FIITJEE MEDICAL TEST SAMPLE PAPER

For students presently in

Class – 11

Biology, Physics & Chemistry – PAPER - 2

Time Duration: 3 Hours **Maximum Marks: 720**

Instructions

Caution: Class, Paper, Code as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong Class, Paper or Code will give wrong results.

1. This Question Paper contains only **3 Sections**. All questions will be Multiple Choice with single correct option out of four choices. The marking scheme is as per the table given below:

Section	Subject	Question No.	Marking Scheme for each questions	
			Correct Answer	Wrong Answer
Section – I	Biology	Q.NO: 1 to 90	+4	-1
Section - II	Physics	Q.NO: 1 to 45	+4	-1
Section - III	Chemistry	Q.NO: 1 to 45	+4	-1

2. Answers have to be marked on the OMR sheet. The Question Paper contains blank spaces for your rough work. No additional sheets will be provided for rough work.
3. Blank papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.
4. Before attempting paper write your Registration Number, Name and Test Centre in the space provided at the bottom of this sheet

Note: Please check this Question Paper contains all **180** questions. If not so, exchange for the correct Question Paper.

Biology Section - I

Straight Objective Type

Biology contains 90 multiple choice questions numbered 1 to 90. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. Primary dentition in human differs from permanent dentition in not having one of the following type of teeth
   (A) Canines (B) Premolars (C) Molars (D)Incsisors

2. Healing of wound in plants takes place by activity of:
   (A) Intercalary meristem (B) Secondary meristem
   (C) Apical meristem (D) Lateral meristem

3. Which of the following statements is not true?
   (A) All members of the kingdom Animalia are multicellular
   (B) Nature of coelom is used as one of the basis of animal classification
   (C) There is no need of classification now as over a million species of animals have been described till now
   (D) The arrangement of cells in the body is one of the classifying feature of the animals

4. Active divisions occur in the cells of:
   (A) Xylem (B) Phloem (C) Cambium (D) Collenchyma

5. Match column-I with column-II and select the correct answer using the options given below.

	Column-I		Column-II
A.	Xylem vessels	I.	Store food materials
B.	Xylem tracheids	II.	Obliterated lumen
C.	Xylem fibre	III.	Perforated plates
D.	Xylem parenchyma	IV.	Chisel-like ends

   (A) A-IV; B-III; C-II; D-I (B) A-III; B-II; C-I; D-IV
   (C) A-II; B-I; C-IV; D-III (D) A-III; B-IV; C-II; D-I

6. Mesoglea is
   (A) A germinal layer present between ectoderm and endoderm
   (B) An undifferentiated layer present between ectoderm and endoderm
   (C) Another name of mesoderm
   (D) A spongy layer of skin

Space for rough work

7. In C_4 plants, Calvin cycle occurs in
   (A) Stroma of bundle sheath chloroplast
   (B) Mesophyll chloroplast
   (C) Grana of bundle sheath chloroplast
   (D) Does not occur as CO2 is fixed mainly by PEP and no CO2 is left for Calvin cycle

8. Xylem fibre is:
   (A) Bastfibre (B) Wood fibre (C) Heart wood (D) Libriformfibre

9. Living beings are made up of cells. This statement belongs to:
   (A) Lamarck (B) Von Helmont
   (C) Hugo de Vries (D) Schleiden and Schwann

10. Prokaryotic cell does not have:
    (A) Nucleolus (B) Membrane bound organelles
    (C) Centrioles (D) All of the above

11. Cristae are found in:
    (A) Surface of grana (B) Surface of plasma membrane
    (C) Wall of mitochondria (D) Nuclear membrane

12. Main function of lenticels is
    (A)Transpiration (B) Guttation (C) Gaseous exchange (D) Bleeding

13. The most abundant element present in the plant is
    (A) Nitrogen (B) Manganese (C) Iron (D) Carbon

14. Which cartilage is present on the end of long bones?
    (A) Calcified cartilage (B) Hyaline cartilage (C) Elastic cartilage (D) Fibrous cartilage

15. Which of the following substances, if introduced into the blood stream, would cause coagulation of blood atthe site of its introduction?
    (A) Thromboplastin (B) Fibrinogen (C) Heparin (D) Prothrombin

16. Which of the following plant has epigynous flower?
    (A) Cucumber (B) Brinjal (C) Mustard (D) Peach

Space for rough work

17. Which of the following is not a part of a leaf?
(A) Pedicel (B) Leaf base (C) Petiole (D) Lamina

18. Which of the following enzyme is responsible for the conversion of oxaloacetic acid into malic acid
(A) PEP oxidase (B) PEP reductase
(C) PEP dismutase (D) Malate dehydrogenase

19. Which of the following absorb light energy for photosynthesis?
(A) Chlorophyll (B) Water molecule (C) O_2 (D) RUBP

20. Plants adapted to low light intensity have
(A) Higher rate of fixation than the sun plants
(B) More extended root system
(C) Leaves modified to spines
(D) Larger photosynthetic unit size than the sun plants

21. Mark the correct sequence of steps for the development of root nodules in legumes
a. Formation of infection thread. b. Division of cortical and pericyclic cells.
c. Curling of root hairs. d. Leghaemoglobin synthesis.
(A) a, c, b, d (B) b, d, a, c (C) c, b, a, d (D) c, a, b, d

22. In which segment of the nephron, reabsorption is minimum?
(A) Proximal convoluted tubule (PCT) (B) Distal convoluted tubule (DCT)
(C) Ascending limb Loop of Henle (D) Descending limb of loop of Henle

23. All enzymes of TCA cycle are located in the mitochondrial matrix except one which is located in inner mitochondrial membranes in eukaryotes and in cytosol in prokaryotes. This enzyme is:
(A) Succinate dehydrogenase (B) Lactate dehydrogenase
(C)Isocitrate dehydrogenase (D) Malate dehydrogenase

24. In monoadelphous condition, stamens have
(A) Filaments of all united in one group but anthers are free
(B) Filaments united in groups but all anthers are free
(C) Anthers are fused but filaments are free
(D) Both anthers and filaments are fused

Space for rough work

25. Which of the metabolites is common to respiration mediated breakdown of fats, carbohydrates and proteins?
(A) Glucose – 6 – phosphate (B) Fructose 1, 6-bisposphate
(C) Pyruvic acid (D) Acetyl CoA

26. Which of the following prevents the fall of fruits?
(A) GA_3 (B) NAA (C) Ethylene (D)Zeatin

27. Cell elongation in internodal regions of the green plants takes place due to
(A)Cytokinins (B) Gibberellins (C) Ethylene (D) Indole acetic acid

28. Velamen is present in
(A) Parasitic roots (B) Assimilatory root (C) Epiphytic roots (D) Fusiform roots

29. Auxin does not increase the
(A) Rate of photosynthesis (B) Rate of respiration
(C) Uptake of water by cells (D) Plasticity of the cell wall

30. Which of the following stage is affected by colchicum
(A) Metaphase (B) Prophase (C) Interphase (D) Anaphase

31. Spindle apparatus is formed during which stage of mitosis
(A) Prophase (B) Metaphase (C) Anaphase (D) Telophase

32. In pachytene stage of meiosis the chromosomes appear
(A) Single stranded (B) Double stranded (C) Three stranded (D) Four stranded

33. Cytokinesis in plants takes place by the formation of
(A) Sphaeroblasts (B) Equatorial cell plate (C) Idioblasts (D) Cell budding

34. The significance of meiosis lies in
(A) Reduction of the diploid number of chromosomes to haploid
(B) Maintaining constancy in the number of diploid chromosomes during sexual reproduction
(C) Production of genetic variability in the population of a species
(D) All the above

Space for rough work

35. Which type of organisation is found in only living beings?
(A) Atomic (B) Molecular (C) Mixture (D) Sub-cellular

36. Growth, development and functioning of living body is due to:
(A) Order (B) Homeostasis (C) Metabolism (D) Adaptation

37. The main function of bile is to:
(A) emulsify fats for digestion (B) eliminate the waste products
(C) digest fat by enzymatic action (D) regulate the process of digestion

38. The basic unit of classification is:
(A) Genus (B) Species (C) Order (D) All of these

39. Match column-I with column-II and select the correct answer using the codes given below.

	Column-I		Column-II
A.	Growth	I.	Production of offspring
B.	Reproduction	II.	Composed of one or more cells
C.	Metabolism	III	Increase in mass and increase in size
D.	Cellular organization	IV	Sum total of all chemical reactions occurring in body

(A) A-I B-II C-III D-IV (B) A-III B-I C-II D-IV
(C) A-III B-I C-IV D-II (D) A-II B-IV C-III D-I

40. Couplet represents the choice made between two opposite options which results in:
(A) rejection of both the option.
(B) acceptance of both the option.
(C) either acceptance or rejection of both the option.
(D) acceptance of only one and rejection of the other.

41. Glycogen is stored in:
(A) Liver (B) Muscles (C) Epidermis (D) Liver and muscles

42. The leaves are modified into tendrils, hooks, pitcher and bladder in the following plants respectively:
(A) Sweet pea. Cat's nail. Nepenthes, Utricularia (B) Sweet pea. Cat's nail, Utricularia, Nepenthes
(C) Nepenthes, Sweet pea. Cat's nail, Utricularia (D) Utricularia, Nepenthes, Cat's nail, Sweet pea

Space for rough work

43. Regions of roots from base to root tip are:
    (A) Maturation zone - Cell division zone-Elongation zone
    (B) Maturation zone - Elongation zone - Cell division zone
    (C) Cell division zone - Elongation zone Maturation zone
    (D) Elongation zone - Cell division zone Maturation zone

44. Boron takes part in
    (A) Photosynthesis
    (B) Activation of enzymes involved in respiration
    (C) Transport of carbohydrates through phloem
    (D) Nitrogen metabolism

45. The stony hard part of the mango represents
    (A) Mesocarp (B) Epicarp (C) Endosperm (D) Endocarp

46. Where is protein digestion completed?
    (A) Stomach (B) Ileum (C) Rectum (D) Duodenum

47. An enzyme which is absent in the intestinal juice is:
    (A) Maltase (B) Nucleases (C) Nucleosidase (D) Lipase

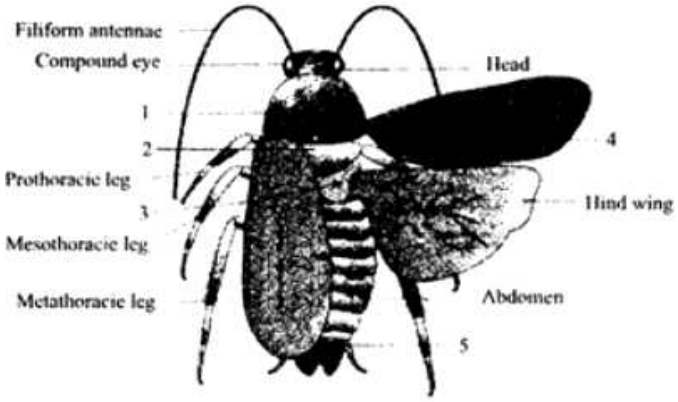
48. Which enzyme is present in infants but is absent in human adults?
    (A) Trypsinogen (B) Pepsin (C) Chymotrypsin (D) Rennin

49. Which of the following guards the opening of hepatopancreatic duct into duodenum?
    (A) Ileoceacal Valve (B) Pyloric Sphinter (C) Sphinter of Oddi (D) Semilunar Vlave

50. Striated or voluntary muscle fibres are found in:
    (A) Lungs (B) Leg muscles (C) Gall bladder (D) Blood vessels

Space for rough work

51. Identify the parts



(A) 1-Pronotum, 2-Mesothorax, 3-Metathora 4-Tegmina, 5-Pleura
(B) 1-Pronotum, 2-Mesothorax, 3-Metathorax 4-Tegmina, 5-Stema
(C) 1-Pronotum, 2-Mesothorax, 3-Metathorax, 4-Tegmina, 5-Anal cerci
(D) 1-Pronotum, 2-Mesothorax, 3-Metathorax, 4 - Tegmina, 5-Anal style

52. Sheath nuclei or Schwann cells and Nodes of Ranvier are found in:
(A) Neurons (B) Osteoblasts (C)Chondroblasts (D) Gland cells

53. The most abundant enzyme in the biosphere is
(A) Collagen (B) RuBisCO (C) Trypsin (D) Insulin

54. An example of protein with quaternary structure is
(A) Myoglobin (B) Haemoglobin (C) Keratin (D) All of these

55. The process of oxidation of glucose during which CO2, H2O and energy are produced is known as
(A) Breathing (B) Inspiration (C) Respiration (D) Expiration

56. _____ is the assemblage of families which exhibit a few similar characters.
(A) Class (B) Genus (C) Species (D) Order

Space for rough work

57. How many ATP are used in glycolysis or For complete phosphorylation of a glucose molecule, how many ATP molecules are required
(A) 4 (B) 2 (C) 6 (D) 8

58. Which of the following is the product of phosphorylationof Fructose – 6- phosphate?
(A) PGA (B) Fructose 1, 6 diphosphate
(C) DPGA (D) Pyruvic acid

59. Which of the following is a class?
(A) Mammalia (B) Sapindales (C) Primate (D) Poales

60. Bacteria were regarded to be plants because:
(A) some of them are green. (B) they are present everywhere.
(C) some of them cannot move. (D) they have a rigid cell wall.

61. Digestive process in human being is
(A)intracellular (B) extracellular (C) both of these (D) none of these

62. Which of the following features are not shown by scientific names of various organism?
(A) They consists of two components
(B) They have Latin origin
(C) They always have “linn” abbreviation at the end of second component
(D) They are printed in italics

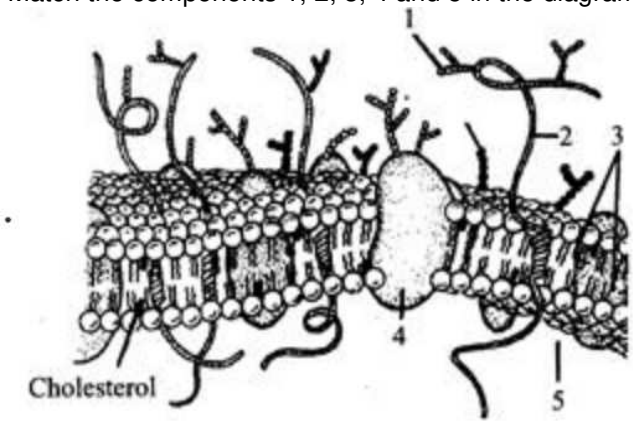
63. Thalamus is
(A) Base of flower (B) Base of ovary
(C) Modification of pollen (D) Modification of petal

64. Which structure of man is similar to spiracle of cockroach?
(A) Nostril (B) Bronchiole (C) Lungs (D)Alveoli

65. Which statement is false about the growth shown by non-living objects?
(A) The growth occurs from outside
(B) The growth is reversible
(C) The growth is due to the accumulation of material on the surface
(D) The growth is intrinsic

Space for rough work

66. Match the components 1, 2, 3, 4 and 5 in the diagram (cell membrane) below from the list (i) to (vii).



(i) Sugar
(ii) Protein
(iii) Lipid bilayer
(iv) Integral protein
(v) Cytoplasm
(vi) Cell wall
(vii) External protein

(A) 1 - (i), 2 - (ii), 3 - (iii), 4 - (iv), 5 - (v)
(B) 1 - (ii), 2 - (i), 3 - (iii), 4 - (iv), 5 - (v)
(C) 1 - (i), 2 - (ii), 3 - (iii), 4 - (iv), 5 - (vi)
(D) 1 - (i), 2 - (ii), 3 - (iii), 4 - (vii), 5 - (v)

67. Bony fishes are
(A) Marine
(B) Fresh water dwelling
(C) Estuary dweller
(D) Both (A) & (B)

68. Which of the following regarding protists, in general, is false?
(A) Protists are always parasitic.
(B) Protists are multi-celled.
(C) All protists are heterotrophic.
(D) All of the above

69. Which of the following facts differentiates the plant virus from other viruses?
(A) DNA is the genetic material
(B) Obligate parasites
(C) RNA is the genetic material
(D) Nucleo-protein nature

Space for rough work

70. Saliva contains the enzyme
(A)amylase (B) maltase (C)invertase (D) sucrose

71. Opening and closing of flowers represent a kind of
(A) Nastic movements (B) Tropic movements
(C) Nutation movements (D) Autonomic movements

72. One of the primary characters of chordates is
(A) Ganglionated nerve cord (B) Paired nerve cord
(C) Solid ventral nerve cord (D) Dorsal hollow nerve cord

73. 'Sap wood' is otherwise called
(A)Duramen (B)Alburnum (C) Pith (D) Medullary rays

74. Secondary growth is absent in
(A) Dicot stem (B) Gymnosperms (C) Monocot stem (D) Dicot root

75. CO_2 concentration in air has which relation with respiration
(A) Directly proportional (B) Inversely proportional
(C) Both [a] and [b] (D) No relation

76. The incomplete breakdown of sugars in anaerobic respiration results in the formation of
(A) Fructose and water (B) Glucose and CO_2
(C) Alcohol and CO_2 (D) Water andCO_2

77. Metameric segmentation is exhibited by which of the following animal?
(A) Adamsia (B) Euspongia (C) Ascaris (D) Pheretima

78. Digestion in coelenterates is
(A) Only intracellular (B) Only extracellular
(C) Both extracellular and intracellular (D) Not required

79. Gastric juice is composed of:
(A) Pepsin, Lipase and Rennin (B) Trypsin, Lipase and Rennin
(C) Trypsin, Pepsin and Lipase (D) Trypsin, Pepsin and Rennin

Space for rough work

80. Element involved in the opening and closing of stomata, stomatal regulation is
(A) Zinc (B) Magnesium (C) Potassium (D) Iron

81. The amount of air that moves in and out of the lungs, with each normal inspiration and expiration iscalled
(A) Residual volume (B) Vital capacity (C) Tidal volume (D) Tidal capacity

82. Number of Calvin cycles required to generate one molecule of Hexose is
(A) 2 (B) 4 (C) 6 (D) 8

83. Girth of stem increases due to activity of _____
(A) Apical Meristems (B) Intercalary meristems
(C) Lateral meristems (D) Parenchyma cells

84. A dikaryon is formed when
(A) Meiosis is arrested (B) Cytoplasm does not fuse
(C) The two haploid cells do not fuse completely (D) None of the above

85. Specialized cells for fixing atmospheric nitrogen in Nostoc are _____
(A) Hormogonia (B) Nodules (C) Akinetes (D) Heterocysts

86. Oxyntic cells secrete _____
(A) Trypin (B) Pepsinogen (C) HCl (D) NaOH

87. A staminode does not Possess_____
(A) Filament (B) Anther (C) Male gametes (D) Pollengrains

88. Who is regarded as father of Taxonomy?
(A) Engler (B) Hutchinson (C) Theopharatus (D) Linnaeus

89. Juxtaglomerular cells of kidney produce a peptide hormone
(A) Gastrin (B) Secretin (C) Estradiol (D) Erythropoietin

90. Micturition is
(A) Removal of faecal matter (B) Removal of NH3 (C) Removal of urea (D) Removal of urine

Space for rough work

Physics Section - II

Straight Objective Type

Physics contains 45 multiple choice questions numbered 1 to 45. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. A wire has a mass 0.3 ± 0.003 g, radius 0.5 ± 0.005 mm and length 6 ± 0.06 cm. The maximum percentage error in the measurement of density is:
   (A) 1 (B) 2 (C) 3 (D) 4

2. The physical quantity having the dimensions $\left[M^{-1}L^{-3}T^{3}A^{2}\right]$ is:
   (A) Resistance (B) Resistivity
   (C) Electrical conductivity (D) Electromotive force

3. If force (F), length (L), current (I) and time (T) are taken as bases then the dimensions of ε_0 are:
   (A) $\left[FL^{2}I^{2}T^{-2}\right]$ (B) $\left[F^{-1}L^{2}I^{2}T^{2}\right]$ (C) $\left[F^{-1}L^{-2}T^{2}I^{-2}\right]$ (D) $\left[F^{2}L^{2}T^{2}I^{2}\right]$

4. If the resultant of n forces of different magnitudes acting at a point is zero, then the minimum value of n is:
   (A) 1 (B) 2 (C) 3 (D) 4

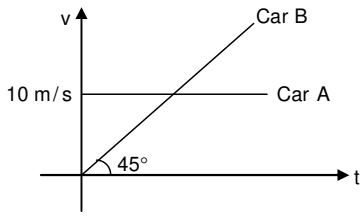
5. Which of the following are true?
   (i) A body having constant speed can have varying velocity
   (ii) Position time graph for two objects with zero relative velocity are parallel
   (iii) The numerical ratio of velocity to speed of an object can never be more than one.
   (A) (i) (B) (ii) and (iii) (C) All (D) None of these

6. A man running on a horizontal road $8\ ms^{-1}$ finds rain falling vertically, if the increases his speed to $12\ m/s^{-1}$; he finds that drops make 30° angle with the vertical. Find the velocity of rain with respect to the road:
   (A) $4\sqrt{7}\ ms^{-1}$ (B) $8\sqrt{2}\ ms^{-1}$ (C) $7\sqrt{3}\ ms^{-1}$ (D) $8\ ms^{-1}$

Space for rough work

7. A point initially at rest moves along x – axis. Its acceleration varies with time as $a = (6t + 5)\ m/s^2$. After start from origin, the distance covered in 2s is:
(A) 20 m (B) 18 m (C) 16 m (D) 25 m

8. Initially car A is 10.5 m ahead of car B. Both start moving at time t = 0 in the same direction along a straight line. The velocity time graph of two cars is shown in figure. The time shown in figure. The time when the car B will catch the car A, will be:

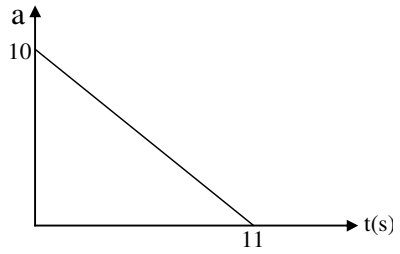


(A) t = 21 sec (B) $t = 2\sqrt{5}$ sec
(C) t = 20 sec (D) None of these

9. If $\vec{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{B} = -\hat{i} + 3\hat{j} + 4\hat{k}$ then projection of $\vec{A}$ on $\vec{B}$ will be:
(A) $\frac{3}{\sqrt{13}}$ (B) $\frac{3}{\sqrt{26}}$ (C) $\sqrt{\frac{3}{26}}$ (D) $\sqrt{\frac{3}{13}}$

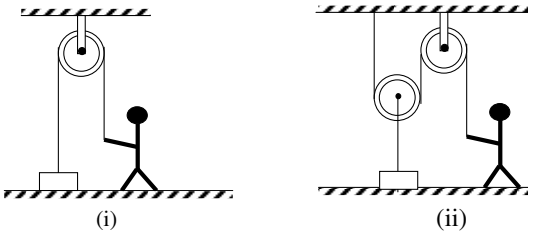
10. The maximum height attained by a projectile when thrown at an angle θ with the horizontal is found to be half the horizontal range. Then θ is:
(A) $\tan^{-1}(2)$ (B) $\pi/6$ (C) $\pi/4$ (D) $\tan^{-1}(1/2)$

11. A particle starts from rest. Its acceleration (a) versus time (t) is as shown in the figure. The maximum speed of the particle will be:
(A) 110 m/s (B) 55 m/s
(C) 550 m/s (D) 660 m/s

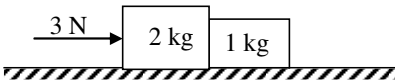


Space for rough work

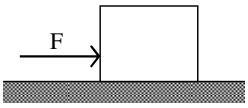
12. In the figure shown, a person wants to raise a block lying on the ground to a height h. In both the cases, if time required is same then in which case he has to exert more force. Assume pulleys and strings are light:
(A) (i) (B) (ii)
(C) Same in both (D) Cannot be determined



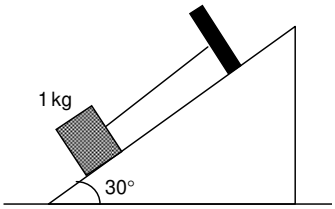
13. Two blocks of 2 kg and 1 kg are in contact on a frictionless table. If a force of 3 N applied on 2 kg block, then the force of contact between the two blocks will be:
(A) 0 N (B) 1 N
(C) 2 N (D) 3 N



14. A body of mass 2 kg is placed on rough horizontal plane. The coefficient of friction between body and plane is 0.2. Then:
(A) Body will move in forward direction if F = 5 N
(B) Body will move in backward direction with acceleration $0.5\,m/s^2$ If force F = 3 N
(C) If F = 3 N, then body will be in rest condition
(D) Both A and C are correct



15. The coefficient of friction between two surface is $\mu = 0.8$. The tension in the string shown in the figure is:
(A) 10 N (B) 6 N
(C) 4 N (D) zero



16. A car moving with a speed of 40 km/hr can be stopped by applying brakes after at least 2 m. If the same car is moving with a speed of 80 km/hr, what is minimum stopping distance?
(A) 2 m (B) 4 m (C) 6 m (D) 8 m

Space for rough work

17. *n* small balls each of mass *m* impinge elastically each second on a surface with velocity *u*. The force experienced by the surface will be

(A) *mnu* (B) 2 *mnu* (C) 4 *mnu* (D) $\frac{1}{2}mnu$

18. A particle moves from position $\vec{r}_1 = 3\hat{i} + 2\hat{j} - 6\hat{k}$ to position $\vec{r}_2 = 14\hat{i} + 13\hat{j} + 9\hat{k}$ under the action of force $4\hat{i} + \hat{j} + 3\hat{k}$ N. The work done will be

(A) 100 *J* (B) 50 *J* (C) 200*J* (D) 75 *J*

19. A particle of mass *m* moving with horizontal speed 2 *m*/*sec*. If *m*<<*M* then for one dimensional elastic collision, the speed of lighter particle after collision will be

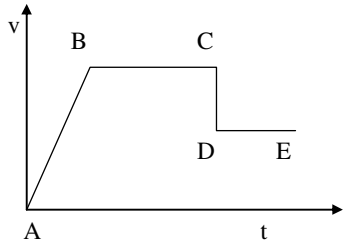
(A) 2 *m*/*sec* in original direction
(B) 2 *m*/*sec* opposite to the original direction
(C) 4 *m*/*sec* opposite to the original direction
(D) 4 *m*/*sec* in original direction

20. The work done on a body does not depend upon

(A) Force applied
(B) Displacement
(C) Initial velocity of the body
(D) Angle at which force is inclined to the displacement.

21. The adjoining diagram shows the velocity versus time plot for, a particle. The work done by the force on the particle is positive from

(A) A to B
(B) B to C
(C) C to D
(D) D to E



22. A body of mass *m* moving with velocity *v* makes a head-on collision with another body of mass 2*m* which is initially at rest. The loss of kinetic energy of the colliding body (mass *m*) is

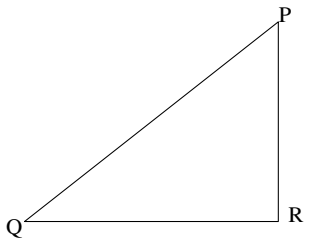
(A) $\frac{1}{2}$ of its initial kinetic energy
(B) $\frac{1}{9}$ of its initial kinetic energy
(C) $\frac{8}{9}$ of its initial kinetic energy
(D) $\frac{1}{4}$ of its initial kinetic energy

Space for rough work

23. A ball of mass *m* moving with velocity *V*, makes a head on elastic collision with a ball of the same mass moving with velocity 2*V* towards it. Taking direction of *V* as positive velocities of the two balls after collision are
(A) – *V* and 2*V* (B) 2*V* and – *V* (C) *V* and – 2*V* (D) – 2*V* and *V*

24. If the amount of work done by a force depends only on the initial and final, positions of the object which has been moved, then such a force is called
(A) Gravitational (B) Dissipative (C) Conservative (D) Retarding

25. For the path *PQR* in a conservative force field. The amounts work done in carrying a body from *P* to *Q* and from *Q* to *R* are 5 *Joule* and 2 *Joule* respectively. The work done in carrying the body from *P* to *R* will be
(A) 7 J (B) 3 J
(C) $\sqrt{21}$ J (D) Zero



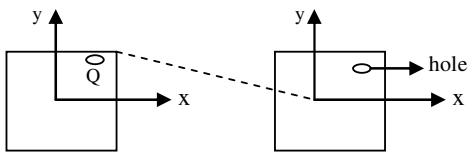
26. A big ball of mass *M*, moving with velocity *u* strikes a small ball of mass *m*, which is at rest. Finally small ball attains velocity *u* and big ball *v*. Then what is the value of *v*
(A) $\frac{M-m}{M}u$ (B) $\frac{m}{M+m}u$ (C) $\frac{2m}{M+m}u$ (D) $\frac{M}{M+m}u$

27. If a person standing on a rotating disc stretches out his hands, the angular speed will
(A) Increase (B) Decrease (C) Remain same (D) None of these

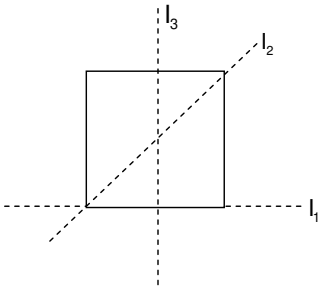
28. The angular momentum of a system of particle is conserved
(A) When no external force acts upon the system (B) When no external torque acts upon the system
(C) When no external impulse acts upon the system (D) When axis of rotation remains same

Space for rough work

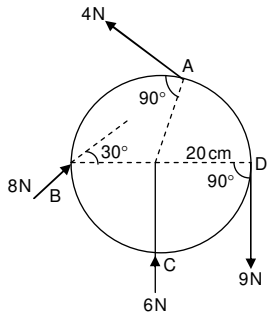
29. A uniform square plate has a small piece Q of an irregular shape removed and glued to the centre of the plate leaving a hole behind in figure. The moment of inertia about the Z – axis is then,
(A) Increased
(B) Decreased
(C) The same
(D) Changed in unpredicted manner



30. A square lamina is as shown in figure. The moment of inertia of the frame about the three axes as shown in figure are I_1, I_2 and I_3 respectively. Select the correct alternative.
(A) $I_1 = I_3 > I_1$ (B) $I_1 > I_2 > I_3$
(C) $I_2 = I_3 > I_1$ (D) $I_1 < I_2 > I_3$



31. Forces are applied on a wheel of radius 20 cm as shown in the figure. The torque produced by the forces 4 N at A, 8 N at B, 6 N are C and 9 N at D at angles indicated is
(A) 5.4 N – m anti – clockwise
(B) 1.80 N – m clockwise
(C) 2.0 N – m clockwise
(D) 3.6 N – m clockwise



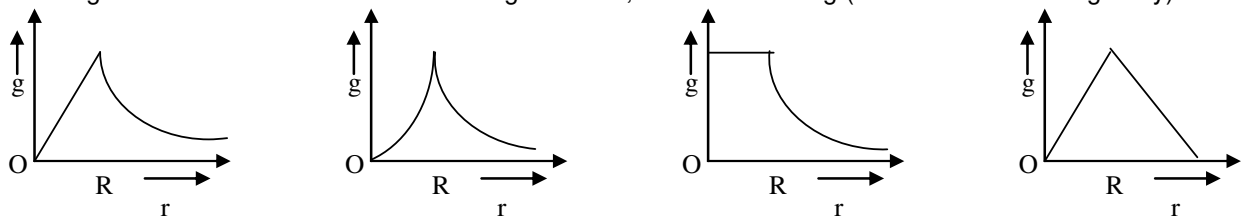
32. The Earth revolves around the sun in 1 year. If the distance between them becomes double, the new time period of revolution of Earth is
(A) $4\sqrt{2}$ year (B) $2\sqrt{2}$ year (C) 4 year (D) 8 year

Space for rough work

33. A swimmer can swim in still water at a rate 4 km/h. If he swims in a river flowing at 3 km/h and keeps his direction (with respect to water) perpendicular to the current. Find his velocity with respect to the ground

(A) $\tan^{-1}\left(\frac{3}{4}\right)$ (B) $\tan^{-1}\left(\frac{4}{5}\right)$ (C) $\tan^{-1}\left(\frac{4}{\sqrt{3}}\right)$ (D) $\tan^{-1}\left(\frac{3}{2}\right)$

34. Starting from the centre of the Earth having radius R, the variation of g (acceleration due to gravity) is shown by



(A) (B) (C) (D)

35. A water fountain on the ground sprinkles water all around it. If the speed of water coming out of the fountain is v, the total area around the fountain that gets wet is

(A) $\pi\frac{v^4}{g^2}$ (B) $\frac{\pi}{2}\frac{v^4}{g^2}$ (C) $\pi\frac{v^4}{g^2}$ (D) $\pi\frac{v^4}{g}$

36. The ratio of the radii of planets P_1 and P_2 is X. The ratio of acceleration due to gravity on them is Y. The ratio of escape velocities from them is

(A) XY (B) $\sqrt{\frac{X^2}{Y}}$ (C) $\sqrt{XY}$ (D) $\sqrt{XY^2}$

37. If a wire is stretched to double its length, its Young's modulus of elasticity will be:
(A) doubled (B) halved (C) unchanged (D) four times

38. The length of a metallic wire is L, its radius is r and one end is fixed. On stretching it with a force F on the other end, an increment in length l is brought about. The length of a second wire of same material is 2L, radius 2r and force applied is 2F. The increment in length will be :
(A)l (B) 2/l (C) l/2 (D) 4l

Space for rough work

39. A point mass oscillates along the x-axis according to the law $x = x_0 \cos(\omega t - \pi/4)$. If the acceleration of the particle is written as $a = A\cos(\omega t + \delta)$, then

(A) $A = x_0;\ \delta = -\pi/4$ (B) $A = x_0\omega^2;\ \delta = \pi/4$

(C) $A = -x_0\omega^2;\ \delta = -\pi/4$ (D) $A = x_0\omega^2;\ \delta = 3\pi/4$

40. If there were no gravity, which of the following will not be there for a fluid?

(A) Viscosity (B) Surface tension

(C) Pressure (D) Archemedes' upward thrust

41. A body of density D_1 and mass M is moving downward in glycerine of density D_2 with constant speed. What is the viscous force acting on it?

(A) MgD_1 (B) MgD_2 (C) $Mg\left(1-\frac{D_2}{D_1}\right)$ (D) $Mg\left(1-\frac{D_1}{D_2}\right)$

42. Radius of one arm of hydraulic lift is four times of radius of other arm. What force should be applied on narrow arm to lift 100 kg?

(A) 26.5 N (B) 62.5 N (C) 6.25 N (D) 8.3 N

43. Bernoulli's equation is an example of conservation of

(A) energy (B) momentum (C) angular momentum (D) mass

44. The time period of a particle in simple harmonic motion is 8 seconds. At t = 0, it is at the mean position. The ratio of the distance travelled by it in the first and second seconds is

(A) 1/2 (B) $1/\sqrt{2}$ (C) $1/\left(\sqrt{2}-1\right)$ (D) $1/\sqrt{3}$

45. If the displacement (x) and velocity v of a particle executing simple harmonic motion are related through the expression $4v^2 = 25 - x^2$ then its time period is

(A) π (B) 2π (C) 4π (D) 6π

Space for rough work

Chemistry Section - III

Straight Objective Type

Chemistry contains 45 multiple choice questions numbered 1 to 45. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. The number of atoms in 52 g of He is
   (A) 78.299×10^{24} atoms (B) 7.820×10^{-24} atoms
   (C) 7.829×10^{24} atoms (D) 78.234×120^{25} atoms

2. The amount of $BaSO_4$ precipitated on mixing $BaCl_2$ (0.5 M) with H_2SO_4 (1 M) will correspond to
   (A) 0.5 mol (B) 1.0 mol (C) 1.5 mol (D) 2.0 mol

3. How many significant figures are present in 0.0000135?
   (A) 7 (B) 8 (C) 4 (D) 3

4. $K_2Cr_2O_7$ in acidic medium converts into
   (A) Cr^{2+} (B) Cr^{3+} (C) Cr^{4+} (D) Cr^{5+}

5. What is the oxidation number of Br in $KBrO_4$?
   (A) + 6 (B) + 7 (C) + 5 (D) + 8

6. Ionisation potential of hydrogen atom is 13.6 eV. Hydrogen atom in ground state is excited by monochromatic light of energy 12.1 eV. The spectral lines emitted by hydrogen according to Bohr's theory will be
   (A) one (B) two (C) three (D) four.

7. Calculate the velocity of an electron placed in the second orbit of Li^{2+} ion.
   (A) 0.521 m s^{-1} (B) 3.27×10^6 cm s^{-1} (C) 4.23×10^3 m s^{-1} (D) 3.27×10^6 m s^{-1}

8. What is the maximum wavelength of line of Balmer series of hydrogen spectrum? ($R = 1.09 \times 10^7$ m^{-1})
   (A) 400 nm (B) 660 nm (C) 486 nm (D) 434 nm

Space for rough work

9. Wavelength of a particular transition for H atom is 400 nm. What can be the wavelength of He^+ for the same transition?
(A) 400 nm (B) 100 nm (C) 1600 nm (D) 200 nm

10. The elements with atomic numbers 9, 17, 35, 53 and 85 belong to
(A) alkali metals (B) alkaline earth metals
(C) halogens (D) noble gases

11. Element X forms a chloride with the formula XCl_2, which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as –
(A) Na (B) Mg (C) Al (D) Si

12. Arrange F, Cl, O, N in the decreasing order of electronegativity –
(A) O > F > N > Cl (B) F > N > Cl > O (C) Cl > F > N > O (D) F > O > N > Cl

13. Which of the following elements is a lanthanide (Rare–earth element)?
(A) Cadmium (B) Californium (C) Cerium (D) Cesium

14. Which of the following element has maximum, first ionisation potential –
(A) V (B) Ti (C) Cr (D) Mn

15. The compressibility of a gas is less than unity at STP. Therefore,
(A) Vm > 22.4L (B) Vm < 22.4L (C) Vm = 22.4L (D) Vm = 44.8L

16. If a mixture of CO and N_2 in equal amounts have total 1 atm. pressure, find out partial pressure of N_2 in the mixture.
(A) 1 atm (B) 0.50 atm (C) 2 atm (D) 3 atm

17. In which phenomena, water changes into water vapour below its B.P.?
(A) Evaporation (B) Condensation
(C) Boiling (D) No such phenomena exist

Space for rough work

18. The liquid which has the highest rate of evaporation is
(A) petrol (B) nail-polish remover (C) water (D) alcohol

19. Which of the following statements best explains why a closed balloon filled with helium gas rises in air?
(A) Helium is an monatomic gas, whereas nearly all the molecules that make up air, such as nitrogen and oxygen, are diatomic.
(B) The average speed of helium atoms is higher than the average speeds of air molecules, and the higher speed of collisions with the balloon walls propels the balloon upward.
(C) Because the helium atoms are of lower mass than the average air molecules, the helium gas is less dense than air. The balloon thus weighs less than the air displaced by its volume.
(D) Because helium has a lower molar mass than the average air molecule, the helium atoms are in faster motion. This means that the temperature of the helium is higher than the air temperature. Hot gases tend to rise.

20. The standard entropies of $CO_2(g)$, C(s) and O_2 (g) are 213.5, 5.740 and 205 JK^{-1} respectively. The standard entropy of formation of CO_2 (g) is
(A) 1.86 JK^{-1} (B) 1.96 JK^{-1} (C) 2.81 JK^{-1} (D) 2.76 JK^{-1}

21. If the internal energy of an ideal gas decreases by the same amount as the work done by the system, the process is
(A) Cyclic (B) Isothermal (C) Adiabatic (D) Isolated

22. An isolated system is that system in which
(A) There is no exchange of energy with the surroundings
(B) There is exchange of mass and energy with the surroundings
(C) There is no exchange of mass or energy with the surroundings
(D) There is exchange of mass with the surroundings

23. Enthalpy of combustion of carbon to CO_2 is – 393.5 kJ mol^{-1}. Calculate the heat released upon formation of 35.2 g of CO_2 from carbon and dioxygen gas
(A) -397 kJ (B) -315 kJ (C) +207 kJ (D) -105 kJ

24. The equilibrium constant for a reaction is 10. What will be the value of ΔG°?
(R = 8.314 JK^{-1} mol^{-1}, T = 300 K)
(A) – 1.24 kJ/mol (B) – 5.744 kJ/mol (C) +1.27 kJ/mol (D) – 1.27 kJ/mol

Space for rough work

25. When sodium acetate is added to an aqueous solution of acetic acid
(A) The pH of the solution decreases (B) The pH of the solution increases
(C) The pH of the solution remains unchanged (D) An acid salt is produced

26. K_{sp} of SrF_2(s) in water is 3.12×10^{-14}. The solubility of SrF_2(s) in 0.1 (M) NaCl solution is
(A) $3.2\times10^{-9}\,(M)$ (B) $2\times10^{-5}\,(M)$
(C) $4\times10^{-4}\,(M)$ (D) Slightly higher than $2\times10^{-5}\,(M)$

27. Cationic hydrolysis gives the following solution:
(A) acidic (B) basic (C) neutral (D) amphoteric

28. If the density of a gas A is 1.5 times that of B then the molecular mass of A is M. The molecular mass of B will be
(A) 1.5 M (B) $\frac{M}{1.5}$ (C) 3M (D) $\frac{M}{3}$

29. Which of the following is not a general characteristic of equilibria involving physical processes?
(A) Equilibrium is possible only in a closed system at a given temperature.
(B) All measurable properties of the system remain constant.
(C) All the physical processes stop at equilibrium.
(D) The opposing processes occur at the same rate and there is dynamic but stable condition.

30. According to Le-chatelier's principle, adding heat to a solid to liquid equilibrium will cause the
(A) Temperature to increase (B) Temperature to decrease
(C) Amount of liquid to decrease (D) Amount of solid to decrease

31. The dissociation constants of two acids HA_1 and HA_2 are 3.0×10^{-4} and 1.8×10^{-5} respectively. The relative strengths of the acids will be approximately
(A) 1 :4 (B) 4 : 1 (C) 1 : 16 (D) 16 : 1

32. Which one of the following molecules has a co-ordinate bond?
(A) NH_4Cl (B) $AlCl_3$ (C) NaCl (D) Cl_2

Space for rough work

33. Which of the following molecule does not have a linear structure?
(A) CO_2 (B) $SnCl_2$ (C) $HgCl_2$ (D) Hg_2Cl_2

34. How many sigma and pi bonds are present in a compound with carbon skeleton $C - C \equiv C - C = C$
(A) 10 sigma, 3 pi (B) 4 sigma, 2 pi (C) 7sigma, 3 pi (D) 6 sigma, 7 pi

35. Which one of the following is not Lewis acid?
(A) $AlCl_3 .6H_2O$ (B) $AlCl_3$ (C) $SnCl_4$ (D) $FeCl_3$

36. Bond order in benzene is:
(A) 1 (B) 2 (C) 1.5 (D) none of these

37. Equivalent weight of crystalline oxalic acid is
(A) 90 (B) 53 (C) 63 (D) 45

38. The total number of atoms represented by the compound $CuSO_4 .5H_2O$ is
(A) 27 (B) 21 (C) 5 (D) 8

39. Which of the following statement is not correct about the characteristics of cathode rays?
(A) They start from the cathode and move towards the anode.
(B) They travel in straight line in the absence of an external electrical or magnetic field.
(C) Characteristics of cathode rays do not depend upon the material of electrodes in cathode ray tube.
(D) Characteristics of cathode rays depend upon the nature of gas present in the cathode ray tube.

Space for rough work

40. 1. Cl, Br, I, if this is Dobereiner's triad and the atomic masses of Cl and I are 35.5 and 127 respectively the atomic mass of Br is –
(A) 162.5 (B) 91.5 (C) 81.25 (D) 45.625

41. Resonance structures can be written for
(A) O_3 (B) NH_3 (C) CH_4 (D) H_2O

42. Hydrogen chloride molecule contains
(A) Polar covalent bond (B) Double bond (C) Co-ordinate bond (D) Electrovalent bond

43. BF_3 and NF_3 both are covalent compounds but NF_3 is polar whereas BF_3 is non-polar. This is because:
(A) Nitrogen atom is smaller than boron atom
(B) N – F bond is more polar than B – F bond
(C) NF_3 is pyramidal whereas BF_3 is planar triangular
(D) BF_3 is electron deficient whereas NF_3 is not

44. Melting point of calcium halides decreases in the order:
(A) $CaF_2 > CaCl_2 > CaBr_2 > CaI_2$ (B) $CaI_2 > CaBr_2 > CaCl_2 > CaF_2$
(C) $CaBr_2 > CaI_2 > CaF_2 > CaCl_2$ (D) $CaCl_2 > CaBr_2 > CaI_2 > CaF_2$

45. The maximum number of 90° angles between bp-bp of electrons is observed in
(A) sp^3d hybridisation (B) dsp^3 hybridisation (C) dsp^2 hybridisation (D) sp^3d^2 hybridisation

Space for rough work

ANSWERKEY

Section - I

Biology

1.B	2.B	3.C	4.C	5.D
6.B	7.A	8.B	9.D	10.D
11.C	12.A	13.A	14.B	15.A
16.A	17.A	18.D	19.A	20.D
21.D	22.C	23.A	24.A	25.D
26.B	27.B	28.C	29.A	30.A
31.B	32.D	33.B	34.D	35.D
36.C	37.A	38.B	39.C	40.D
41.D	42.A	43.B	44.C	45.D
46.B	47.B	48.D	49.C	50.B
51.C	52.A	53.B	54.B	55.C
56.D	57.B	58.B	59.A	60.D
61.B	62.C	63.A	64.A	65.D
66.A	67.D	68.D	69.C	70.A
71.A	72.D	73.B	74.C	75.B
76.C	77.D	78.C	79.A	80.C
81.C	82.C	83.C	84.C	85.D
86.C	87.D	88.D	89.D	90.D

Section - II

Physics

1.D	2.C	3.C	4.C	5.C
6.A	7.B	8.A	9.B	10.A
11.B	12.A	13.B	14.D	15.D
16.D	17.B	18.A	19.A	20.C
21.A	22.C	23.D	24.C	25.A
26.A	27.B	28.B	29.B	30.C
31.B	32.B	33.C	34.A	35.C
36.C	37.C	38.A	39.C	40.D
41.C	42.B	43.A	44.C	45.B

Section – III

Chemistry

1.C	2.A	3.D	4.B	5.B
6.C	7.D	8.B	9. B	10.C
11.B	12.D	13.C	14.D	15.B
16.B	17.A	18.A	19.C	20 D
21.C	22.C	23.B	24.B	25.B
26.D	27.A	28.B	29.C	30.D
31.B	32.A	33.B	34.A	35.A
36.C	37.C	38.B	39.D	40.C
41.A	42.A	43.C	44.A	45.D