UNIVERSITY OF HEALTH SCIENCES, LAHORE

MEDICAL ENTRANCE TEST-2009

TOTAL TIME: 150 Minutes

Entrance Test for Candidates seeking Admission to Medical & Dental Institutions in Punjab

Shuffled Question Papers are Colour-Coded. There are in total FIVE Shuffled Question Papers in Navy Blue, Brown, Pink, Red and Green Colours. It is important that you get and use the MCQ Response Form of the Colour corresponding to the Colour of your Question Booklet.

GENERAL INSTRUCTIONS:

In order to ensure a fair chance to every candidate and to conduct the test efficiently, the candidate must follow the instructions given in this booklet and by the Superintendent.

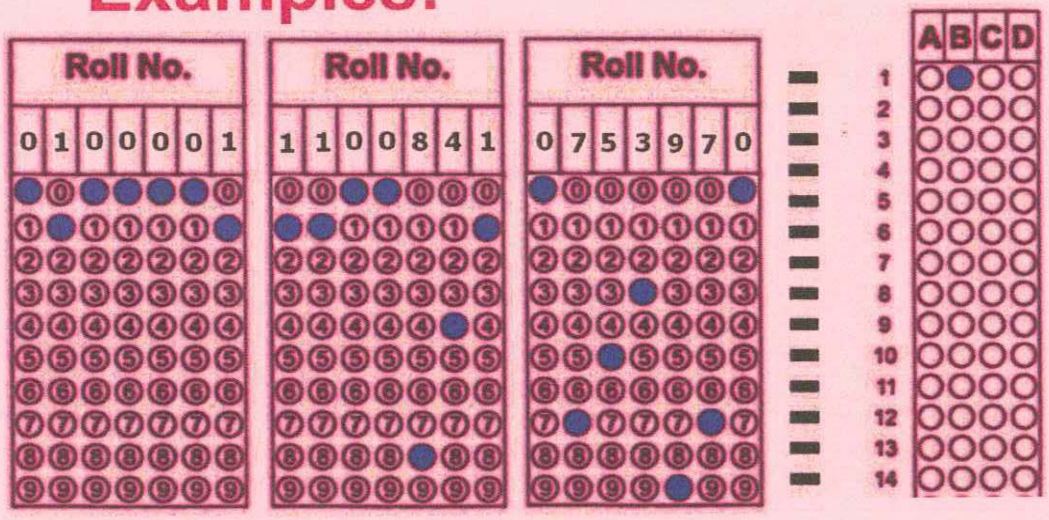
1. **DO NOT FOLD THE MCQ RESPONSE FORM.**
2. One candidate shall only be Issued **One MCQ Response Form of the Colour corresponding to the Colour of the Question Booklet.**
3. The Entrance Test will start exactly at **9:00 a.m.**
4. All answers must be given by completely filling the Circles having the Correct Answer i.e. A, B, C, or D with Blue Ball Pen Only. Filling of circles incompletely, multiple responses and unnecessary marks may mislead the Optical Mark Reader Machine and your Responses may not be evaluated correctly for which the University will NOT be responsible.
5. No mobile phones, notes, books, weapons, armaments or any device that can be used for communication or to cause disturbance in the course of the Test is permitted within the premises of the "Centre".
6. During the Test, candidates will not talk, whisper or turn their eyes or head away from their own papers.
7. Any evidence of cheating or non-compliance of instructions will disqualify the candidate from the Test and his / her name will be removed from the List of the Candidates.
8. The candidates should carefully think about their answers before filling the circles on the Response Form. Once an answer has been given on the Response Form, the candidate will not be permitted to change any of his / her answers in any way.

The candidates should not mark Answers on the Question Paper. All answers must be given on the MCQ Response Form Only by filling the relevant Circle with Blue Ball Pen. Erasing or Filling another Circle for the same answer shall be considered as an Incorrect Response.

Whereas the Content of Paper is Same for all the Students of Respective Groups, the MCQs and their Response Stems are shuffled to Discourage Cheating.

9. All rough work must be done on the back side of the Question Paper ***(not on the MCQ Response Form).***
10. There will be **Negative Marking** in the Test. Each Correct Answer carries Five (05) Marks. However, for each Wrong Answer One (01) Mark will be deducted.
11. The Seven Digit Roll Number should be entered carefully in the designated area both on MCQ Question Paper and the MCQ Response Form where the Corresponding Circles under each Digit should also be shaded as shown in the Examples Below.
12. The MCQ Response Form is to be returned together with the MCQ Question Paper at the end of the Entrance Test.
13. When the Instructor says **STOP,** the candidates should stop writing and turn over their Question Booklets and MCQ Response Forms.
14. No candidate will be allowed to leave the Examination Centre before the end of the Entrance Test.
15. At the end of the Entrance Test the candidates are requested to fill in the "Feed Back Form" which will help the University improve its Services to the Public in Future. **This "Feed Back Form" is NOT PART of the Evaluation Process.**

Examples:



Q. (1). The celluar layer of the periosteum contains:

A) Osteocytes
B) Osteoblasts
C) Osteoclasts
D) Fibroblasts

(Correct Answer is Option "B")

You are to remain seated till all the MCQ Response Forms and Question Booklets have been collected from the Candidates and the Supervisor announces that it is alright for you to leave. Ensure that you have returned the MCQ Response Form and Questions Booklet to the Invigilating Staff. Failure to comply will lead to AUTOMATIC DISQUALIFICATION from MCAT 2009.

University of Health Sciences, Lahore

Roll No. of Candidate

Signature of Candidate

MEDICAL ENTRANCE TEST-2009

For Non-F.Sc. Students Only

Total MCQs: 220

Max. Marks: 1100

Time Allowed: 150 Minutes

PHYSICS

Q.1 Which is a pair of SI base units?

A	ampere	joule
B	coulomb	second
C	kilogram	kelvin
D	metre	newton

Q.2 What is the ratio $\frac{1\mu m}{1Gm}$?

A) 10^{-3}
B) 10^{-9}
C) 10^{-12}
D) 10^{-15}

Q.3 Which formula could be correct for the speed v of ocean waves in terms of the density ρ of sea-water, the acceleration of free fall g, the depth h of the ocean and the wavelength λ ?

A) $v = \sqrt{g\lambda}$

B) $v = \sqrt{\frac{g}{h}}$

C) $v = \sqrt{\rho g h}$

D) $v = \sqrt{\frac{g}{\rho}}$

Q.4 An Olympic Athlete of mass 80 Kg competes in a 100 m race. What is the best estimate of its mean kinetic energy during the race?

A) $4x10^2$ J.
B) $4x10^4$ J.
C) $4x10^3$ J.
D) $4x10^5$ J.

Q.5 The e.m.f induced in a coil by a changing magnetic flux is equal to the rate of change of flux with time. Which is a unit for magnetic flux?

A) $kgm^2s^{-2}A^{-1}$
B) $kgm^2s^{-2}A$
C) $kgms^2A^{-1}$
D) $ms^{-2}A^{-1}$

Q.6 A car is traveling with uniform acceleration along a straight road. The road has marker posts every 100 meter. When the car passes one post, it has a speed of 10m/sec and when it passes the next one, its speed is 20m/sec. what is the car's acceleration?

A) 0.67 m/sec.
B) 2.5 m/sec.
C) 1.5 m/sec.
D) 6.0 m/sec.

Q.7 A ball falls vertically and bounces on the ground. The following statements are about the forces acting while the ball is in contact with the ground. Which statement is correct?

A) The force that the ball exerts on the ground is always equal to the weight of the ball.
B) The force that the ball exerts on the ground is always equal in magnitude and opposite in direction to the force the ground exerts on the ball.
C) The force that the ball exerts on the ground is always greater than the weight of the ball.
D) The weight of the ball is always equal and opposite to the force that the ground exerts on the ball.

(Continued)

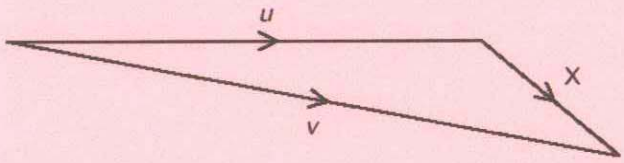
Q.8 **A motorist traveling at 10m/sec can bring his car to rest in a distance of 10m. If he had been traveling at 30m/sec, in what distance could he bring the car to rest using the same braking force?**

A) 17 m.
B) 52 m.
C) 30 m.
D) 90 m.

Q.9 **Which feature of a graph allows acceleration to be determined?**

A) The area under a displacement-time graph.
B) The area under a velocity-time graph.
C) The slope of a displacement-time graph.
D) The slope of a velocity-time graph.

Q.10 **An object has an initial velocity u. It is subjected to a constant force F for t seconds, causing a constant acceleration a. The force is not in the same direction as the initial velocity. A vector diagram is drawn to find the final velocity v.**



What is the length of side X of the vector diagram?

A) F
B) Ft
C) at
D) $u + at$

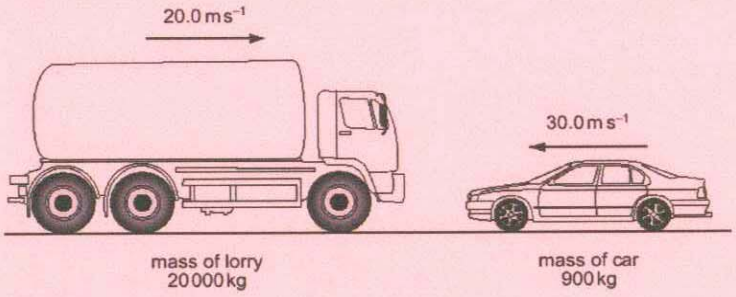
Q.11 **A stone is dropped from the top of a tower of height 40 m. The stone falls from rest and air resistance is negligible. What time is taken for the stone to fall the last 10 m to the ground?**

A) 0.38 s
B) 1.4 s
C) 2.5 s
D) 2.9 s

Q.12 **What is meant by the weight of an object?**

A) The gravitational field acting on the object
B) The gravitational force acting on the object
C) The mass of the object multiplied by gravity
D) The object's mass multiplied by its acceleration

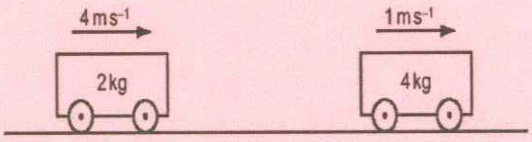
Q.13 **A lorry of mass 20 000 kg is traveling at 20.0 m s^{-1}. A car of mass 900 kg is traveling at 30.0 ms^{-1} towards the lorry.**



What is the magnitude of the total momentum?

A) 209 kN s
B) 373 kN s
C) 427 kN s
D) 1045 kN s

Q.14 **The diagram shows the masses and velocities of two trolleys about to collide.**



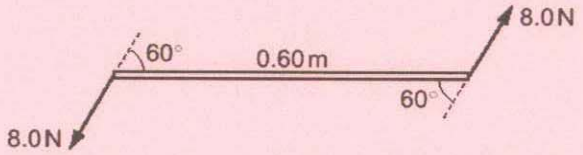
After the impact they move off together. What is the total kinetic energy of the trolleys after the collision?

A) 1.3 J
B) 12 J
C) 18 J
D) 19 J

Q.15 **When a force of 4 N acts on a mass of 2 kg for a time of 2 seconds, what is the rate of change of momentum?**

A) 2 kgm/s^2
B) 8 kgm/s^2
C) 4 kgm/s^2
D) 16 kgm/s^2

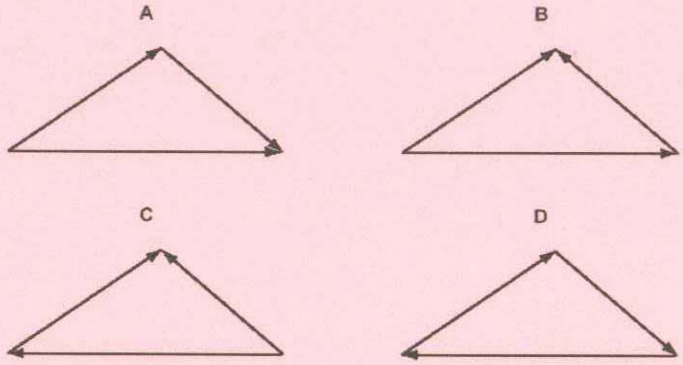
Q.16 **Two 8.0 N forces act at each end of a beam of length 0.60 m. The forces are parallel and act in opposite directions. The angle between the forces and the beam is 60 °.**



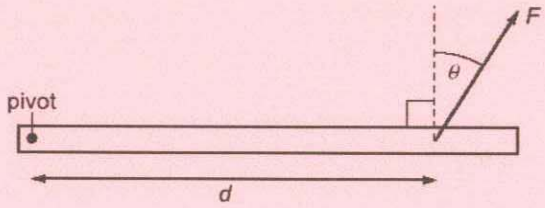
What is the torque of the couple exerted on the beam?

A) 2.4 N m
B) 4.2 N m
C) 4.8 N m
D) 9.6 N m

Q.17 **The diagrams show three forces acting on a body. In which diagram is the body in equilibrium?**



Q.18 **A force F is applied to a beam at a distance d from a pivot. The force acts at an angle θ to a line perpendicular to the beam.**



Which combination will cause the largest turning effect about the pivot?

	F	*d*	θ
A	large	large	large
B	large	large	small
C	small	small	large
D	small	large	small

Q.19 **A submarine descends vertically at constant velocity. The three forces acting on the submarine are viscous drag, upthrust and weight. Which relationship between their magnitudes is correct?**

A) Weight<drag
B) Weight=drag
C) Weight<upthrust
D) Weight>upthrust

Q.20 **Which expression defines power?**

A) force × distance moved in the direction of the force
B) force × velocity
C) work done ÷ time taken
D) work done × time taken

Q.21 **A concrete cube of side 0.50 m and uniform density 2.0 x 103 kg m-3 is lifted 3.0 m vertically by a crane. What is the change in potential energy of the cube?**

A) 0.75 kJ
B) 29 kJ
C) 7.4 kJ
D) 470 kJ

(Continued)

Q.22 Which group of statements applies only to the liquid state?

A) Atoms separated by many atomic diameters; positions of atoms can change; atoms vibrate

B) Atoms separated by many atomic diameters; atoms are in fixed positions; atoms are in continuous, random motion

C) Atoms can touch each other; positions of atoms can change; some random motion of atoms

D) Atoms can touch each other; atoms are in fixed positions; some random motion of atoms

Q.23 Below are four short paragraphs describing the molecules in a beaker of water at 50°C. Which paragraph correctly describes the molecules?

A) The molecules all travel at the same speed. This speed is not large enough for any of the molecules to leave the surface of the water. There are attractive forces between the molecules.

B) The molecules have a range of speeds. Some molecules travel sufficiently fast to leave the surface of the water. There are no forces between the molecules.

C) The molecules have a range of speeds. Some molecules travel sufficiently fast to leave the surface of the water. There are attractive forces between the molecules.

D) The molecules have a range of speeds. The fastest molecules are unable to leave the surface of the water. There are attractive forces between the molecules.

Q.24 In an experiment to demonstrate Brownian motion, smoke particles in a container are illuminated by a strong light source and observed through a microscope. The particles are seen as small specks of light that are in motion. What causes the Brownian motion?

A) Collisions between the smoke particles and air molecules

B) Collisions between the smoke particles and the walls of the container

C) Convection currents within the air as it is warmed by the light source

D) Kinetic energy gained by the smoke particles on absorption of light

Q.25 Which line in the table gives approximate ratios of density and molecular spacing for a substance in its solid, liquid and gas phases?

	density	molecular spacing
	solid : liquid : gas	solid : liquid : gas
A	1000 : 1000 : 1	1 : 1 : 10
B	1000 : 100 : 1	1 : 10 : 1000
C	1000 : 1000 : 1	1 : 1 : 1000
D	1000 : 100 : 1	1 : 10 : 100

Q.26 What is the Young modulus of a metal?

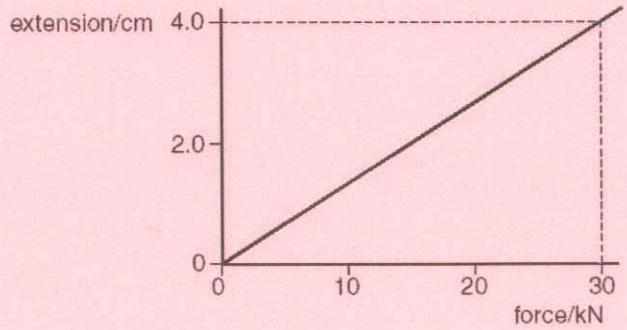
A) extension / force

B) force / extension

C) strain / stress

D) stress / strain

Q.27 The graph shows how the extension of a spring varies with the force used to stretch it.



What is the strain energy stored in the spring when the extension is 4.0 cm?

A) 60 J

B) 120 J

C) 600 J

D) 1200 J

Q.28 **Two springs P and Q both obey Hooke's law. They have spring constants 2*k* and *k* respectively. The springs are stretched, separately, by a force that is gradually increased from zero up to a certain maximum value, the same for each spring. The work done in stretching spring P is *W*P, and the work done in stretching spring Q is *W*Q. How is *W*P related to *W*Q?**

A) $W_P = \frac{1}{4}W_Q$

B) $W_P = \frac{1}{2}W_Q$

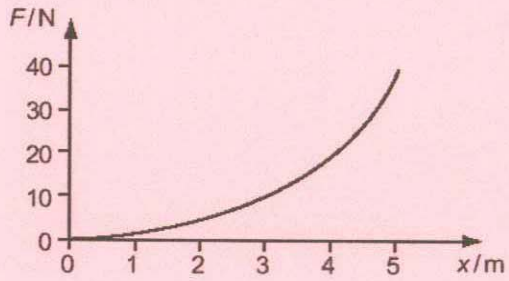
C) $W_P = 2W_Q$

D) $W_P = 4W_Q$

Q.29 **The table shows a load applied to four wires and the cross-sectional area of each. Which of the wires is subjected to the greatest stress?**

	load/N	cross-sectional area/mm^2
A	1500	0.25
B	2000	1.0
C	3000	0.56
D	5000	2.3

Q.30 **The force F required to extend a sample of rubber by a distance x is found to vary as shown.**



The energy stored in the rubber for an extension of 5 m is:

A) Less than 100 J.
B) 100 J.
C) Between 100 J and 200 J.
D) More than 200 J.

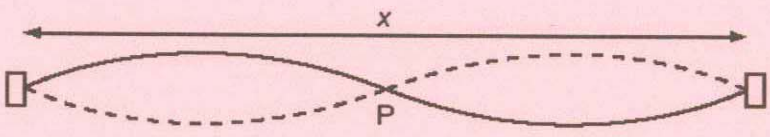
Q.31 **Which of the following is a longitudinal wave?**

A) A light wave traveling through air
B) A radio wave from a broadcasting station
C) A ripple on the surface of water
D) A sound wave traveling through air

Q.32 **A stationary sound wave is set up along the line joining two loudspeakers. Which measurement is sufficient on its own to enable you to deduce the wavelength of the wave?**

A) The amplitude of the sound wave
B) The distance between the two loudspeakers
C) The distance between two adjacent antinodes
D) The frequency of the sound wave

Q.33 **The diagram represents a stationary wave on a stretched string.**



What is represented by point P and by the length x?

	point P	length *x*
A	antinode	one wavelength
B	antinode	two wavelengths
C	node	one wavelength
D	node	two wavelengths

(Continued)

Q.34 **Fringes of separation y are observed on a screen 1.00 m from a Young's slit arrangement that is illuminated by yellow light of wavelength 600 nm. At which distance from the slits would fringes of the same separation y be observed when using blue light of wavelength 400 nm?**

A) 0.33 m
B) 0.67 m
C) 0.75 m
D) 1.50 m

Q.35 **Which of the following types of wave can be polarized?**

A) A longitudinal progressive wave
B) A longitudinal stationary wave
C) A transverse stationary wave
D) A transverse sound wave

Q.36 **Sound wave X has intensity 10^{12} times greater than that of sound wave Y. By how much is the amplitude of X greater than the amplitude of Y?**

A) 10^{6} times
B) 3.16×10^{6} times
C) 5×10^{11} times
D) 10^{12} times

Q.37 **Where, in a standing wave, do the vibrations of the medium occur?**

A) Only at the nodes
B) Only at the antinodes
C) At all points between the nodes
D) At all points between the antinodes

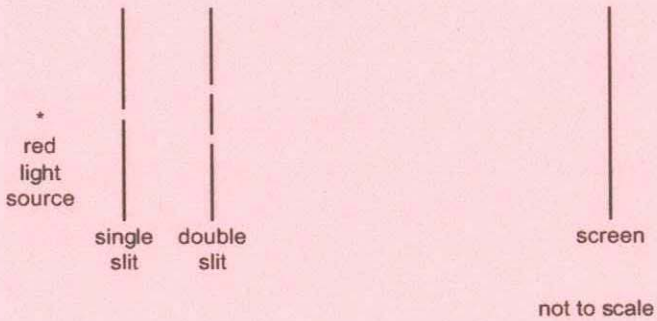
Q.38 **Which phenomenon is associated with transverse waves but not longitudinal waves?**

A) Polarization
B) Reflection
C) Refraction
D) Superposition

Q.39 **Monochromatic light is incident on a diffraction grating and a diffraction pattern is observed. Which line of the table gives the effect of replacing the grating with one that has more lines per metre?**

	number of orders of diffraction visible	angle between first and second orders of diffraction
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

Q.40 **A double-slit interference experiment is set up as shown.**



not to scale

Fringes are formed on the screen. The distance between successive bright fringes is found to be 4 mm. Two changes are then made to the experimental arrangement. The double slit is replaced by another double slit which has half the spacing. The screen is moved so that its distance from the double slit is twice as great. What is now the distance between successive bright fringes?

A) 1 mm
B) 4 mm
C) 8 mm
D) 16 mm

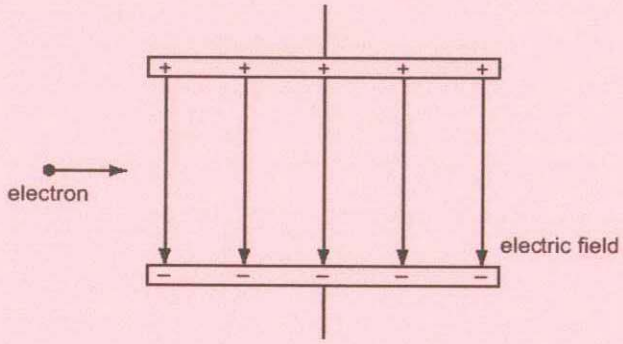
Q.41 **The electric field strength between a pair of parallel plates is E. The separation of the plates is doubled and the potential difference between the plates is increased by a factor of four. What is the new electric field strength?**

A) E
B) 2E
C) 4E
D) 8E

Q.42 **What is a correct statement of Ohm's law?**

A) The potential difference across a component equals the current providing the resistance and other physical conditions stay constant.
B) The potential difference across a component equals the current multiplied by the resistance.
C) The potential difference across a component is proportional to its resistance.
D) The potential difference across a component is proportional to the current in it, providing, physical conditions stay constant.

Q.43 **An electron, traveling horizontally at constant speed in a vacuum, enters a vertical electric field between two charged parallel plates as shown.**



What are the horizontal and vertical components of the motion of this electron when it is in the field?

	horizontal component of motion	vertical component of motion
A	constant speed	acceleration upwards
B	constant speed	acceleration downwards
C	acceleration to the right	acceleration downwards
D	acceleration to the right	acceleration upwards

Q.44 **The current in a resistor is 8.0 mA. What charge flows through the resistor in 0.020 s?**

A) 0.16 mC
B) 1.6 mC
C) 4.0 mC
D) 0.40 C

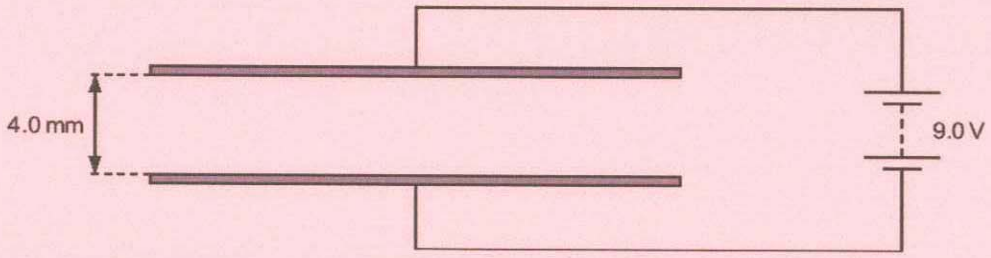
Q.45 **Which equation is used to define resistance?**

A) energy = (current)^2 . resistance . time
B) potential difference = current . resistance
C) power = (current)^2 . resistance
D) resistivity = resistance . area . length

Q.46 **A copper wire of cross-sectional area 2.0 mm^2 carries a current of 10 A. How many electrons pass through a given cross-section of the wire in one second?**

A) 1.0×10^{1}
B) 5.0×10^{6}
C) 6.3×10^{19}
D) 3.1×10^{25}

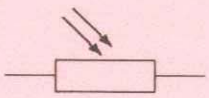
Q.47 **The diagram shows a pair of metal plates 4.0 mm apart connected to a 9.0 V battery.**



What is the electric field between the plates?

A) 4.4×10^{-4} N C^{-1}
B) 3.6×10^{-2} N C^{-1}
C) 36 N C^{-1}
D) 2.3×10^{3} N C^{-1}

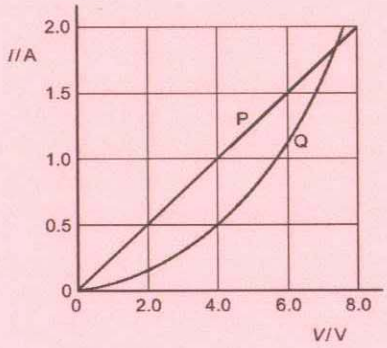
Q.48 **Which electrical component is represented by the following symbol?**



A) A diode
B) A light-dependent resistor
C) A resistor
D) A thermistor

(Continued)

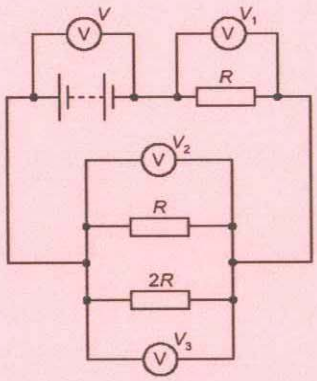
Q.49 The I-V characteristics of two electrical components P and Q are shown below.



Which statement is correct?

A) P is a resistor and Q is a filament lamp.
B) The resistance of Q increases as the current in it increases.
C) At 1.9 A the resistance of Q is approximately half that of P.
D) At 0.5 A the power dissipated in Q is double that in P.

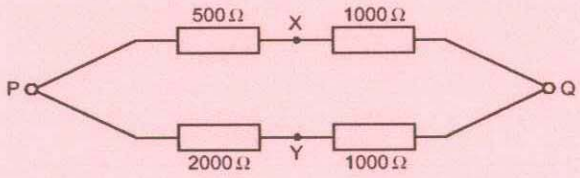
Q.50 The diagram shows a circuit with four voltmeter readings V, V1, V2 and V3.



Which equation relating the voltmeter readings must be true?

A) V = V1 + V2 + V3
B) V + V1 = V2 + V3
C) V3 = 2(V2)
D) V – V1 = V3

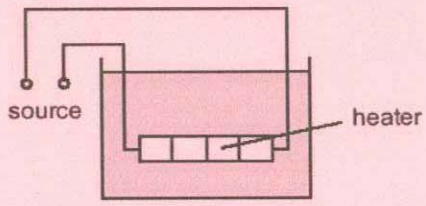
Q.51 A p.d. of 12 V is connected between P and Q.



What is the p.d. between X and Y?

A) 0 V
B) 4 V
C) 6 V
D) 8 V

Q.52 The diagram shows a low-voltage circuit for heating the water in a fish tank.



The heater has a resistance of 3.0 Ω. The voltage source has an e.m.f. of 12 V and an internal resistance of 1.0 Ω. At what rate does the voltage source supply energy to the heater?

A) 27 W
B) 36 W
C) 48 W
D) 64 W

Q.53 **When four identical lamps P, Q, R and S are connected as shown in diagram 1, they have normal brightness.**

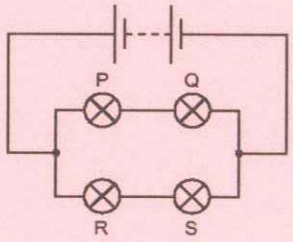


diagram 1

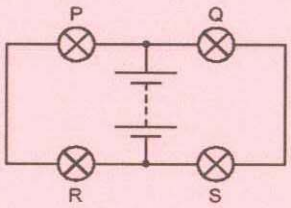
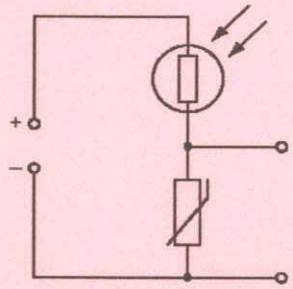


diagram 2

The four lamps and the battery are then connected as shown in diagram 2. Which statement is correct?

A) The lamps do not light.
B) The lamps are less bright than normal.
C) The lamps have normal brightness.
D) The lamps are brighter than normal.

Q.54 **The diagram shows a light-dependent resistor (LDR) and a thermistor forming a potential divider.**



Under which set of conditions will the potential difference across the thermistor have the greatest value?

	illumination	temperature
A	low	low
B	high	low
C	low	high
D	high	high

Q.55 **A student conducts an experiment using an α-particle source. When considering safety precautions, what can be assumed to be the maximum range of α-particles in air?**

A) Between 0 and 5 mm
B) Between 5 mm and 200 mm
C) Between 200 mm and 500 mm
D) Between 500 mm and 1000 mm

Q.56 **What is a correct order of magnitude estimate for the diameter of a typical atomic nucleus?**

A) 10^{-14} m
B) 10^{-18} m
C) 10^{-22} m
D) 10^{-26} m

Q.57 **The decay of a nucleus of neptunium is accompanied by the emission of a β-particle and γ-radiation. What effect (if any) does this decay have on the proton number and the nucleon number of the nucleus?**

	proton number	nucleon number
A	increases	decreases
B	decreases	increases
C	unchanged	decreases
D	increases	unchanged

Q.58 **What is an equivalent unit to 1 volt?**

A) J A^{-1}
B) 1 J C^{-1}
C) W C^{-1}
D) 1 W s^{-1}

(Continued)

Q.59 **Radon-220 is radioactive and decays to Polonium-216 with the emission of an α-particle. The equation for the radioactive decay is shown.**

$$^{220}_{86}Rn \rightarrow {}^{216}_{84}Po + {}^{4}_{2}He$$

How many neutrons are in the radon and polonium nuclei?

	Rn	Po
A	86	84
B	134	132
C	220	212
D	220	216

Q.60 **Isotopes of a given element all have the same:**

A) Charge/mass ratio
B) Neutron number
C) Nucleon number
D) Proton number

CHEMISTRY

Q.61 **In the Basic Oxygen steel-making process the P_4O_{10} impurity is removed by reacting it with calcium oxide. The only product of this reaction is the salt calcium phosphate, $Ca_3(PO_4)_2$. In this reaction, how many moles of calcium oxide react with one mole of P_4O_{10}?**

A) 1
B) 1.5
C) 3
D) 6

Q.62 **What volume of oxygen is required for the complete combustion of a mixture of 5cm^3 of CH_4 and 5 cm^3 of C_2H_4?**

A) 5 cm^3.
B) 10 cm^3.
C) 15cm^3.
D) 25 cm^3.

Q.63 **In which of the following substances does sulphur exhibits its highest oxidation state?**

A) S_8.
B) SO_2.
C) SO_2Cl_2.
D) $Na_2S_2O_3$.

Q.64 **What kind of orbital must an electron with the Principal Quantum Number *n*=2 occupy?**

A) Spherically-shaped orbital.
B) Either an s or p orbital.
C) The orbital closest to the nucleus.
D) A dumbbell-shaped orbital.

Q.65 **Which of the following ions contains five unpaired d-electrons?**

A) Cr^{3+}
B) Fe^{3+}
C) Mn^{3+}
D) Ni^{2+}

Q.66 **Which equation relates to the first ionization energy of bromine?**

A) $Br(g) \longrightarrow Br^-(g) - e^-$
B) $Br(g) \longrightarrow Br^+(g) + e^-$
C) $\frac{1}{2} Br_2(g) \longrightarrow Br^-(g) - e^-$
D) $\frac{1}{2} Br_2(g) \longrightarrow Br^+(g) + e^-$

Q.67 **Which one of the following is NOT planar?**

A) Benzene.
B) Methanal.
C) Propene.
D) Boron trichloride.

Q.68 **Which one of the following is a linear molecule?**

A) H_2O.
B) HCN.
C) SO_2.
D) C_2H_4.

Q.69 **A solid melts sharply just above 100°C. It does not conduct electricity even when molten. It dissolves in hydrocarbon solvents. What is the structure of the solid most likely to be?**

A) Metallic.
B) A molecular crystal.
C) An ionic crystal.
D) An atomic crystal.

Q.70 **Under what conditions of temperature and pressure will a Real Gas behave most likely an Ideal Gas?**

	Temperature	Pressure
A)	Low	Low
B)	Low	High
C)	Standard	Standard
D)	High	Low

Q.71 **A small spacecraft of capacity $10m^3$ is connected to another of capacity $30m^3$. Before connection, the pressure inside the smaller spacecraft is 50 kPa and that inside the larger is 100 kPa. If all measurements are made at the same temperature, what is the pressure in the combined arrangement after connection?**

A) 75 kPa.
B) 87.5 kPa.
C) 100 kPa.
D) 125 kPa.

Q.72 **Which one of the following solids is an example of a substance with a macromolecular structure?**

A) Aluminium chloride.
B) Ice.
C) Magnesium oxide.
D) Silicon (IV) oxide.

Q.73 **Which one of the following is involved in determining the enthalpy change in a chemical reaction?**

A) The mechanism of the reaction
B) The initial and the final states of the reacting system
C) The activation energy of the reaction
D) The number of stages involved in the chemical reaction

Q.74 **For which of the following ions is the enthalpy change of hydration likely to be the most exothermic?**

	Ion	*ionic radius/nm*	*charge on ion*
A)		0.065	+2
B)		0.095	+1
C)		0.135	+2
D)		0.169	+1

Q.75 **Which value would be required to estimate the lattice energy for the hypothetical ionic compound MgH?**

A) The electron affinity of Hydrogen
B) The first ionization energy of Hydrogen
C) The magnesium-hydrogen bond energy
D) The standard enthalpy change of formation of MgH_2

Q.76 **The value of the enthalpy change for the process represented by the equation**

$$Na(s) \longrightarrow Na^+(g)+e^-$$

is equal to:

A) The first ionization energy of sodium.
B) The enthalpy change of vaporization of sodium.
C) The sum of the first ionization energy and the electron affinity of sodium.
D) The sum of the enthalpy change of atomization and the first ionization energy of sodium.

Q.77 **A currentis passed through two cells connected in series. The first cell contains $XSO_4(aq)$ while the second cell contains $Y_2SO_4(aq)$. The relative atomic masses of *X* and *Y* are in the ratio 1:2. What is the ratio?**

Mass of *X* liberated : Mass of *Y* liberated

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

Q.78 **When 5 mol of electrons are passed through a molten aluminium salt, what is the maximum mass of aluminium formed at the cathode?**

A) 5.4g
B) 16.2g
C) 27g
D) 45g

Q.79 **A current of 8 A is passed for 100 min through molten aluminium oxide, using inert electrodes. What is the approximate volume of gas liberated, measured at s.t.p.?**

A) $2.8dm^3$
B) $8.4dm^3$
C) $11.2dm^3$
D) $22.4dm^3$

Q.80 **Which one of the following is a correct statement about the effect of a catalyst?**

A) It provides an alternative route for a reaction
B) It increases the equilibrium constant for the forward reaction
C) It increases the rate constant for the forward reaction but not that of the back reaction
D) It increases the yield of product in an equilibrium

Q.81 **Which one of the following acid solutions can be used to give an effective solution at a pH<7 by partial neutralization with aqueous NaOH?**

A) mol dm^{-3} CH_3CO_2H
B) mol dm^{-3} HI
C) mol dm^{-3} HCl
D) mol dm^{-3} H_2SO_4

Q.82 **The pK_b value for aqueous ammonia at 25°C is 4.8. What is the correct pK_a value for the ammonium ion at this temperature? (K_b denotes the Base Dissociation Constant and K_a denotes the acid dissociation constant).**

A) -4.8
B) 2.2
C) 4.8
D) 9.2

(Continued)

Q.83 **If the rate of decay of a radioactive isotope decreases from 200 counts/min to 25 counts/min after 24 hours, what is its half-life?**

A) 3 hours.
B) 4 hours.
C) 6 hours.
D) 8 hours.

Q.84 **Which one of the following correctly represents the units of the rate constant *k* for a first order reaction?**

A) s^{-1}.
B) mol dm^{-3}
C) mol dm^{-3} s^{-1}
D) mol dm^{-3} s

Q.85 **For the gaseous reaction $2X(g) + Y(g) \longrightarrow Z(g)$, the rate equation is:**

$$\text{Rate} = k[X]^2[Y]^0$$

If the pressure in the reaction vessel is doubled, but the temperature remains constant by what factor does the rate of reaction increase?

A) 2
B) 3
C) 4
D) 8

Q.86 **Which of the following oxides is unlikely to dissolve in aqueous Sodium Hydroxide?**

A) Al_2O_3.
B) MgO.
C) P_4O_{10}.
D) SiO_2.

Q.87 **In which of the following pairs is the radius of the second atoms greater than that of the first atom?**

A) Na, Mg.
B) Sr, Ca.
C) P, N.
D) Cl, Br.

Q.88 **An element Q has a low proton number. It forms an amphoteric oxide and a chloride which, when anhydrous, is readily hydrolyzed by water. Which Group in the Periodic Table might contain Q?**

A) II
B) III
C) IV
D) V

Q.89 **The species Ar, K^+ and Ca^{2+} are isoelectronic (have the same number of electrons). In what order do their radii increase?**

	Smallest ⟶		Largest
A)	Ar	Ca^{2+}	K^+
B)	Ar	K^+	Ca^{2+}
C)	Ca^{2+}	Ar	K^+
D)	Ca^{2+}	K^+	Ar

Q.90 **Which one of the following is likely to have an electronegativity similar to that of Aluminium?**

A) Barium.
B) Beryllium.
C) Calcium
D) Magnesium.

Q.91 **Which one of the following methods is the most suitable for the extraction of barium?**

A) Electrolyzing aqueous barium chloride.
B) Electrolyzing molten barium chloride.
C) Roasting barium sulphide in air.
D) Reducing barium oxide with carbon.

Q.92 **The solubilities of the Group-II metal sulphates decrease as the proton number of the metal increases. Which factor affects this trend?**

A) The atomic radius of the metal atom.
B) The enthalpy change of formation of the sulphate.
C) The enthalpy change of hydration of the metal ion.
D) The first ionization energy of the metal.

Q.93 **The propellant used in the solid rocket booster of a space shuttle is a mixture of aluminium and compound X. Compound X contains chlorine in an oxidation state of +7. Which of the following could be compound X?**

A) NCl_3.
B) NH_4Cl.
C) NH_4ClO_3.
D) NH_4ClO_4.

Q.94 **An aqueous solution containing Br^- ions is treated with $AgNO_3(aq)$, giving a precipitate P which is then tested for its solubility for concentrated $NH_3(aq)$. What is the colour of P and its solubility in $NH_3(aq)$?**

	Colour of P	**Solubility in $NH_3(aq)$**
A)	White	Insoluble
B)	White	Slightly soluble
C)	Cream	Slightly soluble
D)	Yellow	Insoluble

Q.95 **Aqueous sodium chloride (brine) is electrolyzed by using inert electrodes in a cell which is stirred so that the products of electrolysis are able to react. The cell is kept cold. Which one of the following pairs of substances is among the final products?**

A) Hydrogen and chlorine only.
B) Hydrogen and sodium chlorate (I).
C) Hydrogen and sodium chlorate (V).
D) Hydrogen chloride and sodium chlorate (I).

Q.96 **The substances below are all present in the exhaust fumes of a car engine. Which one of these substances could contribute to "Acid Rain"?**

A) N_2.
B) NO.
C) CO.
D) PbO.

Q.97 **Which one of the following pairs of substances will not produce hydrogen when reacted together?**

A) Copper and concentrated Nitric Acid.
B) Ethanol and Metallic Sodium.
C) Magnesium and Steam.
D) Phenol and Metallic Sodium.

Q.98 **Under appropriate conditions, NH_4Br and KNH_2 react as follows:**

$$NH_4Br + KNH_2 \longrightarrow KBr + 2NH_3$$

How the reaction is best classified?

A) Acid-base
B) Condensation
C) Disproportionation reaction
D) Oxidation-reduction

Q.99 **What is the number of isomers of $C_2H_2Cl_2$ including *cis-trans* (geometrical) isomers:**

A) 1
B) 4
C) 2
D) 5

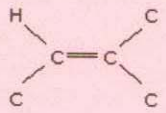
Q.100 **Which hydrocarbon can form a monochloro-substitution derivative which shows both chirality and *cis-trans* isomerism?**

A) $CH_3CH=CH_2$.
B) $(CH)_2C=CH_2$.
C) $CH_3CH=C(CH_3)_2$
D) $CH_3CH=CHCH_2CH_3$

Q.101 **As the number of Carbon atoms in the homologous series of Alkane molecules increases, for which property of the alkanes does the numerical value decrease?**

A) Density.
B) Enthalpy change of vapourization
C) Number of isomers.
D) Vapour pressure.

Q.102 **Trichloroethene is widely used as a dry-cleaning agent.**



With which of the following does trichloroethene react to give a chiral product?

A) Br_2
B) HCl
C) NaCN(aq)
D) NaOH(aq)

Q.103 **Chloroethene, $CH_2=CHCl$, is the monomer of PVC. What are the C–C–C bond angles along the polymeric chain in PVC?**

A) They are all 109.5°.
B) Half are 109.5° and half are 120°.
C) They are all 120°.
D) They are all 180°.

Q.104 **A hydrocarbon which is a liquid at room temperature decolorizes aqueous bromine. What could be the molecular formula of the compound?**

A) C_2H_2.
B) C_2H_4.
C) C_7H_{16}.
D) $C_{10}H_{20}$.

Q.105 **Halogenoalkanes are important molecules in organic synthetic reactions. In particular they undergo a range of nucleophilic reactions. Which reaction proceeds only by an SN^1 mechanism?**

A) $CH_3CH_2Br + NH_3$
B) $CH_3CH_2CH_2I + OH^-$
C) $CH_3CHBrCH_3 + NH_3$
D) $(CH_3)_3CI + OH^-$

Q.106 **Which term describes the action of NaOH(aq) on a bromoalkane?**

A) acid-base reaction
B) electrophilic substitution
C) elimination of HBr
D) nucleophilic substitution

Q.107 **An alcohol with molecular formula $CnH_{2n+1}OH$ has a chiral carbon atom but does not react with MnO^-_4 / H^+. What is the least number of carbon atoms such an alcohol could possess?**

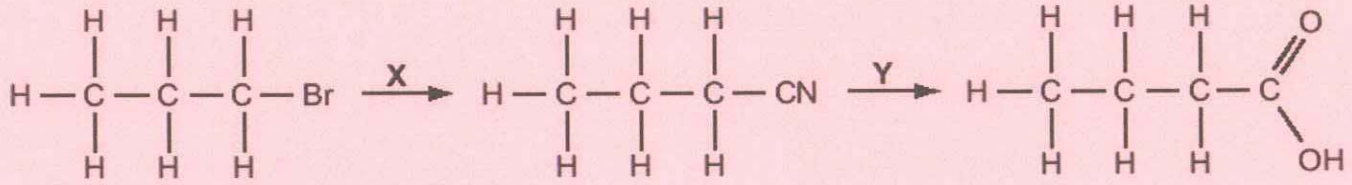
A) 5
B) 6
C) 7
D) 8

Q.108 **Which reagent gives the same visible result with propanal and with propan-2-ol?**

A) 2,4-dinitrophenylhydrazine reagent
B) acidified potassium dichromate(VI)
C) sodium
D) Tollens' reagent

(Continued)

Q.109 X and Y are the reagents required to convert 1-bromopropane into butanoic acid.



What are the correct identities of X and Y?

	X	Y
A	NH_3	HCl(aq)
B	KCN in C_2H_5OH	NaOH(aq)
C	KCN in C_2H_5OH	HCl(aq)
D	HCN	NaOH(aq)

Q.110 Which one of the following correctly describes the acid-base properties of phenol?

A) An acid, stronger than carbonic acid.
B) An acid, weaker than carbonic acid.
C) A neutral compound
D) A base, weaker than ammonia.

Q.111 Ethanal, CH_3CHO, can be reduced using an aqueous methanolic solution of $NaBH_4$ as the reducing agent. This is a nucleophilic addition reaction. What could be the first step of this mechanism?

A) Attack of an H^+ ion at the carbon atom of the carbonyl group
B) Attack of an H^+ ion at the oxygen atom of the carbonyl group
C) Attack of an H^- ion at the carbon atom of the carbonyl group
D) Attack of an H^- ion at the oxygen atom of the carbonyl group

Q.112 Which of these reactions is shown by butanone, $CH_3COCH_2CH_3$?

A) On warming with acidified potassium dichromate(VI) the solution turns green.
B) On heating with Fehling's reagent a red precipitate is formed.
C) With 2,4-dinitrophenylhydrazine reagent an orange precipitate is formed.
D) With hydrogen cyanide an aldehyde is formed.

Q.113 Hept-4-enal is present in cow's milk.

$CH_3CH_2CH=CHCH_2CH_2CHO$
hept-4-enal

What is formed when hept-4-enal is reduced with either hydrogen and a nickel catalyst or sodium borohydride?

A) with H_2 / Ni $CH_3(CH_2)5CH_2OH$
B) with H_2 / Ni $CH_3(CH_2)5CH_3$
C) with $NaBH_4$ $CH_3(CH_2)5CH_2OH$
D) with $NaBH_4$ $CH_3(CH_2)5CHO$

Q.114 The ester $CH_3CH_2CH_2CO_2CH_3$ is responsible for the aroma of apples. When this ester is hydrolysed by acid in the stomach, what is the empirical formula of the organic acid produced?

A) CH_4O
B) C_2H_4O
C) $C_2H_4O_2$
D) $C_3H_7O_2$

Q.115 Which one of the following compounds gives an immediate precipitate with aqueous silver nitrate?

A) $CH_3CH_2CH_2Cl$
B) CH_3CCl_3
C) CH_3COCl
D) C_6H_5Cl

Q.116 Which formula represents the organic compound formed by the reaction of propanoic acid with methanol in the presence of concentrated sulphuric acid as a catalyst?

A) $CH_3CH_2COCH_3$
B) $CH_3CH_2CO_2CH_3$
C) $CH_3CO_2CH_2CH_3$
D) $CH_3CH_2CH_2CO_2CH_3$

Q.117 What is the product of the reaction between phenyl methanol, $C_6H_5CH_2OH$, ethanoyl chloride, CH_3COCl?

A) $C_6H_5CH_2Cl$
B) $C_6H_5CH_2COCl$
C) $C_6H_5CH_2OCOCH_3$
D) $C_6H_5COCH_3$.

Q.118 Which one of the following can form hydrogen bonds between adjacent polymer molecules?

A) Nylon 66
B) Poly(chloroethene)
C) Poly(ethane)
D) Terylene

Q.119 **In 1933, Gibson and Fawcett maintained ethene at a temperature of 170°C under a pressure of 200 atm in the presence of a trace of oxygen for several days. What was the principal product discovered in the reaction vessel when it was cooled and opened?**

A) Artificial diamonds.
B) Benzene.
C) Methane.
D) Poly(ethene).

Q.120 **Which reagent could detect the presence of alcohol in a petrol consisting mainly of a mixture of alkanes and alkenes?**

A) Na
B) Br_2 (in CCl_4)
C) KMnO4(aq)
D) 2,4 dinitrophenylhydrazine

ENGLISH

Q.121 **He was _____of all valuable possessions.**

A) Robbed.
B) Stolen.
C) Pinched.
D) Established.

Q.122 **The presence of armed guards _____us from doing anything disruptive.**

A) Defeated.
B) Excited.
C) Irritated.
D) Prevented.

Q.123 **Our flight was _____from Lahore to Islamabad airport**

A) Diverted.
B) Reflected.
C) Deflected.
D) Shifted.

Q.124 **I am _____forward to our picnic scheduled in next month**

A) Looking.
B) Planning.
C) Seeing.
D) Going.

⟹ **SPOT THE ERROR:** ***In the following sentences some segments of each sentence are underlined. Your task is to identify that underlined segment of the sentence, which contains the mistake that needs to be corrected. Fill the Circle corresponding to that letter under the segment in the MCQ Response Form.***

Q.125 They did not (A) guess how closely (B) he had kept in (C) touch with across (D) the road.

Q.126 He proved that if (A) only germs were (B) excluded of wounds (C), inflammation was (D) averted.

Q.127 The man felt his hair flutter (A) and the tissues of his body drew (B) tight as if he were standing (C) at the centre of a vacuum. (D)

Q.128 He came to the hurdles (A) that he remember (B), over which once (C) he had one so easy a (D) victory.

Q.129 What is meant (A) by birth-rate and death-rate (B) and how do (C) they effect the population? (D)

Q.130 She had left (A) him with a calmness and a poise (B) that accord (C) well with his own inward (D) emotions.

(Continued)

⟹ ***In each of the following question, four alternative sentences are given. Choose the* CORRECT *one and fill the Circle corresponding to that letter in the MCQ Response Form.***

Q.131

A) He lacked both the training and the equipment needed in the job.
B) He lacked both the training and the equipment needed by the job.
C) He lacked both the training and the equipment needed on the job.
D) He lacked both the training and the equipment needed for the job.

Q.132

A) They tried to pacify him for kindness and affection.
B) They tried to pacify him in kindness and affection.
C) They tried to pacify him by kindness and affection.
D) They tried to pacify him with kindness and affection.

Q.133

A) Then he sat down in corner and remained queit.
B) Then he sat down in corner and remained quite.
C) Then he sat down in corner and remain quiet.
D) Then he sat down in corner and remained quiet.

Q.134

A) He was drenched with the hotness of his fear.
B) He was drenched in the hotness of his fear.
C) He was drenched by the hotness of his fear.
D) He was drenched off the hotness of his fear.

Q.135

A) Why did you disagree with me?
B) Why did you disagree to me?
C) Why did you disagree on me?
D) Why did you disagree by me?

Q.136

A) Do not stuff your head by things you do not understand.
B) Do not stuff your head with things you do not understand.
C) Do not stuff your head for things you do not understand.
D) Do not stuff your head in things you do not understand.

Q.137

A) A day later he reached his first glimpse of Lahore.
B) A day later he took his first glimpse of Lahore.
C) A day later he found his first glimpse of Lahore.
D) A day later he caught his first glimpse of Lahore.

Q.138

A) This will have a bad impact to the economy.
B) This will have a bad impact on the economy.
C) This will have a bad impact at the economy.
D) This will have a bad impact over the economy.

Q.139

A) It would save him from dying of thirst.
B) It would save him from dying from thirst.
C) It would save him from dying with thirst.
D) It would save him from dying by thirst.

Q.140

A) All this flashed by his mind in an instant of protest.
B) All this flashed on his mind in an instant of protest.
C) All this flashed through his mind in an instant of protest.
D) All this flashed by off mind in an instant of protest.

⟹ ***In each of the following question, four alternative meanings of a word are given. You have to select the* NEAREST CORRECT MEANING *of the given word and fill the appropriate Circle on the MCQ Response Form.***

Q.141 VEXING
A) Annoying
B) Aggressive
C) Viable
D) Waxy

Q.142 VAGUE
A) Respectful
B) Uncertain
C) Warlock
D) Snow white

Q.143 MANGLED
A) Dodged
B) Grained
C) Indisputable
D) Damaged

Q.144 PRODIGIOUS
A) Productive
B) Enormous
C) Prudential
D) Waddle

Q.145 ASTOUNDED
A) Shocked
B) Discarded
C) Assured
D) Attracted

Q.146 SAGACITY
A) Foolishness
B) Large City
C) Onions
D) Wisdom

Q.147 GRIM
A) Gratis
B) Restless
C) Severe
D) Grater

Q.148 INDOLENTLY
A) Lazily
B) Indecently
C) Ideally
D) Gaily

Q.149 PERISH
A) Furious
B) Come to death
C) Secret
D) Frustrated

Q.150 DOZE
A) Dogged
B) Diet
C) Sleep
D) Medicine to be taken

BIOLOGY

Q.151 What is the order of size of cell components?

	largest ⟶ smallest			
A)	centrioles	mitochondria	lysosomes	nucleoli
B)	mitochondria	nucleoli	lysosomes	centrioles
C)	nucleoli	mitochondria	centrioles	lysosomes
D)	nucleoli	centrioles	mitochondria	lysosomes

Q.152 When mucus is secreted from a goblet cell in the trachea, these events take place.
1 addition of carbohydrate to protein
2 fusion of the vesicle with the plasma membrane
3 secretion of a glycoprotein
4 separation of a vesicle from the Golgi apparatus
What is the sequence in which these events take place?
A) 1 → 4 → 2 → 3
B) 1 → 4 → 3 → 2
C) 4 → 1 → 2 → 3
D) 4 → 1 → 3 → 2

(Continued)

Q.153 **The diameter of living cells varies considerably.**
Typical diameters are:
a prokaryote, such as Streptococcus - 750 nm
an eukaryotic cell, such as a white blood cell - 15 µm
Given these measurements, the diameter of the white blood cell is how many times greater than the prokaryote?
A) x 2
B) x 20
C) x 50
D) x 200

Q.154 **In 1985, a giant bacterium, Epulopiscium fishelsoni, was discovered. Which cell structure(s) would be present in Epulopiscium enabling biologists to classify this organism as prokaryotic?**
A) A cellulose cell wall outside the plasma membrane
B) A pair of centrioles close to the nuclear area
C) Circular DNA lying free in the cytoplasm
D) Smooth endoplasmic reticulum throughout the cytoplasm

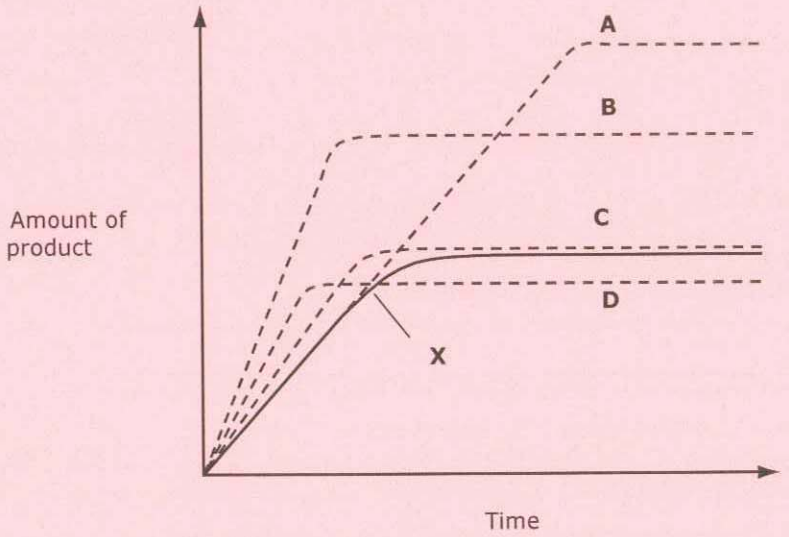
Q.155 **Which describes the structure of amylopectin?**
A) A branched chain with 1,2 and 1,4 glycosidic bonds
B) A branched chain with 1,4 and 1,6 glycosidic bonds
C) An unbranched chain with only 1,4 glycosidic bonds
D) An unbranched chain with 1,4 and 1,6 glycosidic bonds

Q.156 **High concentrations of urea break all bonds, except covalent bonds, in protein molecules. Which level of protein structure would remain unchanged when a protein is treated with urea?**
A) Primary
B) Secondary
C) Tertiary
D) Quaternary

Q.157 **How is the shape of a polypeptide chain maintained when it is coiled into an α helix?**
A) Disulphide bonds
B) Hydrogen bonds
C) Hydrophobic interactions
D) Ionic bonds

Q.158 **What will break an ionic bond between amino acids?**
A) Condensation
B) Hydrolysis
C) Low temperature
D) pH change

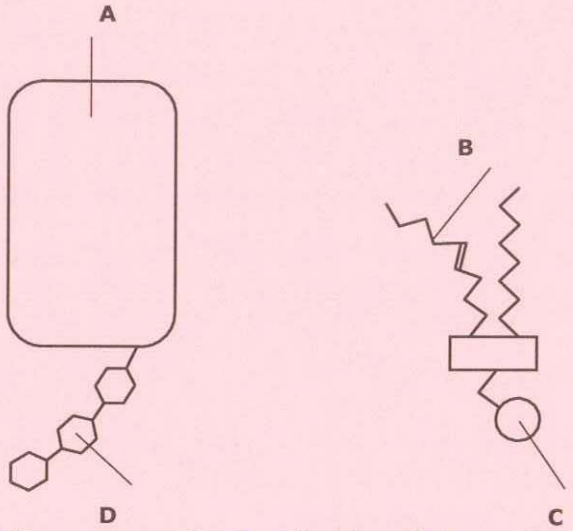
Q.159 **The curve X shows the activity of an enzyme at 20 °C. Curves A, B, C and D show the effect of different conditions on the activity of the enzyme. Which curve shows the effect of increasing the temperature by 10 °C and adding extra substrate?**



Q.160 **Which bonds are the last to break when an enzyme is heated?**
A) Disulphide
B) Hydrogen
C) Hydrophobic interactions
D) Ionic

Q.161 **During the production of apple juice, enzymes are used to break down the components of the cell walls. Which carbohydrate will be produced by this hydrolysis?**
A) Amylose
B) Cellulose
C) α glucose
D) β glucose

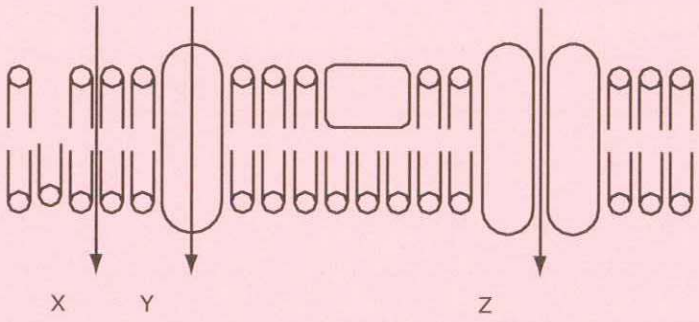
Q.162 **The diagrams show two kinds of molecules found in cell surface membranes. Which part affects the fluidity of the membrane?**



Which process allows the movement of molecules that are too large to pass in through a cell surface membrane?

A) Active transport
B) Endocytosis
C) Exocytosis
D) Facilitated diffusion

Q.163 **The diagram shows three routes through which substances can pass across a cell membrane.**



Which correctly shows the routes for vitamin D, which is fat soluble, and vitamin C, which is water soluble?

	Vitamin D	Vitamin C
A)	Y	X
B)	X	Z
C)	X	Y
D)	Z	Y

Q.164 **Which are features of nuclear division by mitosis?**

1 forms cells of equal size to the parent cell
2 forms genetically identical cells
3 semi-conservative replication of DNA

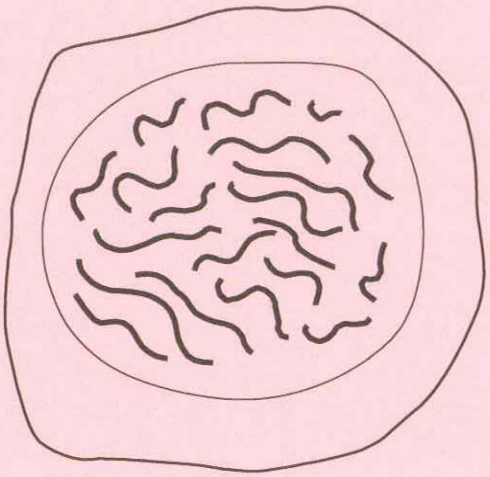
A) 1 and 2 only
B) 2 and 3 only
C) 2 only
D) 1, 2 and 3

Q.165 **Which structure organizes spindle formation during mitosis in animal cells?**

A) Centriole
B) Centromere
C) Nucleolus
D) Nucleus

(Continued)

Q.166 The diagram shows a cell of an organism formed by reduction division.



What is the diploid number for this organism?

A) 10
B) 20
C) 40
D) 46

Q.167 Which processes involve mitosis?

A) Growth, reduction division and asexual reproduction
B) Growth, repair and asexual reproduction
C) Growth, repair and semi-conservative replication
D) Repair, reduction division and asexual reproduction

Q.168 In a DNA molecule, the base sequence AGT codes for the amino acid serine. What is the base sequence of the anti-codon on the tRNA to which serine becomes attached?

A) AGU
B) GAU
C) TCA
D) UCA

Q.169 What terminates the formation of a polypeptide chain during protein synthesis in cells?

A) When a 'stop' codon is reached on the mRNA molecule
B) When a 'stop' codon is reached on the tRNA molecule
C) When the ribosome reaches the end of the mRNA molecule
D) When the ribosome reaches the end of the tRNA molecule

Q.170 The table shows the percentages of bases in DNA from various types of cell.

source of DNA	adenine	guanine	thymine	cytosine
calf thymus	28.2	21.5	27.8	22.5
bull spleen	27.9	22.7	27.3	22.1
bull sperm	28.7	22.2	27.2	22.0
rat bone marrow	28.6	21.4	28.4	21.5
yeast	31.3	18.7	32.9	17.1

What is a valid deduction from these data?

A) DNA occurs in about the same amounts in all cells from the same species.
B) Minute differences in DNA from different cells have large effects.
C) The four bases show complementary base pairing.
D) The structure of DNA is similar in both yeast and animal cells.

Q.171 The two pyrimidine bases most commonly found in DNA are:

A) Uracil and thymine.
B) Cytosine and uracil.
C) Cytosine and thiamine.
D) Cytosine and thymine.

Q.172 If 30% of the bases in a DNA molecule are Adenine, what percentage of the bases are Guanine?

A) 15%.
B) 20%.
C) 30%.
D) 40%.

Q.173 **In mammals, some carbon dioxide is transported by red blood cells in combination with haemoglobin. What is the product of this combination?**

A) Carbamino-haemoglobin
B) Carbonic acid
C) Carboxyhaemoglobin
D) Haemoglobinic acid

Q.174 **A red blood cell, entering the right side of the heart, passes by or through the following structures.**

1 Atrioventricular valve
2 Semilunar valve
3 Right atrium
4 Right ventricle
5 Sinoatrial node

In which order will the red blood cell pass the structures?

A) 3 → 1 → 4 → 5 → 2
B) 3 → 5 → 1 → 2 → 4
C) 5 → 3 → 1 → 4 → 2
D) 5 → 3 → 2 → 4 → 1

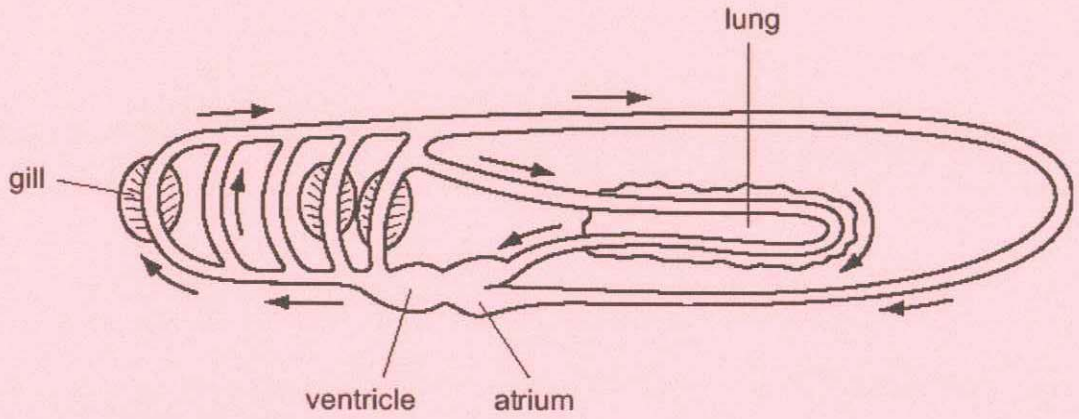
Q.175 **During transpiration, what is the site of evaporation of water in the leaves?**

A) Air spaces
B) Mesophyll cell walls
C) Stomata
D) Walls of xylem vessels

Q.176 **A water potential gradient causes water to move through xylem. Which process is mainly responsible for this water potential gradient?**

A) Capillarity
B) Osmosis
C) Translocation
D) Transpiration

Q.177 **The mammalian circulatory system is described as a closed double circulation. The diagram shows the circulatory system in a different organism. The arrows show the direction of blood flow in the vessels.**



How is the circulatory system in this organism described?

A) Closed double
B) Closed single
C) Open double
D) Open single

Q.178 **Why is the mass flow of sap through sieve elements described as an active process?**

A) Phloem sap is able to flow in sieve elements against the pull of gravity.
B) Sucrose is loaded into a sieve element against a concentration gradient.
C) Sucrose passes out of the phloem into regions where cells are dividing.
D) Water follows sucrose into a sieve element down a water potential gradient.

Q.179 **An oxygen molecule diffuses directly from the air in an alveolus to haemoglobin in a red blood cell. What is the minimum number of cell surface membranes through which this molecule must pass?**

A) 2
B) 3
C) 4
D) 5

Q.180 **Which component of tobacco smoke affects blood pressure?**

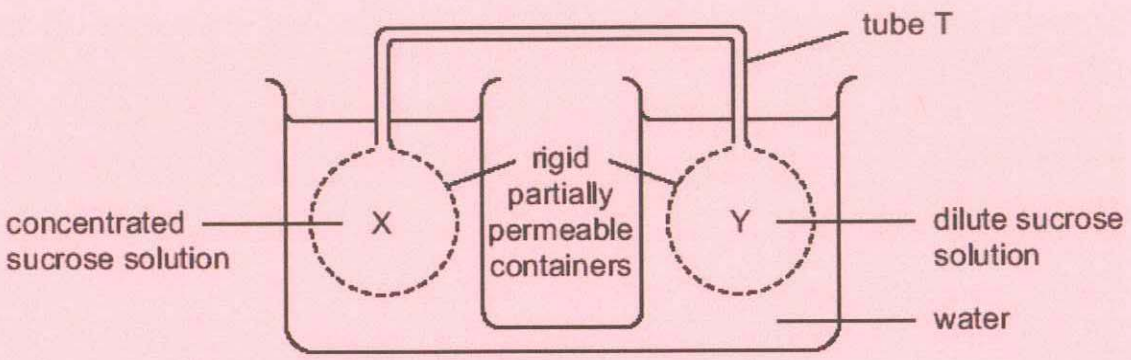
A) Carbon dioxide
B) Carbon monoxide
C) Nicotine
D) Tar

Q.181 **How would health improve if a person suffering from mild emphysema stopped smoking cigarettes?**

A) Goblet cells secrete more mucus, allowing a greater number of pathogens to be trapped
B) Increased numbers of phagocytic macrophages arrive in the lungs
C) Less atheroma build-up on the inner lining of arteries, increasing lumen diameter
D) Less carboxyhaemoglobin produced, increasing oxygen transport by haemoglobin

(Continued

Q.182 The diagram shows a model which can be used to demonstrate mass flow.



X and Y are filled with sucrose solutions of different concentration, causing water to move in or out of X and Y by osmosis or as a result of hydrostatic pressure. Sucrose solution then moves through the tube T joining X and Y.
Which description of this is correct?

	water potential in X compared with Y	direction of movement of sucrose solution in tube T
A	higher (less negative)	from X to Y
B	higher (less negative)	from Y to X
C	lower (more negative)	from X to Y
D	lower (more negative)	from Y to X

Q.183 In an animal cell, which process is dependent upon cell surface area and which process is dependent upon cell volume?

	cell surface area	cell volume
A)	carbon dioxide produced	oxygen used
B)	glucose absorbed	hormones detected
C)	hormones detected	carbon dioxide produced
D)	oxygen used	glucose absorbed

Q.184 Which statement describes the vital capacity of a human lung?

A) The additional volume of air that can be exhaled after breathing out normally
B) The additional volume of air that can be inhaled after breathing in normally
C) The volume of air inhaled and then exhaled during a single tidal breath
D) The volume of air that can be exhaled following a maximum inhalation

Q.185 When climbing a very high mountain there is a risk of altitude sickness. What causes altitude sickness?

A) A high concentration of carbon dioxide accumulates in the blood.
B) Oxygen partial pressure decreases.
C) Red blood cell production increases.
D) The proportion of oxygen in the air decreases.

Q.186 Which disease is treated with drugs that have a similar molecular structure to DNA nucleotides?

A) Cholera
B) HIV / AIDS
C) Malaria
D) Tuberculosis (TB)

Q.187 Which statement explains why people suffering from malaria and people suffering from tuberculosis can both live in northern Europe, but only tuberculosis can be passed on to other people there?

A) Anopheles mosquitoes only breed in sub-tropical and tropical areas.
B) Antibiotics can be used to cure people with tuberculosis.
C) Migrant workers can carry the diseases with them.
D) Tuberculosis bacteria cannot survive in sub-tropical and tropical areas.

Q.188 Which factors would help prevent which disease?

1 Covering water containers
2 Disinfecting and chlorinating water
3 Use of antiviral drugs
4 Vaccination

	Cholera	Malaria	Tuberculosis (TB)
A)	2	1	4
B)	1 and 2	2	3
C)	4	2	3
D)	3	1 and 2	4

Q.189 Which future development in vaccine production is most important in the fight to eradicate measles in developing countries?

A) A combined vaccine to combat it and other diseases
B) A single vaccine, without the need for boosters
C) A vaccine containing only live measles viruses
D) A vaccine produced by genetic engineering techniques

Q.190 The following statements describe some of the stages in phagocytosis.

1 Bacteria become surrounded in a phagocytic vacuole.
2 Bacteria release chemicals that attract neutrophils.
3 Lysosomes fuse with the phagocytic vacuole.
4 Receptor proteins on the neutrophil bind to the bacteria.

Which order defines the correct sequence for phagocytosis?

	→			
A)	3	2	4	1
B)	2	4	1	3
C)	4	1	3	2
D)	1	3	2	4

Q.191 What causes the measles vaccine to be less effective in children from less economically developed countries?

A) Their diet does not contain enough carbohydrate.
B) Their diet does not contain enough protein.
C) They are carriers of the disease.
D) They rapidly become reinfected.

Q.192 What is the function of the plasma cells during an immune response?

A) To secrete antibodies
B) To engulf bacteria
C) To kill cells infected with viruses
D) To change into memory cells

Q.193 What limits the number of trophic levels in a food chain?

A) Biomass of the autotrophs
B) Efficiency of energy conversion between levels
C) Net productivity of the ecosystem
D) Species diversity in the ecosystem

Q.194 The following are definitions of three ecological terms.

1 all of the organisms and their environment
2 group of individuals of one species living in an area
3 all of the organisms living in a habitat

What are the correct definitions of a community and a population?

	Community	Population
A)	1	2
B)	2	1
C)	3	1
D)	3	2

(Continued)

Q.195 Which statement explains why two species cannot permanently occupy the same ecological niche?

A) The two species could not interbreed.
B) The two species may be part of separate food webs.
C) The two species would compete for the same resources.
D) The two species would have different nutritional requirements.

Q.196 Which one of the following attaches phosphate groups to sugar molecules?

A) Adenosine Diphosphate
B) Adenosine Triphosphate
C) Phospholipid.
D) Phosphorylase.

Q.197 Which one of the following is the main biochemical process which takes place inside the mitrochondrial matrix?

A) Photophosphorylation
B) The formation of lactic acid.
C) The glycolytic pathway
D) The tricarboxylic (citric) acid cycle.

Q.198 Which of the following types of mammalian cell does not carry out oxidative phosphorylation?

A) Cardiac muscle cells.
B) Erythrocytes.
C) Neurons.
D) Oxyntic cells.

Q.199 What are the products of the light-dependent reactions of photosynthesis in green plants?

A) ATP and reduced NADP
B) GP (PGA) and reduced NADP
C) GP (PGA) and RuBP
D) Triose phosphate and NADP

Q.200 During photosynthesis, which process releases electrons that return chlorophyll molecules to their reduced state?

A) Activation of photosystem I
B) Oxidation of reduced NADP
C) Phosphorylation of ADP
D) Photolysis of water

Q.201 Why is hemophilia more likely to occur in human males than in human females?

A) Females are the heterogametic sex.
B) Females can only act as carriers.
C) The allele for hemophilia is carried only on the X Chromosome
D) The allele for hemophilia is carried only on the Y Chromosome

Q.202 The genotype of a human zygote will differ from that of both parents. Which of the following does not contribute to this variation?

A) Chiasmata occurring during meiosis.
B) Mutation of genes.
C) Presence of dominant genes.
D) Random combination of gametes.

Q.203 Which of the following cause phenotypic variation among organisms of the same genotype?

A) Mutation.
B) Different sexes.
C) Different varieties of the same species.
D) Exposure to different environments.

Q.204 Polygenic inheritance forms the basis of:

A) Co-dominance.
B) Continuous variation.
C) Polyploidy.
D) Linkage.

Q.205 The antibiotic penicillin:

A) Prevents the production of new cell walls in bacteria.
B) Prevents the production of new cell walls in viruses.
C) Prevents the production of new cell walls in humans.
D) Prevents the production of new cell walls in fungi.

Q.206 Mycoprotein is made by culturing:

A) The fungus fusarium in a fermenter.
B) The fungus aspergillus in a fermenter.
C) Viruses in a fermenter.
D) Mycobacterium tuberculae in a fermentor.

Q.207 Why must the concentration of ions in mammalian body fluids be kept constant?

A) To provide an absolute amount of available ions.
B) To provide the correct osmotic pressure for body cells.
C) To provide a low plasma pH.
D) To provide diffusion gradients for ion uptake.

Q.208 Which of the following is the function of the liver?

A) Breakdown of digestive enzymes.
B) Storage of vitamin C.
C) Production of plasma albumin.
D) Production of granulocytes.

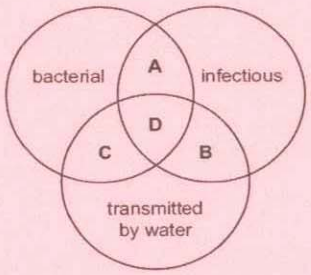
Q.209 Removal of the thyroid gland from an adult human would cause an increase in the rate of:

A) Basal metabolism.
B) Conversion of glycogen to glucose.
C) Excretion of sodium ions from the kidney.
D) Secretion of thyroid stimulating hormone.

Q.210 Certain nerve gases developed for military purposes work by producing convulsive muscular contractions upon the slightest stimulation. This suggests that their function is to inhibit the action of:

A) Acetylcholine.
B) Atropine.
C) Cholinesterase.
D) Eserine.

Q.211 The diagram refers to properties of diseases. Which area of diagram refers to properties that are common to both tuberculosis and cholera?



Q.212 An action potential in a muscle fibre causes the release of calcium ions from the:
A) Actin filaments.
B) Sarcoplasmic reticulum.
C) Sarcolemma.
D) Sarcoplasm.

Q.213 The cell transmits impulses from the:
A) Effector organ to the spinal cord.
B) Receptor cells to the effector organ.
C) Receptor cells to the spinal cord.
D) Spinal cord to the effector organ.

Q.214 Which of the following is common to all neurons?
A) A cell body which contains a nucleus.
B) A thick myelin sheath.
C) Presence of Schwann Cells.
D) Several long axons.

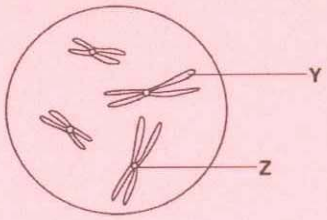
Q.215 Which change contributes to the lowering of the blood sugar level, if a person is injected with insulin?
A) Decrease in the permeability of cells to glucose.
B) Decrease in the rate of absorption of glucose from the gut.
C) Increase in the rate of excretion of glucose.
D) Increase in the synthesis of glycogen.

Q.216 Gametogenesis is the production of:
A) Gametes.
B) Spermatozoa.
C) Kupffer cells.
D) Ova.

Q.217 Contraception means:
A) Preventing fertilization when sexual intercourse takes place.
B) Preventing sexual intercourse.
C) Preventing normal birth of the child.
D) Induction of menopause.

Q.218 What is the function of the enzyme DNA polymerase?
A) To synthesise a polypeptide using mRNA as a template
B) To synthesise a strand of DNA using a polypeptide as a template
C) To synthesise a strand of DNA using DNA as a template
D) To synthesise a strand of mRNA using DNA as a template

Q.219 The diagram shows chromosomes in a nucleus.



What are **Y** and **Z**?

	Y	Z
A	centromere	centriole
B	centromere	chromatid
C	chromatid	centriole
D	chromatid	centromere

Q.220 As a result of the activity of insulin there is:
A) Increased uptake of glucose by muscles.
B) Depletion of fat stores.
C) Deposition of fat in blood vessels.
D) Decreased uptake of glucose by cells.