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MHTCET PCB Sample Paper

Total Time: 3 Hr | Total Marks: 200.0

Physics

1) A wrench is used to tighten a bolt. If the force applied is 30 N and the distance from the bolt is 0.2 meters, what is the torque produced? **1.0**

A) 60 Nm
B) 15 Nm
C) 6 Nm
D) 150 Nm

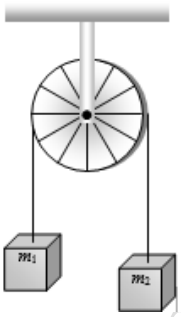
2) What is the order of reverse bias current for p-n junction diode ? **1.0**

A) 1 A
B) 1 mA
C) $1\,\mu A$
D) 1 nA

3) If the bulk modulus of water is 2100 MPa, what is the speed of sound in water? **1.0**

A) 1450 m/s
B) 2100 m/s
C) 0.21 m/s
D) 21 m/s

4) Two masses m_1 = 5 kg and $m_2 = 4.8kg$ tied to a string are hanging over a light frictionless pulley. What is the acceleration of the masses when they are free to move (g = 9.8 $m/s^{2)}$ **1.0**



A) 0.2 m/s^2
B) 9.8 m/s^2
C) 5 m/s^2
D) 4.8 m/s^2

5) Speed of sound in H_2 at temperature T is equal to speed of sound in He at temperature nT. Here n is equal to **1.0**

A) 1.68
B) 2.42
C) 3.12
D) 4.24

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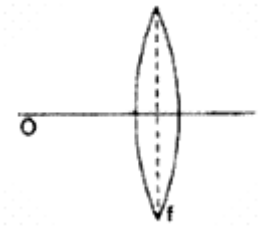
6) A real image of a point object O was formed by an equi-convex lens of focal length f and the magnification was found to be unity. Now the lens is cut into two symmetrical pieces as shown by the dotted line and the right part removed. The position of the image formed by the remaining part is at **1.0**



A) f
B) 2 f
C) −2 f
D) infinity

7) In a compound microscope, which lens system produces the initial enlarged image? **1.0**

A) Eyepiece lens
B) Objective lens
C) Condenser lens
D) Reflector lens

8) A spherical marble, of refractive index 1.5 and curvature 1.5 cm, contains a tiny air bubble at its centre. Where will it appear when seen from outside? **1.0**

A) 1 cm inside
B) at the centre
C) 5/3 cm inside
D) 2 cm inside

9) If two identical planets orbit a star at the same distance but with different masses, how does the gravitational force exerted by the star on each planet compare? **1.0**

A) The force is the same for both planets
B) The force is twice as much for the more massive planet
C) The force is half as much for the more massive planet
D) The force is proportional to the mass of the planet

10) The speed of light in a vacuum is approximately: **1.0**

A) 300,000 km/s
B) 150,000 km/s
C) 100,000 km/s
D) 500,000 km/s

11) What does the uncertainty principle, formulated by Heisenberg, state about particles like electrons? **1.0**

A) The position and momentum of a particle cannot be known precisely at the same time
B) The energy of a particle is always constant
C) Particles can be at rest but still have kinetic energy
D) The wave nature of particles can be ignored at high velocities

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12) Which law of thermodynamics is concerned with the concept of thermal equilibrium? **1.0**

- **A)** First Law
- **B)** Second Law
- **C)** Zeroth Law
- **D)** Third Law

13) Potentiometer measures potential more accurately because **1.0**

- **A)** it measures potential in open circuit
- **B)** it uses sensitive galvanometer for null deflection
- **C)** it uses high resistance potentiometer wire
- **D)** it measures potential in closed circuit

14) What is the primary function of an ammeter in an electrical circuit? **1.0**

- **A)** Measure voltage
- **B)** Measure current
- **C)** Measure resistance
- **D)** Measure power

15) What did the experimental results of Davisson and Germer show about the consistency of electron wavelength? **1.0**

- **A)** The wavelength of electrons is constant regardless of their energy
- **B)** The wavelength of electrons varies with their energy and momentum
- **C)** The wavelength of electrons is always the same as the wavelength of light
- **D)** The wavelength of electrons is unrelated to their momentum

16) A junction transistor acts as **1.0**

- **A)** a rectifier
- **B)** an amplifier
- **C)** the oscillator
- **D)** a voltage regulator

17) A doubly ionized helium nucleus (charge = 3.2×10^{-19} C) enters a region of uniform magnetic field with a velocity (10^3 m/s) $\hat{i}$. The magnetic induction in the region is 20 mT directed towards the positive x-axis. The force on the ion is **1.0**

- **A)** $(6.4 \times 10^{-18}$ N) $\hat{j}$
- **B)** $(6.4 \times 10^{-18}$ N) $\hat{k}$
- **C)** zero
- **D)** none of these

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18) In a common base mode of transistor, the collector current is 5.488 mA for an emitter current of 5.60 mA. The value of the base current amplification fact (β) will be **1.0**

A) 49
B) 50
C) 51
D) 48

19) In an ideal transformer the number of turns of primary and secondary coil is given as 100 and 300 respectively. If the power input is 60 W, the power output is **1.0**

A) 100 W
B) 300 W
C) 180 W
D) 60 W

20) When two soap bubbles of radius r_1 and r_2 $(r_2 > r_1)$ coalesce, the radius of curvature of common surface is **1.0**

A) $r_2 - r_1$
B) $\frac{r_2 - r_1}{r_1 r_2}$
C) $\frac{r_1 r_2}{r_2 - r_1}$
D) $r_2 + r_1$

21) Which of the following materials exhibit strong eddy currents? **1.0**

A) Insulators
B) Conductors
C) Semiconductors
D) Superconductors

22) In a scenario where a magnetic field is suddenly removed from a coil, what does Lenz's Law predict about the induced current? **1.0**

A) It will flow in the direction that maintains the original magnetic field
B) It will flow in the direction that enhances the magnetic field
C) It will flow in the direction that has no effect on the magnetic field
D) It will flow in the direction that opposes the removal of the magnetic field

23) The flywheel of a motor has mass 300 kg and radius of gyration 1.5 m. The motor develops a constant torque of 2000 N.m and the flywheel starts from rest. The work done by the motor during the first 4 revolutions is **1.0**

A) 2 kJ
B) 8 kJ
C) 8n kJ
D) 16π kJ

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24) What is the SI unit of measurement for voltage? **1.0**

A) Ampere
B) Ohm
C) Volt
D) Watt

25) The photoelectric threshold of a certain metal is 3000 A. If the relation of 2000 A is incident on the metal : **1.0**

A) electrons will be emitted
B) positrons will be emitted
C) protons will be emitted
D) electrons will not be emitted

26) Sodium and copper have work junction 2.3 eV and 4.5 eV respectively. Then, the ratio of their threshold wavelengths is nearest to **1.0**

A) 1: 2
B) 4 : 1
C) 2 : 1
D) 1: 4

27) What is the nature of the wavefront associated with a parallel beam of light? **1.0**

A) Plane
B) Spherical
C) Elliptical
D) Mixture of spherical and elliptical

28) In one gram of a solid, there are 5×10^{21} atoms. If one electron is removed from every one of 0.01% of atoms of the solid, charge gained by the solid would be **1.0**

A) + 0.08 C
B) 0.8 C
C) $-0.08\,C$
D) $-0.8\,C$

29) **1.0**

Two SHMs are represented by the equation $y_1 = 10 \sin\left(3\pi t + \frac{\pi}{4}\right)$ and $y_2 = 5\left[\sin 3\pi t + \sqrt{3}\cos 3\pi t\right]$. Their amplitudes are in the ratio

A) 1 : 2
B) 2 : 1
C) 1 : 3
D) 1 : 1

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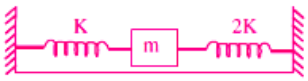
30) If the driving frequency is much higher than the natural frequency of the system, what happens to the amplitude of forced oscillations? **1.0**

A) The amplitude increases
B) The amplitude decreases
C) The amplitude remains unchanged
D) The amplitude becomes unpredictable

31) The mass 'm' is attached to two springs according to the figure. If the frictional force is absent the period of horizontal oscillations of the body will be **1.0**



A) $2\pi\sqrt{\frac{3k}{m}}$
B) $2\pi\sqrt{\frac{k}{m}}$
C) $2\pi\sqrt{\frac{m}{2k}}$
D) $2\pi\sqrt{\frac{m}{3k}}$

32) Which of the following materials is commonly used to make the coil in a galvanometer? **1.0**

A) Copper
B) Aluminum
C) Nichrome
D) Silver

33) Magnetizing and demagnetizing a material that has hysteresis involves **1.0**

A) increase in the temperature of the material
B) a ferro-to-para phase change
C) decrease in the temperature of the material
D) none of the above

34) On which these factors does air/fluid resistance force, acting on a spherical body, not depend? **1.0**

A) Radius of body
B) Velocity of body
C) Coefficient of viscosity
D) Density of body

35) The Q factor of an LCR series resonant circuit is **1.0**

A) resonant frequency/bandwidth
B) bandwidth / resonant frequency
C) $\omega_r/(\omega_1 + \omega_2)$
D) $(\omega_1 + \omega_2)/ \omega_r$

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36) The resistivity of copper at room temperature is 1.7×10^{-8} Ω m. If the free electron density of copper is 8.4×10^{28} m^{-3}, the relaxation time for the free electrons of copper. Given $m_e = 9.11 \times 10^{-31}$ kg and $e = 1.6 \times 10^{-19}$ C **1.0**

A) 1.36×10^{-12} s
B) 2.48×10^{-16} s
C) 4.28×10^{-14} s
D) 2.49×10^{-14} s

37) N molecules, each of mass m of gas A, and 2N molecules each of mass 2m, of gas B are contained in the same vessel which are maintained at a temperature T. The mean square velocity of molecules of B type is denoted by v^2 and the mean square of the X component of the velocity of A type is denoted by ω^2 . then $\frac{\omega^2}{v^2}$ is **1.0**

A) 2
B) 1
C) 1/3
D) 2/3

38) An object hangs from a spring balance. The balance registers 40 N in air, 30 N when the object is immersed in water. Then density of the object is **1.0**

A) 4×10^3 kg m^{-3}
B) 4×10^{-3} kg^{-3}
C) 3×10^3 kg^{-3}
D) 3×10^{-3} kg m^{-3}

39) A particle perform circular motion with an angular momentum M. If angular frequency of particle is doubled and kinetic energy is halved, its angular momentum becomes **1.0**

A) 4 l
B) 2 l
C) l/2
D) l/4

40) The dielectric constant K of an insulator can be **1.0**

A) −1
B) 0.5
C) 0
D) 5

41) In case of linearly polarized light, the magnitude of the electric field vector **1.0**

A) Does not change with time
B) Varies periodically with time
C) increases and decreases linearly with time
D) Is parallel to the direction of propagation

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42) What happens to the energy stored in a magnetic field when the current through the coil is doubled? **1.0**

- **A)** It doubles
- **B)** It quadruples
- **C)** It remains the same
- **D)** It halves

43) The deflection in moving coil galvanometer is **1.0**

- **A)** directly proportional to torsional constant
- **B)** directly proportional to number of turns in the coil
- **C)** inversely proportional to area of coil
- **D)** inversely proportional to the current flowing through the coil

44) Three capacitors of capacitances 2 μF , 3 μF and 6 μF are connected in series. The equivalent capacitance of the combination is **1.0**

- **A)** 11 μF
- **B)** 0.5 μF
- **C)** 1 μF
- **D)** 1.1 μF

45) The principle of superposition explains that: **1.0**

- **A)** The reflected wave always has the same amplitude as the incident wave
- **B)** The reflected wave is always of the same frequency as the incident wave
- **C)** When two or more waves meet, their amplitudes add algebraically
- **D)** The incident wave and reflected wave do not interact

46) The aperture of a big telescope is 5m. If the separation between the moon and the earth 4×10^5 km and the average wavelength of visible light is 5000 Å, then the minimum separation between the objects on the surface of the moon which can be just resolved is approximately **1.0**

- **A)** 1m
- **B)** 10m
- **C)** 50m
- **D)** 200 m

47) In the Compton effect, what is the main change observed in X-ray photons when they scatter off electrons? **1.0**

- **A)** Increase in frequency
- **B)** Decrease in frequency
- **C)** No change in frequency
- **D)** Change in amplitude

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48) The radius of the circular path followed by a charged particle in a cyclotron: **1.0**

- **A)** Increases with increasing magnetic field strength
- **B)** Decreases with increasing electric field strength
- **C)** Is independent of the velocity of the particle
- **D)** Is proportional to the mass of the particle

49) A 10 V storage battery of negligible internal resistance is connected across a 50 Ω resistor made of alloy manganin. How much heat energy is produced in the resistor in 1h? What is the source of the energy? **1.0**

- **A)** 7200 J
- **B)** 6400 J
- **C)** 3200 J
- **D)** 5800 J

50) In stationary longitudinal waves, nodes are points of **1.0**

- **A)** Minimum pressure
- **B)** Maximum pressure
- **C)** Minimum pressure variation
- **D)** Maximum pressure variation

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Chemistry

1) Which of the following exist in gas and liquid state? **1.0**

- **A)** Ethane
- **B)** Propane
- **C)** Butane
- **D)** pentane

2) On mixing a certain alkane with chlorine and irradiating it with UV light, it forms one monochloro alkane. The alkane could be **1.0**

- **A)** neo-pentane
- **B)** propane
- **C)** pentane
- **D)** iso-pentane

3) NH_3 and HCl gas are introduced simultaneously from the two ends of a long tube. A white ring of NH_4Cl appears first **1.0**

- **A)** nearer to the NH_3 end
- **B)** throughout the tube
- **C)** at the centre of the tube
- **D)** nearer to the HCl end

4) The reagent used to convert a carboxyl group (– COOH) into $-CH_3$ group is **1.0**

- **A)** $LiAlH_4$
- **B)** Na and alcohol
- **C)** Red P and H
- **D)** Zn + HCl

5) Which molecule is not linear **1.0**

- **A)** BeF_2
- **B)** BeH_2
- **C)** CO_2
- **D)** H_2O

6) How many moles of magnesium phosphate, $Mg_3(PO_4)_2$ will contain 0.25 mole of oxygen atoms? **1.0**

- **A)** 0.02
- **B)** 3.125×10^{-2}
- **C)** 1.25×10^{-2}
- **D)** 2.5×10^{-2}

7) The wave mechanical model of an atom is based upon which of the following equations? **1.0**

- **A)** Schrodinger's equation
- **B)** de Broglie's equation
- **C)** Heisenberg's uncertainty principle
- **D)** All the above

8) Which element is necessary for normal leaf development? **1.0**

- **A)** Si
- **B)** Ba
- **C)** Mg
- **D)** Ca

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9) Hydrogen has a unique property when compared to other elements in its group. What is it? **1.0**

- **A)** It is the only non-metal in its group
- **B)** It forms hydrides with both metals and non-metals
- **C)** It is not reactive at all
- **D)** It has the highest atomic number in its group

10) The mean free path of a gas molecule is the distance **1.0**

- **A)** between the two opposite walls of the container
- **B)** which the molecule travel in one second
- **C)** through which a molecule moves between two consecutive collisions
- **D)** none of these

11) In electrolytic cell ___ reaction takes place at anode ___ and reaction takes place at cathode. **1.0**

- **A)** reduction, oxidation
- **B)** oxidation, reduction
- **C)** reduction, reduction
- **D)** oxidation, oxidation

12) A reaction is of first order when... **1.0**

- **A)** the amount of product formed increases with linearly with time
- **B)** the rate decreases linearly with time
- **C)** the rate is linearly related to the concentration of the reactant
- **D)** the concentration of the reactant decreases linearly with time

13) The oxidation process taking place in food, is inhibited by **1.0**

- **A)** antacids
- **B)** antibiotic
- **C)** antioxidants
- **D)** antiseptic

14) Which represents the correct order of relative acidic strengths? **1.0**

- **A)** $HCOOH > CH_3COOH > ClCH_2COOH > C_2H_5COOH$
- **B)** $ClCH_2COOH > HCOOH > CH_3COOH > C_2H_5COOH$
- **C)** $CH_3COOH > HCOOH > ClCH_2COOH > C_2H_5COOH$
- **D)** $C_2H_5COOH > CH_3COOH > HCOOH > ClCH_2COOH$

15) Reaction of chloroethane with chlorobenzene and sodium in the presence of dry ether is known as **1.0**

- **A)** Wurtz reaction
- **B)** Wurtz-fitting reaction
- **C)** Fitting reaction
- **D)** Friedel craft reaction

16) For a solution of a non-volatile solute in a volatile solvent, what happens to the vapor pressure of the solvent? **1.0**

- **A)** It increases
- **B)** It decreases
- **C)** It remains unchanged
- **D)** It doubles

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17) In which of the following chemical energy is converted into electrical energy - **1.0**

A) Thermal power
B) Electrolytic cell
C) Electrochemical cell
D) Turbines

18) 2 methyl 2 iodopropane on treatment with aqueous KOH, gives **1.0**

A) propane-2-ol
B) a tertiary alcohol
C) a secondary alcohol
D) secondary butyl alcohol

19) Which one of the following is not protein fibre ? **1.0**

A) silk
B) feathers
C) wool
D) linen

20) The halogen which is most easily reduced is **1.0**

A) fluorine
B) chlorine
C) bromine
D) iodine

21) Zinc does not show variable valency like *d*-block elements because **1.0**

A) It is a soft metal
B) *d*-orbital is complete
C) It is low melting
D) Two electrons are present in the outermost orbit

22) Carboxylic acid reacts with diazomethane to yield: **1.0**

A) amines
B) alcohols
C) esters
D) amides

23) The rate of reaction depends on all factors except **1.0**

A) reaction temperature
B) concentration of reactants
C) magnitude of equilibrium constant
D) specific rate constant

24) If carbon is added to the interstitial sites of a iron, then iron becomes **1.0**

A) softer
B) less tensile
C) less malleable
D) more ductile

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25) Entropy is _____ **1.0**

- **A)** state function
- **B)** non- state function
- **C)** relates orderly arrangement
- **D)** relates freezing of liquid water

26) The concept of equivalence of mechanical energy and heat is proposed by - **1.0**

- **A)** Joule
- **B)** Hess
- **C)** Rutherford
- **D)** Proust

27) The internal energy of an ideal gas depends only on **1.0**

- **A)** pressure
- **B)** temperature
- **C)** volume
- **D)** none of these

28) Secondary structure of proteins refers to **1.0**

- **A)** Mainly denatured proteins and structure of prosthetic group
- **B)** Three dimensional structure specially the bond between amino acid residues that are distant from each other in polypeptide chain
- **C)** Linear sequence of amino acid residue in the polypeptide chain
- **D)** Regular folding patterns of continuous portion of the polypeptide chain

29) Drug which helps to reduce anxiety and brings about calmness is_____ **1.0**

- **A)** tranqulizer
- **B)** diuretic
- **C)** analgesic calmness
- **D)** antihistamine

30) Which one of the following defects does not affect the density of the crystal? **1.0**

- **A)** Schottky defect
- **B)** Interstitial defect
- **C)** Frenkel defect
- **D)** Both in (B) and (C)

31) How many kilocalories are equivalent to 1 calorie? **1.0**

- **A)** 10
- **B)** 100
- **C)** 1,000
- **D)** 1

32) The rate of reaction between A and B increases by a factor of 100, when the concentration of A is increased 10 folds. The order of reaction with respect to A is **1.0**

- **A)** 10
- **B)** 2
- **C)** 1
- **D)** 20

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33) The non-nutritive sweetener is **1.0**

- **A)** saccharine
- **B)** sucrose
- **C)** fructose
- **D)** glucose

34) Which of the following gas is used in very low temperature thermometers? **1.0**

- **A)** He
- **B)** Ne
- **C)** H_2
- **D)** N_2

35) Which of the following contains P–O–P bond? **1.0**

- **A)** Hypophosphorus acid
- **B)** Phosphorus acid
- **C)** Pyrophosphorus acid
- **D)** Ortho phosphoric acid

36) Which one of the following is the most desirable to prepare ether by Williamson's synthesis? **1.0**

- **A)** a primary alkyl halide and alkoxide of tertiary alcohol
- **B)** a secondary alkyl halide and alkoxide of secondary alcohol
- **C)** a tertiary alkyl halide and alkoxide of primary alcohol
- **D)** a primary alkyl halide and alkoxide of primary alcohol

37) Zinc oxide (ZnO) is white when cold and yellow when hot. It is due to the development of **1.0**

- **A)** Frenkel defect
- **B)** Schottky defect
- **C)** Metal excess defect
- **D)** metal deficiency defect.

38) The double bond in ethylene is attacked by (in hydroclorination) **1.0**

- **A)** Cl^-
- **B)** H^+
- **C)** Cl_2
- **D)** Cl^+

39) The function of DNA in an organism is **1.0**

- **A)** to assist in the synthesis of RNA molecule
- **B)** to store information of heredity characteristics
- **C)** to assist in the synthesis of proteins and polypeptides
- **D)** All to these

40) What is the value of Kw at 25°C? **1.0**

- **A)** 1.0×10^{-14}
- **B)** 1.0×10^{-12}
- **C)** 1.0×10^{-10}
- **D)** 1.0×10^{-8}

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41) A 5·25% solution of a substance is isotonic with a 1·5% solution of urea (molar mass = 60 g mol^{-1}) in the same solvent. If the density of both the solutions are assumed to be equal to 1·0 g cm^{-3}. Molar mass of the substance will be **1.0**

A) 1150·0 g mol^{-1}

B) 105·0 g mol^{-1}

C) 210·0 g mol^{-1}

D) 90·0 g mol^{-1}

42) The artificial sweetner aspartame is the methyl ester of the dipeptide **1.0**

A) Glycylalanine

B) Aspartyl phenyl alanine

C) Phenyl alanyl aspartic acid

D) Alanyl glycine

43) In Clemmensen's reduction of carbonyl compounds, the catalyst used is **1.0**

A) Zn - Hg / HCl

B) Hydrazine and KOH / glycol

C) $LiAlH_4$

D) Sn / HCl

44) 25 mL of solution of barium hydroxide on titration with a 0.1 molar solution of hydrochloric acid gave a titre value of 35 mL. The molarity of barium hydroxide solution was **1.0**

A) 0.28

B) 0.35

C) 0.07 M

D) 0.14 M

45) 2-propyl benzene on air oxidation and followed by decomposition by dilute acid gives **1.0**

A) phenol and propanal

B) phenol and propanone

C) phenol and propanol

D) phenol and propionic acid

46) For filtration of chemicals, the cloth used is made up of **1.0**

A) polyamide

B) polyester

C) polyethylene

D) nylon

47) Which one of the following formula represents the first order reaction? **1.0**

A) $K = \frac{2.303}{t} \log \frac{[A]}{[A]_0}$

B) $K = 2.303 \log \frac{a-x}{a}$

C) $[A] = [A_0]e^{-Kt}$

D) $K = \frac{2.303}{t} \log \frac{a+x}{a}$

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48) If the hydrolysis constant (Kh) for a salt is very small, what can be inferred about the salt? **1.0**

A) It hydrolyzes extensively in water
B) It is a strong electrolyte
C) It does not hydrolyze significantly
D) It forms a strongly acidic solution

49) The relationship between half life of a reaction and the order of reaction is **1.0**

A) $t_{1/2} \propto \frac{1}{a^{(n+1)}}$

B) $t_{1/2} \propto \frac{1}{a^{(n+2)}}$

C) $t_{1/2} \propto \frac{1}{a^{(n)}}$

D) $t_{1/2} \propto \frac{1}{a^{(n-1)}}$

50) The number of unpaired electrons in Cr^{+} will be **1.0**

A) 3
B) 4
C) 5
D) 6

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Biology

1) The secretion of bile is regulated by which hormone? **1.0**

- **A)** Insulin
- **B)** Glucagon
- **C)** Secretin
- **D)** Cholecystokinin (CCK)

2) Where is the respiratory electron transport system (ETS) located in plants? **1.0**

- **A)** Intermembrane space
- **B)** Mitochondrial matrix
- **C)** Outer mitochondrial membrane
- **D)** Inner mitochondrial membrane

3) Where does the process of urine formation begin? **1.0**

- **A)** Renal pelvis
- **B)** Bladder
- **C)** Glomerulus
- **D)** Bowman's capsule

4) Which of the following is true regarding stepwise oxidation? **1.0**

- **A)** It always yields a single product
- **B)** It requires harsh reaction conditions
- **C)** It can be used to convert aldehydes to primary alcohols
- **D)** It involves sequential oxidation steps

5) The minor calyx _____. **1.0**

- **A)** collects urine
- **B)** connects pelvis to ureter
- **C)** is present in the cortex
- **D)** receives column of Bertini

6) Which of the following is a characteristic of saturated fatty acids? **1.0**

- **A)** They contain double bonds between carbon atoms
- **B)** They are usually solid at room temperature
- **C)** They are found primarily in plant oils
- **D)** They are considered healthy fats

7) A typical fat molecule is made up of : **1.0**

- **A)** Three glycerol and three fatty acid molecules
- **B)** Three glycerol molecules and one fatty acid molecule
- **C)** One glycerol and three fatty acid molecules
- **D)** One glycerol and one fatty acid molecule

8) Intermediate Question: Which of the following is NOT an excretory organ in humans? **1.0**

- **A)** Liver
- **B)** Lungs
- **C)** Kidneys
- **D)** Pancreas

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9) Which of the following reagents is commonly used in stepwise oxidation? **1.0**

- **A)** Sodium borohydride
- **B)** Jones reagent
- **C)** Grignard reagent
- **D)** Lithium aluminum hydride

10) The active site of an enzyme: **1.0**

- **A)** Binds irreversibly to the substrate
- **B)** Determines the pH of the reaction
- **C)** Is where the substrate binds and the catalytic reaction occurs
- **D)** Is not affected by changes in temperature

11) What causes eczema? **1.0**

- **A)** Bacterial infection
- **B)** Viral infection
- **C)** Fungal infection
- **D)** Allergic reaction

12) Which of the following is not a step in urine formation? **1.0**

- **A)** Filtration
- **B)** Secretion
- **C)** Absorption
- **D)** Reabsorption

13) The presence of DNA in mitochondria and chloroplast supports the hypothesis that **1.0**

- **A)** Mitochondria and chloroplast both originated as independent free living organisms
- **B)** Glycolysis occurs in mitochondria and chloroplast both
- **C)** ATP is produced in mitochondria and chloroplast both
- **D)** Mitochondria and chloroplast undergo meiosis and mitosis independent of nucleus

14) Which biomolecule is distributed more widely in a cell? **1.0**

- **A)** Chloroplast
- **B)** RNA
- **C)** DNA
- **D)** Spaherosomes

15) Which molecule is the first substrate for the Krebs cycle? **1.0**

- **A)** Pyruvate
- **B)** Acetyl CoA
- **C)** Citrate
- **D)** Succinyl-CoA

16) Which one of the following is a non-reducing carbohydrate? **1.0**

- **A)** Maltose
- **B)** Sucrose
- **C)** Lactose
- **D)** Ribose 5-phosphate

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17) Which part of the nephron is responsible for the reabsorption of water and nutrients from the filtrate? **1.0**

- **A)** Glomerulus
- **B)** Bowman's capsule
- **C)** Loop of Henle
- **D)** Collecting duct

18) The _____ cells present in pancreas secrete somatostatin hormone. **1.0**

- **A)** Alpha
- **B)** Beta
- **C)** Delta
- **D)** Omega

19) ———- are the functions of excretory system. **1.0**

- **A)** To eliminate nitrogenous waste
- **B)** Regulate blood pressure
- **C)** To maintain osmolarity of the body
- **D)** All of these

20) Which of the following is NOT a mechanism of nutrient absorption in the small intestine? **1.0**

- **A)** Simple diffusion
- **B)** Active transport
- **C)** Facilitated diffusion
- **D)** Filtration

21) Which nutrient is responsible for activating several enzymes involved in photosynthesis and respiration? **1.0**

- **A)** Iron
- **B)** Zinc
- **C)** Manganese
- **D)** Copper

22) Which plant hormone is involved in regulating the opening and closing of stomata during transpiration? **1.0**

- **A)** Auxin
- **B)** Gibberellin
- **C)** Abscisic acid
- **D)** Cytokinin

23) Consider the following three statements and select the correct option stating which ones are true (T) and which ones are False(F) **1.0**
(i) Cryopreservation is one of the best methods of germplasm storage
(ii) Hilsa, sardines and pomphrets are some freshwater fishes
(iii) Controlled breeding experiments are carried out using artificial insemination

- **A)** FTT
- **B)** TTF
- **C)** FTF
- **D)** TFT

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24) The pollen tube usually enters the embryo sac **1.0**

- **A)** Through one of the synergids
- **B)** By directly penetrating the egg
- **C)** Between one synergid and central cell
- **D)** By knocking off the antipodal cells

25) On which of the following factors does the type of gas produced depend? **1.0**

- **A)** Substrate
- **B)** Cofactors
- **C)** Catalysts
- **D)** Product

26) Luteal phase is characterized by the conversion of a ruptured Graafian follicle into _____ **1.0**

- **A)** corpus luteum
- **B)** corpus albicans
- **C)** corpora quadrigemina
- **D)** primary follicle

27) Introduction of food plants developed by genetic engineering is not desirable because **1.0**

- **A)** Economy of developing countries may suffer
- **B)** These products are less tasty as compared to the already existing products
- **C)** This method is costly
- **D)** There is danger of entry of viruses and toxins with introduced crop

28) What is the role of the Biodiversity Management Committees (BMCs) under the Act? **1.0**

- **A)** To manage and enforce international trade regulations
- **B)** To assist in the local level conservation and management of biodiversity
- **C)** To develop new genetic engineering techniques
- **D)** To oversee the establishment of new protected areas

29) When F1 plants heterozygous for tallness are selfed F2, generation has both tall and dwarf plants. This proves the principle of: **1.0**

- **A)** Dominance
- **B)** Blended inheritance
- **C)** Law of segregation
- **D)** Law of independent assortment

30) Dioecious flowering plant prevents both **1.0**

- **A)** Autogamy and Geitenogamy
- **B)** Geitenogamy and Xenogamy
- **C)** Cleistogamy and Xenogamy
- **D)** Autogamy and xenogamy

31) Which of the following is a potential application of dedifferentiation and redifferentiation in regenerative medicine? **1.0**

- **A)** Inducing dedifferentiation to maintain tissue homeostasis
- **B)** Preventing redifferentiation to promote tissue repair
- **C)** Using redifferentiated cells to replace damaged tissue
- **D)** Inhibiting dedifferentiation to treat genetic diseases

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32) Which structure carries both urine and semen in males? **1.0**

- **A)** Urethra
- **B)** Vas deferens
- **C)** Epididymis
- **D)** Seminal vesicles

33) A chemical carcinogen present in tobacco smoke is responsible for **1.0**

- **A)** Skin cancer
- **B)** Pancreatic cancer
- **C)** Stomach cancer
- **D)** Lung cancer

34) Non-sedative drugs Thlidomide caused Phocomelia characterised by the symptom **1.0**

- **A)** Malformed limbs of foetus
- **B)** Malformation of foetus
- **C)** Vomiting of female during delivery
- **D)** Mental retardation of foetus

35) What is the major component of waste-water? **1.0**

- **A)** Pure water
- **B)** Human excreta
- **C)** Sand
- **D)** Clay

36) Name the hormone that has no role in menstruation **1.0**

- **A)** LH
- **B)** FSH
- **C)** GH
- **D)** TSH

37) Which of the following plant structures is responsible for the transport of water absorbed by roots to the rest of the plant? **1.0**

- **A)** Phloem
- **B)** Stomata
- **C)** Xylem
- **D)** Cortex

38) What is the main role of potassium ions in plants? **1.0**

- **A)** Enhancing root growth
- **B)** Facilitating photosynthesis
- **C)** Regulating water balance
- **D)** Enzyme activation

39) Which mechanism of speciation occurs without physical isolation? **1.0**

- **A)** Allopatric speciation
- **B)** Sympatric speciation
- **C)** Parapatric speciation
- **D)** Peripatric speciation

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40) Which is the most dangerous and common kind of environmental pollution ? **1.0**

- **A)** Air
- **B)** Water
- **C)** Noise
- **D)** Radioactive

41) Genes which code for a pair of contrasting traits are known as **1.0**

- **A)** Dominant genes
- **B)** Alleles
- **C)** Linked genes
- **D)** None of these

42) Resistance to jassids in cotton plants and to cereal leaf beetle in wheat plants is due to **1.0**

- **A)** Biochemical characters
- **B)** Physiological characters
- **C)** Morphological characters
- **D)** None of these

43) During binary fission in amoeba which of the following organelles is duplicated? **1.0**

- **A)** Plasma membrane
- **B)** Nucleus
- **C)** Contractile vacuole
- **D)** All of these

44) What is the molecular mechanism underlying vernalization in plants? **1.0**

- **A)** Activation of flowering genes
- **B)** Inhibition of photosynthesis
- **C)** Reduction of water uptake
- **D)** Increase in leaf senescence

45) Which of the hormones can replace vernalization? **1.0**

- **A)** Auxin
- **B)** Cytokinin
- **C)** Gibberellins
- **D)** Ethylene

46) What was the reason for the exploitation of the Steller's sea cow and the passenger pigeon? **1.0**

- **A)** Competition
- **B)** Loss of habitat
- **C)** Human activities
- **D)** Mutualistic relationships

47) ___ is a life process that is not essential for an individuals survival but for survival of the species. **1.0**

- **A)** Growth
- **B)** Reproduction
- **C)** Respiration
- **D)** Nutrition

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48) Which of the following gases is not included in biogas? **1.0**

- **A)** CH_4
- **B)** H_2S
- **C)** CO_2
- **D)** H_2O

49) Which of the following is a limiting factor in single-cell protein production? **1.0**

- **A)** Temperature
- **B)** pH
- **C)** Nutrient availability
- **D)** All of the above

50) The term "Cambrian Explosion" refers to: **1.0**

- **A)** The sudden increase in oxygen levels during the Cambrian period
- **B)** The rapid diversification of multicellular life forms during the Cambrian period
- **C)** The formation of the Cambrian mountains
- **D)** The mass extinction event that occurred during the Cambrian period

51) In folding produced by cytoplasmic membranes seen in bacteria are called **1.0**

- **A)** Fimbriae
- **B)** Pili
- **C)** Mesosomes
- **D)** Flagellin

52) What is the primary neurotransmitter responsible for transmitting nerve impulses across synapses in the central nervous system? **1.0**

- **A)** Dopamine
- **B)** Serotonin
- **C)** Acetylcholine
- **D)** GABA

53) Which of the following is a measure of water's resistance to flow? **1.0**

- **A)** Surface tension
- **B)** Capillarity
- **C)** Viscosity
- **D)** Adhesion

54) A fungal disease of the poultry is **1.0**

- **A)** Coccidiosis
- **B)** Coryza
- **C)** Aspergillosis
- **D)** Marck's disease

55) Approximately how much of the solar energy that falls on the leaves of a plant is converted to chemical energy by photosynthesis? **1.0**

- **A)** Less than 1%
- **B)** 2-10%
- **C)** 30%
- **D)** 50%

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56) What is the main source of carbon in the carbon cycle? **1.0**

- **A)** Soil
- **B)** Water
- **C)** Atmosphere
- **D)** Plants

57) Cast nets are used to catch _____ **1.0**

- **A)** marine fishes
- **B)** brackish fishes
- **C)** estuary fishes
- **D)** fresh water fishes

58) The process by which a neuron converts an incoming electrical signal into a chemical signal at the synapse is known as: **1.0**

- **A)** Synaptic transmission
- **B)** Neurotransmitter release
- **C)** Action potential propagation
- **D)** Reuptake

59) Deficiency of thyroxine in adults cause **1.0**

- **A)** cretinism
- **B)** myxoedema
- **C)** diabetes
- **D)** Cushing's disease

60) The upright pyramid of number is absent in **1.0**

- **A)** Pond
- **B)** Forest
- **C)** Lake
- **D)** Grassland

61) In which type of selection, individuals with average traits have higher fitness compared to individuals with extreme traits? **1.0**

- **A)** Stabilizing selection
- **B)** Directional selection
- **C)** Disruptive selection
- **D)** Artificial selection

62) Which of the following does not offer ex-situ conservation to the flora and fauna ? **1.0**

- **A)** Zoological parks
- **B)** Botanical gardens
- **C)** Sanctuaries
- **D)** Gene banks

63) Which of the following is not a tool of genetic engineering? **1.0**

- **A)** Cloning vector
- **B)** Restriction enzyme
- **C)** Foreign DNA
- **D)** GMO

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64) The correct sequence of plants in a hydrosere is **1.0**

- **A)** Volvox → Hydrilla → Pistia → Scirpus → Carex → Quercus
- **B)** Pistia → Volvox → scirpus → Hydrilla → Quercus → Carvex
- **C)** Quercus → Carex → Volvox → Hydrilla → Pistia → Scirpus
- **D)** Quercus → carex → scirpus → pistia → Hydrilla → Volvox

65) Hormone thyroxine, adrenaline, and nonadrenaline are formed from _____ **1.0**

- **A)** Glycine
- **B)** Arginine
- **C)** Ornithine
- **D)** Tyrosine

66) The symptom chlorosis is observed as **1.0**

- **A)** yellowing of leaf
- **B)** premature leaf fall
- **C)** malformation of leaf
- **D)** localized death of tissue

67) Ecological niche is **1.0**

- **A)** The surface area of the ocean
- **B)** An ecologically adapted zone
- **C)** The physical position and functional role of a species within the community
- **D)** Formed of all plants and animals living at the bottom of a lake

68) What is the term for the evolutionary process by which species evolve similar traits independently in response to similar environmental pressures? **1.0**

- **A)** Convergent evolution
- **B)** Divergent evolution
- **C)** Adaptive radiation
- **D)** Parallel evolution

69) AIDS is characterized by **1.0**

- **A)** Decrease in the number of killer T-cells
- **B)** Decrease in the number of suppressor T-cells
- **C)** Decrease in the number of helper T-cells
- **D)** Increase in the number of helper T-cells

70) The first clinical application of gene therapy over a 4 year old girl was for **1.0**

- **A)** Adenosine deaminase deficiency
- **B)** Adenosine deficiency
- **C)** Growth deficiency
- **D)** Adenine deficiency

71) The "Big Bang" occurred approximately: **1.0**

- **A)** 4.6 billion years ago
- **B)** 13.8 billion years ago
- **C)** 2.4 billion years ago
- **D)** 66 million years ago

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72) Cerebellum is controlling centre for **1.0**

- **A)** muscular strength
- **B)** memory
- **C)** equilibrium
- **D)** muscular coordination

73) Organisms which are associated with first as well as third trophic level are **1.0**

- **A)** Macrophytes
- **B)** Phytoplanktons
- **C)** Chemoautotrophs
- **D)** Insectivorous plants

74) Which disorder is characterized by the loss of myelin sheath in the central nervous system, leading to impaired nerve function? **1.0**

- **A)** Alzheimer's disease
- **B)** Parkinson's disease
- **C)** Multiple sclerosis
- **D)** Epilepsy

75) What part of ovary secretes progesterone? **1.0**

- **A)** Medulla
- **B)** Epithelial covering
- **C)** Graafian follicle
- **D)** Corpeus luteum

76) Which of the following brain regions is NOT heavily involved in addiction? **1.0**

- **A)** Prefrontal Cortex
- **B)** Amygdala
- **C)** Hippocampus
- **D)** Cerebellum

77) The somatosensory receptors responsible for sensing pain are called: **1.0**

- **A)** Thermoreceptors
- **B)** Mechanoreceptors
- **C)** Nociceptors
- **D)** Proprioceptors

78) By which of the following methods, new and better varieties of plants can be formed **1.0**

- **A)** Selection
- **B)** Grafting
- **C)** Hybridization
- **D)** Hybridization followed by selection

79) Crosses between, the plants of the same variety are called **1.0**

- **A)** Interspecific
- **B)** Intervarietal
- **C)** Intravarietal
- **D)** Intergeneric

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80) Which blood vessel has a muscular layer called tunica media? **1.0**

- **A)** Artery
- **B)** Vein
- **C)** Capillary
- **D)** Venules

81) Infection of Entamoeba histolytica can be checked by **1.0**

- **A)** Bathing before taking meals
- **B)** Covering the food articles
- **C)** Washing hands before taking meals
- **D)** Washing the vegetables before their consumption

82) Which of the following factors does NOT contribute to the development of addiction? **1.0**

- **A)** Genetic predisposition
- **B)** Environmental factors
- **C)** Personal choice alone
- **D)** Psychological factors

83) During which phase of growth are bacteria most susceptible to antibiotics? **1.0**

- **A)** Lag phase
- **B)** Log phase
- **C)** Stationary phase
- **D)** Death phase

84) If a genetic disease is transferred from a phenotypically normal but carrier female to only some of the male progeny, the disease is: **1.0**

- **A)** Autosomal dominant
- **B)** Autosomal recessive
- **C)** Sex-linked dominant
- **D)** Sex-linked recessive

85) Which of the following is not a type of photoreceptor cell found in the retina? **1.0**

- **A)** Rods
- **B)** Cones
- **C)** Ganglion cells
- **D)** Bipolar cells

86) What is the mechanism of sex determination in fruit flies? **1.0**

- **A)** XY system
- **B)** ZW system
- **C)** Temperature-dependent
- **D)** Haplo-diploid

87) Which type of plant cell is more susceptible to plasmolysis: young or mature cells? **1.0**

- **A)** Young cells
- **B)** Mature cells
- **C)** Both equally susceptible
- **D)** Neither

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88) _____ divides the scrotum internally. **1.0**

- **A)** Dartos tunic
- **B)** Valves
- **C)** Septum
- **D)** Septum scroti

89) Which of the following is responsible for cellular immunity **1.0**

- **A)** B-lymphocyte
- **B)** T-lymphocyte
- **C)** Erythrocytes
- **D)** Thrombocytes

90) Which layer of the uterus does the placenta attach to during pregnancy? **1.0**

- **A)** Endometrium
- **B)** Myometrium
- **C)** Perimetrium
- **D)** Epimetrium

91) According to Darwin, what is the primary mechanism for evolution? **1.0**

- **A)** Mutation
- **B)** Natural selection
- **C)** Genetic drift
- **D)** Gene flow

92) Hemp fibres are obtained from **1.0**

- **A)** Corchorus
- **B)** Cannabis sativa
- **C)** Linum
- **D)** Both A and B

93) The extent of chromosome coiling in non - dividing cells is _____ **1.0**

- **A)** Supercoiled
- **B)** Euchromatin
- **C)** Condensed
- **D)** Heterochromatin

94) Which of the following conditions is characterized by a deficiency in red blood cells or hemoglobin? **1.0**

- **A)** Leukemia
- **B)** Anemia
- **C)** Thrombocytopenia
- **D)** Hemophilia

95) What is a linkage map? **1.0**

- **A)** A map showing the geographic locations of genes
- **B)** A map showing the physical distance between genes on a chromosome
- **C)** A map showing the frequency of crossing over between genes
- **D)** A map showing gene expression levels

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96) What is the significance of natural resource conservation? **1.0**

- **A)** Maintaining the ecological processes
- **B)** Disturbing the ecological balance
- **C)** Extinction of biological species
- **D)** Disruption of the quality of the environment

97) Plasma Membrane is _____. **1.0**

- **A)** Selectively Permeable
- **B)** Freely Permeable
- **C)** Non Permeable
- **D)** Impermeable

98) Pattern baldness, moustaches and beard in human males are examples of **1.0**

- **A)** Sex-determining traits
- **B)** Sex linked traits
- **C)** Sex limited traits
- **D)** Sex differentiating traits

99) When root system absorbs water, which is the first physical process concerned with this activity? **1.0**

- **A)** Osmosis
- **B)** Imbibition
- **C)** Facilitated diffusion
- **D)** Diffusion

100) What level of biodiversity refers to the variety of different ecosystems within a larger geographical region? **1.0**

- **A)** Genetic biodiversity
- **B)** Species biodiversity
- **C)** Ecosystem biodiversity
- **D)** Population biodiversity

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