Astronomy 104, Spring 2023

Test 2

Print your name:

_____

Make sure your scantron has your name and code on it.

Show a picture ID,
and
turn in the test paper with the scantron.

Please circle the
correct answers on the test paper.

Answer these questions on the scantron as indicted:

1 **Answer E**
2 **Answer B**
3 **Answer C**

4 How does the speed of light relate to the speed of radio waves and the speed of sound?

A: Radio waves are fastest, light is middle, sound is slowest.

B: Sound and radio waves have the same speed, the speed of light is infinitely fast.

C: Radio waves and sound are slow, light is fast.

D: Radio waves and light have the same speed, sound is much slower.

E: They all have the same speed.

5 How was the speed of light measured for the first time?

A: By measuring the delay in conversations of astronauts.

B: By measuring the slowing down of the time in a spaceship.

C: Getting a laser reflection from the Moon.

D: Measuring the delay in the eclipses of Jupiter's moons.

E: By direct measurement in a laboratory experiment.

6 Which one is an example of the Doppler-effect?

A: The motion of a star makes spectral lines broaden.

B: Magnetic fields make spectral lines break up into several lines.

C: The spectral lines of a moving star are shifted.

D: The overall color of a moving star changes.

E: Gas illuminated by UV radiation glows in an emission spectrum.

7 What is a double-line binary star?

A: A double star with a strong magnetic field.

B: A doule star system with strong stellar wind.

C: A star that is visibly broken up into a pair in the telescope and the orbital motion is noticeable.

D: A star that is visibly broken up into a pair in the telescope but the orbital motion is not noticeable.

E: A short-period binary with both stars' spectral lines visible.

8 How does the Doppler-effect affect the spectrum of a star?

A: Spectral lines shift (usually a tiny bit) when the star moves towards or away from us.

B: An approaching star's light arrive to Earth sooner, which causes its spectral lines broaden.

C: The color of a moving star looks redder/bluer than normal.

D: The spectral lines of an approaching star are shifted from the red end of the spectrum to the blue end.

E: The star's light is stronger when the star is approaching us, and weaker when it is receding.

9 Strong ultraviolet radiation comes only from stars of spectral type …, and why?

A: All spectral types, because they are all hot.

B: K & M, because these are hot enough.

C: O & B, because these are hot enough.

D: None, because stars do not radiate in UV.

E: All spectral types, because UV production does not depend on temperature.

10 Relate the energy of a blue photon to the energy of a red photon.

A: Cannot tell: the energy of photons depends on the strength of the light.

B: Blue photons have half the energy of red photons.

C: Blue photons have a hundred times less energy than red photons.

D: Blue photons have a hundred times as much energy as red photons.

E: Blue photons have twice as much energy as red photons.

11 What type of a spectrum does the Sun have?

A: emission spectrum.

B: a mixture of an emission and an absorption spectrum.

C: absorption spectrum.

D: band spectrum.

E: continuous spectrum.

12 What happens to the spectrum of a star that rotates?

A: They are shifted by an amount proportional to their wavelength.

B: All its spectral lines broaden the same way.

C: Spectral lines become more prominent.

D: It is shifted towards red or blue by an even amount.

E: The spectral lines in the red part of the spectrum become brighter.

13 What percentage of all stars are doubles?

A: All.

B: There are no true double stars. They may seem so only due to perspective.

C: Almost all.

D: Almost none.

E: Half.

14 How do we know the chemical composition of stars?

A: From a chemical analysis of interstellar gas blown in into the solar system.

B: From the presence of each atom's spectral lines.

C: From samples returned by spacecraft.

D: It is calculated based on the amount of energy the star radiates.

E: From a chemical analysis of cosmic rays.

15 What spectral type is the red giant Betelgeuse?

A: M.

B: C.

C: Hydrogen.

D: G.

E: He.

16 What does Wien's law say?

A: Hotter gas radiates stronger than cold, proportionally to the fourth power of temperture.

B: Hotter objects appear redder (I.e. radiate in longer wavelength).

C: Thermal glow gets of shorter wavelength when the temperature of the body is increased.

D: The wavelength of the light of an approaching body is shifted towards blue.

E: Warmer material absorbs red light stronger.

17 When do you see an absorption spectrum?

A: When hot objects glow.

B: When gas is illuminated from the side.

C: When planets reflect sunlight.

D: When charged particle hit magnetic fields.

E: When cold gas is in front of a light source.

18 Which of the following is wrong?

A: X-ray photons have more energy than photons of light.

B: The energy of each photon does not depend on how strong the light is.

C: A blue photon always has more energy than a red photon.

D: The stronger the light, the more energy each of its photons has.

E: Microwave photons have less energy than photons of light.

19 Atoms consist of the following constituents:

A: Electrons, and a nucleus.

B: Electrons and nucleons.

C: Electrons, protons and neutrons.

D: Quarks, electrons, and gluons.

E: Molecules and electrons.

20 What does Stefan-Boltzman's law say?

A: The temperature of a star is inversely proportional to the wavelength of its color.

B: Each absorption line is brightest at a particular temperature.

C: The power radiated by a surface element of a glowing body is proportional to the 4th power of its temperature.

D: The absolute magnitude of a star is independent of its distance.

E: The speed of rotation of a star is inversely proportial to its temperature.

21 What does ionization mean?

A: Atoms losing (some of) their electrons.

B: Electrons moving to a higher orbit in an atom.

C: The breakup of molecules into atoms.

D: A chemical reaction with an ionizing salt.

E: Mixing interstellar gas with Fe-containing dust.

22 The energy of each photon is determined by …

A: the speed of the light.

B: both the wavelength and the strength of the light.

C: the strength of the light only.

D: its wavelength only.

E: nothing at all: it is a universal quantum constant of nature.

23 At what temperature will all molecules disintegrate?

A: Above ~ 2000 K

B: Above ~ 10,000 K.

C: Above ~ 100 K

D: Above ~ 1 million K

E: Above ~ 273 K

24 The spectral type of a star is related to …

A: its surface temperture.

B: the temperature in its core.

C: its chemical composition.

D: its distance.

E: its speed of motion.

25 What is plasma?

A: Hot gas with most molecules broken up into atoms.

B: Gas that contains no free electrons.

C: A viscous liquid.

D: Gas that contains no electrons.

E: (At least partially) ionized gas.

26 A hydrogen nucleus …

A: consists of two protons.

B: is a proton.

C: is a neutron.

D: is a proton and an electron.

E: consists of one proton and one neutron.

27 Why do we use spacecraft to do X-ray astronomy?

A: Because spacecraft is closer to the stars.

B: Because the telescope needs to be cooled to liquid helium temperatures (3K).

C: Because of interference from medical use of X-rays.

D: Because the atmosphere is opaque in X-rays.

E: Because X-ray telescopes radiate dangerous amounts of X-rays.

28 A star's color indicates its …

A: size.

B: temperature.

C: mass.

D: distance.

E: chemical composition.

29 Where do 1. low energy, 2. high energy cosmic rays come from?

A: Low: deep space, High:the Solar Wind.

B: All: beyond the Solar System

C: All: from Earth, mainly nuclear reactors

D: Low: the Solar Wind, High: deep space.

E: All: the Solar Wind

30 The spectrum of a hot glowing body is …

A: emission spectrum.

B: band spectrum.

C: continuous spectrum.

D: absorption spectrum.

E: a mixture of an emission and an absorption spectrum.

31 How do we measure the mass of stars?

A: Using Kepler's III law for binary stars.

B: We measure how strong a gravitational effect they have on the motion of Earth.

C: We measure the strength of their magnetic field.

D: Using Kepler's II law applied on their planets.

E: Using Wien's law, applied to the color of the star.

32 What can you tell from the wavelength of a spectral line?

A: The strength of gravity of the source object.

B: The atmospheric pressure in the source object.

C: How far is the source from the observer.

D: The temperature of the gas that emits the light.

E: Which atom/molecule produced the line.

33 Which one is moving fastest?

A: Radio waves

B: X-rays

C: Visible light

D: The same

E: Laser

34 The spectral type of the Sun is …

A: K

B: M

C: A

D: B

E: G

35 What chemical process changes carbon into oxygen?

A: Burning.

B: Hydrolysis.

C: Oxydation.

D: Electrolysis.

E: None.

36 What happens to matter at 10,000 degrees?

A: All atoms become ionized.

B: Molecules break up.

C: (At least some) atoms break up.

D: All substances become solid.

E: Atomic nuclei change into each other.

37 The equivalent of light at much shorter wavelength is called …

A: Radio waves.

B: Charged particle radiation.

C: Ultraviolet.

D: Neutrinos.

E: X-rays.

38 Why are double stars important in astronomy?

A: It is easier to detect a double star than a single one.

B: They provide the only way to determine the chemical composition of stars.

C: They are the only ones that blow up as supernovae.

D: Double stars have many planets orbiting around them.

E: They provide the only way to tell stellar masses.

39 The wavelength of light determines its …

A: polarization.

B: intensity.

C: color.

D: ratio of electric / magnetic field strength.

E: speed.

40 Why does a planetary nebula glow?

A: It is illumnated by the Sun.

B: It is illuminated by surrounding stars.

C: It is illuminated by the planet whose atmosphere it is.

D: It fluoresces in the UV of the central white dwarf.

E: It reflects the light of the star in its center.

41 What type of spectrum does fluorescence produce?

A: Emission spectrum.

B: Distorted spectrum.

C: Absorption spectrum.

D: Continous spectrum.

E: Band spectrum.

42 What can excite a hydrogen atom?

A: Infrared radiation.

B: A magnetic field.

C: UV radiation.

D: Heating to 1200 K.

E: Red light.

43 How large is the Doppler effect in astronomy in practice?

A: A large shift (say, 10%) in the wavelength of spectral lines.

B: It is impossible to detect the Doppler effect in the spectra of individual stars.

C: Both the position of the spectral lines and the overall color of the star changes noticeably.

D: A tiny (say, 0.01%) shift in the wavelength of spectral lines.

E: A large shift in the overall color of a star, say, from blue to red appearence.

44 How long does light take to arrive from the Sun to Earth?

A: 1 light year.

B: 4 years.

C: an hour.

D: 9 minutes.

E: 4.5 billion years.

45 What change occurs to molecules in hot matter such as the matter of a star? At what temperature?

A: Molecules pick up extra electrons at ~ 10,000 degrees to become ions.

B: Molecules turn into protons and electrons at ~ 2000 degrees.

C: Molecules break up into atoms at ~ 2000 to 3000 degrees.

D: Molecules break up into atoms at ~ 2 million degrees.

E: Molecules are fused into very large atoms at ~ 1200 degrees.