Primrose Schools

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NATIONAL PRIMTALENT OLYMPIAD EXAMINATIONS

SCIENCE

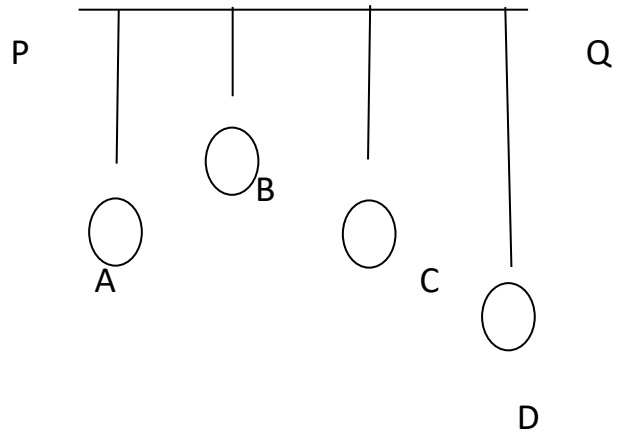
CLASS 10	
	Name :
	Section :
	Roll no :

Guidelines for the Candidates	
1	Please check your Name, Class and Section on the OMR sheet provided to you.
2	In case, OMR sheet with your name is missing, please fill in information about yourself in the blank sheet provided before start of exam.
3	All questions are compulsory. There is no negative marking. Use of calculator is not permitted.
4	There is only **ONE** correct answer. Choose only ONE option for an answer.
5	To mark your choice of answers by darkening the circles in OMR sheet, use **HB Pencil or Blue/Black ball point pen** only.
6	Rough work should be done in the blank space provided in the booklet.
7	Return the OMR sheet to the invigilator at the end of the exam
8	Please fill in your personal details in space on the top of this page before attempting the paper

PHYSICS

SECTION A - LOGICAL REASONING

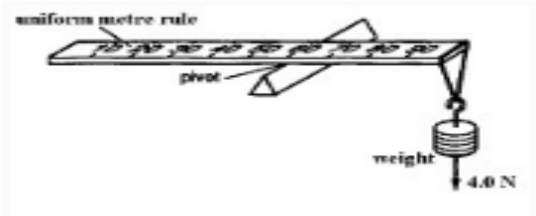
1 In the diagram below, A,B,C,D are four pendulums suspended from same elastic string PQ. The length of A and C are equal to each other while the length of pendulum B is smaller than that of D. Pendulum A is set into a mode of vibrations:



Name the type of vibrations taking place in pendulum B and C.

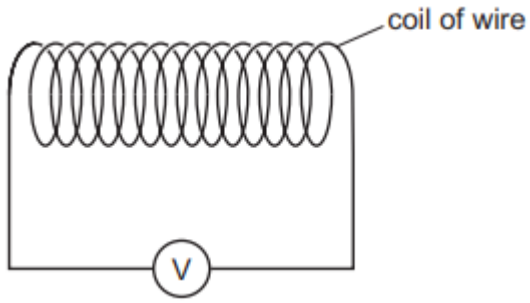
a) Pendulum B and C executes damped vibrations.
b) Pendulum B and C executes forced vibrations.
c) Pendulum B executes forced vibrations and C will be in a state of resonance.
d) None of the above.

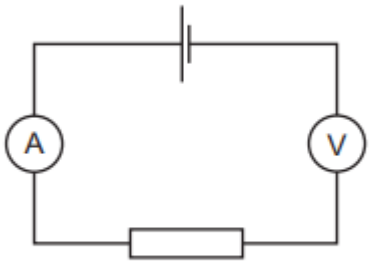
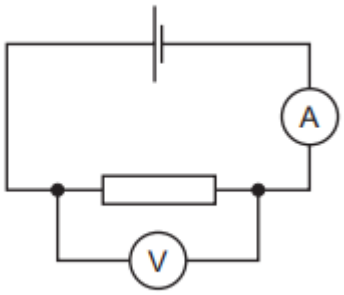
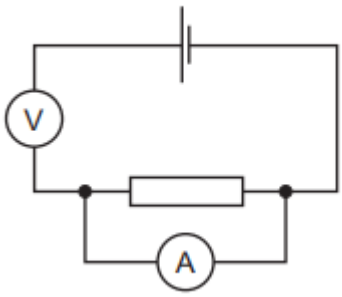
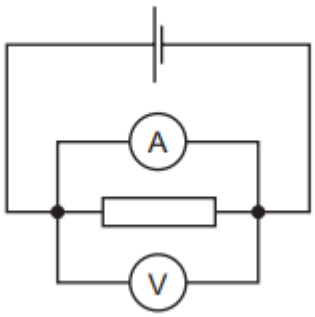
2

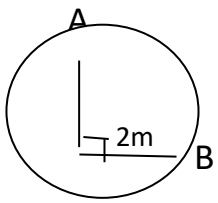


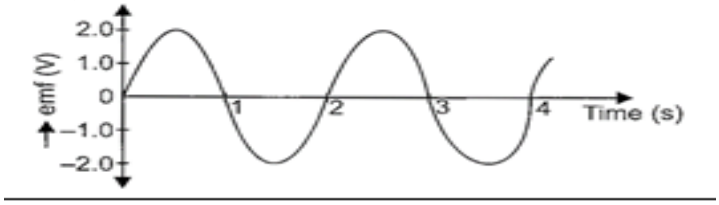
A uniform metre rule of weight 16.0 N is pivoted at the 60 cm mark. A 4.0 N weight is suspended from one end. At the instant when the rule is horizontal, what is the value of the resultant turning moment about the pivot?

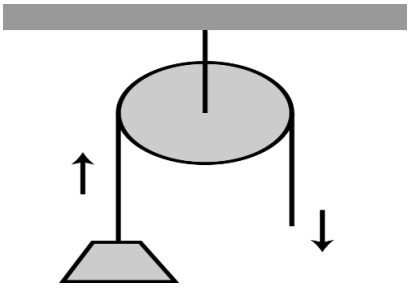
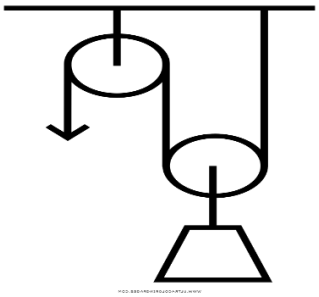
a) Zero
b) 160 Ncm anticlockwise
c) 160 Ncm clockwise
d) 20 N downward

3	Which class of lever found in the human body is being used by a boy: when he holds the load on the palm of his hand when he raises the weight of the body on his toes a) Class III and Class II Lever b) Class II and Class I Lever c) Both are same class levers d) Class III and Class I Lever
4	Dharshan claims to have obtained an image twice the size of the object with a concave lens. Is he correct? Which of the following statement is correct? a) No. Because concave lens produce highly diminished image. b) Yes. Because concave lens produce enlarged image c) No. Because concave lens produce image of same size. d) None of the above
5	Consider the following parts of spectra; 1-visible , 2-infra-red ,3- ultra-violet ,4-microwave Which one of the following is the correct sequence in which their wavelength increases? a) 4-3-1-2 b) 4-1-2-3 c) 3-2-1-4 d) 3-1-2-4
	SECTION B - EVERYDAY PHYSICS
6	A man at the bottom of a pool wants to signal to a person lying at the edge of the pool. The man should beam his water proof light-------- a) Vertically upwards b) at an angle to the vertical which is less than the critical angle c) at an angle to vertical which is equal to the critical angle d) at an angle to the vertical which is greater than the critical angle
7	The diagram shows a coil of wire connected to a voltmeter. 

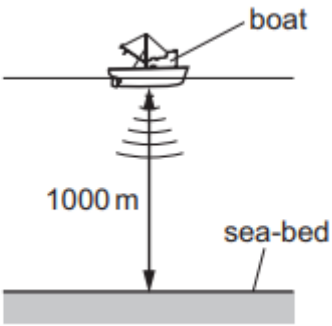
	A student has a magnet and an unmagnetised iron rod. How can an e.m.f. be induced across the coil? a) holding the magnet inside the coil b) holding the iron rod inside the coil c) pushing the magnet into the coil d) pushing the iron rod into the coil
8	A student wishes to determine the resistance of a resistor. She uses an ammeter and a voltmeter in a circuit. In which circuit are the ammeter and voltmeter connected correctly? A  B  C  D 
9	Write the following steps in a sequential order involved in the working of an electric bell. a.The armature is pulled towards the electromagnet. b.The soft iron behaves as an electromagnet c.The circuit breaks and the electromagnet loses the magnetic property. d.The hammer hits the gong. e.Armature goes back and the circuit gets closed. f.The process is repeated and the bell rings continuously g.The circuit is closed.

	a) a b g d e c f b) g b a d c e f c) g b a c d f e d) b a c d e f g
10	The rays that are unaffected by a magnetic field are---- a) Canal rays b) Gamma rays c) Cathode rays d) All the above
11	A source which is situated at the centre of a circle is producing sound. Then the change in frequency (f) of sound heard by two persons at 'A' and 'B' if they move with velocities 20 m/s and 10 m/s respectively along the circular path as shown in figure is ---------. (velocity of sound is 330m/s)  a)2f b) f c) zero d) None of these
12	When a person is walking on ground---- a) he applies a force on the ground b) The ground exerts a force on him. c) No force is applied by the person. d) Both (A) and (B)
13	A wire is placed between the magnetic poles as shown in the figure. In which direction does a force act on the wire?  a) Vertically downward on the wire b) Vertically upward on the wire c) Towards east to west d) Towards west to east

14	The following graph shows the displacement of the bob from its mean position versus time.The time period of the bob is---  a) 1 s b) 3 s c) 2 s d) 1.5 s
15	The efficiency of a machine is 50%. If 300 J of energy given to the machine, its output is: a) 150 erg b) 350 J c) 250 J d) 150 J
16	Which of the following diagrams shows correctly the refraction of light by a prism? 
17	What should you do to reduce the amount of effort needed to lift something using a first class lever? a) move the fulcrum closer to the effort b) move the fulcrum to the middle of the lever c) move the fulcrum closer to the load d) None of the above
18	When both length and area of cross section are doubled, the resistance a) increases by four times b) is doubled c) will become half d) will remain the same

19	A fuse wire is inserted in a ……. a) Live wire b) Neutral wire c) Earth wire d) In any line
20	To produce electric power at the atomic power station, the process used is a) nuclear fusion b) nuclear fission c) both A&B d) none of these
21	If we ignore friction, which of the following two pulleys systems will require less effort (force) to lift the load? A  B  a) Pulley A b) Pulley B c) Both Pulley A & Pulley B will require the same effort (force) d) Not enough information to decide
22	What happens to the current in short circuit? a) reduces substantially b) does not change c) increases heavily d) vary continuously

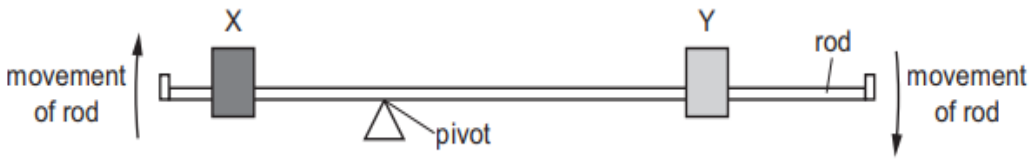
23	How much heat energy is gained when 5 kg of water at 20°C is brought to its boiling point (Specific heat of water = 4.2 kJ kg/K) a) 1680 kJ b) 1700 kJ c) 1720 kJ d) 1740 kJ
24	What is the momentum of ball that is moving at 6 m/s and having 96 J of kinetic energy? a) 900 kg.m/s b) 4 kg.m/s c) 8 kg.m/s d) 32 kg.m/s
25	How much power is required to raise a 30 kg mass to a vertical distance of 6 m in a time of 4 seconds? a)120 watt b) 52.5 watt c) 450 watt d)385 watt
26	**SECTION C - ACHIEVERS SECTION** A pulse of sound is produced at the bottom of a boat. The sound travels through the water and is reflected from the sea-bed. The sound reaches the boat again after 1.3s. The sea-bed is 1000m below the boat.



Using this information, what is the speed of sound in the water?

a) 769m/ s b) 1300m/ s c) 1538m/ s d) 2600m/

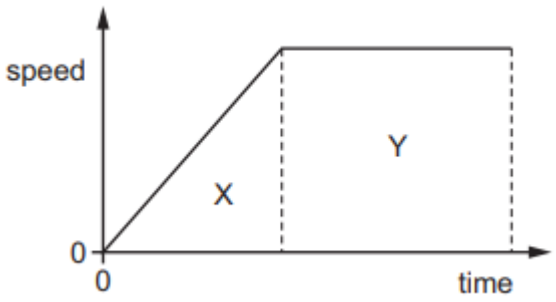
27 The diagram shows an unbalanced rod. Two loads X and Y can be moved along the rod.



The rod turns in a clockwise direction as shown. Which action could make the rod balance?

a) moving X to the left
b) moving X to the right
c) moving Y to the right
d) moving the pivot to the left

28 The diagram shows the speed-time graph for a car.



Which area represents the distance travelled while the car is accelerating?

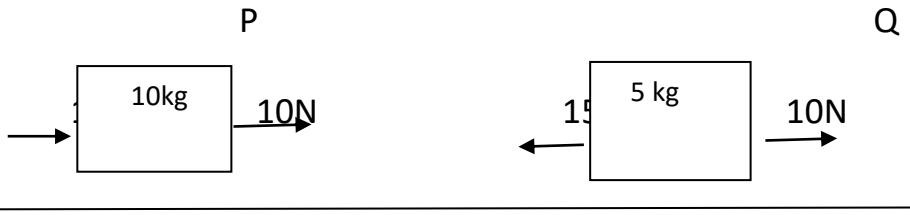
a) X

b) X + Y

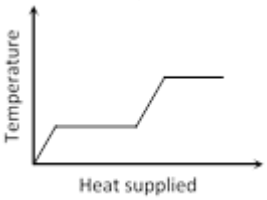
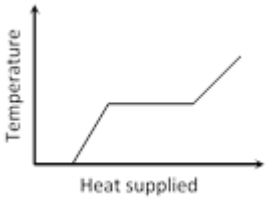
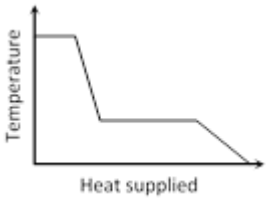
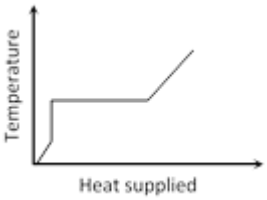
c) Y

d) Y – X

29 Two groups of students A and B with two students in each group, challenge to accelerate two bodies P and Q respectively placed on a frictionless surface as shown in the figure. Which group is successful in imparting more acceleration?



a) group A
b) group B
c) Both A and B
d) None of the above

30	A block of ice at -10°C is slowly heated and converted to steam at 100°C. Which of the following curves represent the phenomenon qualitatively? a)  c)  b)  d) 

CHEMISTRY

SECTION A – LOGICAL REASONING

31. Two signs in each equation have been interchanged. Find them out to get the right result:

(3×7)+(6+4)−(12÷4)=14

a) ×;+
b) −;+
c) ×;÷
d) ÷;+

32.If Akash says, Abhay's mother is the only daughter of my mother." How is Akash related to Abhay?

a) Brother
b) Father
c) Grandfather
d) Maternal Uncle

33. Read the paragraph carefully.

There are six women Shalini, Divya, Ritu, Rashmi, Nisha and Renu in a family of twelve members. There are few married couples in the family and none of the grandchildren ar

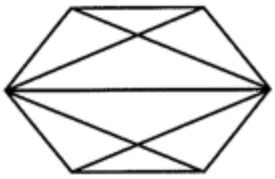
married. Sunil is married in to the family. Rohan, Mahesh and Jatin have a nephew Dipesh who is the only son of Rashmi. Ravi is the paternal grandfather of Nisha. Ritu is the daughter-in-law of Divya. Dipesh's only unmarried maternal uncle, Jatin is the brother-in-law of Sunil. Rohan is the paternal uncle of the Nisha. Ritu has two daughters one of whom is Nisha.

Based on above paragraph answer the given questions.

Dipesh is

a) Mahesh's son
b) Ravi's grandson
c) Rohan's son
d) Sunil’s nephew

34. Analyze the given figure and answer the given question that follow. What is the number of pentagons in the given figure?



a) 2
b) 3
c) 4
d) 6

35. What comes next?

13 17 111 115 119 ?

a) 129
b) 128
c) 127
d) 125

SECTION B – EVERYDAY SCIENCE

36. Observe the given reaction carefully and fill in the blanks by choosing an appropriate option.

$Fe(s)+CuSO_4(aq) \rightarrow FeSO_4(aq)+Cu(s)$

Before reaction, iron is (i) in colour and solution is (ii) in colour. After reaction iron gets (iii) deposits and the solution becomes (iv) in colour.

a)

(i)	(ii)	(iii)	(iv)
Grey	Colourless	Red	Blue

b)

(i)	(ii)	(iii)	(iv)
Red	Blue	Grey	Green

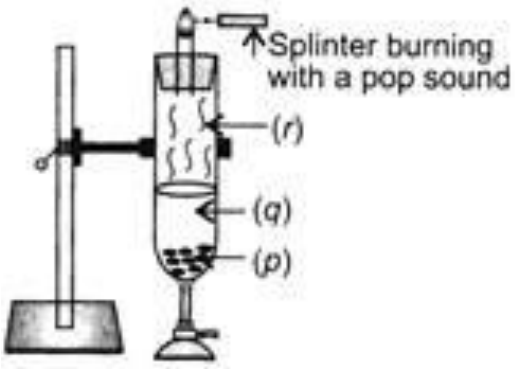
c)

(i)	(ii)	(iii)	(iv)
Grey	Blue	Brown	Green

d)

(i)	(ii)	(iii)	(iv)
Red	Colourless	Grey	Green

37. Observe the given figure carefully and identify the substances marked as (p), (q) and (r).



a)

(p)	(g)	(r)
Zinc	Water	Carbon dioxide

b)

(p)	(g)	(r)
Magnesium	Hydrochloric acid	Oxygen

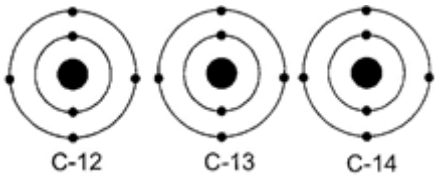
c)

(p)	(g)	(r)
Magnesium	Water	Carbon dioxide

d)

(p)	(g)	(r)
Zinc	Hydrochloric acid	Hydrogen

38. There are three isotopes of carbon which are named as C-12, C-13 and C-14 out of which C-12 is the most abundant isotope. In the given structures of three isotopes, what will be the composition of the nucleus?



a) C -12 : 6p + 6n, C - 13 : 7p + 6n, C - 14 : 8p + 6n

b) C - 12 : 6p + 6n, C -13 : 6p + 7n, C - 14 : 6p + 8n

c) C - 12 : 6p + 6n, C - 13 : 5p + 8n, C - 14 : 7p + 7n

d) C - 12 : 6p + 6n, C - 13 : 12p +1n, C - 14 : 5p + 9n

39. What is the ratio of the number of neutrons present in potassium and magnesium atoms with mass numbers 39 and 24 respectively?

a) 19:12
b) 5:3
c) 5:6
d) 4:3

40. A thin sheet of gold foil is bombarded with α-particles as in Rutherford's experiment. Which of the given descriptions most accurately represents the path of α-particles?

	Undeflected	No. of particles deflected through a small angle	No. of Particles deflected through a large angle
I.	All	None	None
II.	Most	A few	None
III.	Most	A few	A few
IV.	A few	Most	A few

a) I

b) II

c) III

d) IV

41. Which of the following elements liberate hydrogen on reacting with diluted nitric acid?

a) Zn and Mg

b) Mn and Sn

c) Mg and Mn

d) Mn and Fe

42. Which of the following ores are subjected to froth floatation?

a) Al_2O_3
b) ZnS
c) $CaCl_2$
d) KCl

43. Which acid is present in an apple?

a) Citric acid

b) Malic add

c) Tartaric acid

d) Formic acid

44. In the given equation, what does 'X' stand for?

$(2)Al + (x)H_2SO_4 \rightarrow Al_2(SO_4)_3 + (3)H_2$

a) 2
b) 3
c) 1
d) 5

45. Acidic hydrogen is present in

a) Ethyne

b) Ethene

c) Benzene

d) Ethane

46. IUPAC name of the compound $CH_3 - CO - \underset{Cl}{CH} - \underset{Br}{CH} - COOH$ is

a) 2-bromo-3-chloro-4-oxopentanoic acid
b) 4-oxo-3-chloro-2-bromopentanoic acid
c) 4-carboxybromo-3-chlorobutanone
d) None of these

47. Calculate the weight in grams present in 0.7 moles of sodium.

a) 16.1g
b) 16.2g
c) 16.3g
d) 0.161g

48. The concept that acid is proton donor and base is proton acceptor was given by

a) Arrhenius
b) Lowry-Bronsted
c) Lewis
s) Faraday

49. What is a solution of iodine in carbon tetrachloride called?

a) Aqueous solution
b) Alcoholic solution
c) Non-aqueous solution
d) Tincture of iodine

50. Which of the following obey the law of constant proportions in their formation?

a) Mixtures
b) Compounds
c) Elements
d) Colloid

51. A white solid 'A' on heating gives off a gas which turns lime water milky. The residue is yellow when hot but turns white on cooling. This solid 'A' is.

a) Zinc sulphate
b) Zinc carbonate
c) Lead sulphate
d) Lead carbonate

52. Upon the addition of a solution A to a strongly acidified solution of barium nitrate, a white precipitate was obtained which did not dissolve even after large addition of water. Solution A contained.

a) Sodium phosphate
b) Sodium carbonate
c) Sodium sulphate
d) Sodium chloride

53.Rusting of iron is catalysed by which of the following

a) Fe
b) O_2
c) Zn
d) H^+

54. Identify the type of product formed in the given chemical equation.

$$Pb(OH)_2+HNO_3 \rightarrow Pb(OH)NO_3+H_2O$$

a) An acidic salt
b) A basic salt
c) A base
d) An acid

55. Of all the three common mineral acids, only sulphuric acid is found to be suitable for making the solution acidic because
    a) It does not react with $KMnO_4$ or the reducing agent
    b) Hydrochloric acid reacts with $KMnO_4$
    c) Nitric acid is an oxidising agent which reacts with reducing agent
    d) All of the above are correct

SECTION C – ACHIEVERS SECTION

56. The oxidation number of sulphur in $H_2S_2O_7$ and iron in $K_4Fe(CN)_6$ is respectively
    a) + 6 and + 2
    b) + 2 and + 2
    c) + 8 and + 2
    d) + 6 and + 4

57. Which of the following contains alcoholic functional group?

a) CH_3OH

b) CH_2= CH-CH_2OH

c) CH_3- CH(OH)-CH_3

d) All of these

58. Which of the given chemical equations is balanced?
    a) $3Fe+4H_2O \rightarrow Fe_2O_4+4H_2$
    b) $KClO_3 \rightarrow KCl+O_2$
    c) $CaCO_3 \rightarrow CaO+CO_2$
    d) $Al_2O_3 \rightarrow Al_2O_3+CO_2$

59. Identify the correct increasing order of molecular weights of the given compounds.

a) $H_2O>H_2S>CO_2>SO_2$
b) $H_2O>H_2S>CO_2>SO_2$
c) $H_2O<H_2S<CO_2<SO_2$
d) $H_2O>H_2S>CO_2>SO_2$

60. Ferrous sulphate is commercially called

a) blue vitriol
b) green-vitriol
c) white vitriol
d) none of these

BIOLOGY

SECTION A – LOGICAL REASONING

61. Explain why non-woody plants wilt if they receive less water than lost in through transpiration

a) Turgidity
b) Lose Water
c) Wilt
d) Only a and b

62. Bat can fly but it is not a bird. Why?
a) Viviparous with hairs
b) Viviparous with feathers
c) Oviparous with hairs
d) Oviparous with feathers

63. Excessive sprinkling of salt in a playground kills the weed. How?

a) Root pressure b) Plasmolysis
c) Turgor pressure d) Imbibition

64. Buffalo is a cross between
a) Bison x Buffalo b) Bison x cow

c) Buffalo x cow d) None of the above

65. People living at a height of 4,200m and above increase their RBC's by nearly 30%, because efficiency of breathing is

a) High b) less
c) Medium d) None of the above.

SECTION B – EVERYDAY SCIENCE

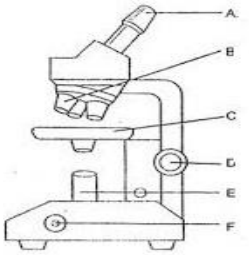
66. Maximum transpiration occurs in ___
    a) Xerophytic Plants
    b) Mesophytic Plants
    c) Algal Cells
    d) Hydrophytic Plants

67. Which of the following tissues includes blood and adipose tissue?
    a) Nervous tissue
    b) Muscle tissue
    c) Epithelial tissue
    d) Connective tissue

68. Which of the cell organelles carry out the function given below?
    Mechanical support, Enzyme circulation, Protein synthesis, Detoxification of drugs

    a) Ribosomes
    b) Chloroplast
    c) Mitochondria
    d) Endoplasmic reticulum

69. Which labelled part magnifies the object under examination?



    a) Only B
    b) Only A
    c) Only B and A
    d) Only C and B

70. Function of Liver is ___

a) Absorption
b) Circulation
c) Deamination
d) Transportation

71. What is the importance of allowing direct sunlight to enter the living room in a house____

a) keeps room pleasant
b) kills microbes
c) increases the air
d) None of the above

72. An apparatus to compare the rate of transpiration in cut shoots.
a) Bell Jar
b) Ganong's Potometer
c) Ganong's Photometer
d) None of the above

73. A plant is kept in a dark cupboard for about 48 hours before conducting any experiment on
photosynthesis to _____
a) remove chlorophyll from leaves
b) remove starch from the plant
c) ensure that no photosynthesis occurs
d) ensure that leaves are free from starch

74. The fluid that is present inside and outside the brain.
a) Cerebrospinal fluid.
b) Fluid
c) Lymph
d) Blood

75. Chromosomal constitution of a cell or an individual is _____
a) Loci
b) Variations
c) Gene

d) DNA

76. Lime stone can absorb CO2 from atmosphere. But it cannot be used to control CO2 pollution. Why?
    a) Technology is still being developed.
    b) Not available on a commercial scale yet
    c) Both a and b
    d) None of the above

77. Hormones are proteins.
    a) Yes
    b) No

78. Which hormone prepares the body for fight or flight?
    a) Thyroxine
    b) adrenaline
    c) insulin
    d) somatostatin

79. When pregnancy does not occur , the life of corpus luteum is about _____
    a) 4 days
    b) 10 days
    c) 14 days
    d) 28 days

80. One of the examples of radiation pollutants in daily life is _____
    a) Sulphur dioxide
    b) Ozone
    c) Iodine 131
    d) Discard fused electric bulbs

81. Nephrons pour their excretory products in the _____
    a) Collecting tubules
    b) kidneys
    c) Uriniferous tubule
    d) ureters

82. Light is necessary in the process of photosynthesis.
    a) Split carbon dioxide
    b) Produce ATP and reducing substance
    c) Release energy

d) Combine carbon dioxide and water

83. The world population day is on _____
    a) June 11
    b) July 11
    c) August 11
    d) September 11
84. Rods and cones are located in

    a) Retina
    b) Choroid
    c) sclera
    d) cornea

85. What prevents the back flow of blood inside the heart during contraction?
    a) Thin wall of atrium
    b) Thick , muscular wall of ventricle
    c) Valves present in heart
    d) All of them

SECTION C – HIGHER ORDER THINKING

86. Nutritional anemia means
    a) tiredness
    b) swollen joints
    c) tooth decay
    d) bone deformation

87. If the whole of the topsoil is washed down, erosion is said to be
    a) sheet erosion
    b) gully erosion
    c) shelter wash off
    d) wind erosion

88. To view distant object the lens of the eye becomes
    a) More convex
    b) Less convex
    c) More concave
    d) Less concave

89. How many erythrocytes does one cubic mm of blood contain?
    a) 2 to 5 million
    b) 5 to 7 million
    c) 7 to 10 million
    d) 6 million

90. Which is responsible for dynamic equilibrium of the body?
    a) Cochlea
    b) Utriculus
    c) Sacculus
    d) Semicircular canals