KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Mark Scored:

Level : B.Sc.
Year : II

Course : PHYS 206
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 06 JUN 2019

SECTION "A"
[20Q. × 1 = 20 marks]

Choose the most appropriate answer among the given options and ***encircle*** *the letter of your choice.*

1. All of the following statements are correct except
   [a] If a gas is expanded adiabatically, then its internal energy will decrease, i.e., the gas will cool down.
   [b] If a gas is compressed adiabatically, then its internal energy will increase, i.e., the gas will get heated.
   [c] If a gas is expanded isothermally, then an amount of heat equivalent to the work done by the gas should be supplied to it from the external source.
   [d] If a gas is compressed isothermally, then an amount of heat equivalent to the work done by the gas should be supplied to it from the external source.

2. For a HEP station with a head height h and volume flow rate Q, the maximum power output is about
   [a] Qh (W) [b] Qh (kW) [c] 10Qh (W) [d] 10Qh (kW)

3. For hydrogen fusion to take place, magnetic confinement uses
   [a] the laser beams or ion beams to heat and expand the hydrogen plasma
   [b] the laser beams or ion beams to heat and squeeze the hydrogen plasma
   [c] the electric and magnetic fields to heat and expand the hydrogen plasma
   [d] the electric and magnetic fields to heat and squeeze the hydrogen plasma

4. Nuclear power plant workers should be constantly monitored
   [a] for nuclear waste disposal
   [b] for proper emergency response
   [c] for any over exposure of nuclear radiation
   [d] to separate them from outside environment

5. An apparent force caused by the rotation of the earth is called
   [a] coriolis force [b] centripetal force [c] centrifugal force [d] terrestrial force

6. The phenomenon associated to the transport of momentum is
   [a] thermal conductivity [b] diffusion
   [c] viscosity [d] ambipolar diffusion

7. Density of air at a pressure of 10^5 N/m^2 is 1.2 kg/m^3. Under these conditions, the root mean square speed of air molecules is
   [a] 1500 m/s [b] 500 m/s [c] 340 m/s [d] 500 cm/s

8. A sound of loudness 80 dB has intensity
   [a] 10^{-4} W/m^2 [b] 10^{-12} W/m^2 [c] 10^{-9} W/m^2 [d] 10^{-6} W/m^2

9. What form of radioactive decay reduces the atomic number by 2?
   [a] beta decay [b] alpha decay [c] gamma decay [d] positron decay

10. In a spontaneous nuclear reaction
[a] the total mass of the products = total mass of the reactants
[b] total mass of the products > total mass of the reactants
[c] total mass of the products < total mass of the reactants
[d] nothing can be said for sure

11. Dry adiabatic lapse rate
[a] is always higher than saturated adiabatic lapse rate
[b] is always lower than saturated adiabatic lapse rate
[c] is always equal to saturated adiabatic lapse rate
[d] can be higher or lower than saturated adiabatic lapse rate depending upon the atmospheric stability

12. Standard reverberation time is the time for sound to die away to a level
[a] 40dB below its original level
[b] 60dB below its original level
[c] 20dB below its original level
[d] 50% of its original level

13. The order of the atmospheric layers, starting from closest to the surface to the top of the atmosphere, is
[a] Mesosphere, Troposphere, Thermosphere, Stratosphere
[b] Troposphere, Stratosphere, Mesosphere, Thermosphere
[c] Thermosphere, Mesophere, Troposphere, Stratosphere
[d] Troposphere, Mesosphere, Stratosphere, Thermosphere

14. The increase in temperature with increase in height in the stratosphere is due to
[a] Conduction.
[b] Convection.
[c] Greater absorption of ultraviolet radiation at the top of the stratosphere.
[d] The rapid decrease in pressure and density of air with the altitude in the stratosphere, thus the ideal gas law requires temperature to increase too.

15. Fuel cell converts chemical energy to electrical energy using a reaction that
[a] eliminates combustion of fuel
[b] requires combustion of fuel
[c] requires no ignition of fuel
[d] fuel is not required

Fill in the blanks.

16. If the efficiency of a Carnot engine is found to increase from 0.3 to 0.4 when the temperature of the sink is lowered by 50 K, then the original temperature of the sink is _____ K.

17. A renewable energy source that does not originate from the sun is _____ energy.

18. The wind speed is reduced to one-fourth of its original speed. Power available remains the same if the diameter of the rotor is increased by _____ times.

19. Water flows between two plates of which the upper one is stationary and the lower one is moving with a velocity V. The velocity of the fluid in contact with the upper plate will be _____.

20. Singly ionized atoms of an element enter a Bainbridge's mass spectrograph with a velocity selector having electric and magnetic fields 30 KV/m and 0.2 Tesla. The velocity of the ion emerging from the selector is _____ m/s.

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F.M. : 55

SECTION "B"
[5Q. × 4 = 20 marks]

Attempt ALL questions.

1. What is meant by lapse rate? Explain why dry adiabatic lapse rate is always more than saturated adiabatic lapse rate.

2. Write a short note on albedo with suitable examples. Explain how the anthropogenic activities can lead to a change in the albedo of the Earths's surface.

OR

What is meant by coefficient of thermal conductivity of a material? A room has a 4m × 4m × 10 cm concrete roof (K= 1.26 W/m-°C). At some instant the temperature outside is 46 °C and that inside is 32 °C. Neglecting the convection, calculate the amount of heat flowing per second in to the room through the roof.

3. At time $t = 0$, a radioactive sample contains 3.50 μg of pure ${}_6C^{11}$, which has a half-life of 20.4 min.
(a) Determine the number N_0 of nuclei in the sample at $t = 0$.
(b) What is the activity of the sample initially and after 8.00 h?

4. Discuss the energy storage and energy distribution (transportation).

OR

Define solar constant. Explain the variation of extraterrestrial solar radiation.

5. Discuss the management of nuclear fuel cycle.

SECTION "C"
[5Q. × 7 = 35 marks]

Attempt ALL questions.

6. Discuss the energy from fossil fuel and estimate the amount of energy release during combustion of natural oil (petroleum) and hence find out the energy content in it in kJ/gm. (Bond energy in kJ/mole for C–C, C–H, O–H, O=O and C=O are 347, 410, 460, 494 and 799 respectively)

7. Define renewable and non-renewable energy sources with examples. Derive an expression for the power developed (available) due to wind.

OR

Explain the different methods of disposal of nuclear waste and discuss the nuclear hazards and safety measures.

8. Give a brief account of the principle and working of a Geiger-Muller counter. Describe how it can be used to detect and measure nuclear radiation. What is meant by the efficiency of the counter?

OR

What is a mass spectrograph? Describe Bainbridge mass spectrograph and explain how atomic masses are determined with it. Mention the important advantage of this type of spectrograph.

9. What do you mean by radiation inversion? Give a brief account of the different shapes of plumes and atmospheric stability.

10. What is meant by noise pollution? Explain the auditory and non-auditory effects of noise on human health. Describe the methods of reducing noise.