Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic : 9_Thermodynamics

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Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

Star A has twice the radius of star B but only half the surface temperature.

The ratio of the luminosity of star A to luminosity of star B is

- ☒ **A** 1:4
- ☒ **B** 1:2
- ☒ **C** 2:1
- ☒ **D** 4:1

(Total for question = 1 mark)

Q2.

If the surface temperature of the Sun were to double, the rate at which energy from the Sun is received on the Earth would increase by a factor of

- ☒ **A** 2
- ☒ **B** 4
- ☒ **C** 8
- ☒ **D** 16

(Total for question = 1 mark)

Q3.

A data book contains the following information for ethanol.

latent heat of fusion = 109 kJ kg^{-1}

latent heat of vaporisation = 838 kJ kg^{-1}

545 J is transferred from a sample of ethanol when it condenses.

Which of the following shows how to calculate the mass of ethanol that condenses?

(1)

- ☒ **A** 545 ÷ 109 000

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- **B** 545 ÷ 838 000
- **C** 109 000 ÷ 545
- **D** 838 000 ÷ 545

(Total for question = 1 mark)

Q4.

The absolute temperature scale is a theoretical scale proposed by Lord Kelvin.

On this scale, zero is the temperature at which

- **A** all gases become liquids.
- **B** an ideal gas would exert no pressure.
- **C** the Celsius temperature is −373 °C.
- **D** water freezes.

(Total for Question = 1 mark)

Q5.
When energy is supplied to a substance, changes in the average molecular kinetic energy (E_k) and the average molecular potential energy (E_p) can occur.

When energy is supplied to an ideal gas

- **A** both E_k and E_p increase.
- **B** E_k may increase.
- **C** E_p may increase.
- **D** E_k increases but E_p decreases.

(Total for Question = 1 mark)

Q6.

A sample of an ideal gas at 27 °C is placed in a sealed container. The gas is heated at constant volume to a temperature of 324 °C.
The ratio of the final pressure to the initial pressure exerted by the gas is approximately

- **A** 1
- **B** 2
- **C** 4
- **D** 12

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(Total for question = 1 mark)

Q7.

Water at 100 °C turns into steam at 100 °C.
Which of the following statements is true?

- ☒ **A** The internal energy is unchanged, but the kinetic energy of the molecules increases.
- ☒ **B** The internal energy is unchanged, but the potential energy of the molecules increases.
- ☒ **C** Both the internal energy and the kinetic energy of the molecules increase
- ☒ **D** Both the internal energy and the potential energy of the molecules increase

(Total for question = 1 mark)

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Q8.

The average kinetic energy of the molecules in an ideal gas is

☒ **A** directly proportional to the square root of the absolute temperature.

☒ **B** directly proportional to the absolute temperature.

☒ **C** independent of the absolute temperature.

☒ **D** inversely proportional to the absolute temperature.

(Total for question = 1 mark)

Q9.

A black body radiator has a temperature of 300°C.

What is the wavelength corresponding to the peak intensity of the emitted radiation?

☒ **A** 5.1×10^{-6} m

☒ **B** 9.7×10^{-5} m

☒ **C** 1.7×10^{0} m

☒ **D** 2.0×10^{5} m

(Total for question = 1 mark)

Q10.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Air is trapped in a glass tube. When the air is forced into a smaller volume at a constant temperature, the pressure increases.

Which of the following statements about air molecules is a reason why the pressure the trapped air exerts on the tube increases?

☒ **A** The molecules have a greater mean kinetic energy.

☒ **B** The molecules make more frequent collisions with each other.

☒ **C** The molecules make more frequent collisions with the walls of the tube.

☒ **D** The molecules experience a greater change in momentum when they collide with the tube.

(Total for question = 1 mark)

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Q11.

Answer the question with a cross in the box you think is correct (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

A sample of an ideal gas has pressure *p*, volume *V* and absolute temperature *T*.

The volume of the gas is decreased to $\frac{2}{3}V$ and the temperature increased to $\frac{6}{5}T$.

Which of the following is the new pressure of the gas?

☐ **A** $\frac{5}{9}p$

☐ **B** $\frac{4}{5}p$

☐ **C** $\frac{5}{4}p$

☐ **D** $\frac{9}{5}p$

(Total for question = 1 mark)

Q12.

When an ideal gas reaches the absolute zero of temperature, the gas

☐ **A** becomes a superfluid.

☐ **B** condenses to a liquid.

☐ **C** has maximum molecular potential energy.

☐ **D** exerts no pressure.

(Total for question = 1 mark)

Q13.

α-Centauri is one of the nearest stars to our Sun. The surface temperatures of these two stars are about the same. α-Centauri has a 20% greater diameter than the Sun.

The ratio of the luminosity of α-Centauri to the luminosity of the Sun is about

☐ **A** 1.2

☐ **B** 1.4

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☒ **C** 1.7

☒ **D** 2.1

(Total for Question = 1 mark)

Q14.

A star of diameter *D* and surface temperature *T* has luminosity *L*.

What is the luminosity of a star of diameter $\frac{D}{2}$ and surface temperature 2*T*?

☒ **A** $\frac{L}{4}$

☒ **B** *L*

☒ **C** 4*L*

☒ **D** 16*L*

(Total for question = 1 mark)

Q15.
Air is a mixture of mostly nitrogen and oxygen molecules. The mass of an oxygen molecule is slightly greater than the mass of a nitrogen molecule.

On average, in a sample of air at a given temperature

☒ **A** the nitrogen and oxygen molecules have the same speed.

☒ **B** the nitrogen molecules are travelling more slowly than the oxygen molecules.

☒ **C** the oxygen molecules are travelling more slowly than the nitrogen molecules.

☒ **D** the molecules have relative speeds that depend upon the amount of each gas present.

(Total for Question = 1 mark)

Q16.

A black body radiator of temperature *T* and surface area *A* has a luminosity *L*.

Which of the following is the luminosity of a black body radiator with surface area *A*/2 and temperature 2*T*?

(1)

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☒ **A** $\frac{L}{2}$

☒ **B** L

☒ **C** $4L$

☒ **D** $8L$

(Total for question = 1 mark)

Q17.

When the absolute temperature of an ideal gas is doubled, the internal energy of the gas changes by a factor of

☒ **A** 1

☒ **B** √2

☒ **C** 2

☒ **D** 4

(Total for question = 1 mark)

Q18.

At night the Earth's surface cools down as energy is radiated away into space.

Most of the energy is radiated away as

☒ **A** infrared radiation.

☒ **B** microwaves.

☒ **C** ultraviolet radiation.

☒ **D** visible light.

(Total for Question = 1 mark)

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