Entrance Examination into the Higher Teacher Training Collage In Bambili the University of Bamenda

Academic year 2012 / 2013; First Cycle, Physics

Paper 1(Major) Physics (Time: 3hrs)

Answer all questions. Write the letter corresponding to the correct answer in the answer booklet. You must submit your question paper together with the answer booklet. Nothing should be written on the question paper.

- Radiocarbon is a product in the atmosphere as a results of: A) Action of ultraviolet light from the sun no atmospheric oxygen B) Lighting charges in the atmosphere C) Action of solar radiations particularly cosmic rays on carbon dioxide present in the atmosphere D) Collision between fast moving neutrons and nitrogen nuclei present in the atmosphere.
- The absorption of ink by blotting paper involves: A) Diffusion of ink through the blotting; B) Siphon action C)Capillary action phenomenon D) Viscosity of ink
- 3. Light year is an unit of: A) Time B) Distance C) Intensity of Light D) Light
- 4. Out of the following pairs, choose the pairs in which the physical quantities do not have identical dimension. A) Force and rate of change of light momentum
 B) Impulse and moment of force C) Planck's constant and momentum
 D)Pressure and Young's modulus.
- 5. If two bodies of different masses, initially at rest, are acted upon by the same force for the same time, then the both bodies acquired the same:A) Kinetic energy B) Acceleration C) Momentum D) Velocity.
- 6. Find the maximum velocity for the overturn of a car moving on a track of radius 100m. The co efficient of friction between the road and the tyres is 0.2.

A) 0.14m/s **B**) 14m/s **C**) 140m/s **D**) 1.4m/s

7. Sound waves in air are:

A) Transverse B) Electromagnetic C) Polarized D) Longitudinal
8. Of the following properties of waves, the one that is independent of the other is its:



A) Velocity B) Wavelength C) Amplitude D) Frequency

- 9. Electric current may be expressed in which one of the following units?
 A) Coulombs volt B) Joules/coulombs C) Coulombs/second D)
 Ohms/second
- 10. The work done by friction force is: **A**) Always positive **B**) Always negative C) Always zero **D**) Either positive or negative depending on the situation.
- 11. Which of the following pairs are based units? A) Velocity in ms⁻¹/ force in Newton B)

Velocity in ms⁻¹/ intensity in candela C) Time in seconds/ electric current in Amperes

D) Time in seconds/ acceleration in ms^{-2}

12. A ball is projected horizontally at 15m/s from a point 20m above a horizontal surface

 $(g = 10 \text{m/s}^{-2})$. The magnitude of its velocity in m/s is when it hits the ground is:

A) 15 B) 10 C) 20

D) 45

13 A displacement vector is a: A) Change in position with velocity B) Velocity C) Scalar

D) Distance with direction.

14. Vector **A**, 5m long and vector **B** 19m long cannot have a resultant vector of:

A) 14

C) 20 **D**)

15

15. A mass of 0.5kg is swung on a vertical circular path at the end of a string. If the speed of the mass is 2 nearest the lowest point, the tension in the string is most nearly

 A) 2N
 B) 7N
 C) 29N

B) 10

D) 45N

16. A spring – loaded toy cannon has a spring with k = 8N/m, which is compressed 60cm. When it is released at 2kg plastic ball will attain a muzzle velocity of:

A) 0.2m/s **B**) 0.4m/s **C**) 1.2m/s

D) 1.0m/s



17. A block of metal which weighs 60 newtons in air and 40 newtons under water has a density in kilograms per meter cubed of: (density of water is 1000g/m^3)

A) 1000 **B**) 3000 **C**) 5000

D) 7000

18. A cylindrical container of height 0.12m and radius 00.5mm

is.....pressure (10^5 Pa). The container is sealed and heated to 370. What is the pressure of the heated gas?

A) 4.36x10⁵Pa **B**) 2.36x10⁵Pa **C**) 1.36x10⁵Pa **D**) 0.36x10⁵Pa

19. A wave moving along a spring: **A**) Cannot be transcend **B**) Carry particles of matter

C) Has no kinetic energy D) has a definite wavelength.

20. An object of mass 20kg completely immersed in a cube of water.....kg, displaces 1.30kg of water, the relative density of the object is closest to:
A) 0.02
B) 0.20
C) 2.00

D) 20.0

21. An aluminum cube having sides of 4.0cm is suspended and immersed in a jar filled with water. If its center of mass is submerged 10.0cm below the water's surface, the average hydraulic pressure on the cube is most nearly:

A) 1Pa **B**) 10Pa **C**) 100Pa

D) 1000Pa

22. Water flows through a conduit of changing size, rising from point 1 to point 2 through a height of 10.0m. The diameter at 1 and 2 are respectively 8.00cm and 5.00cm, density of water is 1.0x10³Pa. If the velocity of the water at point 1 is 1.20m/s, find the velocity at the point 2: A) 1.07m/s
B) 3.07m/s
C) 5.07m/s
D) 13.07m/s

23. If a small body of mass m is moving with angular velocity w in a circle of

radius r. what is the kinetic energy? A) $\frac{mwr}{2}$ B) $\frac{mw^2r}{2}$

C)
$$\frac{mwr^2}{2}$$
 D) $\frac{mw^2r^2}{2}$

24. Photoelectron emission rate is a direct function of radiation:

A) FrequencyB) SpeedC) DensityD) Energy



25. An electron in its ground state becomes energized and jumps up to level 4.When it returns to its original state, the number of possible photon emission is:

A) 7 B) 6 C) 5 D) 4 JULY 2000

1)For some real gases the pressure P is related to the volume V by the relation

P(V + A) = B, where A and B are constants.

i-Determine the unit of A and B ii) show that the expression is homogenous (7mks)

2 Two point masses each of $1.5x10^{-3}kg$ is suspended by a cotton thread of length *l* and carrying a charge, *q*. If at equilibrium, the point masses make an angle of 30° with other.

1) Sketch a free body diagram showing all the forces acting.

ii) Explain the origin of these forces and state any differences that exist between them.

iii) Calculate the total charge Q carried by the point masses (9mks)

3a) Figure (2) shows how log *e* varies with time T in minutes for a radioactive isotope, where A is the activity per minute. Use the figure to determine;

i)The initial activity ii) The decay constant (λ) for the nuclide. iii) The half-life. (9mks)

4) The brake linings of wheels of a vehicle have a mass of 4.2kg and specific heat capacity of 1500J/kg/K. If the mass of the vehicle is $10^{-3}kg$ and its brought to rest when moving at 20m/s by applying the brakes.

i) Estimate the maximum temperature of the linings.

ii) Would the estimated value above increase or decrease if the linings were made of a material of lower heat capacity? Explain. (6mks)

5) Two pendulum bobs X and Y hang side by side in contact with one another at rest, each supported by a thread of $20cm \log x$ has a mass of 200g and Y has a mass of 80g. X is then pulled to one side with its thread tied until it is 10cm higher and is then released to hit Y which gains a height of 15cm.



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i) Explain while the distance moved by Y is more than moved by X.

ii) Calculate the angle between X and Y after the collision.

6a) Draw a diagram of a nuclear reactor.

Explain the rule of the following in the nuclear reactor.

i) The coolant ii) The moderator iii) The control rods. (6mks)

b. i) Distinguish between fission and fusions ii) Sketch the graph of binding energy per nucleon against the mass number and use it to explain why fusion occurs only for atoms with small atomic masses while fission occur for atom with large atomic masses.

7 a i) Explain the difference between the electromotive force and potential difference (2pts).

Figure (3) is the result of an experiment showing the variation of the potential difference against current, I in an electric circuit.

- ii) Use the figure to determine the electromotive force (E.M.F.) of the cell experiment.
- iii) Determine the internal resistance of the cell. (6pts)
- b ii) Draw a circuit diagram from which data could have been obtained.



Figure 4

Figure (4) shows an electric circuit. Determine the reading of the meters, M_1 and M_2 when the switch S is closed. (8pts)

8 a i) Define Young's modulus.

ii) Describe an experiment to determine the Young's modulus of a copper wire (11pts).



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iii)Sketch a graph on the same set of axes graphs showing how stress and strain vary for a piece of glass and a copper wire.

b i) Sketch a graph of the force between two particles as a function of the separation of the particles.

ii) The force, F in Newton between two particles in a solid with their separation in meters, *m* in accordance to the expression, $=\frac{8.0x10^{-20}}{r^2} - \frac{4.0x10^{-96}}{r^{10}}$, Calculate a value for the equilibrium separation and comment on its sign. (6pts)

