


SAMPLE PAPER - 81

Time : 1 : 15 Hr.

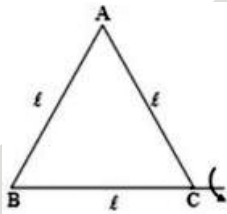
Question : 60

PHYSICS

01. Two particles whose masses are 10 kg and 30 kg and their position vectors are $\hat{i} + \hat{j} + \hat{k}$ and $-\hat{i} - \hat{j} - \hat{k}$ respectively would have the centre of mass at

(1) $-\frac{(\hat{i} + \hat{j} + \hat{k})}{2}$ (2) $\frac{(\hat{i} + \hat{j} + \hat{k})}{2}$
 (3) $-\frac{(\hat{i} + \hat{j} + \hat{k})}{4}$ (4) $\frac{(\hat{i} + \hat{j} + \hat{k})}{4}$

02. Three identical rods each of mass M , length l are joined to form an equilateral ΔABC . Find the moment of inertia about BC as shown.



(1) $\frac{2}{3}Ml^2$ (2) $\frac{Ml^2}{4}$ (3) $\frac{Ml^2}{2}$ (4) none

03. The height above surface of earth where the value of gravitational acceleration is one fourth of that at surface, will be

(1) $\frac{R_e}{4}$ (2) $\frac{R_e}{2}$ (3) $\frac{3R_e}{4}$ (4) R_e

04. The orbital velocity of an artificial satellite in a circular orbit just above the earth's surface is v . For a satellite orbiting at an altitude of half of the earth's radius, the orbital velocity is

(1) $\frac{3}{2}v$ (2) $\sqrt{\frac{3}{2}}v$
 (3) $\sqrt{\frac{2}{3}}v$ (4) $\frac{2}{3}v$

05. The time period of oscillations of a block attached to a spring is t_1 . When the spring is replaced by another spring, the time period of the block is t_2 . If both the springs are connected in series and the block is made to oscillate using the combination, then the time period t of the block is

(1) $t = t_1 + t_2$ (2) $t^2 = t_1^2 + t_2^2$
 (3) $t^{-1} = t_1^{-1} + t_2^{-1}$ (4) $t^{-2} = t_1^{-2} + t_2^{-2}$

06. The mass and the diameter of a planet are three times the respective values for the Earth. The period of oscillation of a simple pendulum on the Earth is 2s. The period of oscillation of the same pendulum on the planet would be:-

(1) $\frac{2}{\sqrt{3}}$ s (2) $2\sqrt{3}$ s
 (3) $\frac{\sqrt{3}}{2}$ s (4) $\frac{3}{2}$ s

07. A string of mass 2.5 kg is under a tension of 200 N. The length of the stretched string is 20.0 m. If the transverse jerk is struck at one end of the string. How long does the disturbance take to reach the other end?

(1) 0.5 s (2) 1 s
 (3) 1.5 s (4) 2 s

08. A wave of frequency 500 Hz has a velocity of 350 ms^{-1} . The distance between two nearest points on the wave which are 60° out of phase with each other will be around

(1) 70 cm (2) 7 cm
 (3) 12.0 cm (4) 120.0 cm

09. The fundamental frequency of a string stretched with a weight of 4 kg is 256 Hz. The weight required to produce its octave is

(1) 16 kg - wt (2) 12 kg - wt
 (3) 24 kg - wt (4) 8 kg - wt

10. A string 2.0 m long and fixed at its ends is driven by a 240 Hz vibrator. The string vibrates in its third harmonic mode. The speed of the wave and its fundamental frequency is

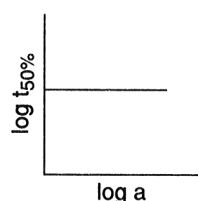
(1) 320 m/s, 120 Hz (2) 180 m/s, 80 Hz
 (3) 180 m/s, 120 Hz (4) 320 m/s, 80 Hz

11. Choose the wrong statement.
 (1) zero-velocity of a particle at any instant does not necessarily mean that its acceleration is zero
 (2) zero acceleration of a particle at any instant does not necessarily mean that its velocity is zero
 (3) if the speed of a particle is constant, its acceleration must be zero
 (4) none of the above
12. When a particle moves in a circle with a uniform speed
 (1) its velocity and acceleration are both constants
 (2) its velocity is constant but the acceleration changes
 (3) its acceleration is constant but the velocity changes
 (4) its velocity and acceleration both change
13. A block A kept on an inclined surface just begins to slide if the inclination is 30° . The block is replaced by another block B and it is found that it just begins to slide if the inclination is 40°
 (1) mass of A > mass of B
 (2) mass of A < mass of B
 (3) mass of A = mass of B
 (4) all the three are possible
14. An inelastic ball is dropped from a height 100 meter. If due to impact it loses 35% of its energy the ball will rise to a height of
 (1) 35 m (2) 65 m (3) 100 m (4) 135 m
15. An object of mass 5 kg and speed 10 ms^{-1} explodes into two pieces of equal mass. One-piece comes to rest. The kinetic energy added to the system during the explosion is
 (1) zero (2) 50 J
 (3) 250 J (4) 500 J
18. 5 mole of H_2SO_4 is mixed with 0.4 mole of Ca(OH)_2 . The maximum number of mole of CaSO_4 formed is:
 (1) 0.2 (2) 0.5
 (3) 0.4 (4) 1.5
19. The conjugate base of $[\text{Al(H}_2\text{O)}_3(\text{OH})_3]$ is:
 (1) $[\text{Al(H}_2\text{O)}_3(\text{OH})_2]^+$ (2) $[\text{Al(H}_2\text{O)}_3(\text{OH})_2\text{O}]^-$
 (3) $[\text{Al(H}_2\text{O)}_3(\text{OH})_3]^-$ (4) $[\text{Al(H}_2\text{O)}_2(\text{OH})_4]^-$
20. The internal energy change when a system goes from state A to B is 40 kJ/mol. If the system goes from A to B by a reversible path and returns to state A by an irreversible path. What would be the net change in internal energy?
 (1) 40 kJ (2) > 40 kJ
 (3) < 40 kJ (4) Zero
21. pK_a of a weak acid (HA) and pK_b of a weak base (BOH) are 3.4 and 3.2 respectively. The pH of their salt (AB) solution is
 (1) 7.0 (2) 1.0
 (3) 7.1 (4) 6.9
22. The following reaction occurs in the blast furnace where iron ore is reduced to iron metal:
 $\text{Fe}_2\text{O}_3(\text{s}) + 3\text{CO}(\text{g}) \rightleftharpoons 2\text{Fe}(\text{l}) + 3\text{CO}_2(\text{g})$
 Using the Le Chatelier's principle, predict which one of the following will not disturb the equilibrium?
 (1) Addition of Fe_2O_3 (2) Removal of CO_2
 (3) Removal of CO (4) Addition of CO_2
23. Among the following, the incorrect statement is
 (1) at very large volume, real gases show ideal behaviour
 (2) at very low temperature, real gases show ideal behaviour
 (3) at Boyle's temperature, real gases show ideal behaviour
 (4) at low pressure, real gases show ideal behaviour
24. A metal crystallises in a face centred cubic structure. If the edge length of its unit cell is 'a', the closest approach between two atoms in metallic crystal will be
 (1) $\sqrt{2}a$ (2) $\frac{a}{\sqrt{2}}$
 (3) 2a (4) $2\sqrt{2}a$
25. What is the standard reduction potential (E°) for $\text{Fe} \rightarrow \text{Fe}^{3+}$?
 Given that:
 $\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}; E_{\text{Fe}^{2+}/\text{Fe}}^\circ = -0.47 \text{ V}$
 $\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}; E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^\circ = 0.77 \text{ V}$
 (1) +0.057 V (2) +0.30 V
 (3) -0.30 V (4) -0.057 V

CHEMISTRY

16. One litre N_2 , $\frac{7}{8}$ litre O_2 and 0.1 litre CO are taken in a mixture under identical conditions of P and T. The amount of gases present in mixture is given by:
 (1) $w_{\text{N}_2} = w_{\text{O}_2} > w_{\text{CO}}$ (2) $w_{\text{N}_2} = w_{\text{CO}} > w_{\text{O}_2}$
 (3) $w_{\text{N}_2} = w_{\text{O}_2} = w_{\text{CO}}$ (4) $w_{\text{CO}} > w_{\text{N}_2} > w_{\text{O}_2}$
17. In a multi-electron atom, which of the following orbitals described by the three quantum numbers will have the same energy in the absence of magnetic field?
 (i) $n = 1, l = 0, m = 0$ (ii) $n = 2, l = 0, m = 0$
 (iii) $n = 2, l = 1, m = 1$ (iv) $n = 3, l = 2, m = 1$
 (v) $n = 3, l = 2, m = 0$
 (1) (i) and (ii) (2) (ii) and (iii)
 (3) (iii) and (iv) (4) (iv) and (v)

26. Given, $C + O_2 \rightarrow CO_2$; $\Delta H = -400$ kJ
 $H_2 + \frac{1}{2} O_2 \rightarrow H_2O$; $\Delta H = -300$ kJ
 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$; $\Delta H = -1200$ kJ
 The heat of formation of methane in kJ will be:
 (1) -200 (2) -400 (3) -20.0 (4) None
27. The solubility products of MA, MB, MC and MD are 1.8×10^{-10} , 4×10^{-3} , 4×10^{-8} and 6×10^{-15} respectively. If a 0.01 M solution of MX is added dropwise to a mixture containing A^- , B^- , C^- and D^- ions, then the one to be precipitated first will be:
 (1) MA (2) MB (3) MC (4) MD
28. A graph plotted between $\log t_{50\%}$ vs. \log concentration is a straight line. What conclusion can you draw from this graph.



- (1) $n = 1$; $t_{1/2} = \frac{1}{x \times a}$ (2) $n = 2$; $t_{1/2} = \frac{1}{a}$
 (3) $n = 1$; $t_{1/2} = \frac{0.693}{k}$ (4) None of these

29. On the basis of data given below predict which of the following gases shows maximum adsorption on a definite amount of charcoal?
- | Gas | CO ₂ | SO ₂ | CH ₄ | H ₂ |
|------------------|-----------------|-----------------|-----------------|----------------|
| Critical temp./K | 304 | 630 | 190 | 33 |
- (1) CO₂ (2) SO₂
 (3) CH₄ (4) H₂
30. Copper is purified by electrolytic refining of blister copper. The incorrect statement(s) about this process is(are)
 (1) impure Cu strip is used as cathode
 (2) acidified aqueous CuSO₄ is used as electrolyte
 (3) pure Cu deposits at cathode
 (4) impurities settle as anode-mud

BOTANY

31. Which of the given statements are true?
 (i) During the development of a dicot embryo, a heart-shaped embryo is followed by globular embryo.
 (ii) The part of embryonal axis above the level of cotyledons is epicotyls, while the part below the level of cotyledons is hypocotyl.

(iii) Monocot seeds possess a single cotyledon represented by scutellum.

- (1) (i) and (ii) (2) (ii) and (iii)
 (3) (i) and (iii) (4) (i), (ii) and (iii)

32. Which of the following crop plant is not matching as correct pair with its variety?
 (i) Wheat - Himgiri
 (ii) Brassica - Pusa gaurav
 (iii) Cauliflower - Pusa komal
 (iv) Chilli - Pusa sadabahar
 (v) Okra - Pusa sawani
 (1) Only (i) (2) (ii) and (iii)
 (3) Only (iii) (4) (iii) and (iv)
33. Match the columns for diseases causing agent in plant and select correct option:

	Column-I		Column-II
(A)	Brown rust of wheat, red rot of sugarcane and late blight of potato	(i)	Bacteria
(B)	Black rot of crucifers	(ii)	Fungi
(C)	Tobacco mosaic, turnip mosaic	(iii)	Mycoplasma
(D)	Yellow mosaic in bhindi	(iv)	Protozoa
(E)	Powdery mildew in mung	(v)	Virus

- (1) (A)-(i); (B)-(ii); (C)-(iii); (D)-(iv); (E)-(v)
 (2) (A)-(ii); (B)-(i); (C)-(iv); (D)-(v); (E)-(ii)
 (3) (A)-(ii); (B)-(i); (C)-(v); (D)-(v); (E)-(ii)
 (4) (A)-(iii); (B)-(ii); (C)-(i); (D)-(v); (E)-(iv)

34. Microbes are also used for commercial and industrial production of certain chemicals like organic acids, alcohols and enzymes, choose correct statements from given statements.
 (i) Aspergillus niger is a fungus produce acetic acid.
 (ii) Acetobacter aceti which is a bacterium which produces citric acid.
 (iii) Clostridium butylicum which is a bacterium which produces butyric acid and propionic acid
 (iv) Lactobacillus which is a bacterium produces lactic acid and CO₂.
 (v) Saccharomyces cerevisiae is used for commercial production of ethanol and CO₂.
 (vi) Microbes can produces enzymes like lipase, pectinases and proteases.
 (1) (v) and (vi)
 (2) (i), (ii), (iii), (iv) and (vi)
 (3) (iv), (v) and (vi)
 (4) All statements are incorrect

35. A population of lotus plants in a pond is 450 in the starting of January 2014. It has a birth rate of 0.2/lotus plant/month. The number of plants after 2 months will be:
- (1) 630 (2) 540
(3) 610 (4) 648

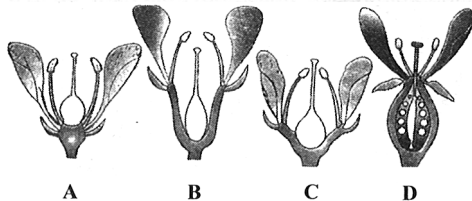
36. Match the following and choose the correct option.

	Column-I		Column-II
(A)	Family	(i)	Tuberosum
(B)	Kingdom	(ii)	Polymoniales
(C)	Order	(iii)	Solanum
(D)	Species	(iv)	Plantae
(E)	Genus	(v)	Solanaceae

- (1) i-D, ii-C, iii-C, iv-B, v-A
(2) i-E, ii-D, iii-B, iv-A, v-C
(3) i-D, ii-E, iii-B, iv-A, v-C
(4) i-E, ii-C, iii-B, iv-A, v-D

37. Dinoflagellates are mostly
- (1) marine and saprophytic
(2) fresh water and photosynthetic
(3) marine and photosynthetic
(4) terrestrial and photosynthetic

38. On the basis of relative position of different floral parts on the thalamus, a flower can be hypogynous, perigynous or epigynous. With respect to the given figures (A, B, C and D), select the correct option.



- (1) A-Hypogynous; B-Perigynous; C-Perigynous; D-Epigynous
(2) A-Hypogynous; B-Epigynous; C-Epigynous; D-Perigynous
(3) A-Epigynous; B-Hypogynous; C-Perigynous; D-Perigynous
(4) A-Hypogynous; B-Hypogynous; C-Perigynous; D-Epigynous

39. Identify the missing words (A, B, C and D) and select the correct option.

Family	Inflorescence	Flower	Stamens	Gynoecium
Fabaceae	A	B	10	D
Solanaceae	Solitary, axillary or cymose	Actinomorphic	5	Bicarpellary
Liliaceae	Solitary, cymose or racemose	Actinomorphic	C	Tricarpellary

- (1) A-Racemose; B-Zygomorphic; C-3 + 3; D-Monocarpellary
(2) A-Racemose; B-Actinomorphic; C-5; D-Bicarpellary
(3) A-Cymose; B-Zygomorphic; C-3 + 3; D-Tricarpellary
(4) A-Cymose; B-Actinomorphic; C-5; D-Multicarpellary

40. Match Column-I with Column-II and select the correct option from the codes given below.

	Column-I (Members of Fabaceae)		Column-II (Economic importance)
(A)	Gram, sem, moong, soybean	(i)	Timber
(B)	Soybean, groundnut	(ii)	Medicine
(C)	Indigofera	(iii)	Fodder
(D)	Sunhemp	(iv)	Fibres
(E)	Sesbania, Trifolium	(v)	Dye
(F)	Dalbergia sissoo	(vi)	Edible oil
(G)	Glycyrrhiza glabra	(vii)	Pulses

- (1) A-(i), B-(ii), C-(iii), D-(iv), E-(v), F-(vi), G-(vii)
(2) A-(vii), B-(vi), C-(v), D-(iv), E-(iii), F-(i), G-(ii)
(3) A-(ii), B-(iv), C-(vi), D-(i), E-(iii), F-(v), G-(vii)
(4) A-(i), B-(iii), C-(v), D-(vii), E-(ii), F-(iv), G-(vi)

41. Match the followings and choose correct option.

	Group-A		Group-B
(A)	Aleurone layer	(i)	without fertilization
(B)	Parthenocarpic fruit	(ii)	Nutrition
(C)	Ovule	(iii)	Double fertilization
(D)	Endosperm	(iv)	Seed

- (1) A-(i), B-(ii), C-(iii), D-(iv)
(2) A-(ii), B-(i), C-(iv), D-(iii)
(3) A-(iv), B-(ii), C-(i), D-(iii)
(4) A-(ii), B-(iv), C-(i), D-(iii)

42. Correct sequence of layers of bacterial cell envelope from outward to inward is

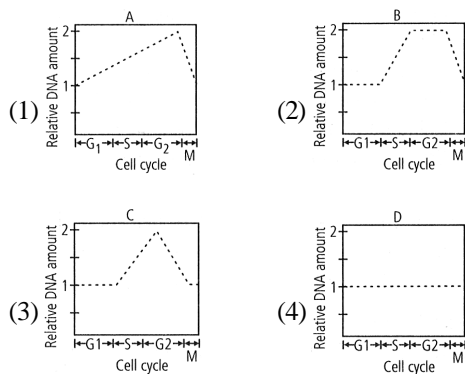
- (1) Cell wall → Glycocalyx → Cell membrane
(2) Cell membrane → Glycocalyx → Cell wall
(3) Glycocalyx → Cell wall → Cell membrane
(4) Glycocalyx → Cell membrane → Cell wall

43. Match the cell organelles given in Column-I with cellular processes in Column-II and select the correct option from the codes given below.

	Column-I		Column-II
(A)	Lysosomes	(i)	Protein synthesis
(B)	Ribosomes	(ii)	Hydrolytic activity
(C)	Smooth endoplasmic reticulum	(iii)	Steroid synthesis
(D)	Centriole	(iv)	Formation of spindle

- (1) A-(ii); B-(i); C-(iii); D-(iv)
(2) A-(i); B-(iii); C-(iv); D-(ii)
(3) A-(i); B-(iv); C-(iii); D-(ii)
(4) A-(iv); B-(iii); C-(i); D-(ii)

44. Disjunction refers to
 (1) the separation of homologous chromosomes at anaphase-I
 (2) the type of chromosomal aberration in which there is loss of a part of a chromosome
 (3) incompatibility in fungi and other thallophytes
 (4) modification of gene action by a nonallelic gene
45. Which one of the following graphs shows the relative change in the amount of mitochondrial DNA of a cell undergoing mitosis?

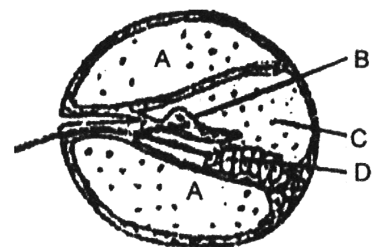


ZOOLOGY

46. Vaccine is included in
 (1) Natural active acquired immunity
 (2) Natural passive acquired immunity
 (3) Artificial active acquired immunity
 (4) Artificial passive acquired immunity
47. Interferon
 (1) Kills the virus in virus infected cell
 (2) Kills the virus and destroy cancerous cell
 (3) Stimulates the TIP (translation Inhibiting protein)
 (4) Antibacterial
48. Cancer cells are more easily damaged by radiation than normal cells because they are
 (1) Undergoing rapid divisions
 (2) Different in structure
 (3) Non-dividing
 (4) Starved of mutation
49. The drugs which are commonly abused are opioid, cannabinoids and coca alkaloid. Majority of these are obtained from while some are obtained from
- (1) Fungi, non-flowering plants
 (2) Flowering plants, fungi
 (3) Fungi, flowering plants
 (4) Non-flowering plants, fungi
50. What will happen if the secretion of peptic cells of gastric glands is blocked with an inhibitor ?
 (1) In the absence of HCl secretion, inactive pepsinogen is not converted into active enzyme pepsin

- (2) Enterokinase will not be released from the duodenal mucosa and so trypsinogen is not converted to trypsin
 (3) Gastric juice will be deficient in chymotrypsin
 (4) Gastric Juice will be deficient in pepsinogen

51. A person is eating boiled potato, what is the food component found in it?
 (1) DNA which gets digested by pancreatic DNAase
 (2) Lactose which is indigestible
 (3) Starch which does not get digested
 (4) Cellulose which is digested by intestinal cellulase
52. Which of the following statement is not correct?
 (1) Brunner's glands are present in the submucosa of stomach and secrete pepsinogen
 (2) Goblet cells are present in the mucosa of stomach and secrete mucus
 (3) Oxyntic cells are present in the mucosa of stomach and secrete HCl
 (4) Acini are present in the pancreas and secrete carboxypeptidase
53. Arteries are best defined as the vessels which:
 (1) Carry blood away from the heart to different organs
 (2) Break up into capillaries which reunite to form a vein
 (3) Carry blood from one visceral organ to another
 (4) Supply oxygenated blood to different organs
54. In the heart, as the action potential reaches the AV node from the SA node, there is a delay of the action potential. This delay is important because
 (1) it allows right atria to receive blood from vena cava
 (2) it allows atria to rest
 (3) it allows stronger right atrial contraction
 (4) it allows ventricles to receive all the blood from the atria.
55. Which of the following events do not occur during joint diastole?
 A. All four chambers of heart are in relaxed state.
 B. Tricuspid and bicuspid valves open.
 C. Action potential is conducted from SAN to AVN
 D. Blood from the pulmonary veins and vena cava flows into the left and right ventricles, respectively through the left and right atria.
 E. The semilunar valves are closed.
 (1) Only E (2) Only C
 (3) Only D (4) Only A and B
56. Given below is a diagrammatic cross-section of a single loop of human cochlea-



- Which one of the following options correctly represents the names of three different parts?
- (1) D: Sensory hair cells, A : endolymph, B: tectorial membrane
(2) A: perilymph, B: tectorial membrane, C: endolymph
(3) B: tectorial membrane, C: perilymph, D: secretory cells
(4) C: endolymph, D: sensory hair cells, A: serum
57. Cornea transplantation is outstandingly successful because
- (1) Cornea is easy to preserve
(2) Cornea is not linked up with blood vascular and immune systems
(3) The technique involved is very simple
(4) Cornea is easily available
58. Select the incorrect statement from the following.
- (1) Eustachian tube connects middle ear cavity with the pharynx.
(2) The Eustachian tube helps in equalizing the pressure on either side of the ear drum.
(3) Oval window is connected with stapes
(4) The ear ossicle decreases the efficiency of transmission of sound waves to the inner ear.
59. Select the total number of hormones from the following which has extra cellular receptor.
Erythropoietin, Gastrin, Secretin, GIP, CCK, Insulin, Glucagon, Thymosin, PTH, ANF.
- (1) 8 (2) 7
(3) 9 (4) 10
60. A steroid hormone typically alters the activity of its target cells by
- (1) Changing the membrane permeability of cell
(2) Entering the cell and altering gene expression.
(3) Activation of IP_3
(4) Conversion of ATP to AMP.

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