


**INDIAN ASSOCIATION OF PHYSICS TEACHERS
NATIONAL STANDARD EXAMINATION IN JUNIOR SCIENCE 2011 - 2012**

Date of examination: 27th November 2011

Time 15.00 to 17.00 Hrs.

Instructions to Candidates

1. In addition to this question paper, you are given a separate answer sheet.
2. On the answer sheet fill up all the entries carefully in the space provided, **ONLY IN BLOCK CAPITALS.**
Incomplete / incorrect / carelessly filled information may disqualify your candidature.
3. On the answer sheet, use only **BLUE or BLACK BALL PEN** for making entries and marking answers.
4. The question paper contains 80 multiple-choice questions. Each question has 4 options, out of which only one is correct. Choose the correct answer and mark a **cross** in the corresponding box on the answer sheet as shown below :

Q.	a	b	c	d
22				

5. Any rough work should be done only on the sheet provided at the end of question paper.
6. A correct answer carries 3 marks and 1 mark will be deducted for each wrong answer.
7. Use of nonprogrammable calculator is allowed.
8. No candidate should leave the examination hall before the completion of the examination.
9. The answers / solutions to this question paper will be available on our website - www.iapt.org.in by 3 rd December 2011.
10. Result sheets and the "centre top 10%" certificates of NSEJS are dispatched to the Professor in charge of the centre. Thus you will get your marks from the Professor in charge of your centre by January 2012 end.
11. TOP 300 (or so) students are called for the next examination-Indian National Junior Science Olympiads (INJSO). Individual letters are sent to these students ONLY.
12. No queries will be entertained in this regard.

PLEASE DO NOT MAKE ANY MARK OTHER THAN (X) IN THE SPACE PROVIDED ON THE ANSWER SHEET.

Answer sheets are evaluated with the help of a machine. Due to this, **CHANGE OF ENTRY IS NOT ALLOWED.**

Scratching or overwriting may result in wrong score.

DO NOT WRITE ANYTHING ON BACK SIDE OF ANSWER SHEET.

CERTIFICATES & AWARDS

Following certificates are awarded by the I.A.P.T. to students successful in NSEJS.

- i) Certificate for "Centre Top 10%" students.
- ii) Merit certificates to statewide Top 1% students.
- iii) Merit certificate and a prize in the form of a book to Nationwide Top 1% students.

TO TAKE THIS EXAMINATION YOU HAVE TO BE BORN ON OR AFTER JANUARY 1, 1997

INDIAN ASSOCIATION OF PHYSICS TEACHERS

NATIONAL STANDARD EXAMINATION IN JUNIOR SCIENCE 2011 – 2012

Total time: 120 minutes

Marks: 240

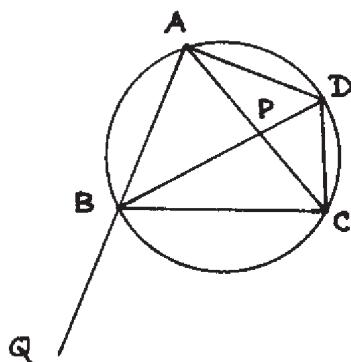
ONLY ONE OUT OF FOUR OPTIONS IS CORRECT

N.B. : Physical constants are given at the end.

- 1) Let the electrostatic force between two electrons (F_e) be x times the gravitational force (F_g) between them. Then, x is of the order of

- (a) 10^{40} .
- (b) 10^{42} .
- (c) 10^{38} .
- (d) 10^{37} .

- 2) In the figure shown below, $m\angle ABD = 2x$, $m\angle ADB = 3x$, $m\angle APB = 4x$ and $m\angle CBQ = 7x$. Therefore, $m\angle BCD$ is



- (a) 90° .
- (b) 85° .
- (c) 72° .
- (d) 96° .

- 3) An arrow shot vertically upwards loses its initial speed by 60% in 3 seconds. The maximum height reached by the arrow is ($g = 9.8 \text{ ms}^{-2}$)

- (a) 122.5 m
- (b) 44.1 m
- (c) 100 m
- (d) 45 m

- 4) Bromine can be liberated from KBr solution by the action of

- (a) iodine solution.
- (b) chlorine water.
- (c) NaCl.
- (d) KI.

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- 5) A certain force applied to a body A gives it an acceleration of 10 ms^{-2} . The same force applied to body B gives it an acceleration of 15 ms^{-2} . If the two bodies are joined together and the same force is applied to the combination, the acceleration will be
- 6 ms^{-2} .
 - 25 ms^{-2} .
 - 12.5 ms^{-2} .
 - 9 ms^{-2} .
- 6) Oxygen exhibits (-1) oxidation state in
- OF_2 .
 - H_2O .
 - H_2O_2 .
 - HClO .
- 7) The process involved in healing of the wound is
- meiosis I and II.
 - mitosis.
 - meiosis I.
 - meiosis II.
- 8) The family pedigree of Queen Victoria shows a number of haemophilic descendents as
- she herself was haemophilic.
 - haemophilia is autosomal recessive disorder.
 - haemophilia is sex linked recessive disorder and Queen Victoria was a carrier.
 - haemophilia is caused by contact and therefore it was seen in the royal family descendents.
- 9) A ball is dropped from a height of 7.2 m . It bounces back to 3.2 m after striking the floor. The ball remains in contact with the floor for 20 ms . Given that $g = 10 \text{ ms}^{-2}$, the average acceleration of the ball during the contact is
- 100 ms^{-2} .
 - 200 ms^{-2} .
 - 600 ms^{-2} .
 - 1000 ms^{-2} .
- 10) In $\triangle ABC$, D is a point on side AC such that $\angle ABD = \frac{1}{2} \angle ABC$. If $AB = 36$, $BC = 48$, $CD = 28$, then the length DA will be
- 20.
 - 21.
 - 22.
 - 24.

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11) Human body cannot digest carbohydrate in the form of

- (a) sugars.
- (b) starch.
- (c) cellulose.
- (d) glycogen.

12) Unsaturated fatty acids contain

- (a) atleast one double bond.
- (b) two double bonds.
- (c) more than two double bonds.
- (d) no double bond.

13) A loaded bus (mass m_2) and an unloaded bus (mass m_1) are both moving with the same kinetic energy. Brakes are applied to both the buses so as to exert equal retarding force. If s_1 and s_2 are the distances covered by the two buses respectively, before coming to rest, then $\frac{s_1}{s_2}$ is

- (a) 1.
- (b) $\frac{m_1}{m_2}$.
- (c) $\sqrt{\frac{m_1}{m_2}}$.
- (d) $\frac{m_1^2}{m_2^2}$.

14) The centre of a clock is taken as origin. At 4.30 pm, the equation of line along minute hand is $x = 0$. Therefore, at this instant the equation of line along the hour hand will be

- (a) $x - y = 0$
- (b) $x + y = 0$
- (c) $y = \sqrt{2}x$
- (d) $y = \frac{x}{\sqrt{2}}$

15) Heterosis is the

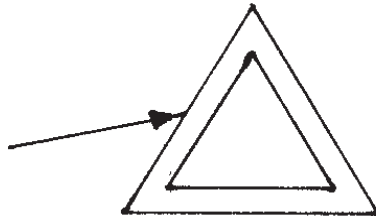
- (a) superiority of male parent over the hybrid.
- (b) superiority of female parent over the hybrid.
- (c) superiority of hybrid over the parents.
- (d) superiority of both the parents over the hybrid.

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16) An equilateral triangle has area $A \text{ cm}^2$. A regular hexagon of maximum area is cut off from the triangle. If the area of the hexagon is 320 cm^2 , the area A is

- (a) 640 cm^2 .
- (b) 480 cm^2 .
- (c) 600 cm^2 .
- (d) 400 cm^2 .

17) A ray of light is incident on a hollow glass prism as shown. Then the ray will undergo



- (a) deviation and dispersion both.
- (b) deviation but no dispersion.
- (c) dispersion but no deviation.
- (d) neither deviation nor dispersion.

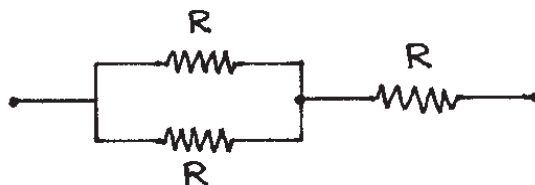
18) In a neon discharge tube $2.8 \times 10^{18} \text{ Ne}^+$ ions move to the right per second while 1.2×10^{18} electrons move to the left per second. Therefore, the current in the discharge tube is

- (a) 0.64 A towards right.
- (b) 0.256 A towards right.
- (c) 0.64 A towards left.
- (d) 0.256 A towards left.

19) Genome of a sexually reproducing organism is

- (a) all the chromosomes present in the diploid cell.
- (b) total number of chromosomes present in the haploid cell.
- (c) total number of genes present in a cell.
- (d) totality of DNA present in the haploid cell.

20) Three equal resistances are connected as shown in the figure. Maximum power that can be dissipated by each resistance is 40 watt . Therefore, the maximum power that can be safely dissipated in the combination is



- (a) 120 watt .
- (b) 80 watt .
- (c) 60 watt .
- (d) 40 watt .

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21) The compound that has both ionic and covalent bonds is

- (a) boric acid (H_3BO_3).
- (b) sodium chloride (NaCl).
- (c) ethyl alcohol ($\text{C}_2\text{H}_5\text{OH}$).
- (d) sodium phenolate ($\text{C}_6\text{H}_5\text{ONa}$).

22) The colonial form of algae is

- (a) Chlamydomonas.
- (b) Chara.
- (c) Porphyra.
- (d) Volvox.

23) An object is placed at a distance x_1 from the focus of a concave mirror. Its real image is formed at a distance x_2 from the focus. Hence, the focal length of the mirror is

- (a) $\frac{x_1 x_2}{x_1 + x_2}$.
- (b) $\sqrt{x_1 x_2}$.
- (c) $\frac{x_1 + x_2}{2}$.
- (d) $|x_1 - x_2|$.

24) If $\frac{b+c-a}{a}$, $\frac{c+a-b}{b}$ and $\frac{a+b-c}{c}$ are in A. P. and $a+b+c \neq 0$, then

- (a) $b = \frac{ac}{a+c}$.
- (b) $b = \frac{2ac}{a+c}$.
- (c) $b = \frac{a+c}{2}$.
- (d) $b = \sqrt{ac}$.

25) The metal that dissolves in liquid ammonia giving dark blue coloured solution is

- (a) Sn.
- (b) Pb.
- (c) Na.
- (d) Ag.

26) How much water should be filled in a container 21 cm in height, so that it appears half filled when viewed from the top of the container? [refractive index of water = $\frac{4}{3}$]

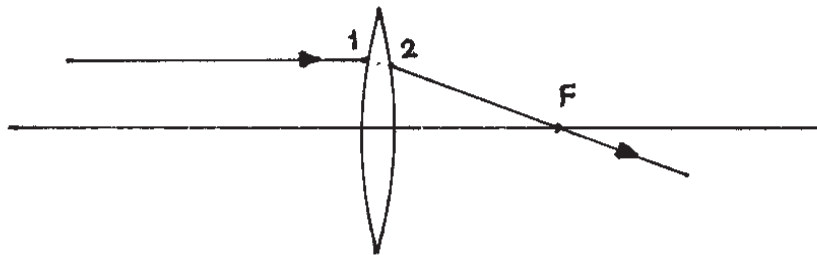
To take this examination you have to be born on or after January 1, 1997.

- (a) 8 cm.
- (b) 10.5 cm.
- (c) 12 cm.
- (d) 14 cm.

27) An electron moving to the east in a horizontal plane is deflected towards south by a magnetic field. The direction of this magnetic field is

- (a) towards north.
- (b) towards west.
- (c) downwards.
- (d) upwards.

28) The figure shows a ray of light incident on a convex lens, parallel to its principal axis. Obviously the emergent ray passes through the principal focus F. Which of the following statements is correct ?



- (a) The ray bends downwards only once inside the lens.
- (b) The ray bends downwards at each surface.
- (c) The ray bends downwards at the first surface and upwards at the second surface.
- (d) The ray bends upwards at the first surface and downwards at the second surface.

29) Hydrogen fluoride is a liquid at room temperature due to

- (a) dimerisation.
- (b) dissociation followed by aggregation.
- (c) association.
- (d) polymerisation.

30) In usual course, the progeny varies from its parents due to

- (a) mutation.
- (b) pleiotropic effect.
- (c) chromosomal recombination.
- (d) independent assortment.

31) If the eight digit number 2575d568 is divisible by 54 and 87, the value of the digit 'd' is

- (a) 4.
- (b) 7.
- (c) 0.
- (d) 8.

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32) Which of the following hydroxides is NOT an alkali ?

- (a) Ammonium hydroxide
- (b) Calcium hydroxide
- (c) Copper hydroxide
- (d) Sodium hydroxide

33) When the polynomial $(6x^4 + 8x^3 + 17x^2 + 21x + 7)$ is divided by $(3x^2 + 4x + 1)$, the remainder is $(ax + b)$. Therefore,

- (a) $a = 1, b = 2$.
- (b) $a = 1, b = -2$.
- (c) $a = 2, b = 1$.
- (d) $a = -1, b = -2$.

34) The most basic oxide among MnO , Mn_2O_3 , MnO_2 and Mn_2O_7 is

- (a) MnO .
- (b) MnO_2 .
- (c) Mn_2O_3 .
- (d) Mn_2O_7 .

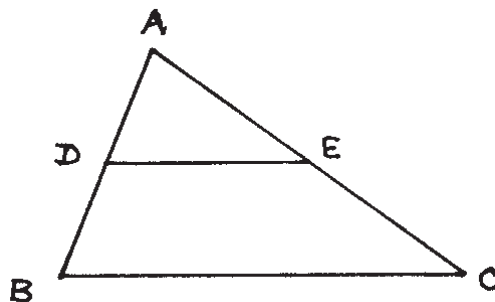
35) BCG vaccine is used to prevent

- (a) tuberculosis.
- (b) blood cancer, cholera and gonorrhoea.
- (c) leprosy.
- (d) goitre.

36) The metal which cannot displace hydrogen from acid is

- (a) silver .
- (b) sodium.
- (c) calcium.
- (d) magnesium.

37) In the figure shown below, $DE \parallel BC$ and $AD = 3x - 2$, $AE = 5x - 4$, $BD = 7x - 5$ and $CE = 5x - 3$. Therefore, the value of x is



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- (a) only 1.
- (b) only $\frac{7}{10}$.
- (c) 1 or $\frac{7}{10}$.
- (d) $\frac{10}{7}$.

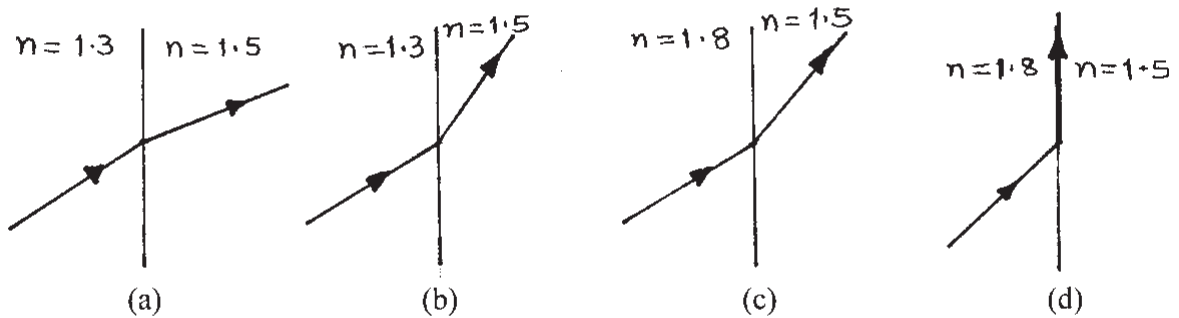
38) Down's syndrome is a result of

- (a) XO genotype.
- (b) XXY genotype.
- (c) Trisomy (chromosome 12).
- (d) Trisomy (chromosome 21).

39) Sudden decrease in the intermolecular forces of attraction occurs most efficiently in

- (a) evaporation.
- (b) melting.
- (c) condensation.
- (d) sublimation.

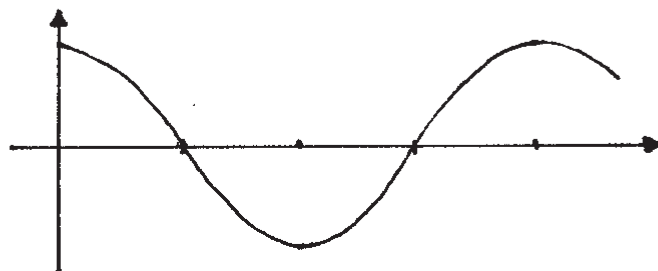
40) Which of the following does NOT represent correct refraction?



41) Correct formula of dolomite is

- (a) $\text{CaCO}_3 \cdot \text{MgCO}_3$.
- (b) $\text{CaCO}_3 \cdot \text{ZnCO}_3$.
- (c) $\text{MgCO}_3 \cdot \text{ZnCO}_3$.
- (d) $\text{FeCO}_3 \cdot \text{CaCO}_3$.

42) The figure shows graphical representation of a sound wave. The quantities on X and Y axes respectively are



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- (a) time and displacement .
- (b) distance and pressure.
- (c) distance and change in density.
- (d) density and pressure.

43) A certain amount of heat is required to raise the temperature of x gram of a substance through t_1° C. The same amount of heat when taken away from y gram of water, it cools through t_2° C. Therefore, the specific heat of the substance is

- (a) $\frac{yt_1}{xt_2}$.
- (b) $\frac{xt_2}{yt_1}$.
- (c) $\frac{yt_2}{xt_1}$.
- (d) $\frac{xt_1}{yt_2}$.

44) An aeroplane is flying horizontally at a height of 3150 m above a horizontal plane ground. At a particular instant it passes another aeroplane vertically below it. At this instant, the angles of elevation of the planes from a point on the ground are 30° and 60° . Hence, the distance between the two planes at that instant is

- (a) 1050 m.
- (b) 2100 m.
- (c) 4200 m.
- (d) 5250 m.

45) Which of the following is NOT a usual floral pigment ?

- (a) Betacyanins.
- (b) Anthocyanins.
- (c) Carotenes.
- (d) Betaxanthins.

46) The element that is NOT present in the compound BARYTA is

- (a) B.
- (b) O.
- (c) H.
- (d) Ba.

47) With reference to human beings, the correct order of taxonomical classification is

- (a) chordata, primata, mammalia, hominidae.
- (b) chordata, mammalia, primata, hominidae.
- (c) chordata, primata, hominidae, mammalia.
- (d) chordata, mammalia, hominidae, primata.

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48) A boy throws a stone (mass 100 g) vertically upwards. It reaches a height of 10 m and then falls to the ground. The work done by the boy is ($g = 10 \text{ ms}^{-2}$)

- (a) 10 J.
- (b) 20 J.
- (c) zero.
- (d) -10 J .

49) The compound used to remove carbon dioxide from air is.

- (a) sodium carbonate.
- (b) sodium hydroxide.
- (c) sodium nitrate.
- (d) sodium chloride.

50) A conical vessel of radius 6 cm and height 8 cm is completely filled with water. A metal sphere is now lowered into the water. The size of the sphere is such that when it touches the inner surface, it just gets immersed. The fraction of water that overflows from the conical vessel is

- (a) $\frac{3}{8}$.
- (b) $\frac{5}{8}$.
- (c) $\frac{7}{8}$.
- (d) $\frac{5}{16}$.

51) Which of the following does NOT involve friction?

- (a) Writing on a paper using a pencil.
- (b) Turning a car to the left on a horizontal road.
- (c) A car at rest parked on a sloping ground.
- (d) Motion of a satellite around the earth.

52) Sting of a honeybee represents modification of

- (a) ovipositor.
- (b) abdominal bristles.
- (c) abdominal appendage.
- (d) mandibles.

53) The property which is characteristic of an electrovalent compound is that

- (a) it is easily vapourised.
- (b) it has a high melting point.
- (c) it is a weak electrolyte.
- (d) it often exists as a liquid.

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54) Out of the following, the correct activity series of the metals is

- (a) $K > Na > Ca > Mg$
- (b) $Na > K > Ca > Mg$
- (c) $Mg > Ca > Na > K$
- (d) $Mg > Na > Ca > K$

55) If the glands in the pharyngeal bulb of earthworm are inactivated, digestion of which of the following is affected ?

- (a) proteins.
- (b) carbohydrates.
- (c) lipids.
- (d) nucleic acids.

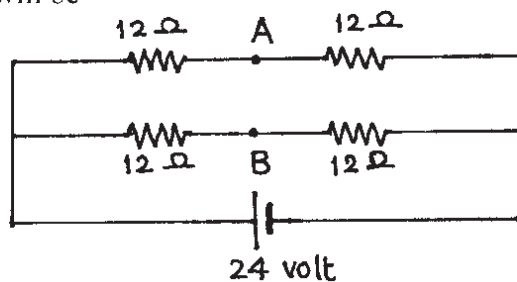
56) Which of the following group elements from the periodic table form electron deficient molecules ?

- (a) Group IV
- (b) Group V
- (c) Group III
- (d) Group I

57) Which of the following elements forms polyatomic molecules ?

- (a) Nitrogen
- (b) Chlorine
- (c) Argon
- (d) Boron

58) In the circuit arrangement shown, if the points A and B are joined by a wire the current in this wire will be



- (a) 1 A.
- (b) 2 A.
- (c) 4 A.
- (d) zero.

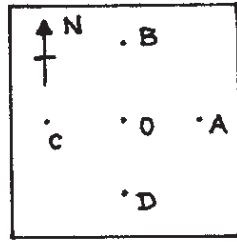
59) Given $\sqrt{600} = 24.49$, the value of $\frac{\sqrt{2} + \sqrt{3}}{\sqrt{3} - \sqrt{2}}$ is

- (a) 9.978
- (b) 8.989
- (c) 9.989
- (d) 9.898

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- 60) Besides drip irrigation, an effective way of economizing farm irrigation without hampering metabolic processes of plants would be the use of
- (a) humidifiers.
 - (b) sun screen nettings.
 - (c) organic fertilizers / manures.
 - (d) antitranspirant sprays.
- 61) Mixture of ethyl alcohol and water can be easily separated by using
- (a) separating funnel.
 - (b) fractional distillation.
 - (c) filter paper.
 - (d) none of the above.
- 62) If $x < 0$ and $\log_7(x^2 - 5x - 65) = 0$, then x is
- (a) -13
 - (b) -11
 - (c) -6
 - (d) -5
- 63) Pressure of a certain volume V of an ideal gas is increased by four times its initial pressure whereas the temperature is reduced to 50% of its initial temperature. The resulting volume of the gas is
- (a) $10 V$.
 - (b) $0.1 V$.
 - (c) $0.5 V$.
 - (d) $0.25 V$.
- 64) If $2^{2x-1} + 2^{1-2x} = 2$, then the value of x is
- (a) 0.5
 - (b) -0.5
 - (c) 1
 - (d) 0
- 65) Like sickle cell anaemia, the other genetic disorder related to blood pigment is
- (a) leukemia.
 - (b) phenylketoneuria.
 - (c) thalassemia.
 - (d) xeroderma pigmentosa.
- 66) Consider points A, B, C, D on a horizontal cardboard equidistant from centre O as shown in the figure. A copper wire perpendicular to the cardboard passes through the centre O and carries an electric current flowing upwards. Deflection of magnetic needle will be maximum when it is kept at the point

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- (a) A.
- (b) B.
- (c) C.
- (d) D.

67) If $a^2 + b^2 + c^2 + d^2 = 25$, out of the following statements the correct one is

- (a) $ab + bc + cd + da \leq 25$.
- (b) $ab + bc + cd + da \geq 25$.
- (c) $ab + bc + cd + da \leq \frac{25}{2}$.
- (d) $ab + bc + cd + da \geq \frac{25}{2}$.

68) The release of chemical messenger at nerve-muscle end plate is under the influence of the ions

- (a) Cl^- .
- (b) Fe^{++} and S^{++} .
- (c) Ca^{++} .
- (d) Mg^{++} and Sr^{++} .

69) Given that $a(a+b) = 36$ and $b(a+b) = 64$, where a and b are positive, $(a-b)$ equals

- (a) 2.8
- (b) 3.2
- (c) -2.8
- (d) -2.5

70) A sphere and a cube have equal surface areas. The ratio of their volumes is

- (a) $\frac{\pi}{6}$.
- (b) $\frac{6}{\pi}$.
- (c) $\sqrt{\frac{6}{\pi}}$.
- (d) $\sqrt{\frac{\pi}{3}}$.

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71) An equilateral triangle has area $A\sqrt{3}$. Three circles are drawn with their centres at the vertices of the triangle. Diameter of each circle is equal to the length of each side of the triangle. The area of the triangle NOT included in any of the three circles is

(a) $A(\sqrt{3} - \frac{\pi}{6})$.

(b) $A(\pi - \sqrt{3})$.

(c) $A(3\pi - \sqrt{3})$.

(d) $A(\sqrt{3} - \frac{\pi}{2})$.

72) In a school, the average score of all 1400 students at an examination was found to be 69.5. The average score of boys in the school was 68 and that of girls was 72. Hence, the number of boys and the number of girls respectively are

(a) 680 and 720.

(b) 720 and 680.

(c) 875 and 525.

(d) 800 and 600.

73) The biochemical analysis to confirm CAM in a given plant is

(a) titratable acid number.

(b) iodine number.

(c) activity of transaminases.

(d) total reducing power.

74) If a, b, c are positive, $\frac{a+c}{b+c}$ is

(a) always smaller than $\frac{a}{b}$.

(b) always greater than $\frac{a}{b}$.

(c) greater than $\frac{a}{b}$ only if $a > b$.

(d) greater than $\frac{a}{b}$ only if $a < b$.

75) Two vectors of equal magnitude are inclined to each other at an angle θ . Keeping the direction of one of them fixed the other is rotated through an equal angle θ . Now, the resultant of these vectors has the same magnitude as each of the two vectors. Therefore, angle θ is

(a) 90° .

(b) 30° .

(c) 45° .

(d) 60° .

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76) Consider the points A(a, b+c), B(b, c+a) and C(c, a+b). The area of ΔABC is

- (a) $2(a^2 + b^2 + c^2)$.
- (b) $\frac{a^2 + b^2 + c^2}{6}$.
- (c) $2(ab + bc + ca)$.
- (d) none of these.

77) Plants with inferior ovary always bear

- (a) pseudocarps.
- (b) berries.
- (c) aggregate fruits.
- (d) seedless fruits.

78) Which of the following hydroxides on heating decomposes to liberate oxygen as one of the products?

- (a) Mercury hydroxide
- (b) Copper hydroxide
- (c) Sodium hydroxide
- (d) Zinc hydroxide

79) The set of annelid characters that are shared by leeches is (i) setae for locomotion, (ii) metameric segmentation, (iii) indeterminate number of segments, (iv) presence of clitellum, (v) hermaphroditism

- (a) (i), (iii), (iv) and (v).
- (b) (ii) and (v).
- (c) (i), (iii) and (v).
- (d) (ii), (iv) and (v).

80) Which of the following statements is INCORRECT?

- (a) Electric current is a scalar quantity.
- (b) Electric lines of force are closed curves.
- (c) Magnetic lines of induction are closed curves.
- (d) Changing magnetic field induces an electric current in a coil.

~~-X-~~

Physical constants you may need –

1. Charge on electron $e = 1.6 \times 10^{-19} \text{ C}$
2. Mass of an electron $m_e = 9.1 \times 10^{-31} \text{ kg}$
3. Universal gravitational constant $G = 6.67 \times 10^{-11} \text{ N m}^2 / \text{kg}^2$
4. Permittivity of free space $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 / \text{N m}^2$

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Rough Sheet

Rough Sheet
