frac{\lambda}{4}$

32. The npn transistors are preferred to pnp transistors because of,
a) npn transistors are cheaper b) npn transistors are easily available
c) Mobility of electrons is more than that of holes d) Mobility of holes is more than that of electrons

33. The truth table of AND gate is given. Identify (α,β).

A	B	Y
1	α	1
0	1	β

a) (1,0) b) (0,1)
c) (0,0) d) (1,1)

34. Tritium has a half- life of 12.5 years undergoing β–decay. What percentage of the original sample of Tritium will remain undecayed after 25 years?
a) 50 % b) 25 %
c) 75 % d) 12.5 %

35. Which of the series of spectra of the Hydrogen atom falls in the visible region?
a) Lyman b) Balmer
c) Paschen d) Brackett

36. An electron, an α-particle, and a proton have same kinetic energies. Which particle has the least De- Broglie wavelength?
a) Electron b) Proton
c) α- particle d) α- particle and proton

37. Wave theory could not explain,
a) Diffraction b) Interference
c) Photoelectric effect d) Polarization

38. If L is the length of the compound microscope, f_o, f_e are the focal lengths of the objective and eye-piece, respectively and D is the least distance of distinct vision. What would be the magnification?
a) $\frac{Lf_o}{Df_e}$ b) $\frac{LD}{f_o f_e}$
c) $\frac{f_o f_e}{LD}$ d) $\frac{Df_o}{Lf_e}$

39. Which of the following relations is correct for a pair of media if i_P is the Brewster's angle and C is the critical angle?

a) $\sin C = \tan i_P$ b) $\sin C (\tan i_P) = 1$

c) $\sin i_P (\tan C) = 1$ d) $\sin i_P (\sin C) = 1$

40. Within what distance the ray optics would be a good approximation if the aperture is 2 mm and the wavelength is 400 nm?

a) 50 m b) 0.5 m

c) 1 m d) 10 m

41. If the convex lens placed in a liquid with refractive index greater than the refractive index of the material of the lens, then,

a) Lens behaves like a convex lens of lesser focal length b) Lens behaves like a convex lens of larger focal length

c) Lens behaves like a concave lens d) Lens behaves like a plane glass

42. The fringe width β, in Young's double slit experiment, changes if the entire set up is placed in a swimming pool of water with refractive index μ as,

a) $\mu\beta$ b) $\mu^2\beta$

c) $\frac{1}{\mu}\beta$ d) $\frac{1}{\mu^2}\beta$

43 The electric field of a plane electromagnetic wave is given by $E_z = 60\sin(0.5\text{x}10^3\text{x} + 1.5\text{x}10^{11}\text{t})$ V/m .What would be the amplitude and direction of the magnetic field?

a) $2\text{x}10^{-7}$ T and Y direction b) $4\text{x}10^{-7}$ T and Y direction

c) $2\text{x}10^{-7}$ T and Y direction d) $4\text{x}10^{-7}$ T and Z direction

44. Which one is the correct order of frequencies?

a) $\nu_{X-ray} > \nu_{IR} > \nu_{UV}$ b) $\nu_{X-ray} > \nu_{IR} = \nu_{UV}$

c) $\nu_{X-ray} > \nu_{UV} > \nu_{IR}$ d) $\nu_{IR} > \nu_{X-ray} > \nu_{UV}$

45. A metal rod of length R is rotated with an angular frequency ω hinged at the centre and the other end at the circumference of a circular metallic ring of radius R m. A constant, uniform magnetic field of B T, parallel to the axis, is present everywhere. What would be the e.m.f. between the center and the metallic ring?

a) $\frac{B\omega^2 R}{2}$ b) $\frac{B\omega R}{2}$

c) $\frac{B\omega R^2}{2}$ d) Zero

46. Two bulbs, one connected with a resistor and the other with an inductor, across the same source, then on switching on the circuit,

a) Bulb connected across the resistor glows instantly. b) Bulb connected across the inductor glows instantly.

c) Both bulbs glow at the same time. d) The bulb connected across the inductor will not glow at all.

47. In any AC circuit with only inductor,

a) The current leads the voltage by $\pi/4$
b) The current lags the voltage by $\pi/4$
c) The current leads the voltage by $\pi/2$
d) The current lags the voltage by $\pi/2$

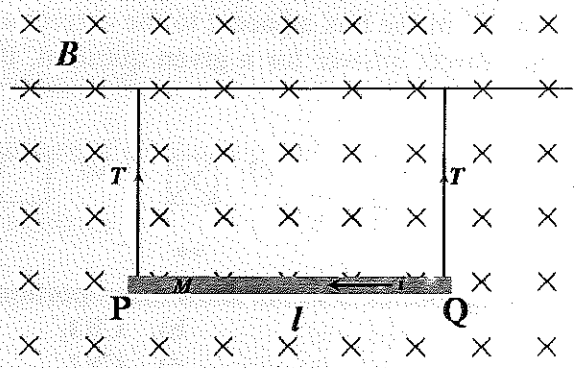
48. If current sensitivity is increased in a moving coil galvanometer

a) Voltage sensitivity must be increased
b) Voltage sensitivity may remain same or increase
c) Voltage sensitivity must be decreased
d) There is no relation between current sensitivity and voltage sensitivity

49. Which of the following is NOT a diamagnetic material?

a) Bismuth
b) Copper
c) Lead
d) Gadolinium

50. A rod of length l and mass M is suspended using two strings in a magnetic field B as shown in the figure. A current i ampere flows in the rod from Q to P. If the rod is in mechanical equilibrium, what would be the tension (T) in the string?



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

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MYSURU 570 006
ENTRANCE EXAMINATION 2018
CHEMISTRY – Set I

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

Instructions: **Answer all the questions**
Each question carries one mark
Use ball point pen with black ink
Do not overwrite

Select the most appropriate answer from among the four alternatives given and indicate it by marking an 'X' in the box adjacent to the correct answer (in the answer sheet). For example, if c) is the correct answer for a given question, then indicate your answer as shown below:

a) ☐ b) ☐ c) ☒ d) ☐

**

1. Which of the following species does not show disproportionate reaction?
   a) ClO^- b) ClO_2^-
   c) ClO_3^- d) ClO_4^-

2. What is the oxidation number of P in NaH_2PO_4 ?
   a) -3 b) 0
   c) +3 d) +5

3. Which of the following is an electron deficient hydride?
   a) CH_4 b) B_2H_6
   c) NH_3 d) H_2O

4. Which of the following alkali metal forms peroxide when it reacts with dry air?
   a) Li b) Na
   c) K d) Cs

5. The main components of cement are
   a) gypsum and limestone b) plaster of paris and alumina
   c) lime and clay d) caustic soda and lime water

6. The inorganic benzene is
   a) borazine b) diborane
   c) borax d) silica

7. The producer gas is a mixture of
   a) CO and H_2
   b) CO and N_2
   c) CO_2 and N_2
   d) CO_2 , H_2 and N_2

8. The hybridization state of carbonyl carbon atom of $CH_3CH{=}CHCHO$ is
   a) sp
   b) sp^2
   c) sp^3
   d) sp^3d

9. In Lassaigne's test, which of the following will not give Prussian blue?
   (i) Benzaldehyde (ii) NH_2NH_2 (iii) $C_6H_5NO_2$ (iv) $C_6H_5NH_2$
   a) only (i)
   b) (i) and (ii)
   c) only (ii)
   d) (iii) and (iv)

10. Select the suitable reagent for the chemical test to distinguish but-2-yne and but-1-yne
   a) $KMnO_4$ solution
   b) $NaNH_2$
   c) soda-lime
   d) H_2SO_4

11. The products obtained by the ozonolysis of 2-ethylbut-l-ene are
   a) methanal and pentan-3-one
   b) ethanal and butan-2-one
   c) methanal and pentan-2-one
   d) ethanal and pentan-2-one

12. Classical smog is a mixture of smoke, fog and
   a) NO_2
   b) SO_2
   c) unsaturated hydrocarbons
   d) formaldehyde

13. Which of the following concentration term of a solution changes with temperature?
   a) molality
   b) mole fraction
   c) molarity
   d) all of these

14. Calculate the number of molecules present in 1.6g of $SO_2(g)$ at STP
   a) 1.505×10^{22}
   b) 3.011×10^{22}
   c) 1.505×10^{23}
   d) 3.011×10^{23}

15. Which of the following set of four quantum numbers is not possible?
   a) $n=2, l=1, m_l=+1, m_s=+1/2$
   b) $n=1, l=0, m_l=0, m_s=-1/2$
   c) $n=1, l=1, m_l=0, m_s=+1/2$
   d) $n=2, l=0, m_l=0, m_s=+1/2$

16. Atom of an element has 11 electrons, 11 protons and 12 neutrons. The mass number of the element is
   a) 33
   b) 22
   c) 11
   d) 23

17. Which of the following will have the most negative electron gain enthalpy?
   a) F
   b) Cl
   c) P
   d) S

18. The neutral molecule that will be isoelectronic with OCl^- ion is
   a) ClO_2
   b) Cl_2O
   c) O_2
   d) ClF

19. The number of bond pair and lone pair of electrons around the central atom in SF_4 are
a) 5,0 b) 4,2
c) 4,1 d) 4,0

20. According to MOT, the correct increasing order of relative stability of $O_2, O_2^+, O_2^-, O_2^{2-}$ species is
a) $O_2^{2-} < O_2^+ < O_2 < O_2^-$ b) $O_2^{2-} < O_2^- < O_2 < O_2^+$
c) $O_2^- < O_2^{2-} < O_2 < O_2^+$ d) $O_2^{2-} < O_2^- < O_2^+ < O_2$

21. When the temperature of a solution is increased, its surface tension
a) decreases b) increases
c) remains same d) first increases and then decreases

22. The temperature at which a real gas obeys ideal gas law over an appreciable range of pressure is called
a) critical temperature b) Boyle temperature
c) inversion temperature d) absolute temperature

23. The p_{OH} value for the strongest base is
a) 0 b) 1
c) 7 d) 14

24. The conjugate base of HCO_3^- is
a) H_2CO_3 b) CO_3^{2-}
c) CO_2 d) both H_2CO_3 and CO_3^{2-}

25. For the reaction $2HI(g) \rightarrow H_2(g) + I_2(g)$, the relationship between ΔH and ΔU is
a) $\Delta H = \Delta U$ b) $\Delta H > \Delta U$
c) $\Delta U > \Delta H$ d) $\Delta H = \Delta U + 2RT$

26. When the magnetic moments of the domains in the substance are aligned in parallel and anti-parallel directions in unequal numbers, the substance shows
a) ferromagnetism b) antiferromagnetism
c) ferrimagnetism d) diamagnetism

27. The structure of the lattice having AAA... type pattern is
a) primitive cubic b) hcp
c) ccp d) fcc

28. The reverse osmosis takes place when the pressure applied on the solution side must be
a) equal to osmotic pressure b) equal to atmospheric pressure
c) less than osmotic pressure d) larger than osmotic pressure

29. The solubility of gases in liquid decreases with increase of temperature because for dissolution of a gas in liquid
a) $\Delta_{sol}H = O$ b) $\Delta_{sol}H > O$
c) $\Delta_{sol}H < O$ d) $\Delta_{sol}H = K_H$

30. E^{o} values for Na^{+}/Na, $2H^{+}/H_2$, Ag^{+}/Ag and F_2 (g)/$2F^{-}$ are -2.71 V, 0.00 V, +0.80 V and +2.87 V respectively. Which one of the following is the strongest reducing agent?
a) Na
b) H_2
c) Ag
d) F_2

31 An example of primary battery is
a) lead storage battery
b) nickel-cadmium cell
c) Leclanche cell
d) fuel cell

32. What is the order of all natural and artificial radioactive decay of unstable nuclei ?
a) 0
b) 1
c) 2
d) fractional

33. A reaction is first order with respect to A and second order with respect to B. When the concentration of both A and B are doubled, the rate of reaction
a) increases by 8 times
b) increases by 4 times
c) increases by 2 times
d) decreases by 2 times

34. A colloid in which a liquid is dispersed in a solid is called as
a) emulsion
b) solution
c) gel
d) foam

35. $BaSO_4$ is used in Rosenmund reduction as
a) catalyst
b) promoter
c) catalytic poison
d) both catalyst and promoter

36. The suitable technique to refine tin metal is
a) Mond's process
b) van Arkel method
c) distillation
d) liquation

37. Silica is used in the extraction of copper as
a) reducing agent
b) depressant
c) flux
d) leaching agent

38. Zinc reacts with dilute nitric acid to liberate
a) NO gas
b) N_2O gas
c) NO_2 gas
d) N_2O_5 gas

39. Which is the strongest acid among HF, HCl, HBr, HI ?
a) HF
b) HCl
c) HBr
d) HI

40. What is the colour of $K_2Cr_2O_7$ solution when its pH=9 ?
a) yellow
b) orange
c) colourless
d) pink

41. The coordination number of Fe in $[Fe(en)_3]^{3+}$ is
a) 0
b) 2
c) 3
d) 6

42. Among the following compounds, which has the highest boiling point?
a) Ethanoic acid
b) Propan-1-ol
c) Propanal
d) Butane

43. Which of the following compound does not undergo Friedel-Crafts reaction?
a) chlorobenzene
b) benzene
c) anisole
d) benzoic acid

44. The suitable chemical test to distinguish methanol and ethanol is
a) Lucas test
b) esterification
c) Iodoform test
d) Tollen's test

45. Which of the following polymer has the weakest intermolecular force?
a) PVC
b) Nylon 6,6
c) Neoprene
d) Bakelite

46. Chemical substances used for the treatment of stress are known as
a) analgesics
b) tranquilizers
c) antihistamines
d) antifertility drugs

47. The major product of the reaction between benzenediazonium chloride and ethanol is
a) chlorobenzene
b) ethylbenzene
c) phenol
d) benzene

48. Xerophthalmia disease is due to the deficiency of
a) vitamin A
b) vitamin C
c) vitamin D
d) vitamin B_6

49. Which structure of protein remains intact and is not destroyed during denaturation?
a) primary
b) secondary
c) tertiary
d) both secondary and tertiary

50. Conversion of phenol into salicylaldehyde is known as
a) Kolbe's reaction
b) Stephen reaction
c) Reimer-Tiemann reaction
d) Williamson synthesis

ALL INDIA INSTITUTE OF SPEECH AND HEARING
MANASAGANGOTHRI
MYSURU 570 006
ENTRANCE EXAMINATION 2018
BIOLOGY SET – II

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

Instructions: Answer all the questions
Each question carries one mark
Use ball point pen with black ink
Do not overwrite

Select the most appropriate answer from among the four alternatives given and indicate it by marking an 'X' in the box adjacent to the correct answer (in the answer sheet). For example, if c) is the correct answer for a given question, then indicate your answer as shown below:

a) ☐ b) ☐ c) ☒ d) ☐

**

1. Lichens represent symbiotic relationship between
   a) algae and fungi b) moss and fungi
   c) virus and bacteria d) algae and bacteria

2. Methanogens are present in the gut region of ruminants such as
   a) cow and buffalo b) mongoose and otter
   c) monkey and ape d) cat and dog

3. According to Allen's rule, the mammals from colder climates have
   a) shorter ears and longer limbs b) longer ears and shorter limbs
   c) longer ears and longer limbs d) shorter ears and shorter limbs

4. Phycoerythrin, chlorophyll *a* and chlorophyll *d* are present in
   a) Chlorophyceae b) Xanthophyceae
   c) Phaeophyceae d) Rhodophyceae

5. Agar- agar is obtained from
   a) virus b) bacteria
   c) fungi d) algae

6. Tissues are absent in the body of
   a) Platyhelminthes b) Annelids
   c) Sponges d) Arthropods

7. Gambusia is a
   a) pest of fish b) parasite of fish
   c) pest of mosquitoes d) predator of mosquito larvae

8. Which of the following roots contain nitrogen fixing bacteria Rhizobium?
   a) Assimilatory roots
   b) Nodulated roots
   c) Napiform roots
   d) Pneumatophores

9. The development of fruit without fertilization is
   a) parthenogenesis
   b) parthenocarpy
   c) apomixis
   d) apogamy

10. The waxy material deposited as casparian strips in the endodermal cells of dicot root is
   a) pectin
   b) suberin
   c) cellulose
   d) lignin

11. Tendons and ligaments are specialized tissues of
   a) dense regular connective tissue
   b) dense irregular connective tissue
   c) loose connective tissue
   d) smooth muscle tissue

12. The epithelial tissue which is found on the walls of blood vessels is
   a) cubiodal epithelium
   b) ciliated columnar epithelium
   c) squamous epithelium
   d) columnar epithelium

13. Who proposed the fluid mosaic model of plasma membrane?
   a) Camillo Golgi
   b) Robert Brown
   c) Schleiden and Schwann
   d) Singer and Nicolson

14. Which one of the following processes requires expenditure of energy?
   a) Facilitated diffusion
   b) Simple diffusion
   c) Active transport
   d) Passive transport

15. The most abundant protein available in the biosphere
   a) RuBisCO
   b) Collagen
   c) Phosphoenol pyruvate carboxylase
   d) ATPase

16. During the cell cycle, DNA replication takes place in
   a) M- phase
   b) G1-phase
   c) S-phase
   d) G2-phase

17. Stomata of CAM plants
   a) never open
   b) open during the day and close at night
   c) open during the night and close at day
   d) open during day and night

18. Mechanism involved in the transport of food synthesised in leaves to the other parts of the plant body is
   a) ascent of sap
   b) mass flow
   c) root pressure
   d) guttation

19. The function of leg-haemoglobin during biological nitrogen fixation in root nodules of legumes is to
   a) convert atmospheric nitrogen to ammonia
   b) protect the nitrogenous enzyme from oxygen
   c) transport oxygen for activity of nitrogenase
   d) convert ammonia to nitrate

20. Photorespiration results in formation of
a) sugars but not ATP
b) ATP but not sugars
c) both ATP and sugars
d) neither ATP nor sugar

21. The first 4-carbon compound taking part in Krebs' cycle is
a) Oxaloacetic acid
b) Fumaric acid
c) Succinic acid
d) Malic acid

22. Treatment of seeds at low temperature for promoting germination is known as
a) vernalisation
b) cryopreservation
c) photoperiodism
d) thermoregulation

23. The wave like contraction of the smooth muscles of digestive tract is called
a) deglutition
b) peristalsis
c) fibrillation
d) mastication

24. Maximum amount of carbon dioxide produced by our body cells is transported to the lungs as
a) carboxy haemoglobin
b) carbonate
c) bicarbonates
d) dissolved in the plasma

25. Which of the following is involved in the coagulation of blood?
a) Albumin
b) Globulin
c) Fibrinogen
d) Serum amylase

26. Which are the ear ossicles present in human beings?
a) Incus and stapes
b) Stapes and malleus
c) Incus and malleus
d) Malleus, incus and stapes

27. Progesterone is secreted by
a) Copora allata
b) Corpus albicans
c) Corpus luteum
d) Corpus callosum

28. The term 'clone' cannot be applied to offsprings formed by sexual reproduction, because
a) offsprings do not possess exact copies of parental DNA
b) DNA of only one parent is copied and passed on to the offspring
c) offsprings are formed at different times
d) DNA of parent and offsprings are completely different

29. Filiform apparatus is a characteristic feature of
a) egg
b) synergids
c) zygote
d) suspensor

30. Which one of the following hormones is responsible for uterine contraction during parturition?
a) Relaxin
b) Vasopressin
c) Oxytocin
d) Prolactin

31 Gynaecomastia is a symptom of
a) Klinefelter's syndrome
b) Turner's syndrome
c) Down's syndrome
d) AIDS

32. Which one of the following codons has dual functions?
a) AUC
b) ACU
c) ACA
d) AUG

33. Thorns of Bougainvillea and tendrils of Cucurbita are examples of
a) vestigial organs
b) retrogressive evolution
c) analogous organs
d) homologous organs

34. Antigen binding sites in antibody are found between
a) two light chains
b) two heavy chains
c) one heavy and one light chain
d) either between two light chains or between two heavy chains

35. MOET is a breeding method used for
a) cloning of Dolly sheep
b) cattle herd improvement
c) apiculture
d) fish cultivation

36. The organism which is used for gene transfer in higher plants is
a) Agrobacterium tumifaciens
b) Bacillus thuringiensis
c) Escherichia coli
d) Acetobacter

37. Primary treatment of waste water involves the removal of
a) solid particles
b) toxic substances
c) harmful bacteria
d) dissolved impurities

38. The technique used to amplify a specific DNA fragment of interest is
a) blotting technique
b) polymerase chain reaction
c) DNA finger printing
d) gel electrophoresis

39. The first clinical gene therapy was given for treating
a) Diabetes mellitus
b) Chicken pox
c) Rheumatoid arthritis
d) Adenosine deaminase deficiency

40. The bacterium Bacillus thuringiensis is widely used in biotechnology as an
a) agent for production of dairy products
b) insecticide
c) industrial source for enzyme production
d) indicator of water pollution

41. Animals that can tolerate narrow range of salinity are called
a) stenohaline
b) eurythermal
c) euryhaline
d) stenothermal

42. The food chain in which the microorganisms break down the energy rich organic compounds prepared by the producers is known as
a) parasitic food chain
b) predator food chain
c) detritus food chain
d) producer food chain

43. The final stable stage in ecological succession is
a) pioneer community
b) climax community
c) seral stage
d) ecological niche

44. Eutrophication causes decrease in dissolved
a) hydrogen
b) salt
c) oxygen
d) carbon dioxide

45. Dodo, an extinct flightless bird belongs to
a) Mauritius
b) Australia
c) Canada
d) Iceland

46. Dihybrid cross is related to the principle of
a) Dominance
b) Independent assortment
c) Segregation
d) Purity of gametes

47. The pre-natal technique to determine genetic disorders of the foetus is called
a) laproscopy
b) amniocentesis
c) vasectomy
d) tubectomy

48. ABA is antagonistic to
a) ethylene
b) cytokinin
c) indole acetic acid
d) gibberellic acid

49. ATPase enzyme needed for muscle contraction is located in
a) Myosin
b) Actin
c) Tropomyosin
d) Troponin

50 Bowman's capsule is found in
a) nephron
b) glomerulus
c) nephridia
d) Malpighian tubule

ALL INDIA INSTITUTE OF SPEECH AND HEARING
MANASAGANGOTHRI
MYSURU 570 006
ENTRANCE EXAMINATION 2018
SET 1 - MATHEMATICS

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

Instructions: **Answer all the questions**
Each question carries one mark
Use ball point pen with black ink
Do not overwrite

Select the most appropriate answer from among the four alternatives given and indicate it by marking an 'X' in the box adjacent to the correct answer (in the answer sheet). For example, if c) is the correct answer for a given question, then indicate your answer as shown below:

a) ☐ b) ☐ c) ☒ d) ☐

**

1. Number of proper nontrivial subsets of a set having 'n' elements is 14. Then 'n' is
   a) 7 b) 6
   c) 5 d) 4

2. Let A and B be two non-disjoint sets. If A has 3 elements and B has 4 elements then number of elements in AUB is at most
   a) 7 b) 6
   c) 5 d) 4

3. In a group of 99 students, 50 play football, 38 plays cricket and 25 play tennis. No student plays exactly two games. All of them play at least one game. Find number of students who play all three games.
   a) 5 b) 6
   c) 7 d) Data in Sufficient

4. Let A be set having 3 elements AxA contains (0,1) and (2,2).Then A is
   a) {x/x is an integer less than 2} b) {x/x is a natural number less than or equal to 2}
   c) {x/x is a non negative integer less than 2} d) {x/x is a non negative integer less than or equal to 2}

5. If total number of relations on A is 16, the number of elements in A is
   a) 2 b) 3
   c) 4 d) 5

6. Which of the following function from R to R is bijective
   a) $f(x)=x^2-1$ b) $f(x)=|x|$
   c) $f(x)=2x^2+1$ d) $f(x)=x^3$

7. If f: A→B and g: B→C are onto then gof is always
   a) onto
   b) into
   c) one-one
   d) many-one

8. f is a function from R to R defined as f(x) =4x+3. Then which among the following function g, gives gof = Identity function
   a) $g(x)=\frac{x+4}{3}$
   b) $g(x)=\frac{x-4}{3}$
   c) $g(x)=\frac{x+3}{4}$
   d) $g(x)=\frac{x-3}{4}$

9. Everyone in Germany speaks German. Which is not its negation:
   a) Not everyone in Germany speaks German
   b) No one in Germany speaks German
   c) At least one person in Germany does not speak German
   d) It is false that everyone in Germany speaks German

10. The inverse of the matrix $A=\begin{bmatrix}-1 & 2\\ -3 & 4\end{bmatrix}$ is:
   a) $\frac{1}{2}\begin{bmatrix}-4 & 2\\ -3 & 1\end{bmatrix}$
   b) $\frac{1}{10}\begin{bmatrix}4 & -2\\ 3 & -1\end{bmatrix}$
   c) $\frac{1}{-2}\begin{bmatrix}4 & -3\\ 2 & -1\end{bmatrix}$
   d) $\frac{1}{2}\begin{bmatrix}4 & -2\\ -3 & -1\end{bmatrix}$

11. Choose the correct answer:
   a) every scalar matrix is an identity matrix
   b) every identity matrix is a scalar matrix
   c) every diagonal matrix is an identity matrix
   d) every square matrix with each element being 1 is an identity matrix

12. If a, b, c, are positive and not all equal, then the value of the determinant of $\begin{bmatrix}a & b & c\\ b & c & a\\ c & a & b\end{bmatrix}$ is:
   a) non-negative
   b) non-positive
   c) negative
   d) positive

13. If $\hat{a}$ and $\hat{b}$ are unit vectors inclined at an angle θ then $|\hat{a}-\hat{b}|$ is equal to
   a) $2\tan\frac{\theta}{2}$
   b) $2\sin\frac{\theta}{2}$
   c) $2\cos\frac{\theta}{2}$
   d) $2\cot\frac{\theta}{2}$

14. If $|\vec{a}|=13$, $|\vec{b}|=5$ and $\vec{a}.\vec{b}=60$ then $|\vec{a}\times\vec{b}|$ is
   a) 25
   b) 50
   c) 60
   d) 75

15. If the sum of two unit vectors is a unit vector then the magnitude of their difference is
   a) 1
   b) $\sqrt{3}$
   c) $\sqrt{2}$
   d) 2

16. The coordinates of a point equidistant from the four points O(0,0,0), A (a,0,0), B (0,b,0) and C (0,0,c) are

a) (a,b,c)

b) $\left(\frac{a}{2},\frac{b}{2},\frac{c}{2}\right)$

c) $\left(\frac{a}{3},\frac{b}{3},\frac{c}{3}\right)$

d) $\left(\frac{a}{4},\frac{b}{4},\frac{c}{4}\right)$

17. A vector makes an angle of $\frac{\pi}{4}$ with each of x-axis and y-axis , then the angle made by it with the z-axis is given by

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

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

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

d) π

18. Let two circular arcs of same lengths subtend angles 60^0 and 75^0 at the centre. If the radius of first circle is 10 units, then the radius of second one is

a) 8

b) 10

c) 12

d) 14

19. $\frac{\sin 7x - \sin 5x}{\cos 7x + \cos 5x}$ is equal to

a) cot x

b) $\cot \frac{x}{2}$

c) tan x

d) $\tan \frac{x}{2}$

20. $\sin^{-1} \frac{3}{5}$ is equal to

a) $\tan^{-1} \frac{4}{5}$

b) $\tan^{-1} \frac{3}{4}$

c) $\tan^{-1} \frac{4}{3}$

d) $\tan^{-1} \frac{5}{4}$

21. $\sin^{-1} x - \cos^{-1} x = \frac{\pi}{6}$, x>0, then x is

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

b) $\frac{1}{\sqrt{2}}$

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

d) $\sqrt{2}$

22. If $x = e^{\frac{i\pi}{10}}$ then $x^2 + \frac{1}{x^2}$ is

a) $2i\sin \frac{\pi}{5}$

b) $2\cos \frac{\pi}{5}$

c) $i\sin \frac{\pi}{5}$

d) $\cos \frac{\pi}{5}$

23. $i^n + i^{n+1} + i^{n+2} + i^{n+3}$ is $(n \in Z)$

a) 1

b) i

c) 0

d) -i

24. $\lim_{x\to 0} \frac{sin2x}{sin3x}$ is

a) 1 b) $\frac{3}{2}$

c) 0 d) $\frac{2}{3}$

25. Let $f(x)=\begin{cases}\frac{g(x)-g(a)}{x-a} \\ g^1(a) \quad x=a\end{cases}$ $x \neq a$ where g is a function differentiable at x=a, then at x=a

a) f is continuous b) f is discontinuous

c) f is continuous only if $g^1(a)=0$ d) none of the above

26. If $y = \tan^{-1}\left\{\frac{\sin x+\cos x}{\cos x-\sin x}\right\}$, then $\frac{dy}{dx}$ =

a) $\frac{1}{2}$ b) 1

c) 0 d) $\frac{3}{2}$

27. if $x=at^2$, $y = 2at$; then $\frac{d^2y}{dx^2}$ =

a) $\frac{-1}{t^2}$ b) $\frac{1}{2at^3}$

c) $\frac{-1}{t^3}$ d) $\frac{-1}{2at^3}$

28. If the rate of change of volume of a sphere is equal to the rate of change of its radius, then its radius is equal to:

a) 1 unit b) $\sqrt{2\pi}$ units

c) $\frac{1}{2\sqrt{\pi}}$ units d) $\frac{1}{\sqrt{2\pi}}$ units

29. The equation of the straight line passing through the points (0,2) and (1,0) is

a) 2x+y+2 = 0 b) 2x-y-2 = 0

c) 2x+y-2 = 0 d) 2x-y+2 = 0

30. The Cartesian equation of the plane passing through the point (1,-1, 2) having 2, 3 & 2 as direction ratios of normal to the plane is

a) 2x+3y+2z = 3 b) 3x+2y+2z = 3

c) 2x+2y+2z = 3 d) 3x+3y+3z = 2

31 If ${}^nP_5 = 42\ {}^nP_3$ n > 4 then n is

a) 10 b) -3

c) -10 d) 3

32. A three digit number is formed using the digits 1 to 9. What is the probability that the number is even? (digits are not repeated).

a) $\frac{1}{9}$ b) $\frac{1}{4}$

c) $\frac{1}{2}$ d) $\frac{4}{9}$

33. How many words can be formed with the letters of the word INVOLUTE with all vowels together

a) 5!4! b) $\frac{8!}{4!}$

c) 8! d) 5!

34. In how many ways a committee of 4 can be selected from a group of 9 boys and 4 girls such that number of girls in committee is always more than number of boys

a) 35 b) 36

c) 37 d) 38

35. Value of ${}^{15}C_0 + {}^{15}C_1 + {}^{15}C_2 + \ldots\ldots\ldots + {}^{15}C_{15}$ is

a) 2^{15} b) 2^{30}

c) 2^{10} d) 2^0

36. n^{th} term of the series $\frac{3}{1^2} + \frac{5}{1^2+2^2} + \frac{7}{1^2+2^2+3^2} + \ldots\ldots\ldots$ is

a) $\frac{n(n+1)}{6}$ b) $\frac{n(n-1)}{6}$

c) $\frac{6}{n(n-1)}$ d) $\frac{6}{n(n+1)}$

37. Given that the equation of a hyperbola is $\frac{x^2}{9} - \frac{y^2}{16} = 1$, its eccentricity and length of latus rectum are

a) $\frac{5}{3}, \frac{32}{3}$ b) $\frac{5}{4}, \frac{32}{3}$

c) $\frac{5}{3}, \frac{9}{2}$ d) $\frac{5}{4}, \frac{9}{2}$

38. The conic represented by the equation $x^2 = 4 + y^2$ is:

a) circle b) ellipse

c) parabola d) hyperbola

39. The sum of squares of n even natural numbers is :

a) $\frac{n(n+1)(2n+1)}{6}$ b) $\frac{2^2(n)(n+1)(2n+1)}{6}$

c) $\frac{2n(n+1)(2n+1)}{6}$ d) none of the above

40. If $\frac{x-4}{2-x} > 0$, then

a) $x > 4, x > 2$ b) $x < -2, x > 4$

c) $x > 2, x < 4$ d) $x > 4, x < 2$

41. $\int_{-1}^{2} |x| dx$ is equal to

a) $\frac{3}{2}$ b) $\frac{1}{2}$

c) $\frac{5}{2}$ d) $\frac{7}{2}$

42. $\int_0^{\frac{x}{2}} \frac{dx}{1+\tan^3 x}$ is equal to

a) $\frac{\pi}{2}$ b) $\frac{\pi}{3}$

c) $\frac{\pi}{4}$ d) 1

43. The area of the region bounded by the two parabolas and $y=x^2$ and $y^2=x$ (in sq units) is

a) $\frac{1}{2}$ b) $\frac{1}{4}$

c) $\frac{1}{6}$ d) $\frac{1}{3}$

44. The area of the circle $x^2+y^2=16$ exterior to the parabola $y^2=6x$(in sq. units) is

a) $\frac{4}{3}\left(4\pi-\sqrt{3}\right)$ b) $\frac{4}{3}\left(4\pi+\sqrt{3}\right)$

c) $\frac{4}{3}\left(8\pi-\sqrt{3}\right)$ d) $\frac{4}{3}\left(8\pi+\sqrt{3}\right)$

45. The order and degree of differential equation $y''=\sqrt{1+y'}$ are

a) 3 and 2 b) 1 and 3

c) 3 and 1 d) 2 and 2

46. The differential equation of the family of parabolas with vertex at origin and x-axis as axis is

a) $x=2y\,y^1$ b) $y=2x\,y^1$

c) $y^1=xy$ d) $y^1=1$

47. If P(A)= $\frac{1}{2}$ P(B)=0 then P(A/B) is

a) 0 b) $\frac{1}{2}$

c) not defined d) 1

48. Two events A and B are independent if

a) A and B are mutually exclusive b) $P(A^1B^1)=[1-P(A)]\,[1-P(B)]$

c) P(A)=P(B) d) P(A)+ P(B)=1

49. The local maximum value of $\frac{\log x}{x}$ in $(0<x<\infty)$ is

a) $\frac{1}{e}$ b) -e

c) 0 d) none of the above

50. The function f(x)= tanx - x

a) always increases b) always decreases

c) never decreases d) sometimes increases and sometimes decreases