IMPORTANT INSTRUCTIONS

- The maximum marks are 360. Time allotted is **120 MINUTES.**
- There are three sections in the question paper having total **90 questions:**
  - Section – A : Biology (30 Questions)
  - Section – B : Chemistry (30 Questions)
  - Section – C : Physics (30 Questions)
- Each question carries **4 marks.**
- **Negative Marking : ¼ (One-fourth) mark** will be deducted for every incorrect answer.
- **Use only BLUE / BLACK ball pen to fill the circles in bubble sheet.**
- Use of PENCIL is strictly **not allowed.**
- **Use of marker and correction pen is strictly prohibited.**

SECTION – A
BIOLOGY

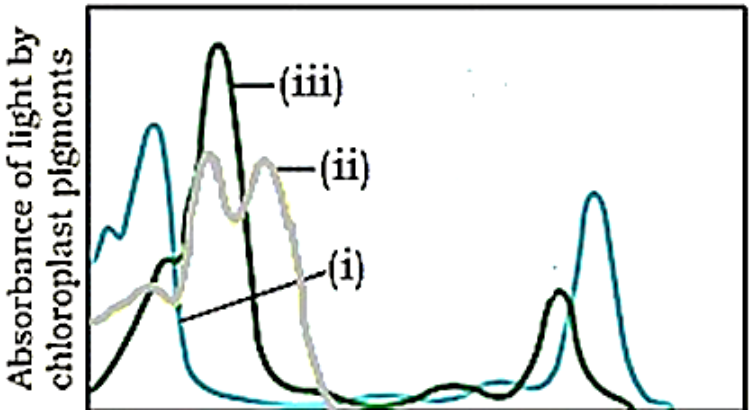
Choose the correct option.

1) **Assertion (A) :** Greenhouse crops like tomatoes and bell peppers are grown in CO_2-enriched atmospheres for higher yields.
Reason (R) : C_4 plants respond to higher CO_2 concentrations by showing an increased rate of photosynthesis.
   a) Both (A) and (R)are true and (R) is the correct explanation of (A)
   b) Both (A) and (R) are true and (R) is the not correct explanation of (A).
   c) (A) is true but (R) is false
   d) (A) is false and (R) is also false.

2) Read the following statements about the stem and identify them as true (T) or false (F).
   i) It is the ascending part of plant axis.
   ii) It develops from radicle of the embryo of a germinating seed.
   iii) Stems are generally green when older but brown when young.
   iv) It may preform function of vegetative propagation.
   a) i) – (T), ii) – (F), iii) – (F), iv) – (T) b) i) – (T), ii) – (T), iii) – (F), iv) – (T)
   c) i) – (T), ii) – (T), iii) – (F), iv) – (F) d) i) – (T), ii) – (F), iii) – (F), iv) – (F)

3) Which two points are known as the twin characteristics of growth?
   i) Increase in mass ii) Metabolism
   iii) Increase in the number of individuals iv) Sense of environment
   a) i) and ii) b) i) and iv)
   c) ii) and iii) d) i) and iii)

4) Identity correct labels



a) (i) - Chl a, (ii) - Chl b, (iii) - Carotenoid
b) (i) - Carotenoid, (ii) - Chl a, (iii) - Chl b
c) (i) - Chl b, (ii) - Chl a, (iii) - Carotenoid
d) (i) - Chl a, (ii) - Carotenoid, (iii) - Chl b

5) How many statements are correct about electrical synapse?

i) At electrical synapse, the membranes of pre and post synaptic neurons are in very close proximity.
ii) Electrical current can flow directly from one neuron into the other across the synapse.
iii) Transmission of an impulse across electrical synapse is very similar to impulse conduction along single axon.
iv) Neuro transmitters are involved in the transmission of impulse at these synapse.
v) Electrical synapse is always faster than chemical synapse.
vi) Electrical synapses are rare in our system.

a) Four
b) Three
c) Five
d) Six

6) Read the following statements and choose the incorrect option.

i) Plasma has 90 – 92% water & 6 – 8% proteins
ii) Erythrocytes are called as formed elements & constitute 55% of blood
iii) Granulocytes include basophil, neutrophil & monocyte
iv) Reduction in number of platelets may cause excessive blood loss

a) i) and ii)
b) ii) and iii)
c) iii) and iv)
d) ii), iii) and iv)

7) Aerobic respiration of glucose, the ATP production in glycolysis (P), pyruvate to acetyl Co-A formation (Q) and Kreb's cycle (R) is as Out of 38 molecules of ATP produced upon follows-

a) P = 2, Q = 6, R = 30
b) P = 8, Q = 6, R = 24
c) P = 8, Q = 10, R = 20
d) P = 2, Q = 12, R = 24

8) Which of the following conditions will stimulate parathyroid gland to release parathyroid hormone?

a) Fall in active Vitamin D levels
b) Fall in blood Ca^{+2} levels
c) Fall in bone Ca^{+2} levels
d) Rise in blood Ca^{+2} levels

9) Match column-I with column-II and choose the correct combination from the options given below.

	Column – I		**Column - II**
1)	Inhibit seed germination	i)	Gibberellin
2)	Sprouting of potato tuber	ii)	Ethylene
3)	Increase yield of sugarcane	iii)	Zeatin
4)	Promote lateral shoot growth	iv)	ABA

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

10) Match column-I with column-II, and choose the correct combination from the options given.

	Column – I		**Column - II**
1)	Exocrine glands	i)	Help in communication with each other
2)	Ligament	ii)	Salivary glands
3)	Areolar tissue	iii)	Loose connective tissue
4)	Gap junction	iv)	Dense regular connective tissue

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

11) Trachea is a straight tube extending up to the mid-thoracic cavity, which divides at the level of

a) 2^{nd} cervical vertebra
b) 5^{th} cervical vertebra
c) 5^{th} thoracic vertebra
d) 5^{th} lumbar vertebra

12) To which class and phylum does Periplaneta belong?

a) Class – Insecta; Phylum – Annelida
b) Class – Reptilia; Phylum – Arthropoda
c) Class – Amphibians; Phylum – Annelida
d) Class – Insecta; Phylum – Arthropoda

13) Regulation of kidney function by Juxtaglomerular Apparatus (JGA) involves certain steps given below. Arrange them in the correct order:

i) Release of enzyme renin
ii) Release of aldosterone from adrenal gland
iii) Reabsorption of Na^+ and water at DCT
iv) Decrease in blood pressure and blood volume
v) Conversion from angiotensinogen to angiotensin II

a) i), v), ii), iii), iv)
b) ii), iii), i), v), iv)
c) iii), iv), i), v), ii)
d) iv), i), v), ii), iii)

14) Arrange the phases of prophase I in order.

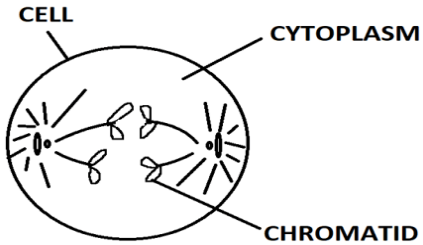
a) Leptotene → Zygotene → Pachytene → Diplotene
b) Zygotene → Leptotene → Pachytene → Diplotene
c) Leptotene → Pachytene → Zygotene → Diplotene
d) Zygotene → Leptotene → Diplotene → Pachytene

15) Which of these is true regarding crossing over?

a) Exchange occurs between non-homologous chromosomes
b) It involves recombination nodules
c) It is not mediated by enzymes
d) It occurs during zygotene

16) Identify the stage of mitosis.

a) Telophase
b) Anaphase
c) Prophase
d) Metaphase



17) At resting membrane potential, which ion concentration is high outside the axonal membrane?

a) Sodium ions
b) Calcium ions
c) Potassium ions
d) Chlorine ions

18) Which one of the following changes takes place during inspiration?

a) Decrease in thoracic cavity
b) Relaxation in diaphragm
c) Relaxation in external intercostal muscles
d) Sternum moves towards ventral and anterior direction

19) Which of the following is not an assumption of the respiratory balance sheet?

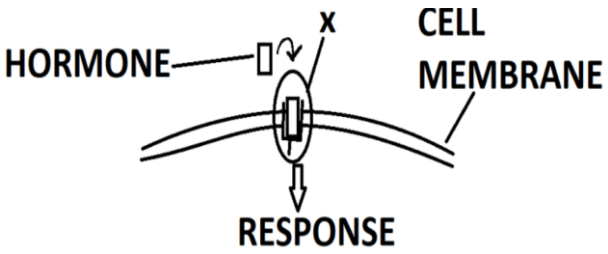
a) NADH synthesised in glycolysis is transferred into mitochondria
b) None of the intermediates is used to synthesise other compounds
c) Respiration is a sequential pathway
d) Energy can never be stored

20) Which of the following mineral is not involved in the formation of renal calculi?

a) Calcium oxalate
b) Calcium carbonate
c) Uric acid
d) Urea

21) Identify the structure 'x

a) Nuclear receptor
b) Intracellular receptor
c) Hormone-receptor complex
d) Gap junction



22) Why is the productivity of C_4 plants better than that of C_3 plants?

a) C_4 plants show Kranz anatomy
b) C_4 plants lack photorespiration
c) C_4 plants show high phosphoglycerate formation
d) C_4 plants show high phosphoglycolate formation

23) Which is the very slow-acting enzyme in chloroplast?

a) ATPase
b) Ribulose-1
c) RUBISCO
d) Carboxylase

24) Which among the following is incorrect about anatomy in a monocot leaf?

a) Stomata is present both on abaxial and adaxial epidermis
b) Mesophyll is well differentiated into Palisade and spongy parenchyma cells
c) Vascular bundles are seen in veins and mid-rib and are surrounded by thick walled bundle sheath
d) Most of the cells are parenchyma cells

25) Which among the following is incorrect about nervous system in Nematodes?

a) Nerve ring made of four ganglia serves as brain

b) Nerve chords are present on the dorsal and ventral side of their body

c) Dorsal nerves act as sensory nerves of the body

d) Ventral nerves act as both motor controllers and sensory nerves of the body

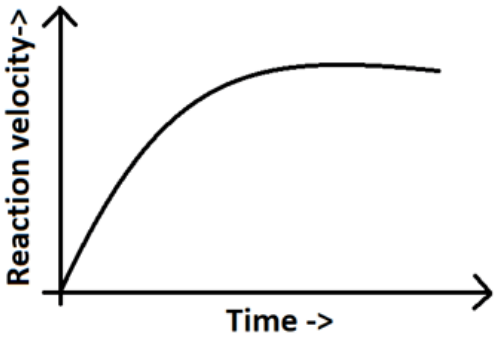
26) What does the graph represent?

a) Effect of change in pH on enzyme activity

b) Effect of change in temperature on enzyme activity

c) Effect of change in concentration of substrate on enzyme activity

d) Effect of change in pressure on enzyme activity



27) Match List I with List II

	List – I		**List - II**
1)	P-wave	i)	Beginning of systole
2)	Q-wave	ii)	Repolarisation of ventricles
3)	QRS complex	iii)	Depolarisation of atria
4)	T-wave	iv)	Depolarisation of ventricles

Choose the correct answer from the options given below :

a) 1) – iv), 2) – iii), 3) – ii), 4) – i)

b) 1) – ii), 2) – iv), 3) – i), 4) – iii)

c) 1) – i), 2) – ii), 3) – iii), 4) – iv)

d) 1) – iii), 2) – i), 3) – iv), 4) – ii)

28) Which among the following is incorrect about Haplo-diplontic life cycle?

a) In this life cycle, both sporophytic phase and gametophytic phase have equal life time

b) Both sporophytic and gametophytic phases are multi-cellular and have independent existence

c) This kind of life cycle is exhibited by Pteridophytes and Bryophyte

d) Ectocarpus exhibits haplo-diplontic life cycle

29) Which among the following is not a rule for writing binomial nomenclature?

a) The generic epithet should start with capital letter and specific epithet should start with small letter with a hyphen separating them

b) All the words in the binomial nomenclature should either be Latinized or should be derived from Latin

c) Binomial nomenclature may contain description about the organism

d) The first part of the binomial nomenclature contains the generic name and the second part contains the specific epithet

30) The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are:

a) Corpora quadrigemina and hippocampus

b) Brain stem and epithalamus

c) Corpus callosum and thalamus

d) Limbic system and hypothalamus

SECTION – B
CHEMISTRY

31) Which of the following compounds has the highest percentage by mass of oxygen?
a) H_2O b) CO_2
c) $C_6H_{12}O_6$ d) C_2H_5OH

32) What is the molarity of a solution made by dissolving 5.85 g of NaCl in water to make 500 mL of solution? (Na=23, Cl=35.5)
a) 0.1 M b) 0.2 M
c) 0.5 M d) 1.0 M

33) How many moles of AgCl will be precipitated when 50 mL of 0.1 M $AgNO_3$ is mixed with 50 mL of 0.05 M NaCl solution?
a) 0.005 b) 0.0025
c) 0.0075 d) 0.01

34) A compound contains 4.07% H, 24.27% C, and 71.65% Cl. Its empirical formula is:
a) CH_2Cl b) CHCl
c) CH_2Cl_2 d) CH_3Cl

35) Which of the following angular momentum values is possible for an electron in Bohr's orbit of a hydrogen atom?
a) $2.5\frac{h}{2\pi}$ b) $1.5\frac{h}{2\pi}$
c) $3\frac{h}{2\pi}$ d) $\frac{h}{3\pi}$

36) The correct set of four quantum numbers for the valence electron of a Rubidium (Z=37) atom is:
a) n=5, l=0, m_l=0, m_s=+1/2 b) n=4, l=1, m_l=0, m_s=+1/2
c) n=5, l=1, m_l =0, m_s=+1/2 d) n=4, l=0, m_l=0, m_s=+1/2

37) The number of angular nodes for a 4d orbital is:
a) 4 b) 3
c) 2 d) 1

38) The time period of revolution of an electron in Bohr's model for a hydrogen like atom in the nth orbit is proportional to:
a) n^2 b) n^3
c) $\frac{n^2}{Z^2}$ d) $\frac{n^3}{Z^2}$

39) Melting point of a solid is x K and its latent heat of fusion (ΔH_{fus}) is 600 cal mol^{-1}. If the entropy change for the fusion of 1 mol solid (ΔS_{fus}) is 2 cal $mol^{-1}K^{-1}$, then the value of x will be:
a) 100 K b) 200 K
c) 300 K d) 1200 K

40) The standard enthalpy of formation of CO(g) can be calculated from the standard enthalpy of combustion of carbon and CO(g). This is an application of:
a) Kirchhoff's Law b) Hess's Law
c) Joule-Thomson effect d) First Law of Thermodynamics

41) The increase in entropy (ΔS) is maximum for the process:
a) $H_2O(l) \rightarrow H_2O(s)$ b) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
c) C(s, diamond) → C(s, graphite) d) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

42) The pH of 10^{-8} M HCl solution is approximately:
a) 8.0 b) 6.95
c) 7.00 d) 7.02

43) For a reaction, $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$, the relationship between K_p and K_c is:
a) $K_p = K_c (RT)^{-1}$ b) $K_p = K_c (RT)$
c) $K_p = K_c$ d) $K_p = K_c (RT)^2$

44) The solubility product of AgCl is 1.8×10^{-10}. What is the solubility of AgCl in pure water?
a) 1.8×10^{-10} M b) 0.9×10^{-10} M
c) 1.34×10^{-5} M d) 3.24×10^{-20} M

45) Which factor affects the value of the equilibrium constant (K)?
a) Concentration of reactants b) Concentration of products
c) Catalyst d) Temperature

46) The correct order of ionic radii for the isoelectronic species N^{3-}, O^{2-}, F^- is:
a) $N^{3-} < O^{2-} < F^-$ b) $N^{3-} > O^{2-} > F^-$
c) $O^{2-} < N^{3-} < F^-$ d) $O^{2-} < F^- < N^{3-}$

47) Among the given species, the most acidic oxide is:
a) MgO b) Al_2O_3
c) P_4O_{10} d) SiO_2

48) Which of the following molecules does not have zero dipole moment?
a) CO_2 b) BF_3
c) CCl_4 d) $CHCl_3$

49) Which of the following species has a bond order of 2.5?
a) O_2^+ b) N_2
c) O_2^- d) C_2

50) The H-N-H bond angle in NH_3 is:
a) 109.5° b) 120°
c) 107° d) 104.5°

51) The total number of lone pairs of electrons on the central atom in the XeF_4 molecule is:
a) 1 b) 2
c) 3 d) 4

52) Which of the following is not a redox reaction?
a) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ b) $CaCO_3 \rightarrow CaO + CO_2$
c) $H_2 + Cl_2 \rightarrow 2HCl$ d) $2Na + Cl_2 \rightarrow 2NaCl$

53) The oxidation number of the central carbon atom in carbon suboxide (C_3O_2) is:
a) $+2$ b) $+\frac{4}{3}$
c) 0 d) -2

54) MnO_4^- is a powerful oxidizing agent. What is the oxidation state of Mn in this ion?
a) $+5$ b) $+6$
c) $+7$ d) $+4$

55) The stability of alkali metal carbonates decreases in the order:
a) $Li_2CO_3 > Na_2CO_3 > K_2CO_3$ b) $Li_2CO_3 < Na_2CO_3 < K_2CO_3$
c) $Na_2CO_3 < K_2CO_3 < Li_2CO_3$ d) $K_2CO_3 < Li_2CO_3 < Na_2CO_3$

56) Hard water contains which of the following ions?
a) Na^+ and K^+ b) Ca^{2+} and Mg^{2+}
c) Cl^- and SO_4^{2-} d) Li^+ and Ba^{2+}

57) The correct order of priority of functional groups for IUPAC naming is:

a) Alcohol > Carboxylic acid > Amine
b) $—SO_3H$ > —COOH > —CHO
c) —COOH > $—SO_3H$ > —CHO
d) Aldehyde > Ketone > Alcohol

58) The most stable carbocation among the following is:

a) $CH_3CH_2^+$
b) $CH_3C^+HCH_3$
c) $^+CH_3$
d) $(CH_3)_3C^+$

59) Ethyne is converted to Benzene when it is passed through:

a) Red hot iron tube
b) Ni catalyst
c) Dilute H_2SO_4
d) $Pd/BaSO_4$

60) Which of the following is used to distinguish between Ethane and Ethyne?

a) Tollen's reagent
b) Bromine water
c) Baeyer's reagent
d) All of these

SECTION – C
PHYSICS

61) A person measures mass of 3 different particles as 435.42g, 226.3g and 0.125 g. According to the rules for arithmetic operations with significant figures, the addition of the masses of 3 particles will be.

a) 661.845 g
b) 661.84 g
c) 662 g
d) 661.8 g

62) The dimensions of $(\mu_0\varepsilon_0)^{-\frac{1}{2}}$ are:

a) $\left[L^{\frac{1}{2}}T^{-\frac{1}{2}}\right]$
b) $[L^{-1}T]$
c) $[LT^{-1}]$
d) $\left[L^{\frac{1}{2}}T^{\frac{1}{2}}\right]$

63) Two balls with same mass and initial velocity, are projected at different angles in such a way that maximum height reached by first ball is 8 times higher than that of the second ball. T_1 and T_2 are the total flying times of first and second ball, respectively, then the ratio of T_1 and T_2 is

a) 2 : 1
b) $\sqrt{2}$: 1
c) $2\sqrt{2}$: 1
d) 4 : 1

64) If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is

a) 45°
b) 180°
c) 0°
d) 90°

65) The horizontal range is four times the maximum height attained by a projectile. The angle of projection is:

a) 90°
b) 60°
c) 45°
d) 30°

66) The acceleration of an object moving in a circle of radius R with uniform speed v is:

a) $\frac{v^2}{R}$
b) $\frac{v^2}{2R}$
c) $\frac{2v^2}{R}$
d) $\frac{3v^2}{2R}$

67) If a vector $(2\hat{\imath} + 3\hat{\jmath} + 8\hat{k})$ is perpendicular to the vector $4\hat{\imath} - 4\hat{\jmath} + a\hat{k}$, then find the value of a

a) -1 b) 0.5

c) -1.37 d) 1.5

68) A train starting from rest first accelerates uniformly up to a speed of 80 km/h for time t then it moves with a constant speed for time 3t. The average speed of the train for this duration of journey will be (in km/h):

a) 70 b) 40

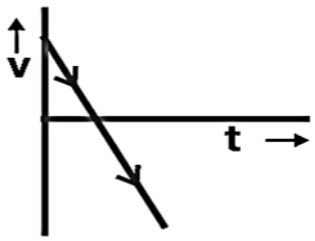
c) 30 d) 80

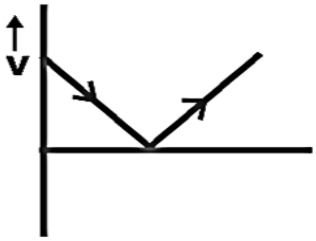
69) Two projectiles of same mass have their maximum kinetic energies in ratio 4:1 and ratio of their maximum heights is also 4:1 then what is the ratio of their ranges?

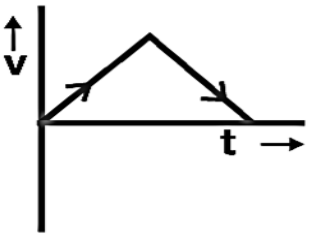
a) 2 : 1 b) 4 : 1

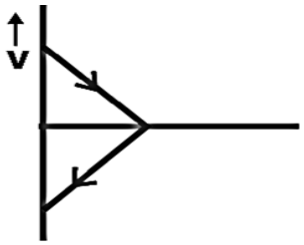
c) 8 : 1 d) 16 : 1

70) A body is thrown vertically upwards. Which one of the following graphs correctly represents the velocity vs time?

a) 

b) 

c) 

d) 

71) The average energy consumed by a human being in a day is

a) 2400 cal b) 2400 J

c) 2400 kJ d) 2400 kcal

72) A ball impinges directly on a similar ball at rest. The first ball is brought to rest by the impact. If half of the kinetic energy is lost by impact, the value of coefficient of restitution is

a) $\frac{1}{2\sqrt{2}}$ b) $\frac{1}{\sqrt{3}}$

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

73) A ball moving with velocity 2 m/s collides head on with another stationary ball of double the mass. If the coefficient of restitution is 0.5, then their velocities (in m/s) after collision will be

a) 0, 1 b) 1, 1

c) 1, 0.5 d) 0, 2

74) Three masses are placed on the x-axis : 300 g at origin, 500 g at x = 40 cm and 400 g at x = 70 cm. The distance of the centre of mass from the origin is.

a) 40 cm b) 45 cm

c) 50 cm d) 30 cm

75) Two particles which are initially at rest move towards each other under the action of their internal attraction. If their speeds are v and 2v at any instant, then the speed of centre of mass of the system will be

a) 2 v
b) Zero
c) 1.5 v
d) v

76) The ratio of the radii of gyration of a circular disc to that of a circular ring, each of same mass and radius, around their respective axes is.

a) $\sqrt{3} : \sqrt{2}$
b) $1 : \sqrt{2}$
c) $\sqrt{2} : 1$
d) $\sqrt{2} : \sqrt{3}$

77) Four identical thin rods each of mass M and length l, form a square frame. Moment of inertia of this frame about an axis through the centre of the square and perpendicular to its plane is

a) $\frac{2}{3}Ml^2$
b) $\frac{13}{3}Ml^2$
c) $\frac{1}{3}Ml^2$
d) $\frac{4}{3}Ml^2$

78) A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N?

a) 0.25 rad/s^2
b) 25 rad/s^2
c) 5 m/s^2
d) 25 m/s^2

79) The instantaneous angular position of a point on a rotating wheel is given by the equation $\theta(t) = 2t^3 - 6t^2$. The torque on the wheel becomes zero at

a) t = 1 s
b) t = 0.5 s
c) t = 0.25 s
d) t = 2 s

80) The ratio of the accelerations for a solid sphere (mass m, and radius R) rolling down an incline of angle θ without slipping, and slipping down the incline without rolling is

a) 5 : 7
b) 2 : 3
c) 2 : 5
d) 7 : 5

81) A planet moves around the sun in an elliptical orbit with the sun at one of its foci. The physical quantity associated with the motion of the planet that remains constant with time is

a) velocity
b) centripetal force
c) linear momentum
d) angular momentum

82) The relation between escape velocity (v_e) and orbital velocity (v_o) on the surface of the earth is

a) $v_e = \sqrt{2}v_0$
b) $v_0 = \sqrt{2}v_e$
c) $\sqrt{v_e} = 2v_0$
d) $v_e = v_0$

83) Two satellites A and B go round a planet P in circular orbits having radii 4R and R respectively. If the speed of the satellite A is 3 V, the speed of satellite B will be

a) 12 V
b) 6 V
c) 16 V
d) 8 V

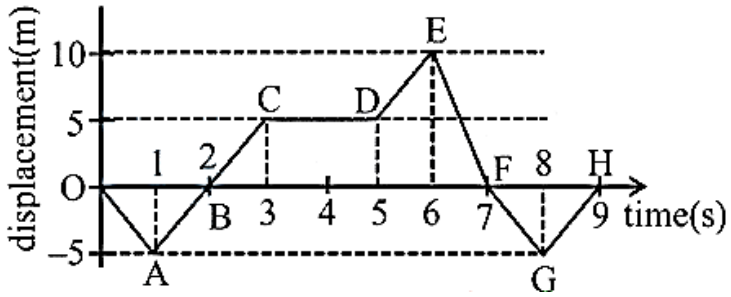
84) A particle of mass M is placed at the centre of a spherical shell of same mass and radius a. What will be the magnitude of the gravitational potential at a point situated at $\frac{a}{2}$ distance from the centre?

a) $\frac{GM}{a}$
b) $\frac{2GM}{a}$
c) $\frac{3GM}{a}$
d) $\frac{4GM}{a}$

85) The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied?

a) length 50 cm and diameter 0.5 mm
b) length 100 cm and diameter 1 mm
c) length 300 cm and diameter 3 mm
d) length 200 cm and diameter 2 mm

86) The displacement x versus time graph is shown below:



i) The average velocity during 0 to 3 s is 10 m/s.
ii) The average velocity during 3 to 5 s is 0 m/s.
iii) The instantaneous velocity at t = 2 s is 5 m/s.
iv) The average velocity during 5 to 7 s and instantaneous velocity at t = 6.5 s are equal.
v) The average velocity from t = 0 s to0 t = 9 s is zero.

Choose the correct answer from the options given below:

a) ii), iii), iv) only
b) ii), iv), v) only
c) i), iv), v) only
d) ii), iii), v) only

87) Water is flowing with velocity 4 ms^{-1} in a cylinder of diameter 8 cm it is connected to a pipe with its end tip of diameter 2 cm. Calculate the velocity of water at this free end.

a) 4 ms^{-1}
b) 8 ms^{-1}
c) 32 ms^{-1}
d) 64 ms^{-1}

88) A capillary tube of radius r is immersed in water and water rises in to a height h. The mass of water in the capillary tube is 5 g. Another capillary tube of radius 2 r is immersed in water. The mass of water that will rise in this tube is

a) 2.5 g
b) 5.0 g
c) 10 g
d) 20 g

89) On a new scale of temperature (which is linear) and called the W scale. The freezing and boiling points of water are 39° W and 239° W respectively. What will be the temperature on the new scale, corresponding to a temperature of 39° C on the Celsius scale?

a) 200° W
b) 139° W
c) 117° W
d) 78° W

90) A sportsman runs around a circular track of radius r such that he traverses the path A to B. The distance travelled and displacement respectively are

a) πr, 2r
b) 2r, 3πr
c) 3πr, 2r
d) 3πr, rπ

