

Jerusalem Science Contest 5783
Environmental Sustainability and Energy
Test 4
Form – A
Answer Key

1) The average distance between the Earth and the Moon is 3.844×10^5 km. At such a distance, how much time in seconds (s) would it take for a photon of light reflected from the sun to reach the Earth?

- a) 1.28 s**
- b) 1.28×10^{-3} s
- c) 1.15×10^9 s
- d) 1.15×10^{12} s

2) Atmospheric CO₂ absorbs

- a) visible light
- b) ultraviolet light.
- c) infrared light.**
- d) gamma rays

3) True or False: UV and visible light are absorbed by the surface of our planet, released as infrared light (heat), trapped by the atmospheric CO₂ and partially released back to earth, causing global warming.

- a) True**
- b) False

4) Why do electric vehicles still cause CO₂ emissions?

- a) Batteries directly give off CO₂.
- b) Electric vehicles run on gas.
- c) The battery power is often derived from fossil fuels like coal.**
- d) Government regulations require the emission of CO₂ for electric vehicles.

5) What is the relationship between the frequency of light and its wavelength?

a) $v=c/\lambda$

b) $v= \lambda/c$

c) $\lambda=v/c$

d) $c= \lambda/v$

6) True or False: in the Electromagnetic Spectrum, as wavelength increases, frequency decreases.

a) **True**

b) False

7) Einstein postulated which of the following:

a) Electromagnetic radiation is not energy.

b) **Light is delivered in small discrete packets called photons.**

c) The energy contained in a photon of light is inversely proportional to the frequency of that light.

8) Exactly 1 mile = 1.609×10^3 m. Planck's Constant, $h = 6.626 \times 10^{-34}$ J-s. Based on the postulate of Louis De Broglie, what would be the wavelength of a 145 g baseball that is pitched with a velocity of 95.0 miles per hour?

a) 4.81×10^{-30} m

b) 1.94×10^3 m

c) 4.81×10^{-38} m

d) **1.08×10^{-34} m**

9) True or False: The energy of a light photon that is absorbed is equal to the binding energy plus the kinetic energy of the ejected electron.

a) **True**

b) False

10) How can light be converted to electricity?

a) **Certain materials emit electrons when light shines on their surface.**

b) Certain batteries become charged when exposed to sunlight

c) The speed of the rotation of the earth causes light to give off energy.

11) One photon of light with a wavelength of 234 nm is how much energy? Planck's Constant is 6.626×10^{-34} J-s, and the speed of light is 3.00×10^8 m/s.

a) **8.49×10^{-19} J**

b) 1.55×10^{-40} J

c) 1.55×10^{-31} J

- 12) What factor of light increases the amount of energy derived from it?
- a) The intensity/brightness
 - b) The frequency**
 - c) The color
 - d) The beauty
- 13) Which of the following is not true about Photosynthesis?
- a) Photosynthesis is the process by which plants get the energy to develop the sugars they need.
 - b) Plants and algae use light energy to convert CO₂ and water to glucose and oxygen.
 - c) Photosynthesis does not take place inside the chloroplasts.**
 - d) Plants use a compound called chlorophyll to absorb the sunlight.
- 14) Calculate the wavelength of a radio signal with a frequency of 100.7 MHz.
- a) 3.021×10^{16} m
 - b) 3.021×10^{10} m
 - c) 2.979 m
 - d) 2.979×10^6 m**
- 15) Which of the following is not currently used as a source of energy for the production of electricity?
- a) Combustion of coal
 - b) Combustion of natural gas
 - c) Nuclear energy
 - d) Lightning**
- 16) Which pair of Torah commandments share – according to some commentaries – a common theme?
- a) Shemitah and Kilayim
 - b) Kilayim and Shilu'ach ha'Ken
 - c) Shilu'ach ha'Ken and "Oso v'Es B'no"**
 - d) Kilayim and "Oso v'Es B'no"
- 17) What is the prohibition of Kilayim?
- a) Cross-breeding animals
 - b) Working two types of animals together
 - c) Sowing different types of seeds together
 - d) All of the above.**

- 18) What is not a reason given for the prohibition of Kilayim?
- a) An act of Kilayim is a lack of faith in the Creator, implying that the world is not good enough.
 - b) An act of Kilayim will destroy a species' ability to procreate.
 - c) The land needs to lie fallow in order to rejuvenate its strength.**
 - d) None of these are reasons given for Kilayim.
- 19) What is the commandment of “Oso v’Es B’no”?
- a) Do not eat the meat of a parent animal and its offspring on the same day.
 - b) Do not slaughter a bird and eat its egg on the same day.
 - c) Do not take the mother bird and its fledglings or eggs from the nest simultaneously.
 - d) Do not slaughter an animal and its offspring on the same day.**
- 20) Besides the Mitzvos that seem to be concerned with protecting animals from extinction, a number of Mitzvos are concerned with protecting animals from distress. Which of the following prohibitions would not be included in this category?
- a) The prohibition against eating the blood of an animal (chol dam lo tochelu)**
 - b) The prohibition against causing pain to animals (tza’ar ba’alei chayim)
 - c) The prohibition against muzzling an ox when it treads grain (lo tachsom shor b’disho)
 - d) The prohibition against eating the limb of a live animal (ever min ha’chai)