

SEAL

DO NOT OPEN THE SEAL UNTIL INSTRUCTED TO DO SO

Test Booklet Number

Subject Code : 2201

Roll Number

00725

**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.

DO NOT OPEN THE SEAL UNTIL INSTRUCTED TO DO SO

SEAL

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SPACE FOR ROUGH WORK

00732

Test Booklet # 1001

EXAMINER'S USE ONLY

Time allowed: 4 hours

INSTRUCTIONS FOR CANDIDATES

1. Read the following instructions carefully in this Test Booklet.
2. Answer the questions in the Test Booklet on the separate sheets provided. Do not write on this Test Booklet.
3. Candidates must sit at their desks and keep their feet and hands still. Do not talk or move about the room.
4. This Test Booklet contains 75 questions. Do not turn the pages until you are told to do so.
5. Each question in the Test Booklet has four possible answers. Only one answer is correct. Mark your answer on the separate sheet provided.
6. Candidates are instructed to answer the questions in the Test Booklet in the order in which they appear. Do not skip any questions.
7. Candidates are instructed to write their answers on the separate sheets provided. Do not write on this Test Booklet.
8. Rough work may be done on the separate sheets provided. Do not write on this Test Booklet.
9. Candidates are to hand in the Test Booklet and the separate sheets at the end of the test.
10. **NEGATIVE MARKING:** If a candidate gives a wrong answer, the candidate will lose one mark. If a candidate does not answer a question, the candidate will not lose any marks.

MATHEMATICS

1. A circular field has a circumference of 240 km. Two cyclists Rakesh and Ravi start together and can cycle at speeds of 12 km/h and 15 km/h respectively around the circular field. After how many hours will they meet again at the starting point?

[A] 5

[B] 40

[C] $66\frac{2}{3}$

[D] 80

2. If $x+y=5$ and $x^2+y^2=111$, then the value of x^3+y^3 is

[A] 115

[B] 770

[C] 555

[D] 227

3. If α and β are the zeroes of the polynomial $p(x) = x^2 - px + q$, then the value of $\alpha^2 + \beta^2$ is

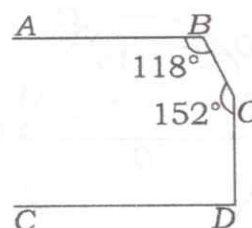
[A] $p^2 + q^2$

[B] $p^2 + 2q$

[C] $p^2 - q^2$

[D] $p^2 - 2q$

4. In the given figure, $AB \parallel CD$, $\angle ABO = 118^\circ$ and $\angle BOD = 152^\circ$, then the measure of $\angle ODC$ is



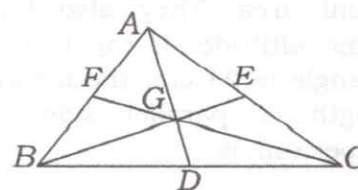
[A] 80°

[B] 90°

[C] 70°

[D] 34°

5. In $\triangle ABC$, the medians AD , BE and CF pass through G . If $GE = 3$ cm, then the length of BE is



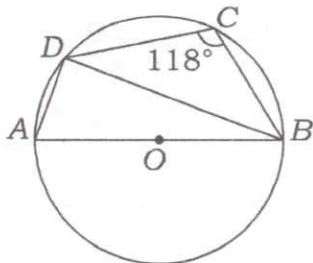
[A] 6 cm

[B] 3 cm

[C] 9 cm

[D] 12 cm

6. In the given figure, AOB is a diameter of the circle with centre O . If $\angle BCD = 118^\circ$, then the measure of $\angle ABD$ is



- [A] 90°
- [B] 28°
- [C] 38°
- [D] 48°
7. A triangle and a trapezium are of equal area. They also have the same altitude. If the base of the triangle is 24 cm, the mean of the length of parallel sides of the trapezium is

- [A] 48 cm
- [B] 24 cm
- [C] 12 cm
- [D] 30 cm

8. The points (a, a) , $(-a, -a)$ and $(-\sqrt{3}a, \sqrt{3}a)$ are the vertices of

- [A] a scalene triangle
- [B] a right-angled triangle
- [C] an isosceles right triangle
- [D] an equilateral triangle

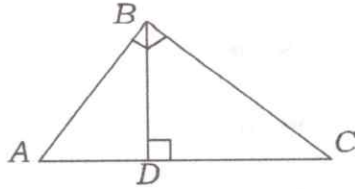
9. The ratio of radii of two cylinders is $1:\sqrt{3}$ and their heights are in the ratio of 2 : 3. The ratio of their volumes is

- [A] 1 : 9
- [B] 2 : 9
- [C] 4 : 9
- [D] 5 : 9

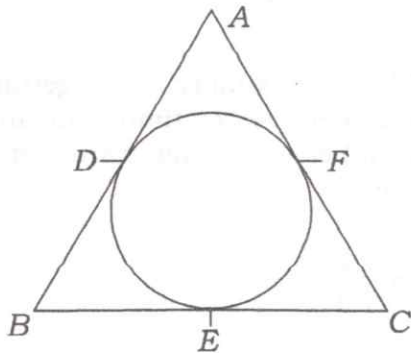
10. Three different coins are tossed together. The probability of getting at least one head is

- [A] $\frac{1}{8}$
- [B] $\frac{4}{8}$
- [C] $\frac{6}{8}$
- [D] $\frac{7}{8}$

11. In the given figure, $\angle ABC = \angle BDC = 90^\circ$. If $AD = 9$ cm, $CD = 16$ cm and $AB = 15$ cm, then the length of BD is



- [A] 12 cm
[B] 16 cm
[C] 15 cm
[D] 25 cm
12. In the given figure, a circle is inscribed in a $\triangle ABC$ touching the sides AB , BC and AC at D , E and F respectively. If the perimeter of $\triangle ABC$ is 50 cm, then $AD + BE + CF$ is equal to

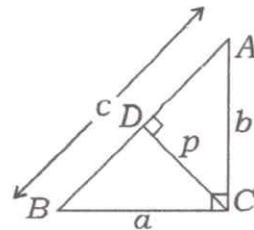


- [A] 18 cm
[B] 20 cm
[C] 22 cm
[D] 25 cm

13. The sum of a two-digit number and the number obtained by interchanging the digits of the number is 121. If the digits of the number differ by 5, then the number is

- [A] 61
[B] 38
[C] 72
[D] 56

14. In the given figure, ABC is a right triangle, right-angled at C . p is the length of perpendicular from C to AB and a , b , c have their usual meanings, then $\frac{1}{a^2} + \frac{1}{b^2}$ is equal to



- [A] p^2
[B] $\frac{1}{p^2}$
[C] $2p^2$
[D] $\frac{2}{p^2}$

15. If $\sqrt{3}\tan\theta = 3\sin\theta$, then the value of $\sin^2\theta - \cos^2\theta$ is

[A] 1

[B] 3

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

[D] $\frac{1}{3}$

16. The roots of the quadratic equation $3x^2 - kx + 14 = 0$ are in the ratio of 7 : 6, then the value of k is

[A] 13

[B] 12

[C] 1

[D] -3

17. For what value of x the terms $2x$, $x + 10$ and $3x + 2$ are in AP?

[A] 2

[B] 4

[C] 6

[D] 1

18. The area of a sector of a circle of radius 16 cm cut off by an arc of length 18.5 cm is

[A] 168 cm^2

[B] 148 cm^2

[C] 154 cm^2

[D] 176 cm^2

19. A cuboidal metal of dimensions $44\text{ cm} \times 30\text{ cm} \times 15\text{ cm}$ is melted and cast into a cylinder of height 28 cm. The radius of this cylinder is

[A] 20 cm

[B] 15 cm

[C] 10 cm

[D] 12 cm

20. The probability of getting a number greater than 2 or an even number in a single throw of a fair die is

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

[B] $\frac{2}{3}$

[C] $\frac{5}{6}$

[D] $\frac{1}{6}$

SCIENCE

21. Our teeth start decaying if we do not take care of our oral hygiene and food habits. The decaying of the teeth majorly happens when

- [A] we eat a lot of food rich in salt
- [B] bacteria start feeding on enamel of our teeth
- [C] bacteria act on food particles and produce acid in our mouth
- [D] the toothpaste used by us is sweet in taste

22. The number of compounds formed by carbon is larger than any other elements of the periodic table. Which of the following statements could define the reason for this property?

- (i) Due to small size, carbon can hold the shared pair of electrons effectively.
- (ii) Compounds formed by carbon are highly reactive and do not have long shelf life.
- (iii) The bonds formed by carbon with its own atoms and other elements are very strong.

- [A] (i), (ii) and (iii)
- [B] (ii) and (iii)
- [C] (i) and (iii)
- [D] (i) and (ii)

23. Calculate the amount of sugar required to make 500 g of an aqueous solution whose concentration is 25% (in terms of mass/mass percentage of the solution).

- [A] 5 g
- [B] 50 g
- [C] 150 g
- [D] 125 g

24. Identify the reducing agent in the following chemical reaction :



- [A] MnO_2
- [B] HCl
- [C] MnCl_2
- [D] Cl_2

25. A light green coloured salt (X) was heated strongly in a boiling tube. A brown coloured residue (Y) was formed along with two gases which had a suffocating and choking effect. Identify X and Y.

- [A] $\text{X} - \text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, $\text{Y} - \text{SO}_2$
- [B] $\text{X} - \text{FeSO}_4$, $\text{Y} - \text{SO}_2$
- [C] $\text{X} - \text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, $\text{Y} - \text{Fe}_2\text{O}_3$
- [D] $\text{X} - \text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{Y} - \text{CuO}$

26. Which of the following is/are example(s) of amphoteric oxide(s)?

[A] Na_2O

[B] ZnO

[C] Al_2O_3

[D] Both [B] and [C]

27. The metals which are on the top of the reactivity series occur in nature in the form of their compounds. How can these metals be obtained from their salts?

[A] Electrolysis of their molten salts

[B] Electrolysis of their aqueous salts

[C] Reduction of their oxides with carbon

[D] Reduction of their oxides with aluminium

28. Given below are some elements of the Modern Periodic Table. Atomic number for each is given in the bracket : A(4), B(9), C(14), D(11) and E(6). Which of these belong to the same group?

[A] A and C

[B] B and D

[C] C and E

[D] A and E

29. When we move from left to right in a period, there is a decrease in the atomic radius. This happens due to which of the following reasons?

[A] No. of electrons is becoming more than protons

[B] No. of protons is becoming more than electrons

[C] Electrons repel each other

[D] Effective nuclear charge increases

30. Four test tubes A, B, C and D contain sample of a neutral liquid which is colourless and transparent. Only one test tube contains two drops of phenolphthalein added to the sample. Which of the following chemicals can be used to identify the test tube which has phenolphthalein added to the neutral liquid?

[A] Vinegar

[B] Lemon juice

[C] Sodium hydroxide

[D] Hydrochloric acid

31. Plaster of Paris is prepared by heating gypsum at 373 K. Which of the following correctly represents the formula of plaster of Paris and gypsum respectively?

[A] POP— $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$,
gypsum— $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

[B] POP— $\text{CaSO}_4 \cdot \text{H}_2\text{O}$,
gypsum— $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

[C] POP— $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$,
gypsum— $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

[D] POP— $\text{CaSO}_4 \cdot 1\frac{1}{2}\text{H}_2\text{O}$,
gypsum— $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

32. Black ink was separated into different colours by paper chromatography. Spots of different colours were observed on the filter paper at different heights. Which of the following statement(s) is/are correct?

(i) Different colours are soluble in the same solvent.

(ii) Colours have different solubilities in the same solvent.

(iii) The most soluble colour rises fastest followed by the other colours.

(iv) Colours have same solubility in the solvent.

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

[B] (ii), (iii) and (iv)

[C] Only (iv)

[D] (i), (iii) and (iv)

33. Which of the following substances are emulsions?

(i) Milk

(ii) Salt solution

(iii) Chalk powder in water

(iv) Face cream

(v) Paint

(vi) Alloys

[A] (i), (vi) and (iii)

[B] (i), (iv) and (v)

[C] (i), (iv) and (vi)

[D] (i), (ii) and (v)

34. Which of the following correctly represents 360 g of water?

(i) 2 moles of H_2O

(ii) 20 moles of H_2O

(iii) 6.022×10^{23} molecules of water

(iv) 1.2044×10^{25} molecules of water

[A] Only (ii)

[B] (i) and (iv)

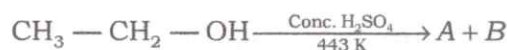
[C] (ii) and (iii)

[D] (ii) and (iv)

35. A change in the physical state can be brought about

- [A] only when energy is given to the system
- [B] only when energy is taken out from the system
- [C] when energy is either given to or taken out from the system
- [D] without any energy change

36. Identify A and B in the following reaction :



- [A] $\text{A} \rightarrow \text{C}_2\text{H}_4$, $\text{B} \rightarrow \text{H}_2\text{O}$
- [B] $\text{A} \rightarrow \text{C}_2\text{H}_6$, $\text{B} \rightarrow \text{H}_2\text{O}$
- [C] $\text{A} \rightarrow \text{CH}_3 - \text{CH}_2 - \text{OSO}_3\text{H}$,
 $\text{B} \rightarrow \text{H}_2$
- [D] $\text{A} \rightarrow \text{CH}_3 - \text{O} - \text{CH}_3$, $\text{B} \rightarrow \text{H}_2\text{O}$

37. A prokaryotic cell

- (i) is generally large in size
- (ii) lacks a true nucleus
- (iii) shows the presence of membrane bound organelles
- (iv) divides by simple fission

The correct options are

- [A] (i) and (ii)
- [B] (ii) and (iii)
- [C] (i) and (iii)
- [D] (ii) and (iv)

38. Red blood cells in animals are placed in hypertonic solution. They will

- [A] swell up
- [B] burst
- [C] shrink
- [D] not change their forms

39. Intercalary meristem is found

- [A] underneath the bark of a tree
- [B] at the growing tips of stems and roots
- [C] at the base of nodes or internodes
- [D] along the sides of the central axis of a plant

40. Select the **incorrect** sentence from the following :

- [A] Cartilage is a form of connective tissue
- [B] Blood has matrix containing proteins, salts and hormones
- [C] Two bones are connected to each other by ligament
- [D] Tendons are non-fibrous tissue with less strength

41. Metameric segmentation is found in

- [A] Phylum Platyhelminthes
- [B] Phylum Annelida
- [C] Phylum Arthropoda
- [D] Phylum Nematoda

42. Choose a parasitic worm among the following :

- [A] Wuchereria
- [B] Nereis
- [C] Earthworm
- [D] Planaria

43. Choose the correct sequence of air passage during inhalation.

- [A] Nostrils → trachea → pharynx → larynx → alveoli
- [B] Nostrils → pharynx → larynx → trachea → alveoli
- [C] Nostrils → larynx → pharynx → trachea → lungs
- [D] Nostrils → larynx → pharynx → lungs

44. Products of anaerobic respiration are

- [A] lactic acid and energy
- [B] lactic acid, CO_2 and energy
- [C] lactic acid, water, CO_2 and energy
- [D] lactic acid, water and energy

45. Choose the correct statements from the following :

- (i) Dendritic ends of a nerve cell take up the stimulus.
 - (ii) The cyton accepts the information and changes it into a response.
 - (iii) The nerve impulse moves from the dendritic ends to the end of the axon.
 - (iv) The electrical impulse causes synapse.
- [A] (i) and (ii)
 - [B] (i) and (iii)
 - [C] (i), (ii) and (iv)
 - [D] (i), (iii) and (iv)

46. Which of the following statements are **true** about the brain?

- (i) The forebrain is the main thinking part of the brain.
- (ii) Cranial nerves arise from the brain.
- (iii) Cerebellum does not control posture and equilibrium of the body.
- (iv) Involuntary actions like salivation and vomiting are controlled by the medulla in the hindbrain.

- [A] (i) and (ii)
- [B] (i), (ii) and (iii)
- [C] (ii) and (iv)
- [D] (i), (ii) and (iv)

47. Folding of leaves in the 'touch-me-not' plant of the Mimosa family is

- (i) a nastic movement
- (ii) growth involved in this movement
- (iii) a directional movement in response to touch
- (iv) due to turgor changes in the cells

Choose the correct statements.

- [A] (i) and (ii)
- [B] (ii) and (iii)
- [C] (i) and (iv)
- [D] (ii) and (iv)

48. The number of chromosomes in parents and offsprings of a particular species remains constant due to

- [A] doubling of chromosomes after gamete formation
- [B] halving of chromosomes during gamete formation
- [C] doubling of chromosomes after zygote formation
- [D] halving of chromosomes after gamete formation

49. Which one of the following parts of a flower attracts animals for pollination?

- [A] Stigma and anther
- [B] Petals only
- [C] Sepals only
- [D] Both sepals and petals

50. At the time of puberty, both in boys and girls reproductive tissues begin to mature and

- [A] their body starts losing weight
- [B] there is a slight decrease in height
- [C] rate of general body growth begins to slow down
- [D] intelligence of an individual goes down

51. When a tall green seeded pea plant (TTyy) is crossed with short yellow seeded pea plant (ttYY), the seeds produced in F_1 generation are of

[A] tall and yellow plants

[B] tall and green plants

[C] short and yellow plants

[D] short and green plants

52. The displacement-time (s-t) graph for two cars A and B is straight lines inclined at the angles of 30° and 60° with the time axis. The ratio of the velocities of the cars A

and B $\left(\frac{V_A}{V_B}\right)$ is

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

[B] $\sqrt{3}$

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

[D] $\frac{1}{3}$

53. An object travels through a distance with a uniform speed of 40 km/h and returns along the same path with a uniform speed of 60 km/h. The average speed of the object for its whole journey is

[A] 46 km/h

[B] 48 km/h

[C] 50 km/h

[D] 52 km/h

54. An object moving with a velocity of 20 m/s can be stopped by applying a force after covering a distance of at least 3 m. If the same object is moving at a velocity of 40 m/s, the same force will be able to stop it after covering a minimum distance of

[A] 6 m

[B] 9 m

[C] 12 m

[D] 18 m

55. An object moving along a straight path with an initial velocity u and acceleration a covers the distance of 60 m in the 6th second and 80 m in the 8th second of its motion. The values of u and a of the object respectively are

[A] 10 ms^{-1} and 10 ms^{-2}

[B] 10 ms^{-1} and 5 ms^{-2}

[C] 5 ms^{-1} and 5 ms^{-2}

[D] 5 ms^{-1} and 10 ms^{-2}

56. A child in a moving train throws a ball vertically upward which falls after sometimes on his palm. From this it may be concluded that the train is moving with

[A] a zero acceleration along a straight track

[B] a zero acceleration along a curved track

[C] a uniform acceleration along a straight track

[D] a uniform negative acceleration along a straight track

57. No unbalanced force acts on an object when it

[A] moves along a horizontal circular path with a uniform speed

[B] moves along a straight path on a horizontal road with a uniform speed

[C] moves vertically upward after being thrown

[D] falls freely from a helicopter

58. Consider the following statements :

(i) Force is a vector quantity.

(ii) SI unit of force is newton.

(iii) Force is always conserved.

(iv) Force changes shape/size of the object on which it acts.

The correct statements are

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

[B] (ii), (iii) and (iv)

[C] (i), (iii) and (iv)

[D] (i), (ii) and (iv)

59. A car and a truck are moving with the same momentum. When same retarding forces are applied, the truck comes to halt in time t_1 and the car in time t_2 . If the mass of the truck is 20 times more than the mass of the car, then

[A] $t_2 = 400t_1$

[B] $t_2 = 100t_1$

[C] $t_2 = 20t_1$

[D] $t_2 = t_1$

60. In a football match, the ball shot towards the goal struck the goalkeeper's foot at a speed of 10 m/s and it bounces back at 20 m/s. If mass of the ball is 500 g and the time of impact of the ball is 0.1 s, the average force exerted by the goalkeeper on the ball is

[A] 50 N

[B] 150 N

[C] 500 N

[D] 1500 N

61. The weight of an object on the surface of the earth is W . If the radius of the earth is R , the height at which the weight of this

object will reduce to $\frac{W}{4}$, is

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

[B] R

[C] $2R$

[D] $4R$

62. When an object is thrown vertically upward, the force of gravity

[A] is opposite to the direction of motion of the object

[B] is in the same direction as the direction of motion of the object

[C] becomes zero at the highest point

[D] increases as the object rises up

63. SI unit of thrust is

[A] pascal

[B] newton

[C] newton-metre

[D] newton per metre

64. A metallic block weighs 2100 N in air, 1800 N in water and 1650 N in a liquid. On the basis of this information, it is concluded that the relative density of the

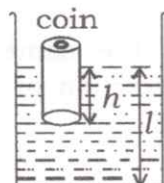
[A] liquid is 3.0

[B] liquid is 4.0

[C] metal is 4.0

[D] metal is 7.0

65. A wooden block with a coin placed on it floats in water as shown. The distances h and l are shown in the figure. If somehow the coin falls into the water, then

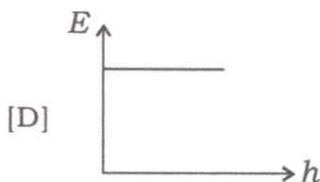
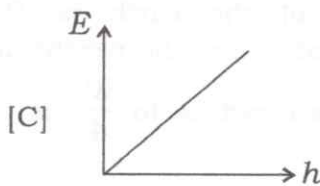
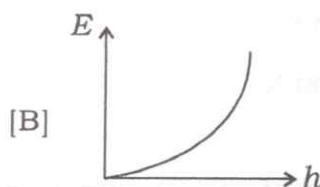
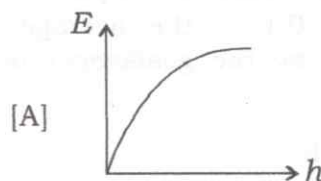


- [A] both h and l decrease
 [B] both h and l increase
 [C] h increases and l decreases
 [D] h decreases and l increases
66. A cricket ball and a wooden ball having same diameter dropped from a cliff 10 m above the ground, while touching the ground they have the same
- [A] kinetic energy
 [B] potential energy
 [C] momentum
 [D] acceleration
67. The kinetic energy of a moving object of mass 1 kg is 1 joule. The speed of the object is
- [A] 1 m/s
 [B] $\sqrt{2}$ m/s
 [C] 2 m/s
 [D] $2\sqrt{2}$ m/s

68. The SI unit of work is joule. The other physical quantity having same unit is

- [A] power
 [B] momentum
 [C] impulse
 [D] energy

69. The graph which represents the variation of kinetic energy (E) of a freely falling object with the vertical distance (h) covered is



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