AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XI EXAMINATION

MAY 2012

Physics Paper II

Time allowed: 2 hours 20 minutes   Marks 55

INSTRUCTIONS

Please read the following instructions carefully.

1.   Check your name and school information. Sign that it is correct.

> **I agree that this is my name and school.**
> **Candidate's signature**

2.   RUBRIC. There are THIRTEEN questions. Answer ALL THIRTEEN questions. Questions 11, 12 & 13 each offers TWO choices. Attempt any ONE choice from each.

3.   When answering the questions:

Read each question carefully.
You may use a black pencil for diagrams. DO NOT use coloured pencils.
DO NOT use staples, paper clips, glue, correcting fluid or ink erasers.
Complete your answer in the allocated space only. DO NOT write outside the answer box.

4.   The marks for the questions are shown in brackets ( ).

5.   You may use a scientific calculator if you wish.

Q.1. (Total 5 Marks)

a. The attractive force F between two masses m_1 and m_2 at a distance r is given by $F = G\dfrac{m_1 m_2}{r^2}$.

Show that the above expression is dimensionally correct. (3 Marks)

b. Write TWO differences between accuracy and precision. (2 Marks)

S.No.	Accuracy	Precision
1		
2		

Q.2. (Total 5 Marks)

a. Explain head to tail rule. In head to tail rule, can vectors be placed in any order of succession? Why? (3 Marks)

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b. By using head to tail rule, draw two vectors as the sides of a parallelogram and the resultant as its diagonal. (2 Marks)

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Q.3. (Total 4 Marks)

Deduce an equation to show that impulse is equal to the change in momentum of an object.

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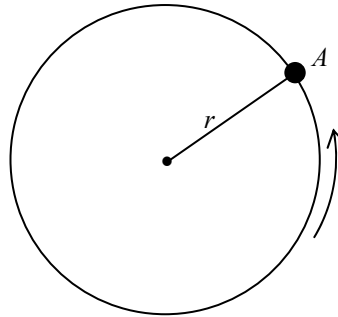
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Q.4. (Total 3 Marks)

List any THREE non-conventional energy sources.
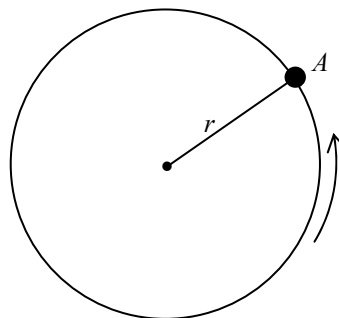
1. _____

2. _____

3. _____

Q.5. (Total 4 Marks)

The diagram represents an object tied to one end of a string being swung around in a circle of radius **r**.

a.   Identify and define the force which keeps the object moving in a circle. Also write its expression.
(3 Marks)

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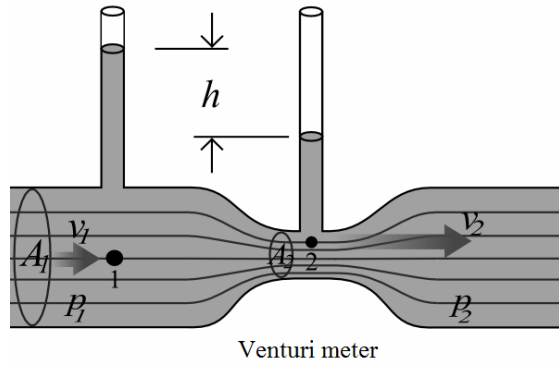
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b.   Assuming that the string breaks at point *A*, draw an arrow showing the path of the ball in the
given diagram. (1 Mark)
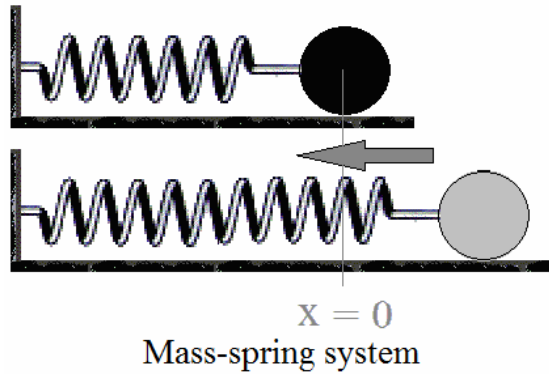

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Q.6. (Total 4 Marks)

Show that Bernoulli's equation for the Venturi meter reduces to $P_1 - P_2 = \dfrac{1}{2} \rho (V_2^2 - V_1^2)$.

Venturi meter

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Q.7.   (Total 5 Marks)
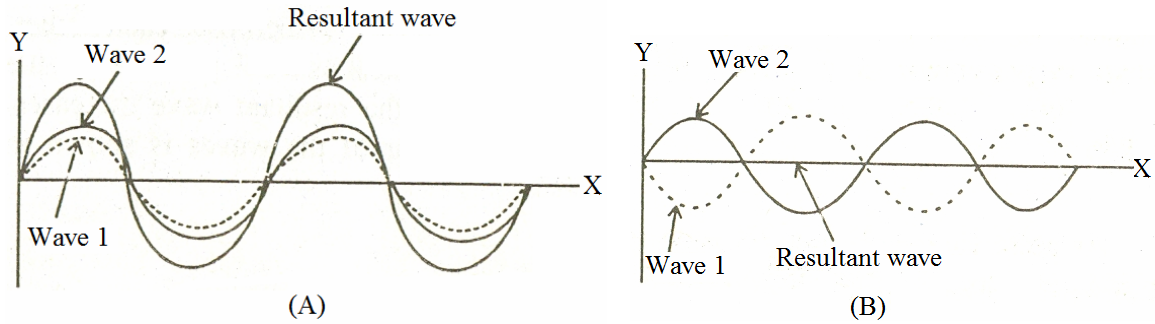
By using energy conservation principle in SHM, show that the speed v of the system shown is
$v = \pm \omega \sqrt{x_0^2 - x^2}$, where x is the displacement and ω is the angular frequency.

$$x = 0$$
Mass-spring system

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Q.8. (Total 3 Marks)

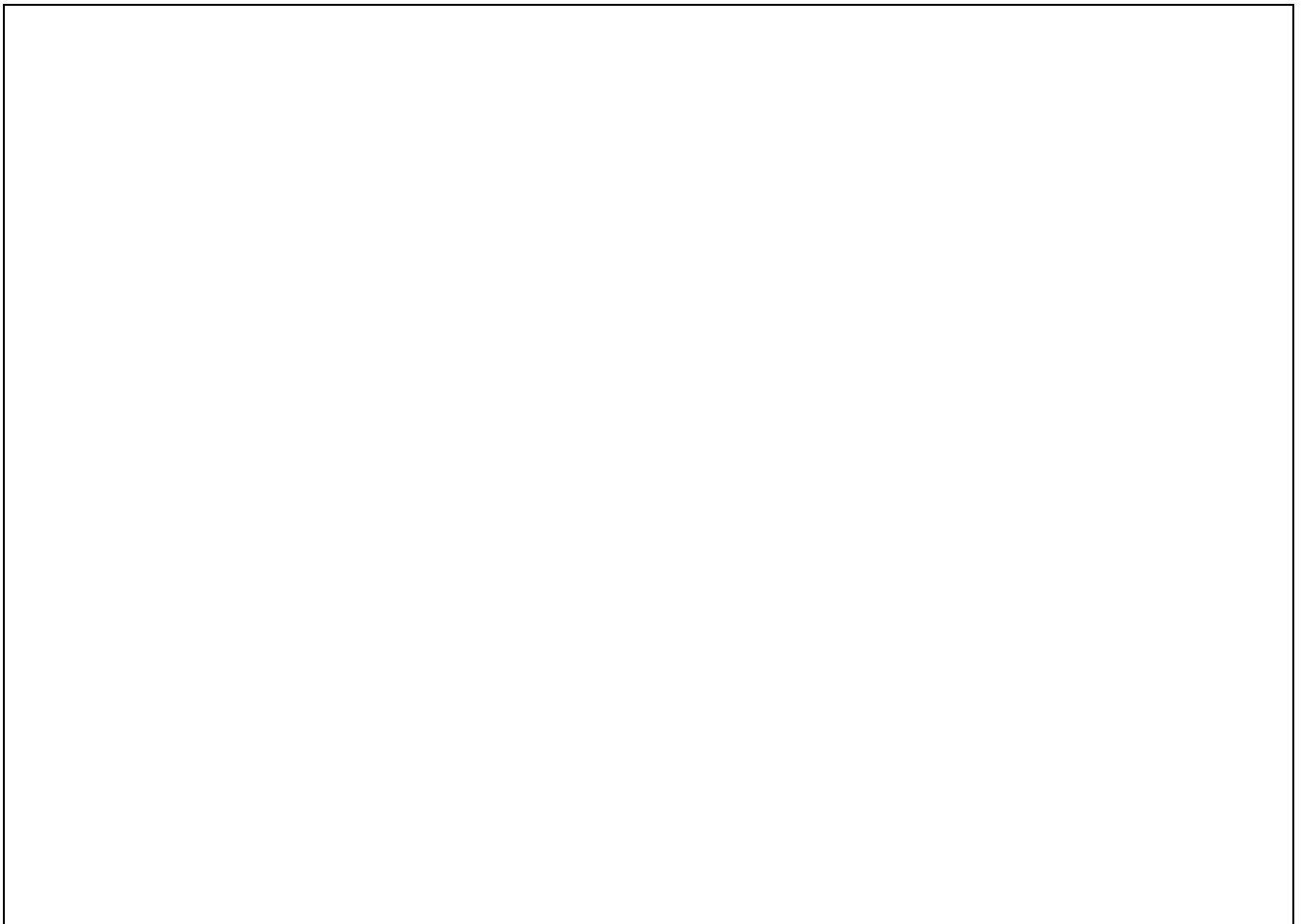What is interference of sound waves? Identify the types of interference in the given diagrams.

(A)　　　　　　　　　　　(B)

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Q.9. (Total 4 Marks)

a.　How can we use Huygen's Principle of superposition of light to analyze a wave front?　(2 Marks)

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b.　Why are the circular fringes formed in Newton's rings?　(2 Marks)

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Q.10. (Total 3 Marks)

Why is it not possible to construct a heat engine that will not expel heat into the atmosphere? Draw a schematic diagram of a heat engine.

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Q.11. (Total 5 Marks)

EITHER

a. A 10 kg object was dropped from a tower of 100 m height. Due to air friction, the object was found to be moving with a velocity of 40 m/s just before hitting the ground. Calculate the frictional force due to air acting upon the object.

OR

b. When a satellite moves in a circular path around the earth, its orbital speed v is $\sqrt{\dfrac{Gm_e}{r}}$, where r is the distance from the satellite to the earth's centre.
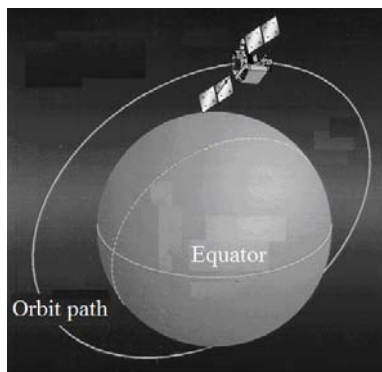
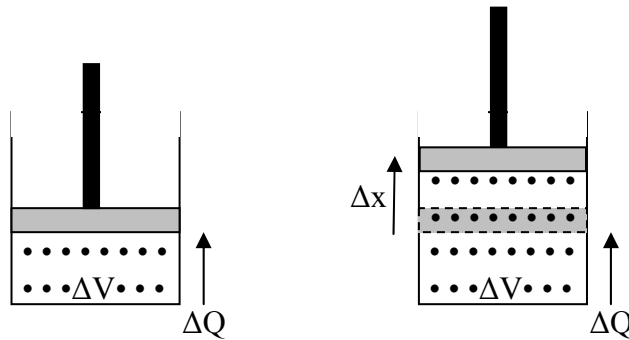Show that the total energy of a satellite is one-half of its absolute potential energy.

Q.12. (Total 5 Marks)

EITHER

a. Prove that the speed of sound varies with the square root of absolute temperature.

OR

b. With the help of Doppler's effect describe the working of the following:

    i.   Radar
    ii.   Sonar
    iii. Satellite

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Q.13. (Total 5 Marks)

EITHER

a. Describe "state function" as a property of a system and "internal energy" (U) as a state function.

OR

b. Describe the first law of thermodynamics with the help of the given diagram. Provide its mathematical expression and illustrate it with an example.

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