

MHS

Physics

Exam to go from grade 11  
to grade 12

Sample Questions

1. What is the direction of the force due to atmospheric pressure on a semi-circular tent? (**select one correct answer**)



1. Tangent to each point along the curve of the tent
  2. Normal to each point along the curve of the tent
  3. Vertically downwards on the tent
2. How are Pressure, Force and Area related?
1.  $P = FA$
  2.  $P = \frac{F}{A}$
  3.  $P = \frac{A}{F}$
3. Which of the following is/are true regarding the direction of pressure we feel at the bottom of a swimming pool? (for each one say **yes** or **no**)
1. The pressure is isotropic
  2. Pressure is a scalar quantity and so direction of pressure is a meaningless term
  3. The pressure has a specific direction
4. What formula can we use to calculate the pressure at a point in a liquid? (**select one correct answer**)
1.  $P = \rho h$
  2.  $P = \rho gh$
  3.  $P = pgh$
5. If a fluid is open to the atmosphere, what kind of pressure will act on its surface? (**select one correct answer**)
1. Atmospheric pressure
  2. Open Fluid pressure
  3. Vacuum pressure
6. A stone drops to the bottom of a 2 m deep pool of liquid of density  $1.5 \times 10^4 \text{ kg.m}^{-3}$  that is open to the atmosphere. What pressure will the stone experience? [Use  $g = 10 \text{ N/kg}$ ] (**select one correct answer**)
1.  $P_{\text{stone}} = (P_{\text{atm}} + 3 \times 10^5) \text{ Pa}$
  2.  $P_{\text{stone}} = 3 \times 10^5 \text{ Pa}$
  3.  $P_{\text{stone}} = (3 \times 10^5 - P_{\text{atm}}) \text{ Pa}$
7. What are the basic **assumptions** of Molecular Kinetic Theory? (for each one say **yes** or **no**)
1. All matter consists of particles.
  2. All particles in matter are in a state of perpetual motion.
  3. All particles in matter never move

8. What is the approximate diameter of an atom? (**select one correct answer**)
1.  $10^{-10}$  m
  2.  $10^{-15}$  m
  3.  $10^{12}$  m
9. Which of the following are true regarding atomic structure? (for each one say **yes** or **no**)
1. Electrons move about the nucleus of an atom in unrestricted space
  2. All electrons in the atom are inside the nucleus
  3. Atoms do not have sharp boundaries
10. Particles in a solid (**select one correct answer**)
1. move like particles in liquid, like ink in water
  2. never move at all, they are perfectly at rest
  3. vibrate in their place, each particle moves randomly about a fixed position
11. The average kinetic energy of particles is directly proportional to the absolute temperature in (for each one say **yes** or **no**).
1. gases
  2. liquids
  3. solids
12. Diffusion and Brownian motion are evidence of what? (**select one correct answer**)
1. That particles in a liquid vibrate about fixed positions
  2. That particles in a liquid do not move
  3. That particles in a liquid are in constant random motion
13. Compared to the particles of solids and liquids, gas particles are far apart. What evidence supports this? (**select one correct answer**)
1. Gases are combustible
  2. Gases are compressible
  3. Gases are made of solids and liquids
14. What does **Boyle's law** state? ( $p$ : pressure [Pa],  $V$ : volume [ $\text{m}^3$ ],  $T$ : temperature [K] &  $k$  is a constant.) (for each one say **true** or **false**)
1. for a fixed quantity of a gas at constant temperature,  $\frac{p_1}{V_1} = \frac{p_2}{V_2} = k$
  2.  $P_1V_1 = P_2V_2 = k$
  3. for a fixed quantity of a gas at constant temperature,  $pV = k$
15. What does the **Pressure Law** state? ( $p$ : pressure [Pa],  $V$ : volume [ $\text{m}^3$ ],  $T$ : temperature [K] &  $k$  is a constant.)
1. for a fixed quantity of a gas at constant temperature,  $p = kV$
  2. for a fixed quantity of a gas at constant pressure,  $V = kT$
  3. for a fixed quantity of a gas at constant volume,  $p = kT$

16. What does **Charles' Law** state? ( $p$ : pressure [Pa],  $V$ : volume [ $\text{m}^3$ ],  $T$ : temperature [K] &  $k$  is a constant.)
1. for a fixed quantity of a gas at constant temperature,  $p = kV$
  2. for a fixed quantity of a gas at constant pressure,  $V = kT$
  3. for a fixed quantity of a gas at constant pressure,  $VT = k$
17. A fixed mass of gas initially had a temperature of 360 K at a pressure of  $6 \times 10^4$  Pa in a volume of  $0.5 \text{ m}^3$ . Calculate the new temperature of the gas if the pressure was increased to  $1.2 \times 10^6$  Pa and the volume decreased to  $0.9 \text{ m}^3$ .
18. What was Thomson's model of the atom? (**select one correct answer**)
1. Electrons in orbit around a negatively charged, relatively heavy nucleus
  2. Electrons dispersed in a positively charged uniform medium
  3. Electrons in orbit around a positively charged, relatively light nucleus
19. Rutherford's experiment (**select one correct answer**)
1. provided evidence for the existence of the electron
  2. demonstrated that the centers of positive charge are parts of the atom (named the nucleus), and occupy a very small fraction of the space occupied by the atom itself
  3. provided evidence for the existence of the neutron
20. The nucleus consists of: (**for each one say yes or no**)
1. electrons
  2. neutrons
  3. protons
  4. puddings
  5. Thomsons
21. The number of nucleons in the nucleus is given by: (**select one correct answer**)
1. atomic number  $Z$
  2. neutron number  $N$
  3. mass number  $A$
22. The atomic number  $Z$  is the number of (**select one correct answer**)
1. protons in a nucleus
  2. neutrons in a nucleus
  3. protons and neutrons in a nucleus
23. Which of the following equations is/are correct? (**for each one say yes or no**)
1.  ${}_{88}^{226}\text{Ra} \rightarrow {}_{86}^{222}\text{Rn} + {}_2^4\text{He}$
  2.  ${}_{38}^{90}\text{Sr} \rightarrow {}_{39}^{90}\text{Y} + {}_{+1}^0\text{e}$
  3.  ${}_{85}^{210}\text{At} \rightarrow {}_{83}^{206}\text{Bi} + {}_2^4\text{He}$

24. Say if the following are **True or False** about alpha particles.
1. Alpha particles are emitted from radioactive nuclei typically at 6% the speed of light ( $\approx 2 \times 10^7 \text{ ms}^{-1}$ )
  2. Alpha particles move in air in straight lines, because of their high momentum
  3. Typically an alpha particle shot in air produces about  $10^5$  ion pairs per cm
  4. Alpha particles are emitted by nuclei with mass numbers greater than 200
  5. Alpha particles are not deflected as they pass through a magnetic field because they carry no charge
25. Say if the following are **True or False** about beta particles.
1. Beta particles are fast moving electrons and are emitted from radioactive nuclei at speeds up to 98 % of the speed of light
  2. Beta particles can travel up to 5 m in air
  3. Beta particles are deflected as they pass through a magnetic field because they carry a negative charge
  4. A beta particle shot in air produces about  $10^{12}$  ion pairs/cm
  5. A beta particle is a fast moving electron symbol:  ${}_{-1}^0e$
26. Say if the following is are **True or False** about gamma rays.
1. Gamma rays are electromagnetic waves. Compared to the other waves in the electromagnetic spectrum, gamma rays have the most energy per photon, and have the shortest wavelength.
  2. Gamma rays are never stopped completely by any material, but a thickness of 4 cm of lead reduces their intensity to 10% of the original value.
  3. Gamma rays are emitted by some radioactive nuclei. More energetic gamma rays come to the earth from outer space, and are called cosmic rays.
  4. Gamma rays are not affected by magnetic or electric field because they carry no charge.
  5. Gamma rays produce a lot of ionization in air (about  $10^5$  ion pairs/cm).
27. What is radioactive decay? (**select one correct answer**)
1. The process of radioactive transmutation of a radioactive nucleus
  2. The process of forcing two atoms to fuse together
  3. The process of detecting radioactive emissions from a radioactive nucleus
28. What is the half-life for a radioactive material? (**select one correct answer**)
1. The time it takes for half of the sample to decay
  2. The time for a radioactive sample to decay completely
  3. Half the time for the sample to be completely decayed
29. Which of the following are true regarding nuclear fission? (for each one say **true** or **false**)
1. Neutrons are given off in a fission reaction
  2. A heavy nucleus splits into two lighter nuclei in a fission reaction
  3. Energy produced in a nuclear power plant comes from a controlled fission chain reaction
  4. The explosion in an atomic bomb is produced from an uncontrolled fission chain reaction

30. \_\_\_\_\_ is the ability to cause a change. (select one answer to fill the space)
1. Energy
  2. Mosquitoes
  3. Chain
31. What is Einstein's mass–energy equation? (select one correct answer)
1.  $E^2 = mc$
  2.  $E = cm^2$
  3.  $E = mc^2$
32. Nuclear fission is: (select one correct answer)
1. the process of induced or driven emission of radiation
  2. the process where small nuclei like hydrogen join together to form larger nuclei like helium releasing energy
  3. the process of breaking up a large nucleus into smaller fragments/nuclei releasing neutrons and energy
33. Nuclear fusion is: (select one correct answer)
1. the process of breaking up a large nucleus into smaller fragments/nuclei
  2. the process of spontaneous emission of radiation
  3. the process where small nuclei like hydrogen join together to form larger nuclei like helium
34. Which of the following is/are true about radiant energy? (select one correct answer)
1. Radiant energy is a form of energy that cannot travel outside matter, i.e. it cannot travel in a vacuum.
  2. Radiant energy has a mass roughly the same as an electron and has a negative charge
  3. Radiant energy can radiate into the space around it, it does not have to radiate its energy directly to another body
35. Which model of light does the photoelectric effect support? (select one correct answer)
1. The wave model
  2. The vacuum model
  3. The particle model
36. Which of the following is/are true? (for each one say **true** or **false**)
1. Photons can vary greatly in the amount of energy they carry.
  2. The study of photons in nature is divided into overlapping categories based on the differing methods of production of the different energies, but they are all photons.
  3. All photons carry the same energy regardless of the source producing these photons.
37. Which of the following describes radio waves? (for each one say **yes** or **no**)
1. They are low energy photons
  2. They have the longest wavelengths compared to other forms of electromagnetic energy
  3. They carry a small amount of energy
  4. They have the lowest frequency compared to other forms of electromagnetic energy

38. Where do microwaves belong in the electromagnetic spectrum? **(select one correct answer)**
1. As part of radio waves, at the low energy end of the radio part of the electromagnetic spectrum
  2. At the highest energy end of the complete electromagnetic spectrum
  3. As part of radio waves, at the high energy end of the radio part of the electromagnetic spectrum
39. Which of the following are true about infrared radiation? **(for each one say true or false)**
1. Food can be cooked using infrared radiation
  2. Humans never emit infrared radiation
  3. Humans cannot detect infrared radiation in any way
40. Which of the following is/are true about visible light? **(for each one say true or false)**
1. Visible light is emitted by very hot objects
  2. Humans emit light through their eyes
  3. Humans can detect visible light with their skin
41. What are the potential **negative** effects that ultraviolet radiation can have on the human body? **(select one correct answer)**
1. Ultraviolet radiation can cause skin cancer
  2. Ultraviolet radiation can cause the body to produce a deadly poison
  3. Ultraviolet radiation can cause people to spontaneously combust
  4. Ultraviolet radiation can cause people to cook from the inside
42. How are x-rays produced? **(select one correct answer)**
1. They are released when fast-moving electrons bombard metals
  2. They are created by constructively interfering ultraviolet photons
  3. They are released when visible light is accelerated to  $2c$
43. Photons of gamma-ray radiation are **(select one correct answer)**
1. the least energetic of all the types of photons in the electromagnetic spectrum
  2. the longest wavelength photons in the electromagnetic spectrum
  3. the most energetic of all the types of photons in the electromagnetic spectrum
44. Which of the following is/are true about kinetic energy? **(select one correct answer)**
1. Objects that move only in a straight line possess rotational kinetic energy
  2. Translational kinetic energy is the name given to the energy possessed by objects due to their net translational motion.
  3. An object is said to possess translational kinetic energy when spinning.
45. Which of the following is/ are true about gravitational potential energy? **(select one correct answer)**
1. It is the name given to the energy possessed by objects due to their motion.
  2. It is the energy that is lost by friction once the body is subjected to translational motion.
  3. It is the name given to the energy possessed by objects due to their position.
  4. It is the name given to the energy stored by elastic objects.

46. Which of the following is/are true about elastic potential energy? (**select one correct answer**)
1. elastic potential energy is the name given to the energy stored by elastic objects.
  2. elastic potential energy is the name given to the energy possessed by objects due to their motion.
  3. elastic potential energy is the energy which is lost by friction once the body is subjected to a translational motion.
47. Which of the following is/ are true about the law of conservation of energy? (**for each one say true or false**)
1. Energy can neither be created nor destroyed
  2. Energy can change from one form to another
  3. Energy can be transferred from one object to another
48. When will a body X do work on a body Y? (**select one correct answer**)
1. When body X does not interact with any other body
  2. When body X interacts with another body Z
  3. When body X transfers energy to body Y
49. A man pushes a box of mass 32 kg with a force of 60 N through a distance of 5 m along a smooth horizontal surface. Calculate the work done by the man.
50. A body, *A*, of mass 12 kg initially moving at  $6 \text{ ms}^{-1}$  interacted with another body *B*. After the interaction the speed of *A* was reduced to  $2 \text{ ms}^{-1}$ . Calculate the work done on *A* by *B*.
51. How can the work done by the Earth on a body be calculated for a body that falls from an initial height  $h_o$  to a final height  $h_f$ ? (**select one correct answer**)
1. Work done by the Earth on the body =  $mgh$ , where  $h = h_o - h_f$
  2. Work done by the Earth on the body =  $mgh$ , where  $h = h_f - h_o$
  3. Work done by the Earth on the body =  $\frac{1}{2} mgh^2$ , where  $h = h_o - h_f$
52. Power is defined as (**select one correct answer**)
1. work done divided by distance
  2. energy transferred per unit time
  3. the sum of potential and kinetic energies