

SAMPLE PAPER - 101

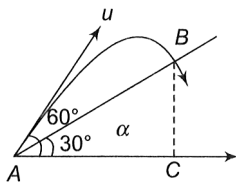
Time : 1 : 15 Hr.

Question : 60

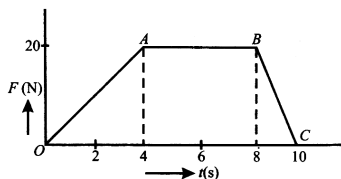
PHYSICS

01. A ball released from the top of a tower travels $\frac{11}{36}$ of the height of the tower in the last second of its journey. The height of the tower is
 (Take $g = 10 \text{ m s}^{-2}$)
 (1) 11 m (2) 36 m (3) 47 m (4) 180 m

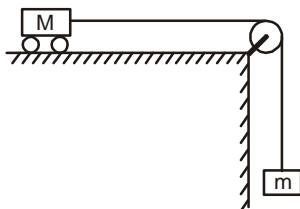
02. Time taken by the projectile to reach from A to B is t . Then the distance AB is equal to:



- (1) $\frac{ut}{\sqrt{3}}$ (2) $\frac{\sqrt{3}ut}{2}$
 (3) $\sqrt{3} ut$ (4) $2 ut$
03. A body of mass 5 kg is acted on by a force F which varies with time t as shown in the given figure. Then the momentum gained by the body at the end of 10 seconds is



- (1) 0 kg m s^{-1} (2) 100 kg m s^{-1}
 (3) 140 kg m s^{-1} (4) 200 kg m s^{-1}
04. A trolley of mass M is attached to a block of mass m by a string passing over a frictionless pulley as shown in figure.



If the coefficient of friction between the trolley and the surface below is μ , what is the acceleration of the trolley and the block system, when they are released ?

- (1) $\left(\frac{m-M}{m+M}\right)g$ (2) $\frac{m}{M}g$
 (3) $\left(\frac{\mu m - M}{m+M}\right)g$ (4) $\left(\frac{m - \mu M}{m+M}\right)g$

05. Which of the following statements is correct ?
 (1) Kinetic energy and momentum both are conserved in all types of collisions
 (2) Kinetic energy is not conserved but momentum is conserved in inelastic collisions
 (3) Momentum is conserved in elastic collisions but not in inelastic collisions
 (4) Kinetic energy is conserved in inelastic collisions but momentum is not conserved in elastic collisions

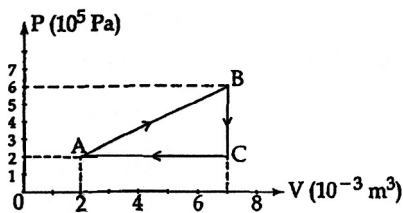
06. The energy density $\frac{u}{V}$ of an ideal gas is related to its pressure P as

- (1) $\frac{u}{V} = 3P$ (2) $\frac{u}{V} = \frac{3}{2}P$
 (3) $\frac{u}{V} = \frac{1}{3}P$ (4) $\frac{u}{V} = \frac{2}{3}P$

07. One mole of an ideal monoatomic gas at temperature T_0 expands slowly according to the law $\frac{P}{V} = \text{constant}$. If

- the final temperature is $2T_0$, heat supplied to the gas is
 (1) $2RT_0$ (2) RT_0
 (3) $\frac{3}{2}RT_0$ (4) $\frac{1}{2}RT_0$

08. A gas is taken through the cycle $A \rightarrow B \rightarrow C \rightarrow A$, as shown. What is the net work done by the gas?



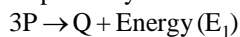
- (1) -2000 J (2) 2000 J
 (3) 1000 J (4) Zero
09. If K_1 and K_2 are the maximum kinetic energies of photoelectrons emitted when lights of wavelength λ_1 and λ_2 respectively incident on a metallic surface and $\lambda_1 = 3\lambda_2$, then :

- (1) $K_1 > \frac{K_2}{3}$ (2) $K_1 < \frac{K_2}{3}$
 (3) $K_1 = 3K_2$ (4) $K_2 = 3K_1$

10. The radioactivity of a sample is A_1 at time t_1 and A_2 at time t_2 . If the mean life of the specimen is T , the number of atoms that have disintegrated in the time interval of $(t_2 - t_1)$ is:

- (1) $(A_1 - A_2)$ (2) $\frac{(A_1 - A_2)}{T}$
 (3) $(A_1 - A_2)T$ (4) $A_1 t_1 - A_2 t_2$

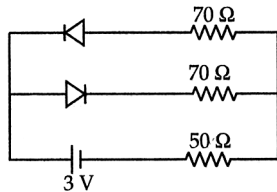
11. Binding energy of nuclei P, Q and R are E_P , E_Q and E_R respectively. In the fusion processes



Calculate, total energy (E_3) released in the fusion process $6P \rightarrow R + \text{Energy } (E_3)$.

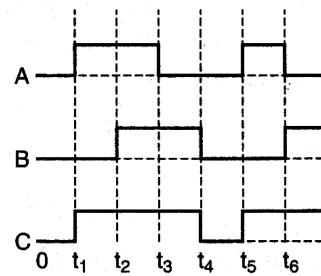
- (1) $E_1 + E_2$ (2) $E_1 - E_2$
 (3) $E_1 - 2E_2$ (4) $2E_1 + E_2$

12. The circuit shown in the figure contains two diodes each with a forward resistance of 30Ω and with infinite backward resistance. If the battery is 3 V , the current through the 50Ω resistance (in ampere) is



- (1) Zero (2) 0.01
 (3) 0.02 (4) 0.03

13. The figure shows a logic circuit with two inputs A and B and the output C . The voltage wave forms across A , B and C are as given. The logic circuit gate is.



- (1) AND gate (2) NAND gate
 (3) OR gate (4) NOR gate

14. Light with an energy flux of $25 \times 10^4 \text{ Wm}^{-2}$ falls on a perfectly reflecting surface at normal incidence. If the surface area is 7.5 cm^2 , the average force exerted on the surface is :

- (1) $1.20 \times 10^{-6} \text{ N}$ (2) $3.0 \times 10^{-6} \text{ N}$
 (3) $1.25 \times 10^{-6} \text{ N}$ (4) $2.50 \times 10^{-6} \text{ N}$

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

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

CHEMISTRY

16. Calculate the amount of H_2 which is left unreacted in the given reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, if 8 g of H_2 is mixed with 16 g O_2 .

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

17. In a sample of H-atom electrons make transition from 5th excited state to ground state, producing all possible types of photons, then the number of lines in infrared region are

- (1) 4 (2) 5
 (3) 6 (4) 3

18. At the top of the mountain, the thermometer reads 0°C and the barometer reads 710 mm Hg . At the bottom of the mountain, the temperature is 30°C and pressure is 760 mm Hg . Density of air at the top with that at the bottom is

- (1) 1 : 1 (2) $1.04 : 1$
 (3) $1 : 1.04$ (4) $1 : 1.5$

19. For the auto-ionization of water at 25°C , $\text{H}_2\text{O}_{(l)} \rightleftharpoons \text{H}^+_{(aq)} + \text{OH}^-_{(aq)}$ is 10^{-14} . What is ΔG° for the process ?

- (1) $\Delta G^\circ = 8 \times 10^4 \text{ J}$ (2) $\Delta G^\circ = 3.5 \times 10^4 \text{ J}$
 (3) $\Delta G^\circ = 10^4 \text{ J}$ (4) None of these

20. Equal volumes of 1 M HCl and 1 M H₂SO₄ are neutralized completely by dil. NaOH solution and x kcal and y kcal heat are liberated, respectively. Which of the following is true?
- (1) x = y (2) $x = \frac{y}{2}$
 (3) x = 2y (4) None of these
21. In the dissociation of PCl₅ as $\text{PCl}_{5(g)} \rightleftharpoons \text{PCl}_{3(g)} + \text{Cl}_{2(g)}$, if the degree of dissociation is α at equilibrium pressure P, then the equilibrium constant for the reaction is
- (1) $K_p = \frac{\alpha^2}{1 + \alpha^2 P}$ (2) $K_p = \frac{\alpha^2 P^2}{1 - \alpha^2}$
 (3) $K_p = \frac{\alpha P^2}{1 - \alpha^2}$ (4) $K_p = \frac{\alpha^2 P}{1 - \alpha^2}$
22. To a 10 mL of 10⁻³ N H₂SO₄ solution, water has been added to make the total volume of 1 L. Its pOH would be
- (1) 3 (2) 12
 (3) 9 (4) 5
23. What would be the normality of 0.3 M H₃PO₃, when it undergoes the following reaction:
 $\text{H}_3\text{PO}_3 + 2\text{OH}^+ \longrightarrow \text{HPO}_3^{2-} + 2\text{H}_2\text{O}$
- (1) 0.6 N (2) 0.15 N
 (3) 0.9 N (4) 0.1 N
24. In the face centered cubic unit cell, the closest packed layers are perpendicular to
- (1) the face of the unit cell
 (2) the face diagonal of the unit cell
 (3) edges of the unit cell
 (4) the body diagonal of the unit cell
25. Which of the following has been arranged in order of decreasing freezing point?
- (1) 0.05 M KNO₃ > 0.04 M CaCl₂ > 0.140 M sugar > 0.075 M CuSO₄
 (2) 0.4 M BaCl₂ > 0.140 M sucrose > 0.075 M CuSO₄ > 0.05 M KNO₃
 (3) 0.075 M CuSO₄ > 0.140 M sucrose > 0.04 M BaCl₂ > 0.05 M KNO₃
 (4) 0.075 M CuSO₄ > 0.05 M NaNO₃ > 0.140 M sucrose > 0.04 M BaCl₂
26. For the cell $\text{Ti} | \text{Ti}^+ || \text{Cu}^{2+} | \text{Cu}$, E_{cell} at 25°C is 0.83 V. The EMF of the cell can be increased by
- (1) increasing [Cu²⁺]
 (2) increasing [Ti⁺]
 (3) decreasing [Cu²⁺]
 (4) increasing temperature to 35°C
 [Assume that at 35°C, E_{cell}^o in same as at 25°C]
27. The limiting molar conductivities Λ° for NaCl, KBr and KCl are 126, 152 and 150 S cm² mol⁻¹, respectively. The Λ° for NaBr S cm² mol⁻¹ is
- (1) 302 (2) 176 (3) 278 (4) 128
28. For the reaction $2A \longrightarrow B + 3C$, if $\frac{d[A]}{dt} = k_1[A]^2$, $\frac{d[B]}{dt} = k_2[A]^2$, $\frac{d[C]}{dt} = k_3[A]^2$, the correct reaction between k₁, k₂ and k₃ is
- (1) k₁ = k₂ = k₃ (2) 2k₁ = k₂ = 3k₃
 (3) 4k₁ = k₂ = 3k₃ (4) $\frac{k_1}{2} = k_2 = \frac{k_3}{3}$
29. The Brownian movement of colloidal particles is because of
- (1) convection currents in the fluid
 (2) unequal bombardments by the molecules of the dispersion medium on colloidal particles
 (3) setting of dispersed phase under gravity
 (4) thermal gradient in the medium
30. In Fe-extraction, the roasting is adopted although the ore is not having any sulphide because
- (1) Haematite is decomposed
 (2) All FeO is to be converted into Fe₂O₃
 (3) All Fe₂O₃ is to be converted into FeO
 (4) Slag formation is encouraged

BOTANY

31. Pollen grains in Pinus, develops inside the
- (1) Pollen chamber
 (2) Microsporangium
 (3) Microgametangium
 (4) Anther
32. Gymnosperms include
- (1) Shrubs
 (2) Medium sized trees
 (3) Tall trees
 (4) All of the above
33. I. In Rhodophyceae, food is stored as mannitol and laminarin.
 II. Ovules of Gymnosperms are not enclosed by ovary wall.
 III. Salvinia is heterosporous.
 IV. In diplontic life cycle, free living gametophyte represents dominant phase.
 Of the above statements:
- (1) II and III are correct, I and IV are wrong
 (2) II and IV are correct, I and III are wrong
 (3) III and IV are correct, I and II are wrong
 (4) I and II are correct, III and IV are wrong

34. Match column I with column II, and choose the correct combination from the options given below.

	Column-I		Column-II
a.	Phylogenetic system	1.	Chemical constituents of plants
b.	Numerical taxonomy	2.	Based on all observable characters
c.	Cytotaxonomy	3.	Based on evolutionary relationships
d.	Chemotaxonomy	4.	Based on chromosome number, structure and behaviour

- (1) a-3; b-4; c-1; d-2 (2) a-3; b-2; c-4; d-1
(3) a-2; b-4; c-1; d-3 (4) a-3; b-4; c-2; d-1
35. In dicot leaves, size of vascular bundles are dependent on the
(1) Size of the leaves
(2) Size of the mesophyll cells
(3) Size of the veins
(4) Size of the bundle sheath cells
36. Water potential and osmotic potential of pure water are
(1) Zero and zero (2) 100 and zero
(3) 100 and 100 (4) Zero and 100
37. Read the following equation:
 $2\text{NO}_2 + \text{O}_2 \rightarrow 2\text{NO}_3^-$
This step is carried out by
(1) Nitrosomonas (2) Nitrobacter
(3) Nitrococcus (4) Both (1) and (3)
38. Which of following element group is present in plant tissue in less than 10 mmole kg^{-1} of dry matter?
(1) Sodium, silicon, selenium and cobalt
(2) Carbon, hydrogen, oxygen and nitrogen
(3) Magnesium, manganese, molybdenum and nickel
(4) Zinc, boron, iron and copper
39. Which one does not fix nitrogen?
(1) Azotobacter
(2) Spirogyra
(3) Anabaena
(4) Nostoc
40. Read the following statements and find out the incorrect statement.
(1) Second step of Calvin cycle (i.e, reduction) involve utilisation of 2 molecules of ATP for reduction and 2 of NADPH for phosphorylation per CO_2 molecule fixed.
(2) The regeneration steps require one ATP for phosphorylation to form RuBP.
(3) It is probably to meet the differences in number of ATP and NADPH used in dark reaction that the cyclic phosphorylation takes place.
(4) Plants that are adapted to dry tropical regions have the C_4 pathway.

41. Photorespiration is favoured by
(1) High oxygen and low carbon dioxide
(2) High carbon dioxide and low oxygen
(3) High temperature and low oxygen
(4) High humidity and temperature
42. What are the reasons why plants can get along without respiratory organs?
a. Each plant part takes care of its own gas exchange needs. There is very little transport of gases from one plant part to another.
b. Plants do not present great demands for gaseous exchange; root, stem and leaves respire at rates far lower than animals do.
c. The distance that gases must diffuse even in large, bulky plants is not great.
(1) a and b (2) b and c
(3) c and a (4) a, b and c
43. There are three major ways in which different cells handle pyruvic acid produced by glycolysis. These are
(1) Fermentation, TCA and ETS
(2) Fermentation, aerobic respiration and TCA
(3) Alcoholic fermentation, lactic acid fermentation and aerobic respiration
(4) Alcoholic fermentation, lactic acid fermentation and ETS
44. Which of the following is correct about growth?
(1) Growth is regarded as one of most fundamental and conspicuous characteristics of living being.
(2) Growth can be defined as an irreversible permanent increase in size of an organ or its parts or even of an individual cell.
(3) Generally growth is accompanied by metabolic processes (both anabolic and catabolic), that occur at the expense of energy.
(4) All of the above
45. Out of 7 contrasting trait pairs selected by Mendel, how many traits were dominant and recessive?
(1) 7 and 7 (2) 8 and 6
(3) 6 and 8 (4) 5 and 9

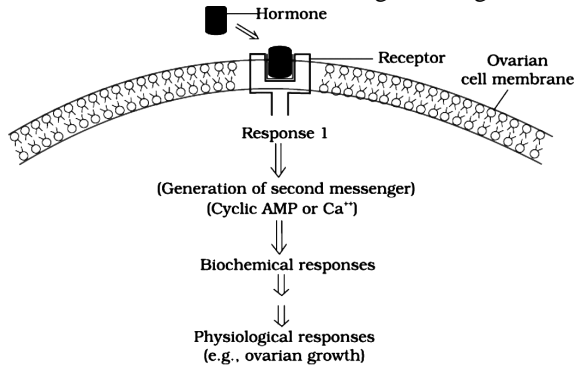
ZOOLOGY

46. The pericardium and the pericardial fluid help in :
(1) Protecting the heart from friction, shocks and keeps it moist
(2) Pumping the blood
(3) Receiving the blood from various parts of the body
(4) None of the above
47. Read the following (A-D) statements
A. Plasma without the clotting factors is called lymph
B. The spleen is the graveyard of RBCs
C. Eosinophils resist infections and are also associated with allergic reactions

D. The universal donor blood group is O+ve
 How many of the above statements are correct ?
 (1) Four (2) Three (3) Two (4) One

48. An organ X has a large blood supply. It produces a hormone lack of which cause a disease called as cretinism. The cause is:
 (1) Excess growth hormone
 (2) Absence of insulin
 (3) Excess adrenalin
 (4) Hyposecretion of thyroid in childhood

49. Which of the following hormone represent the mechanism of hormone action shown in the given diagram?



- (1) Estrogen (2) Progesterone
 (3) FSH (4) Cortisol

50. Which of the following is correct about the human endocrine system?

- (1) Hormones are non-nutrient chemical substances that only act as extracellular messengers and are produced in trace amounts.
 (2) The pars distalis region of a gland situated in the sella tursica, is responsible for secretion of the hormone which induces ovulation.
 (3) Diabetes mellitus is a disorder caused due to decreased secretion of hormones from the alpha cells of the islet of Langerhans of the pancreas.
 (4) The juxtaglomerular cells of the kidney produce a steroid hormone called erythropoietin, which stimulates erythropoiesis.

51. Which set of animals are included under protochordates?

- (1) Salpa, Doliolum, Branchiostoma
 (2) Ascidia, Lancelet, Hag fish
 (3) Doliolum, Balanoglossus, Saccoglossus
 (4) Aplysia, Salpa, Amphioxus

52. Receptorsites for neurotransmitters are present on

- (1) membranes of synaptic vesicles
 (2) pre-synaptic membrane
 (3) tips of axons
 (4) post-synaptic membrane

53. How many cranial nerves in the list given below are of mixed nature?

Olfactory, Trochlear, Trigeminal, Abducens, Facial, Auditory, Glossopharyngeal, Vagus

- (1) four (2) three
 (3) two (4) one

54. I. Pineal gland is located on the ____A____ side of forebrain.

II. Underproduction of hormones of GH leads to ____B____.

III. Glucagon is a ____C____ hormone.

(1)	A	B	C
	Ventral	Cushing's	Hypoglycemic
(2)	A	B	C
	Ventral	Pituitary dwarfism	Hypoglycemic
(3)	A	B	C
	Dorsal	Addison's	Hypoglycemic
(4)	A	B	C
	Dorsal	Pituitary dwarfism	Hypoglycemic

55. Health is :-

- (1) Wealth
 (2) Absence of disease or infirmity
 (3) Weight of body according to height
 (4) State of complete physical mental, and social well being

56. Allograft is

- (1) Grafting in between the individuals of different species
 (2) Grafting in between the individuals of same species
 (3) Heterograft
 (4) Isograft

57. Which of the following antibody can be characterized by the following features?

1. It is the heaviest antibody.
 2. The first antibody which comes into action after entry of the pathogen.
 3. It is a pentamer.
 (1) IgA (2) IgG
 (3) IgM (4) IgE

58. Match the columns with regards to vector -disease.

	Column-I		Column-II
p.	Culex	i.	Dengue
q.	Anopheles	ii.	Filariasis
r.	Aedes	iii.	Malaria

- (1) p-i, q-ii, r-iii
 (2) p-ii, q-iii, r-i
 (3) p-ii, q-i, r-iii
 (4) p-i, q-iii, r-ii

59. Match the following and choose the correct option

	Column-I		Column-II
A.	Adipose tissue	i.	Nose
B.	Stratified epithelium	ii.	Blood
C.	Hyaline cartilage	iii.	Skin
D.	Fluid connective tissue	iv.	Fat storage

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

60. Arrange the correct sequence of enzymes which act on food in different regions of alimentary canal:

- (i) Pepsin (ii) Ptyalin
(iii) Dipeptidase (iv) Carboxypeptidase
(1) 1,3,2,4 (2) 2,1,4,3
(3) 1,4,3,2 (4) 2,1,3,4