

### Mark Scheme for Chittagong Group B

Ques no	Answer and Marks
1	<p>time required for the stone (initially at rest ) to reach the ground  <math>t = 5.0 \text{ s}</math> ( using <math>\frac{1}{2}gt^2</math>) ( 0.5 Marks )</p> <p>The time required for the stone (with non-zero initial velocity ) to reach the ground  <math>t' = 1.9 \text{ s}</math> ( using <math>ut + \frac{1}{2}gt^2</math> and solving quadratic equation and picking the correct value ) ( 0.4 + 0.5+0.3 marks )</p> <p>time difference = <math>t' - t = 3.1 \text{ seconds}</math> ( 0.3 Marks)</p> <p>Precision upto .1 sec in fine ( no penalty )</p>
2	<p>Heat capacity = mass x specific heat capacity (0.4 marks)            Unit of Heat Capacity = <math>\text{J K}^{-1}</math> (0.3 Marks) ,            Unit of specific Heat capacity = <math>\text{J kg}^{-1} \text{K}^{-1}</math> (0.3 marks)</p>
3	<p>The total resistance in the circuit , 12 Ohms. (0.5 Marks).            The unknown resistance, <math>12 - 8 = 4\text{Ohms}</math> ( 0.5 Marks)            If the <u>correct</u> answer is found directly ( 1 Mark)</p>
4	<p>No mark for finding the acceleration ( it is in the figure).</p> <p>The reaction force due to smaller block (m) on the bigger block(M) is <math>F' = 24 - Ma = 24 - (9 \times 2) = 6\text{N}</math>            ( 0.5 for the equation , 0.3 for the number and 0.2 for the unit).            The reaction force on the smaller block (m) due to bigger block(M) = <math>ma = 3 \times 2 = 6\text{N}</math> (0.5 marks)            The second part can also be found by using Newton's third law and thus deserves 0.5 Marks fully.</p>
5	<p>Force on B due to A , <math>F = -36k/16</math> , towards left (0.5 for magnitude , 0.5 for direction )            Force on B due to C, <math>F' = -8k/4 = -2k</math>, towards right (0.5 for magnitude , 0.5 for direction )            As <math>F' &gt; F</math> , the net force is towards right. ( 1 mark – no breakup)            Incorrect answer but use of Coulomb law ( 1 Mark)</p>
6	<p>Area of concerned surface = 1/8 th of full surface area ).            Solid angle covered is thus = <math>4\pi/8 = \pi/2</math>. ( 1 Mark)</p> <p>Mention of the <math>1/8^{\text{th}}</math> ( in any manner ) will get 0.5 marks. Right answer obtained in alternative way will be awarded full mark, i.e. 1 mark.</p>
7	<p>Total initial momentum = 0 . So, the final momentum of the boy = final momentum of the boat . ( 1 mark for using momentum conservation )</p> <p>Thus, speed of water = speed of boat = <u>momentum</u> of boy / mass of boat = <math>(24 \times 8)/300 = .64 \text{ m/s}</math>. ( 1mark – no partial marks )</p>
8	<p>Calculation of the refraction angle , <math>r = \tan^{-1}(8/17) = 25.2^{\circ}</math> ( 1 Mark- other method is fine too , but the number should be correct)</p> <p>Hence refractive index = <math>\sin(40^{\circ})/\sin(25.2^{\circ}) = 1.51</math> ( Use of snell's law – 0.5 marks, answer within <math>1.5 \pm .1</math> , 0.5 marks )</p>

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9	<p>Alpha particles ( 0.5 marks)</p> <p>Because it carries twice the charge of a proton or it carries the maximum charge among the three ( 1 mark)</p>
10	Power = Work done / time = $mgh/t = 14 \text{ kW}$ ( formula carries 0.5 marks , correct answer 0.5 )
11	Center curvature ( 1 point ), Pole of the mirror ( আলোককেন্দ্র ) ( 1 point)
12	Kinetic energy = $\frac{1}{2} mv^2 = 72 \text{ J}$ ( 0.5 marks ) Required Force = $72/4 = 18\text{N}$ (0.5 Marks)
13	<p>The total luminosity = <math>3+5=8 \text{ cd.}</math> (0.4 Marks)</p> <p>The intensity = <math>8/(2)^2 = 2 \text{ cd m}^{-2}</math> (0.6Marks)</p>
14	<p>As the temperature is fixed no change in speed of sound ( 0.5 Marks)</p> <p>Hence the wavelength is reduced as the frequency is increased (0.5 marks)</p> <p>If the former part involved speed is not mentioned the relevant 0.5 marks will not be awarded.</p>
15	<p>One uses <math>P=h\rho g</math> (0.5 Marks )</p> <p>Correct height = <math>10-8 = 8 \text{ cm}</math> (0.5 marks)</p> <p>Approximate number , <math>P = 784 \text{ P}</math> ( if 9.8 is used for <math>g</math> ). If <math>g=10</math> is used the answer will be <math>800 \text{ P}</math> (0.5 Marks )</p>