BHU [Mains]
MEDICAL ENTRANCE EXAM
SOLVED PAPER 2007

Physics

Section-A

1. Two organ pipes both closed at one end, have lengths l and $l + \Delta l$. If the velocity of sound in air is v, then the number of beats per second is

(a) $\frac{v}{4l}$ (b) $\frac{v}{2l}$

(c) $\frac{v}{4l^2}\Delta l$ (d) $\frac{v}{2l^2}\Delta l$

2. If the amount of heat energy received per unit area from sun is measured on earth, mars and jupiter, it will be

(a) same for all
(b) in decreasing order jupiter, mars and earth
(c) in increasing order jupiter, mars and earth
(d) in decreasing order mars, earth and jupiter

3. Four optical media have indices of refraction of 1.40, 1.50, 1.60 and 1.70 respectively. The medium that has the largest critical angle is the one whose index of refraction is

(a) 1.40 (b) 1.50
(c) 1.60 (d) 1.70

4. Which of the following has greatest packing fraction ?

(a) Simple cubic
(b) Body centered cubic
(c) Face centered cubic
(d) All have the same packing fraction

5. An ideal gas has molar specific heat $5R/2$ at constant pressure. If 300 J of heat is given to two moles of gas at constant pressure, the change in temperature is

(a) 7.22°C (b) 8.94°C
(c) zero (d) 5°C

6. A body of mass m falls from a height h and collides with another body of same mass. After collision the two bodies combine and move through distance till they come to rest. Find the work done against the resistive force.

(a) $\frac{1}{2}mg(h + 2d)$ (b) $\frac{1}{2}mg(h + 4d)$

(c) $\frac{1}{2}mg(h - d)$ (d) $\frac{1}{2}mg(h - 2d)$

7. Light of wavelength $\lambda = 4000$ Å and intensity 100 W/m^2 is incident on a plate of threshold frequency 5.5×10^{14} Hz. Find the number of photons incident per m^2 per sec.

(a) 10^{21} (b) 3.0×10^{19}
(c) 2.02×10^{20} (d) 2.02×10^{21}

8. When electron is accelerated between 500 keV, what is the percentage increase in mass ?

(a) 82.35% (b) 97.85%
(c) 42.35% (d) 59.45%

9. Inductive resistance 25 Ω and capacitive resistance 75 Ω are connected across 250 V mains in series. Find the rms potential difference across inductor and capacitor.

(a) 125 V, 375 V (b) 375 V, 125 V
(c) 125 V, 125 V (d) 375 V , 375 V

10. In the Boolean algebra $\overline{A} \cdot \overline{B}$ is same as

(a) $\overline{A + B}$ (b) $A \cdot B$
(c) $\overline{A \cdot B}$ (d) $A + B$

11. When a force F_1 acts on a particle, frequency is 6 Hz and when a force F_2 acts, frequency is 8 Hz. What is the frequency when both the forces act simultaneously in same direction ?

(a) 12 Hz (b) 25 Hz
(c) 10 Hz (d) 5 Hz

12. A hypothetical experiment conducted to determine Young's formula $Y = \frac{\cos\theta\, T^x \cdot \tau}{l^3}$. If Y = Young's modulus, T = time period, τ = torque and l = length, then find the value of x.

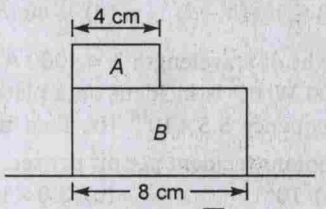
(a) zero (b) 1
(c) 2 (d) 3

13. A particle of mass m, strikes on ground with angle of incidence 45°. If coefficient of restitution $e = 1/\sqrt{2}$, the velocity of reflection is

(a) $\frac{\sqrt{3}}{2}v$ (b) $\sqrt{3}v$

(c) $\frac{1}{2}v$ (d) $\frac{v}{\sqrt{3}}$

14. Two blocks, one of mass $A = 1$ kg and another $B = 2$ kg are shown in figure. A force of 5 N is applied on A. Coefficient of friction between A and B is 0.2 and that between B and horizontal surface is zero. Find the time taken for the front face of A to coincide with that of B.



(a) $2\sqrt{2}$ s (b) $\sqrt{\frac{8}{3}}$ s

(c) $\sqrt{\frac{3}{8}}$ s (d) 2 s

15. Separation between two parallel plates facing each other is 2 cm and surface area $l^2 = 100\ cm^2$. If 10^6 electrons of velocity 10^8 m/s projected into the gap between plates of potential difference 400 V, the deflection of an electron is

(a) 17.6 mm (b) 1.76 mm

(c) 0.176 mm (d) zero

16. If the radius of a coil is changing at the rate 10^{-2} units in a normal magnetic field 10^{-3} units, the induced emf is 1 μV. What is the final radius of the coil ?

(a) 1.6 cm (b) 16 cm

(c) 12 cm (d) 1.2 cm

17. For a radioactive material half-life period is 600 s. If initially there are 600 number of molecules find the time taken for disintegration of 450 molecules and the rate of disintegration.

(a) 1200 s, 0.173 disintegration /s

(b) 1000 s, 0.173 disintegration /s

(c) 1000 s, 1.173 disintegration /s

(d) 1200 s, 1.173 disintegration /s

18. A body is dropped from height 8 m. After striking the surface it rises to 6 m, what is fractional loss in kinetic energy during impact ? Assuming air resistance to be negligible.

(a) 2/5 (b) 1/4

(c) 3/4 (d) 1/5

19. Assuming Newton's law of cooling to be valid, the temperature of body changes from 60°C to 40°C in 7 min. Temperature of surrounding being 10°C. Find its temperature after next 7 min.

(a) 24°C (b) 20°C

(c) 14°C (d) 28°C

20. A ring of mass 0.8 kg and radius 0.1 m makes $\frac{5}{\pi}$ rotations per second about axis perpendicular to its plane through centre. Calculate angular momentum and kinetic energy of ring.

(a) 0.08 kg-m^2/s, 0.2 J

(b) 0.85 kg-m^2/s, 0.2 J

(c) 0.85 kg-m^2/s, 0.4 J

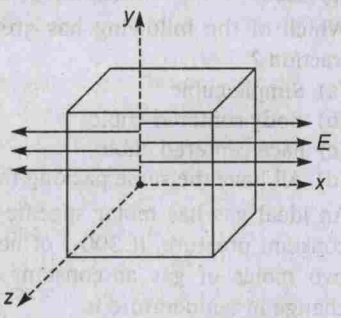
(d) 0.08 kg-m^2/s, 0.4 J

21. There is magnetic material of coercivity 2×10^3 A/m. What current should flow through solenoid of length 15 cm having 150 turns 150 to demagnetise the substance completely ?

(a) 4 A (b) 2.5 A

(c) 2 A (d) 3.5 A

22. Electric field at $x = 10$ cm is 100 V/m and at $x = -10$ cm is −100 V/m. The magnitude of charge enclosed by the cube of side 20 m is



(a) $8\varepsilon_0$ (b) $2\varepsilon_0$

(c) $3\varepsilon_0$ (d) $5\varepsilon_0$

23. A particle is rotating with constant angular acceleration on a circular track. If its angular velocity changes from 20 π rad/s to 40 π rad/s in 10 s, what are the number of revolutions that the particle has completed during this time ?

(a) 100 (b) 150

(c) 250 (d) 1000

24. Two tuning forks when sounded together give 8 beat/s. When A is sounded with air column of length 37.5 cm closed at one end resonance occurs in its fundamental mode. B gives resonance with air column of length 38.5 cm and closed at one end in its fundamental mode. The frequencies of tuning forks are

(a) 300 Hz, 300 Hz (b) 300 Hz, 308 Hz
(c) 308 Hz, 308 Hz (d) 308 Hz, 300 Hz

25. A boy is hanging from a horizontal branch of a tree. The tension in the arms will be maximum when the angle between the arms is

(a) 0° (b) 60°
(c) 90° (d) 120°

Section-B

Direction : *In the following questions more than one of the answers given may be correct. Select the correct answers and mark it according to the code.*

Code :

(a) 1, 2 and 3 are correct
(b) 1 and 2 are correct
(c) 2 and 4 are correct
(d) 1 and 3 are correct

26. A book with many printing errors contains four different expressions for the displacement y of a particle executing simple harmonic motion which of the following options are correct ?

(1) $y = A \sin\left(\frac{2\pi t}{T}\right)$

(2) $y = A \sin vt$

(3) $y = \frac{A}{\sqrt{2}}(\sin \omega t + \cos \omega t)$

(4) $y = \frac{A}{T} \sin\left(\frac{t}{A}\right)$

27. Which of the following are not correct about centre of mass ?

(1) It depends on frame of reference
(2) Internal forces may affect the motion of centre of mass
(3) Centre of mass and centre of gravity are synonymous
(4) In centre of mass frame momentum of a system is always zero

28. If a particle travels a linear distance at speed v_1 and comes back along the same track at speed v_2.

(1) Its average speed is arithmetic mean $(v_1 + v_2)/2$
(2) Its average speed is harmonic mean $2v_1v_2 / (v_1 + v_2)$
(3) Its average speed is geometric mean $\sqrt{v_1 v_2}$
(4) Its velocity is zero

29. Apparent weight of a body in an elevator is more than rest weight. If elevator is

(1) going up and slowing down
(2) going up and speeding up
(3) going down and speeding up
(4) going down and slowing down

30. Let V and E denote the gravitational potential and gravitational field at a point. It is possible to have

(1) $V = 0$ and $E = 0$ (2) $V \neq 0$ and $E = 0$
(3) $V \neq 0$ and $E \neq 0$ (4) $V = 0$ and $E \neq 0$

31. For an isolated system in the absence of any dissipative effect

(1) KE is conserved
(2) total energy is conserved
(3) PE is conserved
(4) mechanical energy is conserved

32. Which of the following statements are correct ?

(1) Young's modulus, bulk modulus and shear modulus have the units of pressure
(2) Young's modulus describes the length elasticity of a material
(3) The value of Young's modulus depends on the dimensions of the body
(4) Modulus of elasticity is the smallest value of stress required to produce a permanent distortion in a body

33. A steel cube weighs 1 kg in air and 0.88 kg in water. The density of the steel is 7.71×10^3 kg/m^3 and of water is 10^3 kg/m^3. The cube

(1) must be solid
(2) consists of impure steel
(3) must be hollow
(4) consists of pure steel

34. A cyclic process is completed by processes 1 and 2. ΔQ and ΔW represent heat supplied and the work done. ΔU_1 and ΔU_2 are the changes in internal energies in the two processes respectively. Then

(1) $\Delta U_1 = -\Delta U_2$ (2) $\Delta U_1 = \Delta U_2$
(3) $\Delta Q = \Delta W$ (4) $\Delta Q = -\Delta W$

35. A heated body emits radiation which has maximum intensity at frequency ν_m. If the temperature of the body is doubled

(1) the maximum intensity radiation will be at frequency $2\nu_m$

(2) the maximum intensity radiation will be at frequency $(1/2)\nu_m$

(3) the total emitted energy will increase by a factor of 2

(4) the total emitted energy will increase by a factor of 16

36. Which one of the following represents a travelling wave ?

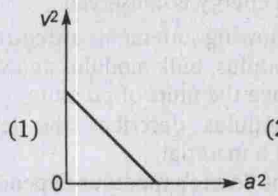
(1) $y = A\sqrt{(x - vt)}$

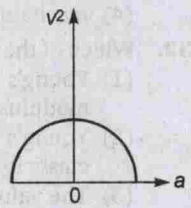
(2) $y = A\cos(ax + bt)$

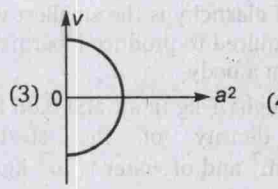
(3) $y = A\log(x - vt)$

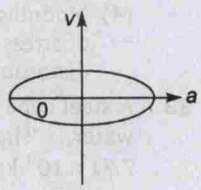
(4) $y = f(x^2 - vt^2)$

37. A particle is performing a linear simple harmonic motion. If the acceleration and the corresponding velocity of the particle are a and v respectively, which of the following graphs is/are correct ?

(1) 

(2) 

(3) 

(4) 

38. In a Young's double-slit experiment, let A and B be the two slits. A thin film of thickness t and refractive index μ is placed in front of A. Let β = fringe width. Then the central maximum will shift

(1) towards A (2) towards B

(3) by $t(\mu - 1)\dfrac{\beta}{\lambda}$ (4) by $\mu t\,\dfrac{\beta}{\lambda}$

39. A charged particle moves with a speed v in a circular path of radius r around a long uniformly charged conductor. If the conductor has a charge per unit length λ, the particle has mass m and charge q; then

(1) $v \propto \sqrt{q}$ (2) $v \propto \sqrt{\lambda}$

(3) $v \propto \sqrt{m}$ (4) $v \propto \dfrac{1}{m}$

40. A parallel plate capacitor is first connected to DC source. It is then disconnected and then immersed in a liquid dielectric. Then

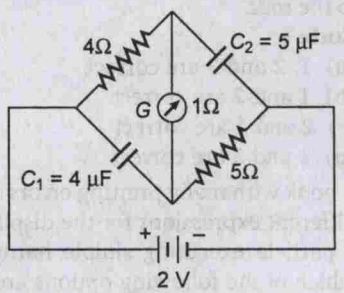
(1) the capacity increases

(2) the liquid level between the plates increases

(3) the potential on the plates will decrease

(4) the liquid level will remain the same as that outside the plates

41. In the circuit shown below, the cell is ideal,



with emf = 2V. The resistance of the coil of the galvanometer G is 1 Ω. Then

(1) 0.2 A current flows in G

(2) potential difference across C_1 is 1 V

(3) potential difference across C_2 is 1.2 V

(4) no current flows in G

42. A uniform wire of resistance R is shaped into a regular n-side of a polygon (n is even). The equivalent resistance between any two corners can have

(1) the maximum value $(R/4)$

(2) the maximum value (R/n)

(3) the minimum value $R\left(\dfrac{n-1}{n^2}\right)$

(4) the minimum value (R/n)

43. Two identical charged particles enter a uniform magnetic field with same speed but at angles 30° and 60° with field. Let a, b and c be the ratio of their time periods, radii and pitches of the helical paths then

(1) $abc > 1$ (2) $abc = 1$

(3) $abc < 1$ (4) $a = bc$

44. In pure rolling fraction of its total energy associated with rotation is α for a ring and β for a solid sphere. Then

(1) $\alpha = 1/2$ (2) $\beta = 2/7$

(3) $\beta = 2/5$ (4) $\alpha = 1/4$

45. A curved road is banked for speed v_0. When a car moves along the road with a constant speed v, the force of friction between the road and the tyres is F. Which of the following statements(s) is (are) correct ?
(1) If $v = v_0$, $F = 0$
(2) If $v < v_0$, F acts outwards
(3) If $v > v_0$, F acts inwards
(4) If $v = 0$, $F = 0$

46. An electron in hydrogen atom first jumps from second excited state to first excited state and then from first excited state to ground state. Let the ratio of wavelength, momentum and energy of photons emitted in these two cases be a, b and c respectively. Then
(1) $c = \frac{9}{4}$ (2) $c = \frac{5}{27}$
(3) $a = \frac{9}{4}$ (4) $b = \frac{5}{27}$

47. Which of the following transitions in He^+ ion will give rise to a spectral line which has the same wavelength as some spectral line in the hydrogen atom ?
(1) $n = 4$ to $n = 2$ (2) $n = 8$ to $n = 4$
(3) $n = 6$ to $n = 3$ (4) $n = 6$ to $n = 2$

48. A solid transparent sphere has a small, opaque dot at its centre. When observed from outside, the apparent position of the dot will be
(1) the same as its actual position
(2) independent of the refractive index of the sphere
(3) farther away from the eye than its actual position
(4) closer to the eye than its actual position

49. The displacement of a string carrying a travelling sinusoidal wave is given by $y = A \sin(kx - \omega t - \phi)$.
At $t = 0$, the particle at $x = 0$ is having half of the maximum amplitude and is moving in upward direction. The value of ϕ may be
(1) 60° (2) 30°
(3) 300° (4) 330°

50. A real object is moving towards a fixed spherical mirror. The image
(1) may move away from the mirror
(2) may move towards the mirror if mirror is concave
(3) must move away from the mirror
(4) may move towards the mirror if mirror is convex

Chemistry

Section-A

1. The angular momentum of the electron in first excited energy state of hydrogen atom is
(a) $\frac{h}{2\pi}$ (b) $\frac{h}{\pi}$
(c) $\sqrt{2(2+l)}\,\frac{h}{2\pi}$ (d) none of these

2. 75% of a first order reaction was completed in 32 min, when was 50% of the reaction completed ?
(a) 24 min (b) 16 min
(c) 8 min (d) 48 min

3. Cyano benzene has
(a) 7 sigma bonds and 4 pi bonds
(b) 7 sigma and 5 pi bonds
(c) 12 sigma and 6 pi bonds
(d) 13 sigma and 5 pi bonds

4. The rate of diffusion of methane at a given temperature is twice that of a gas X. The molecular mass of X is
(a) 4.0 (b) 8.0
(c) 32.0 (d) 64.0

5. When phosphorus reacts with caustic soda, the products are PH_3 and NaH_2PO_2. This reaction is an example of
(a) oxidation (b) reduction
(c) disproportionation (d) none of these

6. For a gaseous reversible reaction, which of the following expressions is correct ?
(a) $K_c = K_p(RT)^{\Delta n}$ (b) $K_p = K_c + \Delta nRT$
(c) $K_p = K_x(p)^{\Delta n}$ (d) $K_p = K_c(RT/\Delta n)$

7. A solution has H^+ ion concentration 0.0005 M. Its pOH is
(a) 8.279 (b) 12.285
(c) 10.699 (d) 13.335

8. For a zero order reaction, $A \longrightarrow P$, $t_{1/2}$ is (k is rate constant)
(a) $\frac{[A]_0}{2k}$ (b) $\frac{\ln 2}{k}$
(c) $\frac{1}{k[A]_0}$ (d) $\frac{\ln 2}{[A]_0 k}$

9. The amount of heat released when 20 mL of 0.5 M NaOH is mixed with 100 mL of 0.1 M HCl is x kJ. The heat of neutralisation (in kJ mol^{-1}) is
(a) $-100\,x$ (b) $-50x$
(c) $+100x$ (d) $+50x$

10. Which of the following electrolyte has least molar conductivity ?
(a) $BeCl_2$ (b) BCl_3
(c) LiCl (d) NaCl

11. Gold number is associated with
(a) electrophoresis
(b) purple of cassius
(c) protective colloid
(d) amount of pure gold

12. H_2O_2 is
(a) poor polar solvent than water
(b) better polar solvent than H_2O
(c) both have equal polarity
(d) better polar solvent but its strong auto oxidising ability limits its use as such

13. Sodium metal is kept under
(a) kerosene oil (b) alcohol
(c) water (d) acids

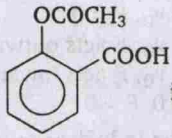
14. Which of the following has the highest calorific value ?
(a) Coal gas (b) Water gas
(c) Producer gas (d) Carbon dioxide gas

15. Which out of the following is called sugar of lead ?
(a) $Pb(NO_3)_2$ (b) $PbCl_2$
(c) $PbCO_3 \cdot Pb(OH)_2$ (d) $Pb(CH_3COO)_2$

16. Which one of the following is the true covalent oxide of iodine ?
(a) I_2O_4 (b) I_2O_5
(c) I_2O_7 (d) I_2O_9

17. Which of the following two are isostructural ?
(a) XeF_2, IF_2^- (b) NH_3, BF_3
(c) CO_3^{2-}, SO_3^{2-} (d) PCl_5, ICl_5

18. The complex used as an anticancer agent is
(a) *mer* $[Co(NH_3)_3Cl_3]$
(b) *cis* $[PtCl_2(NH_3)_2]$
(c) *cis* $K_2[PtCl_2Br_2]$
(d) $Na_2[CoCl_4]$

19. The compound  is used as

(a) antiseptic (b) antibiotic
(c) analgesic (d) pesticides

20. In order to distinguish between $C_2H_5NH_2$ and $C_6H_5NH_2$ which of the following reagents is useful ?
(a) Hinsberg reagent (b) β-naphthol
(c) $CHCl_3/KOH$ (d) NaOH

21. Which reducing agents of the following can be used for the following transformation ?
$CH_3—CH = CH—COOH \longrightarrow$
$CH_3—CH = CH—CH_2OH$
(a) $LiAlH_4$ (b) B_2H_6/THF
(c) H_2/Ni (d) $Na + C_2H_5OH$

22. Propyne on hydrolysis in presence of H_2SO_4 and $HgSO_4$ gives
(a) acetaldehyde (b) acetone
(c) formaldehyde (d) none of these

23. What is the product obtained when chlorine reacts with ethyl alcohol in the presence of NaOH ?
(a) CH_3Cl (b) C_2H_2Cl
(c) CCl_3CHO (d) $CHCl_3$

24. Benzene on ozonolysis yields
(a) glyoxal (b) acetone
(c) ethanal (d) methanol

25. How many structural isomers could be obtained from alkane C_6H_{14} ?
(a) Four (b) Five
(c) Six (d) Seven

Section-B

Direction : *In the following questions more than one of the answers given may be correct. Select the correct answers and mark it according to the code.*

Code :

(a) 1, 2 and 3 are correct
(b) 1 and 2 are correct
(c) 2 and 4 are correct
(d) 1 and 3 are correct

26. If equal volumes of 0.1 M HBr and 0.1 M KOH are mixed, then which of the following is/are correct about the resulting solution ?

(1) $[H_3O^+] = 1.0 \times 10^{-7}$ mol L^{-1}
(2) $[OH^-] = 1.0 \times 10^{-7}$ mol L^{-1}
(3) $[K^+] = 0.05$ mol L^{-1}
(4) $[Br^-] = 0.10$ mol L^{-1}

27. For a reaction to be spontaneous in neither direction which of the following is/are correct regarding the closed system ?

(1) $(\Delta G)_{T,P} = 0$ (2) $(\Delta G)_{T,P} < 0$
(3) $(\Delta S)_{U,V} = 0$ (4) $(\Delta S)_{V,V} > 0$

28. The allotropic forms of carbon, good conductor of electricity are

(1) diamond (2) graphite
(3) fullerenes (4) gas carbon

29. Which of the solution will be acidic ?

(1) 0.1 M $FeSO_4$
(2) 0.1 M $(NH_4)_2SO_4$
(3) 0.1 M CH_3COONa
(4) 0.1 M NH_4OH

30. Which of the following is/are not path dependent ?

(1) Work (2) Enthalpy
(3) Heat change (4) Entropy

31. What happens when detergent is added to water ?

(1) The surface tension increase
(2) Surface tension decrease
(3) Viscosity decrease
(4) Viscosity increase

32. Oxalates of alkaline earth metal(s) sparingly soluble in water are

(1) Ba (2) Ca
(3) Sr (4) Be

33. Diethyl ether can be distinguished from *n*-butanol by

(1) aqueous $FeCl_3$
(2) reaction with Na metal
(3) Tollens' reagent
(4) reaction with chromic anhydride (CrO_3) in dil. H_2SO_4

34. The acids which do not contain a —COOH group

(1) picric acid (2) lactic acid
(3) carbolic acid (4) propanoic acid

35. Which of the following can act as a Lewis base ?

(1) NCl_3 (2) PCl_3
(3) NBr_3 (4) $SbCl_3$

36. Auto reduction process is used for the extraction of

(1) Cu (2) Hg
(3) Pb (4) Al

37. $K_4[Fe(CN)_6]$ is used for the detection of

(1) Zn^{2+} ions (2) Cu^{2+} ions
(3) Fe^{3+} ions (4) Fe^{2+} ions

38. Hydrogen can be obtained from water, by the action of water on

(1) calcium carbide (2) calcium hydride
(3) calcium oxide (4) calcium

39. Which of the following are ores of lead ?

(1) Galena (2) Anglesite
(3) Cerussite (4) Plumbago

40. Which of the following have asymmetric carbon atom ?

(1) $CH_2Cl—CH_2Br$
(2) CH_3CHDCl
(3) CH_3CHCl_2
(4) $CH_2Br—CHOH—CH_3$

41. Which of the following carbide can be used to prepare methane by its action with water ?

(1) Aluminium carbide
(2) Beryllium carbide
(3) Calcium carbide
(4) Silicon carbide

42. Phenol is less acidic than

(1) acetic acid (2) *p*-methoxyphenol
(3) *p*-nitrophenol (4) ethanol

43. The products of reaction of alcoholic silver nitrite with ethyl bromide are

(1) ethanol (2) nitroethane
(3) ethene (4) ethyl nitrite

44. The raw material to form nylon is

(1) adipic acid
(2) hexamethylene diamine
(3) isoprene
(4) butadine

45. The base units that are present is DNA are
(1) adenine (2) guanine
(3) cytosine (4) uracil

46. The positive carbyl amine test is given by
(1) N,N-dimethyl aniline
(2) 2,4-dimethyl aniline
(3) N-methyl-*o*-methyl aniline
(4) *p*-methyl benzylamine

47. Which are reducing sugar ?
(1) Glucose (2) Fructose
(3) Mannose (4) Sucrose

48. CO_2 is isostructural with
(1) $HgCl_2$ (2) C_2H_2
(3) $SnCl_2$ (4) NO_2

49. The oxidation reactions are
(1) $Sn^{2+} \longrightarrow Sn^{4+}$ (2) $Fe^{3+} \longrightarrow Fe^{2+}$
(3) $F^- \longrightarrow F$ (4) $Pb^{2+} \longrightarrow Pb$

50. Decrease in atomic number is observed during :
(1) alpha emission (2) positron emission
(3) electron emission (4) beta emission

Zoology

Section-A

1. Cockroach and other insects have blood which
(a) resembles human blood in colour
(b) has RBCs
(c) circulates through arteries and veins
(d) circulates through an open system

2. Albinos have been reported in
(a) white race (b) black race
(c) both (a) and (b) (d) none of these

3. Cranial capacity of *Australopithecus* was
(a) 350–450 cm^3 (b) 650–700 cm^3
(c) 1050–1150 cm^3 (d) 1400–1450 cm^3

4. Which law of evolution states that "warm-blooded" mammals of hot and humid areas have abundant melanin pigment ?
(a) Dollo's law (b) Gloger's law
(c) Cope's law (d) Gause's law

5. Reason of death of a patient of cobra-bite is
(a) destruction of RBCs
(b) inactivation of nerves
(c) permanent contraction of muscles
(d) none of the above

6. The most important component of contraceptive pills is
(a) progesterone (b) growth hormone
(c) thyroxine (d) luteinizing hormone

7. Yolk plug forms during
(a) morula-formation
(b) blastula-formation
(c) gastrula
(d) neurulation

8. In which of the following only cone cells are found ?
(a) Fovea centralis (b) Retina
(c) Fossa ovalis (d) Blind spots

9. Hepatic portal system collects blood from
(a) liver (b) lungs
(c) kidney (d) alimentary canal

10. The first digit of the forearm is termed
(a) pollex (b) hallux
(c) pollux (d) none of these

11. Bidder's canal is meant for passage of
(a) ova (b) urine
(c) sperms (d) all of these

12. Striped muscle fibre has
(a) one nucleus (b) two nucleus
(c) many nuclei (d) no nuclei

13. Billroth's cords are characteristic of
(a) spinal cord (b) notochord
(c) nerve cord (d) spleen

14. Nuhn's glands are present in
(a) intestine (b) tongue
(c) skin (d) stomach

15. Amylopsin acts upon
(a) polysaccharide in any medium
(b) polysaccharide in acidic medium
(c) polysaccharide in alkaline medium
(d) polypeptides

16. Hypoxia is the condition in which less oxygen becomes available to the tissues. This may be due to
(a) lesser oxygen in the atmosphere
(b) more CO in air
(c) less RBCs in blood
(d) all of the above

17. Carotid labyrinth contains
(a) olfactoreceptors (b) baroreceptors
(c) chemoreceptors (d) phonoreceptors

18. Juxtaglomerular cells of renal cortex synthesizes a hormone called
(a) ADH (b) oxytoxin
(c) renin (d) urochrome

19. Corpora striata occur in
(a) cerebrum (b) cerebellum
(c) medulla (d) diencephalon

20. A point mutation comprising the substitution of purine by pyrimidine is called
(a) deletion (b) transition
(c) transversion (d) translocation

21. Exoskeleton/scales are absent in
(a) fishes (b) reptiles
(c) *Ichthyophis* (d) *Rana tigrina*

22. Gill cover is absent in
(a) shark (b) *Labeo*
(c) salmon (d) all of these

23. The cyst wall of *Euglena* is made up of
(a) lipids (b) histones
(c) carbohydrates (d) lipoproteins

24. The class of coelenterate which exhibits polymorphism ?
(a) Hydrozoa (b) Scyphozoa
(c) Anthozoa (d) All of these

25. Which pairing is not correct?
(a) *Stegomyia* — Yellow fever
(b) *Pediculus* —Trench fever
(c) *Culex* — Malaria
(d) *Xenopsylla* —Bubonic plague

Section-B

Direction : *In the following questions more than one of the answers given may be correct. Select the correct answers and mark it according to the code.*

Codes :
(a) 1, 2 and 3 are correct
(b) 1 and 2 are correct
(c) 2 and 4 are correct
(d) 1 and 3 are correct

26. On the basis of nature of maternal and foetal tissue, types of placenata are
(1) haemochorial placenta
(2) haemoendothelial placenta
(3) cotyledonary placenta
(4) deciduate placenta

27. Antigenic determinant sites bind to which portions of an antibody molecule ?
(1) light chain (2) heavy chain
(3) intermediate chains (4) plasma cells

28. Types of quill (flight) feathers are
(1) down feathers (2) covert
(3) filoplume (4) remiges

29. Which of the following factors raise the P_{50} value and shifts the HbO_2 dissociation curve to right and vice versa ?
(1) Rise in PCO_2
(2) Rise in H^+ ions (= fall in pH)
(3) Fall in temperature
(4) Fall in diphosphoglyceric acid

30. Which of the following are fat soluble vitamins ?
(1) Retinol (2) Calciferol
(3) Tocopherol (4) Riboflavin

31. Uric acid is an excretory product of
(1) insects (2) birds
(3) terrestrial reptiles (4) mammals

32. Spongy or cancellous bones are
(1) skull bones (2) vertebrae
(3) femur (4) ribs

33. Cowper's gland secrete a substance to
(1) nourish sperms
(2) neutralize acidity
(3) kill pathogens
(4) lubricate female's vagina to facilitate copulation

34. The valve situated between the left atrium and left ventricle is called
(1) bicuspid valve (2) tricuspid valve
(3) mitral valve (4) eustachian valve

35. Bipolar neurons occur in
(1) retina of eyes (2) olfactory epithelium
(3) inner ear (4) brain

36. Cardiac muscles are
(1) striated (2) voluntary
(3) involuntary (4) nonstriated

37. Anterior lobe of pituitary gland secretes
(1) ACTH, TSH and oxytocin
(2) STH, GH and TSH
(3) TSH ADH and prolactin
(4) FSH, GH and LH

38. Which of the following is true about preen gland ?
(1) Occur in birds
(2) Also known as uropygial gland
(3) Occur in bats
(4) Help in digestion

39. Cartilaginous fishes have
(1) placoid scales
(2) cycloid or ctenoid scales
(3) scroll valve
(4) operculum

40. Which of the following belongs to phylum Arthropoda ?
(1) Cockroach (2) Goldfish
(3) Silverfish (4) Cuttlefish

41. Structures present in a mature proglottid are
(1) a pair of longitudinal nerve cord (lateral nerve cord)
(2) Mehli's gland
(3) cirrus sac
(4) one ovary and two oviducts

42. Proteolytic enzymes present in the pancreatic juice are
(1) pepsin (2) elastase
(3) salivary amylase (4) chymotrypsin

43. RBC and adipose tissue cells respire anaerobically because they
(1) possess very few mitochondria
(2) require much less energy
(3) possess very few mitochondria and a large amount of energy
(4) possess carbonic anhydrase

44. The coats of eyeball are
(1) sclera (2) retina
(3) conjunctiva (4) otolith membrane

45. Which of the following structure is absent in forelimb of frog ?
(1) Brachium (2) Web
(3) Antebrachium (4) Tarsal

46. P-wave of ECG indicates
(1) depolarization of atrial muscles
(2) activation of SA-node
(3) spread of excitation from SA node to AV node
(4) repolarization of atria and depolarisation of ventricles

47. Which of the following cranial nerves are mixed ?
(1) Vagus (2) Trigeminal
(3) Glossopharyngeal (4) Auditory

48. Which of the following is correct grouping ?
(1) Ectoderm—retina, epidermis, nervous system
(2) Mesoderm—ovary, urinary bladder, Kidney
(3) Mesoderm—kidney, connective tissue, testis
(4) Endoderm—thyroid, pineal gland, thymus

49. Heterochromatin
(1) contains a highly repetitice sequence of DNA
(2) is the inert segment of the chromosome adjacent to the centromere
(3) is tightly coiled during the interphase
(4) lightly stained regions

50. Which of the following are haploid in nature ?
(1) Spermatids
(2) Secondary spermatocytes
(3) Spermatogonia
(4) Primary spermatocytes

Botany

Section-A

1. Hormogonia are the vegetative reproductive structures of
(a) *Chlamydomonas* (b) *Spirogyra*
(c) *Oscillatoria* (d) *Ulothrix*

2. *Azotobacter* and *Beijerinckia* are the examples of
(a) symbiotic nitrogen-fixers
(b) non-symbiotic nitrogen-fixers
(c) ammonifying bacteria
(d) disease causing bacteria

3. *Smilax* a climbing genus belongs to
(a) Cucurbitaceae (b) Solanaceae
(c) Liliaceae (d) Cruciferae

4. In certain parts of India, muscular distrophy is commonly found amongst the poor people because they eat cheap pulse from the plant
(a) *Pisum satiuvm*
(b) *Lathyrus sativus*
(c) *Cicer arietinum*
(d) *Phaseolus mungo*

5. If a dwarf pea plant was treated with gibberellic acid, it became as tall, as tall pea plants. If these pea plants are crossed with pure tall pea plants, what will be the phenotypic ratio in F_1 generation ?
(a) All dwarf plants
(b) 50% tall and 50% dwarf plants
(c) 75% tall and 25% dwarf plants
(d) 100% tall plants

6. Colchicine is obtained from *Colchicum automnale*. It belongs to family
(a) Leguminosae (b) Solanaceae
(c) Asteraceae (d) Liliaceae

7. Moll's experiment explains that
(a) carbon dioxide is essential for photosynthesis
(b) chlorophyll and water are necessary for photosynthesis
(c) light and water are essential for photosynthesis
(d) all of the above are correct

8. Energy transfer from one traphic level to other in a food chain is
(a) 10% (b) 20%
(c) 1% (d) 2%

9. Stem is reduced in
(a) rhizome (b) corm
(c) bulb (d) tuber

10. Heterophylly of *Limnophila* is
(a) environmental (b) developmental
(c) habitual (d) adaptive

11. Synandrous condition is the fusion of
(a) filaments only
(b) both filaments and anthers
(c) anthers only
(d) petals

12. Which one yields sunn hemp ?
(a) *Corchorus* (b) *Hibiscus*
(c) *Crotolaria* (d) *Cannabis*

13. Rod-shaped elongated thick-walled lignified dead cells found in seed coat of pulses (legumes) are
(a) macrosclereids (b) astrosclereids
(c) brachysclereids (d) osteosclereids

14. Dicot root having more than six vascular bundles are found in
(a) Pea (b) Sunflower
(c) *Ficus* (d) *Ranunculus*

15. Regulator gene controls chemical synthesis (Operon concept) by
(a) inhibiting transcription of *m*RNA
(b) inhibiting enzymes
(c) inhibiting passage of *m*RNA
(d) inhibiting substrate enzyme reaction

16. 'Illegitimate crossing over' is another term for
(a) transition
(b) transversion
(c) reciprocal translocation
(d) none of the above

17. A substance unrelated to substrate but capable of reversibly changing activity of enzyme by binding to a site other than active site is called
(a) competitive inhibitor
(b) non-competitive inhibitor
(c) catalytic inhibitor
(d) allosteric modulator/inhibitor

18. Golgi apparatus is absent in
(a) higher plants
(b) yeast
(c) bacteria and blue-green algae
(d) liver cells

19. Which one is common amongst nucleus, chloroplast and mitochondria ?
(a) Cristae
(b) Thylakoids
(c) Nucleic acid
(d) Carbohydrate metabolism

20. Sporocarp is a reproductive structure of
(a) some algae
(b) some aquatic ferns
(c) angiosperms having spores
(d) bryophytes

21. Pond ecosystem shows
(a) inverted pyramid of number
(b) inverted pyramid of biomass
(c) upright pyramid of biomass
(d) inverted pyramid of energy

22. Under anaerobic conditions, bacterium *Pseudomonas* changes
(a) nitrate to molecular nitrogen
(b) nitrate to ammonia
(c) nitrate to nitrite
(d) nitrite to nitrate

23. Deciduous forests have
(a) variety of grasses
(b) broad-leaved trees
(c) narrow-leaved trees
(d) variety of crocodiles

24. Physiologically active form of phytochrome is
(a) P_{730}/P_{Fr} (b) P_{660}/Pr
(c) P_{700} (d) P_{680}

25. The archesporium of ovule is
(a) single celled terminal
(b) single celled central
(c) single celled hypodermal
(d) single celled lateral

Section-B

Direction : *In the following questions more than one of the answers given may be correct. Select the correct answers and mark it according to the code.*

Codes :
(1) 1, 2 and 3 are correct
(2) 1 and 2 are correct
(3) 2 and 4 are correct
(4) 1 and 3 are correct

26. Pollen tube of *Cycas* acts
(1) as an agent for carrying male gamete to the egg
(2) as a haustorium
(3) as endosperm
(4) as female cone

27. Which of the following conditions are necessary for the growth of the moulds, *Mucor* or *Penicillium* ?
(1) Warmth (2) Carbohydrate
(3) Water (4) Light

28. Latex vessels are found in
(1) *Calotropis* (2) *Hevea*
(3) *Oleander* (4) Papaya

29. Which of the following characteristics are associated with halophytes plants ?
(1) Presence of pneumatophores
(2) Leaves and stem have hairy and waxy covering
(3) Shows viviparous germination
(4) Leaves show heterophylly

30. The characteristic feature of leghaemoglobin are
(1) it is a source of energy
(2) it is a pinkish colour pigment found in nodules
(3) activated by the presence of Mg^{2+} ions
(4) it protects nitrogen fixing enzyme nitrogenase from oxygen

31. Cyathium is characterised by
(1) single female flower surrounded by many male flowers
(2) as involucre of bracts enclosing all the flowers
(3) fleshy inflorescence axis with a pearshaped cavity inside
(4) single male flower surrounded by many female flowers

32. Parietal placentation is found in the members of
(1) family cucurbitaceae
(2) family solanaceae
(3) family brassicaceae
(4) family leguminosae

33. Which of the following is true regarding guttation ?
(1) Occurs through stomata
(2) Occurs through hydathodes
(3) Loss of pure water
(4) Occurs mostly during night and early morning

34. Which of the following statements are true for complementary genes ?
(1) Both the genes interact to produce a complementary new trait
(2) Pair of nonallelic genes
(3) The F_2 ratio is generally 9 : 7
(4) The F_2 ratio is generally 9 : 3 : 4

35. Coenzymes
(1) act as a donor of groups of atoms added to the substrate
(2) act as an acceptor of groups of atoms removed from the substrate
(3) can not be easily separated from apoenzyme
(4) do not act as prosthetic group

36. Suckers are
(1) formed from the internode of underground stem
(2) formed from the node of underground stem
(3) roots which are formed from the upper portion of nodes
(4) roots which are formed from the lower portion of nodes

37. Non-cyclic photophosphorylation produces
(1) NADPH (2) ATP and O_2
(3) ATP only (4) O_2 only

38. C_4 pathway occurs
(1) only in monocots (2) in monocots
(3) in most of the dicots (4) in few dicots

39. Link between glycolysis, Krebs' cycle and β-oxidation of fatty acid or carbohydrate and fat metabolism is
(1) Acetyl CoA
(2) a compound formed by oxidative de-carboxylation
(3) a 2-carbon compound
(4) oxaloacetic acid

40. The enzymes taking part in recombinant DNA technology are
(1) restriction endonuclease
(2) ligase
(3) reverse transcriptase
(4) phosphatase

41. The mode of asexual reproduction in bacteria are
(1) formation of gametes
(2) endospore formation
(3) conjugation
(4) zoospores formation

42. Acid rain is caused by
(1) sulphur dioxide (2) hydrogen chloride
(3) nitrogen oxides (4) phosphates

43. Censer mechanism is found in
(1) *Aristolochia* (2) *Antirrhinum*
(3) *Papaver* (4) *Clematis*

44. Aerenchyma is present in which of the following plants ?
(1) *Neptunia* (2) *Potamogeton*
(3) *Bryophyllum* (4) *Vallisneria*

45. One internode long phylloclade is found in
(1) Ruscus (2) Opuntia
(3) Asparagus (4) Calotropis

46. In a dicot plant, the epibasal tier forms
(1) cotyledons (2) plumule
(3) hypocotyl (4) radicle

47. Morphogenesis in plants is controlled by
(1) Auxins (2) Gibberellins
(3) Cytokinins (4) Abscisic acid

48. Which of the following chemical reactions are associated with photorespiration ?
(1) $RuBP + O_2 \xrightarrow{\text{RuBP oxygenase}} PGA + \text{Phosphoglycolate}$
(2) $\text{Glycolate} + O_2 \xrightarrow{\text{Oxidase}} \text{Glyoxylate} + H_2O_2$
(3) $\text{Glycerate} + ATP \xrightarrow[H_2]{\text{Kinase}} 3\text{phosphoglycerate} + ADP$
(4) $RuBP + CO_2 \xrightarrow[\text{Carboxylase}]{\text{RuBP}} 2PGA$

49. Agar-agar is
(1) a jelly like substance, employed in the manufacture of ice cream
(2) used in culture medium for microorganisms as solidifying agent
(3) obtained from Gelidium, Gracilaria
(4) a product of brown algae

50. Epigeal germination occurs
(1) due to the growth and elongation of hypocotyl
(2) in papaya and cotton
(3) in maize and rice
(4) due to elongation of epicotyl