

COMMON ENTRANCE TEST - 2017

PHYSICS

1. A coil of inductive reactance $1/\sqrt{3}\Omega$ and resistance 1Ω is connected to a 200 V, 50 Hz A.C. supply. The time lag between maximum voltage and current is

- (A) $\frac{1}{200}$ s (B) $\frac{1}{300}$ s
(C) $\frac{1}{500}$ s (D) $\frac{1}{600}$ s

Ans: D

2. A car moving with a velocity of 20 ms^{-1} stopped in a distance of 40 m. If the same car is travelling at double the velocity, the distance travelled by it for same retardation is

- (A) 320 m (B) 1280 m
(C) 160 m (D) 640 m

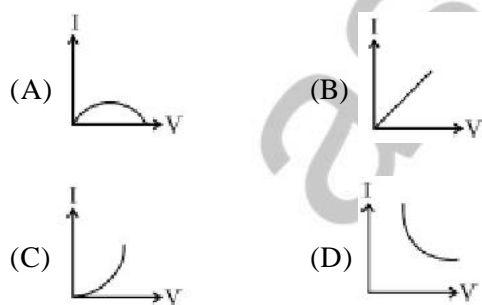
Ans: C

3. The particles emitted in the decay of ${}^{238}_{92}\text{U}$ to ${}^{234}_{92}\text{U}$

- (A) 2α and 2β (B) 1α and 1β
(C) 1α only (D) 1α and 1β

Ans: D

4. Of the following graphs, the one that correctly represents the I-V. characteristics of a 'Ohmic device' is



Ans: B

5. The susceptibility of a ferromagnetic substance is

- (A) Zero (B) > 1
(C) < 1 (D) $\gg 1$

Ans: D

6. The working of magnetic braking of trains is based on

- (A) Eddy current (B) Pulsating current

(C) Alternating current (D) Steady current

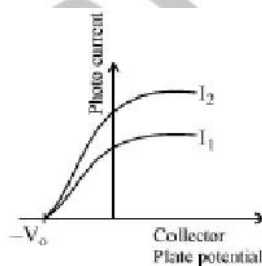
Ans: A

7. A substance of mass 49.53 g occupies 1.5cm^3 of volume. The density of the substance (in g cm^{-3}) with correct number of significant figures is

- (A) 3.3 (B) 3.300
(C) 3.302 (D) 3.30

Ans: BONUS

8. From the following graph of photo current against collector plate potential, for two different intensities of light i_1 and i_3 , one can conclude



- (A) $I_1 = I_2$
(B) $I_1 > I_2$
(C) $I_1 < I_2$
(D) Comparison is not possible

Ans: C

9. Two balls are thrown simultaneously in air. The acceleration of the centre of mass of the two balls when in air,

- (A) is equal to g (Acceleration due to gravity)
(B) depends on the speeds of the two balls
(C) depends on the masses of the two balls
(D) depends on the direction of motion of the two balls.

Ans: A

10. If \vec{E} and \vec{B} represent electric and magnetic field vectors of an electromagnetic wave, the direction of propagation of the wave is along

- (A) $\vec{E} \times \vec{B}$ (B) $\vec{B} \times \vec{E}$
(C) \vec{E} (D) \vec{B}

Ans: A

11. A body of mass 50 kg. is suspended using a spring balance inside a lift at rest. If the lift starts falling freely, the reading of the spring balance is
 (A) < 50 kg (B) = 50 kg
 (C) > 50 kg (D) = 0

Ans:D

12. Two point charges $A = +3$ nC and $B = +1$ nC are placed 5 cm apart in air. The work done to move charge B towards A by 1 cm is
 (A) 2.0×10^{-7} J (B) 2.7×10^{-7} J
 (C) 12.1×10^{-7} J (D) 1.35×10^{-7} J

Ans:D

13. A proton, a deuteron and an α - particle are projected perpendicular to the direction of a uniform magnetic field with same kinetic energy. The ratio of the radii of the circular paths described by them is
 (A) $1:\sqrt{2}:1$ (B) $1:\sqrt{2}:\sqrt{2}$
 (C) $\sqrt{2}:\sqrt{2}:1$ (D) $\sqrt{2}:1:1$

Ans:A

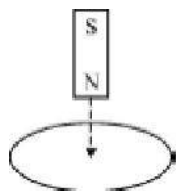
14. The S.I. unit of specific heat capacity is
 (A) J K^{-1} (B) J kg^{-1}
 (C) $\text{J mol}^{-1} \text{K}^{-1}$ (D) $\text{J kg}^{-1} \text{K}^{-1}$

Ans:D

15. In the three parts of a transistor, 'Emitter' is of
 (A) large size and lightly doped
 (B) moderate size and heavily doped
 (C) thin size and heavily doped
 (D) large size and moderately doped

Ans:B

16. A bar magnet is allowed to fall vertically through a copper coil placed in a horizontal plane. The magnet falls with a net acceleration



- (A) Zero (B) = g
 (C) $< g$ (D) $> g$

Ans: C

17. For which combination of working temperatures, the efficiency of 'Carnot's engine is the least?
 (A) 100K, 80K (B) 40 K, 20 K
 (C) 80 K, 60 K (D) 60 K, 40 K

Ans: A

18. A basic communication system consists of
 (a) Transmitter (b) Information source
 (c) User of information (d) Channel
 (e) Receiver
 (A) b, a, d, e and c (B) a, b, c, d and e
 (D) b, e, a, d and c (D) b, d, a, c and e

Ans:A

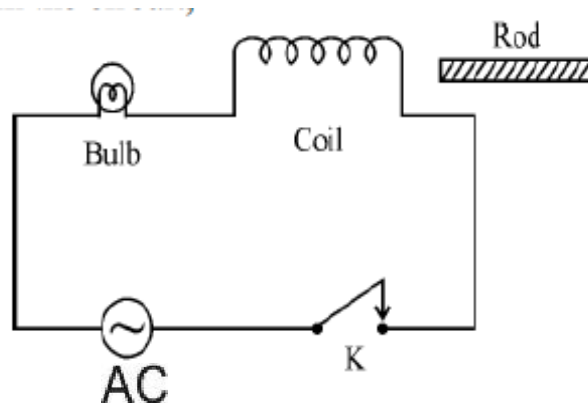
19. According to Huygens' principle, during refraction of light from air to a denser medium
 (A) Wavelength decreases but speed increases
 (B) Wavelength increases but speed decreases
 (C) Wavelength and speed increase
 (D) Wavelength and speed decrease

Ans:D

20. A galvanometer of resistance 50Ω is connected to a battery of 3 V along with a resistance of 2950Ω in series shows full-scale deflection of 30 divisions. The additional series resistance required to reduce the deflection to 20 divisions is
 (A) 2950Ω (B) 1500Ω
 (C) 4440Ω (D) 7400Ω

Ans: B

21. In the A.C. circuit shown, keeping 'K' pressed, if an iron rod is inserted into the coil, the bulb in the circuit,



- (A) glows less brightly
 (B) glows with same brightness (as before the rod is inserted)

- (C) gets damaged
(D) glows more brightly

Ans: A

22. A magnetic dipole of magnetic moment $6 \times 10^{-2} \text{ Am}^2$ and moment of inertia $12 \times 10^{-6} \text{ kgm}^2$ performs oscillations in a magnetic field of $2 \times 10^{-2} \text{ T}$. The time taken by the dipole to complete 20 oscillations is ($\pi \approx 3$)
- (A) 18 s (B) 6 s
(C) 36 s (D) 12 s

Ans: D

23. 4×10^{10} electrons are removed from a neutral metal sphere of diameter 20 cm placed in air. The magnitude of the electric field (in NC^{-1}) at a distance of 20 cm from its center is
- (A) 640 (B) 5760
(C) Zero (D) 1440

Ans: D

24. The mass defect of ${}^4_2\text{He}$ is 0.03 u. The binding energy per nucleon of helium (in MeV) is
- (A) 6.9825 (B) 27.93
(C) 2.793 (D) 69.825

Ans: A

25. A cylindrical conductor of diameter 0.1 mm carries a current of 90 mA. The current density (in Am^{-2}) is ($\pi \approx 3$)
- (A) 1.2×10^7 (B) 3×10^6
(C) 6×10^6 (D) 2.4×10^7

Ans: A

26. Which of the following properties is 'False' for a bar magnet ?
- (A) It doesn't produce magnetic field.
(B) Its like poles repel and unlike poles attract.
(C) Its poles cannot be separated.
(D) It points in North-South direction when suspended.

Ans: A

27. According to Cartesian sign convention, in ray optics
- (A) all distances are taken negative
(B) all distances in the direction of incident ray are taken positive
(C) all distances are taken positive
(D) all distances in the direction of incident ray are

taken negative

Ans: B

28. A linear object of height 10 cm is kept in front of a concave mirror of radius of curvature 15 cm, at a distance of 10 cm. The image formed is
- (A) magnified and erect
(B) magnified and inverted
(C) diminished and erect
(D) diminished and inverted

Ans: B

29. The energy gap in case of the following is less than 3 eV ?
- (A) Germanium (B) Iron
(C) Copper (D) Aluminium

Ans: A

30. The minimum value of effective capacitance that can be obtained by combining 3 capacitors of capacitances 1 pF, 2 pF and 4 pF
- (A) $\frac{4}{7} \text{ pF}$ (B) 1 pF
(C) 2 pF (D) $\frac{7}{4} \text{ pF}$

Ans: A

31. Two spheres of electric charges +2 nC and -8 nC are placed at a distance 'd' apart. If they are allowed to touch each other, what is the new distance between them to get a repulsive force of same magnitude as before?
- (A) d (B) $\frac{d}{2}$
(C) $\frac{3d}{4}$ (D) $\frac{4d}{3}$

Ans: C

32. The value of acceleration due to gravity at a depth of 1600 km is equal to
- (A) 4.9 ms^{-2} (B) 9.8 ms^{-2}
(C) 7.35 ms^{-2} (D) 19.6 ms^{-2}

Ans: C

33. Two simple pendulums A and B are made to oscillate simultaneously and it is found that A completes 10 oscillations in 20 sec and B completes 8 oscillations in 10 sec. The ratio of the lengths of A and B is
- (A) $\frac{25}{64}$ (B) $\frac{64}{25}$
- (C) $\frac{8}{5}$ (D) $\frac{5}{4}$

Ans: B

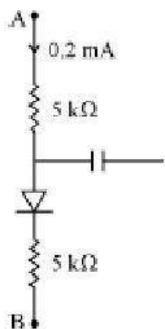
34. A motor pump lifts 6 tonnes of water from a well of depth 25 m to the first floor of height 35 m from the ground floor in 20 minutes. The power of the pump (in kW) is [$g = 10 \text{ ms}^{-2}$]
- (A) 3 (B) 12
- (C) 1.5 (D) 6

Ans: A

35. The waves set up in a closed pipe are
- (A) Longitudinal and Progressive
- (B) Transverse and Progressive
- (C) Transverse and Stationary
- (D) Longitudinal and Stationary

Ans: D

36. In the figure shown, if the diode forward voltage drop is 0.2 V, the voltage difference between A and B is



- (A) 2.2 V (B) 1.3 V
- (C) 0 (D) 0.5 V

Ans: A

37. If $\vec{A} = 2\hat{i} + 3\hat{j} + 8\hat{k}$ is perpendicular to $\vec{B} = 4\hat{j} - 4\hat{i} + \alpha\hat{k}$, then the value of ' α ' is
- (A) $-\frac{1}{2}$ (B) $\frac{1}{2}$
- (C) 1 (D) -1

Ans: A

38. The angle between velocity and acceleration of a particle describing uniform circular motion is
- (A) 180° (B) 90°
- (C) 45° (D) 60°

Ans: B

39. A straight wire of length 50 cm carrying a current of 2.5 A is suspended in mid-air by a uniform magnetic field of 0.5 T (as shown in figure). The mass of the wire is ($g = 10 \text{ ms}^{-2}$)



- (A) 250 gm (B) 125 gm
- (C) 62.5 gm (D) 100 gm

Ans: C

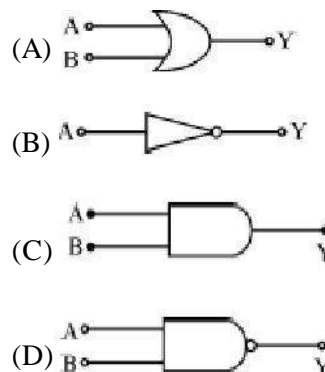
40. 'Young's modulus' is defined as the ratio of
- (A) hydraulic stress and hydraulic strain
- (B) shearing stress and shearing strain
- (C) tensile stress and longitudinal strain
- (D) bulk stress and longitudinal strain

Ans: C

41. Which of the following semi-conducting devices is used as voltage regulator ?
- (A) LASER diode (B) Zener diode
- (C) Solar cell (D) Photo diode

Ans: B

42. Which of the following logic gates is



Ans: C

43. A particle is dropped from a height 'H'. The de Broglie wavelength of the particle depends on height as
- (A) $H^{-1/2}$ (B) H^0
(C) $H^{1/2}$ (D) H

Ans: A

44. Three point charges of $+2q$, $+2q$ and $-4q$ are placed at the corners A, B and C of an equilateral triangle ABC of side 'x'. The magnitude of the electric dipole moment of this system is
- (A) $2qx$ (B) $3\sqrt{2}qx$
(C) $3qx$ (D) $2\sqrt{3}qx$

Ans: D

45. In a system of two crossed polarisers, it is found that the intensity of light from the second polariser is half from that of first polariser. The angle between their pass axes is
- (A) 60° (B) 30°
(C) 0° (D) 45°

Ans: D

46. A piece of copper is to be shaped into a conducting wire of maximum resistance. The suitable length and diameter are _____ and _____ respectively.
- (A) $2L$ and $L/2$ (B) $L/2$ and $2d$
(C) L and d (D) $2L$ and d

Ans: A

47. During scattering of light, the amount of scattering is inversely proportional to _____ of wavelength of light.
- (A) square (B) fourth power
(C) half (D) cube

Ans: B

48. A jet plane of wing span 20 m is travelling towards west at a speed of 400 ms^{-1} . If the earth's total magnetic field is $4 \times 10^{-4} \text{ T}$ and the dip angle is 30° , at that place, the voltage difference developed across the ends of the wing is
- (A) 0.8 V (B) 6.4 V
(C) 3.2 V (D) 1.6 V

Ans: D

49. The energy (in eV) required to excite an electron from $n = 2$ to $n = 4$ state in hydrogen atom is
- (A) -0.85 (B) +4.25
(C) -3.4 (D) +2.55

Ans: D

50. 'Hydraulic lift' works on the basis of
- (A) Stoke's law (B) Bernoulli's Law
(C) Pascal's Law (D) Toricelli's law

Ans: C

51. In a nuclear reactor the function of the Moderator is to decrease
- (A) number of neutrons
(B) speed of neutrons
(C) escape of neutrons
(D) temperature of the reactor

Ans: B

52. The scientist who is credited with the discovery of 'nucleus' in an atom is
- (A) Rutherford (B) Niels Bohr
(C) Balmer (D) J.J. Thomson

Ans: A

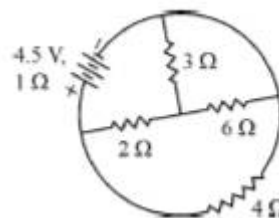
53. A system of 2 capacitors of capacitance $2 \mu\text{F}$ and $4 \mu\text{F}$ is connected in series across a potential difference of 6V. The electric charge and energy stored in the system are
- (A) $36 \mu\text{C}$ and $108 \mu\text{J}$ (B) $8 \mu\text{C}$ and $24 \mu\text{J}$
(C) $1 \mu\text{C}$ and $3 \mu\text{J}$ (D) $10 \mu\text{C}$ and $30 \mu\text{J}$

Ans: B

54. In metre bridge experiment, with a standard resistance in the right gap and a resistance coil dipped in water (in a beaker) in the left gap, the balancing length obtained is 'l'. If the temperature of water is increased, the new balancing
- (A) < 1 (B) > 1
(C) $= 0$ (D) $= 1$

Ans: B

55. The power dissipated in 3Ω resistance in the following circuit is



- (A) 0.25 W (B) 0.75 W
(C) 1 W (D) 0.5 W

Ans: B

56. The mean energy of a molecule of an ideal gas is

- (A) $\frac{1}{2}KT$ (B) $2KT$
(C) KT (D) $\frac{3}{2}KT$

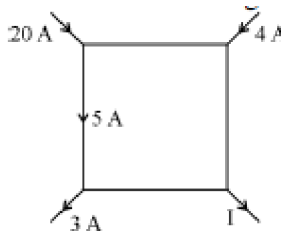
Ans: D

57. The magnetic field at the center of a current carrying loop of radius 0.1 m is $5\sqrt{5}$ times that at a point along its axis. The distance of this point from the centre of the loop is

- (A) 0.1 m (B) 0.2 m
(C) 0.05 m (D) 0.25 m

Ans: B

58. The value of I in the figure shown below is



- (A) 21 A (B) 4 A
(C) 8 A (D) 19 A

Ans: A

59. In Young's double-slit experiment if yellow light is replaced by blue light, the interference fringes become

- (A) darker (B) brighter
(C) wider (D) narrower

Ans: D

60. The output of a step down transformer is measured to be 48 V when connected to a 12 w bulb. The value of peak current is

- (A) $\frac{1}{\sqrt{2}}A$ (B) $\sqrt{2}A$
(C) $\frac{1}{2\sqrt{2}}A$ (D) $\frac{1}{4}A$

Ans: C

8. Which of the following is not a biodegradable polymer ?
 (A) Glyptol
 (B) Polyhydroxy butyrate - CO - β hydroxy valerate
 (C) pHBV
 (D) Nylon 2-Nylon-6

Ans: (A)

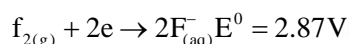
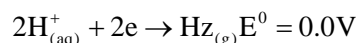
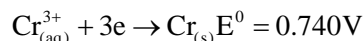
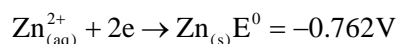
9. Reduction of ketones cannot be carried out with which of the following reagents ?
 (A) Sodium borohydride or Lithium Aluminium hydride
 (B) Zinc amalgam and concentrated HCl
 (C) Hydrazine and KOH in ethylene glycol
 (D) Hydrogen in presence of palladium in Barium sulphate and quinoline

Ans: (D)

10. Which of the following structure of a molecule is expected to have three bond pairs and one lone pair of electrons ?
 (A) Octahedral (B) Trigonal Planar
 (C) Pyramidal (D) Tetrahedral

Ans: (C)

11. The standard reduction potential at 298 K for the following half cell reaction



Which of the following is strongest reducing agent ?

- (A) $\text{Zn}_{(\text{s})}$ (B) $\text{Cr}_{(\text{s})}$
 (C) $\text{H}_{2(\text{g})}$ (D) $\text{F}_{2(\text{g})}$

Ans: (A)

12. Plaster of Paris is represented as

- (A) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (B) CaSO_4
 (C) $\text{CaSiO}_4 \cdot \text{H}_2\text{O}$ (D) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$

Ans: (D)

13. Toluene reacts with halogen in presence of Iron (III) chloride giving ortho and para halo compounds. The reaction is

- (A) Nucleophilic substitution reaction
 (B) Free radical addition reaction
 (C) Electrophilic elimination reaction
 (D) Electrophilic substitution reaction

Ans: (D)

14. In a face centred cubic arrangement of A and B atoms in which 'A' atoms are at the corners of the unit cell and 'B' atoms are at the face centers. One of the 'A' atom is missing from one corner in unit cell. The simplest formula of compound is

- (A) $A_7 B_8$ (B) $A_7 B_3$
 (C) AB_3 (D) $A_7 B_{24}$

Ans: (D)

15. The correct order of increasing basic nature for the bases NH_3 , CH_3NH_2 and $(\text{CH}_3)_2\text{NH}$ in aqueous solutions

- (A) $\text{CH}_3\text{NH}_2 < \text{NH}_3 < (\text{CH}_3)_2\text{NH}$
 (B) $\text{NH}_3 < \text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH}$
 (C) $\text{CH}_3\text{NH}_2 < < \text{NH}_3$
 (D) $(\text{CH}_3)_2\text{NH} < \text{NH}_3 < \text{CH}_3\text{NH}_2$

Ans: (B)

16. The electronegativities of C, N, Si and P are in the order of

- (A) $\text{P} < \text{Si} < \text{C} < \text{N}$ (B) $\text{Si} < \text{P} < \text{C} < \text{N}$
 (C) $\text{P} < \text{Si} < \text{N} < \text{C}$ (D) $\text{Si} < \text{P} < \text{N} < \text{C}$

Ans: (B)

17. For a reaction $\frac{1}{2}A \rightarrow 2B$ rate of disappearance of A is related to rate of appearance of B by the expression

- (A) $\frac{-d[A]}{dt} = \frac{1}{2} \frac{d[B]}{dt}$ (B) $\frac{-d[A]}{dt} = 4 \frac{d[B]}{dt}$
 (C) $\frac{-d[A]}{dt} = \frac{1}{4} \frac{d[B]}{dt}$ (D) $\frac{-d[A]}{dt} = \frac{d[B]}{dt}$

Ans: (C)

18. Which of the following statement is incorrect ?
 (A) The rate law for any reaction cannot be determined experimentally
 (B) Complex reactions have fractional order.
 (C) Biomolecular reactions involve simultaneous collision between two species
 (D) Molecularity is only applicable for elementary reaction.

Ans: (A)

19. The co-ordination number and the oxidation state of the element 'M' in the complex $[M(en)_2(C_2O_4)]NO_2$ {where (en) is ethan-1, 2- diamine} are respectively
 (A) 6 and 3 (B) 4 and 3
 (C) 6 and 2 (D) 4 and 2

Ans: (A)

20. Select wrong chemical reaction among the following
 (A) $8NH_3 + 3Cl_2 \rightarrow 6NH_4Cl + N_2$
 (B) $2Ca(OH)_2 + 2Cl_2 \rightarrow Ca(OCl)_2 + CaCl_2 + 2H_2O$
 (C) $2NaOH + Cl_2 \rightarrow 2NaCl + H_2 + O_2$
 (D) $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$

Ans: (C)

21. If 3.01×10^{20} molecules are removed from 98mg of H_2SO_4 , then number of moles of H_2SO_4 left are
 (A) 0.1×10^{-3} mol (B) 9.95×10^{-2} mol
 (C) 0.5×10^{-3} mol (D) 1.66×10^{-3} mol

Ans: (C)

22. Which of the following elements forms $p_\pi - p_\pi$ bond with itself ?
 (A) P (B) Se
 (C) N (D) Te

Ans: (C)

23. Which of the following statement is in accordance with the Arrhenius equation ?
 (A) Rate of reaction does not change with increase in activation energy
 (B) Rate constant decreases exponentially with increase in temperature
 (C) Rate of a reaction increases with increase in temperature
 (D) Rate of a reaction increases with decrease in activation energy

Ans: (C,D)

24. The Glycosidic linkage present in sucrose is between
 (A) C - 1 of β glucose and C - 4 of α - glucose
 (B) C - 1 of α - glucose and C - 4 of β - fructose
 (C) C - 1 of α - glucose and C - 4 of α - glucose
 (D) C - 1 of α - glucose and C - 4 of β -fructose

Ans: (D)

25. A reaction has both ΔH and $\Delta S - ve$. The rate of reaction
 (A) Increases with increase in temperature
 (B) Cannot be predicted for change in temperature
 (C) Increases with decrease in temperature
 (D) Remains unaffected by change in temperature

Ans: (C)

26. Addition of mineral acid to an aqueous solution of Borax, the following compound is formed
 (A) Pyroboric acid (B) Boron hydride
 (C) Meta boric acid (D) Orthoboric acid

Ans: (D)

27. The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition elements which shows highest magnetic moment ?
 (A) $3d^7$ (B) $3d^8$
 (C) $3d^5$ (D) $3d^2$

Ans: (C)

28. The process which is responsible for the formation of delta at a place where rivers meets the sea is
 (A) Coagulation (B) Colloid formation
 (B) Peptization (D) Emulsification

Ans: (A)

29. Extraction of chlorine from brine solution is based on
 (A) Oxidation (B) Acidification
 (C) Chlorination (D) Reduction
 Ans: (A)
30. Lower members of aliphatic carboxylic acid are soluble in water. This is due to
 (A) Formation of hydrogen bonds with water.
 (B) Due to London forces
 (C) Water is non electrolyte
 (D) Van der-Waals interaction with water molecules.
 Ans: (A)
31. Which one of the following is not a common component of photo-chemical smog ?
 (A) Ozone
 (B) Acrolein
 (C) Peroxy acetyl nitrate
 (D) Chloro fluoro carbons
 Ans: (D)
32. Which of the following is not a favourable condition for physical adsorption ?
 (A) High temperature
 (B) High pressure
 (C) Higher critical temperature of adsorbate
 (D) Low temperature
 Ans: (A)
33. The correct statement regarding defect in solids is
 (A) Frenkel defect is usually favoured by a very small difference in the sizes of cations and anions.
 (B) Frenkel defect is a dislocation defect.
 (C) Trapping of proton in the lattice leads to the formation of F-centers.
 (D) Schottky defect has no effect on the physical properties of solids.
 Ans: (B)
34. According to crystal field theory, the M - L bond in a complex is
 (A) partially covalent (B) purely ionic
 (C) purely covalent (D) purely co-ordinate
 Ans: (B)
35. Which of the following crystal has unit cell such that $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90^\circ$?
 (A) NaNO_3 (B) K_2SO_4
 (C) KNO_3 (D) $\text{K}_2\text{Cr}_2\text{O}_7$
 Ans: (D)
36. Which of the following statement is wrong regarding Lanthanoids ?
 (A) Ln(III) compounds are predominantly ionic in character.
 (B) Ln(III) compounds are generally colourless.
 (C) Ln(III) hydroxides are mainly basic in nature.
 (D) The ionic size of Ln(III) ions decreases with increasing atomic number.
 Ans: (B)
37. Hormones are secreted by ductless glands of human body. Iodine containing hormone is
 (A) Adrenoline (B) Thyroxine
 (C) Testosterone (D) Insulin
 Ans: (B)
38. The Vant Hoff's factor 'i' accounts for
 (A) extent of solubility of solute
 (B) extent of mobility of solute
 (C) extent of dissolution of solute
 (D) extent of dissociation of solute
 Ans: (D)
39. In which of the following, homolytic bond fission takes place ?
 (A) Free radical chlorination of methane
 (B) Addition of HBr to double bond
 (C) Alkaline hydrolysis of ethyl chloride
 (D) Nitration of Benzene
 Ans: (A)
40. The correct set of quantum number for the unpaired electrons of chlorine atom is
 (A) $2, 1, -1, +\frac{1}{2}$ (B) $2, 0, 0, +\frac{1}{2}$
 (C) $3, 1, 1, \pm\frac{1}{2}$ (D) $3, 0, 0, \pm\frac{1}{2}$
 Ans: (C)
41. Which of the following metallic oxide exhibit amphoteric nature ?
 (A) CaO (B) Al_2O_3
 (C) Na_2O (D) BaO
 Ans: (B)

42. Which one of the following noble gas has an unusual property of diffusing through the materials such as rubber, glass or plastic ?

- (A) Kr (B) Ne
(C) Ar (D) He

Ans: (D)

43. When the pure solvent diffuses out of the solution through the semi-permeable membrane then the process is called

- (A) Sorption (B) Dialysis
(C) Reverse osmosis (D) Osmosis

Ans: (C)

44. Cannizzaro's reaction is an example of auto oxidation

- (A) It is a reaction answered by only aldehydes containing a α -hydrogen.
(B) It is a reaction answered only by aromatic aldehydes.
(C) It is a reaction answered by all aldehydes.
(D) It is a typical reaction of aliphatic aldehyde.

Ans: (B)

45. The equilibrium constant for the reaction $N_{1(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ is 4×10^{-4} at 2000 K. In presence of a catalyst the equilibrium is attained ten times faster. Therefore the equilibrium constant in presence of catalyst of 2000 K is

- (A) 4×10^{-3} (B) 4×10^{-2}
(C) 40×10^{-4} (D) 4×10^{-4}

Ans: (D)

46. Which of the following is the correct electron dot structure of N_2O Molecule ?

- (A) $:\ddot{N} = N = \ddot{O}:$ (B) $:\ddot{N} \equiv \overset{+}{N} - \ddot{O}:$
(C) $:\ddot{N} = N = \ddot{O}:$ (D) $:\ddot{N} = N = \ddot{O}:$

Ans: (B)

47. Pick the correct statement among the following :

- (A) Sodium dodecyl benzene sulphonate used in tooth paste is a cationic detergent.
(B) Non-ionic detergents is formed when polyethylene glycol reacts with adipic acid
(C) Cetyl trimethyl ammonium bromide is a popular cationic detergent used in air conditioner
(D) Sodium lauryl sulphate forms an insoluble scum with hard water.

Ans: (C)

48. Pick the wrong statement from the following :

- (A) Deficiency of Vitamin B₆ (pyridoxime) results in convulsions
(B) Sources of Vitamin are yeast, milk, green vegetables and cereals
(C) deficiency of vitamin D causes xerophthalmia
(D) Consumption of citrus fruits and green leafy vegetables in food prevents scurvy

Ans: (C)

49. Which of the following order is true regarding the acidic nature of phenol ?

- (A) phenol < O-cresol < O-nitrophenol
(B) Phenol > O-cresol > O-nitrophenol
(C) phenol < O-cresol > O-nitrophenol
(D) O-cresol < phenol < O-nitrophenol

Ans: (D)

50. Identify the correct statement in the following :

- (A) n-butane and isobutane are functional isomers
(B) Propan-1-ol and propan-2-ol are position isomers
(C) Dimethyl ether and ethanol are chain isomers
(D) Ethanoic acid and methyl methanoate are position isomers

Ans: (2)

51. Gabriel phthalimide synthesis is used in the preparation of primary amine from phthalimide, which of the following reagent is not used during the process ?

- (A) KOH (B) NaOH
(C) HCl (D) Alkyl halides

Ans: (C)

52. $3\text{Cl}^-_{(\text{aq})} \rightarrow \text{ClO}^- + 2\text{Cl}^-$ is an example of

- (A) Oxidation reaction
- (B) Reduction reaction
- (C) Disproportionation reaction
- (D) Decomposition reaction

Ans: (B)

53. Hydrogenation of vegetable oils in presence of finely divided Nickel as catalyst. The reaction is

- (A) Enzyme catalysed reaction
- (B) Homogeneous catalysis
- (C) Heterogeneous catalysis
- (D) Liquid catalysed reaction

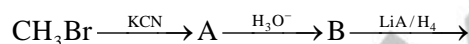
Ans: (C)

54. In the manufacture of hydrogen from water gas ($\text{CO} + \text{H}_2$), which of the following is correct statement ?

- (A) CO and H_2 are separated based on difference in their densities.
- (B) H_2 is removed by occlusion with pd.
- (C) CO is oxidized to CO_2 with steam in the presence of a catalyst followed by absorption of CO_2 in alkali
- (D) Hydrogen is isolated by diffusion.

Ans: (C)

55. In the following sequence of reactions



The end product C is

- (A) Acetone
- (B) Ethyl alcohol
- (C) Methane
- (D) Acetaldehyde

Ans: (B)

56. The monomer used in Novolac, a polymer used in paints

- (A) Melamine and Formaldehyde
- (B) Phenol and Formaldehyde
- (C) Butadiene and Acrylo nitrile
- (D) Butadiene and Styrene

Ans: (B)

57. For the preparation of Alkanes, aqueous solution of sodium or potassium salt of carboxylic acid is subjected to

- (A) Hydrolysis
- (B) Electrolysis
- (C) Hydrogenation
- (D) Oxidation

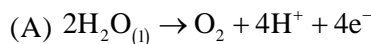
Ans: (B)

58. Which of the following aqueous solution has highest freezing point ?

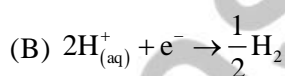
- (A) 0.1 molal $\text{Al}_2(\text{SO}_4)_3$
- (B) 0.1 molal BaCl_2
- (C) 0.1 molal AlCl_3
- (D) 0.1 molal NH_4Cl

Ans: (D)

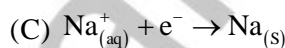
59. In the electrolysis of aqueous Sodium chloride solution, Which of the half cell reaction will occur at anode ?



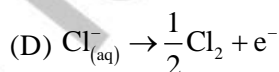
$$E^0_{\text{cell}} = +1.23 \text{ volts}$$



$$E^0_{\text{cell}} = 0.00 \text{ volts}$$



$$E^0_{\text{cell}} = -2.71 \text{ volts}$$



$$E^0_{\text{cell}} = 1.36 \text{ volts}$$

Ans: (D)

60. The metal extracted by leaching with a cyanide is

- (A) Al
- (B) Na
- (C) Cu
- (D) Ag

Ans: (D)

MATHEMATICS

1. If an LPP admits optimal solution at two consecutive vertices of a feasible region, then
- (1) the LPP under consideration is not solvable
 - (2) the LPP under consideration must be reconstructed
 - (3) the required optimal solution is at the midpoint of the line joining two points
 - (4) the optimal solution occurs at every point on the line joining these two points

Ans: 4

2. Let $\Delta = \begin{vmatrix} Ax & x^2 & 1 \\ By & y^2 & 1 \\ Cz & z^2 & 1 \end{vmatrix}$ and $\Delta_1 = \begin{vmatrix} A & B & C \\ x & y & z \\ zy & zx & xy \end{vmatrix}$

then $\begin{vmatrix} Ax & By & Cy \\ x^2 & y^2 & z^2 \\ 1 & 1 & 1 \end{vmatrix}$

- (1) $\Delta_1 = 2\Delta$
- (2) $\Delta_1 = -\Delta$
- (3) $\Delta_1 = \Delta$
- (4) $\Delta_1 \neq \Delta$

Ans: 3

3. The total number of terms in the expansion of $(x+a)^{47} - (x-a)^{47}$ after simplification is

- (1) 96
- (2) 48
- (3) 47
- (4) 24

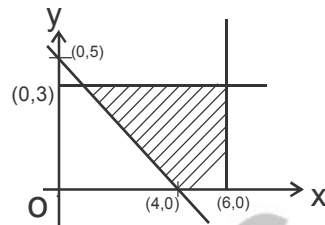
Ans: 4

4. The function $f(x) = x^2 + 2x - 5$ is strictly increasing in the interval

- (1) $(-\infty, -1)$
- (2) $[-1, \infty)$
- (3) $(-\infty, -1]$
- (4) $(-1, \infty)$

Ans: 2

5. The shaded region in the figure is the solution set of the inequations



- (1) $5x + 4y \leq 20, x \leq 6, y \leq 3, x \geq 0, y \geq 0$
- (2) $5x + 4y \geq 20, x \geq 6, y \leq 3, x \geq 0, y \geq 0$
- (3) $5x + 4y \geq 20, x \leq 6, y \leq 3, x \geq 0, y \geq 0$
- (4) $5x + 4y \geq 20, x \leq 6, y \geq 3, x \geq 0, y \geq 0$

Ans: 3

6. The point on the curve $y^2 = x$ where the tangent makes an angle of $\pi/4$ with X-axis is

- (1) (4,2)
- (2) $(\frac{1}{2}, \frac{1}{4})$
- (3) $(\frac{1}{4}, \frac{1}{2})$
- (4) (1,1)

Ans: 3

7. $\int_{-\pi/2}^{\pi/2} \frac{dx}{e^{\sin x} + 1}$

- (1) 1
- (2) 0
- (3) $\frac{\pi}{2}$
- (4) $-\frac{\pi}{2}$

Ans: 3

8. If \vec{a} & \vec{b} are unit vectors, then angle between \vec{a} & \vec{b} for $\sqrt{3}\vec{a} - \vec{b}$ to be unit vector is

- (1) 45°
- (2) 60°
- (3) 90°
- (4) 30°

Ans: 4

9. The contrapositive statement of the statement " If x is prime number , then x is odd" is

- (1) If x is not odd , then x is not a prime number
 (2) If x is a prime number , then x is not odd
 (3) If x is not a prime number , then x is not odd
 (4) If x is not a prime number , then x is odd

Ans: 1

10. $\int_{-5}^5 |x+2| dx$ is equal to

- (1) 28 (2) 30
 (3) 29 (4) 27

Ans: 3

11. If $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$ then x is equal to

- (1) 4 (2) 8
 (3) 2 (4) $\pm 2\sqrt{2}$

Ans: 4

12. If $2 \begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$, then the value of x and y are

- (1) $x = 3, y = 3$ (2) $x = -3, y = 3$
 (3) $x = 3, y = -3$ (4) $x = -3, y = -3$

Ans: 1

13. $\int_0^{\pi/2} \frac{1}{a^2 \cdot \sin^2 x + b^2 \cdot \cos^2 x} dx$

- (1) $\frac{\pi}{2ab}$ (2) $\frac{\pi b}{4a}$
 (3) $\frac{\pi a}{2b}$ (4) $\frac{\pi a}{4b}$

Ans: 1

14. $\int \sqrt{x^2 + 2x + 5} dx$ is equal to

(1) $\frac{1}{2}(x+1)\sqrt{x^2 + 2x + 5} + 2 \log|x+1 + \sqrt{x^2 + 2x + 5}| + C$

(2) $(x+1)\sqrt{x^2 + 2x + 5} + \frac{1}{2} \log|x+1 + \sqrt{x^2 + 2x + 5}| + C$

(3) $(x+1)\sqrt{x^2 + 2x + 5} + 2 \log|x+1 + \sqrt{x^2 + 2x + 5}| + C$

(4) $(x+1)\sqrt{x^2 + 2x + 5} - 2 \log|x+1 + \sqrt{x^2 + 2x + 5}| + C$

Ans: 1

15. A box has 100 pens of which 10 are defective The probability that out of a sample of 5 pens drawn one by one with replacement and atleast one is defective is

(1) $\frac{9}{10}$ (2) $\frac{1}{2} \left(\frac{9}{10}\right)^4$

(3) $\left(\frac{9}{10}\right)^5 + \frac{1}{2} \left(\frac{9}{10}\right)^4$ (4) $\frac{1}{2} \left(\frac{9}{10}\right)^5$

Ans: 3

16. The range of $\sec^{-1} x$ is

(1) $[0, \pi] - \left\{\frac{\pi}{2}\right\}$ (2) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

(3) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ (4) $[0, \pi]$

Ans: 1

17. $\int \frac{(x+3)e^x}{(x+4)^2} dx$ is equal to

(1) $\frac{e^x}{(x+4)^2} + C$ (2) $\frac{e^x}{(x+3)} + C$

(3) $\frac{1}{(x+4)^2} + C$ (4) $\frac{e^x}{(x+4)} + C$

Ans: 4

18. If $y = \begin{vmatrix} f(x) & g(x) & h(x) \\ 1 & m & n \\ a & b & c \end{vmatrix}$, then $\frac{dy}{dx}$ is equal

to

(1) $\begin{vmatrix} f^1(x) & g^1(x) & h^1(x) \\ 1 & m & n \\ a & b & c \end{vmatrix}$

$$(2) \begin{vmatrix} 1 & m & n \\ f(x) & g(x) & h(x) \\ a & b & c \end{vmatrix}$$

$$(3) \begin{vmatrix} f^1(x) & 1 & a \\ g^1(x) & m & b \\ h^1(x) & n & c \end{vmatrix}$$

$$(4) \begin{vmatrix} 1 & m & n \\ a & b & c \\ f^1(x) & g^1(x) & h^1(x) \end{vmatrix}$$

Ans: 1,3,4

19. General solution of differential equation

$$\frac{dy}{dx} + y = 1 (y \neq 1) \text{ is}$$

$$(1) \log \left| \frac{1}{1-y} \right| = x + C \quad (2) \log |1-y| = x + C$$

$$(3) \log |1+y| = x + C \quad (4) \log \left| \frac{1}{1-y} \right| = -x + C$$

Ans: 1

20. If A is a square matrix of order 3×3 , then $|KA|$ is equal to

$$(1) K^2 |A| \quad (2) K |A|$$

$$(3) 3K |A| \quad (4) K^3 |A|$$

Ans: 4

$$21. \text{ If, } A = \frac{1}{\pi} \begin{bmatrix} \sin^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & \cot^{-1}(\pi x) \end{bmatrix}$$

$$B = \begin{bmatrix} -\cos^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & -\tan^{-1}(\pi x) \end{bmatrix} \text{ then } A - B \text{ is}$$

equal to

$$(1) 0 \quad (2) \frac{1}{2}I$$

$$(3) I \quad (4) 2I$$

Ans: 3

22. If ${}^nC_{12} = {}^nC_8$ then n is equal to

$$(1) 12 \quad (2) 20$$

$$(3) 26 \quad (4) 6$$

Ans: 2

23. The probability distribution of X is

X	0	1	2	3
P(X)	0.3	x	2k	2k

The value of k is

$$(1) 0.7 \quad (2) 0.3$$

$$(3) 1 \quad (4) 0.14$$

Ans: 4

24. The degree of the differential equation

$$\left[1 + \left(\frac{dy}{dx} \right)^2 \right]^2 = \frac{d^2y}{dx^2} \text{ is}$$

$$(1) 3 \quad (2) 2$$

$$(3) 1 \quad (4) 4$$

Ans: 3

25. $3 + 5 + 7 + \dots$ to n terms is

$$(1) n(n+2) \quad (2) (n+1)^2$$

$$(3) n^2 \quad (4) n(n-2)$$

Ans: 1

$$26. \int \frac{\cos 2x - \cos 2\theta}{\cos x - \cos \theta} dx \text{ is equal to}$$

$$(1) 2(\sin x + x \cos \theta) + C$$

$$(2) 2(\sin x - x \cos \theta) + C$$

$$(3) 2(\sin x + 2x \cos \theta) + C$$

$$(4) 2(\sin x - 2x \cos \theta) + C$$

Ans: 1

27. If A and B are finite sets and $A \subset B$, then

$$(1) n(A \cup B) = n(B) \quad (2) n(A \cap B) = \phi$$

$$(3) n(A \cap B) = n(B) \quad (4) n(A \cup B) = n(A)$$

Ans: 1

28. The value of $\lim_{\theta \rightarrow 0} \frac{1 - \cos 4\theta}{1 - \cos 6\theta}$ is

- (1) 9/4 (2) 9/3
(3) 4/9 (4) 3/4

Ans: 3

29. If $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ are orthogonal, then value of λ is

- (1) 3/2 (2) 1
(3) 0 (4) -5/2

Ans: 4

30. If $f(x) = \begin{cases} Kx^2 & \text{if } x \leq 2 \\ 3 & \text{if } x > 2 \end{cases}$ is continuous at $x = 2$

, then the value of K is

- (1) 3/4 (2) 4
(3) 4/3 (4) 3

Ans: 1

31. The area of triangle with vertices (K,0), (4,0), (0,2) is 4 square units, then value of K is

- (1) 8 (2) 0 or 8
(3) 0 (4) 0 or -8

Ans: 2

32. If $\left(\frac{1+i}{1-i}\right)^m = 1$, then the least positive integral value

of m is

- (1) 2 (2) 4
(3) 3 (4) 1

Ans: 2

33. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$,

then the value of $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$ is equal to

- (1) 3/2 (2) 1
(3) 3 (4) -3/2

Ans: 4

34. The value of $\cos^2 45^\circ - \sin^2 15^\circ$ is

- (1) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (2) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

- (3) $\frac{\sqrt{3}}{2}$ (4) $\frac{\sqrt{3}}{4}$

Ans: 4

35. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = x^4$, then

- (1) f may be one - one and onto
(2) f is neither one-one nor onto
(3) f is one - one and onto
(4) f is one - one but not onto

Ans: 2

36. If $\sin x = \frac{2t}{1+t^2}$, $\tan y = \frac{2t}{1-t^2}$, then $\frac{dy}{dx}$ is equal

to

- (1) 0 (2) 2
(3) 1 (4) -1

Ans: 3

37. The plane $2x - 3y + 6z - 11 = 0$ makes an angle $\sin^{-1}(\alpha)$ with X-axis. the value of α is equal to

- (1) $\frac{\sqrt{2}}{3}$ (2) $\frac{2}{7}$

- (3) $\frac{\sqrt{3}}{2}$ (4) $\frac{3}{7}$

Ans: 2

38. If $f(x) = 8x^3$, $g(x) = x^{1/3}$ then $f \circ g(x)$ is

- (1) 8x (2) $8^3 x$
(3) $(8x)^{1/3}$ (4) $8x^3$

Ans: 1

39. If $y = \log(\log x)$ then $\frac{d^2 y}{dx^2}$ is equal to

- (1) $\frac{-(1 + \log x)}{x^2 \log x}$ (2) $\frac{-(1 + \log x)}{(x \log x)^2}$

- (3) $\frac{(1 + \log x)}{(x \log x)^2}$ (4) $\frac{(1 + \log x)}{x^2 \log x}$

Ans: 2

52. The area of the region boundend by the curve $y = x^2$ and the line $y = 16$

- (1) $\frac{64}{3}$ sq.units (2) $\frac{32}{3}$ sq.units
(3) $\frac{256}{3}$ sq.units (4) $\frac{128}{3}$ sq.units

Ans: 3

53. If coefficient of varition is 60 and standard deviation is 24, then Arthmetic mean is

- (1) 40 (2) 7/20
(3) 20/7 (4) 1/40

Ans: 1

54. Two events A and B will be independent if

- (1) $P(A^1 \cap B^1) = 1(1 - P(A))(1 - P(B))$
(2) $P(A) + P(B) = 1$
(3) $P(A) = P(B)$
(4) A and B are mutually exclusive

Ans: 1

55. Area of the region bounded by the curve $y = \cos x, x = 0$ and $x = \pi$ is

- (1) 4 sq. units (2) 3 sq. units
(3) 1 sq. units (4) 2 sq. units

Ans: 4

56. The value of C in Mean value theorem for the function $f(x) = x^2$ in $[2, 4]$ is

- (1) 3 (2) 7/2
(3) 4 (4) 2

Ans: 1

57. Equation of line passing through the point (1,2) and perpendicular to the line $y = 3x - 1$

- (1) $x + 3y = 0$ (2) $x + 3y - 7 = 0$
(3) $x + 3y + 7 = 0$ (4) $x - 3y = 0$

Ans: 2

58. If $\tan^{-1} x + \tan^{-1} y = \frac{4\pi}{5}$, then $\cot^{-1} x + \cot^{-1} y$ is equal to

- (1) $\frac{2\pi}{5}$ (2) $\frac{\pi}{5}$
(3) $\frac{3\pi}{5}$ (4) π

Ans: 2

59. If a matrix A is both symmetric and skew symmetric, then

- (1) A is diagonal matrix (2) A is a zero matrix
(3) A is scalar matrix (4) A is square matrix

Ans: 2

60. The distance of the point (-2,4,-5) from the line

$$\frac{x+3}{3} = \frac{y-4}{5} = \frac{z+8}{6} \text{ is}$$

- (1) $\sqrt{\frac{37}{10}}$ (2) $\frac{37}{10}$
(3) $\frac{\sqrt{37}}{10}$ (4) $\frac{37}{\sqrt{10}}$

Ans: 1