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End-semester exam

Q.1

What is the primary determinant of the perceived color of an object?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ The object's distance from the observer
- ☒ The wavelengths that the object reflects
- ☐ The object's texture and surface characteristics
- ☐ The temperature of the light illuminating the object

Q.2

Which of the following is a condition of the eye that affects your distance vision where you can see objects that are near, but you have trouble viewing objects that are farther away like a grocery store, aisle markers or road signs?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ Cataract
- ☒ Myopia
- ☐ Hyperopia
- ☐ Astigmatism

Q.3

In virtual reality systems, gaze input refers to:

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ Interacting with virtual objects through voice commands
- ☐ Using hand gestures to interact with virtual objects
- ☐ Controlling movement through head-tracking sensors
- ☒ Navigating virtual environments by tracking eye movements

Q.4

A particular case of aberration which occurs when a fish-eyed lens is used and that causes straight lines to appear curved outwards, is called as _____ distortion.

Max. score: 1; Neg. score: 0; Your score: 0

Your answer:

petzel

Correct answer:

barrel

Q.5

Fill in the blanks to two places after the decimal

A ray of light initially travelling through the air (refractive index = 1.0) enters a material at an angle of 30 degrees with respect to the line normal to the surface. The light in this material is observed to bend towards the normal by 5 degrees. The index of refraction, n, of the material is _____.

Max. score: 1; Neg. score: 0; Your score: 1

Your answer:

1.18

Correct answer:

1.15 - 1.25

Q.6

Identify the type of optical defect in the below image. The left image is the one with the defect while the right image has the defect corrected.

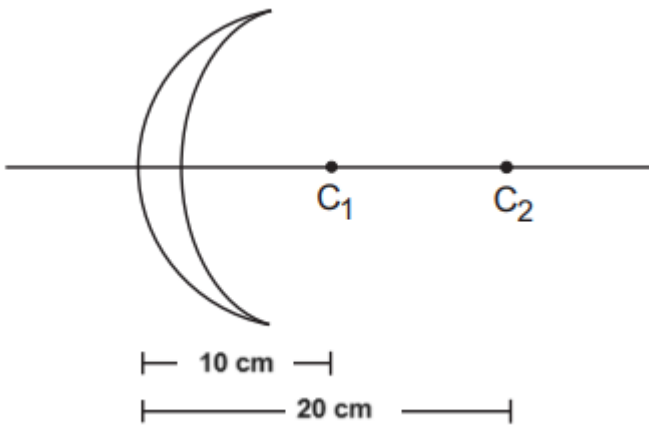


Max. score: 1; Neg. score: 0; Your score: 1

- ☐ Chromatic aberration
- ☐ Barrel distortion
- ☒ Pincushion distortion
- ☐ Astigmatism

Q.7

The points C1 and C2 denote the centres of curvature of a thin lens shown below and the refractive index is 1.5. The focal length of the thin lens is _____ cm.



Max. score: 1; Neg. score: 0; Your score: 1

Your answer:

40

Correct answer:

39.9 - 40.1

Q.8

The rays of different colors fail to converge at a point after going through a converging lens. What is this defect called?

Max. score: 1; Neg. score: 0; Your score: 1

- ☒ Chromatic aberration
- ☐ Spherical aberration
- ☐ Distortion
- ☐ Coma

Q.9

How can touch sensations be simulated in virtual reality (VR) environments?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ By enhancing the visual fidelity of textures to create a sense of touch
- ☐ By emitting scents corresponding to virtual objects in the environment.
- ☒ By integrating haptic feedback devices such as gloves or controllers.
- ☐ By adjusting the temperature of the VR headset to mimic tactile sensations.

Q.10

A convex lens is made of a material with a refractive index of 1.6. If the radii of curvature of its two surfaces are 12 cm and 8 cm respectively, its focal length is _____ cm.

Max. score: 1; Neg. score: 0; Your score: 1

Your answer:

8

Correct answer:

7.9 - 8.1

Q.11

How does haptic exploration contribute to texture perception in virtual reality (VR) environments?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ By adjusting the temperature of the VR headset to mimic tactile sensations.
- ☐ By enhancing the visual fidelity of textures through high-resolution displays.
- ☒ By providing tactile feedback and sensations through haptic feedback devices.
- ☐ By emitting scents corresponding to virtual objects' textures in the environment.

Q.12

How can you draw a ray that extends for a specific distance in Unity using Debug.DrawRay?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ By omitting the direction parameter and setting the length parameter to the desired distance
- ☐ By specifying a direction vector and leaving the length parameter undefined
- ☐ By setting the length parameter to zero, which extends the ray infinitely
- ☒ By defining both the origin and direction parameters, with the length



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Max. score: 1; Neg. score: 0; Your score: 1

- ☐ To improve gameplay balance
- ☐ To prevent motion sickness in players
- ☒ To maintain a realistic perspective by avoiding kinematic singularities that cause the viewpoint to spin uncontrollably
- ☐ To avoid rendering glitches for game objects with multiple oblique angled features

Q.14 In VR headsets, which optical component is primarily responsible for enlarging the virtual image and focusing it on the user's eyes?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ Reflector Solution
- ☐ Prism
- ☒ Lens
- ☐ Polarizer

Q.15 What aspect of VR experiences is typically evaluated in usability testing?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ The cost of VR hardware
- ☒ The realism of graphics and audio
- ☒ The ease of navigation and interaction within the VR environment
- ☐ The duration of VR sessions

Q.16 How does the use of high refresh rate displays contribute to the optical performance of VR headsets?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ It improves motion tracking accuracy
- ☐ It enhances color reproduction
- ☐ It reduces image distortion
- ☒ It minimizes screen flicker

Q.17 A triangle in the XY plane has vertices given by A(2, 3), B(4, 1) and C(6, 5). It is rotated by 90 degrees in the counterclockwise direction about the origin. The vertex C has now transformed to the vertex C' with its new X coordinate given as

Max. score: 1; Neg. score: 0; Your score: 1

Your answer:
-5

Correct answer:
-5.01 - -4.99

Q.18 In AR/VR design, what is the primary purpose of sketching?

Max. score: 1; Neg. score: 0; Your score: 1

- ☒ To generate code for programming AR/VR interactions
- ☐ To create detailed 3D models for implementation
- ☒ To visualize and iterate on concepts quickly
- ☐ To compile user feedback

Q.19 The flicker fusion threshold refers to:

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ The threshold for perceiving color in low-light conditions.
- ☐ The minimum brightness required to detect a flickering light source.
- ☒ The maximum frequency of flickering at which a light source appears steady.
- ☐ The time it takes for the human eye to adapt to changes in ambient lighting.

Q.20 After conducting a usability survey for a virtual reality (VR) application, a developer wants to determine if there is a significant difference in the user satisfaction scores between two versions of the application. The satisfaction scores for Version A are: 85, 88, 82, 90, 87, and for Version B are: 78, 80, 75, 82, 79. At a significance level of 0.05, it is observed that the critical t-value with 9 degrees of freedom is -2.262. What is the conclusion regarding the user satisfaction scores for Version A and Version B of the VR application?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ The significance level is insufficient to draw a conclusion
- ☒ There is a significant difference in user satisfaction scores between the two versions.
- ☐ There is no significant difference in user satisfaction scores between the two versions.
- ☐ The difference in user satisfaction scores cannot be determined from the provided information

Q.21 Answer to two places after the decimal

A lens has a power of +4.0 diopters. So, its focal length in meters is _____ m.

Max. score: 1; Neg. score: 0; Your score: 1

Your answer:
0.25

Correct answer:
0.24 - 0.26

Q.22 What does each panel in an AR/VR storyboard represent?

Max. score: 1; Neg. score: 0; Your score: 1

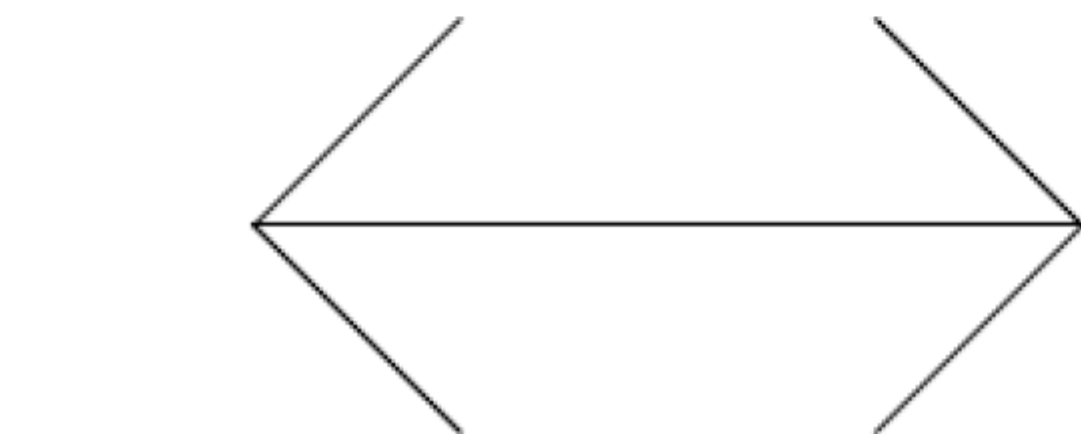
- ☐ A marketing campaign
- ☒ A step in the user's journey
- ☐ A design iteration
- ☐ A usability test scenario

Q.23 Which coordinate system is commonly used to represent positions and orientations in virtual worlds?

Max. score: 1; Neg. score: 0; Your score: 1

- ☐ Spherical coordinate system
- ☒ Cartesian coordinate system
- ☐ Polar coordinate system
- ☐ Cylindrical coordinate system

Q.24 Which illusion below corresponds to the figure below where the lower horizontal segment appears to be shorter than the one above, but they are the same length?

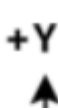


Max. score: 1; Neg. score: 0; Your score: 1

- ☐ Checker shadow illusion
- ☒ Muller-Lyer illusion
- ☐ Ponzi illusion
- ☐ Ebbinghaus illusion

Q.25 Which of the following figures represents a positive rotation about the z-axis in a left-handed co-ordinate system?

Max. score: 1; Neg. score: 0; Your score: 1

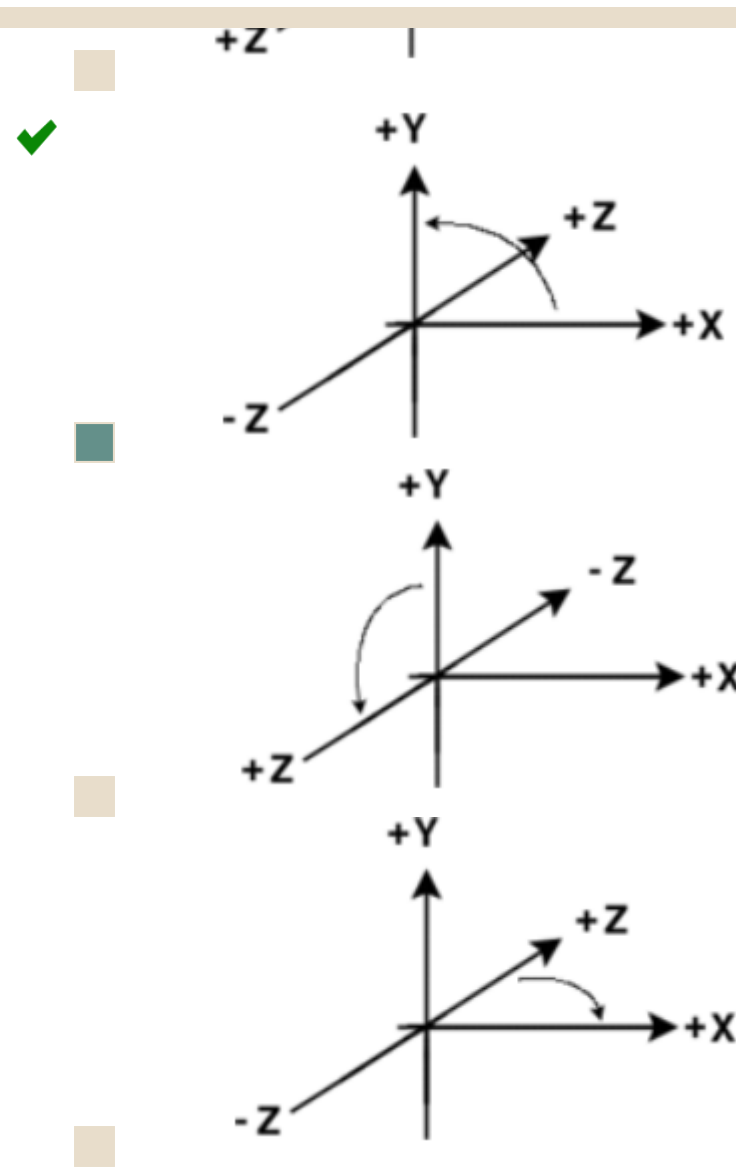




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Q.26 Which component of a half-edge stores information about the adjacent face?

Max. score: 1; Neg. score: 0; Your score: 1

- Previous half-edge
- Origin vertex
- Twin half-edge
- Next half-edge

Q.27 In virtual world geometry, what does the term "mesh" refer to?

Max. score: 1; Neg. score: 0; Your score: 1

- The algorithm for rendering textures in real-time
- The grid system used to map coordinates in virtual space
- The virtual environment's lighting system
- The geometric structure defining the surfaces of objects

Q.28 What is texture mapping used for in 3D graphics?

Max. score: 1; Neg. score: 0; Your score: 0

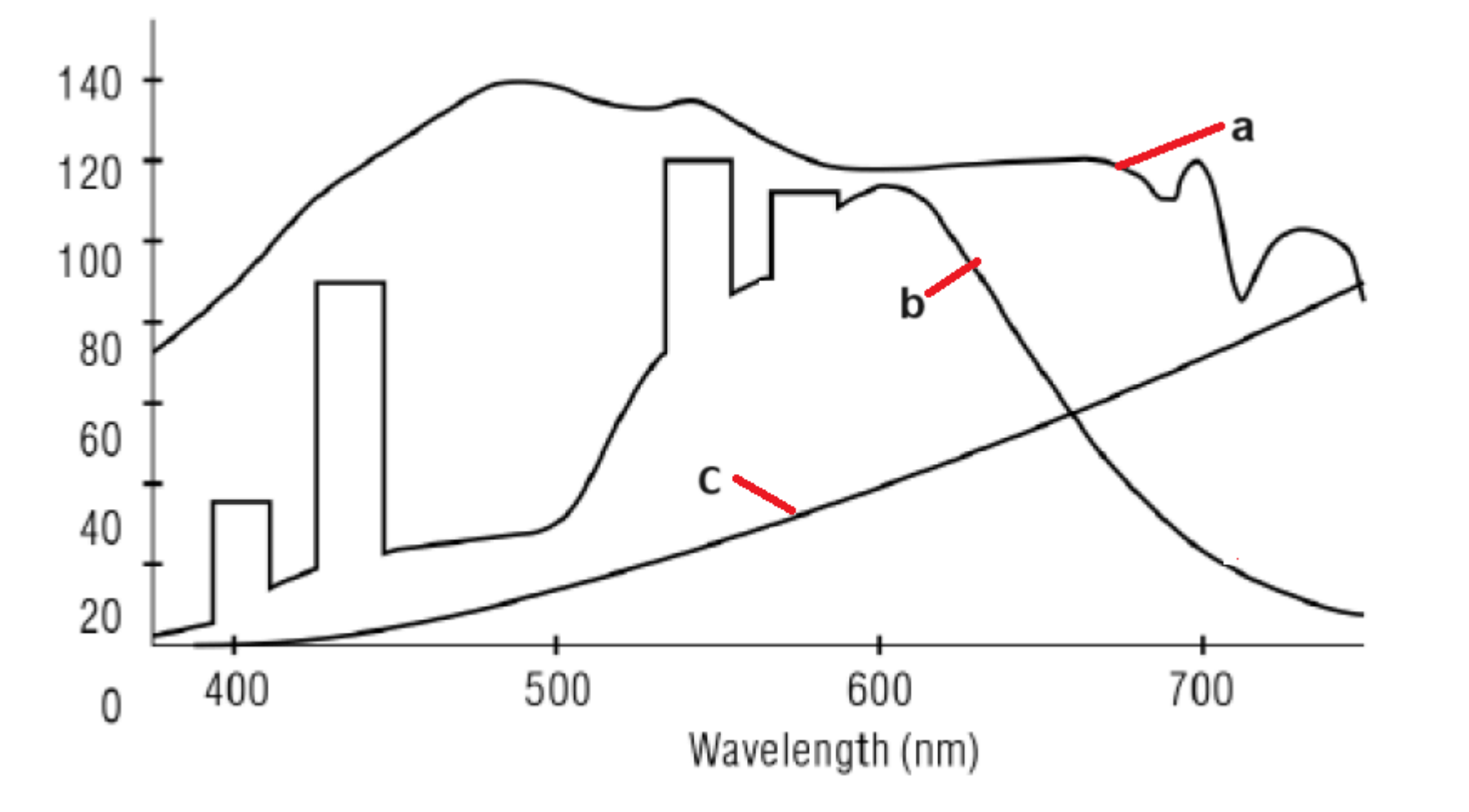
- To create lighting effects
- To create 3D models from scratch
- To add color and shading to 3D objects
- To define the surface properties of 3D objects

Q.29 What is the purpose of Unity's Rigidbody component?

Max. score: 1; Neg. score: 0; Your score: 1

- To control audio playback
- To handle object transformations
- To render 3D models
- To simulate physics interactions

Q.30 Match the graphs of spectral power distributions to different types of light sources.



Max. score: 1; Neg. score: 0; Your score: 1

- a - Fluorescent
- b - Incandescent
- c - Noon sunlight
- a - Noon sunlight
- b - Fluorescent
- c - Incandescent
- a - Noon sunlight
- b - Incandescent
- c - Fluorescent
- a - Fluorescent
- b - Noon sunlight
- c - Incandescent

Q.31 In C#, what does the virtual keyword indicate when applied to a method in a base class?

Max. score: 1; Neg. score: 0; Your score: 1

- The method is automatically invoked by derived classes
- The method cannot be overridden in derived classes
- The method must be overridden in derived classes
- The method can be overridden in derived classes

Q.32 In a half-edge data structure, what does the "next" half-edge point to?

Max. score: 1; Neg. score: 0; Your score: 0

- The next half-edge in the opposite direction
- The next half-edge around the same face
- The next half-edge along the same edge
- The next half-edge in the global order

Q.33 Which of the following types of lighting represents a light that's located at a point in the scene and emits light in a cone shape?

Max. score: 1; Neg. score: 0; Your score: 1

- Area light
- Point light
- Spot light
- Directional light

Q.34 What term describes the ability of the human visual system to perceive the color of an object as relatively constant despite changes in illumination?

Max. score: 1; Neg. score: 0; Your score: 1

- Color illusion
- Color constancy
- Color temperature
- Color adaptation

Q.35 What is the primary function of lenses in Head-Mounted Displays (HMDs)?

Max. score: 1; Neg. score: 0; Your score: 1

- To regulate the frame rate of the VR content
- To adjust the brightness of the display
- To enhance the color accuracy of the visuals
- To magnify and focus the virtual images for the user

Q.36 Which Unity component is commonly used to define the visual appearance of objects by



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- ScriptableObject
- Collider
- Rigidbody
- Shader

Q.37 Which Unity function casts a ray, from an origin, in a specified direction with a length against all colliders in the Scene?

Max. score: 1; Neg. score: 0; Your score: 1

- Renderer
- Physics.Raycast
- PhysicMaterial
- Projector

Q.38 A triangle in the XY plane has vertices given by A(3, -1), B(4, 1) and C(2,1). It is rotated by 90 degrees in the counterclockwise direction about the origin. The vertex A has now transformed to the vertex A* with its new X coordinate given as _____.

Max. score: 1; Neg. score: 0; Your score: 1

Your answer:
1
Correct answer:
0.99 - 1.01

Q.39 How many half-edges are associated with each undirected edge in a DCEL?

Max. score: 1; Neg. score: 0; Your score: 1

- 4
- 1
- 2
- 3

Q.40 What is the primary function of Reichardt detectors in visual processing?

Max. score: 1; Neg. score: 0; Your score: 1

- To enhance color contrast and brightness perception
- To detect edges and contours in images
- To perceive depth and distance in the visual scene
- To analyze motion and detect the direction of movement

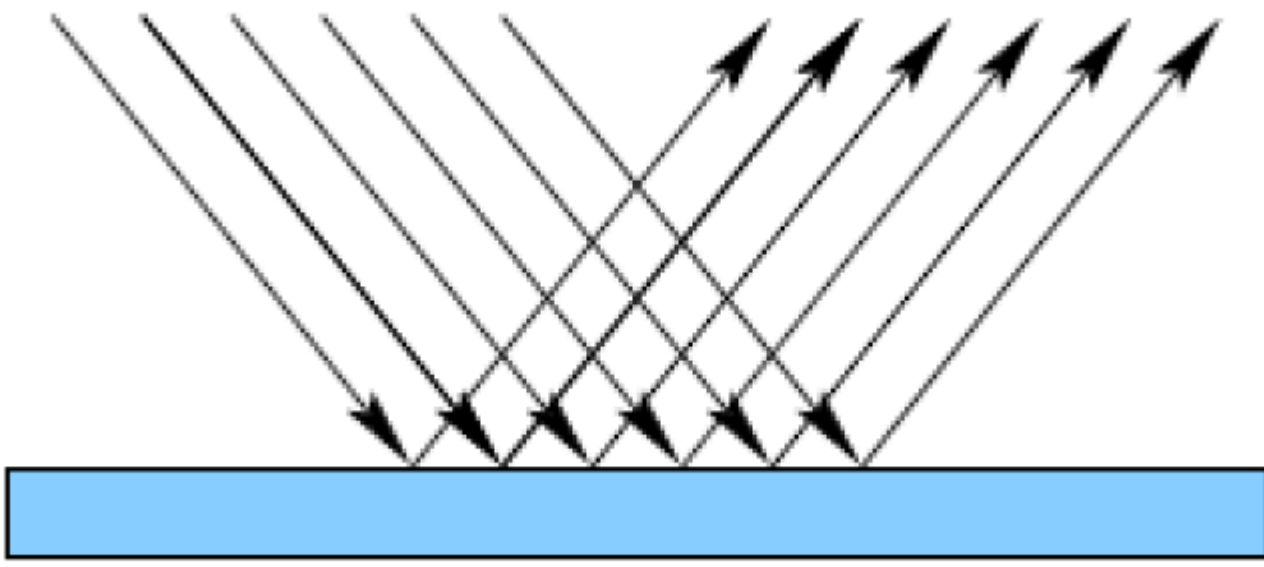
Q.41 What is usually the most complicated operation while moving models in virtual worlds?

Max. score: 1; Neg. score: 0; Your score: 0

- Shearing
- Translation
- Scaling
- 3D rotations

Q.42 State whether the below statement is true or false.

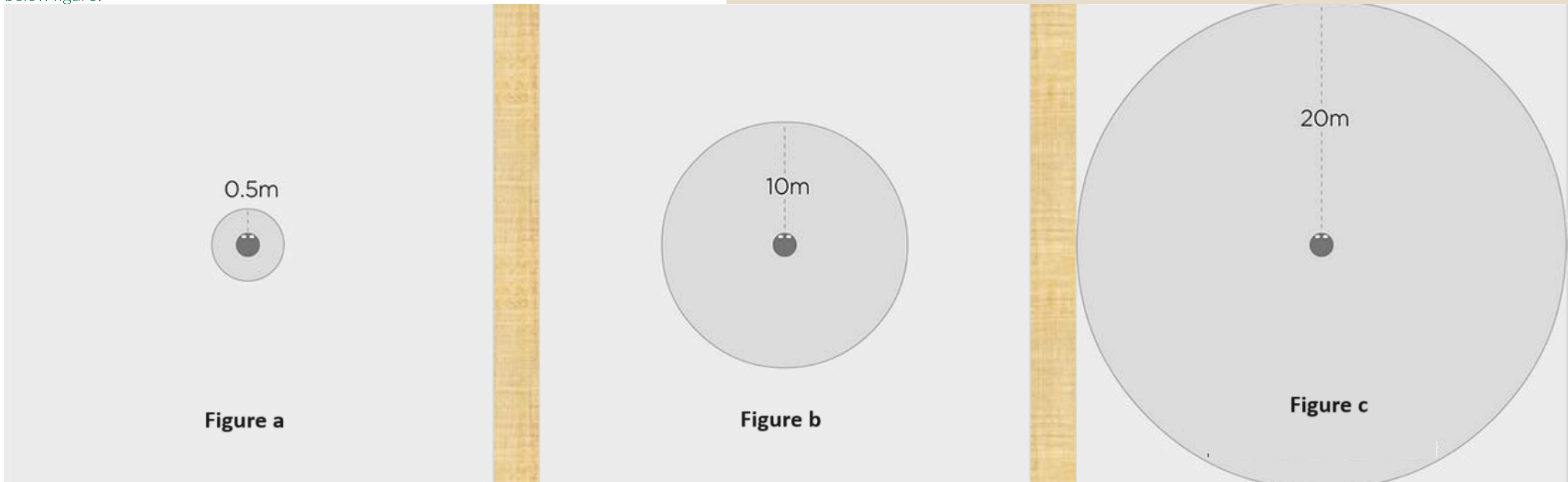
The below figure is an example of diffuse reflection.



Max. score: 1; Neg. score: 0; Your score: 1

- false
- true

Q.43 The human eye is limited by viewing distances which need to be kept in mind while designing head mounted displays. Which types of viewing distances are represented in the below figure?



Max. score: 1; Neg. score: 0; Your score: 1

- None of these options
- Figure a - Minimum comfortable viewing distance
- Figure b - Strong stereoscopic depth perception
- Figure c - Limit of stereoscopic depth perception
- Figure a - Strong stereoscopic depth perception
- Figure b - Minimum comfortable viewing distance
- Figure c - Limit of stereoscopic depth perception
- Figure a - Limit of stereoscopic depth perception
- Figure b - Strong stereoscopic depth perception
- Figure c -Minimum comfortable viewing distance

Q.44 Which approach is commonly used for delivering user training in VR environments?

Max. score: 1; Neg. score: 0; Your score: 1

- Offering online forums and community support for users to troubleshoot issues
- Providing written manuals and documentation for users to study independently.
- Conducting live seminars and workshops with VR experts demonstrating usage.
- Incorporating interactive tutorials and guided experiences within the VR application.

Q.45 How do stereo cues contribute to depth perception in VR?

Max. score: 1; Neg. score: 0; Your score: 1

- By measuring the angle of convergence of the eyes
- By providing information about the relative size of objects
- By detecting differences in brightness and contrast
- By utilizing the parallax effect between the two eyes

Q.46 What is ideation in the design process?

Max. score: 1; Neg. score: 0; Your score: 1

- The stage where stakeholders provide feedback on designs
- The final stage where designs are implemented
- The process of generating, developing, and communicating new ideas
- The phase where prototypes are tested for usability

Q.47 Which challenge is associated with implementing gaze input in virtual reality systems?

