101 – TEST FOR B TECH / 5 YR INTEGRATED MSC

(SHIFT III)

PHYSICS

1. A certain screw gauge has a pitch of 0.5 mm. If there are 50 divisions on the head scale, the dimension of the object can then be determined to an accuracy of

|  |  |
| --- | --- |
| (A) | 0.05 cm  |
| (B) | 0.01 cm  |
| (C) | 0.001 cm  |
| (D) | 0.0001 cm  |

2. The refractive index of glass measured by a given method by four independent measurements is found to have values of 1.54, 1.58, 1.52 and 1.56 respectively. The mean value of refractive index with percentage error is

|  |  |
| --- | --- |
| (A) | 1.55 ± 1.29 % |
| (B) | 1.55 ± 0 % |
| (C) | 1.56 ± 6 % |
| (D) | 1.56 ± 0 % |

3. A particle moves for 20 seconds with velocity 3 m/s and then with velocity 4 m/s for another 20 seconds and finally moves with velocity 5 m/s for next 20 seconds. Then the average velocity of the particle is

|  |  |
| --- | --- |
| (A) | 3 m/s |
| (B) | 4 m/s |
| (C) | 5 m/s |
| (D) | Zero |

4. An athlete completes one round of a circular track of radius *R* in 40 s. What will be his displacement at the end of 2 min 40 seconds?

|  |  |
| --- | --- |
| (A) | 8*R*  |
| (B) | 8$π$*R*  |
| (C) | 2*R*  |
| (D) | Zero  |

5. A wheel having 1 m diameter makes 60 revolutions per minute. The linear speed of a point on its circumference is

|  |  |
| --- | --- |
| (A) | *π*/2 m/s  |
| (B) | *π* m/s  |
| (C) | 2*π*  m/s  |
| (D) | 60*π* m/s  |

6. A car starts from rest to cover a distance *s*. The coefficient of friction between the road and the tyres is *μ*. The maximum time in which the car can cover the distance is proportional to

|  |  |
| --- | --- |
| (A) | *μ*  |
| (B) | $\sqrt{μ}$  |
| (C) | 1/*μ*  |
| (D) | 1/$\sqrt{μ}$  |

7. A diesel engine pumps 40 kg of water in 1 second. The water comes out vertically upwards with a velocity of 3 m/s. What is the power of the engine in kilo Watt?

|  |  |
| --- | --- |
| (A) | 12 kW  |
| (B) | 1.2 kW  |
| (C) | 120 kW  |
| (D) | 1200 kW |

8. Which one of the following is the S.I. unit of electric field strength?

|  |  |
| --- | --- |
| (A) | Am–1 |
| (B) | Nm–1 |
| (C) | Vm–1 |
| (D) | Coulomb s–1cm–1 |

9. If the distance between the two charged particles is reduced to half the original distance, then the force between them becomes

|  |  |
| --- | --- |
| (A) | doubled |
| (B) | one-forth |
| (C) | one-half |
| (D) | four times |

10. A metal sheet is placed between two charges separated by a distance. Then the force between them will

|  |  |
| --- | --- |
| (A) | increase |
| (B) | decrease |
| (C) | remains the same |
| (D) | be reduced to half the initial value |

11. If the separation between carbon and oxygen in CO molecule is 0.12 nm, then the distance of the center of mass from the carbon atom is

|  |  |
| --- | --- |
| (A) | 0.03 nm  |
| (B) | 0.068 nm  |
| (C) | 0.05 nm  |
| (D) | 0.06 nm  |

12. A hole is drilled along the earth’s diameter and a stone is dropped into it. When the stone is at the center of the earth, it has

|  |  |
| --- | --- |
| (A) | mass  |
| (B) | weight  |
| (C) | potential energy  |
| (D) | zero mass |

13. Two wires of the same radius and material have lengths in the ratio 1:2. If these are stretched by the same force, the strain produced in the two cases will be in the ratio

|  |  |
| --- | --- |
| (A) | 1:2  |
| (B) | 2:1  |
| (C) | 1:1  |
| (D) | 4:1  |

14. The phase difference between the displacement and velocity of a particle executing SHM is

|  |  |
| --- | --- |
| (A) | *π*/2  |
| (B) | *π*  |
| (C) | *π*/4  |
| (D) | 0  |

15. Standing waves are produced in a 10 m long stretched string. If the string vibrates in 5 segments and the wave velocity is 20 m/sec, the frequency is

|  |  |
| --- | --- |
| (A) | 2 Hz  |
| (B) | 4 Hz  |
| (C) | 5 Hz  |
| (D) | 10 Hz  |

16. A parallel plate condenser is charged and isolated. When a sheet of glass is interposed between the plates

|  |  |
| --- | --- |
| (A) | the charges on the plates will be reduced  |
| (B) | the potential difference between the plates will be reduced  |
| (C) | the potential difference between the plates will be increased  |
| (D) | the charges on the plates will be increased  |

17. If a capacitor of Capacitance 10 micro Farad (µF) is charged to a potential difference of 100 V, the energy stored in it is

|  |  |
| --- | --- |
| (A) | 0.5 J |
| (B) | 0.05 ergs |
| (C) | 10 J |
| (D) | 0.05 J |

18. With increase in altitude, the conductivity of the atmosphere

|  |  |
| --- | --- |
| (A) | first increases and then decreases |
| (B) | increases |
| (C) | decreases |
| (D) | remains constant |

19. An electric iron box has a heater coil of resistance 50 Ω. If it is connected to 230 V AC mains, the current flowing through the heater coil will be

|  |  |
| --- | --- |
| (A) | 4.6 mA |
| (B) | 5 A |
| (C) | 4.6 A |
| (D) | 15 A |

20. Glass has a resistivity of the order of

|  |  |
| --- | --- |
| (A) | 10–8 Ω m |
| (B) | 10–5 Ω m |
| (C) | 108 Ω m |
| (D) | 10 12 Ω m |

21. A long solenoid of *n* turns has a self inductance *L* and area of cross section *a*. When a current flows through the solenoid, it produces a magnetic field *B*. The current flowing through the solenoid is

|  |  |
| --- | --- |
| (A) | *B a n / L*  |
| (B) | *BanL*  |
| (C) | *Bn / aL*  |
| (D) | *B / anL*  |

22. A conductor of length *r* moves in a uniform magnetic field of induction *B* with a velocity ***v***. The emf induced across the conductor is

|  |  |
| --- | --- |
| (A) | (*v × B*) *. r*  |
| (B) | *v.* (*r × B*) |
| (C) | *B .* (*r × v*)  |
| (D) | *r ×* (*v × B*)  |

23. The penetrating powers of *α*, *β* and *γ* radiation, in decreasing order are

|  |  |
| --- | --- |
| (A) | *α*, *β*, *γ* |
| (B) | *γ*, *α*, *β* |
| (C) | *β*, *γ*, *α* |
| (D) | *γ*, *β*, *α*  |

24. A half-wave rectifier is being used to rectify an alternating voltage of frequency 50 Hz. The number of pulses of rectified current obtained in one second is

|  |  |
| --- | --- |
| (A) | 50 |
| (B) | 25 |
| (C) | 100 |
| (D) | 6 |

25. The voltage *V* and the current *I* flowing through an A.C circuit are given by *V =* 2 cos100 *πt* and *I =* 4 sin *100 πt*, where *t* represents time. The power dissipated in the circuit is

|  |  |
| --- | --- |
| (A) | zero Watt |
| (B) | 8 Watt |
| (C) | 4 Watt |
| (D) | 2 Watt |

26. An alternating e.m.f. is given by *V =* 100 sin 314 *t*. Its frequency is

|  |  |
| --- | --- |
| (A) | 100 Hz |
| (B) | 50 Hz |
| (C) | 314 Hz |
| (D) | 60 Hz |

27. In a purely inductive circuit, the current

|  |  |
| --- | --- |
| (A) | is in phase with voltage |
| (B) | is out of phase with voltage |
| (C) | leads the voltage by 90° |
| (D) | lags behind the voltage by 90° |

28. The current and voltage in an A.C. circuit are given by and *E = Eo* sin *ωt*. Then the average power consumption *P* in the circuit is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) | zero |

29. Two electric bulbs whose resistances are in the ratio 1:2, are connected in parallel to a constant voltage source. The power dissipated in them is in the ratio

|  |  |
| --- | --- |
| (A) | 1:2 |
| (B) | 2:1 |
| (C) | 1:1 |
| (D) | 1:4  |

30. The neutral temperature for a thermocouple is 270°C. If the temperature of the cold junction is 15°C, then the inversion temperature is

|  |  |
| --- | --- |
| (A) | 255°C |
| (B) | 285°C |
| (C) | 570°C |
| (D) | 525°C |

31. A source emits a sound of frequency 400 Hz but the listener hears it to be 390 Hz. Then

|  |  |
| --- | --- |
| (A) | the listener is moving towards the source |
| (B) | the source is moving toward the listener |
| (C) | the listener is moving away from the source |
| (D) | the listener has a defective ear  |

32. The binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li++ is

|  |  |
| --- | --- |
| (A) | 122.4 eV |
| (B) | 30.6 eV |
| (C) | 13.6 eV |
| (D) | 3.4 eV |

33. Which of the following nuclei has lowest value of the binding energy per nucleon?

|  |  |
| --- | --- |
| (A) | 2He4 |
| (B) | 24Cr52 |
| (C) | 62Sm152 |
| (D) | 80Hg100 |

34. The average number of neutrons emitted during the fission of U235 is

|  |  |
| --- | --- |
| (A) | 3 |
| (B) | 2 |
| (C) | 1.5 |
| (D) | 2.5 |

35. The radioactive decay of uranium into thorium is represented by the equation 92U238 → 90Th234 + X, then X is

|  |  |
| --- | --- |
| (A) | an electron |
| (B) | a neutron |
| (C) | a proton |
| (D) | an alpha particle |

36. The same radioactive nucleus may emit

|  |  |
| --- | --- |
| (A) | all the three *α*, *β* and *γ* simultaneously |
| (B) | either *α* or *β* or *γ* at a time |
| (C) | all the three *α*, *β* and *γ* at a time |
| (D) | only *α* and *β* |

37. The radius of a nucleus of mass number A is proportional to

|  |  |
| --- | --- |
| (A) | A |
| (B) | A½ |
| (C) | A⅓ |
| (D) | A3 |

38. Which one of the statements about nuclear forces is INCORRECT?

|  |  |
| --- | --- |
| (A) | Nuclear forces are short range forces |
| (B) | Nuclear forces are charge independent forces |
| (C) | Nuclear forces are exchange forces |
| (D) | Nuclear forces are central forces  |

39. Which one of the statements about neutron is INCORRECT?

|  |  |
| --- | --- |
| (A) | Neutron is a fundamental particle |
| (B) | Neutron has no charge |
| (C) | Nuclei of all elements in nature contain neutron |
| (D) | Neutron has a spin |

40. The ground state energy of the hydrogen atom is

|  |  |
| --- | --- |
| (A) | 13.6 eV |
| (B) | 0 eV |
| (C) | –3.4 eV  |
| (D) | –13.6 eV |

41. Which one of the statements about matter waves is INCORRECT?

|  |  |
| --- | --- |
| (A) | Matter waves are not electromagnetic waves |
| (B) | Matter waves are also called probability waves |
| (C) | de Broglie waves are pilot waves i.e., these waves guide the particle |
| (D) | The phase velocity of the matter waves in vacuum is independent of wavelength |

42. Kinetic energy of the cathode rays (electrons) depend on

|  |  |
| --- | --- |
| (A) | voltage applied to the electrode |
| (B) | depend on work function |
| (C) | depend on both (A) and (B) |
| (D) | does not depend on any physical quantity |

43. A man cannot see objects clearly at a distance greater than 2 m. He is then suffering from

|  |  |
| --- | --- |
| (A) | short sight |
| (B) | long sight |
| (C) | astigmatism |
| (D) | presbyopia |

44. The magnifying power of a simple microscope can be increased by if we use eyepiece of

|  |  |
| --- | --- |
| (A) | higher focal length |
| (B) | smaller focal length |
| (C) | higher diameter |
| (D) | smaller diameter |

45. If the focal length of the objective and eyepiece lens of an astronomical telescope are  and ** respectively, then its magnifying power is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

46. If and  stand for focal length of the lens for red colour and violet colour respectively, then the longitudinal chromatic aberration of the lens for parallel rays is given by

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

47. The deviation produced by a flint glass prism for violet and red light rays are 3.25° and 3.10° respectively. Then the angular dispersion is

|  |  |
| --- | --- |
| (A) | 6.35° |
| (B) | 3.175° |
| (C) | 0.15° |
| (D) | 6.35 radians |

48. Total internal reflection is NOT possible in the case when light travels from

|  |  |
| --- | --- |
| (A) | glass to air |
| (B) | glass to water |
| (C) | water to glass |
| (D) | water to air |

49. When the angle of incidence on a certain material is 60°, the reflected light is completely polarized. The angle of refraction is then

|  |  |
| --- | --- |
| (A) | 60° |
| (B) | 90° |
| (C) | 30° |
| (D) | 45° |

50. A sugar solution of length 15 cm has specific rotation of 65° and produces a optical rotation of 7°. Then the concentration of the solution is

|  |  |
| --- | --- |
| (A) | 0.7 g/cc |
| (B) | 13.9 g/cc |
| (C) | 0.0717 g/cc |
| (D) | 0.01g/cc |

51. To observe diffraction, the size of an obstacle

|  |  |
| --- | --- |
| (A) | should be of the order of wavelength |
| (B) | should be much larger than the wavelength |
| (C) | has no relation to wavelength |
| (D) | should be exactly *λ*/2. |

52. If the distance between the screen and the slit is doubled in Young’s double slit experiment, the fringe width will become

|  |  |
| --- | --- |
| (A) | four times |
| (B) | two times |
| (C) | one-half |
| (D) | one-fourth |

53. When light waves suffer reflection at the interface between air and glass, the change of phase of the reflected wave is

|  |  |
| --- | --- |
| (A) | zero |
| (B) | *π* |
| (C) | 2*π* |
| (D) | *π*/2 |

54. If a string of string constant *k* is stretched by a length *x* under tension *T*, the energy stored is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

55. The Young’s modulus of a perfectly rigid body is

|  |  |
| --- | --- |
| (A) | zero |
| (B) | unity |
| (C) | infinite |
| (D) | may be any finite non-zero value |

56. A wire elongates by *l* mm when a load W is hanged at from it. If the wire goes over a pulley and the two weights W each are hung at the two ends, the elongation of the wire (in mm) will be

|  |  |
| --- | --- |
| (A) | *l*/2 |
| (B) | *l* |
| (C) | 2*l* |
| (D) | zero |

57. If two liquids of same masses but densities  and  respectively are mixed, then the density of the mixture is

|  |  |
| --- | --- |
| (A) |  |
| (B) |   |
| (C) |   |
| (D) |  |

58. A boy carries on his head an airtight box containing a bird resting on the floor of the box. When the bird starts flying inside the box, he will feel that the box is now

|  |  |
| --- | --- |
| (A) | lighter |
| (B) | heavier |
| (C) | same in weight as before |
| (D) | lighter in the beginning and heavier later |

59. A cork ball is floating on the surface of water in a beaker. The beaker is covered with a bell jar and the air is evacuated. What will happen to the ball?

|  |  |
| --- | --- |
| (A) | Sink a little |
| (B) | Rise a little |
| (C) | Remain unchanged |
| (D) | Sink completely |

60. The thermometer used as a reference standard is

|  |  |
| --- | --- |
| (A) | mercury thermometer |
| (B) | platinum resistance thermometer |
| (C) | gas thermometer |
| (D) | thermocouple thermometer |

61. If *α* is coefficient of linear expansion, *β* is coefficient of superficial expansion and *γ* is the coefficient of cubical expansion, then for the same rise in temperature, the percentage changes in *α*, *β* and *γ* are in the ratio

|  |  |
| --- | --- |
| (A) | 1:2:3 |
| (B) | 3:2:1 |
| (C) | 1:1:1 |
| (D) | 1:2:4 |

62. If *K* and *σ* respectively are the thermal and electrical conductivities of a metal at absolute temperature *T*, then

|  |  |
| --- | --- |
| (A) | = constant |
| (B) | = constant |
| (C) | = constant |
| (D) | = constant  |

63. The velocity *V* of thermal radiation is (*C* = velocity of light in vacuum)

|  |  |
| --- | --- |
| (A) | *V < C* |
| (B) | *V > C* |
| (C) | *V = C* |
| (D) | dependent on the medium |

64. Which one of the following statements about electromagnetic waves is INCORRECT?

|  |  |
| --- | --- |
| (A) | They do not require material medium for propagation |
| (B) | They are not deflected in electric an magnetic fields |
| (C) | The waves are transverse in nature |
| (D) | They cannot be diffracted |

65. If  and  represent electric and magnetic field vectors of the electromagnetic waves, then the direction of propagation of the waves will be along

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

66. The area of *B-H* hysteresis loop in a ferromagnetic material is a measure of the

|  |  |
| --- | --- |
| (A) | net energy dissipated per unit volume per cycle of magnetization of the material |
| (B) | permeability of the material |
| (C) | susceptibility of the material |
| (D) | retentivity of the material |

67. The unit cubic cell of Al has an edge length equal to 4.5 × 10–10 m. The number of unit cells in an aluminium foil of volume 91 × 10–6 m3 is

|  |  |
| --- | --- |
| (A) | 1024 |
| (B) | 10–24 |
| (C) | 108 |
| (D) | 1023 |

68. The gate with the Boolean expression  for its output is

|  |  |
| --- | --- |
| (A) | AND |
| (B) | NAND |
| (C) | XOR |
| (D) | XNOR |

69. The Boolean expression for NOR gate is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

70. What gate has the truth table given below?

|  |  |  |
| --- | --- | --- |
| A | B | Y |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

|  |  |
| --- | --- |
| (A) | NOT |
| (B) | AND |
| (C) | NAND |
| (D) | NOR |

71. A transistor amplifier is operated in common emitter configuration at constant collector voltage of *VC* = 1.5 V, such that the change in the base current from 100 μA to 150 μA produces a change in the collector current from 5 mA to 10 mA. The current gain *β* of the circuit is then

|  |  |
| --- | --- |
| (A) | 50 |
| (B) | 67 |
| (C) | 75 |
| (D) | 100 |

72. A two stage transistor amplifier has a gain of 10 for the first stage and a gain of 20 for the second stage. The overall gain of the cascade amplifier will be

|  |  |
| --- | --- |
| (A) | 30 |
| (B) | 10 |
| (C) | 200 |
| (D) | 2 |

73. Long range radio transmission is possible when the radio waves are reflected from the ionosphere. For this to happen, the frequency of the radio waves must be in the range

|  |  |
| --- | --- |
| (A) | 80-150 MHz |
| (B) | 8-25 MHz |
| (C) | 1-3 MHz |
| (D) | 150-1500 kHz |

74. The colour of a star is dependent on its

|  |  |
| --- | --- |
| (A) | radius |
| (B) | distance from the earth |
| (C) | temperature |
| (D) | structure |

75. Hubble constant *H* has the dimensions of

|  |  |
| --- | --- |
| (A) | mass |
| (B) | length |
| (C) | (time)–1 |
| (D) | temperature |

CHEMISTRY

76. Given the latent heat of vapouration of water as 40.7 kJ mol–1 at 373 K, ∆S for one mole of water converted to steam at 373 K is

|  |  |
| --- | --- |
| (A) | 109.1 JK–1 mol–1 |
| (B) | 40.7 kJ mol–1 |
| (C) | 81.4 kJ mol–1 |
| (D) | 218.2 JK–1 mol–1 |

77. For a non-linear triatomic gas the value of the ratio of Cp and Cv at laboratory temperature is (assuming no vibrational contribution)

|  |  |
| --- | --- |
| (A) | 7/5 |
| (B) | 9/7 |
| (C) | 8/3 |
| (D) | 4/3 |

78. 6 moles of SO2 and 6 moles of O2 are allowed to form SO3 in a closed vessel. At the equilibrium stage, 60% of SO2 is used up. The total number moles of the mixture at equilibrium is

|  |  |
| --- | --- |
| (A) | 10.2 |
| (B) | 9.8 |
| (C) | 7.2 |
| (D) | 11.2 |

79. pH of a solution obtained by mixing equal volumes of the solutions with pH 3 and pH 5 is

|  |  |
| --- | --- |
| (A) | 4.0 |
| (B) | 3.5 |
| (C) | 3.3 |
| (D) | 2.0 |

80. The Ksp of AgCl is 1 × 10–10, its solubility in pure water in 0.01 M NaCl is

|  |  |
| --- | --- |
| (A) | 2 × 10–10 |
| (B) | 1 × 10–8 |
| (C) | 2 × 10–8 |
| (D) | 1 × 10–10 |

81. The edge length of fcc unit cell is 508 pm. The radius of the atom is …………… pm.

|  |  |
| --- | --- |
| (A) | 180 |
| (B) | 200 |
| (C) | 618 |
| (D) | 288 |

82. Crystalline solids having the least enthalpy of fusion is

|  |  |
| --- | --- |
| (A) | Molecular solid |
| (B) | Metallic solid |
| (C) | Ionic solid |
| (D) | Covalent solid |

83. Vapour pressure of water at 298 K is 19.8 mm of Hg. 0.1 mole of glucose is dissolved in 172.8 g of water. The vapour pressure of the solution is

|  |  |
| --- | --- |
| (A) | 19.6 mm |
| (B) | 16.9 mm |
| (C) | 19.0 mm |
| (D) | 18.9 mm |

84. Osmotic pressure of blood is 8.21 atm at 37°C. Amount of glucose that should be used per litre of intravenous injection that is at the same osmotic pressure of blood is

|  |  |
| --- | --- |
| (A) | 58.4 g |
| (B) | 29.2 g |
| (C) | 5.84 g |
| (D) | 2.92 g |

85. The equitant conductance of 1 M benzoic acid is 12.8 Scm2 eq–1 and if the limiting equivalent conductance of benzoate ion and H+ ion are 42 and 288.42 Scm2 eq–1, respectively, its degree of dissociation is

|  |  |
| --- | --- |
| (A) | 39% |
| (B) | 3.9% |
| (C) | 0.35% |
| (D) | 0.039% |

86. Two half-cells of electrode potentials of E1 and E2 are combined to form a cell of potential E3, (n1, n2 and n3 are number of electrons involved in first electrode, second electrode and the cell) E3 is

|  |  |
| --- | --- |
| (A) | E3 = E2 – E1 |
| (B) | E3 = (E1n1 + E2n2)/n3 |
| (C) | E3 = (E1n1 – E2n2)/n32 |
| (D) | E3 = E1 + E2 |

87. The potential of half-cell consisting of zinc electrode in 0.01 M ZnSO4 solution at 25°C is (E° = –0.763 V)

|  |  |
| --- | --- |
| (A) | –0.8221 V  |
| (B) | –0.704 V |
| (C) | –0.881 V |
| (D) | –0.645 V |

88. A dilute aqueous solution of CuSO4 is electrolyzed using Pt electrodes. The products at the anode and cathode are

|  |  |
| --- | --- |
| (A) | O2, H2 |
| (B) | H2, O2 |
| (C) | O2, Cu  |
| (D) | S2O82–, H2 |

89. The half-life for radioactive decay of C14 is 5730 years. An archaeological artefact containing wood had only 80% of the C14 found in living tree. The age of the sample is

|  |  |
| --- | --- |
| (A) | 1845 years |
| (B) | 2865 years |
| (C) | 4584 years |
| (D) | 1146 years |

90. If the volume of the reaction vessel is halved, for the reaction, 2SO2(g) + O2(g) 2SO3(g), then the rate is

|  |  |
| --- | --- |
| (A) | 1/6th of its initial value |
| (B) | 1/4th of its initial value |
| (C) | 8 times of its initial value |
| (D) | 4 times of its initial value |

91. The rate equation for a reaction: A → B is r = k[A]0. If the initial concentration of the reactant is ‘a’ mol dm–3, then half-life period of reaction is

|  |  |
| --- | --- |
| (A) | a/k |
| (B) | 2a/k |
| (C) | a/2k |
| (D) | k/a |

92. The number of unit cells present in 39 g of potassium that crystallizes as body centered cubic structure is (NA = Avogadro number)

|  |  |
| --- | --- |
| (A) | NA |
| (B) | 0.25 NA |
| (C) | 0.5 NA |
| (D) | 0.75 NA |

93. Which one of the following is not correctly matched?

|  |  |
| --- | --- |
| (A) | [Ni(CN)4]2− – dsp2 hybridization, dia-magnetic |
| (B) | [Cu(NH3)4]2+ – sp3 hybridization, para-magnetic |
| (C) | [NiCl4]2− – sp3 hybridization, tetrahedral |
| (D) | [CuCl4]2− – sp3 hybridization, para-magnetic |

94. Which one of the following statements is not true according to Werner’s theory of coordination compounds?

|  |  |
| --- | --- |
| (A) | Both primary and secondary valencies can be satisfied by anions |
| (B) | Secondary valency is non-directional |
| (C) | Primary valency is ionic valency |
| (D) | Metal ions exhibit two types of valencies |

95. Which one of the following is true regarding the energies of d-orbitals of tetragonally distorted octahedral geometry?

|  |  |
| --- | --- |
| (A) | dyz > dxz > dxy |
| (B) |  |
| (C) | dxz > dyz |
| (D) |  |

96. In the estimation of Ca(II) ions, in the presence of ammonia-ammonium chloride buffer solution, EDTA acts as a …………… ligand.

|  |  |
| --- | --- |
| (A) | flexidentate |
| (B) | pi-donor |
| (C) | hexadentate |
| (D) | tetradentate |

97. How much amount of oxalic acid dihydrate crystals are required to prepare 1 L of a decinormal solution of it?

|  |  |
| --- | --- |
| (A) | 6.3 g |
| (B) | 12.6 g |
| (C) | 3.15 g |
| (D) | 9 g |

98. What is correct order of increasing acidic strength of oxides of nitrogen?

|  |  |
| --- | --- |
| (A) | NO < N2O3 < N2O4 < N2O5 |
| (B) | NO = N2O3 < N2O4 = N2O5 |
| (C) | NO > N2O3 < N2O4 > N2O5 |
| (D) | NO > N2O3 > N2O4 > N2O5 |

99. Regarding compounds of sulfur, which one of the following statements in not true?

|  |  |
| --- | --- |
| (A) | SF6 does not undergo hydrolysis |
| (B) | SF4 undergoes hydrolysis |
| (C) | SF6 is thermally stable and chemically inert |
| (D) | SF4 acts as Lewis acid |

100. Fluorine does not act as the central atom in interhalogen compounds, because

|  |  |
| --- | --- |
| (A) | it is highly electronegative |
| (B) | of absence of d-orbitals |
| (C) | of its small size |
| (D) | of its gaseous nature |

101. A hydrometallurgical process involves the following steps.

 Ag2S + 4 NaCN → 2 Na[Ag(CN)2] + Na2S

 2 Na[Ag(CN)2] + Zn → Na2[Zn(CN)4] + 2 Ag↓

 Which one of the following statements is true?

|  |  |
| --- | --- |
| (A) | In the second step Zn(II) is reduced to Zn(0) |
| (B) | Dicyanoargentum(I) complex is insoluble in water |
| (C) | In the first step Ag(I) is reduced to Ag(0) |
| (D) | Tetracyanozinc(II) complex is soluble in water |

102. Transition metals exhibit variable oxidation states. This is because

|  |  |
| --- | --- |
| (A) | the outermost shell is empty |
| (B) | they are all metals |
| (C) | the energies of (*n* – 1)d and ns orbitals are almost equal |
| (D) | the ionization energy to remove electron from ns orbital is very low |

103. The general electronic configuration of inner-transition elements is

|  |  |
| --- | --- |
| (A) | (*n* – 2)f1–14 (*n* – 1)d0, 1 |
| (B) | (*n* – 2)f1–14 (*n* – 1)d0–1 *n*s2 |
| (C) | (*n* – 1)f1–14 (*n* – 1)d0–1 *n*s2 |
| (D) | (*n* – 2)f1–14 *n*s2 |

104. Which of the following species would be diamagnetic?

|  |  |
| --- | --- |
| (A) | Cr3+ |
| (B) | Co3+ |
| (C) | Br |
| (D) | Zn2+ |

105. Which orbital is designated by the quantum numbers: *n* = 5, *l* =1, *ml* = 0?

|  |  |
| --- | --- |
| (A) | 5s |
| (B) | 5p |
| (C) | 5d |
| (D) | 5f |

106. If travelling at equal speeds, which of the following matter waves have the longest wavelength?

|  |  |
| --- | --- |
| (A) | Electron  |
| (B) | Proton |
| (C) | Neutron |
| (D) | α particle |

107. Number of angular nodes for 4d orbital is

|  |  |
| --- | --- |
| (A) | 4 |
| (B) | 3 |
| (C) | 2 |
| (D) | 1 |

108. Which of the following will not show deflection from the path on passing through electric field?

|  |  |
| --- | --- |
| (A) | Electron  |
| (B) | Neutron  |
| (C) | Cathode rays |
| (D) | Proton  |

109. Complete the following nuclear equation:

 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

110. Which among the following sequence is best suited for selective transformation on 2-methylbutane to 2-methylbutan-2-ol?

|  |  |
| --- | --- |
| (A) | Treatment with Cl2 in the presence of UV light followed by hydrolysis with potassium hydroxide in water |
| (B) | Treatment with Cl2 in the presence of UV light followed by hydrolysis with potassium hydroxide in ethanol |
| (C) | Treatment with Br2 in the presence of UV light followed by hydrolysis with potassium hydroxide in water |
| (D) | Treatment with I2 in the presence of UV light followed by hydrolysis with potassium hydroxide in a 1:1 mixture of water and ethanol |

111. Ozone depletion in Antartica is due to

|  |  |
| --- | --- |
| (A) | sulphur containing gases |
| (B) | peroxy acetyl nitrate |
| (C) | chlorine nitrate |
| (D) | fluorine |

112. When an organic compound ‘A’ was treated sequentially with ammonia and Br2/KOH, methanamine was obtained. Then ‘A’ is an

|  |  |
| --- | --- |
| (A) | ethanol |
| (B) | ethyl acetate  |
| (C) | acetonitrile  |
| (D) | acetic acid |

113. How many structural isomers are possible for C3H9N?

|  |  |
| --- | --- |
| (A) | 3 |
| (B) | 4 |
| (C) | 5 |
| (D) | 6 |

114. Which is a non-reducing sugar?

|  |  |
| --- | --- |
| (A) | Glucose |
| (B) | Sucrose |
| (C) | Maltose |
| (D) | Fructose |

115. 0.200 g of an organic compound contains 71% carbon. What is the mass of CO2 produced when it is subjected to complete combustion?

|  |  |
| --- | --- |
| (A) | 0.142 |
| (B) | 0.039 |
| (C) | 0.521 |
| (D) | 0.733 |

116. Consider the following compounds:

|  |  |
| --- | --- |
| (i) | hydrazine |
| (ii) | paracetamol |
| (iii) | chlorophyll |
| (iv) | saccharin |

 How many among them will test negative for nitrogen in Lassaigne’s test ?

|  |  |
| --- | --- |
| (A) | 1 |
| (B) | 2 |
| (C) | 3 |
| (D) | 4 |

117. Which among the following is more reactive towards nitration using nitrating mixture?

|  |  |
| --- | --- |
| (A) | *tertiary*-Butylbenzene |
| (B) | Toluene |
| (C) | Benzene |
| (D) | Chlorobenzene |

118. Which among the following is antiaromatic?

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

119. Hydrogenation of acetyl chloride in the presence of Pd-BaSO4 as catalyst to obtain ethanal is

|  |  |
| --- | --- |
| (A) | Clemmensen reduction |
| (B) | Rosenmund reduction |
| (C) | Schmidt reaction |
| (D) | Dakin reaction |

120. Which among the following compounds will selectively give the same addition product with HBr under both Markonikkoff’s and anti-Markonikkoff’s addition conditions?

|  |  |
| --- | --- |
| (A) | CH3-CH=CH-CH2-CH3 |
| (B) | CH3-CH=CH-C(CH3)2 |
| (C) | CH3-CH=CH-CH(CH3)2 |
| (D) | C6H5-CH=CH2 |

121. Among the following, the organic compound that gives propyne on treatment with sodamide with minimal side products is

|  |  |
| --- | --- |
| (A) | CH3CH2CHCl2 |
| (B) | CH3CCl=CH2 |
| (C) | CH3CCl=CH2Cl |
| (D) | CH3CCl2-CH3 |

122. Which among the following tests is useful to differentiate between styrene and phenol?

|  |  |
| --- | --- |
| (A) | Lucas test |
| (B) | Test with bromine water |
| (C) | Test with bromine in dry chloroform  |
| (D) | Test with KMnO4 |

123. Identify the **incorrect** statement about natural rubber.

|  |  |
| --- | --- |
| (A) | Double bonds are located between C2 and C3 of each isoprene unit |
| (B) | Has mostly trans double bonds |
| (C) | Intermolecular forces are quite weak |
| (D) | Has a randomly coiled structure |

124. The monomer unit/units in cellulose is/are

|  |  |
| --- | --- |
| (A) | *α*-D-glucose |
| (B) | *β*-D-glucose |
| (C) | Alternating *α*-D­-glucose and D-fructose units  |
| (D) | Alternating *β*-D-fructoseandD-fructose units  |

125. Which among the following vitamins is the most efficient antioxidant?

|  |  |
| --- | --- |
| (A) | Vitamin D |
| (B) | Vitamin C |
| (C) | Vitamin B |
| (D) | Vitamin A |

MATHEMATICS

126. Suppose  Then 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

127. Let *a* and *b* be non zero real numbers such that  Then

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

128. Let  Then 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

129. Let  and  Then 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

130. Let   and  Then 

|  |  |
| --- | --- |
| (A) | 3 |
| (B) | 5 |
| (C) | 7 |
| (D) | 9 |

131. Suppose  then *x* is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

132. The maximum value of  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

133. The chances to fail in Mathematics is 20% and the chances to fail in Chemistry is 25%. The chance to fail in at least one subject is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

134. An urn contains 4 red and 6 blue balls. The probability that two balls are drawn in which second ball drawn is blue without replacements, is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

135. The third moment about the mean for normal distribution is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) | 0 |

136. A box contains 24 identical balls of which 12 are white and remaining black. The balls are drawn at random from the box one at a time with replacement. The probability that a white ball is drawn for the 4th time on the 7th draw is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

137. 5 gentlemen and 5 ladies take seats at random round a table. The probability that they are sitting alternatively is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

138. Let *A* and *B* be two non-empty subsets of a set *X* such that *A* is not a subset of *B.* Then

|  |  |
| --- | --- |
| (A) | *A* and *B* are disjoint |
| (B) |  |
| (C) | *A* is the complement of *B* |
| (D) | *A* and *B* may be disjoint |

139. Let  be defined by  Then *f* is

|  |  |
| --- | --- |
| (A) | a one-to-one function |
| (B) | an onto function |
| (C) | both one-to-one and onto function |
| (D) | neither one-to-one nor onto function |

140. Let  for all real  Then 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  for all  |
| (D) |  for all  |

141. Define  for all real numbers *x*. Then

|  |  |
| --- | --- |
| (A) |  for all *x* |
| (B) |  for all *x*, *y* |
| (C) |  for all *x* |
| (D) | All (A) to (C) above are not true |

142. The sum  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

143. If  then 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) | 0 |

144. The sum of the series  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

145. If 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

146. Sum of the series 

|  |  |
| --- | --- |
| (A) | *e* |
| (B) |  |
| (C) |  |
| (D) |  |

147. The value of 

|  |  |
| --- | --- |
| (A) | 0 |
| (B) | 1 |
| (C) |  |
| (D) | 2 |

148. If *A* is a skew-symmetric matrix of order *n,* then the trace of *A* is

|  |  |
| --- | --- |
| (A) |  |
| (B) | *n* |
| (C) | 0 |
| (D) | 1 |

149. Suppose  Then

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

150. Let  One of the root of the equation  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

151. Let *A* be the matrix  Then the value of  is equal to

|  |  |
| --- | --- |
| (A) | 8 |
| (B) | 64 |
| (C) | 16 |
| (D) | 32 |

152. Given that the matrix  Then the value of *x* is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

153. For a positive integer *n*, the third term in the expansion of  is  Then the value of *n* is

|  |  |
| --- | --- |
| (A) | 6 |
| (B) |  |
| (C) | 3 |
| (D) | 15 |

154.  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

155. The coefficient of  in the expansion of 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

156. Given that the coefficient of  and  in the expansion of  are equal. Then *n* =

|  |  |
| --- | --- |
| (A) | 91 |
| (B) | 8.7! |
| (C) | 71 |
| (D) | 7.8! |

157. Number of terms in the expansion of  is

|  |  |
| --- | --- |
| (A) | 10 |
| (B) | 8 |
| (C) | 6 |
| (D) | 5 |

158. There are 5 letters and 5 different envelopes. The number of ways in which all the letters can be put in wrong envelope is

|  |  |
| --- | --- |
| (A) | 119 |
| (B) | 44 |
| (C) | 59 |
| (D) | 40 |

159. The number of diagonals in an octagon will be

|  |  |
| --- | --- |
| (A) | 12 |
| (B) | 16 |
| (C) | 18 |
| (D) | 20 |

160. The number of divisors of the form  of the integer 240 is equal to

|  |  |
| --- | --- |
| (A) | 3 |
| (B) | 4 |
| (C) | 12 |
| (D) | 15 |

161. There are three coplanar parallel lines. If any *p* points are taken on each of the lines, the maximum number of triangles with vertices at these points is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

162. In class of 18 students, every student has to hand shake with every other student. The total number of handshakes was

|  |  |
| --- | --- |
| (A) | 17 |
| (B) | 18 |
| (C) | 153 |
| (D) | 306 |

163. Total number of numbers that are less than 4*.*106 and can be formed using the digits 1, 2, 3 is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

164. A variable name in certain computer language must be either an alphabet or an alphabet followed by a decimal digit. Total number of different variable names that can exist in that language is equal to

|  |  |
| --- | --- |
| (A) | 280 |
| (B) | 286 |
| (C) | 290 |
| (D) | 296 |

165. Let *X* = {*a* | *a* is a prime number and *a* < 30}. The number of different rational numbers whose numerator and denominator belong to *X* is

|  |  |
| --- | --- |
| (A) | 90 |
| (B) | 91 |
| (C) | 180 |
| (D) | 181 |

166. Let  and *z* be a complex number. Then the value of  where *n* is a multiple of 3 is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) | 0 |

167. Assume that  Then  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

168. If *ω* is a cube root of unity, then  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) | 2 |
| (C) | 4 |
| (D) |  |

169.  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

170. Let *z* be a complex number satisfying the relation  Then  is equal to

|  |  |
| --- | --- |
| (A) | 5 |
| (B) | 6 |
| (C) | 7 |
| (D) | 8 |

171. If *z* is a complex number such that is purely real. Then

|  |  |
| --- | --- |
| (A) | *z* is purely imaginary |
| (B) | *z* is purely real |
| (C) |  |
| (D) |  and  |

172. The product of all values of  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

173. Let *z* be a complex number such that  Then

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

174. Let  Then 

|  |  |
| --- | --- |
| (A) | are never possible |
| (B) | are always possible |
| (C) | are sometimes possible |
| (D) | cannot be discussed |

175. The inequality  is true, when *x* belongs to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

176. Let  The value of the expression  is always greater than or equal to

|  |  |
| --- | --- |
| (A) | 1 |
| (B) | 2 |
| (C) |  |
| (D) |  |

177. Solutions of  are

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) | 9 |

178. If  and  is real, then

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

179. Let *a, b, c* be three distinct numbers which are in a Geometric Progression. Also the numbers *a,* 2*b,* 3*c* are in an Arithmetic Progression. Then the common ratio of the Geometric Progression is

|  |  |
| --- | --- |
| (A) | 3 |
| (B) | 1 |
| (C) |  |
| (D) |  |

180. Three positive real numbers *x*, *y*, *z* are in Arithmetic Progression and *xyz* = 4*.* The the minimum value of *y* is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

181. The maximum possible integer value of sum  is

|  |  |
| --- | --- |
| (A) | 134 |
| (B) | 136 |
| (C) | 138 |
| (D) | 140 |

182. Let  denotes the sum of *n* terms of an Arithmetic Progression. Then the value of  is

|  |  |
| --- | --- |
| (A) | 0 |
| (B) | 3 |
| (C) | 6 |
| (D) | 9 |

183. The sum of 10 terms of the series 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

184. The harmonic mean of two numbers is 8*.* Also their arithmetic mean is *A* and geometric mean is *G.* If *G* satisfies 2*A* + *G*2 = 90*,* then the numbers are

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

185. The sum  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

186. The equation  has

|  |  |
| --- | --- |
| (A) | no solution |
| (B) | one solution |
| (C) | two solutions |
| (D) | more than two solutions |

187. Let *α* and *β* be the roots of the equation *my*2 *− ny − p* = 0*.* Then the root of the equation (*m* + *px*)2 = *n*2*x* are

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

188. If the roots of the equation *y*2 *−* 2*my* + *m*2 + *m −* 3 = 0 are real and less than 3*,* then

|  |  |
| --- | --- |
| (A) | *m* = 1 |
| (B) |  |
| (C) | *m* = 2 |
| (D) | *m* < 2 |

189. Let  be the roots of the equation  Then  are roots of the equation

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

190. The number of real solutions of the equation  is

|  |  |
| --- | --- |
| (A) | 3 |
| (B) | 2 |
| (C) | 1 |
| (D) | 0 |

191. Given that the sum of the squares of the roots of the equation  is 13. Then number of values of *k* lying in the interval [1*,* 4] is

|  |  |
| --- | --- |
| (A) | 0 |
| (B) | 1 |
| (C) | 2 |
| (D) | 3 |

192. Let  Then

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

193. The equation  has

|  |  |
| --- | --- |
| (A) | infinitely many solutions |
| (B) | finitely many solutions |
| (C) | has no solutions in integers |
| (D) | has no solutions |

194. The value of *x* satisfying  in the interval  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

195. In a triangle *ABC*, let  Then  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) | *ac* |
| (C) | *bc* |
| (D) |  |

196. Let  be the sides of a  Further two equation  and  have a common root. Then the 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

197. If the sides of a triangle are proportional to the cosines of the opposite angles, then

|  |  |
| --- | --- |
| (A) | the triangle is right angled |
| (B) | the triangle is isosceles |
| (C) | the triangle is equilateral |
| (D) | one of the angle is obtuse |

198. Let a in a  Then the values of  and  are equal to respectively

|  |  |
| --- | --- |
| (A) | and  |
| (B) |  and  |
| (C) |  and  |
| (D) |  and  |

199. Given that the lengths of the sides  of a  are in an Arithmetic Progression. Then the ration  lies in the interval

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

200. The two adjacent sides *AB* and *BC* of a cyclic quadrilateral *ABCD* are 2 and 5 units respectively and the angle between them is 60°*.* Then the area of circle circumscribing the quadrilateral *ABCD* is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

201. In a   then  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

202. In the   is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

203.  is equal to

|  |  |
| --- | --- |
| (A) | 0 |
| (B) |  |
| (C) | 1 |
| (D) |  |

204. If  and   is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

205. The first and last terms of an Arithmetic Progression are 1 and 56*.* If the sum of its terms is 290, then the number of terms will be

|  |  |
| --- | --- |
| (A) | 4 |
| (B) | 6 |
| (C) | 8 |
| (D) | 10 |

206. Suppose *A* is a point which is at equidistant from  and  Then the point *A* is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

207. The midpoint of the line joining (*−*6*,* 4) and (8*,−*6) divides the line joining (3*,* 6) and (*−*6*,−*3) in the ratio

|  |  |
| --- | --- |
| (A) | 2:7 externally |
| (B) | 2:7 internally |
| (C) | 3:7 internally |
| (D) | 3:7 externally |

208. The sum of the distances from a point to the two perpendicular lines is 2*.* The locus of the point is

|  |  |
| --- | --- |
| (A) | a square |
| (B) | a pair of straight lines |
| (C) | an ellipse |
| (D) | a parabola |

209. If a point  is shifted by a distance  units parallel to the line  then the new position of *P* is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

210. The length of the common chord of intersection of the circles  and  is

|  |  |
| --- | --- |
| (A) | 0 |
| (B) | 1 |
| (C) | 2 |
| (D) | 3 |

211. The equation of the tangents to the circle  with 3 as *x* coordinate are

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

212. The equation of the circumcircle of the triangle formed by the lines  and  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

213. The equation of a parabola is *y*2 = 4*x. P*(1*,* 3) and *Q*(1, 1) are two points in the *xy*-plane. Then, for the parabola

|  |  |
| --- | --- |
| (A) | *P* and *Q* are exterior points |
| (B) | *P* is an interior point while *Q* is an exterior point |
| (C) | *P* and *Q* are interior points |
| (D) | *P* is an exterior point while *Q* is an interior point |

214. A circle having its center at (2*,* 3) is cut orthogonally by the parabola *y*2 = 4*x.* The possible intersection point of these curves can be

|  |  |
| --- | --- |
| (A) | (1, 2) or  |
| (B) | (9, 6) or  |
| (C) | (1, 2) or (4, 4) |
| (D) | (1, 3) or  |

215. If the polar of  is always touching the ellipse  then the locus of the pole is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

216. The radius of the circle passing through the foci of the ellipse  and having its center (0*,* 3) is

|  |  |
| --- | --- |
| (A) | 4 |
| (B) | 3 |
| (C) |  |
| (D) |  |

217. The equation to the hyperbola having its eccentricity 2 and the distance between foci as 8*,* is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

218. The equation of the hyperbola whose vertices are at (5*,* 0) and (*−*5*,* 0) andas one of its directrices, is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

219.  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

220. Let  and  Then 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

221. Given that the line *y* = 3*x* + *c* touches the curve  The value of *c* is

|  |  |
| --- | --- |
| (A) | an integer |
| (B) | always a rational number |
| (C) | always an irrational number |
| (D) | sometimes a rational number |

222. Let  Then 

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) | 0 |
| (D) |  |

223. If  and  then  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

224. If   then, for all  

|  |  |
| --- | --- |
| (A) | 1 |
| (B) | 2 |
| (C) |  |
| (D) | 0 |

225. If , then  at  is equal to

|  |  |
| --- | --- |
| (A) | 0 |
| (B) | 1  |
| (C) |  |
| (D) |  |

226. The function  exists for

|  |  |
| --- | --- |
| (A) | [1, 4] |
| (B) | [1, 0] |
| (C) | [0, 5] |
| (D) | [5, 0] |

227. The range of the function   is

|  |  |
| --- | --- |
| (A) | {0} |
| (B) | {0, 1} |
| (C) |  |
| (D) |  |

228. The period of the function  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

229. Let  be defined as . Then which of the following is true?

|  |  |
| --- | --- |
| (A) | *f* is discontinuous for all *x* |
| (B) | *f* is continuous for all *x* |
| (C) | *f* is discontinuous at , where *k* is an integer |
| (D) | *f* is continuous at , where *k* is an integer |

230. The period of the function  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

231.  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

232. Let  be natural numbers with   is equal to

|  |  |
| --- | --- |
| (A) | 2 |
| (B) |  |
| (C) |  |
| (D) | 0 |

233. 

|  |  |
| --- | --- |
| (A) | 1 |
| (B) | 2 |
| (C) | 3 |
| (D) | 4 |

234. If the curve *y* = *x*2 + *bx* + *c* touches the line *y* = *x* at the point (1*,* 1)*,* then the values of *x* for which the curve has a negative gradient are

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

235. The sub tangent, ordinate and sub normal to the parabola *y*2 = 4*ax* at a point (different from the origin) are

|  |  |
| --- | --- |
| (A) | in Harmonic Progression |
| (B) | in Geometric Progression |
| (C) | in Arithmetic Progression |
| (D) | equal |

236. If  then

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

237. The minimum value of  is

|  |  |
| --- | --- |
| (A) | 0 |
| (B) | 1 |
| (C) | 2 |
| (D) | 3 |

238.  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

239.  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

240. The value of  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

241. Consider the group  where  for all  Then the inverse of arbitrary element *a* is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

242. The area bounded by *y* = 2*x − x*2 and *y* -axis is

|  |  |
| --- | --- |
| (A) | 3 sq. units |
| (B) | 2 sq. units |
| (C) | 1 sq. units |
| (D) | 0 sq. units |

243. If the position vector of three points are  then the three points are

|  |  |
| --- | --- |
| (A) | non-coplanar |
| (B) | non-collinear |
| (C) | collinear |
| (D) | unit vectors |

244. The sides of a parallelogram are  Then the unit vector parallel to one of the diagonals is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

245. In a three dimensional space, the equation 8*x* + 7*y* = 0 represents

|  |  |
| --- | --- |
| (A) | the *z-*axis |
| (B) | the *z-*plane |
| (C) | the *x-*axis |
| (D) | the plane *y* = 0 |

246. The plane  and the line  are related as

|  |  |
| --- | --- |
| (A) | parallel to the plane |
| (B) | at right angles to a plane |
| (C) | lies in the plane |
| (D) | meets the plane obliquely |

247. If the position vectors of *A,B* and *C* are respectively  and  then  is equal to

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

248. The number of solutions at *x* = 5 for the equation  is

|  |  |
| --- | --- |
| (A) | 0 |
| (B) | 1 |
| (C) | 5 |
| (D) |  |

249. A solution of the differential equation  is

|  |  |
| --- | --- |
| (A) |  |
| (B) |  |
| (C) |  |
| (D) |  |

250. 

|  |  |
| --- | --- |
| (A) | 10 |
| (B) | 12 |
| (C) | 15 |
| (D) | 18 |

