IIT - JEE & MEDICAL FOUNDATION TEST - 12

CLASS - VIII	IIT & MEDICAL TEST -12	Max.Marks :240
		Time : 2 ½ hr

Instructions :

i. The test paper consists of **eighty** multiple choice questions.
Mathematics **1 to 20,** Physics **21 to 40,** Chemistry **41 to 60** and Biology **61 to 80.**

ii Each followed by four alternatives A, B, C and D.

iii. Each correct answer carries **+ 3 Marks**.

MATHEMATICS		Time : 40 min

SECTION - I : Single Response Type Questions

This section contains **12** multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**. Each **correct** answer carries **3 marks**.

1. If $\sin\theta = -\frac{7}{25}$ and θ is not in the fourth quadrant, then $\frac{7\cot\theta - 24\tan\theta}{7\cot\theta + 24\tan\theta} =$

A) 17/31 B) -17/31 C) 31/17 D) -31/17

2. The LCM of $(2x^2 - 3x - 2)$ and $(x^3 - 4x^2 + 4x)$ is:

(A) $x(2x^2 + 1)(x^2 + 2)$ (B) $x(2x + 1)(x - 2)^2$ (C) $x(2x^2 + 1)(x - 1)^2$ (D) $x(2x + 1)(x^2 - 1)$

3. If $\left(a^4 + \frac{1}{a^4}\right) = 727$, then the value of $\left(a^3 - \frac{1}{a^3}\right)$ is

(A) 103 (B) 130 (C) 310 (D) 140

4. $\sec\theta \times \text{cosec}\,\theta =$_____

(A) $\frac{1}{\tan\theta}$ (B) $\frac{\sin\theta}{\cot\theta}$ (C) $\frac{1}{\cos^2\theta}$ (D) $\frac{1}{\cos\theta \times \sin\theta}$

5. $(b - c + d + a)(d + a - b + c) + (c - d + a + b)(b + c + d - a)$

(A) 4(ad + bc) (B) 2(ad + bc) (C) 3(ad + bc) (D) (ad + bc)

6. Factorisation of $x^4 + 25y^4 - 10x^2y^2$ is

A) $\left(x^2 + 5y^2\right)^2$ B) $\left(x^2 + y^2\right)^2$ C) $\left(x^2 - 5y^2\right)^2$ D) $\left(x^2 - y^2\right)^2$

7. $\sin\frac{3\pi}{5} + \sin\frac{4\pi}{5} + \sin\frac{6\pi}{5} + \sin\frac{7\pi}{5} =$

A) 0 B) -1 C) 1 D) 2

8. $\sin^4\theta + 2\sin^2\theta\left(1 - \frac{1}{\text{cosec}^2\theta}\right) + \cos^4\theta =$

A) 0 B) $\sqrt{2}$ C) 1 D) 2

9. If $x\sec\theta + y\tan\theta = a, x\tan\theta + y\sec\theta = b$ then $a^2 - b^2 =$

A) x + y B) x - y C) $x^2 + y^2$ D) $x^2 - y^2$

10. The value of $\cos 24^\circ + \cos 55^\circ + \cos 125^\circ + \cos 204^\circ + \cos 300^\circ$ is

(A) 1/2 (B) –1/2 (C) 1 (D) –1

11. If $\sec\theta - \tan\theta = \frac{a+1}{a-1}$, then $\cos\theta =$

(A) $\frac{a^2+1}{a^2-1}$ (B) $\frac{a^2-1}{a^2+1}$ (C) $\frac{2a}{a^2+1}$ (D) $\frac{2a}{a^2-1}$

12. If $x = \cos\alpha\cos\beta, y = \cos\alpha\sin\beta, z = \sin\alpha$ then $x^2 + y^2 + z^2 =$_____

(A) 1 (B) x^2 (C) y^2 (D) z^2

SECTION - II : Multiple Response Type Questions

This section contains 4 multiple correct answer (s) type questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONE OR MORE is/are correct. Each correct answer carries 3 marks.

13. Choose the correct statement ?

(A) 10 degrees is equal to 600 minutes (B) An angle equal to 90^0 is called reflex angle

(C) 50 grades is 45 degrees (D) 30° and 60° are complementary angles

14. Which of the following is true ?

(A) L.C.M of $12p^2q^2$, $6p^2q$ and $3pq$ is $12p^2q^2$.

(B) H.C.F of $30a^2b^2c^2$, $-18a^2b^3c^4$, $6abc^3$ is $-6abc^2$

(C) LCM of $10a^2bc$, $15abc$, $20ab^2c^2$ is $120a^2b^2c^2$

(D) HCF of $(x^2 - 6x + 9)$ and $(x^3 - 27)$ is $(x - 3)$

15. Choose the correct statement ?

(A) If $x + y = 5$ and $xy = 6$, then the value of $x^3 + y^3 = 35$

(B) If $x+\frac{1}{x}=5$, the value of $x^2+\frac{1}{x^2}=23$ (C) $ab=\left(\frac{a+b}{2}\right)^2-\left(\frac{a-b}{2}\right)^2$

(D) $a^4+4=\left(a^2+a+2\right)\left(a^2-a+2\right)$

16. $\sin 1470^0 =$

(A) 1/2 (B) 1 (C) $\cos 60^0$ (D) - 1/2

SECTION- III : Linked Comprehension Type

This section contains 1 paragraphs. Based upon paragraph, 3 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct. Each correct answer carries 3 marks.

Paragraph for Question Nos. 17 to 19

H.C.F = (H.C.F of numerical coefficients) × (Each common factor raised to lowest power)

L.C.M = (L.C.M of numerical coefficients) × (Each factor raised to highest power)

Based on the above data answer the following questions.

17. The HCF of $(2a^2 + a - 6)$, $(2a - 3)^2$ and $(4a^2 - 9)$ is

(A) $2a - 3$ (B) $2a + 3$

(C) $(a + 2)(2a - 3)(2a + 3)$ (D) $(a + 2)(2a - 3)^2(2a + 3)$

18. The L.C.M of $x^2 + xy$ and $x^2 - y^2$ is

(A) $x + y$ (B) $x - y$ (C) $x(x + y)(x - y)$ (D) $x(x + y)$

19. The H.C.F and L.C.M of $2x^2 + 4x$, $x^2 - 4$ and $x^2 + 4x + 4$ are respectively.

(A) $(x + 2)$, $2x(x - 2)(x + 2)^2$ (B) $(x - 2)$, $2x(x + 2)(x - 2)^2$

(C) $(x - 2)$, $2x(x + 2)(x - 2)$ (D) none

SECTION- IV : Matrix Matching type questions

Given below matrix matching type question, with two columns(each having some items) each. Each item of Column I has to be matched with one or more than one items of Column II. Each correct answer carries 8 marks. Zero marks if not attempted. There is partial marking.

20.

Column - I	**Column - II**
(a) $\sqrt{1-\sin^2\theta}$	(p) $\sec\theta$
(b) $\sqrt{\sec^2\theta-1}$	(q) $\cot\theta$
(c) $\sqrt{\operatorname{cosec}^2\theta-1}$	(r) $\cos\theta$
(d) $\sqrt{1+\tan^2\theta}$	(s) $\tan\theta$
	(t) $\sin\theta$

(A) a-r; b-q; c-s; d-p (B) a-r; b-s; c-q; d-p

(C) a-r; b-s; c-p; d-q (D) a-r; b-q; c-p; d-s

PHYSICS		Time : 40 min

SECTION - I : Single Response Type Questions

This section contains **12** multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**. Each **correct** answer carries **3 marks**.

21. Which of the following is most likely to acquire an electrostatic charge?

(A) Objects that are electrical conductors.

(B) Objects that are electrical nonconductors.

(C) Conductors and nonconductors are equally likely to acquire electrostatic charges.

(D) Objects that are grounded.

22. When a ray of light passes from rarer to denser medium, then ($i \neq 0$)

(A) angle of inclidince is greater than angle of refraction

(B) angle of inclidince is less than angle of refraction

(C) angle of inclidince is equal to angle of refraction (D) all of these

23. Which of the following best describes the image formed by a plane mirror?

(A) virtual, inverted and enlarged

(B) real, inverted and reduced

(C) virtual, upright and the same size as object

(D) real, upright and the same size as object

24. Two charged particles having charges +25 mC and +50 mC are separated by a distance of 8 cm. The ratio of force on them is :

(A) 1 : 1 (B) 1 : 2 (C) 4 : 1 (D) 2 : 1

25. A concave mirror is used to focus the image of a flower on a nearby well 120 *cm* from the flower. If a lateral magnification of 16 is desired, the distance of the flowerfrom the mirror should be

A) 8cm B) 12cm C) 80cm D) 120cm

26. In lateral inversion

A) right side of the object will be right side of the image

B) left side of the object will be left side of the image

C) upside of the object will be down side of the object

D) right side of the object will be left side of the image.

27. Find the resistance of a copper coil of total wire length 10m and area of cross section 1.0 mm^2. The resistivity of copper = $1.7 \times 10^{-8}\,\Omega - m$

(A) $0.13\,\Omega$ (B) $0.17\,\Omega$ (C) $0.34\,\Omega$ (D) $0.56\,\Omega$

28. The equivalent resistance of resistors in series is always

(A) equal to the mean of component resistors

(B) less than the lowest of component resistors

(C) in between the lowest and the highest of component resistors

(D) equal to the sum of the component resistors

29. The resistance (R) of a conductor is given by ____ (where ρ is specific resistance, l is the length of conductor and A is area of cross-section of the conductor).

(A) $R = \rho\frac{l}{A}$ (B) $R = \rho\frac{l}{A^2}$ (C) $R = \rho\frac{l^2}{A}$ (D) $R = \rho\frac{l}{\sqrt{A}}$

30. The equivalent resistance, when three resistors $2\Omega, 4\Omega$ and $6\,\Omega$ are connected in parallel is

(A) $\frac{11}{12}\Omega$ (B) $\frac{12}{11}\Omega$ (C) $\frac{12}{13}\Omega$ (D) $\frac{13}{12}\Omega$

31. We have two wires A and B of same mass and same material. The diameter of the wire A is half that of B. If the resistance of wire A is $24\,\Omega$, then the resistance of wire B will be

(A) $12\,\Omega$ (B) $3.0\,\Omega$ (C) $1.5\,\Omega$ (D) $24\,\Omega$

32. Resistances of $2\,\Omega$ and $3\,\Omega$ are connected in series. If the potential difference across the $2\,\Omega$ resistor is 3 V, the potential difference across $3\,\Omega$ is

(A) 4.5 V (B) 9 V (C) 3 V (D) 2 V

SECTION - II: Multiple Response Type Questions

This section contains 4 multiple correct answer (s) type questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONE OR MORE is/are correct. Each correct answer carries 3 marks.

33. Choose the current statement :

(A) If the resistance is doubled, the current gets halved.

(B) If the resistance is halved, the current gets doubled.

(C) If the resistance is doubled, the current gets doubled.

(D) If the resistance is halved, the current gets halved.

34. With regard to refraction which of the following statement is false.

A) It is a change in direction of light when it passes from one transparent medium into another of different optical density

B) Light is deviated away from the normal when it enters an optically dense medium from a less dense medium

C) The velocity of light is changed during refraction

D) The wavelength of the light is changed during refraction

35. Choose the incorrect statements.

(A) Reflection of light is independent of the nature of reflecting surface.

(B) In diffused reflection , the light is reflected in only one direction.

(C) A virtual image can be obtained on a screen.

(D) Real images are always located behind the mirror.

36. The electrical resistance of a conductor depends on

(A) Length of the conductor (B) Area of cross - section of the conductor

(C) Temperature of the conductors (D) Nature of the material of the conductor

SECTION- III: Linked Comprehension Type

This section contains 1 paragraphs. Based upon paragraph, 3 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct. Each correct answer carries 3 marks.

Paragraph for Question Nos. 37 to 39

The force acts along the line joining the two charges $F = k\frac{q_1 q_2}{r^2}$

37. A charge Q is to be divided on two objects. What should be the values of the charges on the objects so that the force between the objects can be maximum ?

(A) $\frac{Q}{2}$ (B) $\frac{Q}{4}$ (C) 2Q (D) 4Q

38. Two equal charges placed 3cm apart in air attract each other with a force of 40N.The magnitude of each charge is

(A) 2×10^{-4} C (B) 1×10^{-6} C (C) 2×10^{-6} C (D) 4×10^{-6} C

39. Two balls carrying charges $+7\mu C$ and $-5\mu C$ attract each other with a force F. If a charge $-2\mu C$ is added to both, then the force between them will be

(A) F (B) $\frac{F}{2}$ (C) 2F (D) Zero

SECTION- IV: Matrix Matching type questions

Given below matrix matching type question, with two columns(each having some items) each. Each item of Column I has to be matched with one or more than one items of Column II. Each correct answer carries 8 marks. Zero marks if not attempted. There is partial marking.

40.

Column - I	**Column - II**
a) Effective area of cross-section increases	p) In parallel combination
b) Effective length of resistor increase	q) $R = \frac{R_1 R_2}{R_1 + R_2}$

c) Resistance decreases r) $R = R_1+R_2$

d) Resistance increases s) In series combination

(A) a-p; b-r,q; c-p,q; d-r,s (B) a-p,q; b-r,s; c-p,q; d-r,s

(C) a-p,s; b-r,s; c-p,q; d-r,s (D) a-p,q; b-r,s; c-p,s; d-r,q

CHEMISTRY — Time : 40 min

SECTION - I : Single Response Type Questions

This section contains **12** multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**. Each **correct** answer carries **3 marks**.

41. Which one of the following statements about negative ions is incorrect?

(A) they are also known as anions

(B) they are formed when atoms gain electrons

(C) they are larger than the atom from which they were formed

(D) they are smaller than the atom from which they were formed

42. Oxidizing agents does not include

(A) potassium iodide (B) potassium manganate

(C) potassium dichromate (D) bromine solutions

43. The atomic weight of an element is 23. The weight of one atom of that element is :

A) 23 a.m.u B) $23 \times 1.66\times10^{-24}$g C) Both A and B D) 23 grams

44. Lattice energy of an ionic compound sepends upon:

A) Packing of ions only. B) Size of the ion only

C) Charge on the ion and size of the ion. D) Charge on the ion only.

45. What is the symbol of ammonium ion?

(A) NO+ (B) NH_4^+ (C) N_3^- (D) OH^-

46. Volume at N.T.P. of 0.22 g of CO_2 is same as that of

(A) 0.01 g of hydrogen (B) 0.085 g of NH_3

(C) 320 mg of gaseous SO_2 (D) All the the above

47. Which of the following compounds are all covalent compounds?

A) LiCl, K_2O, NO_2 B) CO_2, Na_2SO_4, SO_3

C) SO_2, CO_2, PCl_5 D) CsClO, KCl, MgO

48. In which of the following, dative bond is present?

(A) CH_4 (B) CCl_4 (C) H_2O (D) SF_6

49. When two atoms of chlorine combine to form one molecule of chlorine gas, the energy of the molecule is:

(A) Greater than that of separate atoms (B) Equal to that of separate atoms

(C) Lower than that of separate atoms (D)None of these

50. Molecule having maximum number of lone pairs of electrons on central atom is:

(A) PH_3 (B) H_2S (C) CH_4 (D) BrF_5

51. Which of the following is not a property of covalent compounds?

(A) They have low melting points. (B) They are not electrical conductors.

(C) They exhibit space isomerism. (D) They undergo chemical reactions quickly.

52. The dative bond is present in

(A) NH_3 (B) SO_3 (C) PCl_5 (D) BF_3

SECTION - II : Multiple Response Type Questions

This section contains 4 multiple correct answer (s) type questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONE OR MORE is/are correct. Each correct answer carries 3 marks.

53. Which of the following compounds follow octet rule?

A) CS_2 B) PBr_3 C) IBr (D) BrF_5

54. Which of the following is/are the redox reactions?

(A) $BaO_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2$ (B) $2BaO + O_2 \longrightarrow 2BaO_2$

(C) $4KClO_3 \longrightarrow 4KClO_2 + 2O_2$ (D) $SO_2 + 2H_2S \longrightarrow 2H_2O + 3S$

55. Which one of the following statements is correct ?.

(A) One gram atom of carbon contains avogadro's number of atoms.

(B) One mole of oxygen gas contains Avogadro's number of atoms.

(C) One mole of hydrogen contains Avogadro's number of atoms.

(D) One mole of electrons stands for 6.02×10^{23} electrons

56. Which of the following are correct about covalent bond?

(A) It is formed by sharing of the electrons

(B) It is equal to ionic bond

(C) Its study was done by Kossel

(D) When two non-metals are combined, then a covalent bond is formed

SECTION- III: Linked Comprehension Type

This section contains 1 paragraphs. Based upon paragraph, 3 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct. Each correct answer carries 3 marks.

Paragraph for Question Nos. 57 to 59

There are many cases where different atoms of the same element possess different relative masses. Such atoms of the same element which have different relative masses are called isotopes. In such cases, atomic mass of the element is average of relative masses of different isotopes of the element.

Isotope	Relative abundance(%)	Atomic mass
C - 12	98.892	12
C - 13	1.108	13.00335
C - 14	2×10^{-10}	14.00317

57. From the above information, find the average atomic mass of carbon.

A) 12.50 B) 11.75 C) 10.90 D) 12.001

58. Nitrogen occurs in nature in the form of two isotopes with atomic mass 14 and 15 respectively. If average atomic mass of nitrogen is 14.0067, what is the % abundance of the two isotopes?

A) 50%, 50% B) 9.33%, 0.67% C) 25%, 75% D) 33.33%, 66.66%

59. Copper consists of two isotopes, copper-63 and copper-65.Its relative atomic mass is 63.62.Find the abundance of each isotope respectively.

A) 69%, 31% B) 31%, 31% C) 59%, 31% D) 31%, 55%

SECTION- IV : Matrix Matching type questions

Given below matrix matching type question, with two columns(each having some items) each.Each item of Column I has to be matched with one or more than one items of Column II. Each correct answer carries 8 marks. Zero marks if not attempted. There is partial marking.

60.

Column-I	**Column-II**
a) $MgCl_2$	p) Ionic
b) CaC_2	q) Covalent
c) $CuSO_4.5H_2O$	r) Coordinate
d) KHF_2	s) Hydrogen bond

A) a-p; b-p,q,r; c-p,q,s; d-p,q,s B) a-p; b-p,q; c-p,q,; d-p,q,r

C) a-p; b-p,q; c-p,q,r,s; d-p,q,s D) a-p; b-q; c-p,q,r; d-p,s

BIOLOGY		Time : 30 min

This section contains **20** multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**. Each **correct** answer carries **3 marks**.

SECTION - I: Single Response Type Questions

61. The sex of a child is determined by the
A) chromosomes of the father B) chromosomes of the mother
C) Rh factor of the parents D) blood group of the father

62. The type of reproduction in which two parents male & female take part.
A) Asexual B) Sexual C) Budding D) Fission

63. The four blood groups in humans are
(A) A, B, C and D (B) A, B, AB and C (C) A, B, AB and O (D) A, B, AB and OO

64. A female secondary sexual characteristic is :-
A) voice becoming shrill B) voice becoming hoarse
C) growth of adam's apple D) growth of hair on the chest

65. Out of two daughter cells produced as a result of binary fission in Amoeba
(A) one is large and the other is small
(B) one is uninucleate and the other is without nucleus
(C) one is spherical and the other is irregular
(D) the two are nearly equal sized and identical

66. Osmosis helps in
A) absorption of water from soil B) stomatal movements
C) maintaining turgidity in plant cells D) translocation of food

67. Teenagers is the other name used for _____.
A) Adolescents B) Adults C) Children D) Older people

68. Which of the given figure represent budding in Hydra correclty ?
(A)  (B)  (C)  (D) 

69. What is the function of WBCs ?
(A) Transport of oxygen (B) Fight against germs
(C) Involved in blood clotting (D) All of these

70. What is hormone ?
A) Organic complex substance B) Chemical messenger
C) Glandular secretion D) Blood cells

71. The development of Reproductive system in human beings under the influence of
A) Enzymes B) Hormones C) Carbohydrates D) Fats

72. Human heart has
(A) one auricle and one ventricle. (B) two auricles and one ventricle.
(C) two auricles and two ventricles. (D) one auricle and two ventricles.

73. AIDS is caused by
A) HIV B) Bacteria C) Fungus D) Protozoans

74. The deficiency of parathorome leads to
A) Tetany B) AIDS C) Fluorasis D) Calcination

75. At puberty, a diet rich in proteins is essential for
(A) supplying sufficient energy (B) the formation of new cells for growth
(C) the formation of strong bones and teeth (D) protection from diseases.

76. Which of the following maintain the amount of salt and water in blood
A) Cortisol B) Aldosterone C) Adrenalin D) Thyroxine

77. Production of sex hormones is under the control of

(A) thyroid gland (B) adrenal gland (C) testis (D) pituitary gland

78. The body part where a hormone reaches and produces its effect is called

(A) end site (B) regulator site (C) tropic site (D) target site

79. HIV does not spread by

A) By Sharing toilets B) By Touching C) By Shaking hands D) All of the above

80.

Column -I	**Column -II**
gland	**hormone secreted**
a) pancreas	p) testosterone
b) testis	q) insulin
c) pituitary	r) epinephrine
d) ovary	s) growth hormone
e) adrenal	t) estrogen

(A) a-q; b-p; c-s; d-r; e-t (B) a-q; b-p; c-s; d-t; e-r

(C) a-q; b-p; c-t; d-r; e-s (D) a-q; b-t; c-s; d-r; e-p