

SEAL

Test Booklet Code

GHM

No.: 4223348

This Booklet contains 20 pages.

D

Do not open this Test Booklet until you are asked to do so.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on side-1 and side-2 carefully with blue/black ball point pen only.
2. The test is of 3 hours duration and Test Booklet contains 180 questions. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For each incorrect response, one mark will be deducted from the total scores. The maximum marks are 720.
3. Use Blue/Black Ball Point Pen only for writing particulars on this page/ marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.
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7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is NOT permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over Answer Sheet and dealt with as an unfair means case.
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/ Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals): HARSHITA SHERMAWAT

Roll Number : in figures 64100528

: in words Sixty four thousand five hundred & twenty eight only

Centre of Examination (in Capitals): JAWAHAR SR. SEC SCHOOL

Candidate's Signature: Harshita Invigilator's Signature: _____

Fascimile signature stamp of _____

Centre Superintendent _____



SEAL

1. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of 15 ms^{-1} . Then, the frequency of sound that the observer hears in the echo reflected from the cliff is :

(Take velocity of sound in air = 330 ms^{-1})

- (1) 838 Hz
- (2) 885 Hz
- (3) 765 Hz
- (4) 800 Hz

$$f = 800 = 6 \left(\frac{330 - 15}{330 - 15} \right)$$

$$f = \frac{900 \times 60}{63} = \frac{315 \times 63}{60}$$

2. Out of the following options which one can be used to produce a propagating electromagnetic wave ?

- (1) A chargeless particle
- (2) An accelerating charge
- (3) A charge moving at constant velocity
- (4) A stationary charge

$$\frac{46 \times 10^3}{63}$$

3. An inductor 20 mH, a capacitor 50 μF and a resistor 40 Ω are connected in series across a source of emf $V = 10 \sin 340 t$. The power loss in A.C. circuit is :

- (1) 0.76 W
- (2) 0.89 W
- (3) 0.51 W
- (4) 0.67 W

$$\frac{0.51 \times 100}{63}$$

$$\frac{63 \times 10}{72} = \frac{63 \times 10}{72}$$

4. Match the corresponding entries of column 1 with column 2. [Where m is the magnification produced by the mirror]

Column 1

Column 2

- | | |
|------------------------|--------------------------|
| (A) $m = -2$ | (a) <u>Convex mirror</u> |
| (B) $m = -\frac{1}{2}$ | (b) Concave mirror |
| (C) $m = +2$ | (c) Real image |
| (D) $m = +\frac{1}{2}$ | (d) Virtual image |

- (1) A → a and d; B → b and c; C → b and d; D → b and c
- (2) A → c and d; B → b and d; C → b and c; D → a and d
- (3) A → b and c; B → b and c; C → b and d; D → a and d
- (4) A → a and c; B → a and d; C → a and b; D → c and d

5. Coefficient of linear expansion of brass and steel rods are α_1 and α_2 . Lengths of brass and steel rods are l_1 and l_2 respectively. If $(l_2 - l_1)$ is maintained same at all temperatures, which one of the following relations holds good ?

- (1) $\alpha_1^2 l_2 = \alpha_2^2 l_1$
- (2) $\alpha_1 l_1 = \alpha_2 l_2$
- (3) $\alpha_1 l_2 = \alpha_2 l_1$
- (4) $\alpha_1 l_2^2 = \alpha_2 l_1^2$

6. At what height from the surface of earth the gravitation potential and the value of g are $-5.4 \times 10^7 \text{ J kg}^{-2}$ and 6.0 ms^{-2} respectively? Take the radius of earth as 6400 km :

- (1) 1400 km
- (2) 2000 km
- (3) 2600 km
- (4) 1600 km

7. A piece of ice falls from a height h so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted into heat during its fall. The value of h is : [Latent heat of ice is $3.4 \times 10^5 \text{ J/kg}$ and $g = 10 \text{ N/kg}$]

- (1) 136 km
- (2) 68 km
- (3) 34 km
- (4) 544 km

8. In a diffraction pattern due to a single slit of width 'a', the first minimum is observed at an angle 30° when light of wavelength 5000 \AA is incident on the slit. The first secondary maximum is observed at an angle of :

- (1) $\sin^{-1} \left(\frac{1}{2} \right)$
- (2) $\sin^{-1} \left(\frac{3}{4} \right)$
- (3) $\sin^{-1} \left(\frac{1}{4} \right)$
- (4) $\sin^{-1} \left(\frac{2}{3} \right)$

9. A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf's is :

- (1) 3 : 4
- (2) 3 : 2
- (3) 5 : 1
- (4) 5 : 4

10. A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8×10^{-4} J by the end of the second revolution after the beginning of the motion ?

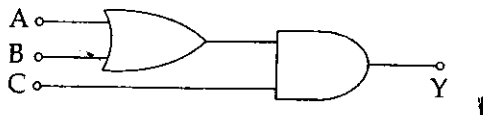
- (1) 0.18 m/s²
- (2) 0.2 m/s²
- (3) 0.1 m/s²
- (4) 0.15 m/s²

11. An air column, closed at one end and open at the other, resonates with a tuning fork when the smallest length of the column is 50 cm. The next larger length of the column resonating with the same tuning fork is :

- (1) 150 cm
- (2) 200 cm
- (3) 66.7 cm
- (4) 100 cm

$$L = \frac{\lambda}{4}$$

12. To get output 1 for the following circuit, the correct choice for the input is :



- (1) A = 1, B = 1, C = 0
- (2) A = 1, B = 0, C = 1
- (3) A = 0, B = 1, C = 0
- (4) A = 1, B = 0, C = 0

13. A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then :

- (1) Compressing the gas isothermally or adiabatically will require the same amount of work.
- (2) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.
- (3) Compressing the gas isothermally will require more work to be done.
- (4) Compressing the gas through adiabatic process will require more work to be done.

14. The intensity at the maximum in a Young's double slit experiment is I_0 . Distance between two slits is $d = 5\lambda$, where λ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 10d$?

- (1) $\frac{3}{4} I_0$
- (2) $\frac{I_0}{2}$
- (3) I_0
- (4) $\frac{I_0}{4}$

$$y = \frac{\lambda D}{d}$$

15. A car is negotiating a curved road of radius R. The road is banked at an angle θ . The coefficient of friction between the tyres of the car and the road is μ_s . The maximum safe velocity on this road is :

- (1) $\sqrt{\frac{g}{R} \frac{\mu_s + \tan\theta}{1 - \mu_s \tan\theta}}$
- (2) $\sqrt{\frac{g}{R^2} \frac{\mu_s + \tan\theta}{1 - \mu_s \tan\theta}}$
- (3) $\sqrt{gR^2 \frac{\mu_s + \tan\theta}{1 - \mu_s \tan\theta}}$
- (4) $\sqrt{gR \frac{\mu_s + \tan\theta}{1 - \mu_s \tan\theta}}$

$$L T^{-2}$$

$$V = a t$$

$$L T^{-1} = L T^{-2} \times L^2$$

$$L \times L T^{-2}$$

$$L T^{-2}$$

D

16. An electron of mass m and a photon have same energy E . The ratio of de-Broglie wavelengths associated with them is:

- (1) $c(2mE)^{\frac{1}{2}}$ $\lambda = \frac{h}{mv} \Rightarrow \frac{E}{mv \times v}$
- (2) $\frac{1}{c} \left(\frac{2m}{E} \right)^{\frac{1}{2}}$
- (3) $\frac{1}{c} \left(\frac{E}{2m} \right)^{\frac{1}{2}}$ $h\nu = E$
 $h = \frac{E + P^2}{2m}$
 $\frac{E \times \pi \times 10^8 \times 12}{m \times c \times 2m}$
- (4) $\left(\frac{E}{2m} \right)^{\frac{1}{2}}$
- (c being velocity of light)

17. A black body is at a temperature of 5760 K. The energy of radiation emitted by the body at wavelength 250 nm is U_1 , at wavelength 500 nm is U_2 and that at 1000 nm is U_3 . Wien's constant, $b = 2.88 \times 10^6$ nmK. Which of the following is correct?

- (1) $U_1 > U_2$
- (2) $U_2 > U_1$
- (3) $U_1 = 0$
- (4) $U_3 = 0$
- $\lambda = 10^3$

18. Given the value of Rydberg constant is 10^7 m^{-1} , the wave number of the last line of the Balmer series in hydrogen spectrum will be:

- (1) $0.25 \times 10^7 \text{ m}^{-1}$
- (2) $2.5 \times 10^7 \text{ m}^{-1}$
- (3) $0.025 \times 10^4 \text{ m}^{-1}$
- (4) $0.5 \times 10^7 \text{ m}^{-1}$
- $\frac{10^7 - 1 \times 10^7}{4 \times 10^7 - 6 \times 10^7} \times 10^7 = \frac{1}{7}$
 $\frac{10^7}{12} = \frac{1}{7}$

19. A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800Ω is connected in the collector circuit and the voltage drop across it is 0.8 V. If the current amplification factor is 0.96 and the input resistance of the circuit is 192Ω , the voltage gain and the power gain of the amplifier will respectively be:

- (1) 4, 4
- (2) 4, 3.69
- (3) 4, 3.84
- (4) 3.69, 3.84
- $R_L = 800 \Omega$
 $V_A = 0.8 \text{ V}$

20. Two non-mixing liquids of densities ρ and $n\rho$ ($n > 1$) are put in a container. The height of each liquid is h . A solid cylinder of length L and density d is put in this container. The cylinder floats with its axis vertical and length pL ($p < 1$) in the denser liquid. The density d is equal to:

- (1) $[2 + (n-1)p]\rho$
- (2) $[1 + (n-1)p]\rho$
- (3) $[1 + (n+1)p]\rho$
- (4) $[2 + (n+1)p]\rho$

21. If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1s and 2s is:

- (1) $\frac{3}{2}A + \frac{7}{3}B$ $v = At + Bt^2$
 $= A + B \times 2$
 $(2A + 6B)$
- (2) $\frac{A}{2} + \frac{B}{3}$
- (3) $\frac{3}{2}A + 4B$
- (4) $3A + 7B$ $2A + 5B = A + 3B$

22. An astronomical telescope has objective and eyepiece of focal lengths 40 cm and 4 cm respectively. To view an object 200 cm away from the objective, the lenses must be separated by a distance:

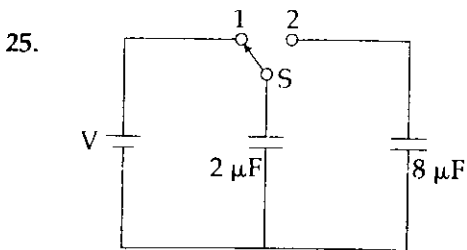
- (1) 50.0 cm
- (2) 54.0 cm
- (3) 37.3 cm
- (4) 46.0 cm
- $\Delta p = 20 \text{ cm}$
 $M_p = 20 \text{ cm}$

23. The ratio of escape velocity at earth (v_e) to the escape velocity at a planet (v_p) whose radius and mean density are twice as that of earth is:

- (1) 1:4
- (2) 1: $\sqrt{2}$
- (3) 1:2
- (4) 1:2 $\sqrt{2}$
- $v_e = \sqrt{\frac{2GM}{R}}$
 $v_p = \sqrt{\frac{2GM_p}{R_p}}$
 $\frac{v_e}{v_p} = \frac{\sqrt{\frac{2GM}{R}}}{\sqrt{\frac{2GM_p}{R_p}}} = \frac{\sqrt{2} \times \sqrt{GM}}{\sqrt{2} \times \sqrt{GM}} = 1$

24. A long straight wire of radius a carries a steady current I . The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B' , at radial distances $\frac{a}{2}$ and $2a$ respectively, from the axis of the wire is:

- (1) 1
- (2) 4
- (3) $\frac{1}{4}$
- (4) $\frac{1}{2}$
- $\frac{1}{2} = \frac{\sqrt{2} \times \sqrt{GM} \times \sqrt{GM}}{\sqrt{2} \times \sqrt{GM}} = \frac{\sqrt{2} \times \sqrt{GM} \times \sqrt{2} \times \sqrt{GM}}{\sqrt{2} \times \sqrt{GM}}$
 $\Rightarrow \frac{\sqrt{2} \times \sqrt{GM} \times \sqrt{GM}}{\sqrt{2} \times \sqrt{GM}}$



A capacitor of $2 \mu\text{F}$ is charged as shown in the diagram. When the switch S is turned to position 2, the percentage of its stored energy dissipated is :

- (1) 75%
- (2) 80%
- (3) 0%
- (4) 20%

26. When a metallic surface is illuminated with radiation of wavelength λ , the stopping potential is V . If the same surface is illuminated with radiation of wavelength 2λ , the stopping potential is $\frac{V}{4}$. The threshold wavelength for the metallic surface is :

- (1) $\frac{5}{2} \lambda$ *q.v. = w +*
- (2) 3λ
- (3) 4λ
- (4) 5λ

27. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is :

- (1) 45° *A + B = A - B*
- (2) 180° *180 = 0*
- (3) 0°
- (4) 90°

28. A body of mass 1 kg begins to move under the action of a time dependent force $\vec{F} = (2t\hat{i} + 3t^2\hat{j})\text{N}$, where \hat{i} and \hat{j} are unit vectors along x and y axis. What power will be developed by the force at the time t ?

- (1) $(2t^3 + 3t^4) \text{ W}$ *P = F \cdot v*
 - (2) $(2t^3 + 3t^5) \text{ W}$
 - (3) $(2t^2 + 3t^3) \text{ W}$ *P = a \cdot v*
 - (4) $(2t^2 + 4t^4) \text{ W}$ *v = 2 + 6t*
- v = 6*

29. The angle of incidence for a ray of light at a refracting surface of a prism is 45° . The angle of prism is 60° . If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are :

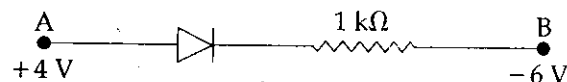
- (1) $45^\circ; \sqrt{2}$
- (2) $30^\circ; \frac{1}{\sqrt{2}}$
- (3) $45^\circ; \frac{1}{\sqrt{2}}$
- (4) $30^\circ; \sqrt{2}$

30. A particle moves so that its position vector is given by $\vec{r} = \cos \omega t \hat{x} + \sin \omega t \hat{y}$. Where ω is a constant.

Which of the following is true ?

- (1) Velocity is perpendicular to \vec{r} and acceleration is directed towards the origin.
- (2) Velocity is perpendicular to \vec{r} and acceleration is directed away from the origin.
- (3) Velocity and acceleration both are perpendicular to \vec{r} .
- (4) Velocity and acceleration both are parallel to \vec{r} .

31. Consider the junction diode as ideal. The value of current flowing through AB is :



- (1) 10^{-1} A *-2 = v*
- (2) 10^{-3} A *I = V/R => = -2 / (1 x 10^3)*
- (3) 0 A
- (4) 10^{-2} A *-2 x*

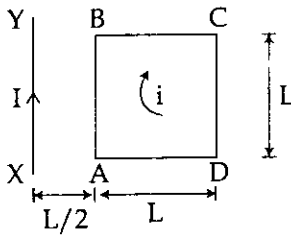
32. Two identical charged spheres suspended from a common point by two massless strings of lengths l , are initially at a distance d ($d \ll l$) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v . Then v varies as a function of the distance x between the spheres, as :

- (1) $v \propto x^{-\frac{1}{2}}$
- (2) $v \propto x^{-1}$
- (3) $v \propto x^{\frac{1}{2}}$ *2t +*
- (4) $v \propto x$

33. A small signal voltage $V(t) = V_0 \sin \omega t$ is applied across an ideal capacitor C :
- (1) Current $I(t)$ is in phase with voltage $V(t)$.
 - (2) Current $I(t)$ leads voltage $V(t)$ by 180° .
 - (3) Current $I(t)$, lags voltage $V(t)$ by 90° .
 - (4) Over a full cycle the capacitor C does not consume any energy from the voltage source.

34. The magnetic susceptibility is negative for :
- (1) ferromagnetic material only
 - (2) paramagnetic and ferromagnetic materials
 - (3) diamagnetic material only
 - (4) paramagnetic material only

35. A square loop ABCD carrying a current i , is placed near and coplanar with a long straight conductor XY carrying a current I , the net force on the loop will be :



- (1) $\frac{2\mu_0 i I L}{3\pi}$
- (2) $\frac{\mu_0 i I L}{2\pi}$
- (3) $\frac{2\mu_0 i I}{3\pi}$
- (4) $\frac{\mu_0 i I}{2\pi}$

36. A uniform rope of length L and mass m_1 hangs vertically from a rigid support. A block of mass m_2 is attached to the free end of the rope. A transverse pulse of wavelength λ_1 is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is λ_2 . The ratio λ_2/λ_1 is :

- (1) $\sqrt{\frac{m_2}{m_1}}$
- (2) $\sqrt{\frac{m_1 + m_2}{m_1}}$
- (3) $\sqrt{\frac{m_1}{m_2}}$
- (4) $\sqrt{\frac{m_1 + m_2}{m_2}}$

37. When an α -particle of mass ' m ' moving with velocity ' v ' bombards on a heavy nucleus of charge ' Ze ', its distance of closest approach from the nucleus depends on m as :

- (1) $\frac{1}{m^2}$
- (2) m
- (3) $\frac{1}{m}$
- (4) $\frac{1}{\sqrt{m}}$

38. A disk and a sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of the two objects gets to the bottom of the plane first ?

- (1) Both reach at the same time
- (2) Depends on their masses
- (3) Disk
- (4) Sphere

39. From a disc of radius R and mass M , a circular hole of diameter R , whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre ?

- (1) $11 MR^2/32$
- (2) $9 MR^2/32$
- (3) $15 MR^2/32$
- (4) $13 MR^2/32$

40. A long solenoid has 1000 turns. When a current of 4A flows through it, the magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self-inductance of the solenoid is :

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

41. What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop ?

- (1) $\sqrt{3gR}$
- (2) $\sqrt{5gR}$
- (3) \sqrt{gR}
- (4) $\sqrt{2gR}$

42. The molecules of a given mass of a gas have r.m.s. velocity of 200 ms^{-1} at 27°C and $1.0 \times 10^5 \text{ Nm}^{-2}$ pressure. When the temperature and pressure of the gas are respectively, 127°C and $0.05 \times 10^5 \text{ Nm}^{-2}$, the r.m.s. velocity of its molecules in ms^{-1} is:

- (1) $\frac{100\sqrt{2}}{3}$
- (2) $\frac{100}{3}$
- (3) $100\sqrt{2}$
- (4) $\frac{400}{\sqrt{3}}$

Handwritten notes for Q42:

$$V_{\text{rms}} = \sqrt{\frac{3P}{\rho}}$$

$$\frac{V_1}{V_2} = \sqrt{\frac{P_1 \rho_2}{P_2 \rho_1}}$$

$$\frac{200}{V_2} = \sqrt{\frac{1.0 \times 10^5 \times 100}{0.05 \times 10^5 \times 100}}$$

$$V_2 = \frac{200}{\sqrt{2}} = \frac{200}{\sqrt{3}}$$

43. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$, where a and b are positive constants. The total heat produced in R is:

- (1) $\frac{a^3R}{2b}$
- (2) $\frac{a^3R}{b}$
- (3) $\frac{a^3R}{6b}$
- (4) $\frac{a^3R}{3b}$

Handwritten notes for Q43:

$$m + \frac{v}{t} = m + \frac{v}{t}$$

$$v = \frac{50 \times 25}{2 \times 100}$$

$$a = \frac{25}{100 \times 2}$$

44. A refrigerator works between 4°C and 30°C . It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is: (Take $1 \text{ cal} = 4.2 \text{ Joules}$)

- (1) 236.5 W
- (2) 2365 W
- (3) 2.365 W
- (4) 23.65 W

Handwritten notes for Q44:

$$v^2 = \dots$$

$$v = at$$

$$P = a \cdot v$$

45. A uniform circular disc of radius 50 cm at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of 2.0 rad s^{-2} . Its net acceleration in ms^{-2} at the end of 2.0 s is approximately:

- (1) 6.0
- (2) 3.0
- (3) 8.0
- (4) 7.0

Handwritten notes for Q45:

$$a = \dots$$

$$F \times r = \tau$$

$$m \times r \times \frac{50}{2 \times 100} = m \times 2$$

$$a = \frac{4}{2}$$

46. Which of the following would appear as the pioneer organisms on bare rocks?

- (1) Mosses
- (2) Green algae
- (3) Lichens
- (4) Liverworts

Handwritten calculation for Q46:

$$\frac{400}{v^2} = \frac{300}{400}$$

47. Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of following options:

- (1) The above processes happen only during night time.
- (2) One process occurs during day time, and the other at night.
- (3) Both processes cannot happen simultaneously.
- (4) Both processes can happen together because the diffusion coefficient of water and CO_2 is different.

48. Lack of relaxation between successive stimuli in sustained muscle contraction is known as:

- (1) Tetanus
- (2) Tonus
- (3) Spasm
- (4) Fatigue

Handwritten calculations for Q48:

$$v^2 = \frac{400 \times 400}{300}$$

$$v = \frac{400}{\sqrt{3}} = 4$$

49. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers:

- (1) Ammonia
- (2) Methane
- (3) Nitrous oxide
- (4) Ozone

Handwritten calculation for Q49:

$$\frac{40}{\sqrt{3 \times 5}} = \frac{40\sqrt{3}}{3}$$

50. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?

- (1) The names are written in Latin and are italicised
- (2) When written by hand, the names are to be underlined
- (3) Biological names can be written in any language
- (4) The first word in a biological name represents the genus name, and the second is a specific epithet

51. A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage. There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in :

- (1) Somaclonal variation
- (2) Polyteny
- (3) Aneuploidy
- (4) Polyploidy

52. The two polypeptides of human insulin are linked together by :

- (1) Covalent bond
- (2) Disulphide bridges
- (3) Hydrogen bonds
- (4) Phosphodiester bond

53. Reduction in pH of blood will :

- (1) decrease the affinity of hemoglobin with oxygen.
- (2) release bicarbonate ions by the liver.
- (3) reduce the rate of heart beat.
- (4) reduce the blood supply to the brain.

54. In a chloroplast the highest number of protons are found in :

- (1) Inter membrane space
- (2) Antennae complex
- (3) Stroma
- (4) Lumen of thylakoids

55. Which type of tissue correctly matches with its location ?

- | Tissue | Location |
|-----------------------------|-------------------|
| (1) Transitional epithelium | Tip of nose |
| (2) Cuboidal epithelium | Lining of stomach |
| (3) Smooth muscle | Wall of intestine |
| (4) Areolar tissue | Tendons |

56. Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other ?

- (1) Aldosterone - Atrial Natriuretic Factor
- (2) Relaxin - Inhibin
- (3) Parathormone - Calcitonin
- (4) Insulin - Glucagon

57. In mammals, which blood vessel would normally carry largest amount of urea ?

- (1) Hepatic Vein
- (2) Hepatic Portal Vein
- (3) Renal Vein
- (4) Dorsal Aorta

58. Pick out the correct statements :

- (a) Haemophilia is a sex-linked recessive disease.
- (b) Down's syndrome is due to aneuploidy.
- (c) Phenylketonuria is an autosomal recessive gene disorder.
- (d) Sickle cell anaemia is an X - linked recessive gene disorder.

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

59. Which of the following approaches does not give the defined action of contraceptive ?

(1)	Hormonal contraceptives	Prevent/retard entry of sperms, prevent ovulation and fertilization
(2)	Vasectomy	prevents spermatogenesis
(3)	Barrier methods	prevent fertilization
(4)	Intra uterine devices	increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms

60. Which one of the following characteristics is not shared by birds and mammals ?

- (1) Viviparity
- (2) Warm blooded nature
- (3) Ossified endoskeleton
- (4) Breathing using lungs

61. Emerson's enhancement effect and Red drop have been instrumental in the discovery of :
- (1) Photophosphorylation and cyclic electron transport
 - (2) Oxidative phosphorylation
 - (3) Photophosphorylation and non-cyclic electron transport
 - (4) Two photosystems operating simultaneously
62. In which of the following, all three are macronutrients ?
- (1) Molybdenum, magnesium, manganese
 - (2) Nitrogen, nickel, phosphorus-
 - (3) Boron, zinc, manganese
 - (4) Iron, copper, molybdenum
63. Changes in GnRH pulse frequency in females is controlled by circulating levels of :
- (1) progesterone only
 - (2) progesterone and inhibin
 - (3) estrogen and progesterone
 - (4) estrogen and inhibin
64. The coconut water from tender coconut represents :
- (1) Free nuclear proembryo
 - (2) Free nuclear endosperm
 - (3) Endocarp
 - (4) Fleshy mesocarp
65. Which of the following guards the opening of hepatopancreatic duct into the duodenum ?
- (1) Pyloric sphincter
 - (2) Sphincter of Oddi
 - (3) Semilunar valve
 - (4) Ileocaecal valve
66. Which one of the following is the starter codon ?
- (1) UAA
 - (2) UAG
 - (3) AUG
 - (4) UGA
67. Spindle fibres attach on to :
- (1) Centromere of the chromosome
 - (2) Kinetosome of the chromosome
 - (3) Telomere of the chromosome
 - (4) Kinetochore of the chromosome
68. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of :
- (1) 3:1: Tall: Dwarf
 - (2) 3:1:: Dwarf: Tall
 - (3) 1:2:1:: Tall homozygous: Tall heterozygous: Dwarf
 - (4) 1:2:1:: Tall heterozygous: Tall homozygous: Dwarf
69. A typical fat molecule is made up of :
- (1) One glycerol and one fatty acid molecule
 - (2) Three glycerol and three fatty acid molecules
 - (3) Three glycerol molecules and one fatty acid molecule
 - (4) One glycerol and three fatty acid molecules
70. A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called :
- (1) Strip farming
 - (2) Shifting agriculture
 - (3) Ley farming
 - (4) Contour farming
71. Which of the following is not a stem modification ?
- (1) Tendrils of cucumber
 - (2) Flattened structures of *Opuntia*
 - (3) Pitcher of *Nepenthes*
 - (4) Thorns of citrus
72. Which of the following features is not present in *Periplaneta americana* ?
- (1) Exoskeleton composed of N-acetylglucosamine
 - (2) Metamerically segmented body
 - (3) Schizocoelom as body cavity
 - (4) Indeterminate and radial cleavage during embryonic development
73. Name the chronic respiratory disorder caused mainly by cigarette smoking :
- (1) Respiratory acidosis
 - (2) Respiratory alkalosis
 - (3) Emphysema
 - (4) Asthma

D

74. Which one of the following statements is not true ?

- (1) Pollen grains of many species cause severe allergies ✓
 (2) Stored pollen in liquid nitrogen can be used in the crop breeding programmes ✓
 (3) Tapetum helps in the dehiscence of anther ✓
 (4) Exine of pollen grains is made up of sporopollenin ✓

75. Which of the following is required as inducer(s) for the expression of Lac operon ?

- (1) lactose
 (2) lactose and galactose
 (3) glucose
 (4) galactose

76. Mitochondria and chloroplast are :

- (a) semi-autonomous organelles.
 (b) formed by division of pre-existing organelles and they contain DNA but lack protein synthesizing machinery. ✓

Which one of the following options is correct ?

- (1) (a) is true but (b) is false.
 (2) Both (a) and (b) are false.
 (3) Both (a) and (b) are correct. ✓
 (4) (b) is true but (a) is false.

77. It is much easier for a small animal to run uphill than for a large animal, because :

- (1) Small animals have a lower O_2 requirement. ✓
 (2) The efficiency of muscles in large animals is less than in the small animals.
 (3) It is easier to carry a small body weight.
 (4) Smaller animals have a higher metabolic rate.

78. Seed formation without fertilization in flowering plants involves the process of :

- (1) Somatic hybridization
 (2) Apomixis ✓
 (3) Sporulation
 (4) Budding

79. The *Avena* curvature is used for bioassay of :

- (1) IAA
 (2) Ethylene ✓
 (3) ABA
 (4) GA_3

80. A plant in your garden avoids photorespiratory losses, has improved water use efficiency, shows high rates of photosynthesis at high temperatures and has improved efficiency of nitrogen utilisation. In which of the following physiological groups would you assign this plant ?

- (1) CAM
 (2) Nitrogen fixer ✓
 (3) C_3
 (4) C_4

81. Which is the National Aquatic Animal of India ?

- (1) Blue whale ✓
 (2) Sea-horse
 (3) Gangetic shark
 (4) River dolphin

82. Which of the following is not a feature of the plasmids ?

- (1) Transferable
 (2) Single-stranded
 (3) Independent replication
 (4) Circular structure

83. The amino acid Tryptophan is the precursor for the synthesis of :

- (1) Estrogen and Progesterone
 (2) Cortisol and Cortisone
 (3) Melatonin and Serotonin
 (4) Thyroxine and Triiodothyronine

84. Joint Forest Management Concept was introduced in India during :

- (1) 1980s ✓
 (2) 1990s
 (3) 1960s
 (4) 1970s

85. Water soluble pigments found in plant cell vacuoles are :

- (1) Carotenoids
 (2) Anthocyanins
 (3) Xanthophylls
 (4) Chlorophylls

86. Which one of the following is a characteristic feature of cropland ecosystem?

- (1) Absence of weeds ~~✗~~ \Rightarrow cropland ecosystem
 (2) Ecological succession
 (3) Absence of soil organisms ~~✗~~
 (4) Least genetic diversity feature

87. Which of the following characteristic features always holds true for the corresponding group of animals?

(1)	Possess a mouth with an upper and a lower jaw	Chordata
(2)	3-chambered heart with one incompletely divided ventricle	Reptilia <input checked="" type="checkbox"/>
(3)	Cartilaginous endoskeleton	Chondrichthyes <input checked="" type="checkbox"/>
(4)	Viviparous	Mammalia ✗

88. The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the:

- (1) Methanogens
 (2) Eubacteria
 (3) Halophiles
 (4) Thermoacidophiles

89. Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain:

- (1) Gamma globulin
 (2) Attenuated pathogens
 (3) Activated pathogens
 (4) Harvested antibodies

90. When does the growth rate of a population following the logistic model equal zero? The logistic model is given as $dN/dt = rN(1-N/K)$:

- (1) when N/K equals zero.
 (2) when death rate is greater than birth rate.
 (3) when N/K is exactly one.
 (4) when N nears the carrying capacity of the habitat.

91. Which one of the following statements is wrong?

- (1) Uracil is a pyrimidine.
 (2) Glycine is a sulphur containing amino acid.
 (3) Sucrose is a disaccharide.
 (4) Cellulose is a polysaccharide.

92. The taq polymerase enzyme is obtained from:

- (1) *Bacillus subtilis*
 (2) *Pseudomonas putida*
 (3) *Thermus aquaticus*
 (4) *Thiobacillus ferrooxidans*

93. Gause's principle of competitive exclusion states that:

- (1) No two species can occupy the same niche indefinitely for the same limiting resources.
 (2) Larger organisms exclude smaller ones through competition.
 (3) More abundant species will exclude the less abundant species through competition.
 (4) Competition for the same resources excludes species having different food preferences.

94. Stems modified into flat green organs performing the functions of leaves are known as:

- (1) Phylloclades
 (2) Scales
 (3) Cladodes
 (4) Phyllodes

95. Which part of the tobacco plant is infected by *Meloidogyne incognita*?

- (1) Stem
 (2) Root
 (3) Flower
 (4) Leaf

96. Fertilization in humans is practically feasible only if:

- (1) the ovum and sperms are transported simultaneously to ampullary - isthmic junction of the cervix.
 (2) the sperms are transported into cervix within 48 hrs of release of ovum in uterus.
 (3) the sperms are transported into vagina just after the release of ovum in fallopian tube.
 (4) the ovum and sperms are transported simultaneously to ampullary - isthmic junction of the fallopian tube.

97. Which of the following statements is not true for cancer cells in relation to mutations?

- (1) Mutations inactivate the cell control.
 (2) Mutations inhibit production of telomerase.
 (3) Mutations in proto-oncogenes accelerate the cell cycle.
 (4) Mutations destroy telomerase inhibitor.

98. Which of the following structures is homologous to the wing of a bird?

- (1) Hind limb of Rabbit
 (2) Flipper of Whale
 (3) Dorsal fin of a Shark
 (4) Wing of a Moth

99. Match the terms in Column I with their description in Column II and choose the correct option:

Column I	Column II
(a) Dominance	(i) Many genes govern a single character
(b) Codominance	(ii) In a heterozygous organism only one allele expresses itself
(c) Pleiotropy	(iii) In a heterozygous organism both alleles express themselves fully
(d) Polygenic inheritance	(iv) A single gene influences many characters

Code:

	(a)	(b)	(c)	(d)
(1)	(iv)	(i)	(ii)	(iii)
(2)	(iv)	(iii)	(i)	(ii)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(ii)	(iii)	(iv)	(i)

100. Which of the following is wrongly matched in the given table?

	Microbe	Product	Application
(1)	<i>Streptococcus</i>	Streptokinase	removal of clot from blood vessel ✓
(2)	<i>Clostridium butylicum</i>	Lipase	removal of oil stains
(3)	<i>Trichoderma polysporum</i>	Cyclosporin A	immunosuppressive drug ✓
(4)	<i>Monascus purpureus</i>	Statins	lowering of blood cholesterol

101. Select the incorrect statement:

- (1) LH and FSH decrease gradually during the follicular phase. ✓
- (2) LH triggers secretion of androgens from the Leydig cells. ✓
- (3) FSH stimulates the sertoli cells which help in spermiogenesis. ✓
- (4) LH triggers ovulation in ovary. ✓

102. Which of the following is a restriction endonuclease?

- (1) DNase I
- (2) RNase
- (3) Hind II ✓
- (4) Protease

103. Microtubules are the constituents of:

- (1) Centrioles, Spindle fibres and Chromatin
- (2) Centrosome, Nucleosome and Centrioles
- (3) Cilia, Flagella and Peroxisomes
- (4) Spindle fibres, Centrioles and Cilia

104. Select the correct statement:

- (1) *Sequoia* is one of the tallest trees ✓
- (2) The leaves of gymnosperms are not well adapted to extremes of climate
- (3) Gymnosperms are both homosporous and heterosporous
- (4) *Salvinia*, *Ginkgo* and *Pinus* all are gymnosperms

105. In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to:

- (1) Auto-immune disease ✓
- (2) Active immunity
- (3) Allergic response
- (4) Graft rejection

106. In a testcross involving F_1 dihybrid flies, more parental-type offspring were produced than the recombinant-type offspring. This indicates:

- (1) The two genes are linked and present on the same chromosome.
- (2) Both of the characters are controlled by more than one gene.
- (3) The two genes are located on two different chromosomes.
- (4) Chromosomes failed to separate during meiosis.

107. Which of the following statements is not correct ?
- (1) Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.
 - (2) Some reptiles have also been reported as pollinators in some plant species. ✓
 - (3) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style. ✓
 - (4) Insects that consume pollen or nectar without bringing about pollination are called pollen/nectar robbers. ✓
108. Asthma may be attributed to : →
- (1) inflammation of the trachea ✓
 - (2) accumulation of fluid in the lungs
 - (3) bacterial infection of the lungs
 - (4) allergic reaction of the mast cells in the lungs
109. In context of Amniocentesis, which of the following statement is incorrect ?
- (1) It can be used for detection of Down syndrome. ✓
 - (2) It can be used for detection of Cleft palate.
 - (3) It is usually done when a woman is between 14 - 16 weeks pregnant. ✓
 - (4) It is used for prenatal sex determination.
110. Specialised epidermal cells surrounding the guard cells are called :
- (1) Bulliform cells
 - (2) Lenticels
 - (3) Complementary cells
 - (4) Subsidiary cells ✓
111. Which of the following is the most important cause of animals and plants being driven to extinction ?
- (1) Habitat loss and fragmentation
 - (2) Co-extinctions
 - (3) Over-exploitation. ✓
 - (4) Alien species invasion
112. Analogous structures are a result of :
- (1) Shared ancestry
 - (2) Stabilizing selection
 - (3) Divergent evolution
 - (4) Convergent evolution ✓
113. Which of the following most appropriately describes haemophilia ?
- (1) Chromosomal disorder
 - (2) Dominant gene disorder
 - (3) Recessive gene disorder
 - (4) X-linked recessive gene disorder ✓
114. Cotyledon of maize grain is called :
- (1) coleoptile
 - (2) scutellum ✓
 - (3) plumule
 - (4) coleorhiza
115. The term ecosystem was coined by :
- (1) E. Haeckel ✓
 - (2) E. Warming ✓
 - (3) E.P. Odum ✓
 - (4) A.G. Tansley
116. Which of the following features is not present in the Phylum - Arthropoda ?
- (1) Parapodia ✓
 - (2) Jointed appendages ✓
 - (3) Chitinous exoskeleton ✓
 - (4) Metameric segmentation ✓
117. Which one of the following cell organelles is enclosed by a single membrane ?
- (1) Lysosomes ✓
 - (2) Nuclei
 - (3) Mitochondria ✓
 - (4) Chloroplasts ✓
118. Which of the following is not a characteristic feature during mitosis in somatic cells ?
- (1) Chromosome movement
 - (2) Synapsis
 - (3) Spindle fibres
 - (4) Disappearance of nucleolus

119. A river with an inflow of domestic sewage rich in organic waste may result in :

- (1) An increased production of fish due to biodegradable nutrients. ~~X~~
- (2) Death of fish due to lack of oxygen. ✓
- (3) Drying of the river very soon due to algal bloom. ~~X~~
- (4) Increased population of aquatic food web organisms. ~~X~~

120. Which of the following is **not** required for any of the techniques of DNA fingerprinting available at present ?

- (1) Restriction enzymes ✓
- (2) DNA - DNA hybridization
- (3) Polymerase chain reaction
- (4) Zinc finger analysis ✓

121. In meiosis crossing over is initiated at :

- (1) Zygotene
- (2) Diplotene
- (3) Pachytene
- (4) Leptotene

122. Which **one** of the following statements is **wrong** ?

- (1) Eubacteria are also called false bacteria. ~~X~~
- (2) Phycomycetes are also called algal fungi.
- (3) Cyanobacteria are also called blue-green algae.
- (4) Golden algae are also called desmids.

123. Blood pressure in the pulmonary artery is :

- (1) more than that in the pulmonary vein.
- (2) less than that in the venae cavae.
- (3) same as that in the aorta.
- (4) more than that in the carotid.

124. Which of the following statements is **wrong** for viroids ?

- (1) They cause infections
- (2) Their RNA is of high molecular weight ~~X~~
- (3) They lack a protein coat
- (4) They are smaller than viruses

125. Photosensitive compound in human eye is made up of :

- (1) Opsin and Retinol
- (2) Transducin and Retinene
- (3) Guanosine and Retinol
- (4) Opsin and Retinal

126. One of the major components of cell wall of most fungi is :

- (1) Cellulose
- (2) Hemicellulose.
- (3) Chitin
- (4) Peptidoglycan ✓

127. Following are the two statements regarding the origin of life :

- (a) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.
- (b) The first autotrophic organisms were the chemoautotrophs that never released oxygen.

Of the above statements which one of the following options is **correct** ?

- (1) Both (a) and (b) are correct. ✓
- (2) Both (a) and (b) are false.
- (3) (a) is correct but (b) is false.
- (4) (b) is correct but (a) is false.

128. Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom :

- (1) Fungi
- (2) Animalia
- (3) Monera
- (4) Protista ✓

129. Tricarpellary, syncarpous gynoecium is found in flowers of :

- (1) Fabaceae
- (2) Poaceae
- (3) Liliaceae
- (4) Solanaceae ✓

130. A complex of ribosomes attached to a single strand of RNA is known as :

- (1) Polypeptide
- (2) Okazaki fragment
- (3) Polysome ✓
- (4) Polymer

131. In the stomach, gastric acid is secreted by the :

- (1) peptic cells
 (2) acidic cells ✗
 (3) gastrin secreting cells ✓
 (4) parietal cells ✓

132. Identify the correct statement on 'inhibin' :

- (1) Is produced by granulose cells in ovary and inhibits the secretion of LH.
 (2) Is produced by nurse cells in testes and inhibits the secretion of LH.
 (3) Inhibits the secretion of LH, FSH and Prolactin.
 (4) Is produced by granulose cells in ovary and inhibits the secretion of FSH.

133. The standard petal of a papilionaceous corolla is also called :

- (1) Vexillum ✓
 (2) Corona ✓
 (3) Carina
 (4) Pappus

134. In bryophytes and pteridophytes, transport of male gametes requires :

- (1) Birds
 (2) Water
 (3) Wind
 (4) Insects

135. Proximal end of the filament of stamen is attached to the :

- (1) Placenta
 (2) Thalamus or petal
 (3) Anther
 (4) Connective

136. Which of the following statements about the composition of the vapour over an ideal 1 : 1 molar mixture of benzene and toluene is correct? Assume that the temperature is constant at 25°C. (Given, Vapour Pressure Data at 25°C, benzene = 12.8 kPa, toluene = 3.85 kPa)

- (1) The vapour will contain equal amounts of benzene and toluene.
 (2) Not enough information is given to make a prediction.
 (3) The vapour will contain a higher percentage of benzene.
 (4) The vapour will contain a higher percentage of toluene.

137. Match the compounds given in column I with the hybridisation and shape given in column II and mark the correct option.

Column I	Column II
(a) XeF ₆	(i) distorted octahedral
(b) XeO ₃	(ii) square planar ✗
(c) XeOF ₄	(iii) pyramidal
(d) XeF ₄	(iv) square pyramidal

Code :

	(a)	(b)	(c)	(d)
(1)	(iv)	(iii)	(i)	(ii)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(i)	(iii)	(iv)	(ii)
(4)	(i)	(ii)	(iv)	(iii)

138. The correct statement regarding the comparison of staggered and eclipsed conformations of ethane, is :

- (1) The eclipsed conformation of ethane is more stable than staggered conformation even though the eclipsed conformation has torsional strain.
 (2) The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.
 (3) The staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain.
 (4) The eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain.

139. Fog is a colloidal solution of :

- (1) Solid in gas
 (2) Gas in gas
 (3) Liquid in gas ✓
 (4) Gas in liquid

140. Match items of Column I with the items of Column II and assign the correct code :

Column I		Column II	
(a)	Cyanide process	(i)	Ultrapure Ge
(b)	Froth floatation process	(ii)	Dressing of ZnS
(c)	Electrolytic reduction	(iii)	Extraction of Al
(d)	Zone refining	(iv)	Extraction of Au
		(v)	Purification of Ni

Code:

- | | | | | |
|-----|-------|-------|-------|------|
| | (a) | (b) | (c) | (d) |
| (1) | (i) | (ii) | (iii) | (iv) |
| (2) | (iii) | (iv) | (v) | (i) |
| (3) | (iv) | (ii) | (iii) | (i) |
| (4) | (ii) | (iii) | (i) | (v) |

141. Which is the correct statement for the given acids ?

- (1) Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid.
 - (2) Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid.
 - (3) Both are diprotic acids.
 - (4) Both are triprotic acids.
- 3806.11*

142. The correct thermodynamic conditions for the spontaneous reaction at all temperatures is :

- (1) $\Delta H < 0$ and $\Delta S > 0$
 - (2) $\Delta H < 0$ and $\Delta S < 0$
 - (3) $\Delta H < 0$ and $\Delta S = 0$
 - (4) $\Delta H > 0$ and $\Delta S < 0$
- 732 x 1000 x 0.52*

143. Which one of the following statements is correct when SO_2 is passed through acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution ?

- (1) SO_2 is reduced.
 - (2) Green $\text{Cr}_2(\text{SO}_4)_3$ is formed.
 - (3) The solution turns blue.
 - (4) The solution is decolourized.
- 732 x 0.52 x 1000 x 100*

144. The correct statement regarding RNA and DNA, respectively is :

- (1) The sugar component in RNA is arabinose and the sugar component in DNA is ribose.
- (2) The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose.
- (3) The sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose.
- (4) The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose.

145. Which of the following reagents would distinguish cis-cyclopenta-1, 2-diol from the trans-isomer ?

- (1) MnO_2
- (2) Aluminium isopropoxide
- (3) Acetone
- (4) Ozone

146. The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha-carbon, is :

- (1) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as carbonylation.
- (2) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as keto-enol tautomerism.
- (3) a carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol.
- (4) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibration.

147. At 100°C the vapour pressure of a solution of 6.5 g of a solute in 100 g water is 732 mm. If $K_b = 0.52$, the boiling point of this solution will be :
- 732 = 6.5 / (6.5 x 100) x 1000 x 0.52*

- (1) 102°C
 - (2) 103°C
 - (3) 101°C
 - (4) 100°C
- T_b = K_b m*
DT_b = 0.52 x 7

148. Consider the nitration of benzene using mixed conc. H_2SO_4 and HNO_3 . If a large amount of KHSO_4 is added to the mixture, the rate of nitration will be :

- (1) unchanged
 - (2) doubled
 - (3) faster
 - (4) slower
- a = 10^-20 x 2 x 6.94*
530 x 6

149. The pressure of H_2 required to make the potential of H_2 -electrode zero in pure water at 298 K is :

- (1) 10^{-10} atm
 - (2) 10^{-4} atm
 - (3) 10^{-14} atm
 - (4) 10^{-12} atm
- a = 10^-21 x 2 x 6.94*
530 x 6 x 10^23

0.52×7320
 104

2164
 3760

$t_{1/2} = ?$
 $0.04 \text{ mol l}^{-1} \text{ s}^{-1}$
 $0.03 \text{ mol l}^{-1} \text{ s}^{-1}$
 0.104010

150. The correct statement regarding the basicity of arylamines is :

- (1) Arylamines are generally more basic than alkylamines because of aryl group.
- (2) Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridized.
- (3) Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring π electron system.
- (4) Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are not delocalized by interaction with the aromatic ring π electron system.

151. In a protein molecule various amino acids are linked together by :

- (1) peptide bond
- (2) dative bond
- (3) α - glycosidic bond
- (4) β - glycosidic bond

152. Consider the molecules CH_4 , NH_3 and H_2O . Which of the given statements is false ?

- (1) The H-O-H bond angle in H_2O is smaller than the H-N-H bond angle in NH_3 .
- (2) The H-C-H bond angle in CH_4 is larger than the H-N-H bond angle in NH_3 .
- (3) The H-C-H bond angle in CH_4 , the H-N-H bond angle in NH_3 , and the H-O-H bond angle in H_2O are all greater than 90° .
- (4) The H-O-H bond angle in H_2O is larger than the H-C-H bond angle in CH_4 .

153. Which of the following statements is false ?

- (1) Ca^{2+} ions are not important in maintaining the regular beating of the heart.
- (2) Mg^{2+} ions are important in the green parts of plants.
- (3) Mg^{2+} ions form a complex with ATP.
- (4) Ca^{2+} ions are important in blood clotting.

154. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules ?

- (1) $\text{Br}_2 > \text{I}_2 > \text{F}_2 > \text{Cl}_2$
- (2) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$
- (3) $\text{I}_2 > \text{Br}_2 > \text{Cl}_2 > \text{F}_2$
- (4) $\text{Cl}_2 > \text{Br}_2 > \text{F}_2 > \text{I}_2$

$d = \frac{2 \times M}{3 \times N_A}$

155. The rate of a first-order reaction is $0.04 \text{ mol l}^{-1} \text{ s}^{-1}$ at 10 seconds and $0.03 \text{ mol l}^{-1} \text{ s}^{-1}$ at 20 seconds after initiation of the reaction. The half-life period of the reaction is :

- (1) 44.1 s
- (2) 54.1 s
- (3) 24.1 s
- (4) 34.1 s

$r = \frac{k[C_0]}{t}$
 $r = \frac{k[C_t]}{t}$
 $k \times t = k(C_0)$
 $C_0 = \frac{0.4}{k}$
 $C_t = \frac{0.3}{k}$

156. Which one given below is a non-reducing sugar ?

- (1) Glucose
- (2) Sucrose
- (3) Maltose
- (4) Lactose

$\ln \frac{C_0}{C_t} = kt$
 $2.303 \times \log \frac{0.4}{0.3} = kt$

157. Which one of the following characteristics is associated with adsorption ?

- (1) ΔG and ΔH are negative but ΔS is positive
- (2) ΔG and ΔS are negative but ΔH is positive
- (3) ΔG is negative but ΔH and ΔS are positive
- (4) ΔG , ΔH and ΔS all are negative

158. Two electrons occupying the same orbital are distinguished by :

- (1) Azimuthal quantum number
- (2) Spin quantum number
- (3) Principal quantum number
- (4) Magnetic quantum number

$e^- e^-$
 $\uparrow \downarrow$
 0.6×10^{-20}

159. Lithium has a bcc structure. Its density is 530 kg m^{-3} and its atomic mass is 6.94 g mol^{-1} . Calculate the edge length of a unit cell of Lithium metal. ($N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)

- (1) 527 pm
- (2) 264 pm
- (3) 154 pm
- (4) 352 pm

$a = \frac{0.4771}{0.3086} = 1.5478$

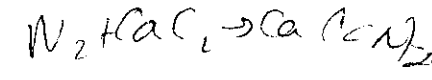
160. The pair of electron in the given carbanion, $\text{CH}_3\text{C}\equiv\text{C}^-$, is present in which of the following orbitals ?

- (1) sp²
- (2) sp
- (3) 2p
- (4) sp³

$\sqrt{3}a = 48$
 $a = 48/\sqrt{3}$

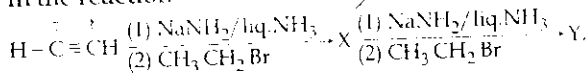
161. The product obtained as a result of a reaction of nitrogen with CaC_2 is :

- (1) CaCN_3
- (2) Ca_2CN
- (3) $\text{Ca}(\text{CN})_2$
- (4) CaCN



D

162. In the reaction



X and Y are :

- (1) X = 2-Butyne ; Y = 2-Hexyne
- (2) X = 1-Butyne ; Y = 2-Hexyne
- (3) X = 1-Butyne ; Y = 3-Hexyne
- (4) X = 2-Butyne ; Y = 3-Hexyne

163. MY and NY₃, two nearly insoluble salts, have the same K_{sp} values of 6.2 × 10⁻¹³ at room temperature. Which statement would be true in regard to MY and NY₃ ?

- (1) The salts MY and NY₃ are more soluble in 0.5 M KY than in pure water.
- (2) The addition of the salt of KY to solution of MY and NY₃ will have no effect on their solubilities.
- (3) The molar solubilities of MY and NY₃ in water are identical.
- (4) The molar solubility of MY in water is less than that of NY₃.

164. When copper is heated with conc. HNO₃ it produces :

- (1) Cu(NO₃)₂, NO and NO₂
- (2) Cu(NO₃)₂ and N₂O
- (3) Cu(NO₃)₂ and NO₂
- (4) Cu(NO₃)₂ and NO

165. The product formed by the reaction of an aldehyde with a primary amine is :

- (1) Carboxylic acid
- (2) Aromatic acid
- (3) Schiff base
- (4) Ketone

166. The addition of a catalyst during a chemical reaction alters which of the following quantities ?

- (1) Enthalpy
- (2) Activation energy
- (3) Entropy
- (4) Internal energy

167. Predict the correct order among the following :

- (1) bond pair - bond pair > lone pair - bond pair > lone pair - lone pair
- (2) lone pair - bond pair > bond pair - bond pair > lone pair - lone pair
- (3) lone pair - lone pair > lone pair - bond pair > bond pair - bond pair
- (4) lone pair - lone pair > bond pair - bond pair > lone pair - bond pair

168. Consider the following liquid - vapour equilibrium.

Liquid ⇌ Vapour

Which of the following relations is correct ?

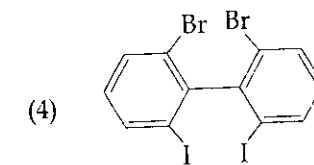
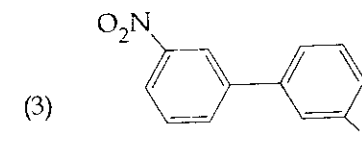
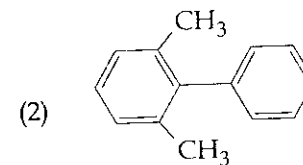
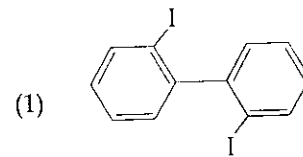
$$(1) \frac{d \ln P}{dT^2} = \frac{-\Delta H_v}{T^2}$$

$$(2) \frac{d \ln P}{dT} = \frac{\Delta H_v}{RT^2}$$

$$(3) \frac{d \ln G}{dT^2} = \frac{\Delta H_v}{RT^2}$$

$$(4) \frac{d \ln P}{dT} = \frac{-\Delta H_v}{RT}$$

169. Which of the following biphenyls is optically active ?

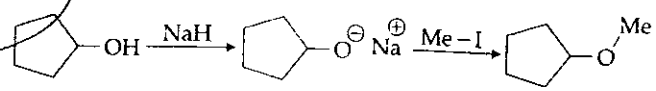


170. Which of the following statements about hydrogen is incorrect ?

- (1) Hydronium ion, H₃O⁺ exists freely in solution.
- (2) Dihydrogen does not act as a reducing agent.
- (3) Hydrogen has three isotopes of which tritium is the most common.
- (4) Hydrogen never acts as cation in ionic salts.

171. The electronic configurations of Eu (Atomic No. 63), Gd (Atomic No. 64) and Tb (Atomic No. 65) are:
- (1) $[Xe]4f^{65}d^{16}s^2$, $[Xe]4f^{75}d^{16}s^2$ and $[Xe]4f^{85}d^{16}s^2$
 - (2) $[Xe]4f^{76}s^2$, $[Xe]4f^{75}d^{16}s^2$ and $[Xe]4f^{96}s^2$
 - (3) $[Xe]4f^{76}s^2$, $[Xe]4f^{86}s^2$ and $[Xe]4f^{85}d^{16}s^2$
 - (4) $[Xe]4f^{65}d^{16}s^2$, $[Xe]4f^{75}d^{16}s^2$ and $[Xe]4f^{96}s^2$

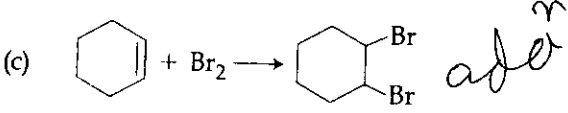
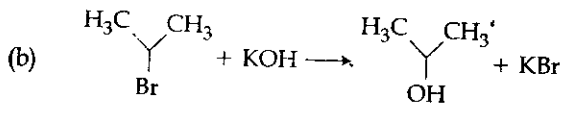
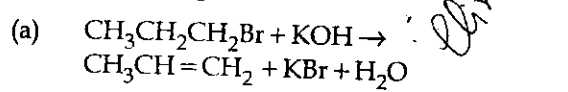
172. The reaction



can be classified as:

- (1) Dehydration reaction
- (2) Williamson alcohol synthesis reaction
- (3) Williamson ether synthesis reaction
- (4) Alcohol formation reaction

173. For the following reactions:



Which of the following statements is correct?

- (1) (a) is elimination, (b) and (c) are substitution reactions.
- (2) (a) is substitution, (b) and (c) are addition reactions.
- (3) (a) and (b) are elimination reactions and (c) is addition reaction.
- (4) (a) is elimination, (b) is substitution and (c) is addition reaction.

174. In which of the following options the order of arrangement does not agree with the variation of property indicated against it?

- (1) $I < Br < Cl < F$ (increasing electron gain enthalpy)
- (2) $Li < Na < K < Rb$ (increasing metallic radius)
- (3) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (increasing ionic size)
- (4) $B < C < N < O$ (increasing first ionisation enthalpy)

181
20
1080

175. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape?
- (1) 3/8
 - (2) 1/2
 - (3) 1/8
 - (4) 1/4
- $n = n$
 $m = m$
 $v \cdot t = t$

176. Among the following, the correct order of acidity is:

- (1) $HClO_2 < HClO < HClO_3 < HClO_4$
- (2) $HClO_4 < HClO_2 < HClO < HClO_3$
- (3) $HClO_3 < HClO_4 < HClO_2 < HClO$
- (4) $HClO < HClO_2 < HClO_3 < HClO_4$

177. Which of the following is an analgesic?

- (1) Streptomycin
- (2) Chloromycetin
- (3) Novalgin
- (4) Penicillin

FN
EAT NMPALS

178. Natural rubber has:

- (1) Alternate cis - and trans-configuration
- (2) Random cis - and trans-configuration
- (3) All cis-configuration
- (4) All trans-configuration

179. The ionic radii of A^+ and B^- ions are $0.98 \times 10^{-10} m$ and $1.81 \times 10^{-10} m$. The coordination number of each ion in AB is:

- (1) 8
- (2) 2
- (3) 6
- (4) 4

$$\frac{0.98 \times 10^{-10}}{1.81 \times 10^{-10}} = \frac{98}{181}$$

180. Which of the following has longest C-O bond length? (Free C-O bond length in CO is 1.128 Å.)

- (1) $[Fe(CO)_4]^{2-}$
- (2) $[Mn(CO)_6]^+$
- (3) $Ni(CO)_4$
- (4) $[Co(CO)_4]^{\ominus}$

181
25
905

181
-000-
980
227