BEYOND

PHYSICS **CHEMISTRY**

BIOLOGY **MATHEMATICS**

SCIENCE MOVEMENT

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PHYSICS

**Choose the correct alternative. Only One choice is Correct :**

1. A virtual image of same size as object is produced by :
   - **(A)** Convex mirror
   - **(B)** Concave mirror
   - **(C)** Plane mirror
   - **(D)** Concave lens

2. Angle of incident ray with normal is 30°. The incident ray after reflection will deviate though an angle :
   - **(A)** 60°
   - **(B)** 120°
   - **(C)** 120°
   - **(D)** 90°

3. The time taken by light to travel through a glass plate of thickness t and having refractive index n is : (c is the velocity of light).
   - **(A)** $\dfrac{t}{nc}$
   - **(B)** $\dfrac{t}{n^2 c}$
   - **(C)** $\dfrac{nt}{c}$
   - **(D)** $\dfrac{n^2 t}{c}$

4. An object is placed at a distance $\left(\dfrac{f}{3}\right)$ from a convex lens. The distance of image from the lens will be :
   - **(A)** f
   - **(B)** $\dfrac{3}{2}f$
   - **(C)** $\dfrac{f}{3}$
   - **(D)** $\dfrac{f}{2}$

5. In case of a converging lens :
   - **(A)** Image formed by it is always real
   - **(B)** The sun's rays can be brought to a focus
   - **(C)** Both faces of the lens must be of same radius
   - **(D)** It must not produce a virtual image

6. Light travel fastest in :
   - **(A)** Water
   - **(B)** Air
   - **(C)** Glass
   - **(D)** Diamond

7. A concave mirror forms the image of an object on a screen. If the lower half of the mirror is covered with an opaque card, the effect would be :
   - **(A)** The image is less brighter
   - **(B)** The lower half of the image disppears
   - **(C)** The upper half of the image disppears
   - **(D)** The image is more disppears

8. When light is refracted, which of its following properties does not change?
   - **(A)** Wavelength
   - **(B)** Frequency
   - **(C)** Speed
   - **(D)** Intensity

9. The image formed by a concave mirror is :
   - **(A)** Always real
   - **(B)** Always virtual
   - **(C)** Virtual for the object placed between pole and focus
   - **(D)** Virtual if the object is at infinity

10. Colour of light is determined by its :
    - **(A)** Speed
    - **(B)** Wavelength
    - **(C)** Frequency
    - **(D)** Intensity

11. Select the wrong statement :
    - **(A)** Light travels rectilinearly
    - **(B)** Light is a wave in nature
    - **(C)** Light has greater speed than sound in air
    - **(D)** Light cannot travel through vaccum

12. Light of two colours, A and B passed through a plane boundary. If A is bent more than B, then which colour travels more slowly in the second medium which is denser?
    - **(A)** B
    - **(B)** A
    - **(C)** Both travel with same
    - **(D)** Nothing can be said

13. Time taken by a ray of light to travel through glass slab of thickness 4 cm and refractive index 1.5 will be : (Take c, speed of light $= 3 \times 10^8$ m/s).

(A) 10^{-8} sec   (B) 2×10^{-10} sec   (C) 2×10^{-8} sec   (D) 10^{-12} sec

14. For a ray, incident at an angle $45°$ on a plane mirror the deviation produced in its path will be :

(A) $45°$ (B) $90°$ (C) $120°$ (D) $150°$

15. An object is initially at a distance of $160\,cm$ from a plane mirror. If the mirror approaches the object at a speed of 10 cm/s. Then after $4s$ the distance between the object and its image will be :

(A) $320\,cm$ (B) $280\,cm$ (C) $240\,cm$ (D) $120\,cm$

16. An object is placed between two plane mirrors inclined at $30°$ to each other. The maximum number of image seen for an object placed between them, will be :

(A) 10   (B) 11   (C) 12   (D) Infinite

17. A concave mirror of radius of curvature R produces a real image n times the size of the object, then distance of the object from the mirror is :

(A) $-2(n-1)R$ (B) $\dfrac{-(n-1)}{2n}R$ (C) $\dfrac{-(n+1)R}{2n}$ (D) $\dfrac{-(n+1)}{2}R$

18. A person standing in front of a mirror find his image larger than himself. It implies that the mirror is :

(A) Plane mirror   (B) Convex mirror   (C) Concave mirror   (D) Any one of these

19. Convex mirror forms inverted image of a real object.
(A) Under no circumstances
(B) When the object is very far from the mirror
(C) When object is at distance equal to focal length
(D) When object is at distance equal to radius of mirror

20. An object is placed at a distance $4.5\,m$ from the convex mirror of radius of curvature $1m$, then :
(A) Image is $1/10$ in size of object   (B) Image is virtual and erect
(C) Image is at $45\,cm$ behind the mirror   (D) All of these

21. If for a sphereical mirror object distance is u, image distance is v and focal length is f then correct relation for magnified m is:

(A) $m = \dfrac{f-v}{f}$ (B) $m = \dfrac{f}{f-v}$ (C) $m = \dfrac{f-u}{f}$ (D) $m = \dfrac{f}{f+u}$

22. The nature of the image of a candle flame located $40\,cm$ from a concave spherical mirror is real, inverted and magnited four times. Then the radius of curvature of the mirror is :

(A) $32\,cm$ (B) 64 cm   (C) $48\,cm$ (D) $80\,cm$

23. A convex lens is made up of three different materials as shown in the figure. For a point object placed on its axis, the number of images formed are :

(A) 1   (B) 3

(C) 4   (D) 5

24. Nine images are formed when two mirrors are held at an angle.

(A) $30°$ (B) $60°$ (C) $45°$ (D) $36°$

25. For real extended objects if the image formed by a single lens, is erect, then image :

(A)   Must be real   (B)   May be real   (C)   Must be virtual   (D)   May be real or virtual

26. For real extended object, if the image formed by a single lens is inverted, then :

(A)   Image is real   (B)   Lens is convergent

(C)   Image is either diminished or enlarged   (D)   All of these

27. Two plane mirrors A and B are aligned parallel to each other, as shown in the figure. A light ray is incident at an angle $30°$ at a point just inside one end of A. The plane of incidence coincides with the plane of the figure. The maximum number of times the ray undergoes reflections (including the first one) before it emerges out is :
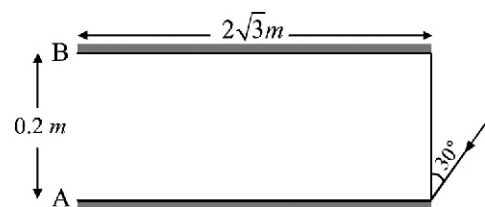
(A)   28   (B)   31

(C)   32   (D)   34

28. A ray of light is incident on a glass slab ($n_g = 1.5$), thickness t, in such a manner that the angle of refraction is $30°$, then the sine of angle of incidence will be :

(A) $\left(\dfrac{\sqrt{3}}{4}\right)$ (B) $\left(\dfrac{\sqrt{3}}{2}\right)$ (C) $\left(\dfrac{3}{4}\right)$ (D) $\left(\dfrac{3\sqrt{3}}{8}\right)$

29. Why is refractive index of any transparent medium other than air greater than one?

(A)   Because the speed of light in vacuum is always less than its speed in a transparent medium.

(B)   Because the speed of light in vacuum is always greater than its speed in a transparent medium.

(C)   Frequency of wave changes when it crosses the medium.

(D)   Because speed of light in transparent medium does not change.

30. What change will occur in an image produced by a lens, if half of the lens is wrapped in a black paper?

(A)   The size of the image will be reduced to one half   (B)   The brightness of image will be reduced.

(C)   There will be no effect.   (D)   The image will disappear.

31. In the figure, there are two convex lenses L_1 and L_2 having focal length f_1 and f_2 respectively. The distance between L_1 and L_2 will be :
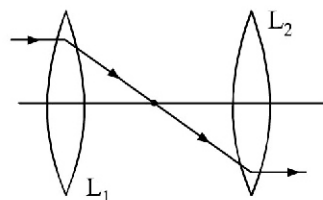
(A) f_1 (B) f_2

(C) $f_1 + f_2$ (D) $f_1 - f_2$

32. A convex lens and a concave lens, each having same focal length of 25 cm are placed coaxially in close contact to form a combination of lens. The power of the combination will be :

(A)   25 dioptre   (B)   50 dioptre   (C)   Zero   (D)   Infinite dioptre

33. A convex lens is made of two different materials as shown in the figure. A beam of light is coming from ∞ as shown. Which of the following is true?
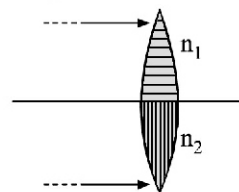
(A)   Two images are formed

(B)   Continuous image is formed between focal point of lower lens and infinity

(C)   One image is formed

(D)   No image is formed

34. When a plane mirror is rotated through an angle θ, then the reflected rays rotate through an angle 2θ. The size of the image.

(A) Becomes half (B) Double (C) Remains unchanged (D) is quadrupled

35. A light of wavelenght λ gets refracted from vacuum to a medium of refractive incdex n. The ratio of wavelengths of incident and refracted wave is :

(A) $1:n$ (B) $1:1$ (C) $n:1$ (D) $n^2:1$

36. A convex lens of focal length f produces a real image $1/n$ times of the size of the object. The distance of the object from the lens is :

(A) $\dfrac{f}{n}$ (B) nf (C) $(n-1)f$ (D) $(n+1)f$

37. A real, inverted and image of same size as of object is formed when the object is place x at cm from a concave mirror, then x is equal to : [when f is focal length, R is radius of curvature]

(A) f (B) R (C) $f/2$ (D) $R/4$

38. A glass rod of refractive index 1.42 is immersed in kerosene. The refractive index of kerosene is 1.42. Then the rod will:

(A) appear bent (B) appear raised above the liquid
(C) become invisible (D) None of the above

39. An object of height 6 cm is placed on the principal axis of a concave mirror of focal length f at a distance of 4f. The length of the image will be :

(A) 2 cm (B) 12 cm (C) 4 cm (D) 1.2 cm

40. The magnification of an object placed in front of a convex lens of focal length 20 cm is +2. To obtain a magnification of –2, the object has to be moved a distance equal to :

(A) 10 cm (B) 30 cm (C) 20 cm (D) 40 cm

CHEMISTRY

1. Modern periodic law is based on :
   (A) Atomic Number   (B) Atomic Mass
   (C) Electrons   (D) All of these

2. Which element has electronic configuration of 2, 8, 3 :
   (A) Sodium   (B) Magnesium
   (C) Silicon   (D) Aluminium

3. Modern Periodic table has :
   (A) 6 periods   (B) 7 periods
   (C) 8 periods   (D) None of these

*4. Which of the following is a metalloid :
   (A) Si   (B) Sn
   (C) Sb   (D) Ga

5. What is the valency of carbon :
   (A) 2   (B) 3
   (C) 4   (D) 1

6. Which of the following has the maximum size :
   (A) Li   (B) Na
   (C) K   (D) H

7. Which of the following has smallest size :
   (A) K   (B) Ca
   (C) Br   (D) Kr

8. How many maximum number of electrons can M-shell hold ?
   (A) 8   (B) 18
   (C) 10   (D) 2

9. Which of the following is not a Dobereiner triad :
   (A) Ca, Sr, Ba   (B) Cl, Br, I
   (C) Li, Na, K   (D) Be, Mg, Ca

10. In Modern periodic table, metallic character :
   (A) Decreases on moving left to right
   (B) Increases on moving left to right
   (C) Decreases on moving top to bottom
   (D) Option (A) and (C)

11. Upto which elements, the law of octaves was found to be applicable ?
   (A) Oxygen   (B) Calcium
   (C) Cobalt   (D) Potassium

12. According to mendeleev's periodic law, the elements were arranged in the periodic table in the order of :
   (A) Increasing atomic number
   (B) Decreasing atomic number
   (C) Increasing atomic masses
   (D) Decreasing atomic masses

13. In Mendeleev's periodic table, gaps were left for the elements to be discovered later. Which of the following elements found a place in the periodic table later ?
   (A) Germanium   (B) Chlorine
   (C) Oxygen   (D) Silicon

14. Which of the following statement(s) about the modern periodic table are incorrect ?
   I. The elements in the modern periodic table are arranged on the basis of their decreasing atomic numbers.
   II. The elements in the modern periodic table are arranged on the basis of their increasing atomic masses.
   III. Isotopes are placed in adjoining group(s) in the periodic table.
   IV. The elements in the modern periodic table are arranged on the basis of their increasing atomic number.
   (A) Only I   (B) I, II and III
   (C) I, II and IV   (D) Only IV

15. Which of the following statements about the modern periodic table is correct ?
   (A) It has 18 horizontal rows know as periods
   (B) It has 7 vertical columns rows known as periods
   (C) It has 18 vertical column known as groups
   (D) It has 7 horizontal rows known as groups

16. Which of the given elements A, B, C, D and E with atomic number 2, 3, 7, 10 and 30 respectively belong the same period ?

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

(C) A, D, E   (D) B, D, E

17. The elements A, B, C, D and E have atomic number 9, 11, 17, 12 and 13 respectively. Which pair of elements belong to the same group ?

(A) A and B   (B) B and D

(C) A and C   (D) D and E

18. Where would you locate the element with electronic configuration 2, 8 in the modern periodic table ?

(A) Group 8   (B) Group 2

(C) Group 18   (D) Group 10

19. An element which is an essential constituent of all organic compounds belongs to :

(A) group 1   (B) group 14

(C) group 15   (D) group 16

20. Which of the following is the outermost shell for elements of period 2 ?

(A) K shell   (B) L shell

(C) M shell   (D) N shell

21. Which one of the following elements exhibit maximum number of valence electrons ?

(A) Na   (B) Al

(C) Si   (D) P

22. What type of oxide would Eka-aluminium form ?

(A) EO_3 (B) E_3O_2

(C) E_2O_3 (D) EO

23. Three elements B, Si and Ge are :

(A) metals   (B) non-metals

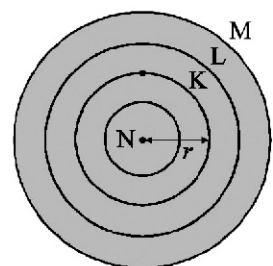(C) metalloids

(D) metal, non-metal and metalloid respectively

24. Which of the following elements will form an acidic oxide ?

(A) An element with atomic number 7

(B) An element with atomic number 3

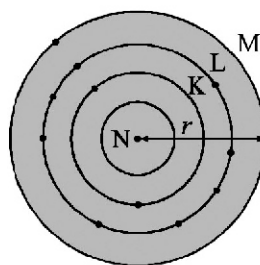(C) An element with atomic number 12

(D) An element with atomic number 19

25. Which one of the following depict the correct representation of atomic radius (r) of an atom ?
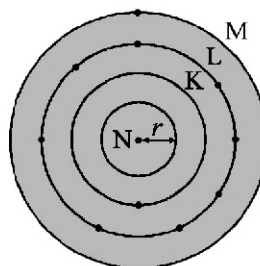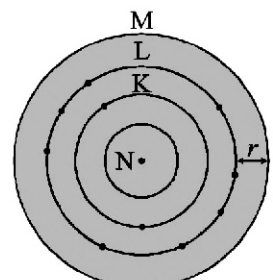

[i]   [ii]

[iii]   [iv]

(A) [i] and [ii]   (B) (ii) and (iii)

(C) (iii) and (iv)   (D) (i) and (iv)

26. Which one of the following does not increase while moving down the group of the periodic table ?

(A) Atomic radius

(B) Metallic character

(C) Valence electron

(D) Number of shells in an element

27. On moving from left to right in a period in the periodic table, the size of the atom :

(A) increases

(B) decreases

(C) does not change appreciably

(D) first decreases and then increases

28. Which of the following set of elements is written in order of their increasing metallic character ?

(A) Be, Mg, Ca   (B) Na, Li, K

(C) Mg, Al, Si   (D) C, O, N

29. Which of the following statements is not a correct statement about the trends when moving from left to right across the periods of periodic table.

(A) The elements become less metallic in nature

(B) The number of valence electrons increases

(C) The atoms lose their electrons more easily

(D) The oxides becomes more acidic

30. 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

31. Which of the following is a dobereiner's triad ?

(A) Ne, Ca, Na   **(B)** H_2, N_2, O_2

(C) Li, Na, K   **(D)** Na, Br, Ar

32. Name the scientist who gave the Law of octaves ?

(A) Mendeleev   **(B)** Newlands

(C) Dalton   **(D)** Dobereiner

33. Mendeleev's periodic table is based on the :

(A) atomic weight   **(B)** Atomic number

(C) Atomic radius   **(D)** Atomic volume

34. Which of the following is not an inert gas ?

(A) helium (He)   **(B)** Argon (Ar)

(C) Bromine (Br)   **(D)** Radon (Rn)

35. When we move from left to right across a period, the electron affinity :

(A) remains the same   **(B)** approaches zero

(C) decreases   **(D)** increases

36. Which element still has dicey position in modern periodic table ?

(A) Carbon   **(B)** Nitrogen

(C) Oxygen   **(D)** Hydrogen

37. The law of triads is not applicable on :

(A) Cl, Br, I   **(B)** S, Se, Te

(C) Na, K, Rb   **(D)** Ca, Sr, Ba

38. Which of the following elements is a semi-metal ?

(A) Aluminium   **(B)** Chlorine

(C) Sodium   **(D)** Sillicon

39. Which group of elements in modern periodic table is referred 'alkali metals' ?

(A) Group 1   **(B)** Group 2

(C) Group 17   **(D)** Group 18

40. Group 17 elements are also called as :

(A) Alkali Metals   **(B)** Alkaline Earth Metals

**(C)** Halogens   **(D)** Noble Gases

BIOLOGY

1. A plant placed near a window bends outward because
   (A) its tip is able to obtain more light
   (B) its tip is able to receive necessary warmth
   (C) the auxin content on the shaded side is higher than that on the lighter side and as a result the shaded side elongate more than the cells on the illuminated side and the tip bends outward.
   (D) its tip is able to get more oxygen

2. Phototropic and geotropic movements in plants have been traced to be linked with
   (A) enzymes   (B) starch
   (C) gibberellins   (D) auxins

3. Phototropic movements of roots and stems are due to :
   (A) action of gravity
   (B) effect of light
   (C) differential hormonal effect
   (D) epinasty and hyponasty

4. Bending of growing shoot towards sunlight is called
   (A) thigmotropism   (B) hydrotropism
   (C) photonasty   (D) phototropism

5. Clinostat is the apparatus, which is used to :
   (A) measure growth of stem
   (B) eliminate the effect of gravity causing geotropism
   (C) identify the chemicals present in stem tip
   (D) measure growth rate

6. Thigmotropism is best exhibited by :
   (A) tendrils   (B) stem apex
   (C) root apex   (D) leaf apex

7. Pneumatophores are :
   (A) positive geotropic
   (B) negative phototropic
   (C) thigmotropic
   (D) ageotropic

8. Indian telegraph plant commonly known as :
   (A) Desmodium gyrans
   (B) Crotolaria juncea
   (C) Butea monosperma
   (D) Malva indica

9. The closure of lid of pitcher in pitcher plant is :
   (A) a paratonic movement
   (B) a tropic movement
   (C) a turgor movement
   (D) an autonomous movement

10. Auxanometer is meant for :
    (A) photosynthetic activity
    (B) growth activity
    (C) the amount of auxins
    (D) respiratory activity

11. Movements of leaves of the sensitive plant Mimosa pudica is due to :
    (A) thermonasty   (B) seismonasty
    (C) photonasty   (D) nyctinasty

12. Which of the following movements in plants is NOT related to changes in auxin levels?
    (A) Nyctinastic leaf movements
    (B) Movement of roots towards soil
    (C) Movement of sunflower tracking the direction of sun
    (D) Movement of shoot towards light

13. Movement of hairs in Drosera is :
    (A) photonastic   (B) thermonastic
    (C) thigmonastic   (D) seismonastic

14. Leaves of many grasses are capable of folding and unfolding because they
    (A) are isobilateral
    (B) have specialised bulliform cells
    (C) have parallel vascular bundles
    (D) are very thin

15. Agent orange is a herbicide that contains synthetic
    (A) auxin   (B) cytokinin
    (C) gibberellins   (D) pigments

16. Avena coleoptile test to find out growth promoting hormones was performed by :
(A) Went (B) Lysenko
(C) Butler (D) Borthwick

17. Which of the following effects of auxins is of wide application :
(A) Induction of fruit development
(B) Induction of root initiation
(C) Prevention of abscission
(D) All of the above

18. Stem elongation is affected by :
(A) Gibberellin and florigen
(B) Auxin and gibberellin
(C) Florigen and kinin
(D) Kinin and auxin

19. Apical dominance means :
(A) Supression of growth of apical bud by axillary buds
(B) Supression of growth of axillary buds by the presence of apical bud
(C) Stimulation of growth of axillary buds by removal of apical bud
(D) Inhibition of growth of axillary buds by removal of apical bud

20. Which of the following is not natural occuring plant hormone :
(A) 2, 4-D (B) Cytokinin
(C) Gibbrellin (D) I.A.A

21. Parthenocarpy is the production of :
(A) Fruits with pollination
(B) Fruits without fertilization
(C) Seeds with fertilization
(D) Only seeds and no fruits

22. Phytohormone term was coined by :
(A) Gregory and Purvis
(B) F.W. Went (C) Thimann
(D) L.J. Audus

23. Cytokinin :
(A) Is a hormone whose main function is to induce the cell division
(B) Is the process of cell division
(C) Retards cell division
(D) Causes dormancy

24. Gibberellin was first extracted from :
(A) Gibberella (B) Gellidium
(C) Gracillaria (D) Aspergillus

25. Which of the following breaks the dormancy of seeds :
(A) IAA (B) GA
(C) Ethylene (D) All of the above

26. Abscisic acid induces :
(A) Shoot elongation
(B) Cell elongation and cell wall formation
(C) Cell division
(D) Leaf fall and dormancy

27. Which of the following is a hypothetical hormone:
(A) Gibberellin (B) Auxin
(C) Cytokinin (D) florigen

28. Which plant is LDP :
(A) Tobacco (B) Glycine
(C) Mirabilis (D) Spinach

29. Mimosa (touch me not plant) shows :
(A) Thigmotropism movement
(B) Chemotactic movement
(C) Thigmonasty
(D) Seismonasty

30. The two systems that regulate the activities of other systems of an animal are :
(A) nervous system and muscular system
(B) endocrine system and respiratory system
(C) nervous system and endocrine system
(D) muscular system and sense organs

31. In which direction does the nerve impulse travel once it is received by the receptor?
(A) Terminal branches, axon, cell body and dendrite
(B) Dendrite, axon, cell body and terminal braches
(C) Axon, dendrite, axon, cell body and terminal branches
(D) Cell body, axon, dendrite and terminal branches

32. The effect of myelin sheath on an impulse is :
(A) to affect the speed of the incoming impulse
(B) to moderate the speed of the incoming impulse

    (C)   to increase the speed of conduction of the impulse

    (D)   It is insulating material and has nothing to do with the speed of the impulse

33. At most of the synapses :

    (A)   an electric current jumps a gap

    (B)   there is contact between two neurons

    (C)   heat is produced

    (D)   neurohumors or neurohormones are released

34. Learning, abstract thinking, memory and behaviour of a person are governed by :

    (A)   cerebellum   (B)   cerebrum

    (C)   thalamus   (D)   medulla

35. The cerebellum is concerned with :

    (A)   coordination of muscular movements

    (B)   memorization of facts

    (C)   perception

    (D)   regulation of the working of the heart and lungs

36. Reflex action in a body is not :

    (A)   inborn

    (B)   automatic and quick

    (C)   protective in nature

    (D)   voluntary

37. The number of cranial nerves is :

    (A)   ten pairs in man and ten pairs in a toad

    (B)   thirteen pairs in man and ten pairs in a toad

    (C)   twelve pairs in man and ten pairs in a toad

    (D)   twelve pairs in man and twelve pairs in a toad

38. The following are not the functions of medulla of the brain :

    (A)   control of voluntary actions, memory and judgement

    (B)   respiration and coughing

    (C)   circulation and heart beat

    (D)   swallowing and vomiting

39. Neurotransmitter released by the terminal branches of neurons are :

    (A)   acetylcholine and noradrenaline

    (B)   sympathin and thyroxine

    (C)   acetylcholine and cholinesterase

    (D)   cholinesterse and noradrenaline

40. Maximum developed cerebrum is found in :

    (A)   sharks   (B)   rabbit

    (C)   man   (D)   whale

41. Dorsal nerve cord is characteristic of :

    (A)   earthworm   (B)   hydra

    (C)   amoeba   (D)   primates

42. The conditioned reflex was discovered by :

    (A)   Watson and Crick

    (B)   Pavlov

    (C)   Morgan

    (D)   Mendel

43. The main portion (s) of a neuron is(are) :

    (A)   cyton with dendrites

    (B)   axon with or without sheath

    (C)   terminal branch

    (D)   All of the above

44. Grey matter of the brain contains :

    (A)   cell bodies

    (B)   cell bodies with processes

    (C)   cell bodies with processes and a large number of synapses

    (D)   sensory and motor nerve cells

45. Hypothalamus controls the following function of the body, excluding :

    (A)   sleep

    (B)   body temperature

    (C)   osmoregulation

    (D)   analysis of stimuli received through sense organs

MATHEMATICS

01. (22, 48), (61, 76), (29, 34) are some pairs of distinct two digit numbers whose product ends with digit 6. How many such pairs are there?
(A) 477 (B) 315
(C) 549 (D) 405

02. The digits 1, 2, 3, 4 are used to generate 256 different 4-digits numbers. The sum of the 256 numbers is
(A) 71440 (B) 711040
(C) 704110 (D) 741040

03. Find the area in square centimeters of the shaded rectangle if all other shapes 1, 2, 3 in the large 9cm × 5cm rectangle are squares.
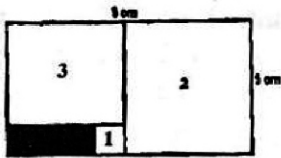
(A) 4 (B) 3
(C) 2 (D) 1.5

04. In the diagram PS = PQ and QS = QR. If $\angle SPQ = 80°$ then $\angle QRS$ equals
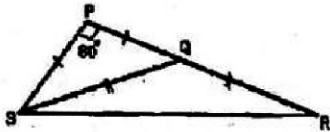
(A) 15° (B) 20°
(C) 25° (D) 30°

05. Three squares are joined together at the corners onto two vertical poles as shown aside. Find the value of x when the angles are given as shown.
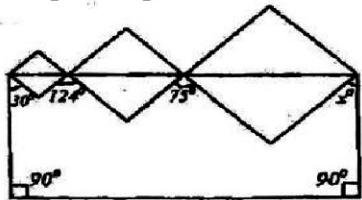
(A) 39 (B) 41
(C) 43 (D) 44

06. Numbers with two digits or more in which the digits reading from left to right occur in strictly increasing order are called as "sorted numbers". For example 125, 14 and 239 are sorted number while 255, 74 and 198 are not. Suppose that a complete list of sorted numbers is prepared and written in increasing order, the 100th number on this list is

(A) 389 (B) 356
(C) 345 (D) 258

07. In how many different ways can 3 children share eight identical sweets so that each child gets at least one?
(A) 21 (B) 24
(C) 36 (D) 45

08. Given that $(1 - x)(1 + x + x^2 + x^3 + x^4) = \dfrac{31}{32}$ and x is a rational number. Then $1 + x + x^2 + x^3 + x^4 + x^5$ is

(A) $\dfrac{31}{64}$ (B) $\dfrac{31}{32}$

(C) $\dfrac{63}{64}$ (D) $\dfrac{63}{32}$

09. Given $a + a^2 + a^3 + ... = \dfrac{5}{6}$

$a^2 + a^3 + a^4 + ... = \dfrac{25}{66}$

$b + b^2 + b^3 + ... = \dfrac{6}{5}$

$b^2 + b^3 + b^4 + ... = \dfrac{36}{55}$ then $a^2 - b^2$ is

(A) $\dfrac{-1}{11}$ (B) $\dfrac{1}{11}$

(C) $\dfrac{-1}{30}$ (D) $\dfrac{11}{30}$

10. The last two digits of $(2006)^{2005}$ is
(A) 16 (B) 36
(C) 76 (D) 96

11. A cone is made from a circular sector, by joining the two radii and the ratio of the radius and slant height of the cone is as 1 : 2. Then the angle of the sector from which the cone is made is
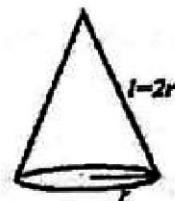
(A) 90° (B) 35°
(C) 180° (D) 70°

12. The number of prime numbers less than 100 which can be expressed as the sum of the square of two natural numbers is
(A) 11 (B) 12
(C) 16 (D) 20

13. Given the equation of the circle $x^2 + y^2 = 100$, the number of points (a, b) lying on the circle, where 'a' and 'b' are both integers is
(A) 2 (B) 4
(C) 8 (D) 12

14. In the adjoining figure P, M, Q and R are collinear points are PM = MQ = MS. It is also given $SR^2 = PR.QR$. Then
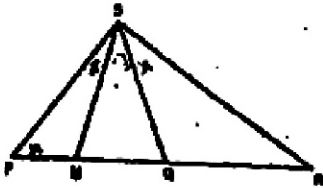
(A) $\angle QSR = \angle MSP$ (B) $\angle QSR = \angle MSQ$
(C) $\angle QSM = \angle PSM$ (D) $\angle SQR = \angle SMP$

15. Seven consecutive numbers are chosen. From these seven numbers, two numbers are chosen. What is the probability that the sum of the two numbers chosen is divisible by 7?
(A) $\dfrac{1}{7}$ (B) $\dfrac{2}{7}$
(C) $\dfrac{3}{7}$ (D) $\dfrac{4}{7}$

16. If two successive discounts of a% and b% are given on the sale of a certain article, the single equivalent discount is
(A) $a + b + \dfrac{ab}{100}$ (B) $a + b - \dfrac{ab}{100}$
(C) $a - b + \dfrac{ab}{100}$ (D) $a - b - \dfrac{ab}{100}$

17. In a triangle ABC, $\angle A = 30°, BC = 6\,cm$. Then the radius of the circum circle is
(A) 3 cm (B) 6 cm
(C) 8 cm (D) 4.5 cm

18. AB is the diameter of the circle. Then $\angle QPB$ is
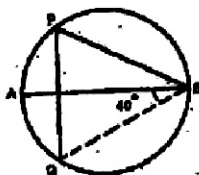
(A) 40° (B) 50°
(C) 60° (D) 30°

19. If $\dfrac{97}{19} = w + \cfrac{1}{x + \cfrac{1}{y + \cfrac{1}{v}}}$ where w, x, y are integers then w + x + y equals
(A) 16 (B) 17
(C) 18 (D) 19

20. PQRS is a common diameter of the there circles. The area of the middle circle is the average of the areas of the other two.
If PQ = 2 RS = 1 then the length of QR is
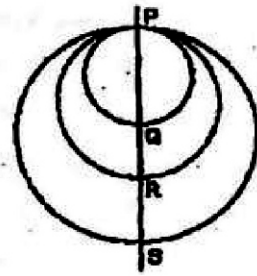
(A) $1 + \sqrt{6}$ (B) $\sqrt{6} - 1$
(C) 4 (D) 3

21. The positive numbers x and y satisfy xy = 1. The minimum value of $\dfrac{1}{x^4} + \dfrac{1}{4y^4}$ is
(A) $\dfrac{1}{2}$ (B) $\dfrac{5}{8}$
(C) 1 (D) no minimum

22. Of the points (0, 0), (2, 0), (3, 1), (1, 2), (3, 3), (4, 3) and (2, 4) at most how many can be on a circle?
(A) 5 (B) 3
(C) 4 (D) 6

23. How many of these expressions $x^3 + y^4, x^4 + y^3, x^3 + y^3$ and $x^4 - y^4$ are positive for all possible numbers x and y for which x > y?
(A) 1 (B) 0
(C) 2 (D) 3

24. The number of ordered pair of digits (A, B) such that A 3640548981270644 B is divisible by 99 is
(A) 3 (B) 2
(C) 1 (D) zero

25. These roots of the equation $x^5 - 40x^4 + Px^3 + Qx^2 + Rx + S = 0$ are in geometric progression. The sum of their reciprocals is 10. Then |S| is equal to
(A) 16 (B) 32
(C) 4 (D) 1

26. In a polygon there are 6 right angles and the remaining angles are all equal to $200°$ each. The number of sides of the polygene is
(A) 15 (B) 12
(C) 9 (D) 23

27. Two natural numbers differ by 41. The bigger number is greater than 30 times the smaller number plus 10. The smaller number is
(A) 11 (B) 2007
(C) 71 (D) 1

28. The value of,
$$\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{3^2}\right)\left(1-\frac{1}{4^2}\right)\cdots\left(1-\frac{1}{2007^2}\right) \text{ is}$$

(A) $\dfrac{2008}{2007}$ (B) $\dfrac{1004}{2007}$

(C) $\dfrac{2007}{2008}$ (D) 1

29. PQRS is a rectangle of area 2000 cm². Two lines parallel to the sides are drawn to cut the rectangle into four rectangels of areas A, B, C, D. Given A = 1000 cm², B = 500 cm², C = 300 cm², D = 200 cm² which of the following is possible?
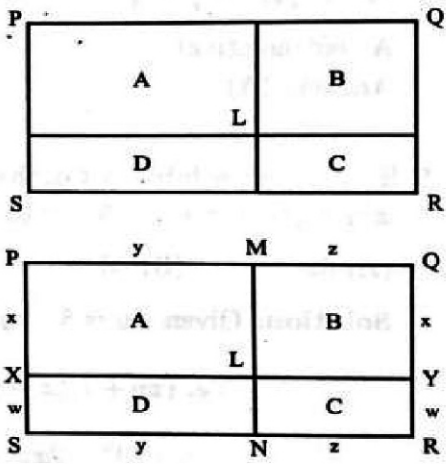
(A) Such a division is not possible
(B) Exactly two such divisions are possible
(C) At least two such divisions are possible
(D) In such a division the point L lies on one of the diagonals

30. If (x, y) is a solution set of the system of equations $xy = 8$ and $x^2y + y^2x + x + y = 54$, then $x^2 + y^2 =$
(A) 62 (B) 46
(C) 20 (D) 100

31. The number of natural numbers n for which
$$\frac{15n^2 + 8n + 6}{n} \text{ is a natural number is}$$
(A) 8 (B) 2
(C) 3 (D) 4

32. If a, b, c are real; $a \neq 0, b \neq 0, c \neq 0$ and $a+b+c \neq 0$ and $\dfrac{1}{a}+\dfrac{1}{b}+\dfrac{1}{c}=\dfrac{1}{a+b+c}$ then (a + b) (b + c) (c + a) =
(A) 1 (B) 3 abc
(C) 0 (D) abc

33. In a rectangle the length is x units more than its breadth. If its length is increased by y units and its breadth is decreased by z units, the area is unaltered. The breadth of the rectangle is

(A) $\dfrac{(x+y)z}{y-z}$ (B) $\dfrac{x}{x-y}$

(C) $\dfrac{(x-y)z}{y+z}$ (D) $\left(\dfrac{(x+y)z}{y-x}\right)$

34. Two circles touch internally at A. AOB is the diamter of the bigger circle of centre O. OPQ is a tangent to the smaller circle. APL is a straight line. If $\angle BOL = 42°$, then $\angle LOQ =$
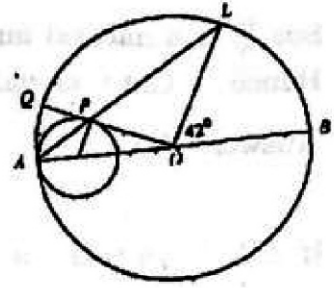
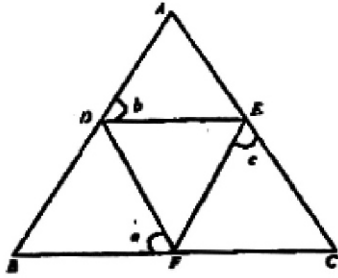(A) 84° (B) 104°
(C) 90° (D) 117°

35. The units digit of $3^{2007} \times 7^{2008} \times 13^{2009}$ is
(A) 3 (B) 1
(C) 9 (D) 7

36. a, b, c, d are four distinct positive real numbers such that a > b, c < d, b > c and d < a. Then
(A) b < d < a always (B) d < b < a always
(C) d > c and d < b (D) a is the greatest always

37. In the adjoining figure, AB = AC. DEF is an equilateral triangle. Then
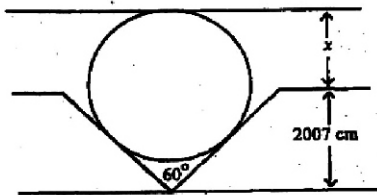

(A) $a + b + c = 108°$ (B) $a + b = 2c$

(C) $a = \dfrac{b+c}{2}$ (D) $a + c = 2b$

38. $x^{n+1} - x^n - x + 1$ is exactly divisible by $(x-1)^2$ if n is

(A) an odd positive integer
(B) an even positive integer
(C) an odd prime
(D) any positive integer

39. If a, b, c, d are non zero positive reals and $a + b + c + d = s$, then the minimum value of

$$\left(\frac{s}{a}-1\right)\left(\frac{s}{b}-1\right)\left(\frac{s}{c}-1\right)\left(\frac{s}{d}-1\right)$$ is

(A) 4   (B) S
(C) 81   (D) S^4

40. In the adjoining figure the diamter of the circle is 2007 cm. Then x is

(A) $\dfrac{2007}{2}$ cm   (B) $\dfrac{2007}{4}$ cm

(C) 2007 cm   (D) $\dfrac{2}{3} \times 2007$ cm

41. The number of real solutions of the equation $1 + x + x^2 + x^3 = x^4 + x^5$

(A) 1   (B) 5
(C) 4   (D) 3

42. A two digit number is increased by 20% when its digits are reversed. Then the sum of the digits of the number is

(A) 2   (B) 7
(C) 9   (D) 8

43. If a, b, c, d are positive integers such taht a = bcd, b = cda, c = abd and d = abc, the value of $(a+b+c+d)^4 / (ab+bc+cd+da)$ is

(A) 16   (B) 1

(C) 34   (D) $\dfrac{4^4}{3^2}$

44. a, b, c are three numbers satisfying the following conditions. (i) $abc \neq 0$ (ii) $a + b + c = abc$

(iii) $(a+b)(b+c)(c+a) \neq 0$ and (iv)

$\dfrac{a+b}{1-ab} + \dfrac{b+c}{1-bc} + \dfrac{c+a}{1-ca} = kabc$, then k =

(A) 0   (B) 1
(C) – 1   (D) 2

45. The sum of the fourth powers of the roots of the equation $x^3 - x^2 - 2x + 2 = 0$ is

(A) 1   (B) 5
(C) 9   (D) 13

46. If $\tan\theta$ and $\tan\phi$ are the roots of the quadratic equation $x^2 - Ax + B = 0$ and $\cot\theta$ and $\cot\phi$ are the roots of $x^2 - Cx + D = 0$ then CD =

(A) AB   (B) $\dfrac{1}{A-B}$

(C) $\dfrac{A}{B^2}$ (D) $\dfrac{A}{B}$

47. A,B,C can walk at the rates 3, 4 and 5 km an hour respectively. They start from a place at 1, 2, 3 hrs respectively. When B catches A, B sends him back with a message to C. At what time C gets the message?

(A) 5 hrs. 15 mts.   (B) 3 hrs. 30 mts.
(C) 6 hrs. 15 mts.   (D) 5 hrs. 45 mts.

48. The units digit of $(1 + 9 + 9^2 + 9^3 + ... + 9^{2007})$ is

(A) 1   (B) 9
(C) 0   (D) 8

49. The sides of a triangle are integers. The perimeter is 8. The area is

(A) $\sqrt{8}$ (B) 8
(C) 5   (D) 12

50. If x + y + z = 2007, xy + yz + zx = 4011 $x \neq 1$; $y \neq 1$; $z \neq 1$ then the value of $\dfrac{1}{1-x} + \dfrac{1}{1-y} + \dfrac{1}{1-z}$ is

(A) 1   (B) 2008

(C) $\dfrac{1}{2008}$ (D) 0

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