M.E.S. INDIAN SCHOOL, DOHA – QATAR
MODEL EXAMINATION – JANUARY 2015

SUBJECT : PHYSICS

Class : XI (CBSE) Time : 3 Hrs. Max. Marks: 70

SET : B

General Instructions :

- *All questions are compulsory.*
- *There is **29** questions in total. Question numbers **1 to 8** are very short answer questions, and carry **1** mark each.*
- *Question numbers **9 to 16** are short answer questions, carrying **2** mark each.*
- *Question numbers **17 to 25** are short answer questions, carrying **3** mark each.*
- *Question number **26** is value –based question carrying **4** marks.*
- *Question numbers **27 to 29** are long answer questions, carrying **5** mark each.*
- *There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all three questions of 5 marks each. You have to attempt only one of the given choices in such questions.*
- *Draw neat and labelled diagrams wherever necessary.*
- *Take value of $g = 10 m/s^2$*
- *Use of calculators is not permitted. However, you may use log tables if necessary.*

1. If $x = a+bt+ct^2$, where x is in metres and 't' in second, what is the dimension formula of c. (1)
2. What do you mean by positive and negative work ? (1)
3. Which is more elastic, water or air ? Why ? (1)
4. Write the condition necessary for a motion to be SHM. (1)
5. What is the main difference between forced oscillation and resonance ? (1)

(This question paper contains 03 pages)

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6. In summer when the valve of a bicycle tube is removed, the escaping air appears cold. Why ? (1)

7. Can a body have zero velocity where acceleration is non zero ? (1)

8. What is the acceleration of a body falling through a viscous medium after terminal velocity is reached ? (1)

9. A car travels first half distance between two places with a speed of 40km/hr and the rest half distance with a speed of 60km/hr. What is the average speed of the car ? (2)

10. A unit vector is represented by $a\hat{i} + b\hat{j} + c\hat{k}$. If the values of 'a' and 'b' are 0.6 and 0.8 respectively, find the value of c. (2)

11. State the law of conservation of linear momentum and prove it using Newton's third law of motion. (2)

12. A constant retarding force of 50N is applied to a body of mass 20kg moving initially with a speed 15m/s. How long does the body take to stop ? (2)

13. State Newtons second law of motion and deduce Newtons first law from it ? (2)

14. Springs A and B are identical except that A is stiffer than B. In which spring, more work is done if they are stretched by the same amount? Explain. (2)

15. Define (i) Elastic limit (ii) Rigidity modulus. (2)

16. What are inertial and non-inertial frames of reference? (2)

OR

Friction is a necessary evil. Explain?

17. 1 cm^3 of hydrogen and 1cm^3 of oxygen are given at N.T.P. Explain with reason which will have a larger number of molecules? (3)

18. Can a body have (1) energy without momentum (2) momentum without energy ? Explain. (3)

19. Establish the relation $S = ut + \frac{1}{2} at^2$ graphically. (3)

20. Establish the relation between torque and angular acceleration. (3)

OR

Establish the relation between angular momentum and moment of Inertia.

21. State Pascal's law and explain how is it applied to hydraulic lift with the help of a diagram? (3)

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22. State three postulates of kinetic theory of gases. Obtain expression for **rms** velocity of gas molecules in terms of (i) Temperature (ii) Pressure. (3)

23. Explain laplace correction to Newtons formula for velocity of sound in a gas. How does the velocity of sound vary with (i) Temperature (ii) Humidity. (3)

24. An air bubble of volume 1 cm^3 rises from bottom of a lake 40m deep at a temperature 12°c.To what volume does it grow when it reaches the surface which is at a temperature of 35°c? (3)

25. Show that the potential energy of a spring stretched by a distance x is $\frac{1}{2}kx^2$, where 'k' is the spring constant? (3)

26. An aircraft executes a horizontal loop at a speed of 720kmh^{-1} with its wings banked at 15°. What is the radius of the loop?

26. Pinki along with her brother went to near by park for morning walk on Sunday. She saw a swing there requested her brother to swing herself. Her brother pushed the swing two or three times and after some time he got tired and sit down in the near by bench. Pinki stands in the running swing due to which the speed and hence the amplitude of vibration of the swing increased by large amount and Pinki started crying after seeing this her brother who was walking there rushed towards the swing and adviced her to sit down on the swing. Now the swing started to swing with the lower speed and seeing this Pinki stopped crying. (4)

(i) What are the values displayed by the boy ?
(ii) What is the cause of the change in speed of the swing?
(iii) Why the pendulum clock gets slowed down on the mountain?
(iv) What is the time period of simple pendulum at the centre of earth ?

27. a) Discuss elastic collision in one Dimension obtain expression for velocities of the two bodies after such a collision. (5)

OR

b) What is a projectile? Derive an expression for (i) time of flight
(ii) Horizontal range of a projectile projected obliquely from horizontal?

28. a) Derive expressions for energy of a harmonic oscillator. (5)
b) A harmonic oscillator has a total energy E. for what value of the displacement the K.E. and P.E. are equal?

OR

State and prove Bernoullis theorem. Write any two applications.

29. a) Define angle of repose. Show that the angle of repose is equal to angle of friction? (5)
b) Discuss the variation of 'g' with the height above the earth surface ?

OR

State and prove law of conservation of momentum based on (i) Newton's second law (ii) Newton's third law.