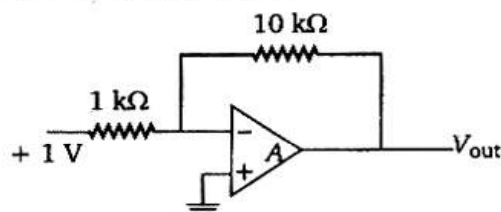


VITEEE 2008

- Two beams of light will not give rise to an interference pattern, if
 - they are coherent
 - they have the same wavelength
 - they are linearly polarized perpendicular to each other
 - they are not monochromatic
- A slit of width a is illuminated with a monochromatic light of wavelength λ from a distant source and the diffraction pattern is observed on a screen placed at a distance D from the slit. To increase the width of the central maximum one should
 - decrease D
 - decrease a
 - decrease λ
 - The width cannot be changed
- A thin film of soap solution ($n = 1.4$) lies on the top of a glass plate ($n = 1.5$). When visible light is incident almost normal to the plate, two adjacent reflection maxima are observed at two wavelengths 400 and 630 nm. The minimum thickness of the soap solution is
 - 420 nm
 - 450 nm
 - 630 nm
 - 1260 nm
- If the speed of a wave doubles as it passes from shallow water into deeper water, its wavelength will be
 - unchanged
 - halved
 - doubled
 - quadrupled
- A light whose frequency is equal to 6×10^{14} Hz is incident on a metal whose work function is 2eV. [$h = 6.63 \times 10^{-34}$ Js, $1\text{eV} = 1.6 \times 10^{-19}$ J]
The maximum energy of the electrons emitted will be
 - 2.49 eV
 - 4.49 eV
 - 0.49 eV
 - 5.49 eV
- An electron microscope is used to probe the atomic arrangements to a resolution of 5 Å.
What should be the electric potential to which the electrons need to be accelerated?
 - 2.5 V
 - 5V
 - 2.5 kV
 - 5 kV
- Which phenomenon best supports the theory that matter has a wave nature?
 - Electron momentum
 - Electron diffraction
 - Photon momentum
 - Photon diffraction
- The radioactivity of a certain material drops to $\frac{1}{16}$ of the initial value in 2 h. The half-life of this radio nuclide is
 - 10 min
 - 20 min
 - 30 min
 - 40 min
- An observer A sees an asteroid with a radioactive element moving by at a speed $= 0.3c$ and measures the radioactivity decay time to be T_A . Another observer B is moving with the asteroid and measures its decay time as T_B . Then T_A and T_B are related as
 - $T_B < T_A$
 - $T_A = T_B$
 - $T_B > T_A$
 - Either (A) or (C) depending on whether the asteroid is approaching or moving away from A
- ^{234}U has 92 protons and 234 nucleons total in its nucleus. It decays by emitting an alpha particle. After the decay it becomes
 - ^{232}U
 - ^{232}Pa
 - ^{230}Th
 - ^{230}Ra
- K_α and K_β X-rays are emitted when there is a transition of electron between the levels
 - $n = 2$ to $n = 1$ and $n = 3$ to $n = 1$ respectively
 - $n = 2$ to $n = 1$ and $n = 3$ to $n = 2$ respectively
 - $n = 3$ to $n = 2$ and $n = 4$ to $n = 2$ respectively
 - $n = 3$ to $n = 2$ and $n = 4$ to $n = 3$ respectively

12. A certain radioactive material ${}_Z X^A$ starts emitting α and β particles successively such that the end product is ${}_{Z-3} Y^{A-8}$. The number of α and β particles emitted are
- 4 and 3 respectively
 - 2 and 1 respectively
 - 3 and 4 respectively
 - 3 and 8 respectively

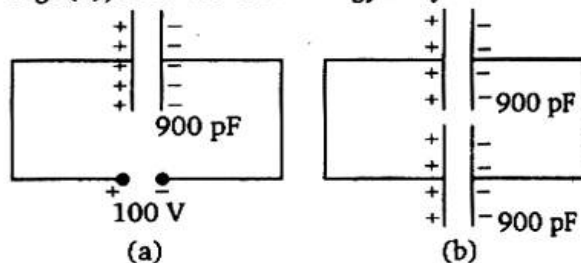
13.



In the circuit shown above, an input of 1 V is fed into the inverting input of an ideal Op-amp A. The output signal V_{out} will be

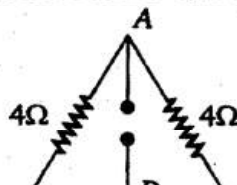
- + 10 V
 - 10 V
 - 0 V
 - infinity
14. When a solid with a band gap has a donor level just below its empty energy band, the solid is
- an insulator
 - a conductor
 - p-type semiconductor
 - n-type semiconductor
15. A p-n junction has acceptor impurity concentration of 10^{17} cm^{-3} in the P side and donor impurity concentration of 10^{16} cm^{-3} in the N side. What is the contact potential at the junction? (kT = thermal energy, intrinsic carrier concentration $n_i = 1.4 \times 10^{10} \text{ cm}^{-3}$)
- $(kT/e) \ln(4 \times 10^{12})$
 - $(kT/e) \ln(2.5 \times 10^{23})$
 - $(kT/e) \ln(10^{23})$
 - $(kT/e) \ln(10^9)$
16. A Zener diode has a contact potential of 1 V in the absence of biasing. It undergoes Zener breakdown for an electric field of 10^6 V/m at the depletion region of p-n junction. If the width of the depletion region is $2.5 \mu\text{m}$, what should be the reverse biased potential for the Zener breakdown to occur?
- 3.5 V
 - 2.5 V
 - 1.5 V
 - 0.5 V
17. In Colpitt oscillator the feedback network

18. The reverse saturation of p-n diode
- depends on doping concentrations
 - depends on diffusion lengths of carriers
 - depends on the doping concentrations and diffusion lengths
 - depends on the doping concentrations, diffusion length and device temperature
19. A radio station has two channels. One is AM at 1020 kHz and the other FM at 89.5 MHz. For good results you will use
- longer antenna for the AM channel and shorter for the FM
 - shorter antenna for the AM channel and longer for the FM
 - Same length antenna will work for both
 - Information given is not enough to say which one to use for which
20. The communication using optical fibres is based on the principle of
- total internal reflection
 - Brewster angle
 - polarization
 - resonance
21. In nature, the electric charge of any system is always equal to
- half integral multiple of the least amount of charge
 - zero
 - square of the least amount of charge
 - integral multiple of the least amount of charge
22. The energy stored in the capacitor as shown in Fig. (a) is $4.5 \times 10^{-6} \text{ J}$. If the battery is replaced by another capacitor of 900 pF as shown in Fig. (b), then the total energy of system is



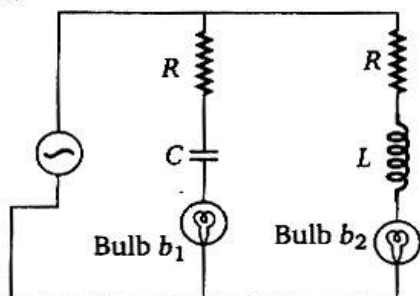
- $4.5 \times 10^{-6} \text{ J}$
 - $2.25 \times 10^{-6} \text{ J}$
 - zero
 - $9 \times 10^{-6} \text{ J}$
23. Equal amounts of a metal are converted into cylindrical wires of different lengths L and

- (c) length = $2L$ and area = $\frac{A}{2}$
 (d) All have the same resistance, as the amount of the metal is the same
24. If the force exerted by an electric dipole on a charge q at a distance of 1 m is F , the force at a point 2 m away in the same direction will be
 (a) $\frac{F}{2}$ (b) $\frac{F}{4}$
 (c) $\frac{F}{6}$ (d) $\frac{F}{8}$
25. A solid sphere of radius R_1 and volume charge density $\rho = \frac{\rho_0}{r}$ is enclosed by a hollow sphere of radius R_2 with negative surface charge density σ , such that the total charge in the system is zero, ρ_0 is a positive constant and r is the distance from the centre of the sphere. The ratio $\frac{R_2}{R_1}$ is
 (a) $\frac{\sigma}{\rho_0}$ (b) $\sqrt{2\sigma/\rho_0}$
 (c) $\sqrt{\rho_0/(2\sigma)}$ (d) $\frac{\rho_0}{\sigma}$
26. A solid spherical conductor of radius R has a spherical cavity of radius a ($a < R$) at its centre. A charge $+Q$ is kept at the centre. The charge at the inner surface, outer surface and at a position r ($a < r < R$) are respectively
 (a) $+Q, -Q, 0$ (b) $-Q, +Q, 0$
 (c) $0, -Q, 0$ (d) $+Q, 0, 0$
27. A cylindrical capacitor has charge Q and length L . If both the charge and length of the capacitors are doubled, by keeping other parameters fixed, the energy stored in the capacitor
 (a) remains same
 (b) increases two times
 (c) decreases two times
 (d) increases four times
28. Three resistances of 4Ω each are connected as shown in figure. If the point D divides the resistance into two equal halves, the resistance between point A and D will be



29. The resistance of a metal increases with increasing temperature because
 (a) the collisions of the conducting electrons with the electrons increase
 (b) the collisions of the conducting electrons with the lattice consisting of the ions of the metal increase
 (c) the number of conduction electrons decrease
 (d) the number of conduction electrons increase
30. In the absence of applied potential, the electric current flowing through a metallic wire is zero because
 (a) the electrons remain stationary
 (b) the electrons are drifted in random direction with a speed of the order of 10^{-2} cm/s
 (c) the electrons move in random direction with a speed of the order close to that of velocity of light
 (d) electrons and ions move in opposite direction
31. A meter bridge is used to determine the resistance of an unknown wire by measuring the balance point length l . If the wire is replaced by another wire of same material but with double the length and half the thickness, the balancing point is expected to be
 (a) $\frac{1}{8}l$ (b) $\frac{1}{4}l$
 (c) $8l$ (d) $16l$
32. Identify the incorrect statement regarding a superconducting wire
 (a) transport current flows through its surface
 (b) transport current flows through the entire area of cross-section of the wire
 (c) it exhibits zero electrical resistivity and expels applied magnetic field
 (d) it is used to produce large magnetic field
33. A sample of HCl gas is placed in an electric field of 3×10^4 NC $^{-1}$. The dipole moment of each HCl molecule is 6×10^{-30} Cm. The maximum torque that can act on a molecule is
 (a) 2×10^{-34} C 2 mN $^{-1}$

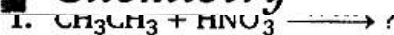
34. When a metallic plate swings between the poles of a magnet
- no effect on the plate
 - eddy currents are set up inside the plate and the direction of the current is along the motion of the plate
 - eddy currents are set up inside the plate and the direction of the current oppose the motion of the plate
 - eddy currents are set up inside the plate
35. When an electrical appliance is switched on, it responds almost immediately, because
- the electrons in the connecting wires move with the speed of light
 - the electrical signal is carried by electromagnetic waves moving with the speed of light
 - the electrons move with the speed which is close to but less than speed of light
 - the electrons are stagnant
36. Two identical incandescent light bulbs are connected as shown in the figure. When the circuit is an AC voltage source of frequency f , which of the following observations will be correct?



- Both bulbs will glow alternatively
- Both bulbs will glow with same brightness provided frequency $f = \frac{1}{2\pi} \sqrt{1/LC}$
- Bulb b_1 will light up initially and goes off, bulb b_2 will be ON constantly
- Bulb b_1 will blink and bulb b_2 will be ON constantly

37. A transformer rated at 10 kW is used to connect a 5 kV transmission line to a 240 V circuit. The ratio of turns in the windings of the transformer is
- 5
 - 20.8
 - 104
 - 40
38. Three solenoid coils of same dimension, same number of turns and same number of layers of winding are taken. Coil 1 with inductance L_1 was wound using a Mn wire of resistance $11 \Omega/\text{m}$; Coil 2 with inductance L_2 was wound using the similar wire but the direction of winding was reversed in each layer; Coil 3 with inductance L_3 was wound using a superconducting wire. The self-inductance of the coils L_1, L_2, L_3 are
- $L_1 = L_2 = L_3$
 - $L_1 = L_2; L_3 = 0$
 - $L_1 = L_3; L_2 = 0$
 - $L_1 > L_2 > L_3$
39. Light travels with a speed of 2×10^8 m/s in crown glass of refractive index 1.5. What is the speed of light in dense flint glass of refractive index 1.8?
- 1.33×10^8 m/s
 - 1.67×10^8 m/s
 - 2.0×10^8 m/s
 - 3.0×10^8 m/s
40. A parallel beam of fast moving electrons is incident normally on a narrow slit. A screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statement is correct?
- Diffraction pattern is not observed on the screen in the case of electrons
 - The angular width of the central maximum of the diffraction pattern will increase
 - The angular width of the central maximum will decrease
 - The angular width of the central maximum will remains the same

Chemistry



- $\text{CH}_3\text{CH}_2\text{NO}_2$
- $\text{CH}_3\text{CH}_2\text{NO}_2 + \text{CH}_3\text{NO}_2$
- $2\text{CH}_3\text{NO}_2$
- $\text{CH}_2=\text{CH}_2$

- ethanol
- acetamide

3. Which will not go for diazotisation?

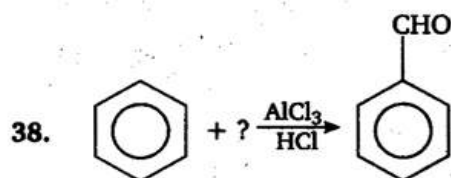
- $\text{C}_6\text{H}_5\text{NH}_2$
- $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$

$\text{H}_2\text{N}-$

$\text{H}_2\text{N}-$

4. Secondary nitroalkanes can be converted into ketones by using Y. Identify Y from the following
- $$\begin{array}{c} R \\ \diagup \\ CHNO_2 + Y \longrightarrow \\ \diagdown \\ R \end{array} \longrightarrow \begin{array}{c} R \\ \diagup \\ C=O \\ \diagdown \\ R \end{array}$$
- (a) aqueous HCl
(b) aqueous NaOH
(c) $KMnO_4$
(d) CO
5. Alkyl cyanides undergo Stephen reduction to produce
(a) aldehyde (b) secondary amine
(c) primary amine (d) amide
6. The continuous phase contains the dispersed phase throughout, example is
(a) water in milk
(b) fat in milk
(c) water droplets in mist
(d) oil in water
7. The number of hydrogen atoms present in 25.6 g of sucrose ($C_{12}H_{22}O_{11}$) which has a molar mass of 342.3 g is
(a) 22×10^{23}
(b) 9.91×10^{23}
(c) 11×10^{23}
(d) 44×10^{23} H atoms
8. Milk changes after digestion into
(a) cellulose (b) fructose
(c) glucose (d) lactose
9. Which of the following set consists only of essential amino acids?
(a) Alanine, tyrosine, cystine
(b) Leucine, lysine, tryptophane
(c) Alanine, glutamine, lycine
(d) leucine, proline, glycine
10. Which of the following is a ketohexose?
(a) Glucose (b) Sucrose
(c) Fructose (d) Ribose
11. The oxidation number of oxygen in KO_3 , Na_2O_2 is
(a) 3, 2 (b) 1, 0
(c) 0, 1 (d) -0.33, -1
12. Reaction of PCl_5 and $PbMgBr$ would give
13. Which of the following is not a characteristic of transition elements?
(a) Variable oxidation states
(b) Formation of coloured compounds
(c) Formation of interstitial compounds
(d) Natural radioactivity
14. Cl — P — Cl bond angles in PCl_5 molecule are
(a) 120° and 90° (b) 60° and 90°
(c) 60° and 120° (d) 120° and 30°
15. The magnetic moment of a salt containing Zn^{2+} ion is
(a) 0 (b) 1.87
(c) 5.92 (d) 2
16. The number of formula units of calcium fluoride, CaF_2 present in 146.4 g of CaF_2 (the molar mass of CaF_2 is 78.08 g/mol) is
(a) 1.129×10^{24} CaF_2
(b) 1.146×10^{24} CaF_2
(c) 7.808×10^{24} CaF_2
(d) 1.877×10^{24} CaF_2
17. The IUPAC name of the given compound $[Co(NH_3)_5Cl]Cl_2$ is
(a) penta amino cobalt chloride chlorate
(b) cobalt penta ammine chloro chloride
(c) pentamine chloro cobalt (III) chloride
(d) penta amino cobalt (III) chlorate
18. When SCN^- is added to an aqueous solution containing $Fe(NO_3)_3$, the complex ion produced is
(a) $[Fe(OH_2)_2(SCN)]^{2+}$
(b) $[Fe(OH_2)_5(SCN)]^{2+}$
(c) $[Fe(OH_2)_8(SCN)]^{2+}$
(d) $[Fe(OH_2)(SCN)]^{6+}$
19. Hair dyes contain
(a) copper nitrate (b) gold chloride
(c) silver nitrate (d) copper sulphate
20. Schottky defects occurs mainly in electrovalent compounds where
(a) positive ions and negative ions are of different size
(b) positive ions and negative ions are of same

21. The number of unpaired electrons calculated in $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{F}_6)]^{3-}$ are
 (a) 4 and 4 (b) 0 and 2
 (c) 2 and 4 (d) 0 and 4
22. The standard free energy change of a reaction is $\Delta G^\circ = -115 \text{ kJ}$ at 298 K. Calculate the equilibrium constant K_p in $\log K_p$ ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$).
 (a) 20.16 (b) 2.303
 (c) 2.016 (d) 13.83
23. If an endothermic reaction occurs spontaneously at constant temperature (T) and pressure (p), then which of the following is true?
 (a) $\Delta G > 0$ (b) $\Delta H < 0$
 (c) $\Delta S > 0$ (d) $\Delta S < 0$
24. If a plot of $\log_{10} C$ versus t gives a straight line for a given reaction, then the reaction is
 (a) zero order (b) first order
 (c) second order (d) third order
25. A spontaneous process is one in which the system suffers
 (a) no energy change
 (b) a lowering of free energy
 (c) a lowering of entropy
 (d) an increase in internal energy
26. The half-life period of a first order reaction is 1 min 40 s. Calculate its rate constant.
 (a) $6.93 \times 10^{-3} \text{ min}^{-1}$
 (b) $6.93 \times 10^{-3} \text{ s}^{-1}$
 (c) $6.93 \times 10^{-3} \text{ s}$
 (d) $6.93 \times 10^3 \text{ s}$
27. The molar conductivities of KCl, NaCl and KNO_3 are 152, 128 and $111 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. What is the molar conductivity of NaNO_3 ?
 (a) $101 \text{ S cm}^2 \text{ mol}^{-1}$
 (b) $87 \text{ S cm}^2 \text{ mol}^{-1}$
 (c) $-101 \text{ S cm}^2 \text{ mol}^{-1}$
 (d) $-391 \text{ S cm}^2 \text{ mol}^{-1}$
28. The electrochemical cell stops working after sometime because
 (a) electrode potential of both the electrodes becomes zero
29. The amount of electricity required to produce one mole of copper from copper sulphate solution will be
 (a) 1 F (b) 2.33 F
 (c) 2 F (d) 1.33 F
30. Dipping iron article into a strongly alkaline solution of sodium phosphate
 (a) does not affect the article
 (b) forms $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ on the surface
 (c) forms iron phosphate film
 (d) forms ferric hydroxide
31. Hydroboration oxidation of 4-methyl octene would give
 (a) 4-methyl octanol
 (b) 2-methyl decane
 (c) 4-methyl heptanol
 (d) 4-methyl-2-octanone
32. When ethyl alcohol is heated with conc. H_2SO_4 , the product obtained is
 (a) $\text{CH}_3\text{COOC}_2\text{H}_5$ (b) C_2H_2
 (c) C_2H_6 (d) C_2H_4
33. Anisole is the product obtained from phenol by the reaction known as
 (a) coupling
 (b) etherification
 (c) oxidation
 (d) esterification
34. Ethylene glycol gives oxalic acid on oxidation with
 (a) acidified $\text{K}_2\text{Cr}_2\text{O}_7$ (b) acidified KMnO_4
 (c) alkaline KMnO_4 (d) periodic acid
35. Diamond is hard because
 (a) all the four valence electrons are bonded to each carbon atoms by covalent bonds
 (b) it is a giant molecule
 (c) it is made up of carbon atoms
 (d) it cannot be burnt
36. A Wittig reaction with an aldehyde gives
 (a) ketone compound
 (b) a long chain fatty acid
 (c) olefin compound
 (d) epoxide
37. Cannizaro reaction is given by
 (a) HCHO
 (b) >C(OH)COOH



Identify the reactant.

- (a) H_2O (b) HCHO
(c) CO (d) CH_3CHO

39. Maleic acid and fumaric acid are

- (a) position isomers
(b) geometric isomers
(c) enantiomers
(d) functional isomers

40. The gas evolved on heating alkali formate with soda-lime is

- (a) CO (b) CO_2
(c) hydrogen (d) water vapour

Mathematics

1. If $\vec{a}, \vec{b}, \vec{c}$ be three unit vectors such that

$$\vec{a} \times (\vec{b} \times \vec{c}) = \frac{1}{2} \vec{b}, \vec{b} \text{ and } \vec{c} \text{ being}$$

non-parallel. If θ_1 is the angle between \vec{a} and \vec{b} and θ_2 is the angle between \vec{a} and \vec{c} , then

- (a) $\theta_1 = \frac{\pi}{6}, \theta_2 = \frac{\pi}{3}$ (b) $\theta_1 = \frac{\pi}{3}, \theta_2 = \frac{\pi}{6}$
(c) $\theta_1 = \frac{\pi}{2}, \theta_2 = \frac{\pi}{3}$ (d) $\theta_1 = \frac{\pi}{3}, \theta_2 = \frac{\pi}{2}$

2. The $\vec{r}^2 - \vec{r} \cdot \vec{c} + h = 0, |\vec{c}| > \sqrt{h}$, represents

- (a) circle (b) ellipse
(c) cone (d) sphere

3. The simplified expression of $\sin(\tan^{-1} x)$, for any real number x is given by

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

4. If $\left| \frac{z-25}{z-1} \right| = 5$, find the value of $|z|$.

- (a) 3 (b) 4
(c) 5 (d) 6

5. Argument of the complex number $\left(\frac{-1-3i}{2+i} \right)$ is

- (a) 45° (b) 135°
(c) 225° (d) 240°

6. In a triangle ABC , the sides b and c are the roots of the equation $x^2 - 61x + 820 = 0$ and

$A = \tan^{-1}\left(\frac{4}{3}\right)$, then a^2 is equal to

- (a) 1098 (b) 1096
(c) 1097 (d) 1095

- (a) 6 (b) 8
(c) 12 (d) 9

8. The centre and radius of the sphere $x^2 + y^2 + z^2 + 3x - 4z + 1 = 0$ are

- (a) $\left(-\frac{3}{2}, 0, -2\right); \frac{\sqrt{21}}{2}$ (b) $\left(\frac{3}{2}, 0, 2\right); \sqrt{21}$
(c) $\left(-\frac{3}{2}, 0, 2\right); \frac{\sqrt{21}}{2}$ (d) $\left(-\frac{3}{2}, 2, 0\right); \frac{21}{2}$

9. Let A and B are two fixed points in a plane, then locus of another point C on the same plane such that $CA + CB = \text{constant}$, ($> AB$) is

- (a) circle (b) ellipse
(c) parabola (d) hyperbola

10. The directrix of the parabola $y^2 + 4x + 3 = 0$ is

- (a) $x - \frac{4}{3} = 0$ (b) $x + \frac{1}{4} = 0$
(c) $x - \frac{3}{4} = 0$ (d) $x - \frac{1}{4} = 0$

11. If $g(x)$ is a polynomial satisfying $g(x)g(y) = g(x) + g(y) + g(xy) - 2$ for all real x and y and $g(2) = 5$, then $\lim_{x \rightarrow 3} g(x)$ is

- (a) 9 (b) 10
(c) 25 (d) 20

12. The value of $f(0)$ so that $\frac{(-e^x + 2^x)}{x}$ may be continuous at $x = 0$ is

- (a) $\log\left(\frac{1}{2}\right)$ (b) 0
(c) 4 (d) $-1 + \log 2$

13. Let $[]$ denotes the greatest integer function and $f(x) = [\tan^2 x]$. Then,

- (a) $\lim_{x \rightarrow 0} f(x)$ does not exist
(b) $\lim_{x \rightarrow 0} f(x) = 0$
(c) $\lim_{x \rightarrow 0} f(x) = 1$
(d) $\lim_{x \rightarrow 0} f(x) = 2$

14. A spherical balloon is expanding. If the radius is increasing at the rate of 2 cm/min, the rate at which the volume increases (in cubic centimetres per minute) when the radius is 5 cm, is

(a) 10π (b) 100π
(c) 200π (d) 50π

15. The length of the parabola $y^2 = 12x$ cut off by the latusrectum is

(a) $6[\sqrt{2} + \log(1 + \sqrt{2})]$
(b) $3[\sqrt{2} + \log(1 + \sqrt{2})]$
(c) $6[\sqrt{2} - \log(1 + \sqrt{2})]$
(d) $3[\sqrt{2} - \log(1 + \sqrt{2})]$

16. If $I = \int \frac{x^5}{\sqrt{1+x^3}} dx$, then I is equal to

(a) $\frac{2}{9}(1+x^3)^{\frac{5}{2}} + \frac{2}{3}(1+x^3)^{\frac{3}{2}} + c$
(b) $\log|\sqrt{x} + \sqrt{1+x^3}| + c$
(c) $\log|\sqrt{x} - \sqrt{1+x^3}| + c$
(d) $\frac{2}{9}(1+x^3)^{\frac{3}{2}} - \frac{2}{3}(1+x^3)^{\frac{1}{2}} + c$

17. Area enclosed by the curve $\pi[4(x - \sqrt{2})^2 + y^2] = 8$ is

(a) π sq unit (b) 2π sq unit
(c) 3π sq unit (d) 4π sq unit

18. The value of $\int_0^a \sqrt{\frac{a-x}{x}} dx$ is

(a) $\frac{a}{2}$ (b) $\frac{a}{4}$
(c) $\frac{\pi a}{2}$ (d) $\frac{\pi a}{4}$

19. Let y be the number of people in a village at time t . Assume that the rate of change of the population is proportional to the number of people in the village at any time and further assume that the population never increases in time. Then, the population of the village at any fixed time t is given by

(a) $y = e^{kt} + c$, for some constants $c \leq 0$ and $k \geq 0$
(b) $y = ce^{kt}$, for some constants $c \geq 0$ and $k \leq 0$
(c) $y = e^{ct} + k$, for some constants

$$(a) \left(y - \frac{dy}{dx}\right)^2 = a^2 \left[1 + \left(\frac{dy}{dx}\right)^2\right]$$

$$(b) \left(y - x \frac{dy}{dx}\right)^2 = a^2 \left[1 + \left(\frac{dy}{dx}\right)^2\right]$$

$$(c) \left(y - x \frac{dy}{dx}\right) = a^2 \left[1 + \frac{dy}{dx}\right]$$

$$(d) \left(y - \frac{dy}{dx}\right) = a^2 \left[1 - \frac{dy}{dx}\right]$$

21. The differential equation $\left|\frac{dy}{dx}\right| + |y| +$ admits

(a) infinite number of solutions
(b) no solutions
(c) a unique solution
(d) many solutions

22. Solution of the differential equation $x dy - y dx - \sqrt{x^2 + y^2} dx = 0$ is

(a) $y - \sqrt{x^2 + y^2} = cx^2$
(b) $y + \sqrt{x^2 + y^2} = cx^2$
(c) $y + \sqrt{x^2 + y^2} = cy^2$
(d) $x - \sqrt{x^2 + y^2} = cy^2$

23. Let p, q, r and s be statements and suppose $p \rightarrow q \rightarrow r \rightarrow p$. If $\sim s \rightarrow r$, then

(a) $s \rightarrow \sim q$ (b) $\sim q \rightarrow s$
(c) $\sim s \rightarrow \sim q$ (d) $q \rightarrow \sim s$

24. In how many number of ways can 10 students be divided into three teams, one containing four students and the other three?

(a) 400 (b) 700
(c) 1050 (d) 2100

25. If R be a relation defined as aRb iff $|a - b|$ then the relation is

(a) reflexive
(b) symmetric
(c) transitive
(d) symmetric and transitive

26. Let S be a finite set containing n elements. the total number of commutative operation on S is

(a) $n^{\left[\frac{n(n+1)}{2}\right]}$ (b) $n^{\left[\frac{n(n-1)}{2}\right]}$
(c) $n^{(n^2)}$ (d) $2^{(n^2)}$