

**INDIAN SCHOOL MUSCAT  
FINAL TERM EXAMINATION (MS)  
PHYSICS**

CLASS: XI  
28.02.2018

Sub. Code: 042

Time Allotted: 3 Hrs  
Max. Marks: 70

**SECTION A**

1. Any two correct differences between gravitational force and electromagnetic force. 1
2. Satellite revolving close to earth has larger speed 1
3. The length of pendulum made of invar does not change with temperature and hence the time period of oscillation remains the same 1
4. For 100% efficiency  $T_1 = \infty$  (or)  $T_2 = 0$  k. As absolute zero and infinite temperature cannot be realized in practice, the efficiency of a heat engine cannot have 100%. The efficiency of a heat engine is always less than unity. 1
5. Correct definition of degrees of freedom for an ideal gas. 1

**SECTION B**

6. Random errors are errors due to the precision / limitations of the measurement device. Can be avoided by taking repeated measurements and obtaining an average value 2
7. a) The coefficient of friction between the rubber tyres and the road is lesser than the coefficient of friction between iron and steel (1 mark) 2  
b) No, the total linear momentum after explosion should be zero so flying in mutually perpendicular direction is not possible. (1 mark)
8. 

Using  $F = \frac{GMm}{R^2}$  2

we have new weight

given by  $F' = \frac{GMm}{(2R)^2} = \frac{1}{4} F$  1

$\therefore$  Weight becomes one-fourth of the original value. 1
9. a) Young's modulus for steel is more than that of copper, therefore the springs made of steel and not of copper (1 mark) 2  
b) The area under the stress-strain curve represents the mechanical energy per unit volume (1 mark)
10. Derivation of differential equation for simple harmonic motion. 2

### SECTION C

11. a) velocity-time graph for an object thrown vertically upwards returning to the point of projection. (1 mark) 3  
b) No. at a given time object can not be in multiple positions. (1 mark)  
c) Yes. A stone thrown returns after reaching maximum. (1 mark)
12. a) Statement of parallelogram law of vector addition. (1 mark) 3  
b) Proof of commutative law of addition. (2 marks)
13. a) Because of inertia of direction (1 mark) 3  
b) The total change in momentum of the ball is constant. Hence, if time taken by a player in bringing the ball to rest is more, rate of momentum change will be less. Thus, the player will have to apply smaller force and his hand will also be safe from hitting. (1 mark)  
c)  $R = m(g+a) = m(g+3g) = 4mg$  (1 mark)
14. Statement and verification of work-energy theorem for constant force. (3 marks) 3

### OR

- a) Any two differences between conservative and non-conservative forces. (1 mark)  
b) Expression for the potential energy stored in a spring block system. (2 marks):  
Intod  $\frac{1}{2}$   
Diagram  $\frac{1}{2}$   
Derivation 1
15. a) Verification of law of conservation of energy for a freely falling object. (2 marks) 3  
b) The graph showing variation of kinetic energy and potential energy for the object under free fall. Graph with correct axes (1 mark)
16. a) We have the eqn: Torque =  $F \times r$ . So, the wrench of longer arm is used then the moment of the force (torque) is greater than the wrench of shorter arm. So, the wrench of longer arm is preferred in comparison to the shorter arm (1 mark) 3  
b) A ballet dancer can vary her angular speed by outstretching her arms and legs. Suppose the dancer is rotating with her legs and arms stretched outward and if she suddenly folds her arms and brings her stretched legs closer, thereby reducing the moment of inertia, her angular velocity increases due to conservation of angular momentum (2 marks)
17. a) Statement of perpendicular axes theorem. (1 mark) 3

18. Statement (1) and correct proof of the law of periods of planetary motion (2 marks). 3
19. a) It high heat capacity and low cost makes it a suitable heat-transfer medium (1 mark) 3  
 b) The silver coating on the inner bottle prevents heat transfer by radiation (1 mark)  
 c) By swelling their feathers, the birds provide air pockets round their body. The air is trapped in the swelled feathers which provides the birds a heat insulation from surrounding (1 mark)
20. Derivation of the relation (3 marks) 3
21. Statement of law of equi-partition of energy (1 mark). Calculating the the ratio of specific heat capacities of a mono atomic gas (2 mark). 3
22. a) It is a traveling wave(½mark) 3  
 b) Frequency - $\nu = 5.73$  Hz and amplitude 3 cm. (1 ½ marks)  
 c)  $\lambda = 3.49$  m(1 mark)

#### SECTION D

23. a) any correct values shown by Raju (2 marks) 4  
 b) 21.6 m and 4 sec (2 marks)

#### SECTION E

24. a) Statement (1 mark) and verification of law of conservation of linear momentum (2 marks).  
 b) 270N (2 marks)

#### OR

- a) Derivation of Newton's first law (1 ½ marks) and third law (1 ½ marks)  
 b) Impulse = 0.6 kg m/s (2 marks)
- 5
25. a) Statement Bernoulli's principle. (1 mark) 5  
 Fig + introduction 1 mark  
 Derivation 1 mark

$$P_1 + (1/2)\rho V_1^2 = P_2 + (1/2)\rho V_2^2 \quad (1/2 \text{ mark})$$

$$\begin{aligned}
 P_2 - P_1 &= (1/2) \rho (V_1^2 - V_2^2) \\
 (P_2 - P_1) A &= (1/2) \rho (V_1^2 - V_2^2) A \quad (1/2 \text{ mark}) \\
 &= (1/2) \times 1.3 \times [70^2 - 63^2] \times 2.5 \\
 &= 1512.87 \text{ N} = 1.51 \times 10^3 \text{ N} \quad (1 \text{ mark})
 \end{aligned}$$

Therefore, the lift on the wing of the aeroplane is  $1.51 \times 10^3$  N.

**OR**

a) Definition terminal velocity (1 mark)

Introduction+ fig (1/2 mark)

Derivation (1 1/2 marks)

b)  $F = 6 \pi \eta r v$  (1 mark)

$F = 135.6 \times 10^{-8}$  N 1 mark

26. a) Introduction and fig – 1 mark

5

Proving SHM – 1 mark

Derivation Time period – 1 mark

b) To avoid breaking of bridge due to resonance (1 mark)

c) Energy – time graph damped oscillations (1 mark)

**OR**

a) Fig (1 1/2 mark)

Derivation (1 1/2 mark)

b) Any two difference (1 mark)

c) Humid air is less dense (1/2 mark)

And speed of sound is inversely proportional to square root of density (1/2 mark)