iQuest
An Initiative by IITians

iSMART
iQuest Scholastic & Mental Aptitude Reward Test

FOR MOVING TO CLASS 12TH (EXCEL)
SAMPLE TEST (MED.)

Time: 1 Hr		Max Marks : 240

SYLLABUS & SCHEME

| SUBJECTS	Qs.	SYLLABUS
PHYSICS	15	Units & Dimensions, Kinematics, NLM, WPE, Circular Motion, Collision, COM, Rotation
CHEMISTRY	15	Atomic Structure, Mole Concept, Gaseous State, Periodic Classification, Chemical Bonding, Thermodynamics, Chemical Equilibrium, Ionic Equilibrium, Redox Reactions
BOTANY	15	Morphology, Anatomy, Classification, Plantae
ZOOLOGY	15	Animal Kingdom, Biomolecules, Animal Morphology, Animal Tissue, Digestion and Absorption, Breathing and Exchange of gases

INSTRUCTIONS TO CANDIDATE

➢ Each subject in this paper consists of multiple choice questions with only one correct answer. **+4 marks** will be awarded for correct answer and **–1 mark** for wrong answer.

➢ Please read the instructions given for each question carefully and fill the correct answer against the question numbers on the answer sheet in the respective subject.

➢ Use blue or black ball point pen to darken the appropriate circle & mark should completely fill the circle.

➢ The Question paper contains blank spaces for your rough work. No additional sheet will be provided for rough work.

➢ Blank papers, Clipboards, Log Tables, Slide rule, Calculators, Cellular phones, Pagers and Electronic gadgets in any form are not allowed.

➢ Write your Name, Student ID in the block at the top of the Answer Sheet. Also write your Name & Student ID in the space provided on this cover page of question paper.

➢ **This is a Sample Test Paper Actual Paper Pattern may vary.**

Name:_____Student ID_____

1. A particle is thrown vertically upwards from the surface of the earth. Let T_P be the time taken by the particle to travel from a point P above the earth to its highest point and back to the point P. Similarly, let T_Q be the time taken by the particle to travel from another point Q above the earth to its highest point and back to the same point Q. If the distance between the points P and Q is H, the expression for acceleration due to gravity in terms of T_P, T_Q and H, is :-
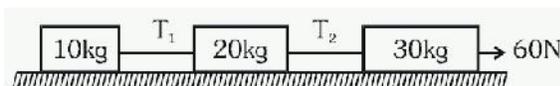
(A) $\dfrac{6H}{T_P^2 + T_Q^2}$

(B) $\dfrac{8H}{T_P^2 - T_Q^2}$

(C) $\dfrac{2H}{T_P^2 + T_Q^2}$

(D) $\dfrac{H}{T_P^2 - T_Q^2}$

2. An aeroplane is travelling horizontally at a height of 2000 m from the ground. The aeroplane, when at a point P, drops a bomb to hit a stationary target Q on the ground. In order that the bomb hits the target, What angle θ must the line PQ make with the vertical ? $[g = 10 \text{ ms}^{-2}]$
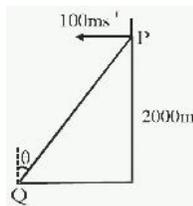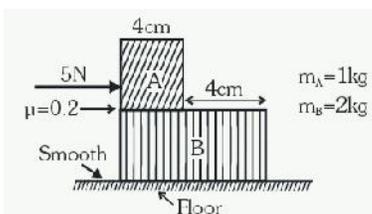

(A) 15°

(B) 30°

(C) 90°

(D) 45°

3. For the following system

(A) Acceleration of the system = 2m/s^2

(B) $T_1 = 20$ N

(C) $T_2 = 10$N

(D) $T_2 > T_1$

4. For shown situation in figure (Assume : $g = 10 \text{ ms}^{-2}$)

(A) The acceleration of the block A is 1m/s^2

(B) The acceleration of the block B is 3m/s^2

(C) The time taken for the front face of A lining up with the front face of B is 0.25 sec

(D) The time taken for the front face of A lining up with the front face of B is 0.50 sec

5. Two equal masses are placed as shown in the figure. Friction at the pulley is negligible. If coefficient of sliding friction of the mass on the horizontal surface is 0.2 and if the hanging mass is just released from position of rest, the acceleration of the system, is (take $g = 9.8 \text{ m/s}^2$) :-
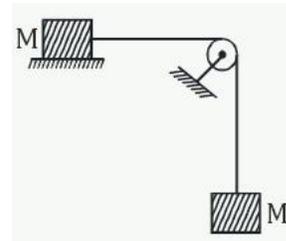
(A) 1 m/s²

(B) 2 m/s²

(C) 3.92 m/s²

(D) 4 m/s²

6. A block of mass 5kg is placed on horizontal surface, and a pushing force 20N is acting on block as shown in fig. If coefficient of friction between block and surface is 0.2 then frictional force and speed of block after 15 sec, are respectively :-

(Given $g = 10 \text{ m/s}^2$)
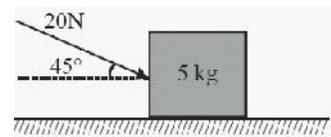
(A) $(5 + 2\sqrt{2})\text{N}, 3.25\,\text{ms}^{-1}$

(B) $(10 + 2\sqrt{2})\text{N}, 3.25\,\text{ms}^{-1}$

(C) $(5 + 2\sqrt{2})\text{N}, 3.94\,\text{ms}^{-1}$

(D) $(10 + 2\sqrt{2})\text{N}, 3.94\,\text{ms}^{-1}$

7. A particle of mass 'M' falls from height 'h' and gets stick after collision, with identical particle lying on sand. After sticking, both particles moves a distance d in sand, then the work done against retarding force of sand is :-

(A) $\dfrac{Mgh}{2} + 2Mgd$

(B) $\dfrac{Mgh}{2} + Mgd$

(C) $\dfrac{Mgh}{2} - 2Mgd$

(D) $\dfrac{Mgh}{2} - Mgd$

8. A body is dropped from height 8m. After striking the surface it rises to 6m, the fractional loss in kinetic energy during impact, is (Assuming the frictional resistance to be negligible)

(A) $\dfrac{1}{2}$ (B) $\dfrac{1}{4}$

(C) $\dfrac{1}{5}$ (D) $\dfrac{1}{7}$

9. A body of mass 0.8 kg has initial velocity $(3\hat{i} - 4\hat{j})$ m/sec. and final velocity $(-6\hat{j} + 2\hat{k})$ m/sec, the change in kinetic energy of the body is :

(A) 2 J (B) 3 J

(C) 4 J (D) 6 J

10. A chain of mass m and length L is held on a frictionless table in such a way that its $\dfrac{1}{n}$th part is hanging below the edge of table. The work done to pull the hanging part of chain is :-

(A) $\dfrac{mgL^2}{2n^2}$ (B) zero

(C) $\dfrac{mgL}{2n}$ (D) $\dfrac{mgL}{2n^2}$

11. The angle between angular momentum and linear momentum for a particle in motion is :-

(A) 0° (B) 90°

(C) 45° (D) 180°

12. Two identical rods each of mass M and length L are kept according to figure. The moment of inertia of rods about an axis passing through O and perpendicular to the plane of rods, is :-
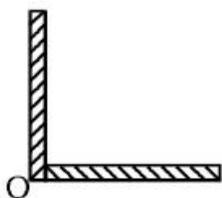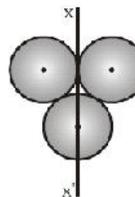

(A) $\dfrac{1}{3}ML^2$ (B) $\dfrac{2}{3}ML^2$

(C) $2ML^2$ (D) $\dfrac{1}{2}ML^2$

13. A flywheel rotates with a uniform angular acceleration. Its angular velocity increases from 20π rad/s to 40π rad/s in 10 seconds. The number of rotations, it made in this period are :
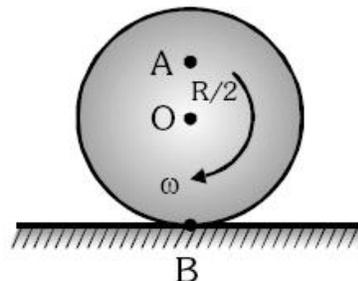
(A) 100 (B) 150

(C) 200 (D) 250

14. Three identical rings of mass 'M' and radius 'R' are placed shown in figure. The moment of inertia about axis xx' is :


(A) $\dfrac{5}{2}MR^2$ (B) $\dfrac{7}{2}MR^2$

(C) $\dfrac{3}{2}MR^2$ (D) $\dfrac{9}{2}MR^2$

15. A disc is rotating with angular velocity (ω) about its axis (without any translation push) on a smooth surface : The directions and magnitudes of velocity at points B and A are :

(A) $V_A = +\dfrac{\omega R}{2}$ (Towards right), $V_B = -\omega R$ (Towards left)

(B) $V_A = -\omega R$ (Towards right), $V_B = \dfrac{\omega R}{2}$ (Towards left)

(C) $V_A = +\dfrac{\omega R}{4}$ (Towards right), $V_B = -\omega R$ (Towards left)

(D) $V_A = +\dfrac{\omega R}{2}$ (Towards right), $V_B = \dfrac{\omega R}{2}$ (Towards left)

16. For the redox reaction,

$$MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + CO_2 + H_2O$$
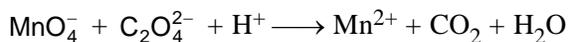
The correct coefficients of the reactants for the balanced reaction are -

MnO_4^- $C_2O_4^{2-}$ H^+

(A) 2 5 16   (B) 16 5 2
(C) 5 16 2   (D) 2 16 5

17. The oxidation state of S in $Na_2S_4O_6$ is -
(A) +2   (B) +4
(C) +6   (D) +2.5

18. The empirical formula of a compound is CH. Its molecular weight is 78. The molecular formula of the compound will be :
(A) C_2H_2 (B) C_3H_3
(C) C_4H_4 (D) C_6H_6

19. One mole of a non-ideal gas undergoes a change of state (2.0 atm, 3.0L, 95K) $\rightarrow$ (4.0 atm, 5.0L, 245 K) with a change in internal energy, $\Delta U = 30.0$ L -atm. The change in enthalpy (ΔH) of the process in L-atm is:
(A) 40.0   (B) 42.3
(C) 44.0
(D) Not defined, because pressure is not constant

20. Standard molar heats of formation of ethane (C_2H_6), $CO_2(g)$ and $H_2O(l)$ are –21.1, –94.1 and –68.3 kcal respectively. The standard enthalpy of combustion of ethane is
(A) 372 kcal   (B) –472 kcal
(C) –372 kcal   (D) –68.3 kcal

21. At infinite dilution, the percentage ionisation for both strong and weak electrolytes is
(A) 1%   (B) 20%
(C) 50%   (D) 100%

22. Which of the following pairs do not form peroxide
(A) Na,K   (B) Li, Mg
(C) Ca,Sr   (D) Ca, Ba

23. Covalent compounds are generally ...... in water
(A) Soluble   (B) Insoluble
(C) Dissociated   (D) Hydrolysed

**24.** $\dfrac{K_p}{K_c}$ for the given reaction will be

$$2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g) \text{ is}$$
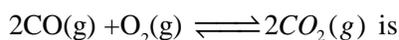
(A) RT   (B) $\dfrac{1}{RT}$
(C) $\dfrac{1}{\sqrt{RT}}$ (D) $\sqrt{RT}$

25. When equal volumes of pH = 4 and pH = 6 are mixed together then the pH of the resulting solution will be [Take log 5 = 0.7]
(A) 5.75   (B) 4.3
(C) 5   (D) 5.3

26. If the k_{sp} for AgCl is 1.8×10^{-10}, what would be its molar solubility in 1M $AgNO_3$
(A) 1.8×10^{-10} (B) 1.8×10^{-9}
(C) 3.2×10^{-20} (D) 1.34×10^{-10}

27. For the given equilibrium

$$Ag^+ + 2NH_3 \rightleftharpoons Ag(NH_3)_2^+ \qquad k_1 = 1.8 \times 10^7$$

$$Ag^+ + Cl^- \rightleftharpoons AgCl \qquad k_2 = 5.6 \times 10^9$$

Than, what would be the equilibrium constant for process given below

$$AgCl + 2NH_3 \rightleftharpoons [Ag(NH_3)_2]^+ + Cl^-$$
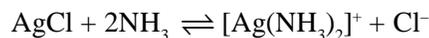
(A) 10^{-17} (B) 3.1×10^{-22}
(C) 3.2×10^{-3} (D) 10^{17}

28. If the radius of first orbit of H is r, then the radius of first Bohr's orbit of Li^{2+} will be -
(A) 3 r   (B) 27 r
(C) $\dfrac{r}{27}$ (D) $\dfrac{r}{3}$

29. For the non-zero volume of molecules having no forces of attraction, the variaion of compressibility factor $Z = \dfrac{PV}{RT}$ with pressure is given by the graph
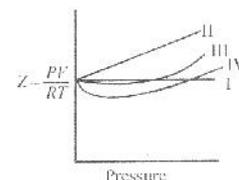
(A) I
(B) II
(C) III
(D) IV

30. An exothermic reaction is represented by the graph
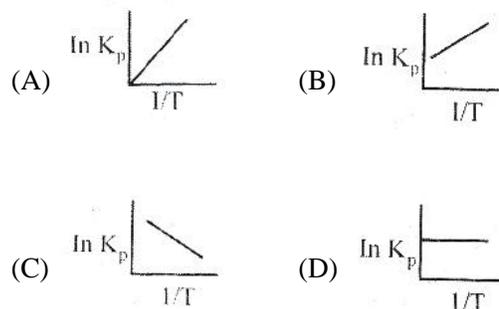
31. Elaters help in dispersal of spores of :
(A) *Riccia*   (B) *Marchantia*
(C) *Dryopteris*   (D) *Funaria*

32. Which of following type of anther is found in Malvaceae ?
(A) Monothecous   (B) Dithecous
(C) Polythecous   (D) Without thecous

33. Fascicular cambium is the cambium of vascular bundle of :
(A) monocot stem   (B) dicot stem
(C) monocot leaf   (D) dicot leaf

34. Companion cells in plants are associated with :
(A) vessels   (B) sperms
(C) sieve elements   (D) guard cell

35. Mosses and ferns are found in moist and shady places because both :
(A) require presence of water for fertilization
(B) do not need sunlight for photosynthesis
(C) depend for their nutrition on micro-organisms which can survive only at low temperature
(D) cannot compete with sun-loving plants

36. Cork cambium results in the formation of cork which becomes impermeable to water due to the accumulation of :
(A) resins   (B) suberin
(C) lignins   (D) tannins

37. The family containing mustard and its main characters are :
(A) Brassicaceae – Tetramerous flowers, six stamens, bicarpellary gynoecium, siliqua type fruit
(B) Brassicaceae – Pentamerous flowers, many stamens, pentacarpellary gynoecium, capsule type fruit
(C) Solanaceae – Pentamerous flowers, five stamens, bicarpellary gynoecium berry type fruit
(D) Poaceae – Trimerous flowers, three stamens, monocarpellary gynoecium, caryopsis type of fruit

38 Which one of the following statements pertaining to plant structure is correct ?
(A) Cork have stomata but lenticels carry out transpiration
(B) Passage cells help in transfer of food from cortex to phloem
(C) Sieve tube elements possess cytoplasm but no nuclei
(D) The shoot apical meristem has a quiescent centre

39. Viruses that infect bacteria multiply and cause their lysis, are called :
(A) lysozymes   (B) lipolytic
(C) lytic   (D) lysogenic

40. Choose the correct sequence of stages of growth curve for bacteria
(A) lag, log, stationary, decline phase
(B) lag, log, stationary phase
(C) stationary, lag, log, decline phase
(D) decline, lag, log phase

41. These organisms are fungus like in one phase of their life cycle and *Amoeba* like in another phase of their life cycle
(A) diatoms   (B) slime molds
(C) dinoflagellates   (D) water molds

42. In some seeds, reminans of nucellus are also persistent. This residual, persistent nucellus is the
(A) pericarp   (B) perisperm
(C) chalazosperm   (D) mesosperm

43. Dimorphic roots are found in
(A) *Ephedra*   (B) *Gnetum*
(C) *Pinus*   (D) *Pea*

44. The algae used in space research is
(A) *Gracilaris*   (B) *Porphyra*
(C) *Chondrus*   (D) *Chlorella*

45. Mesophyll is usually differentiated in :
(A) monocot leaf   (B) isobilateral leaf
(C) dorsiventral leaf (D) both (A) and (B)

46. The term 'anadromous' in relation to salmons and hilsa pertains to their
(A) reproduction and excretion
(B) respiration
(C) migration and spawning
(D) maturation of gonads

47. Match the following host with their parasites

Taenia	A. Pig
2. Liverfluke	B. _Aedes aegypti_
3. _Ascaris_	C. Snail
4. Plague	D. Dog
5. Rabies	E. None of the five animals
6. Dengue	F. Ratflea

	1	2	3	4	5	6
(A)	F	A	E	B	D	C
(B)	A	C	E	F	D	B
(C)	A	B	C	D	E	F
(D)	F	E	B	A	C	D

48. In earthworm, the mode of origin of coelom involves
(A) inpushing of ectoderm segmentally, to form sacs which coalesce to give rise to a continuous cavity
(B) out pocketing of the alimentary canal and the pockets coalesce to form a continuous cavity
(C) separation of mesoderm in the early embryonal period into two layers to create space in between them
(D) retention and subsequent enlargement of embryonal blastocoel to form a space between mesoderm and endoderm

49. Iron free compound in Hb is
(A) globin (B) haematin
(C) bilirubin (D) cyanin

50. The commonest and smallest type of leucocyte in a healthy adult man is
(A) lymphocytes (B) monocytes
(C) eosinophils (D) basophils

51. The deficiency of the enzyme tyrosinase leads to a serious disorder in the body
(A) alkaptonuria (B) phenylketonuria
(C) tyrosinate (D) albinism

52. One of the following refers to 'feed back mechanism', the effect of
(A) change in pH and temperature on enzyme substrate complex
(B) end product concentration on the rate of enzymatic reactions
(C) substrate concentration on the rate of enzymatic reactions
(D) enzymes concentration on the rate of reaction

53. A competitive inhibitor of an enzyme has which of the following properties ?
(A) It is frequently a feedback inhibitor
(B) It becomes covalently attached to an enzyme
(C) it interferes with substrate binding to the enzyme
(D) It causes reversible inactivation of the enzyme

54. Muscle of Boyden and muscle of Oddi are related to
(A) pancreas (B) uvula
(C) stomach (D) intestine

55. Functional residual capacity and inspiratory capacity when added together give
(A) breathing reserve (B) total lung capacity
(C) vital capacity
(D) maximum voluntary ventilation

56. The correct match is

Blood Groups	Plasma antibodies
A. A	I. a and b
B. B	II. b
C. O	III. a
D. AB	IV. nil.

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

57. Pick up the correct match

A. Oxyntic cells	I. Bile
B. Wirsung duct	II. HCl
C. Brunner's glands	III. Pancreatic hormones
D. Fat digestion	IV. Pancreas
E. α, β, δ cells	V. Duodenum

	A	B	C	D	E
(A)	I	II	III	IV	V
(B)	II	IV	V	I	III
(C)	V	IV	III	II	I
(D)	II	I	III	IV	V

58. The total number of lobes and alveoli present in both the lungs of man is
(A) 17 and 30 million, respectively
(B) 5 and 300 million, respectively
(C) 19 and 300 million, respectively
(D) 18 and 300 lakh, respectively

59. The correct arrangement of leg parts of cockroach is
(A) coxa, femur, trochanter, tibia and claws
(B) coxa, trochanter, femur, tibia, tarsus and claws
(C) coxa, tibia, femur, planulae and claws
(D) None of the above

60. The inner layer of blood vessel walls, consisting of endothelium, basement membrane, lamina propria and internal elastic membrane, is the
(A) tunica adventitia (B) tunica intima
(C) tunica media (D) tunica muscularis

ANSWER KEY

PHYSICS

1.	(B)	**2.**	(D)	**3.**	(D)	**4.**	(C)	**5.**	(C)	**6.**	(D)
7.	(A)	**8.**	(B)	**9.**	(D)	**10.**	(D)	**11.**	(A)	**12.**	(B)
13.	(B)	**14.**	(B)	**15.**	(A)							

CHEMISTRY

16.	(A)	**17.**	(D)	**18.**	(D)	**19.**	(C)	**20.**	(C)	**21.**	(D)
22.	(B)	**23.**	(B)	**24.**	(B)	**25.**	(B)	**26.**	(A)	**27.**	(C)
28.	(D)	**29.**	(B)	**30.**	(B)							

BOTANY

31.	(B)	**32.**	(A)	**33.**	(B)	**34.**	(C)	**35.**	(A)	**36.**	(B)
37.	(A)	**38**	(C)	**39.**	(C)	**40.**	(A)	**41.**	(B)	**42.**	(B)
43.	(C)	**44.**	(D)	**45.**	(C)							

ZOOLOGY

46.	(C)	**47.**	(B)	**48.**	(C)	**49.**	(A)	**50.**	(A)	**51.**	(D)
52.	(B)	**53.**	(C)	**54.**	(A)	**55.**	(B)	**56.**	(B)	**57.**	(B)
58.	(B)	**59.**	(B)	**60.**	(B)							