SEAL

DO NOT OPEN THE SEAL UNTIL INSTRUCTED TO DO SO

Test Booklet Number	Subject Code : 2501	Roll Number
00485	**MATHEMATICS AND SCIENCE**	

Time Allowed : 2 Hours **Maximum Marks : 300**

INSTRUCTIONS FOR CANDIDATES

Read the following instructions carefully before you answer the questions given in this Test Booklet :

1. Answers to questions in this Test Booklet are to be given on an **OMR Answer Sheet** provided to the candidate **separately**.
2. Candidate must fill up Name, Category, Test Booklet Number, Subject Code and Roll Number in the **OMR Answer Sheet** carefully as per instructions given.
3. This Test Booklet consists of **75 questions**. **All** questions are compulsory and carry equal marks.
4. Each question in this Test Booklet has four possible alternative answers namely, [A], [B], [C] and [D], one of which is correct. Candidate should choose the correct answer against each question out of four alternative answers.
5. Candidate is instructed to answer the questions by **darkening (●)** with **Ballpoint pen** only in the circle bearing the correct answer.
6. Candidate should not attempt more than one answer in each question. More than one attempt in any form against a question shall be treated as incorrect.
7. Marking of answer other than darkening shall be cancelled and darkening should remain within the circle otherwise computer shall not accept during evaluation of the **OMR Answer Sheet.**
8. Rough work must not be done on the **OMR Answer Sheet.** Use the blank space given in this Test Booklet for rough work.
9. Candidate is to hand over the **OMR Answer Sheet** to the Invigilator before leaving the Examination Hall.
10. **NEGATIVE MARKING** : Each question carries **4 (four)** marks for correct response. For each incorrect response, **1 (one)** mark will be deducted from the total score. More than one answer indicated against a question will be deemed as incorrect response and will be negatively marked.

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SPACE FOR ROUGH WORK

MATHEMATICS

1. The largest positive integer that will divide 123, 229 and 305 leaving remainders 3, 4 and 5 respectively is :

   [A] 30

   [B] 15

   [C] 18

   [D] 17

2. The factors of $a^2 + b - ab - a$ are :

   [A] $(a - 1)(a - b)$

   [B] $(a - 1)(a + b)$

   [C] $(a + 1)(a - b)$

   [D] $(a + 1)(a + b)$

3. If one zero of the polynomial $p(x) = (k^2 + 4)x^2 + 16x + 4k$ is reciprocal of the other, then k is equal to :

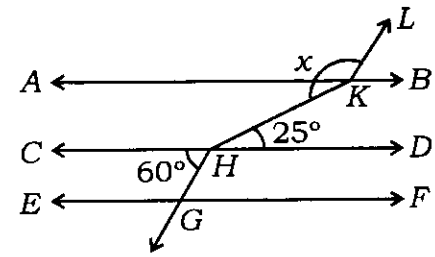
   [A] 2

   [B] –2

   [C] 1

   [D] –1

4. In the given figure, $AB \| CD \| EF$ and $GH \| KL$. If $\angle CHG = 60°$, $\angle KHD = 25°$ and $\angle HKL = x°$, then the value of x is :



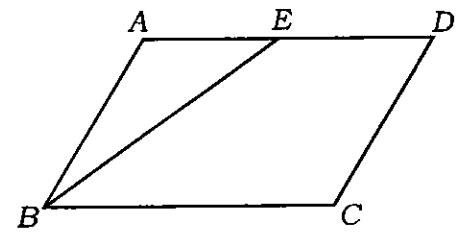
   [A] 85°

   [B] 145°

   [C] 120°

   [D] 95°

5. In the given figure, $ABCD$ is a parallelogram and E is the mid point of AD, then if $ar(\Delta ABE) = k\ ar(ABCD)$, find k.



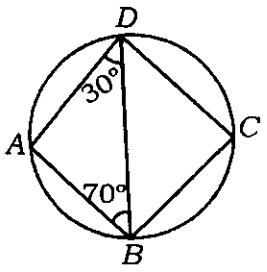
   [A] $\frac{1}{2}$

   [B] 4

   [C] 3

   [D] $\frac{1}{4}$

6. In the given figure, $\angle ADB = 30°$ and $\angle ABD = 70°$, then $\angle BCD$ is equal to



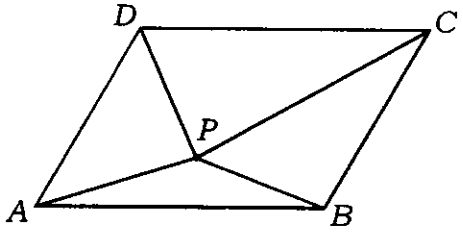
[A] 90°

[B] 80°

[C] 100°

[D] 120°

7. In the given figure, P is a point in the interior of parallelogram $ABCD$. If ar($ABCD$) = 60 cm^2, then ar(ΔADP) + ar(ΔBPC) =



[A] 15 cm^2

[B] 30 cm^2

[C] 45 cm^2

[D] 20 cm^2

8. A hemisphere of inner diameter 18 cm is full with a liquid which is to be poured into cylindrical bottles each of diameter 3 cm and height 4 cm. The number of bottles required are :

[A] 50

[B] 54

[C] 45

[D] 60

9. The mean of five numbers is 27. If one of the numbers is excluded the mean gets reduced by 2. The excluded number is :

[A] 35

[B] 27

[C] 25

[D] 40

10. If a quadrilateral has two adjacent sides equal and the other two sides equal, then it is called, a :

[A] parallelogram

[B] square

[C] rectangle

[D] kite

11. The point on x-axis equidistant from (5, 4) and (–2, 3) is

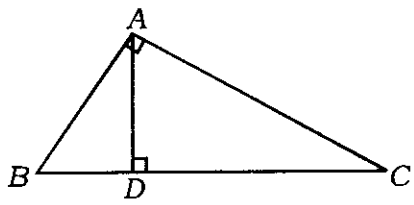
[A] (3, 0)

[B] (2, 0)

[C] (0, 2)

[D] (4, 0)

12. In ΔABC, $AD \perp BC$ and $\angle A$ is a right angle. Then AD^2 is equal to :



[A] $AB \times AC$

[B] $BD \times CD$

[C] $BC \times AC$

[D] $AB \times BC$

13. 3 men and 6 boys can finish a piece of work in 3 days, while 2 men and 5 boys can finish it in 4 days. The time taken by one boy alone to finish the work is

[A] 18 days

[B] 36 days

[C] 24 days

[D] 20 days

14. The areas of two similar triangles are 196 sq.cm and 169 sq.cm. If the median of first triangle is 4 cm, then the median of other triangle is (in cm) :

[A] 7.31

[B] 1.73

[C] 3.71

[D] 1.37

15. The length of shadow of a tower is $\sqrt{3}$ times that of its length. The angle of elevation of sun at that moment is :

[A] 45°

[B] 60°

[C] 30°

[D] 40°

16. The area of a rhombus is 96 sq.cm and one of its diagonals is 12 cm. The perimeter of the rhombus is

[A] 80 cm

[B] $8\sqrt{13}$ cm

[C] 40 cm

[D] 48 cm

17. Which term of the AP 24, 21, 18, 15, ... is the first negative term?

[A] 8th

[B] 10th

[C] 12th

[D] 6th

18. The area of the largest triangle that can be inscribed in a semicircle of radius r cm is

[A] $2r$ cm^2

[B] $2r^2$ cm^2

[C] $\frac{1}{2}r^2$ cm^2

[D] r^2 cm^2

19. A hollow sphere of internal and external diameters 4 cm and 8 cm respectively, is melted to form a cone of base diameter 8 cm. The height of the cone (in cm) is :

[A] 14

[B] 13

[C] 12

[D] 16

20. The probability for a randomly selected number out of 1, 2, 3,...., 25 to be a prime number is :

[A] $\frac{12}{25}$

[B] $\frac{23}{25}$

[C] $\frac{10}{25}$

[D] $\frac{9}{25}$

SCIENCE

21. Rutherford took gold foil for α-scattering experiment because of the following reason :

[A] It is a pure substance

[B] It is extremely mallerble

[C] It is a non-reactive metal

[D] Both [A] & [C]

22. The number of electrons in an element 'A' are 92 and the number of neutrons in it 143. Which of the following represents its correct symbol?

[A] $^{143}_{92}A$

[B] $^{51}_{92}A$

[C] $^{92}_{235}A$

[D] $^{235}_{92}A$

23. HCl reacts with NaOH as per the given reaction :

$HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

If 36.5g of HCl is reacted with 40g of NaOH, it will form 18g of water and 'X'g of NaCl. What is the value of 'X'.

[A] 58.5g

[B] 40g

[C] 48.5g

[D] 35.5g

24. The symbols of elements Tin, Gold, Silver and Potassium respectively are :

[A] Ti, Au, Ag, K

[B] Ti, Au, Ag, P

[C] Sn, Au, Ag, K

[D] Sn, Ag, Au, P

25. Milk has been added to water to form a translucent solution. Which of the following is correct for this mixture :

[A] Homogeneous and shows Tyndall effect

[B] Heterogeneous and shows Tyndall effect

[C] Heterogeneous and does not show Tyndall effect

[D] Homogeneous and does not show Tyndall effect

26. The following examples are of some colloids we come across in our daily life. Choose the correct combination :

	Example	*Type of Colloid*	*Dispersed phase and Dispersion Medium*
[A]	Face Cream	Emulsion	Liquid in Liquid
[B]	Cheese	Sol	Liquid in Solid
[C]	Shaving Cream	Gel	Air in Liquid
[D]	Smoke	Foam	Solid in Gas

27. The boiling point of three different liquids A, B, C is given as 40°C, 52°C & 119°C respectively. Which one of the following correctly represents their boiling point in Kelvin?

[A] 313K, 315K, 392K

[B] 313K, 325K, 392K

[C] 323K, 325K, 392K

[D] 313K, 315K, 382K

28. What will happen if fried food articles are kept in open for some days :

[A] No change will be observed.

[B] Change in taste and odour due to reduction.

[C] Change in taste and odour due to oxidation.

[D] It absorbs moisture but no change in taste or odour.

29. Element 'X' reacts with element 'Y' to form a compound 'Z'. During the reaction 'X' loses electrons and 'Y' gains electrons. Which of the following properties is not shown by 'Z'?

[A] It has high Melting point.

[B] It occurs as a solid.

[C] It conducts electricity in the solid & molten state.

[D] It is soluble in water.

30. Choose the correct composition of Brass and Bronze respectively :

[A] Brass – Cu and Sn ;
Bronze – Cu and Zn

[B] Brass – Cu and Zn ;
Bronze – Lead and Sn

[C] Brass – Cu and Br ;
Bronze – Sn and Ag

[D] Brass – Cu and Zn ;
Bronze – Cu and Sn

31. Thermite reaction is used to join Railway tracks. Which of the following is a correct chemical equation for this reaction in terms of chemicals and their physical states :

[A] $Fe_2O_3(s) + 2Al(s) \longrightarrow 2Fe(s) + Al_2O_3(s)$

[B] $Fe_2O_3(s) + 2Al(s) \longrightarrow 2Fe(l) + Al_2O_3(s)$

[C] $Fe_2O_3(l) + 2Al(l) \longrightarrow 2Fe(s) + Al_2O_3(s)$

[D] $Al_2O_3(s) + Fe(s) \longrightarrow 2Al(l) + Fe_2O_3(s)$

32. When ethanol reacts with acetic acid in the presence of an acid, a sweet smelling compound is formed whose formula is :

[A] C_2H_5COONa

[B] $C_2H_5COOCH_3$

[C] $CH_3COOC_2H_5$

[D] CH_3COOCH_3

33. Out of the given organic compounds identify alkenes :

C_3H_6, C_2H_2, C_4H_{10}, C_5H_{10}, C_6H_{10}

[A] C_2H_2, C_5H_{10}

[B] C_2H_2, C_3H_6, C_5H_{10}

[C] C_6H_{10}, C_3H_6, C_4H_{10}

[D] C_3H_6, C_5H_{10}

34. Study the following sets of elements. Which one of them correctly represents Dabereiner's Triad? (Atomic masses are given in the brackets)

[A] A(7), B(23), C(39)

[B] D(4), E(14), F(30)

[C] P(20), Q(18), R(40)

[D] X(1), Y(20), Z(30)

35. Identify the three elements which were predicted to exist in nature by Mendeleev and were discovered later :

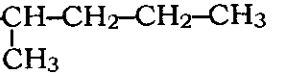
[A] Scandium, Tin, Germanium

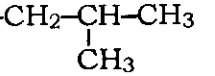
[B] Cobalt, Scandium, Gallium,

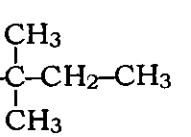
[C] Scandium, Gallium, Germanium

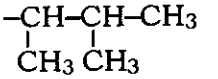
[D] Silicon, Gallium, Scandium

36. Which of the following is not an isomer of hexane :

[A] 

[B] 

[C] 

[D] 

37. Take out an epidermal peel from the lower surface of a Rhoeo leaf and place it on a clean slide. Put a drop of 10% NaCl sol. on it. Cover it. The cell membrane shrinks after some time. The process which is observed is :

[A] Osmosis

[B] Diffusion

[C] Plasmolysis

[D] Imbibition

38. Choose the correct statements which are associated with mitochondria.

1. They are bounded by two membranes.

2. They possess enzymes for the oxidation of carbohydrates.

3. They do not have their own DNA and ribosomes.

4. They are also called the suicidal bags of the cell.

[A] 1 and 2

[B] 1 and 3

[C] 2 and 3

[D] 2 and 4

39. Consider the following statements:

1. Meristematic tissue is made of more than one type of cells.

2. Meristematic tissue has cells with dense protoplasm and prominent nuclei.

3. Meristematic tissue is made of cells that are capable of cell division.

4. Meristematic tissue does not have vacuoles in its cells.

Which one of the above statements is incorrect?

[A] 1

[B] 2

[C] 3

[D] 4

40. A dicotyledonous plant has

1. a fibrous root system.

2. leaves showing reticulate venation.

3. flowers bearing three petals in each of them.

4. seeds which break into two equal halves.

[A] 1 and 2

[B] 1 and 3

[C] 2 and 3

[D] 2 and 4

41. An organism shows the following features : (a) Spiny skinned (b) Waterdriven tube system and (c) Hard calcium carbonate structures used as a skeleton.

It belongs to

[A] Phylum Mollusca

[B] Phylum Arthropoda

[C] Phylum Echinodermata

[D] Phylum Coelenterata

42. Translocation of organic solutes from leaves to storage organs is achieved by

[A] Sieve tubes and companion cells

[B] Sieve tubes only

[C] Sieve tubes and phloem parenchyma

[D] Companion cells and phloem parenchyma

43. Which one of the following statements is incorrect?

[A] Glomerulus is a bunch of blood capillaries present in the Bowman's capsule.

[B] The blood entering the glomerulus carries waste material.

[C] Walls of glomerular capillaries are thick and fully permeable.

[D] Filtration of blood takes place through the glomerular walls.

44. One of the events that does not occur during photosynthesis is :

[A] Oxygen is released during the process.

[B] Carbon dioxide is released during the process.

[C] Carbon dioxide is absorbed during the process.

[D] Solar energy is absorbed by the chlorophyll in the leaves.

45. A squirrel runs away in a scary situation. The hormone released by its body in such an emergency is

[A] Thyroxine

[B] Estrogen

[C] Insulin

[D] Adrenaline

46. The hormone which requires iodine for its synthesis is

[A] Parathyroid

[B] Growth

[C] Thyroid

[D] Oxytocin

47. Which among the following is a correct sequence of organs in the human female reproductive system?

[A] Ovary → Fallopian tube → Uterus → Cervix → Vagina

[B] Ovary → Uterus → Fallopian tube → Cervix → Vagina

[C] Uterus → Ovary → Fallopian tube → Cervix → Vagina

[D] Ovary → Fallopian tube → Cervix → Uterus → Vagina

48. Which of the statements given below are true?

Testosterone performs the function of

1. regulating formation of sperms.
2. helping in the development of secondary sexual characters in females.
3. maintaining the temperature at which sperm formation takes place.
4. helping in the development of secondary sexual characters in males.

[A] 1 and 2

[B] 1 and 3

[C] 1 and 4

[D] 1, 3 and 4

49. Which one of the following will help Bryophyllum plant to propagate naturally?

[A] Terminal buds at the tip of stem.

[B] Adventitious buds on the roots of the plant.

[C] Axillary buds in the axil of a leaf.

[D] Adventitious buds on leaf margins.

50. Which of the following statements is not true with respect to variation?

[A] Variation results in change in genetic composition.

[B] Variations are lesser in number in asexual reproduction.

[C] Variation have a survival advantage for a species.

[D] Variation is not selected naturally.

51. Wild cabbage is a plant which has been cultivated to generate different vegetables to be used as food by the process of

[A] Artificial Selection

[B] Natural Selection

[C] Speciation

[D] Genetic Drift

52. The displacement-time (s-t) graph for two moving objects X and Y are straight lines inclined at the angles of 45° and 60° with the time axis. The ratio of velocities of X and Y $\left(v_x / v_y\right)$ is

[A] $\frac{1}{\sqrt{3}}$

[B] $\sqrt{3}$

[C] $\frac{3}{4}$

[D] $\frac{4}{3}$

53. Consider the following table in which the distance covered by a moving object along the X-axis at different intervals are given below.

t(s)	0	2	4	6	8	10
x(m)	0	8	14	14	21	28

On analysing the above data we can derive the following conclusion.

[A] The speed of the object is maximum between 8s and 10s of its motion.

[B] The speed of the object is zero between 4s and 6s of its motion.

[C] The average speed of the moving object is 1.4 ms^{-1}.

[D] The speed of the object is uniform.

54. An object P starts from rest with an acceleration P_a. After 2s another object Q starts from rest from the same point with an acceleration Q_a. If they reach the same point at the end of 7th second then the ratio of P_a and Q_a $\left(P_a/Q_a\right)$ is

[A] $\frac{5}{7}$

[B] $\frac{13}{9}$

[C] $\frac{9}{11}$

[D] $\frac{9}{13}$

55. An object starting from rest along a straight path with a uniform acceleration 'a' covers a distance x_1 in a time interval t. If it continues to move along the same path with the same acceleration for the next time interval t during which it covers a distance x_2, then select the correct relation from the following :

[A] $x_2 = 8x_1$

[B] $x_2 = 4x_1$

[C] $x_2 = 3x_1$

[D] $x_2 = x_1$

56. A truck running at 25 m/s slows down to 5 m/s over a distance of 30 m. The time for which brakes are applied by the driver is

[A] 4.0 s

[B] 3.0 s

[C] 2.0 s

[D] 1.0 s

57. An unbalanced force acts on an object. The object must

[A] move along a circular path

[B] remain in same state

[C] move with a uniform velocity

[D] be accelerated

58. Action and reaction forces do not balance each other because they

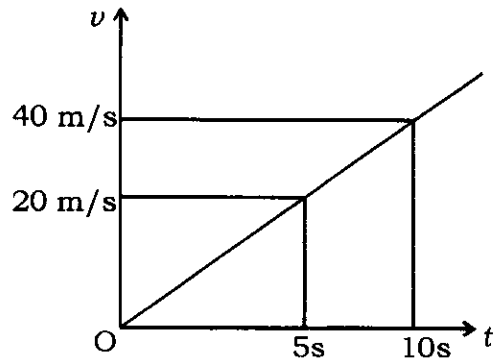
[A] act simultaneoously

[B] act on the same object

[C] act in opposite directions

[D] act on two different objects.

59. The velocity-time graph for an object of mass 10 kg is as shown. The force required to move the object between 5s and 10s is



[A] 200 N

[B] 100 N

[C] 40 N

[D] 20 N

60. A fielder in a match catches a cricket ball of mass 150 g moving with a velocity of 20 m/s in 0.1 s. The force experienced by the fielder is

[A] 15 N

[B] 30 N

[C] 150 N

[D] 300 N

61. The weight of an object on the surface of the earth is 90 N. If this object is taken above the surface of the earth at a height equal to half of the radius of the earth, then the gravitational force on the object due to earth will be

[A] 72 N

[B] 60 N

[C] 40 N

[D] 36 N

62. An object is released from rest. If the vertical distance travelled during first second is d_1 and an additional distance d_2 in the next second then $\frac{d_2}{d_1}$ is

[A] 4

[B] 3

[C] 2

[D] 1

63. Two objects are released simultaneously from heights h_1 and h_2. If they reach the ground after a time t_1 and t_2 and strike the ground with velocities of v_1 and v_2 respectively, then

[A] $\frac{t_1}{t_2} = \frac{v_1}{v_2} = \sqrt{\frac{h_1}{h_2}}$

[B] $\frac{t_1}{t_2} = \frac{v_2}{v_1} = \sqrt{\frac{h_1}{h_2}}$

[C] $\frac{t_1}{t_2} = \frac{v_2}{v_1} = \sqrt{\frac{h_2}{h_1}}$

[D] $\frac{t_1}{t_2} = \sqrt{\frac{v_2}{v_1}} = \sqrt{\frac{h_1}{h_2}}$

64. A block of a metal weighs 2100 N in air, 1800 N in water and 1650 N in a liquid, then the relative density of the

[A] metal is 3.0

[B] metal is 4.0

[C] liquid is 1.5

[D] liquid is 3.0

65. A solid of density ρ_s is floating in a liquid of density ρ_l. If V is the volume of the solid and v is the volume submerged in the liquid, then v/V is

[A] $\frac{\rho_s}{\rho_l}$

[B] $\frac{\rho_s}{\rho_s + \rho_l}$

[C] $\frac{\rho_l - \rho_s}{\rho_l + \rho_s}$

[D] $\frac{\rho_l}{\rho_l + \rho_s}$

66. A solid block of silver weighs 540 N in air. If the density of silver and water are 10.8×10^3 kg/m^3 and 10^3 kg/m^3 respectively. The apparent weight of the silver block when immersed fully in water will be

[A] 535 N

[B] 490 N

[C] 440 N

[D] 50 N

67. Two object of masses 10 kg and 50 kg have equal kinetic energies. The ratio of their momenta is

[A] 5 : 1

[B] $\sqrt{5}$: 1

[C] 1 : $\sqrt{5}$

[D] 1 : 5

68. A person is holding a suitcase of mass 10 kg at a height of 75 cm from the ground. The work done by the person while waiting for a taxi for 100 seconds is

(g = 10 m/s^2)

[A] 7500 J

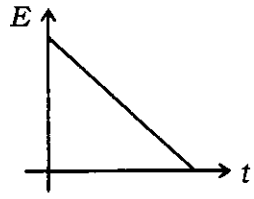
[B] 750 J

[C] 75 J

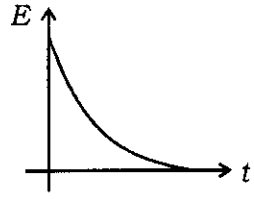
[D] Zero

69. The graph which represents the variation of total mechanical energy (E) of a falling object with time (t) during its fall is

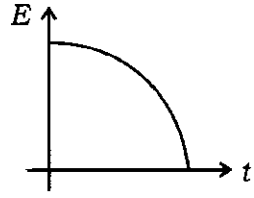
[A]



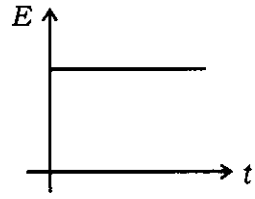
[B]



[C]



[D]



70. The frequency of a sound wave is 1700 Hz. If the wavelength of the wave is 20 cm, the time it will take to travel a distance of 510 m is

[A] 0.5 s

[B] 1.2 s

[C] 1.5 s

[D] 3.0 s

71. A virtual magnified image of an object can be produced by

(A) Concave mirrors and concave lenses both

(B) Convex mirrors and convex lenses both

(C) Convex mirrors and concave lenses both

(D) Concave mirrors and convex lenses both

72. Consider the following statements

a. Light from the sun near the horizon passes through thinner layer of air.

b. Light from the sun covers larger distance of the earth's atmosphere before reaching our eyes.

c. Near the horizon most of the blue light and shorter wavelength are scattered away by the particles.

d. Light from the sun near the horizon passes through the thicker layer of air.

The correct statements that give reasons for the reddish appearance of the sun at the time of sun-rise and sun-set are

[A] b, c and d

[B] a and b only

[C] a, b and c

[D] a and d only

73. A constant current 2 A when passed through a conductor produces 80 J of heat in 10 s. The resistance of the conductor is

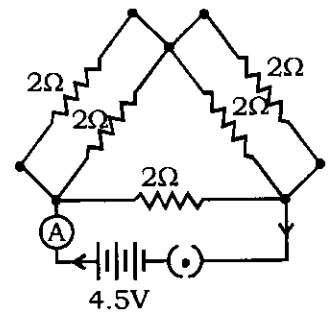
[A] 1.5Ω

[B] 2.0Ω

[C] 2.5Ω

[D] 4.0Ω

74. The current in the given circuit is



[A] 1.5 A

[B] 2.0 A

[C] 3.0 A

[D] 4.5 A

75. A person spends Rs.270 per month (30 days) on electric light. If one unit of electricity (kWh) costs Rs.9.00 and he uses 10 identical LED bulbs for 10 hours a day, the power of each LED bulb is

(A) 25 W

(B) 20 W

(C) 15 W

(D) 10 W

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

SEAL

SPACE FOR ROUGH WORK

SEAL

SEAL